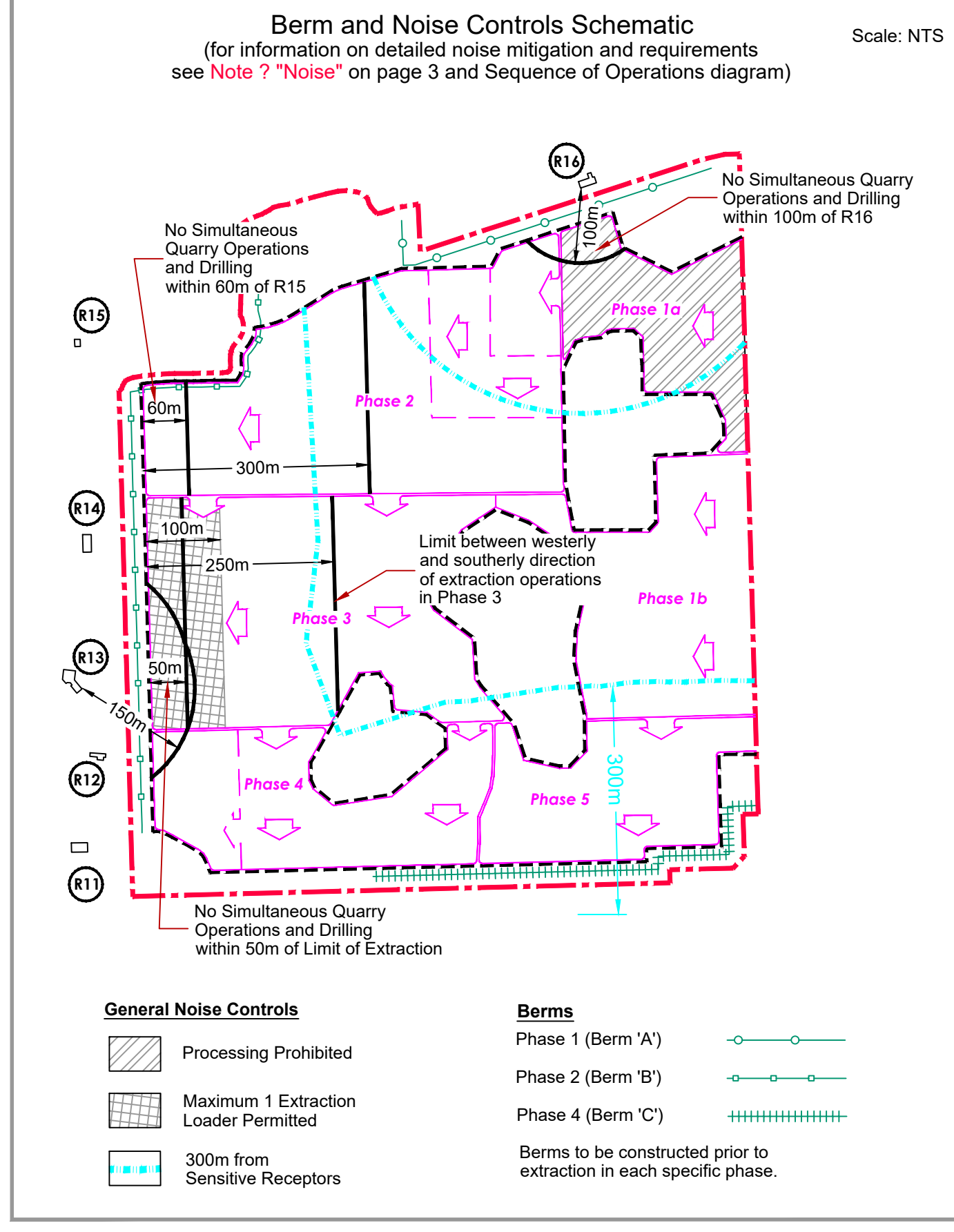
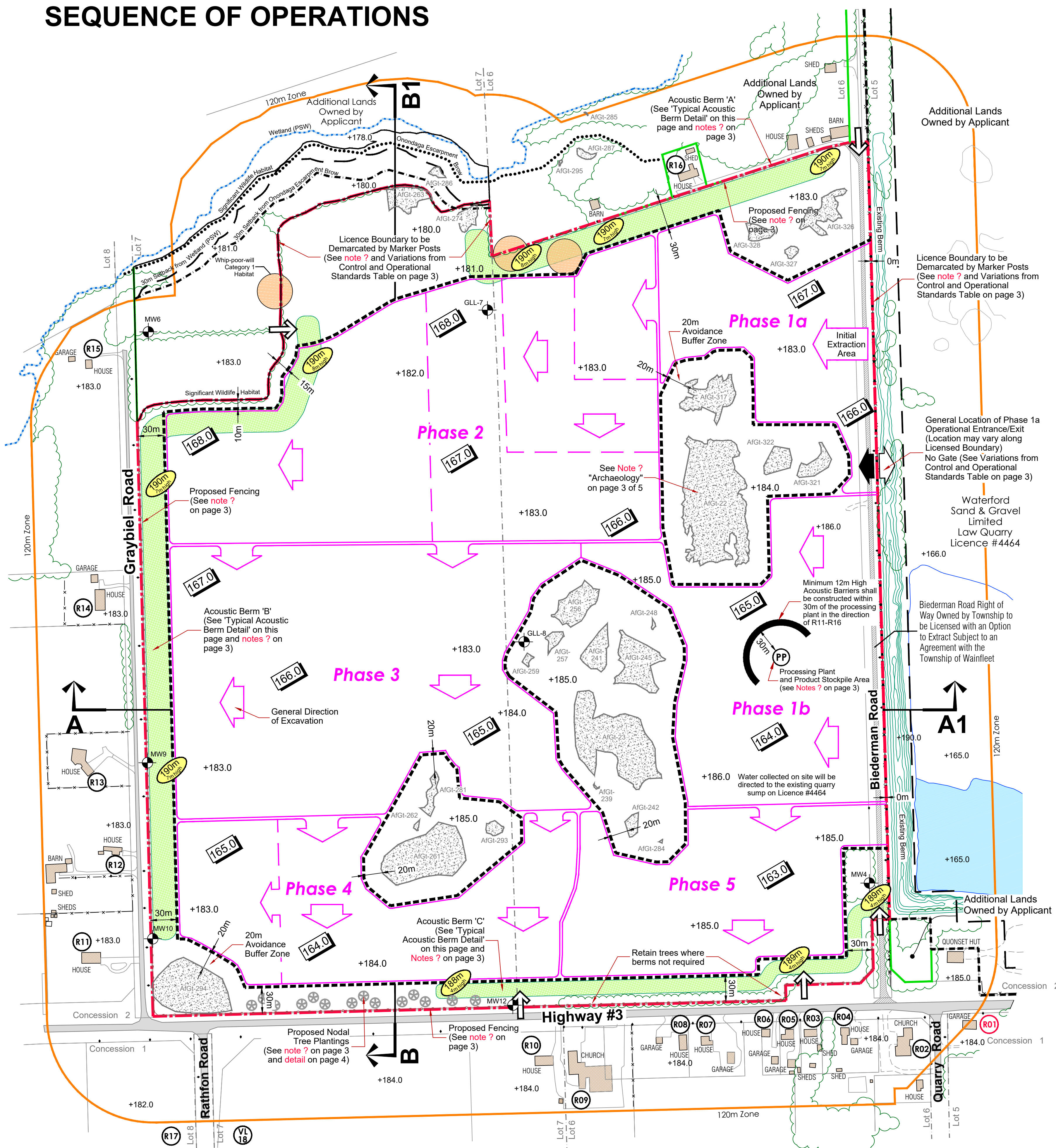


Appendix A

SEQUENCE OF OPERATIONS



General Noise Controls

- Processing Prohibited
- Maximum 1 Extraction Loader Permitted
- 300m from Sensitive Receptors

Berms

- Phase 1 (Berm 'A')
- Phase 2 (Berm 'B')
- Phase 4 (Berm 'C')

Berms to be constructed prior to extraction in each specific phase.

Legal Description
Part of Lots 6 & 7, Concession 2 and Part of Road Allowance Between Lots 5 & 6, Concession 2 (geographic Township of Wainfleet) Township of Wainfleet Region of Niagara

Legend

- Boundary of Area to be Licensed
- Existing Licensed Boundary
- Existing Spot Elevation
- Existing Fence
- Building/Structure
- Field Access
- Monitoring Well
- Existing Vegetation
- Archaeological Sites
- Tree Plantings
- Cross Sections
- Limit of Extraction
- Additional Lands Owned by Applicant
- Operational Entrance
- General Direction of Excavation
- Proposed Acoustic Berm
- Proposed Fence
- Proposed Spot Elevation
- Noise Receptor
- Internal Haul Road

Site Plan Amendments

No.	Date	Description	By

NDMNR Approval Stamp

MHBC Stamp

PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
MHBC
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.574.3650 F: 519.574.0121 | WWW.MHBCPLAN.COM

Applicant

Waterford Sand & Gravel Limited
70 Ewart Avenue
Brantford, Ontario
N3T 5M1
Tel: (519) 752-1300

Applicant's Signature
Ed Lamb
VP/GM Construction Materials

Project

Law Quarry Extension
Part of Lots 6 & 7, Concession 2
(Geographic Township of Wainfleet) Township of Wainfleet, Regional Municipality of Niagara

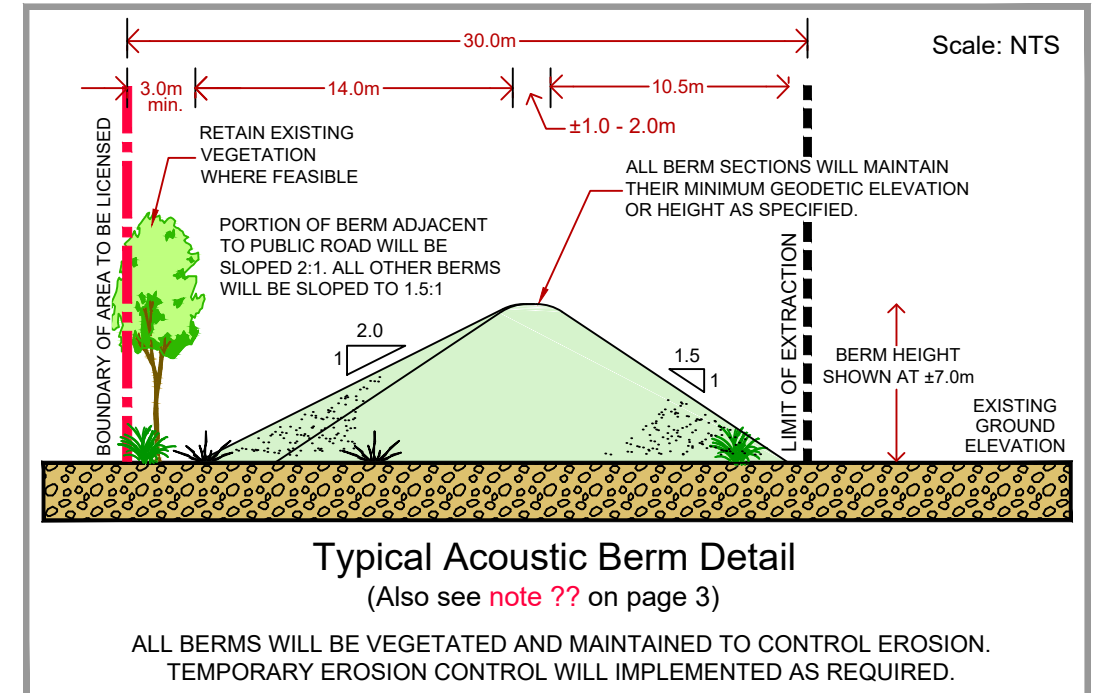
ARA Licence Reference No. _____ Pre-approval review: _____

For Client Review - March 2022

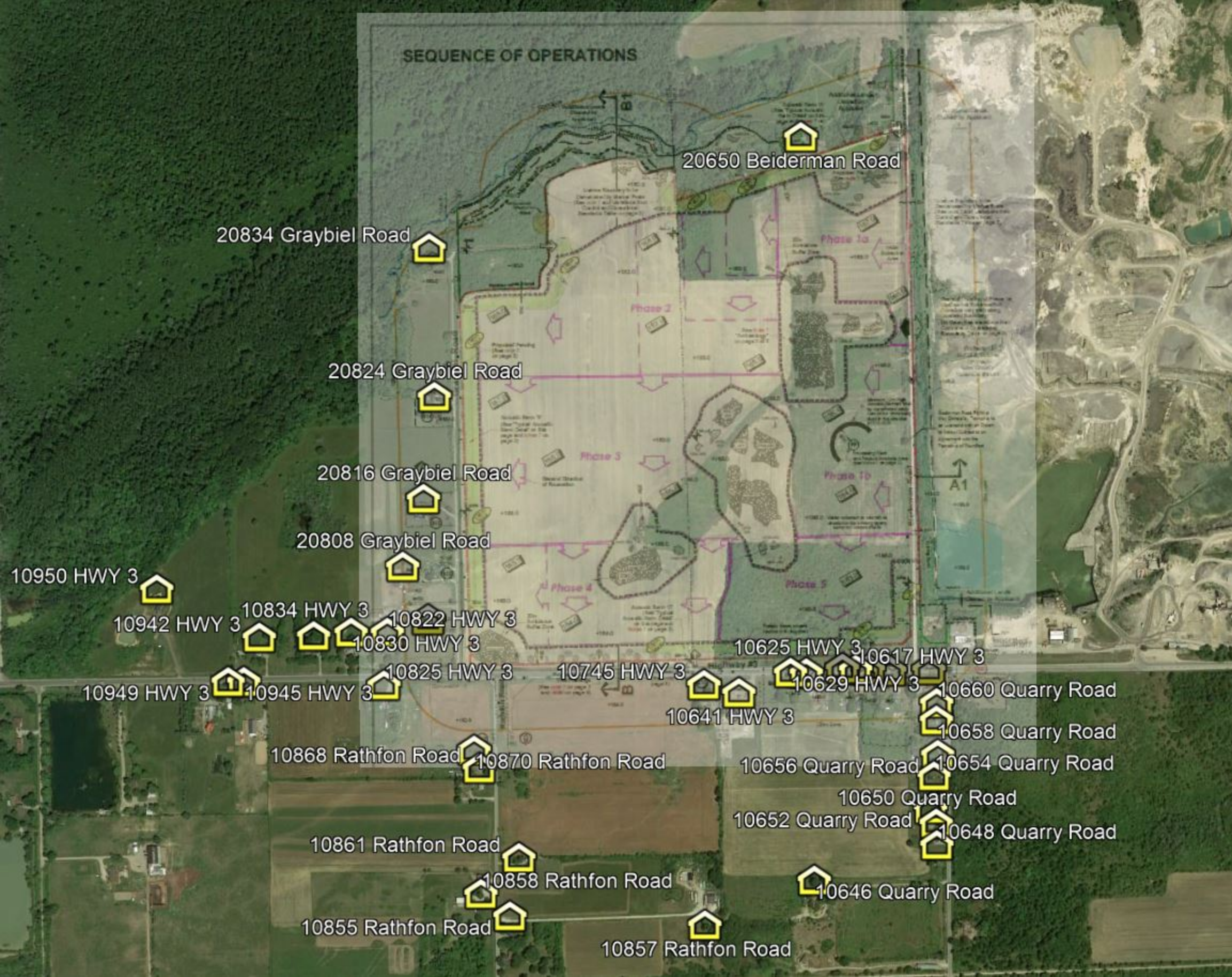
Plot Scale 1:2,500 (Arch D) SCALE 1:2.5 [1mm = 2.5 units] MODEL

Drawn By D.G.S. File No. _____

Checked By C.P. File No. **0956B**



SEQUENCE OF OPERATIONS



20650 Beiderman Road

20834 Graybiel Road

20824 Graybiel Road

20816 Graybiel Road

20808 Graybiel Road

10950 HWY 3

10942 HWY 3

10834 HWY 3

10822 HWY 3

10830 HWY 3

10825 HWY 3

10745 HWY 3

10625 HWY 3

10617 HWY 3

10629 HWY 3

10660 Quarry Road

10949 HWY 3

10945 HWY 3

10641 HWY 3

10658 Quarry Road

10868 Rathfon Road

10870 Rathfon Road

10656 Quarry Road

10654 Quarry Road

10650 Quarry Road

10652 Quarry Road

10648 Quarry Road

10861 Rathfon Road

10858 Rathfon Road

10646 Quarry Road

10855 Rathfon Road

10857 Rathfon Road

10825 HWY 3



10745 HWY 3



10625 HWY 3



10621 HWY 3



10617 HWY 3



10615 HWY 3



10611 HWY 3



10660 Quarry Road



10658 Quarry Road



10868 Rathfon Road



10870 Rathfon Road



10656 Quarry Road



10654 Quarry Road



10652 Quarry Road



10650 Quarry Road



10648 Quarry Road



10861 Rathfon Road



10858 Rathfon Road



10646 Quarry Road

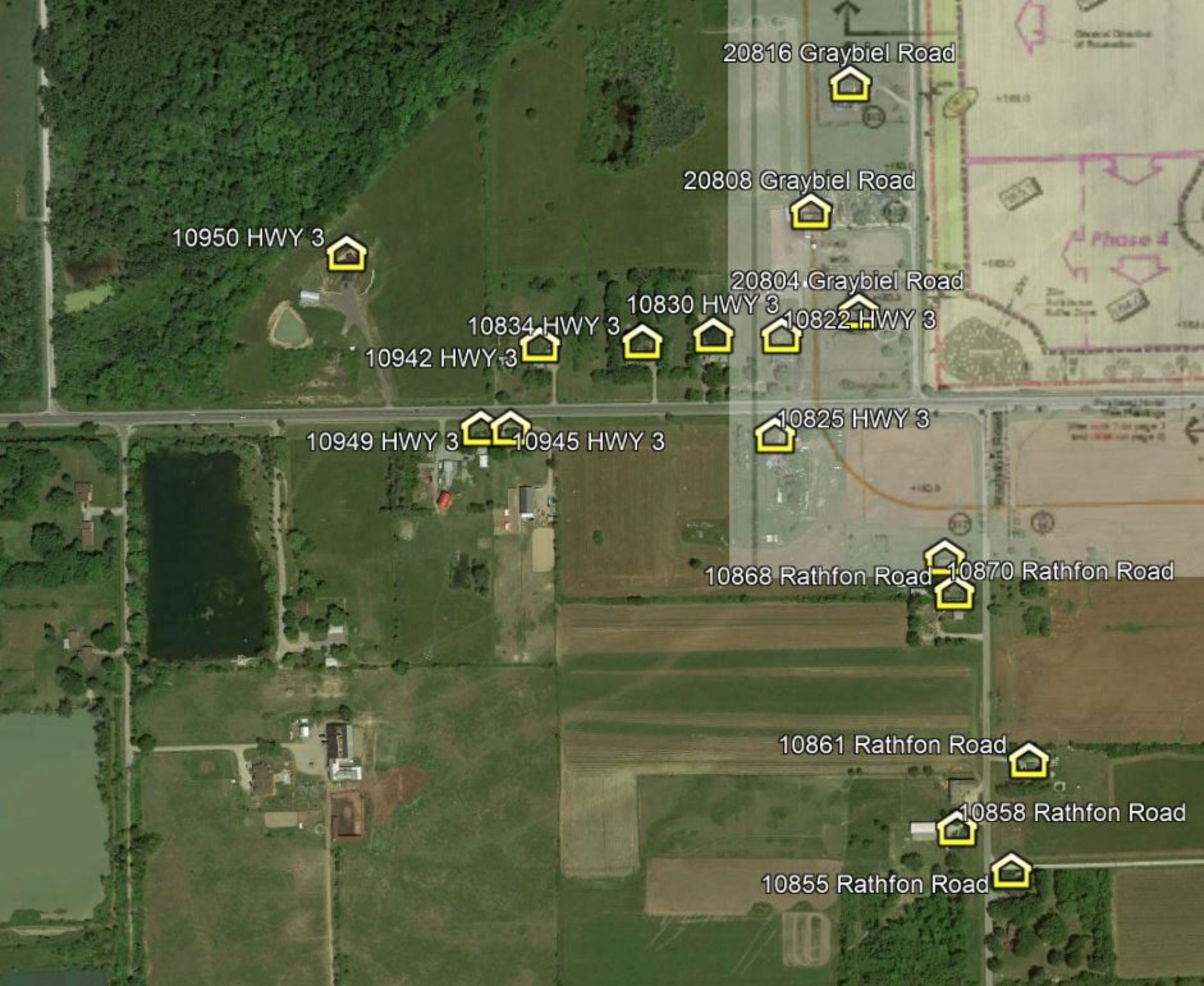


10855 Rathfon Road



10857 Rathfon Road





20816 Graybiel Road

20808 Graybiel Road

20804 Graybiel Road

10950 HWY 3

10830 HWY 3

10834 HWY 3

10822 HWY 3

10942 HWY 3

10825 HWY 3

10949 HWY 3

10945 HWY 3

10868 Rathfon Road

10870 Rathfon Road

10861 Rathfon Road

10858 Rathfon Road

10855 Rathfon Road

SEQUENCE OF OPERATIONS

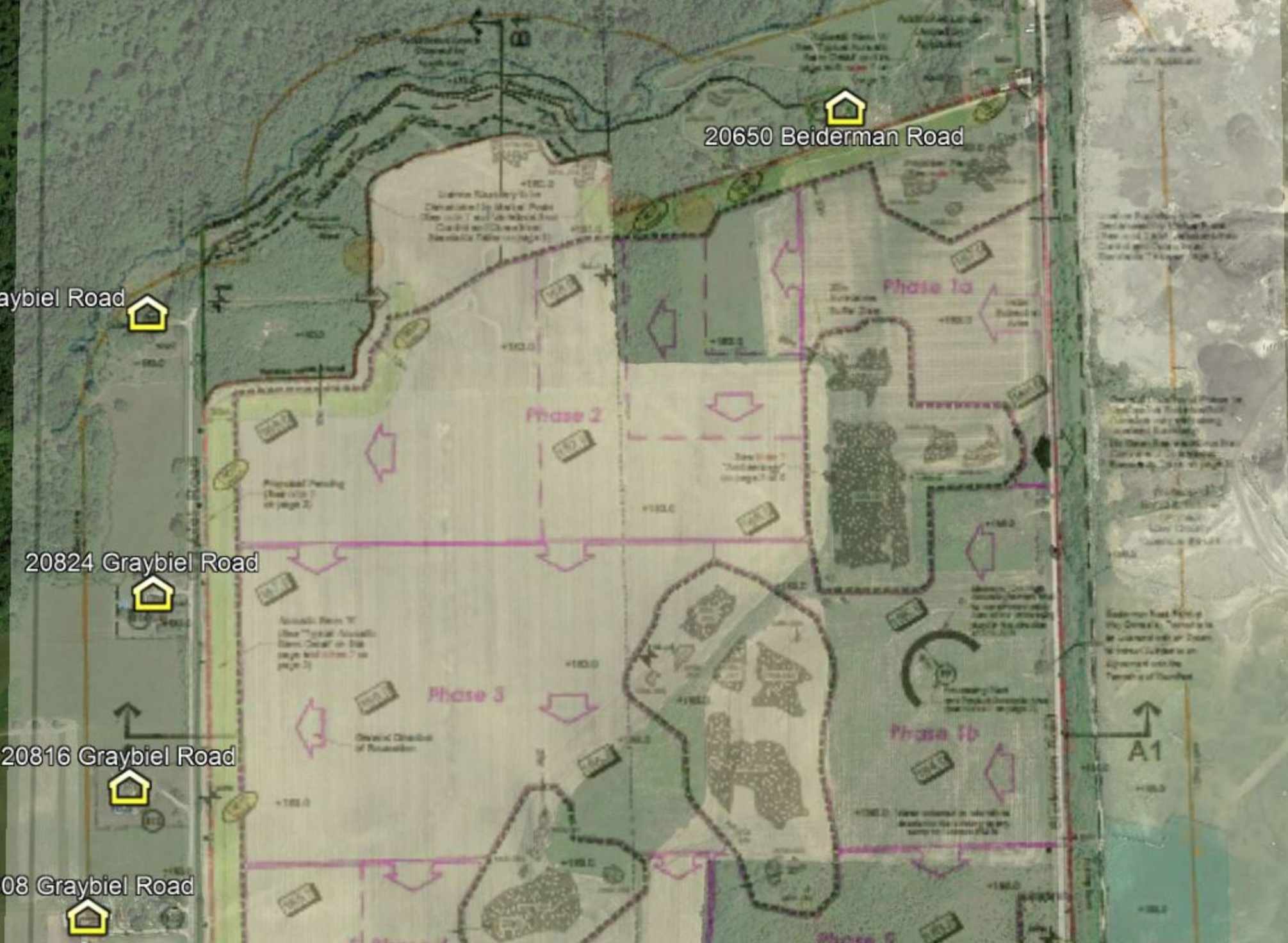
20650 Beiderman Road

20834 Graybiel Road

20824 Graybiel Road

20816 Graybiel Road

20808 Graybiel Road



Appendix B

Waterford Law Quarry

PREVAILING METEOROLOGICAL CONDITIONS

Medians provided by Environment Canada
Canadian Climate Normals 1971-2000
St.Catherines

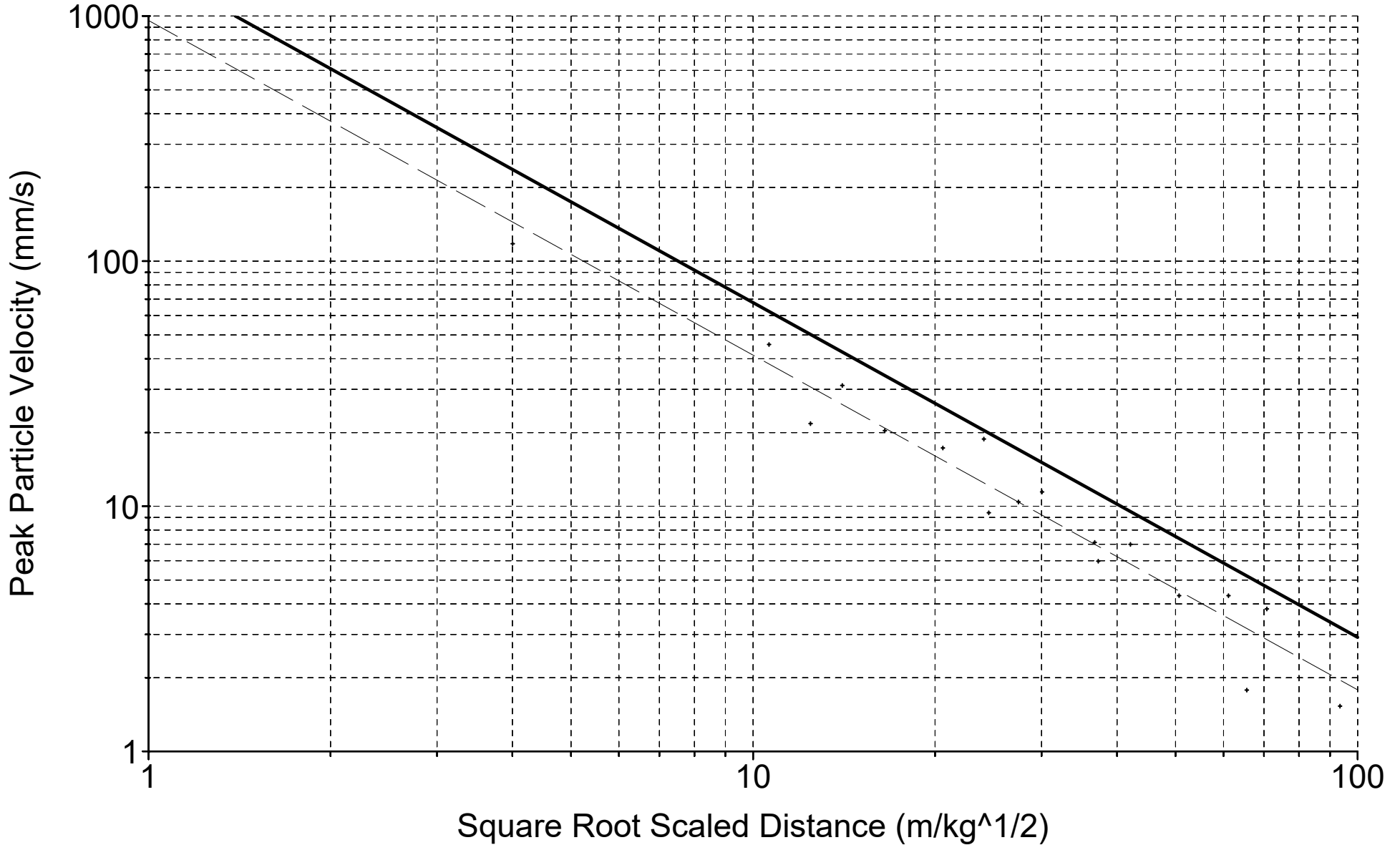
Date	Wind Direction	Max Hourly Wind Velocity Km/h	Temperature (Deg Celsius)
January	SW	89	-4.1
February	SW	63	-3.6
March	SW	74	1.1
April	SW	74	7.2
May	SW	65	13.6
June	SW	65	18.8
July	SW	63	21.8
August	SW	59	20.8
September	SW	53	16.6
October	SW	63	10.3
November	SW	70	4.6
December	SW	70	-1.1

Appendix C

Regression Line For BACK GROUND VIBRATION ATTENUATION - FINAL.SDF

95% Line Equation: $V = 1571.5 * (SD)^{-1.366}$

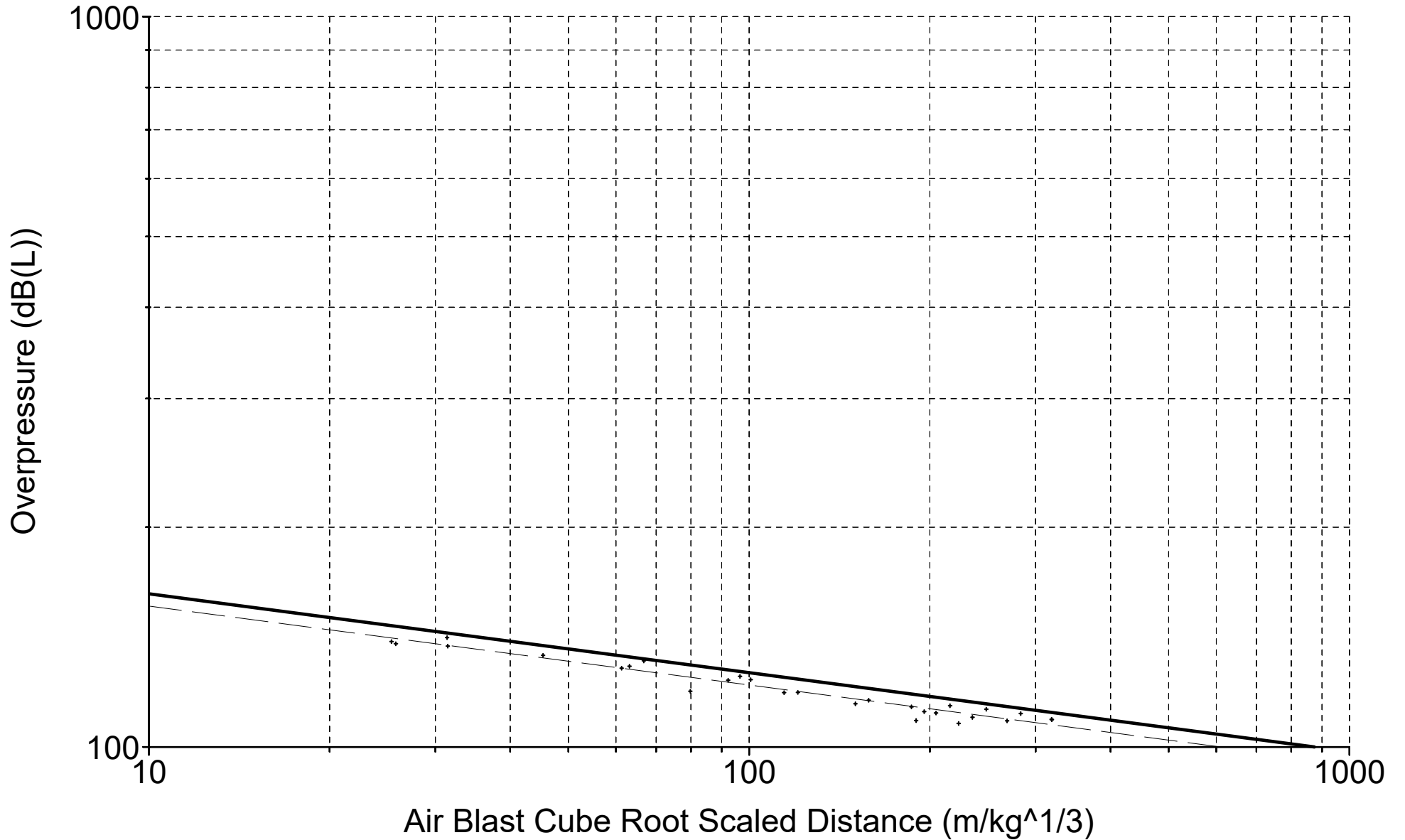
Coefficient of Determination = 0.947 Standard Deviation = 0.107



Regression Line For FRONT AIRBLAST ATTENUATION - FINAL.SDF

95% Line Equation: $V = 207.9 * (SD)^{-0.108}$

Coefficient of Determination = 0.949 Standard Deviation = 0.008



Histogram Start Time 09:36:59 September 17, 2020
Histogram Finish Time 15:06:06 September 17, 2020
Number of Intervals 65.00 at 5 minutes
Range Geo:254.0 mm/s
Sample Rate 1024sps
Job Number: 7862

Serial Number BE20120 V 10.72-8.17 MiniMate Plus/8
Battery Level 6.3 Volts
Unit Calibration September 12, 2019 by InstanTel
File Name V120IMYG.1N0

Notes

Location: 8-F
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

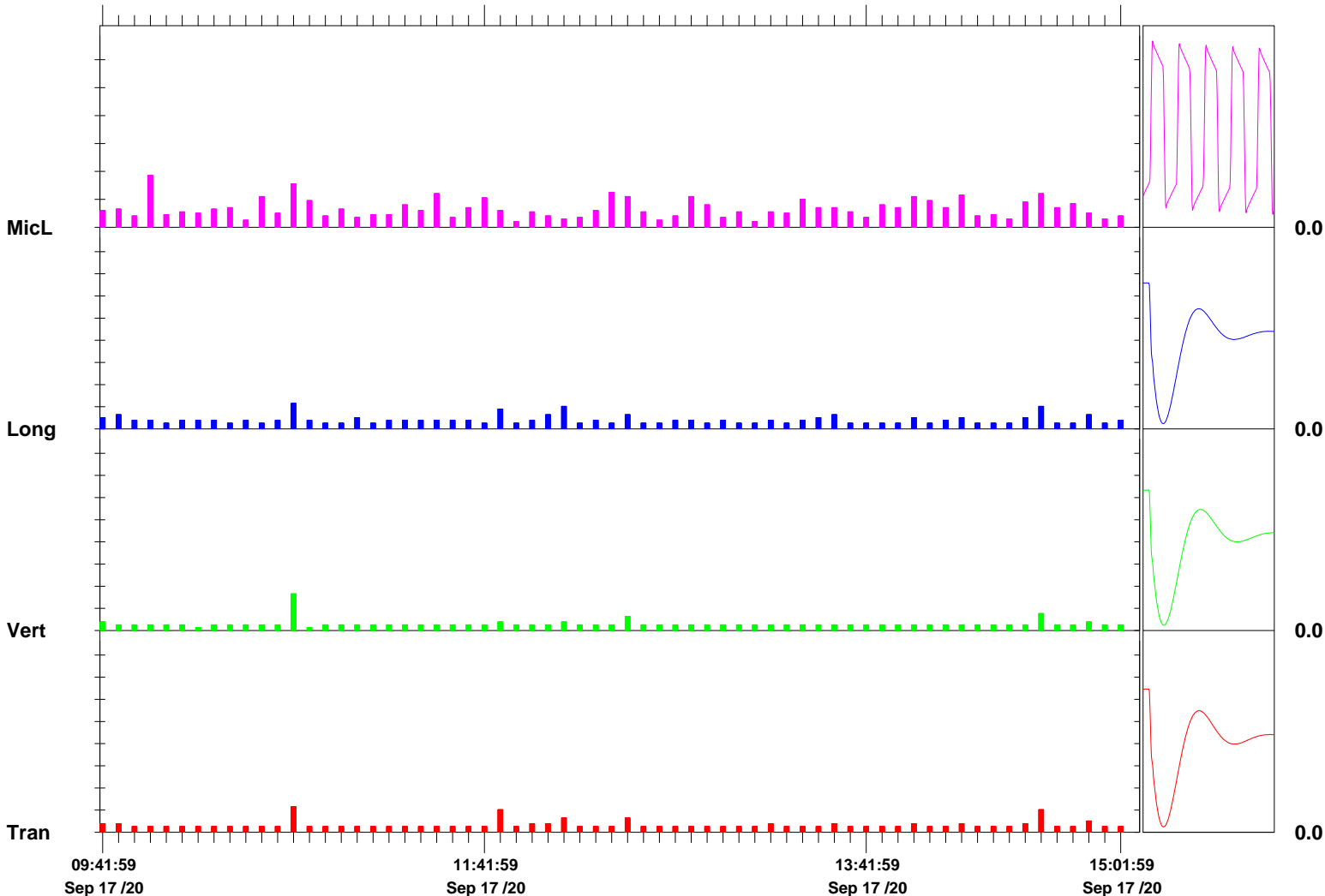
Extended Notes

Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 113.3 dB(L) 9.250 pa.(L) on September 17, 2020 at 09:56:59
ZC Freq 5.0 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 505 mv)

	Tran	Vert	Long	
PPV	1.143	1.651	1.143	mm/s
ZC Freq	37	85	16	Hz
Date	Sep 17 /20	Sep 17 /20	Sep 17 /20	
Time	10:41:59	10:41:59	10:41:59	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.4	7.6	Hz
Overswing Ratio	3.5	3.6	3.7	

Peak Vector Sum 1.888 mm/s on September 17, 2020 at 10:41:59



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 5.000 pa.(L)/div

Sensor Check

Date/Time Long at 10:38:06 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5059 V 10.72-4.32 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration August 11, 2020 by InstanTel
File Name G059IMYI.V10

Notes

Location: 1-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

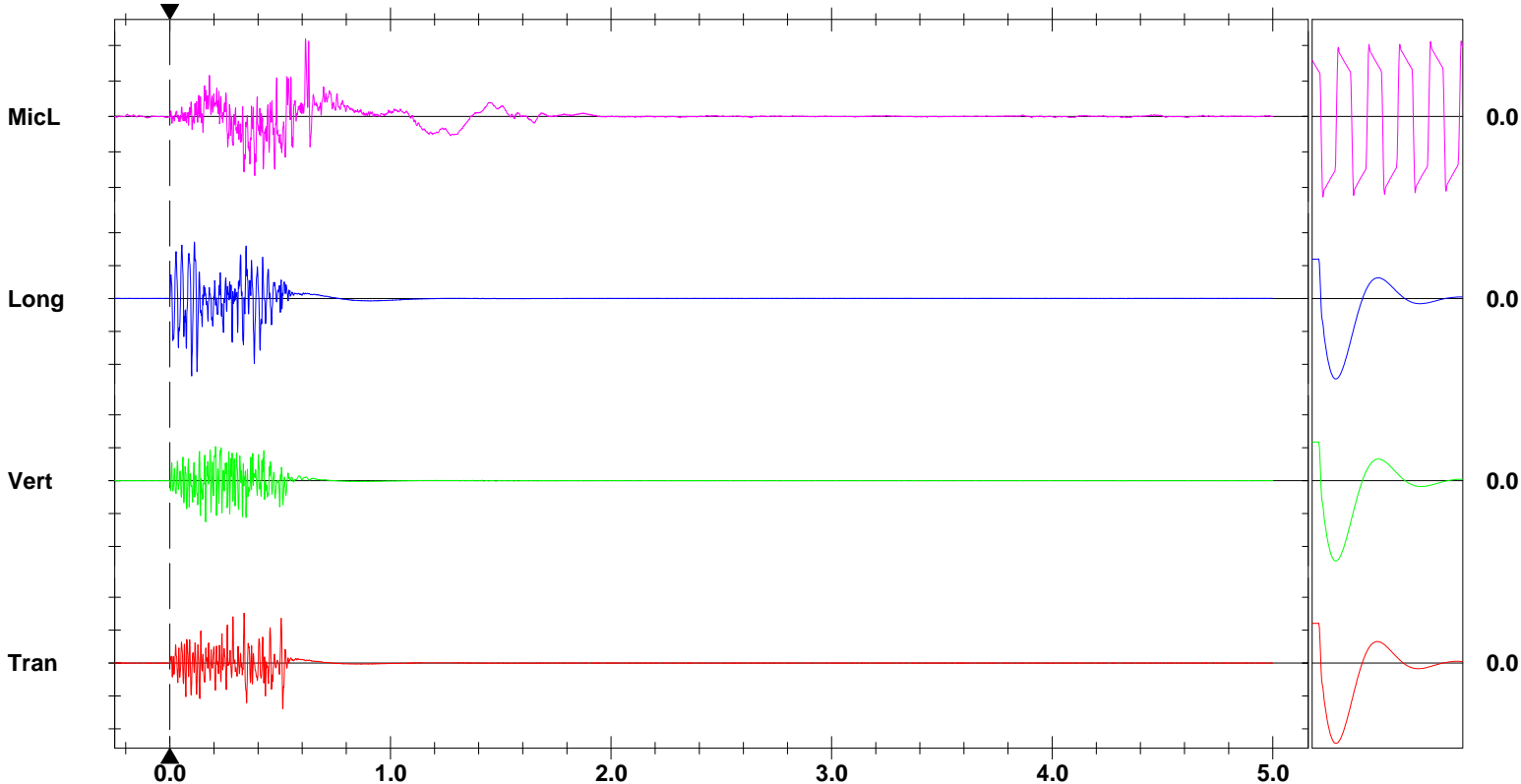
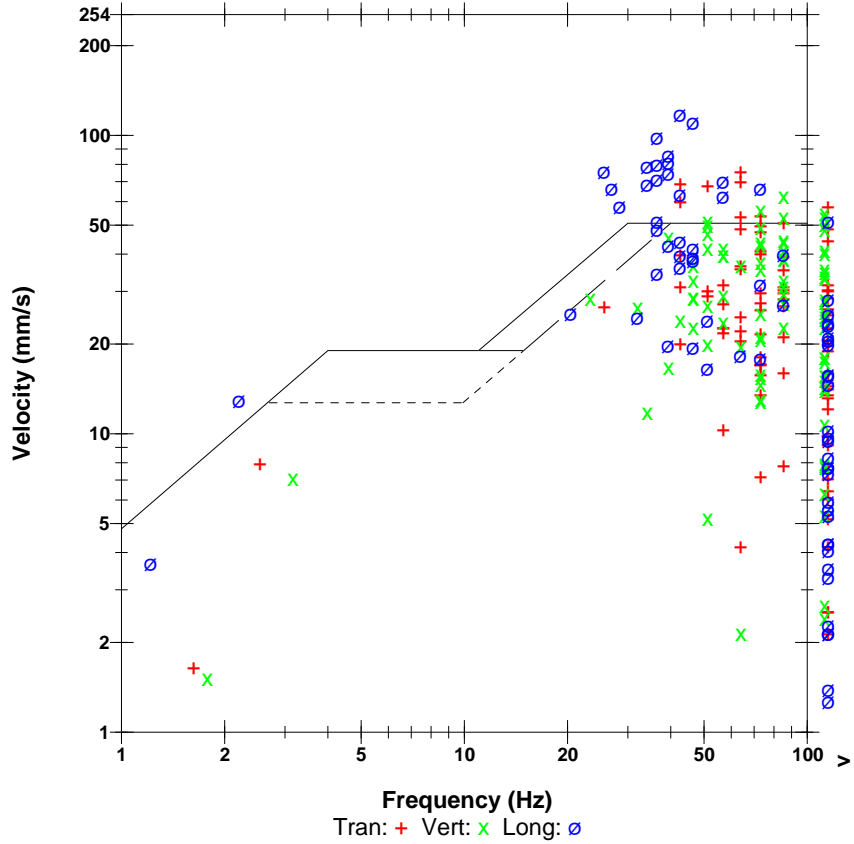
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 134.7 dB(L) 109.3 pa.(L) at 0.615 sec
ZC Freq 8.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 578 mv)

	Tran	Vert	Long	
PPV	75.95	62.74	117.7	mm/s
ZC Freq	64	85	43	Hz
Time (Rel. to Trig)	0.337	0.162	0.099	sec
Peak Acceleration	3.593	5.210	4.574	g
Peak Displacement	0.337	0.207	0.589	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.8	3.9	

Peak Vector Sum 122.1 mm/s at 0.099 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 50.00 mm/s/div Mic: 50.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:19 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5717 V 10.72-4.32 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration August 18, 2020 by InstanTel
File Name G717IMYI.VV0

Notes

Location: 2-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

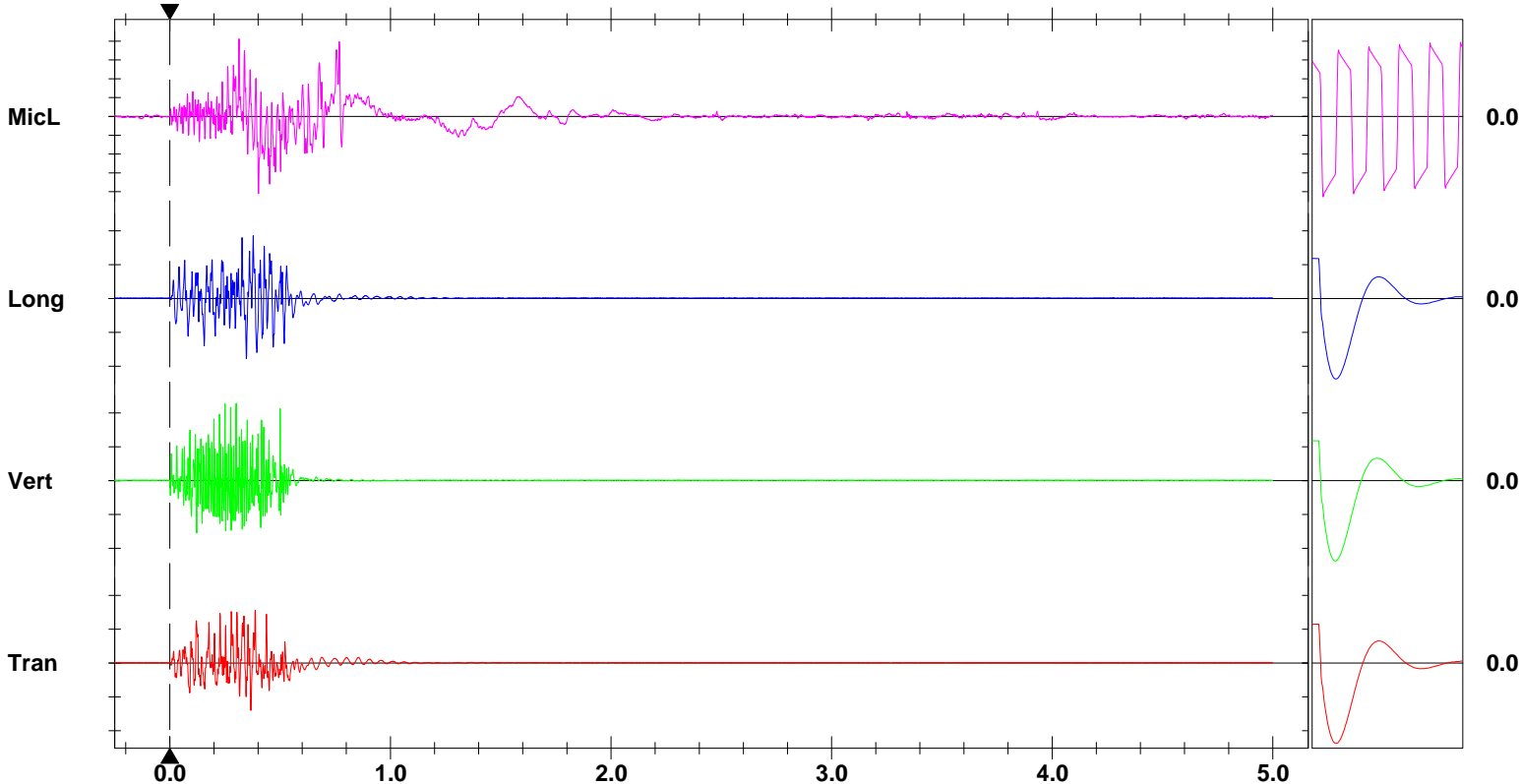
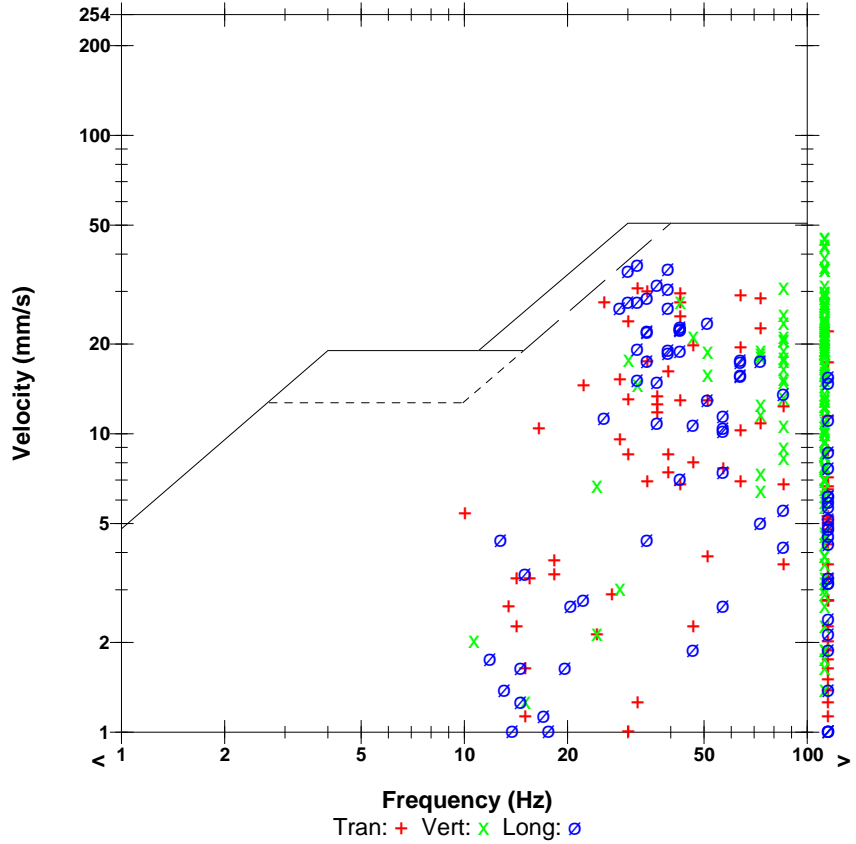
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 126.3 dB(L) 41.25 pa.(L) at 0.313 sec
ZC Freq 24 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 620 mv)

	Tran	Vert	Long	
PPV	31.11	45.72	37.08	mm/s
ZC Freq	32	>100	32	Hz
Time (Rel. to Trig)	0.388	0.301	0.378	sec
Peak Acceleration	1.511	4.189	1.286	g
Peak Displacement	0.145	0.073	0.142	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.6	7.3	Hz
Overswing Ratio	3.7	3.6	3.7	

Peak Vector Sum 49.42 mm/s at 0.328 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 20.00 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:22 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BK5780 V 10.72-4.32 MiniMate Plus/8
Battery Level 6.4 Volts
Unit Calibration November 19, 2019 by InstanTel
File Name G780IMYI.VY0

Notes

Location: 3-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

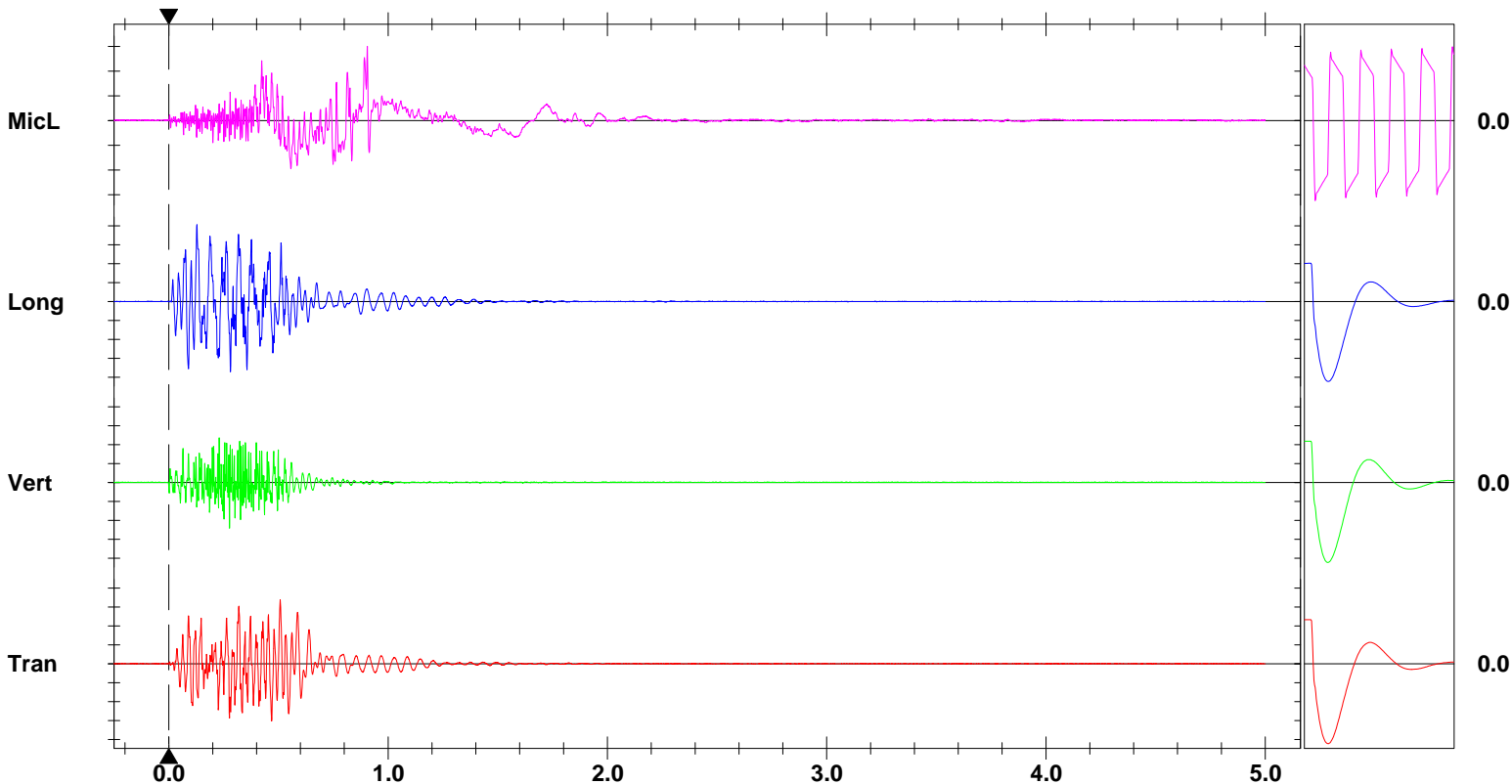
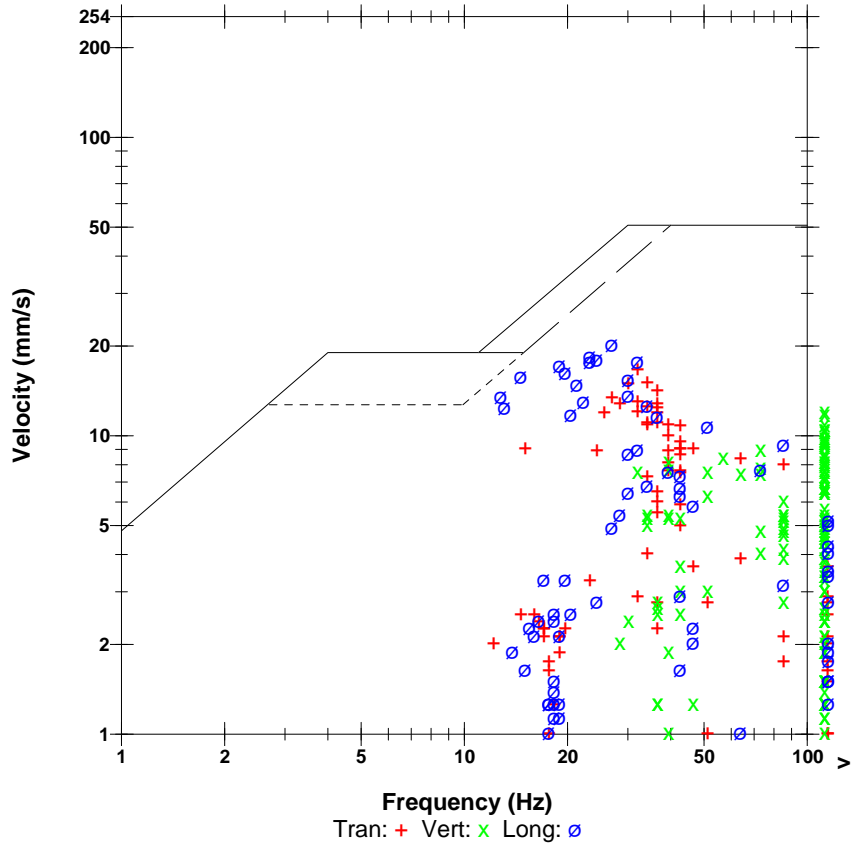
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 123.5 dB(L) 30.00 pa.(L) at 0.905 sec
ZC Freq 10 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 603 mv)

	Tran	Vert	Long	
PPV	16.89	12.06	20.32	mm/s
ZC Freq	32	>100	27	Hz
Time (Rel. to Trig)	0.508	0.276	0.128	sec
Peak Acceleration	0.703	1.034	0.610	g
Peak Displacement	0.080	0.025	0.135	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.2	Hz
Overswing Ratio	3.8	3.5	4.1	

Peak Vector Sum 23.14 mm/s at 0.090 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:29 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE9545 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration November 7, 2019 by InstanTel
File Name K545IMY1.W50

Notes

Location: 4-B
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

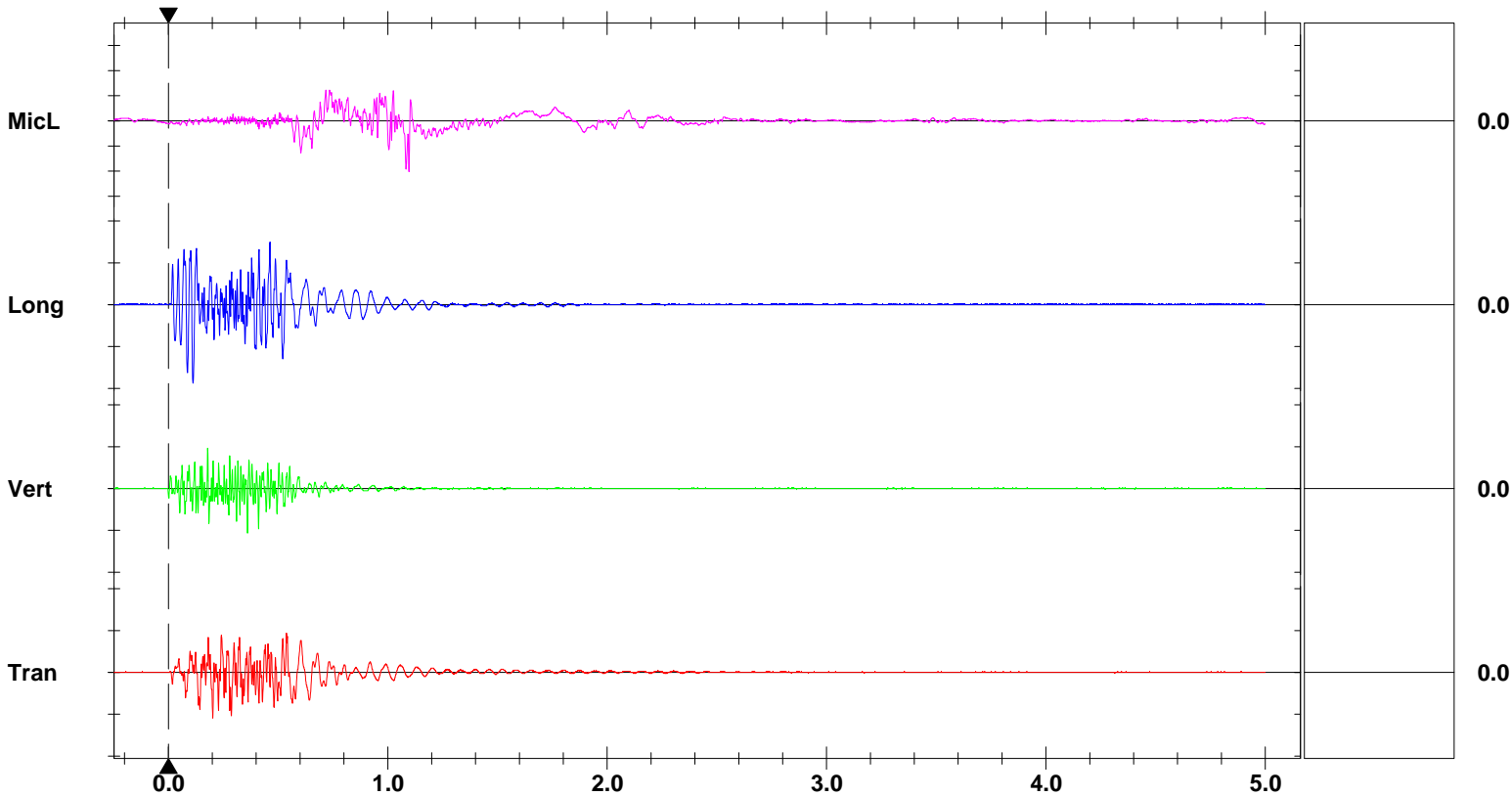
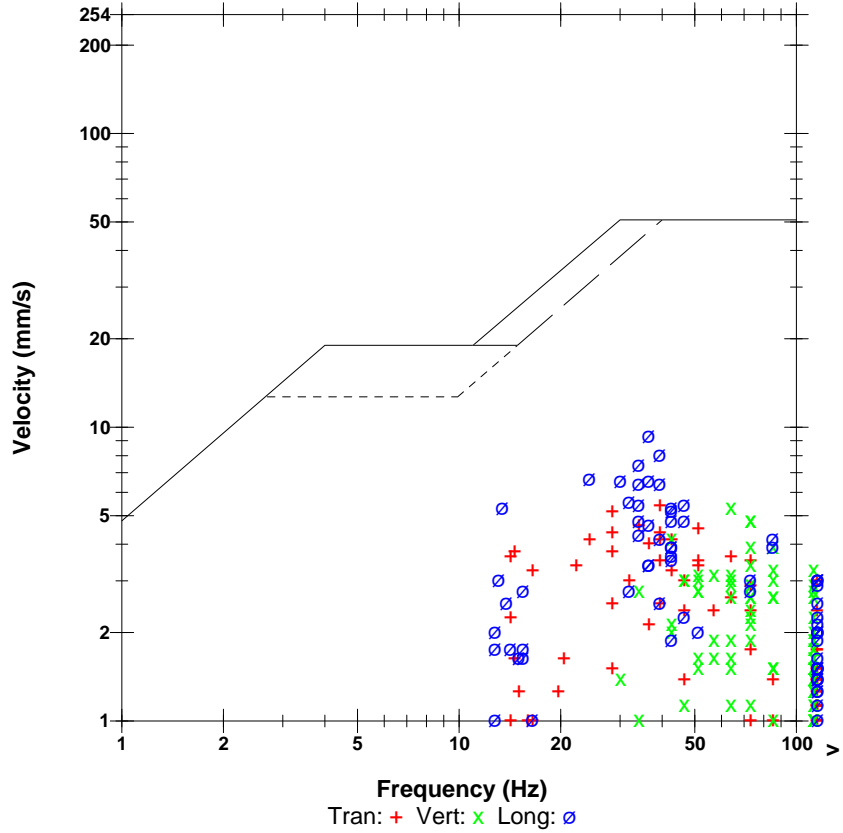
Combo Mode September 17, 2020 08:42:05
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 120.1 dB(L) 20.25 pa.(L) at 1.097 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.461	5.334	9.398	mm/s
ZC Freq	39	64	37	Hz
Time (Rel. to Trig)	0.202	0.360	0.112	sec
Peak Acceleration	0.225	0.265	0.305	g
Peak Displacement	0.040	0.011	0.051	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 9.440 mm/s at 0.111 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:29 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE16062 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration December 14, 2019 by InstanTel
File Name R062IMYI.W50

Notes

Location: 2-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

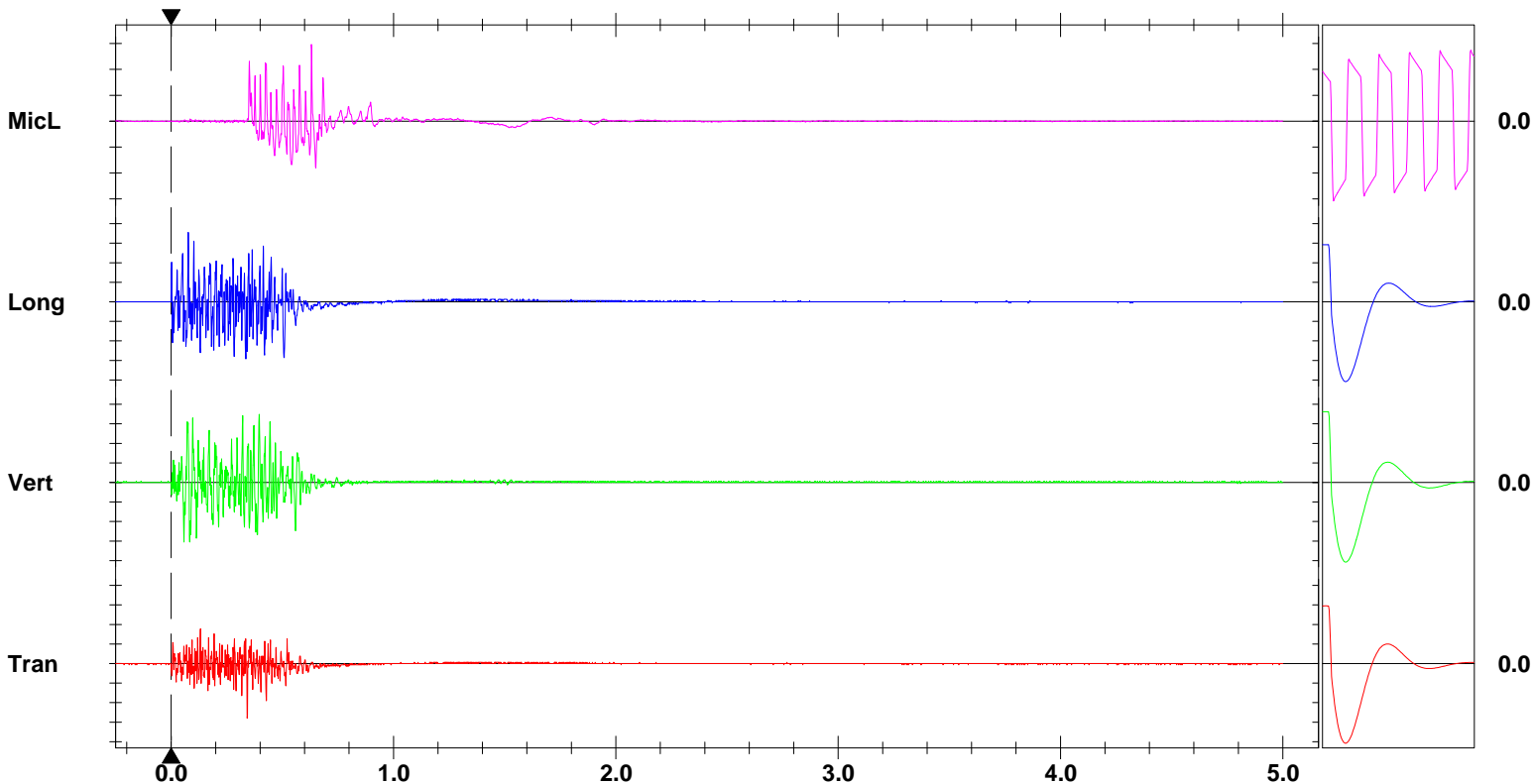
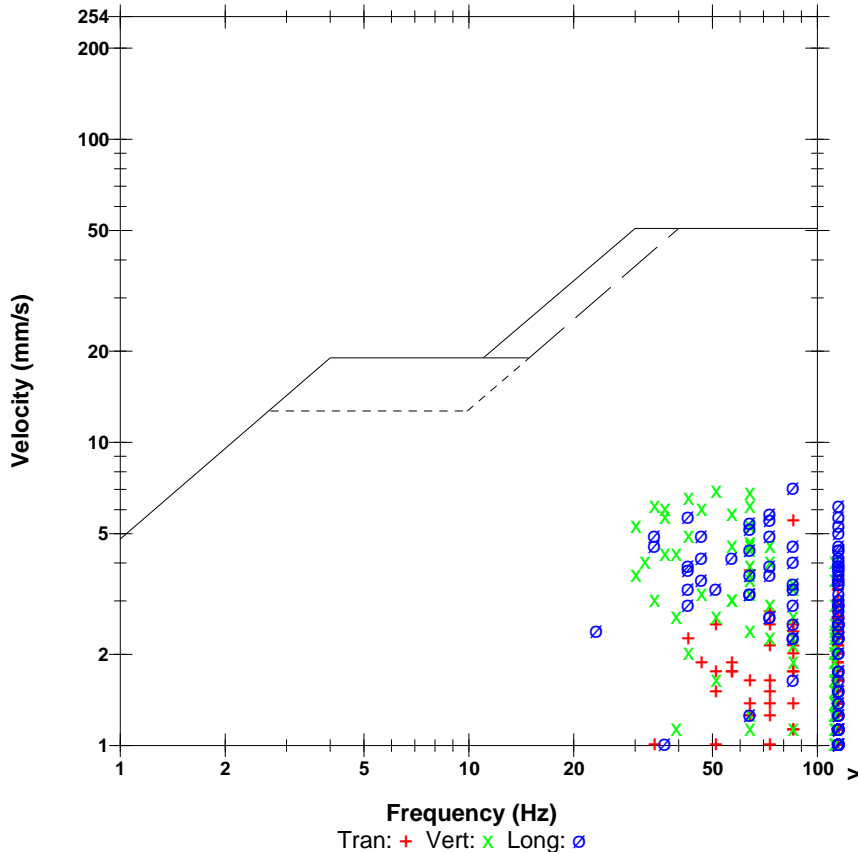
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 137.4 dB(L) 148.0 pa.(L) at 0.631 sec
ZC Freq 47 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 595 mv)

	Tran	Vert	Long	
PPV	5.588	6.985	7.112	mm/s
ZC Freq	85	51	85	Hz
Time (Rel. to Trig)	0.342	0.396	0.077	sec
Peak Acceleration	0.292	0.371	0.411	g
Peak Displacement	0.009	0.027	0.022	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	4.1	3.9	4.3	

Peak Vector Sum 8.535 mm/s at 0.076 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:32 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE16148 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 5, 2020 by InstanTel
File Name R148IMYI.W80

Notes

Location: 5-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

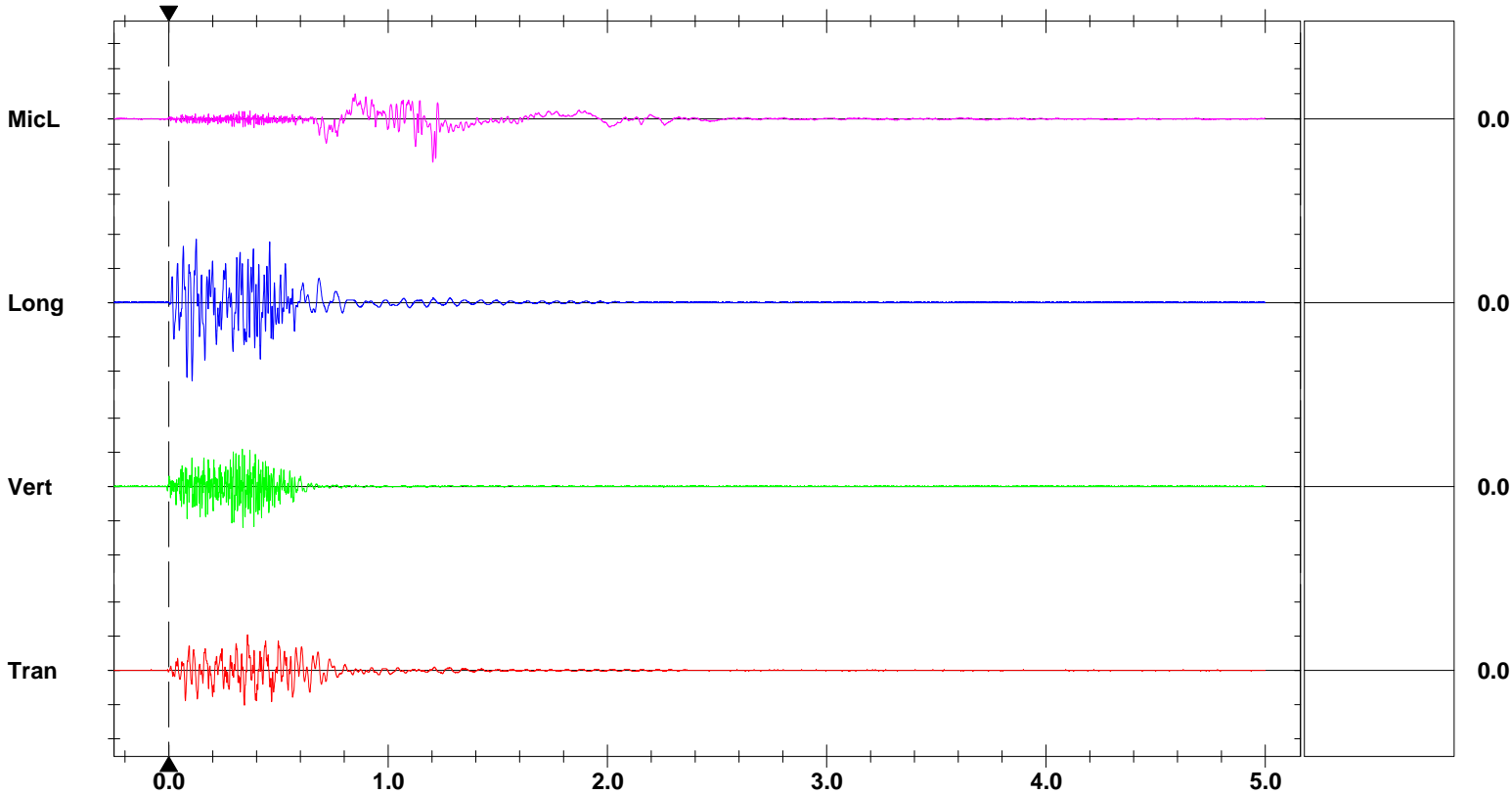
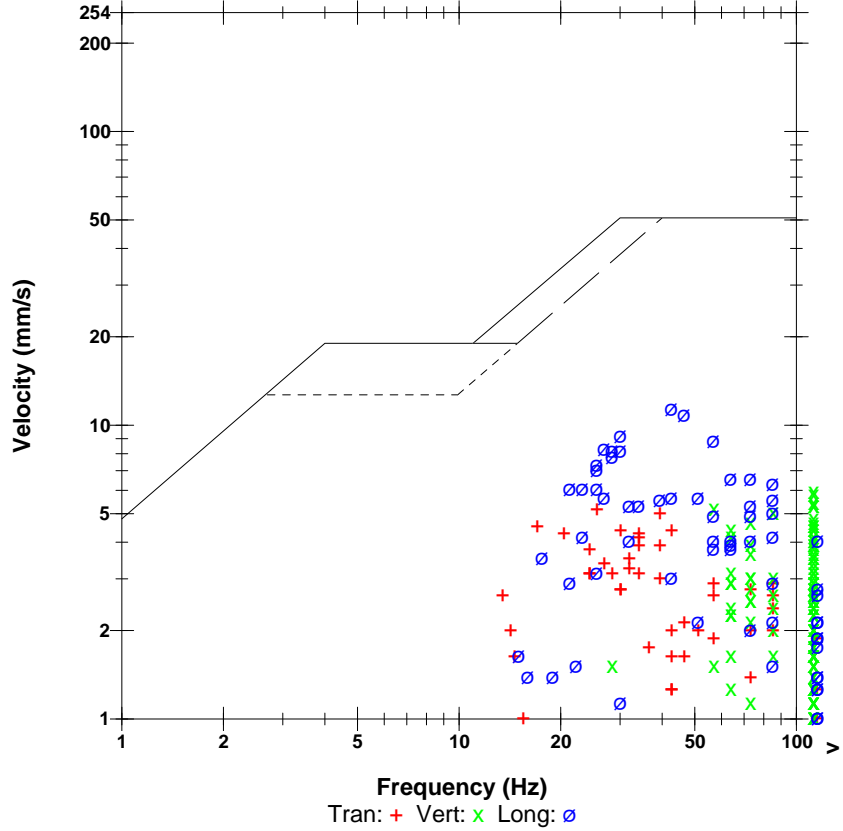
Combo Mode September 17, 2020 08:49:31
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 118.7 dB(L) 17.25 pa.(L) at 1.204 sec
ZC Freq 9.7 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.207	5.969	11.43	mm/s
ZC Freq	26	>100	43	Hz
Time (Rel. to Trig)	0.358	0.338	0.106	sec
Peak Acceleration	0.212	0.597	0.384	g
Peak Displacement	0.030	0.010	0.043	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 11.97 mm/s at 0.105 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:35 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE8091 V 10.72-8.17 MiniMate Plus
Battery Level 6.2 Volts
Unit Calibration December 13, 2019 by InstanTel
File Name J0911MY1.WB0

Notes

Location: 6-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

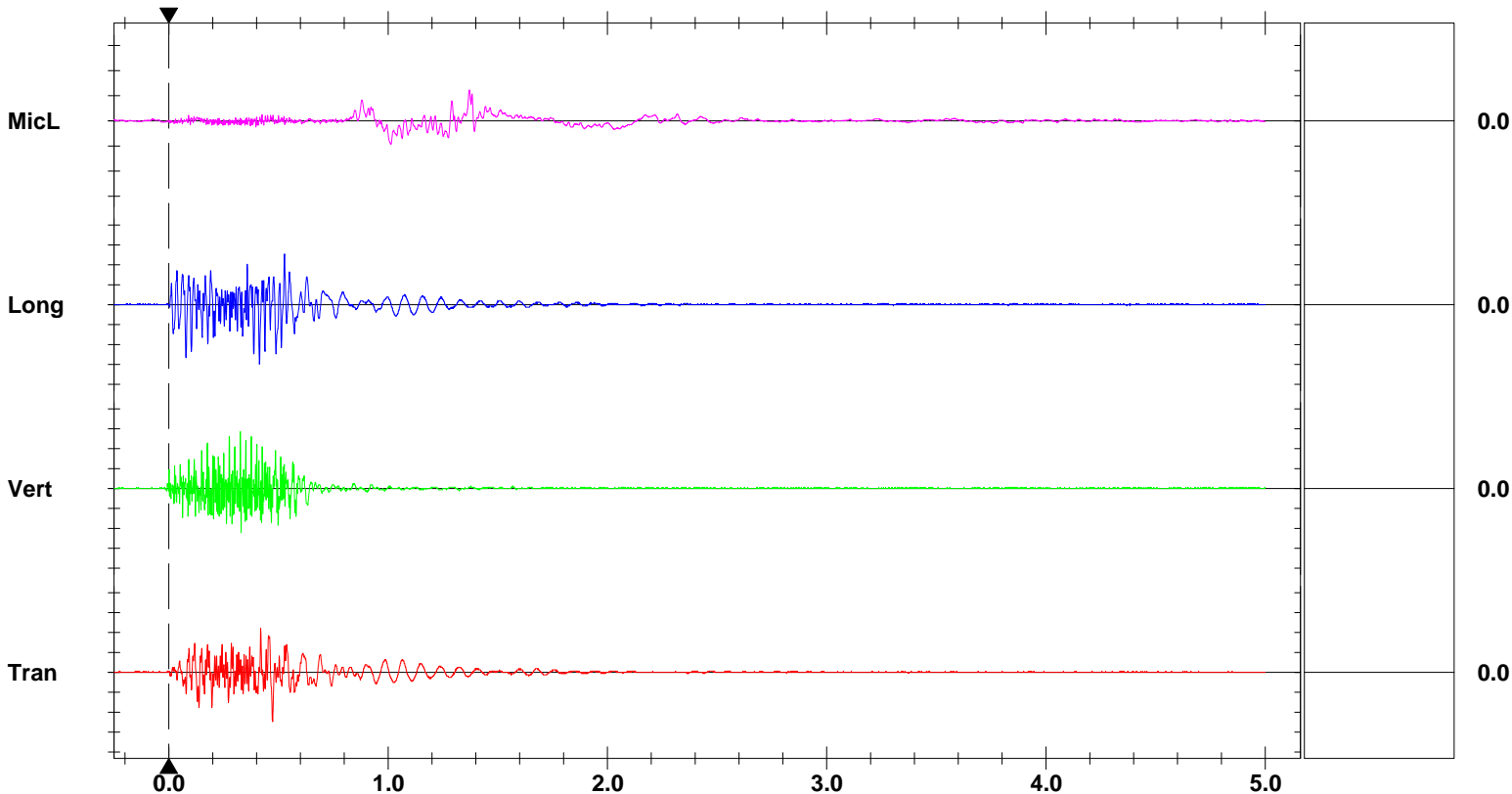
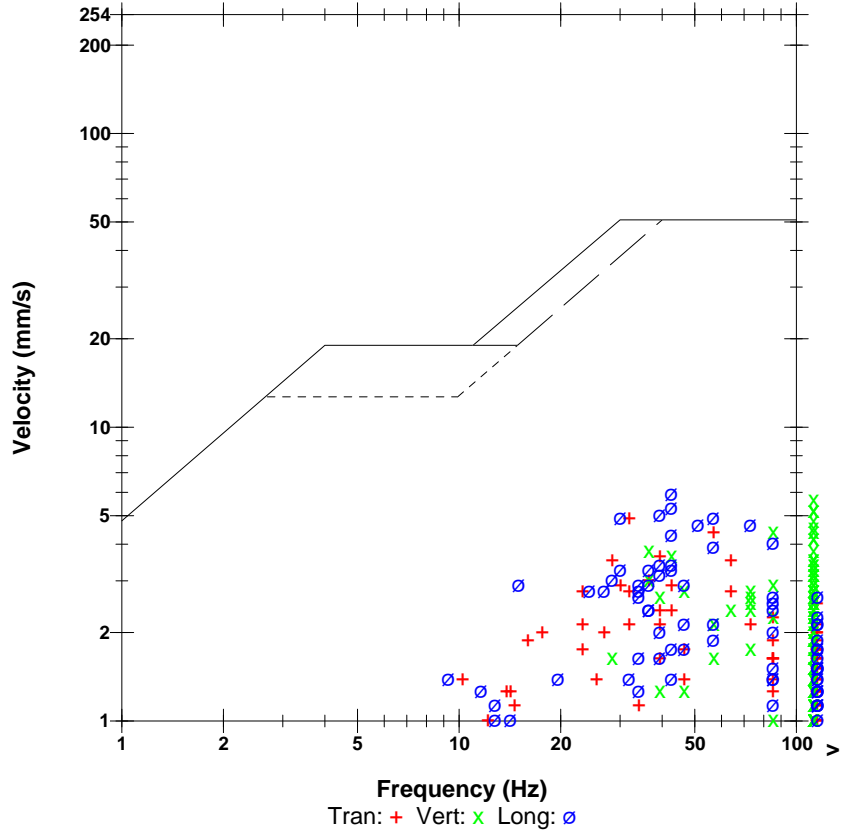
Combo Mode September 17, 2020 08:57:34
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 115.7 dB(L) 12.25 pa.(L) at 1.370 sec
ZC Freq 9.5 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	4.953	5.715	5.969	mm/s
ZC Freq	32	>100	43	Hz
Time (Rel. to Trig)	0.473	0.326	0.413	sec
Peak Acceleration	0.186	0.504	0.212	g
Peak Displacement	0.021	0.010	0.024	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 6.310 mm/s at 0.413 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:38 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE20120 V 10.72-8.17 MiniMate Plus/8
Battery Level 6.3 Volts
Unit Calibration September 12, 2019 by InstanTel
File Name V120IMYI.WE0

Notes

Location: 8-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

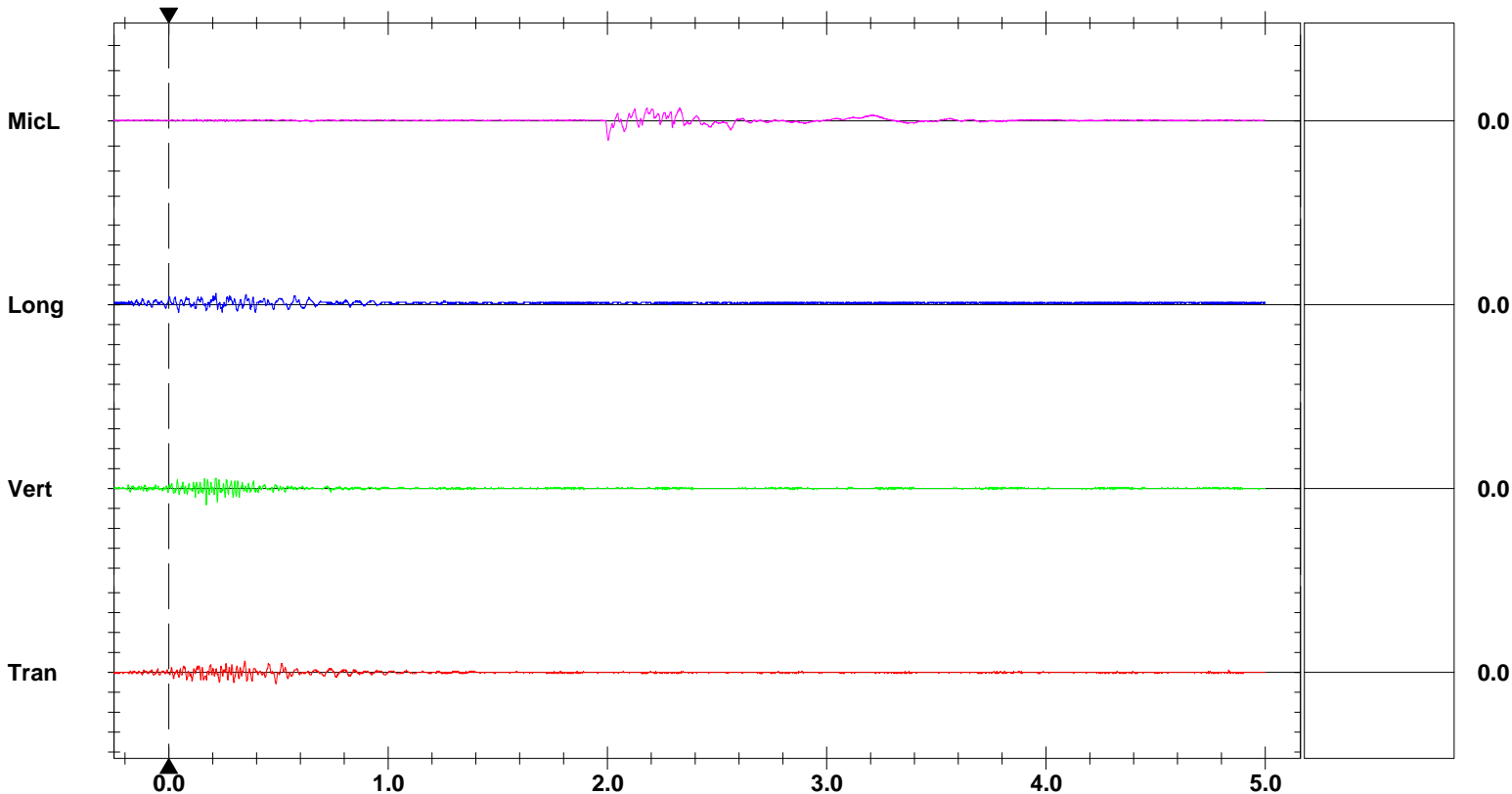
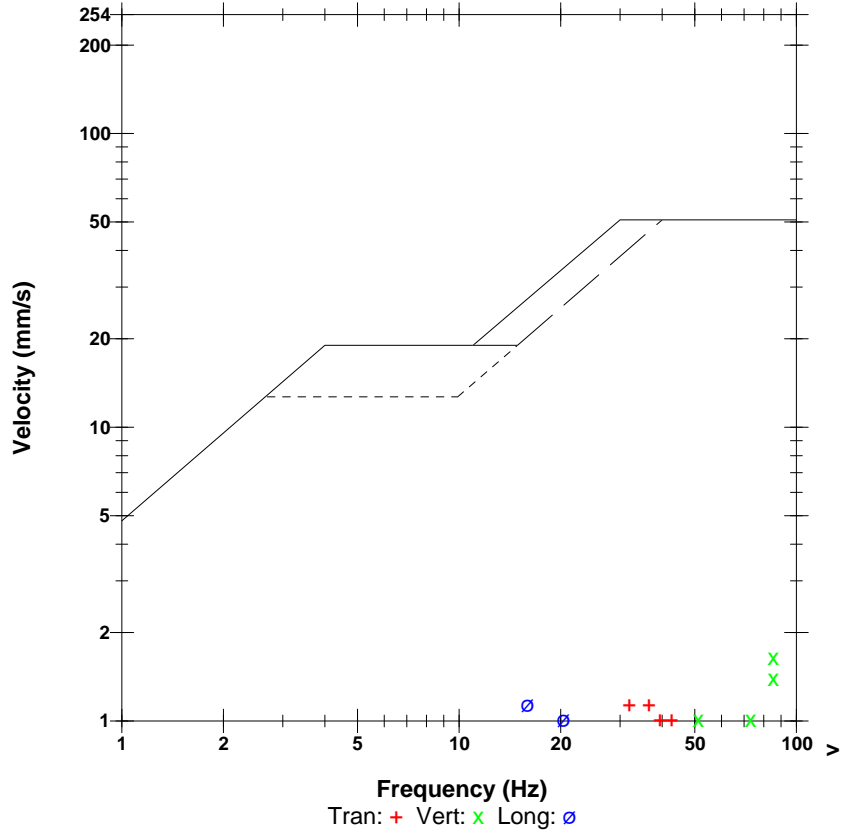
Combo Mode September 17, 2020 09:36:58
 Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 111.8 dB(L) 7.750 pa.(L) at 2.003 sec
ZC Freq 12 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.143	1.651	1.143	mm/s
ZC Freq	37	85	16	Hz
Time (Rel. to Trig)	0.346	0.171	0.214	sec
Peak Acceleration	0.053	0.080	0.040	g
Peak Displacement	0.006	0.004	0.009	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.888 mm/s at 0.171 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:39 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE20121 V 10.72-8.17 MiniMate Plus/8
Battery Level 6.4 Volts
Unit Calibration February 6, 2020 by InstanTel
File Name V121IMYI.WF0

Notes

Location: 7-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

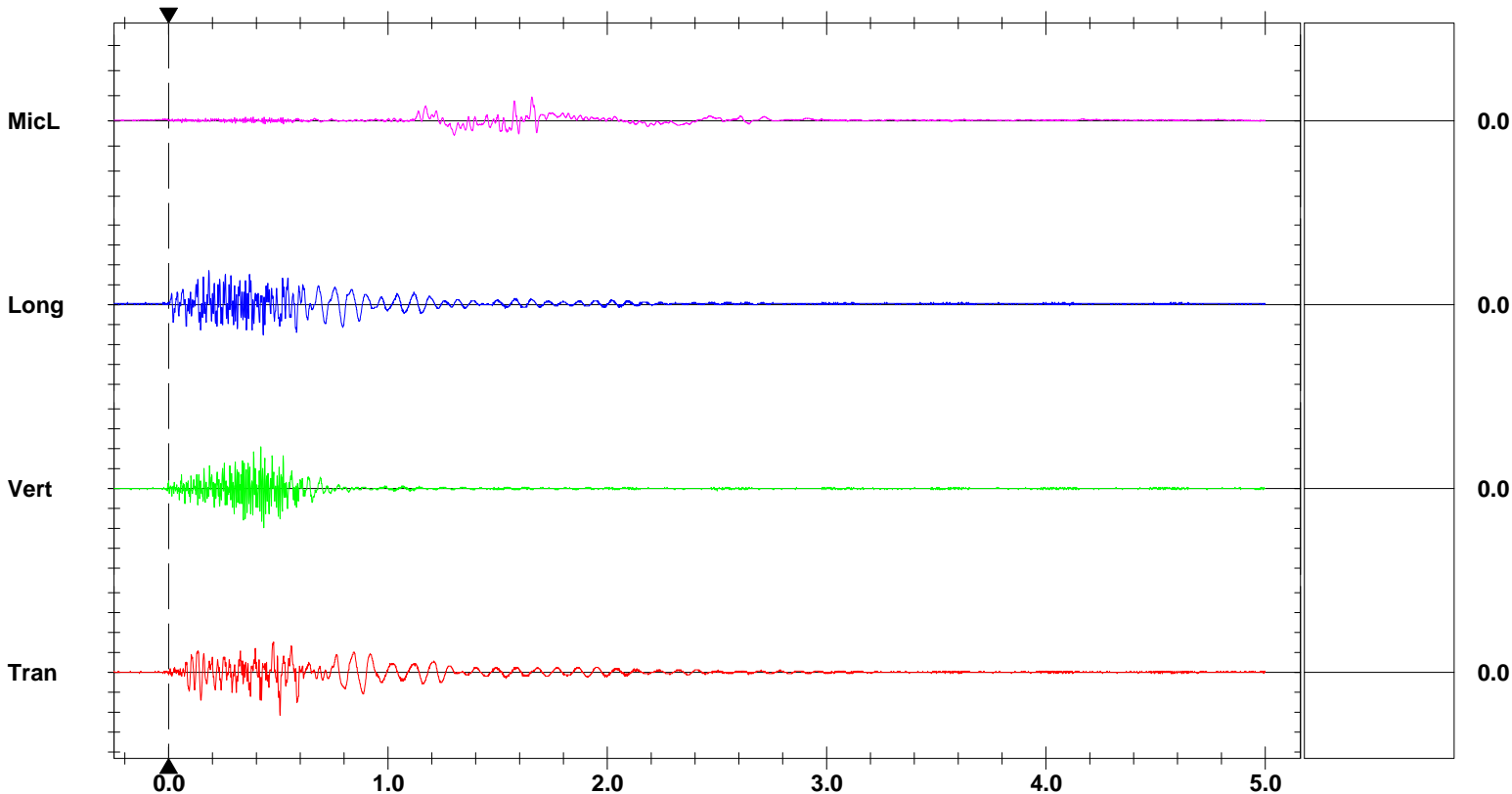
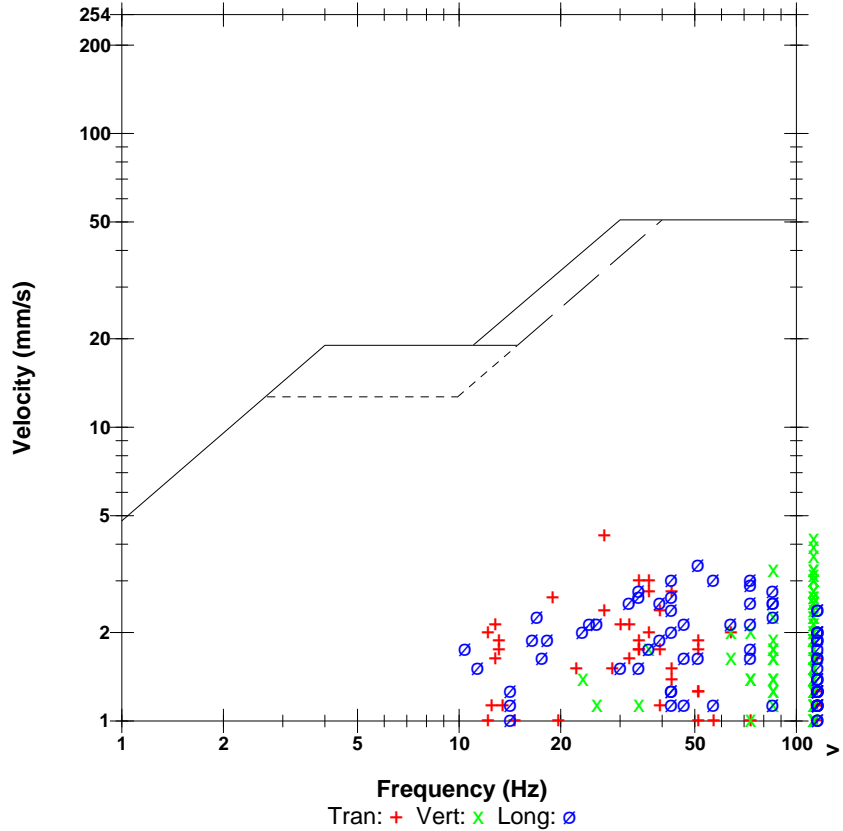
Combo Mode September 17, 2020 09:05:57
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 113.5 dB(L) 9.500 pa.(L) at 1.656 sec
ZC Freq 10 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	4.318	4.191	3.429	mm/s
ZC Freq	27	>100	51	Hz
Time (Rel. to Trig)	0.508	0.420	0.184	sec
Peak Acceleration	0.146	0.292	0.172	g
Peak Displacement	0.026	0.009	0.023	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.618 mm/s at 0.508 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:40 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BA14924 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration October 16, 2019 by InstanTel
File Name P924IMY1.WG0

Notes

Location: 8-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

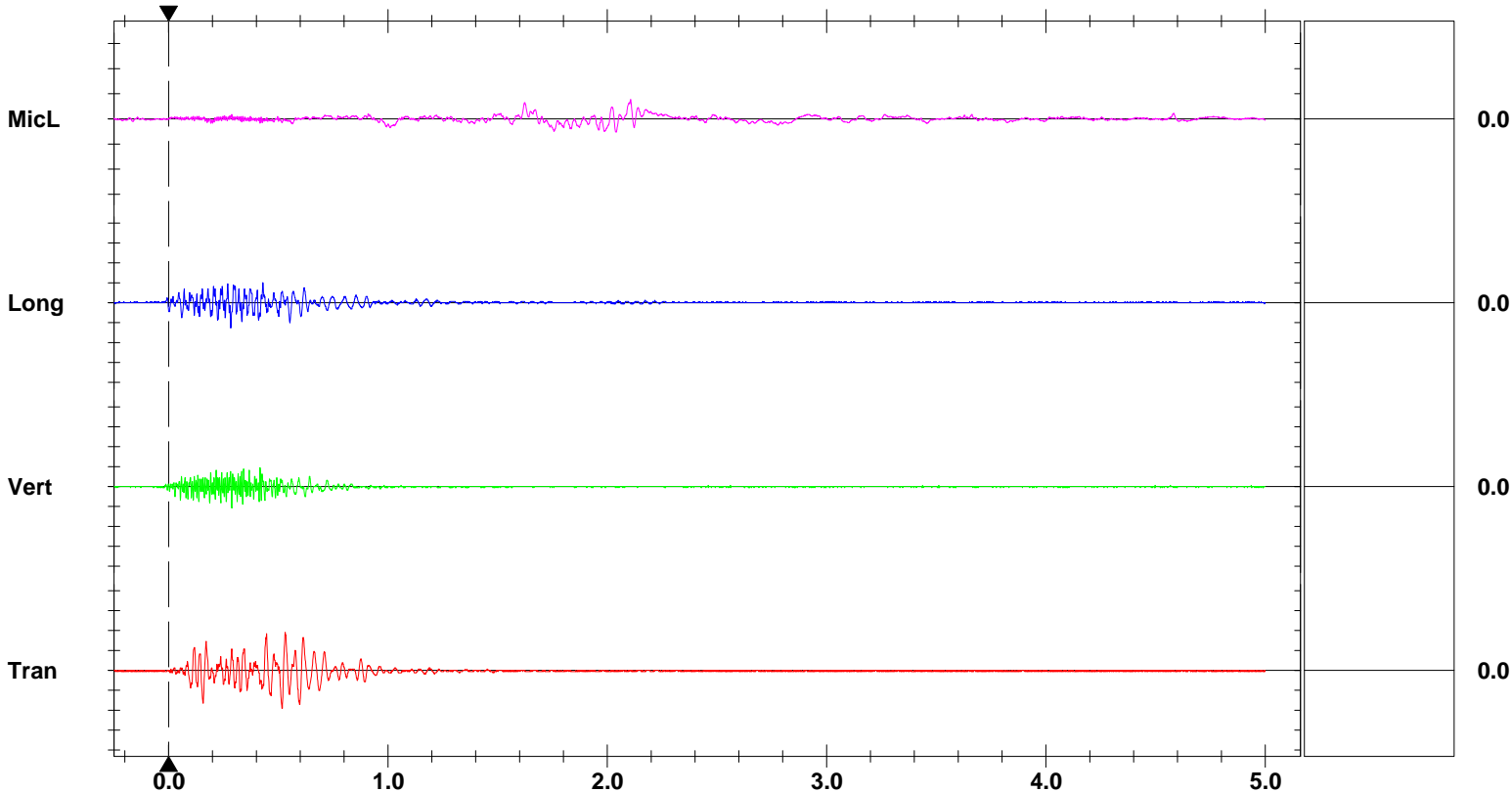
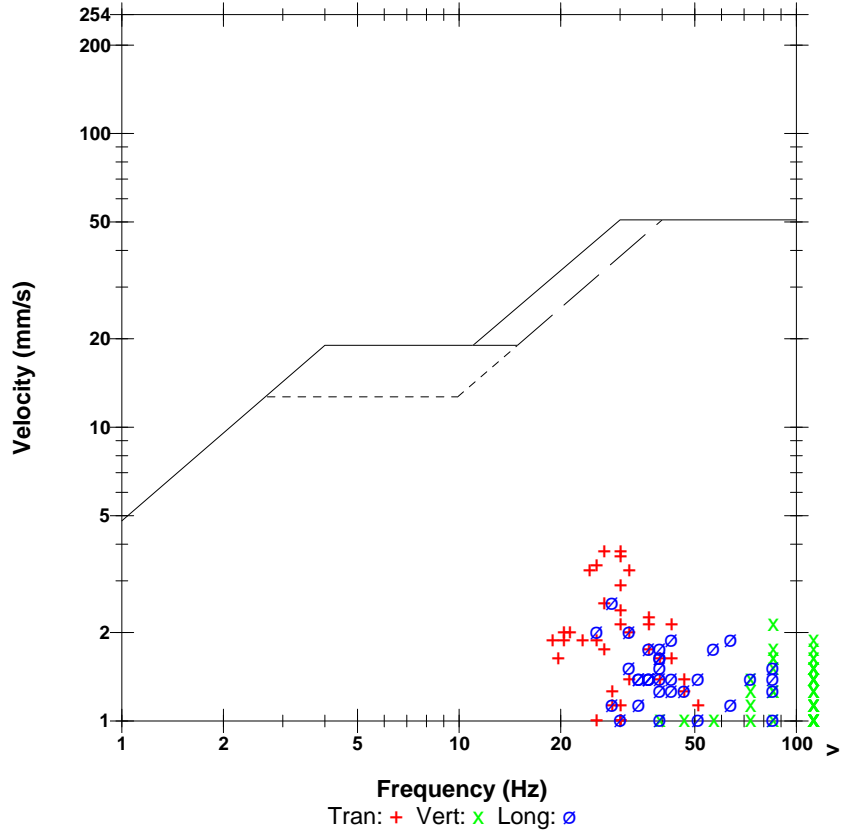
Combo Mode September 17, 2020 09:12:07
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 111.8 dB(L) 7.750 pa.(L) at 2.105 sec
ZC Freq 13 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.810	2.159	2.540	mm/s
ZC Freq	30	85	28	Hz
Time (Rel. to Trig)	0.517	0.288	0.283	sec
Peak Acceleration	0.093	0.133	0.106	g
Peak Displacement	0.023	0.004	0.009	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.028 mm/s at 0.518 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:41 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM11715 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration May 8, 2020 by InstanTel
File Name UM11715_20200917103841.IDFW

Notes

Location: 3-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

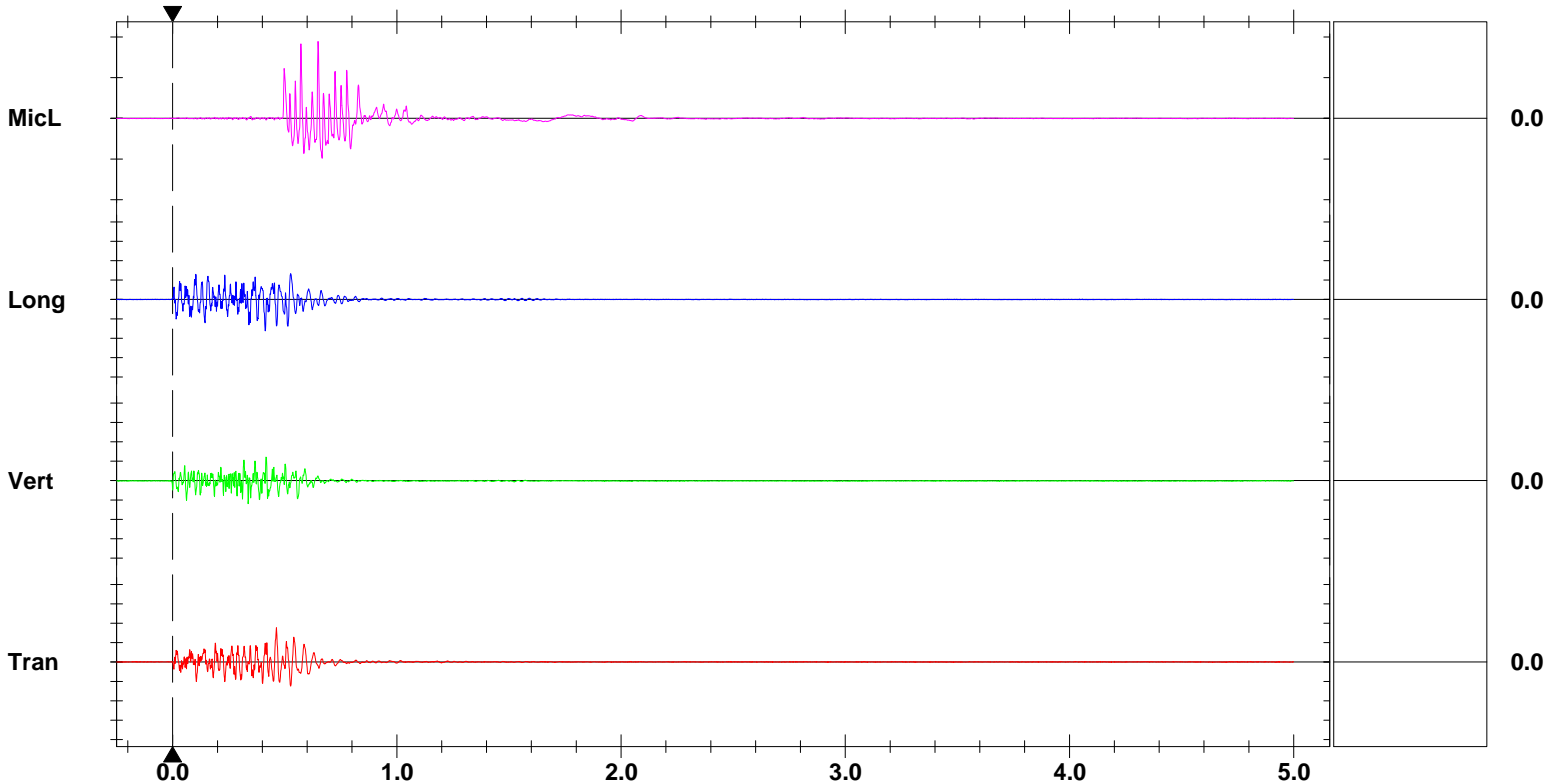
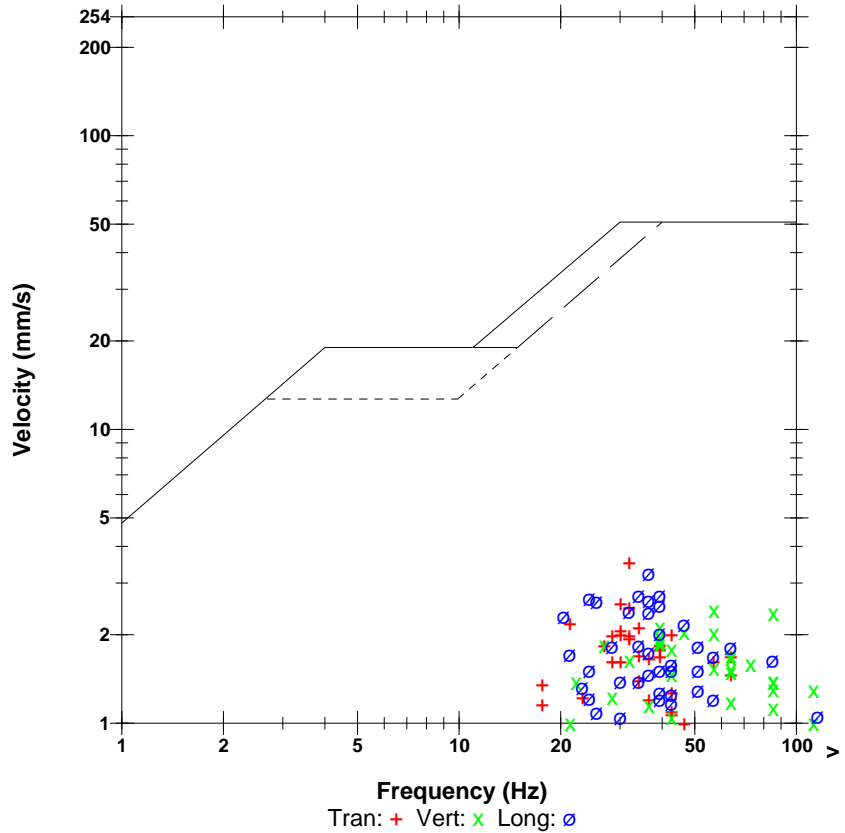
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 133.5 dB(L) 94.52 pa.(L) at 0.648 sec
ZC Freq 43 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.547	2.428	3.239	mm/s
ZC Freq	32	57	37	Hz
Time (Rel. to Trig)	0.463	0.416	0.413	sec
Peak Acceleration	0.094	0.136	0.109	g
Peak Displacement	0.016	0.010	0.016	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.497 mm/s at 0.463 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:38:41 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM12202 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration August 5, 2020 by InstanTel
File Name UM12202_20200917103841.IDFW

Notes

Location: 4-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

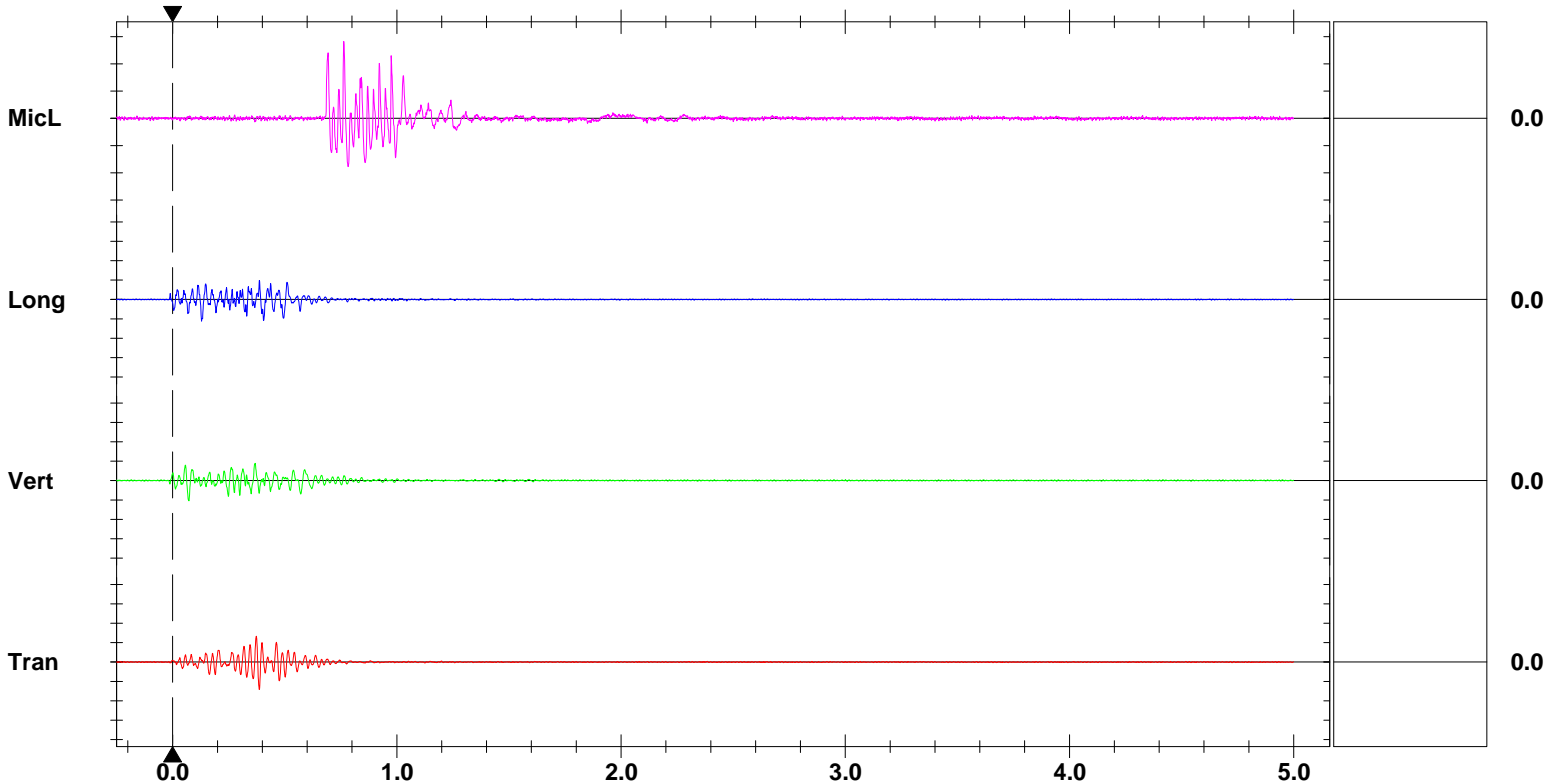
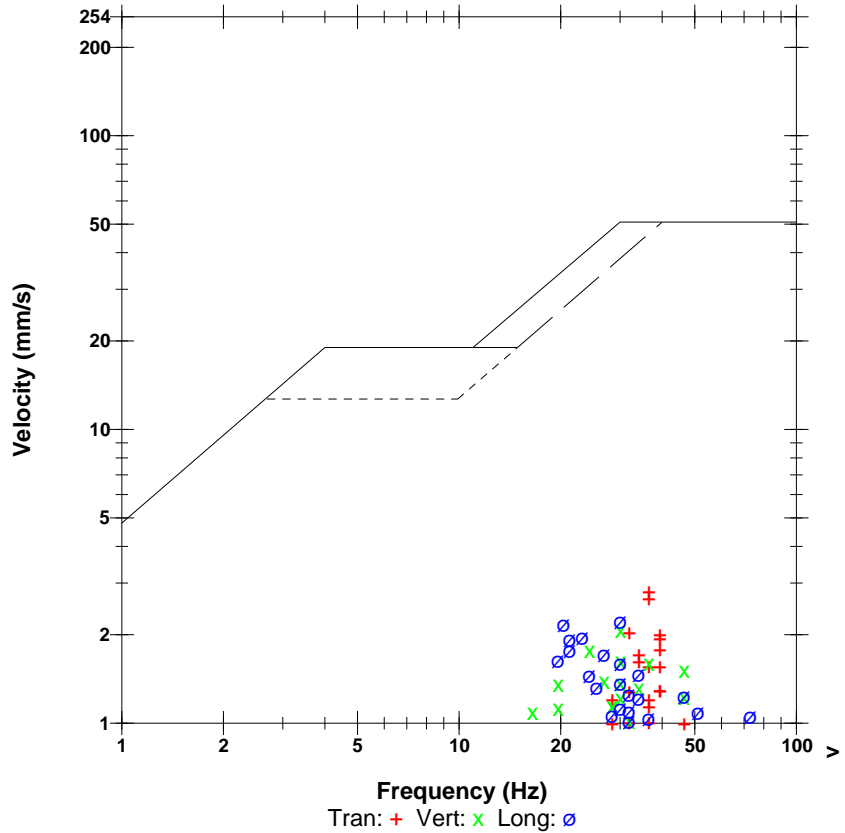
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 129.0 dB(L) 56.49 pa.(L) at 0.764 sec
ZC Freq 39 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.830	2.081	2.231	mm/s
ZC Freq	37	30	30	Hz
Time (Rel. to Trig)	0.387	0.072	0.129	sec
Peak Acceleration	0.070	0.047	0.067	g
Peak Displacement	0.012	0.011	0.013	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.667 mm/s at 0.387 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:41 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13869 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration August 5, 2020 by InstanTel
File Name UM13869_20200917103841.IDFW

Notes

Location: 5-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

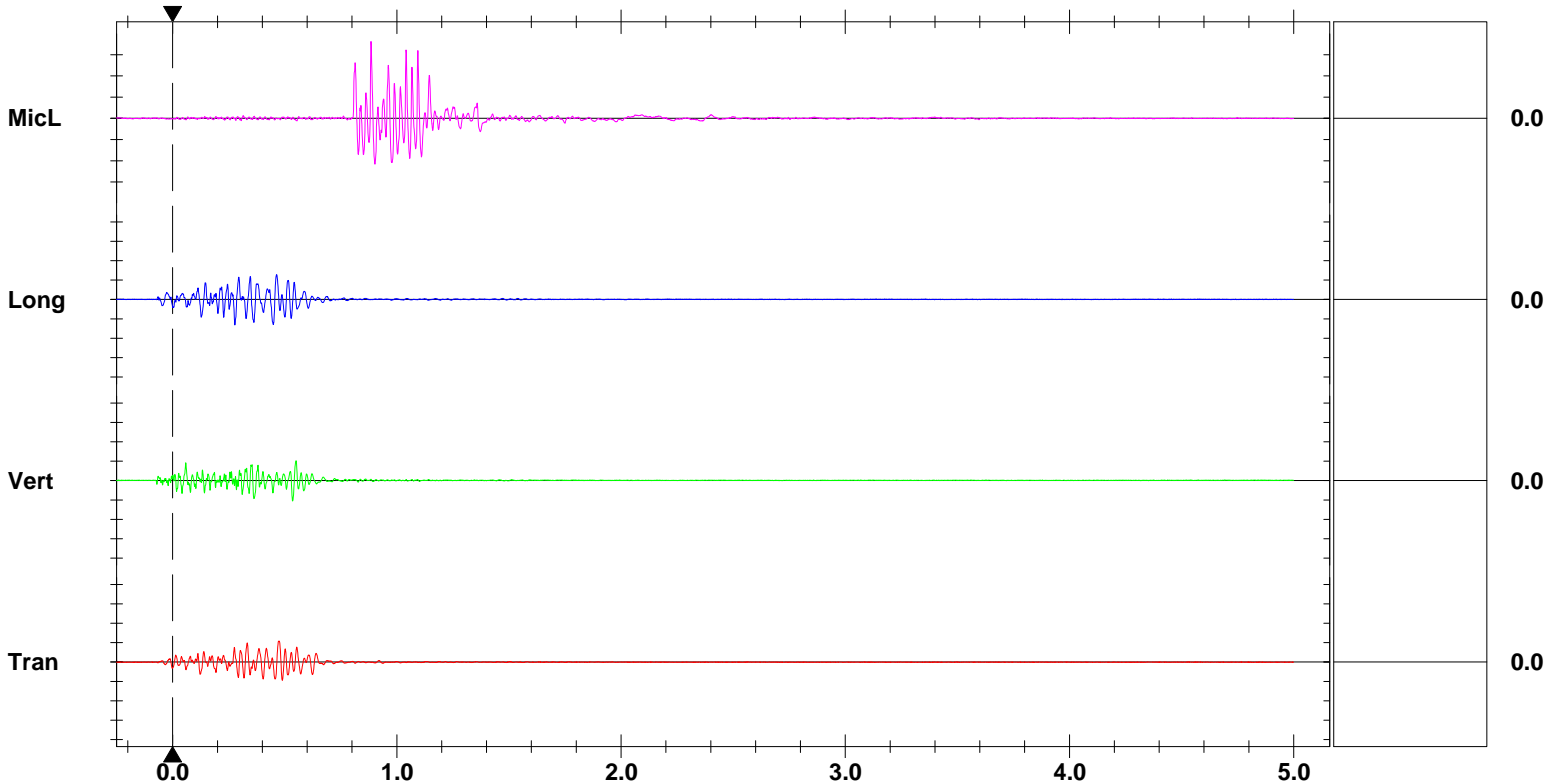
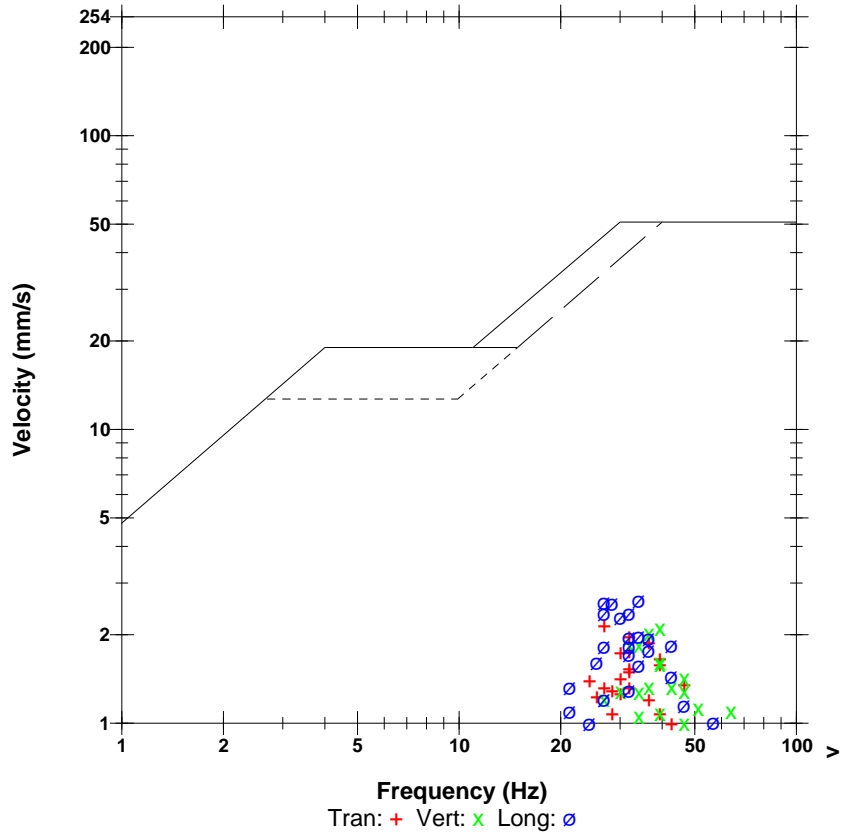
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 119.2 dB(L) 18.14 pa.(L) at 0.885 sec
ZC Freq 43 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.160	2.104	2.625	mm/s
ZC Freq	27	39	34	Hz
Time (Rel. to Trig)	0.473	0.535	0.277	sec
Peak Acceleration	0.052	0.073	0.072	g
Peak Displacement	0.014	0.009	0.015	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.005 mm/s at 0.362 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:42 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13270 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 10, 2020 by InstanTel
File Name UM13270_20200917103842.IDFW

Notes

Location: 9-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

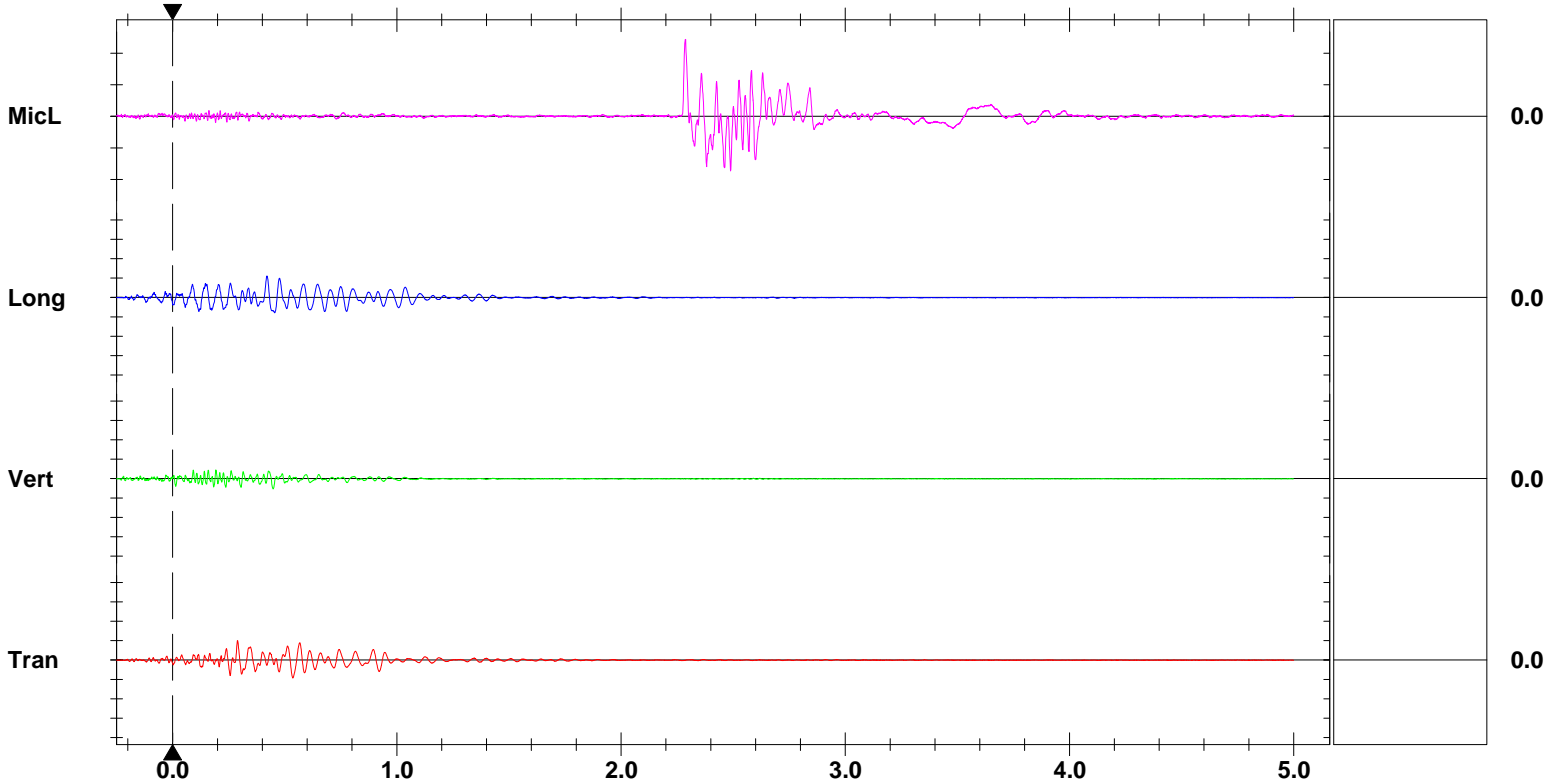
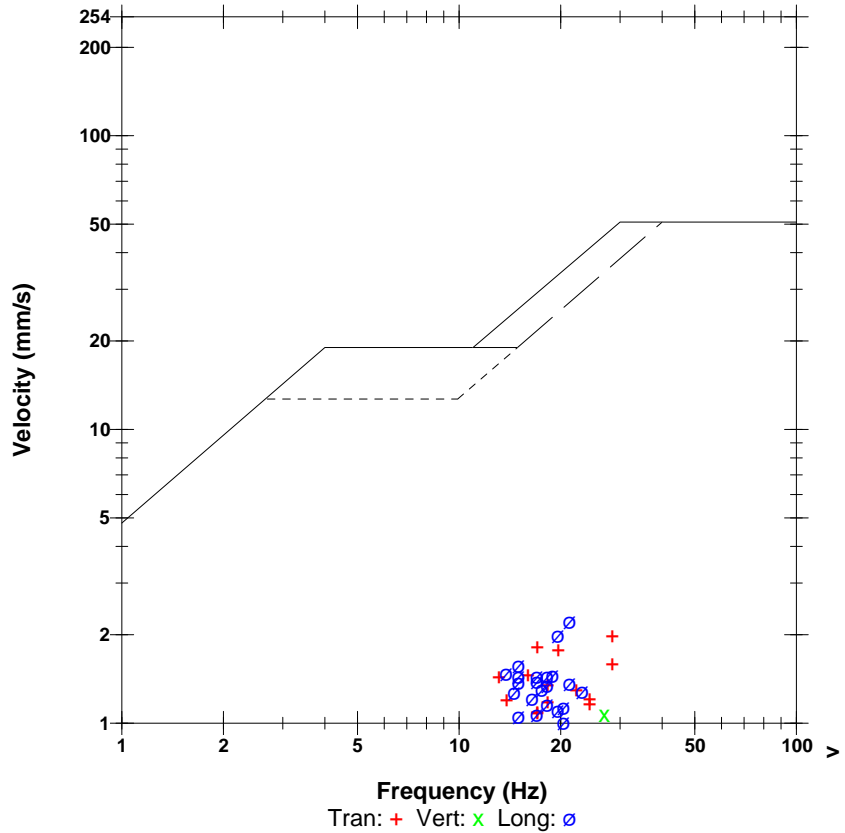
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 107.7 dB(L) 4.872 pa.(L) at 2.286 sec
ZC Freq 15 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.002	1.072	2.223	mm/s
ZC Freq	28	27	21	Hz
Time (Rel. to Trig)	0.289	0.448	0.421	sec
Peak Acceleration	0.035	0.034	0.033	g
Peak Displacement	0.016	0.006	0.019	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.328 mm/s at 0.476 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:38:42 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13870 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 27, 2020 by InstanTEL
File Name UM13870_20200917103842.IDFW

Notes

Location: 6-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

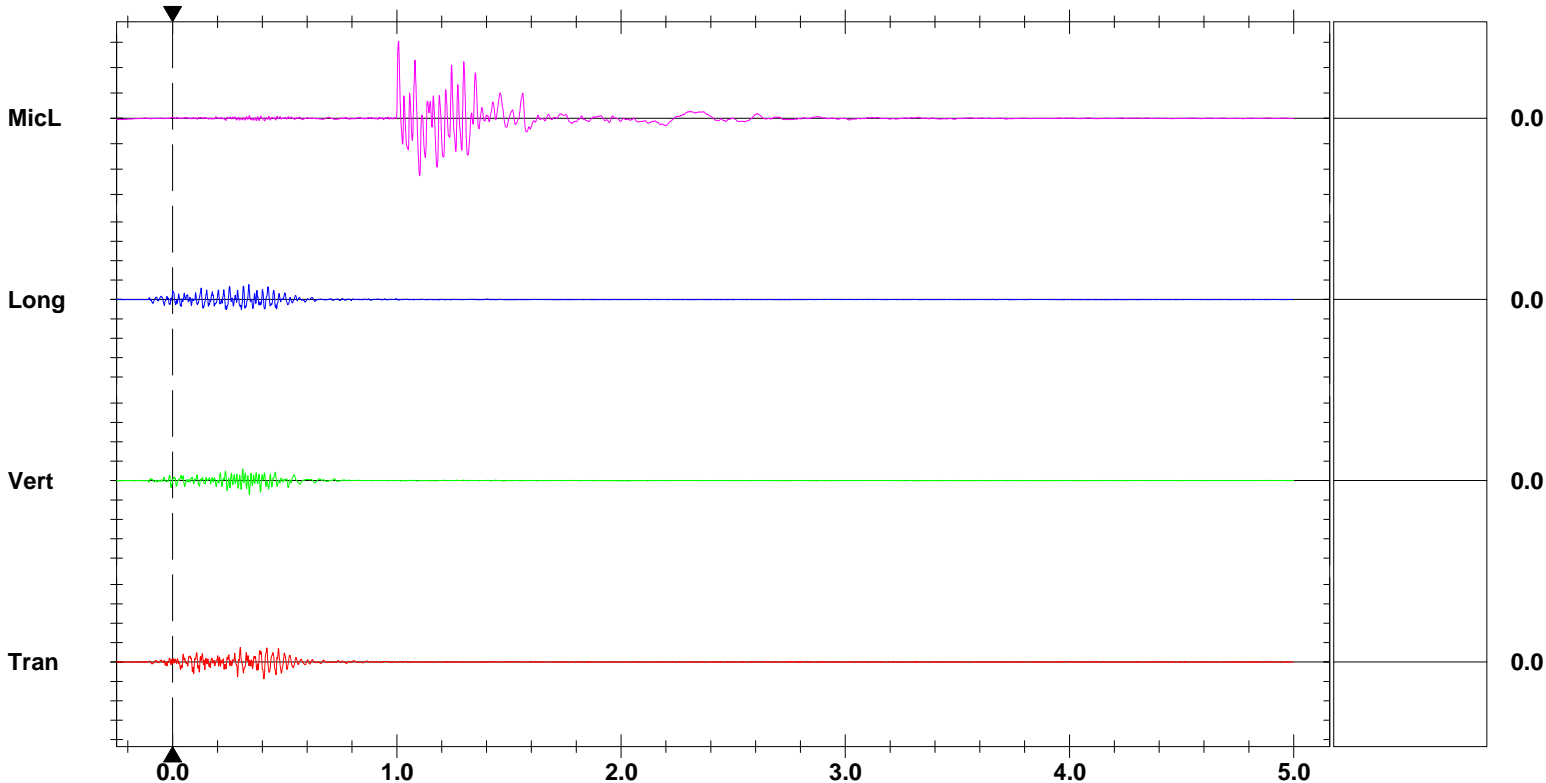
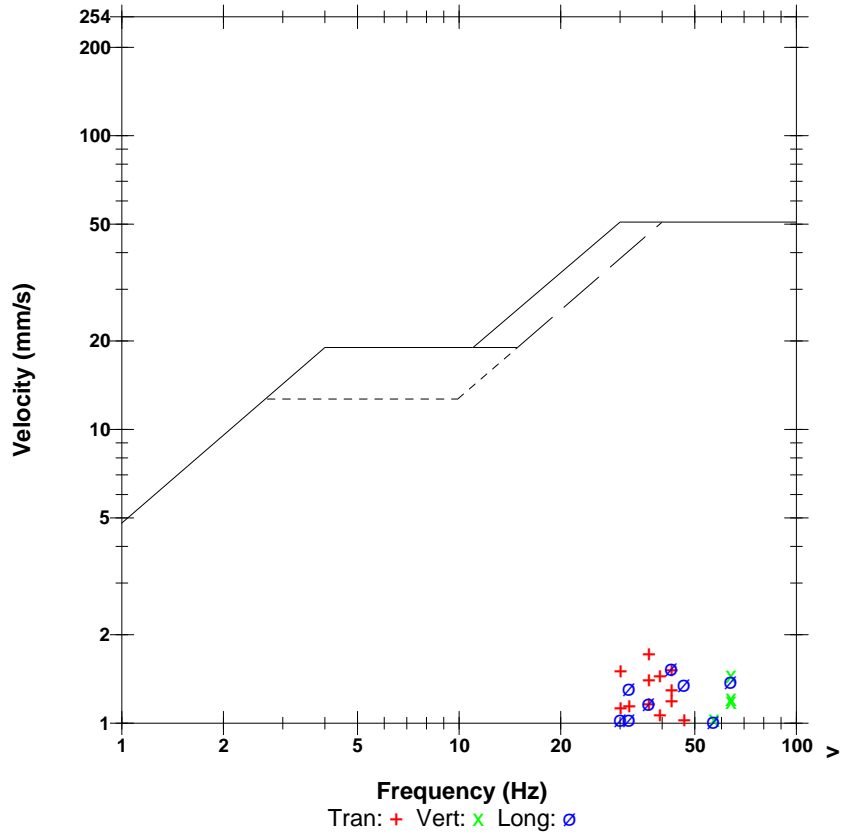
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 123.6 dB(L) 30.29 pa.(L) at 1.008 sec
ZC Freq 26 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.734	1.458	1.537	mm/s
ZC Freq	37	64	43	Hz
Time (Rel. to Trig)	0.407	0.342	0.340	sec
Peak Acceleration	0.064	0.049	0.067	g
Peak Displacement	0.007	0.004	0.005	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.981 mm/s at 0.408 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 12:22:08 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE9545 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration November 7, 2019 by InstanTel
File Name K545IMYN.OW0

Notes

Location: 4-B
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

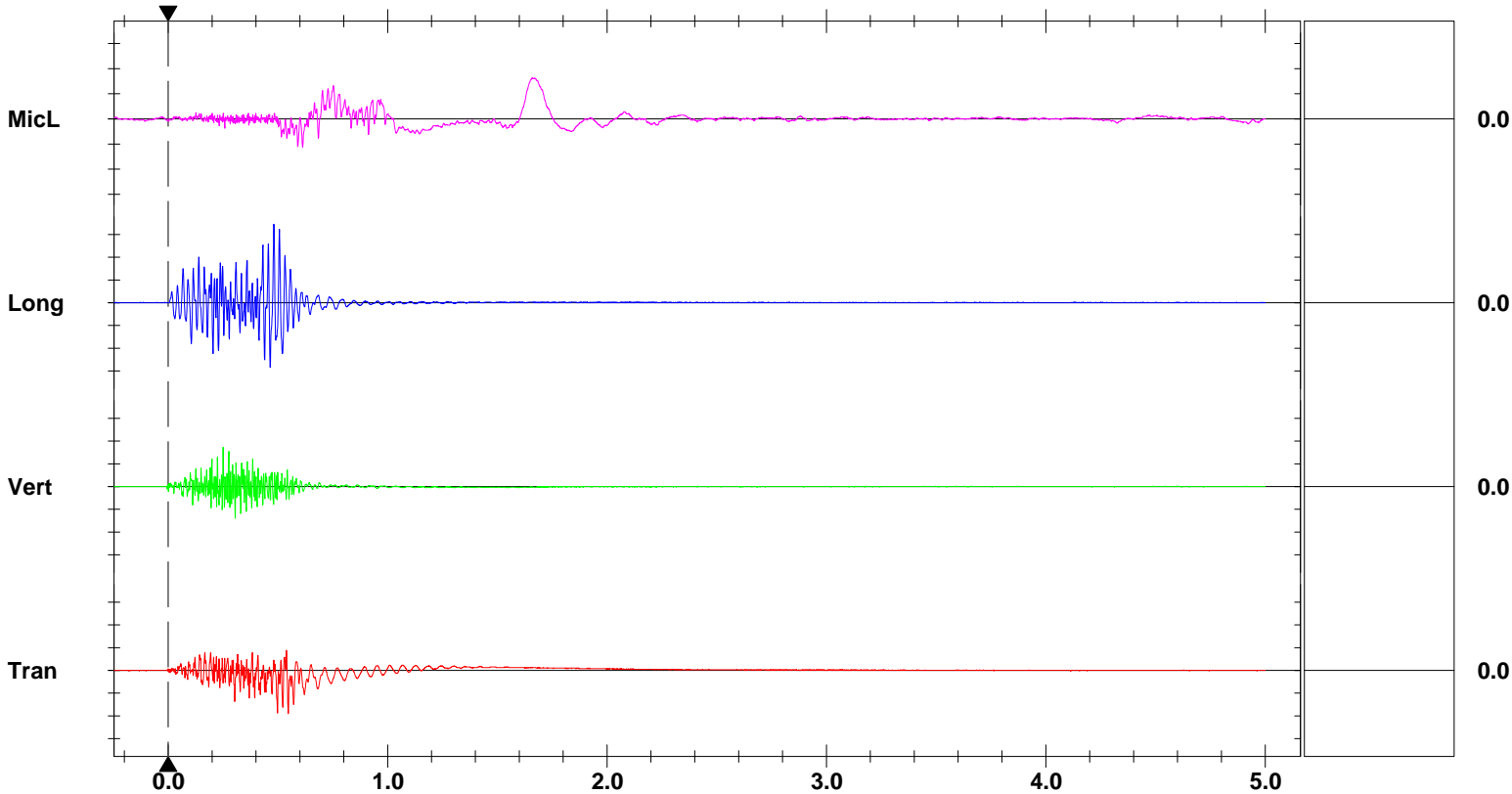
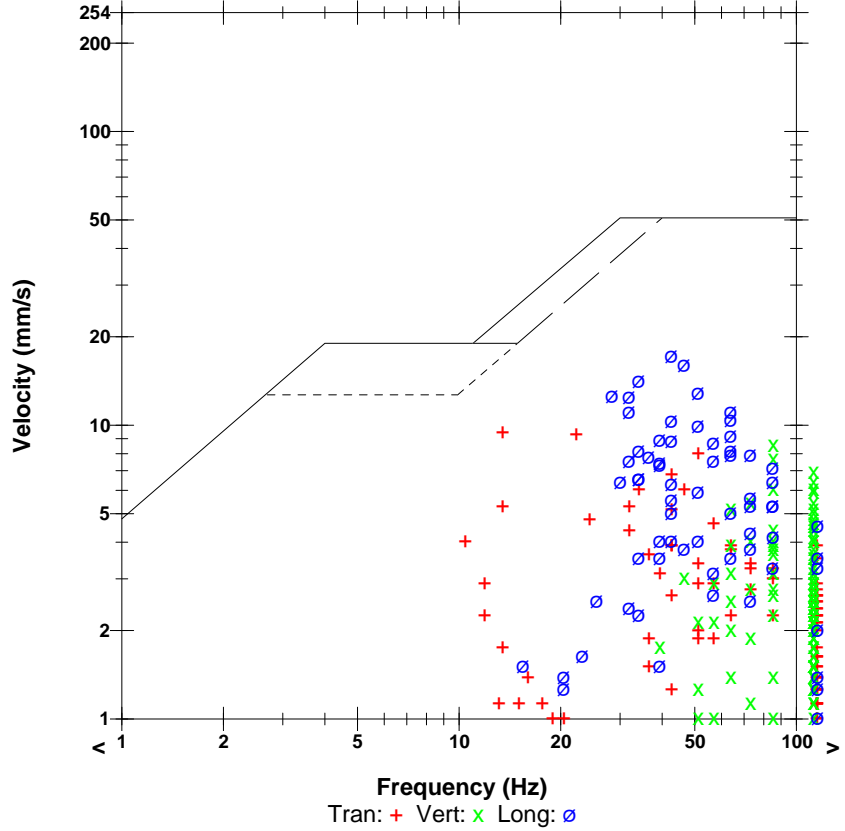
Combo Mode September 17, 2020 11:10:07
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 118.3 dB(L) 16.50 pa.(L) at 1.659 sec
ZC Freq 3.3 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	9.525	8.636	17.27	mm/s
ZC Freq	13	85	43	Hz
Time (Rel. to Trig)	0.547	0.250	0.481	sec
Peak Acceleration	0.371	0.544	0.464	g
Peak Displacement	0.269	0.012	0.058	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 17.71 mm/s at 0.481 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 12:22:08 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE16062 V 10.72-1.1 Minimate Blaster
Battery Level 6.4 Volts
Unit Calibration December 14, 2019 by InstanTel
File Name R062IMYN.OW0

Notes

Location: 2-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

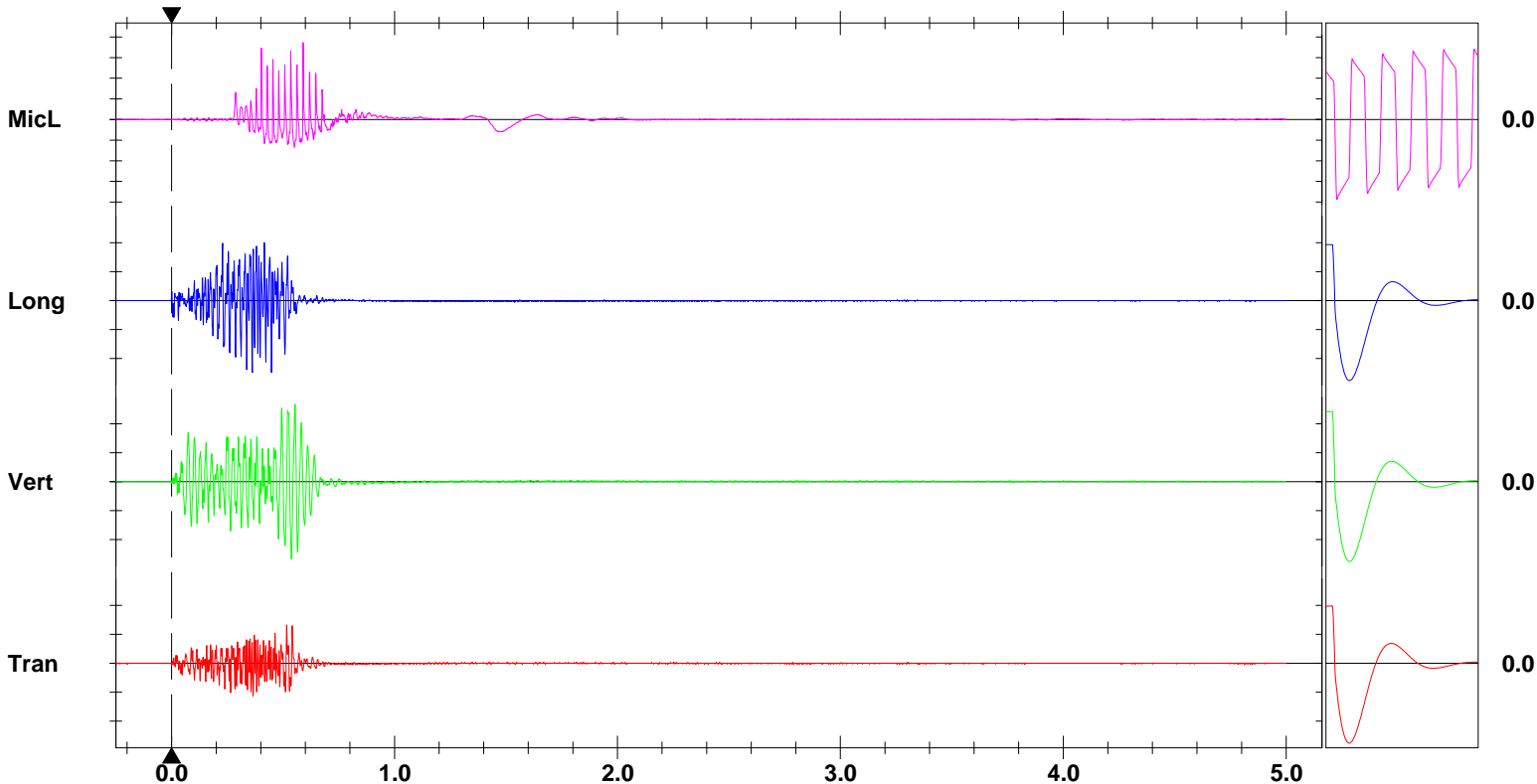
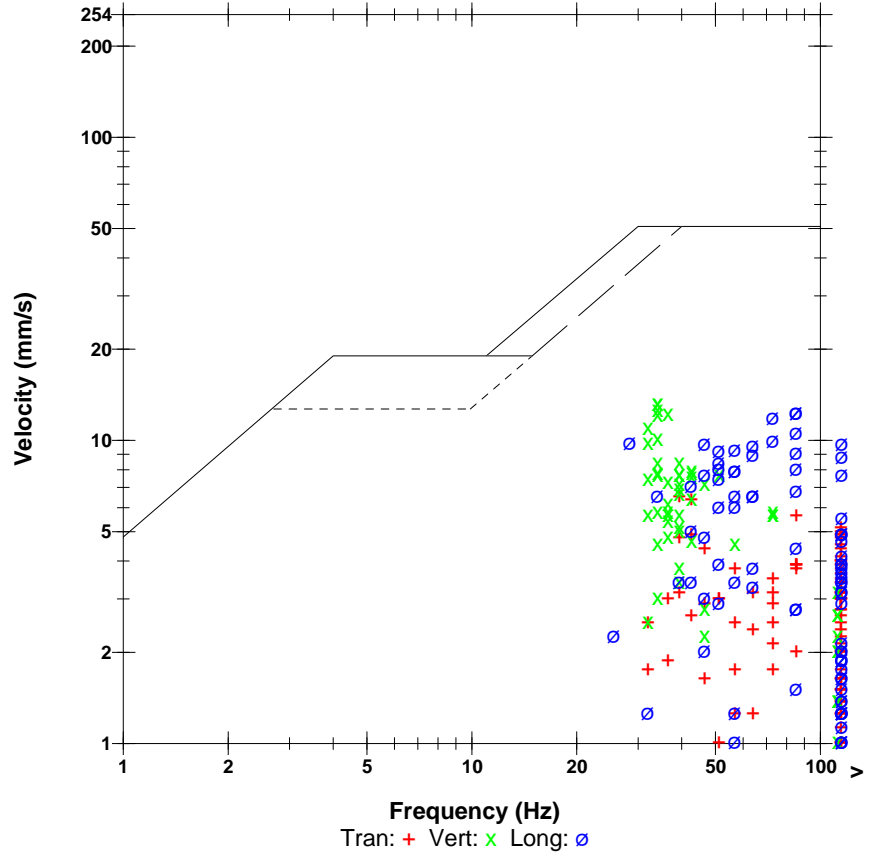
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 139.4 dB(L) 186.5 pa.(L) at 0.590 sec
ZC Freq 57 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 561 mv)

	Tran	Vert	Long	
PPV	6.604	13.33	12.45	mm/s
ZC Freq	39	34	85	Hz
Time (Rel. to Trig)	0.516	0.537	0.362	sec
Peak Acceleration	0.345	0.384	0.795	g
Peak Displacement	0.019	0.060	0.030	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	4.0	3.9	4.2	

Peak Vector Sum 14.65 mm/s at 0.521 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 50.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 12:22:19 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BA14924 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration October 16, 2019 by InstanTel
File Name P924IMYN.P70

Notes

Location: 8-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

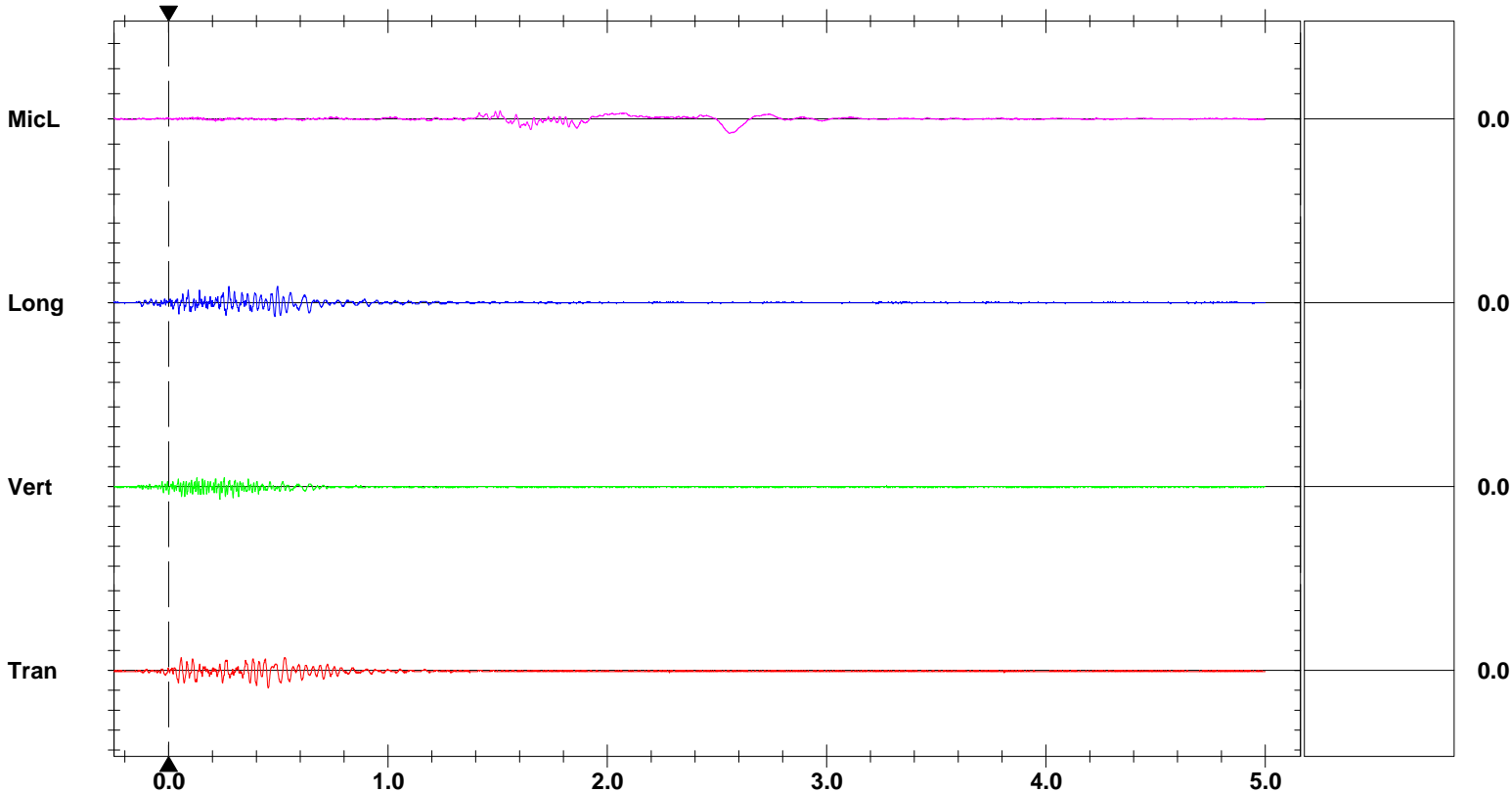
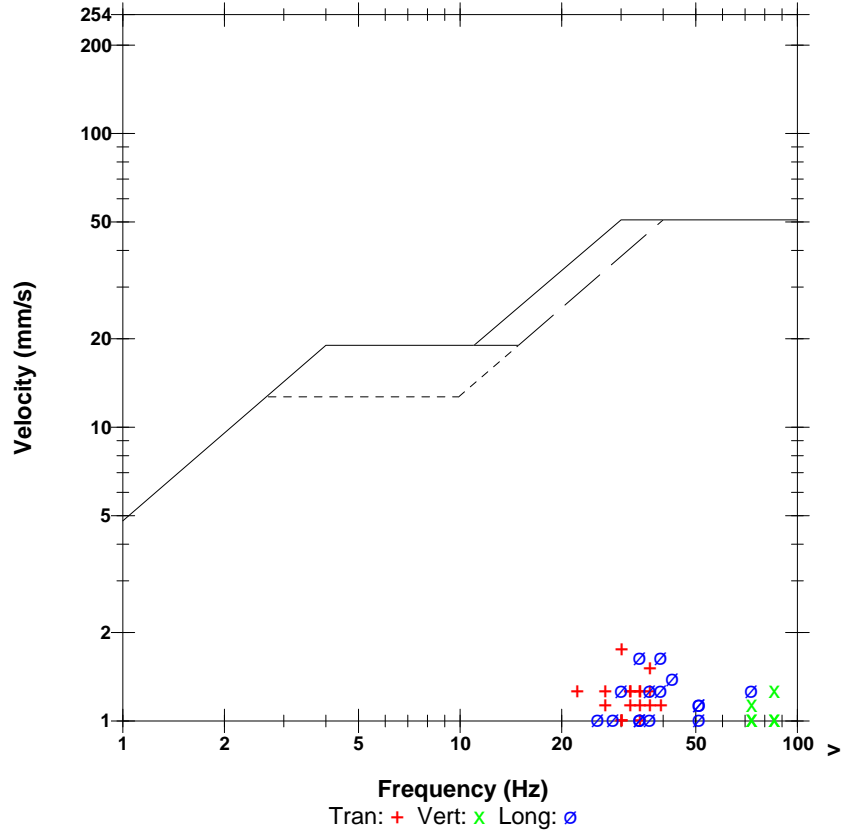
Combo Mode September 17, 2020 10:44:06
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 109.2 dB(L) 5.750 pa.(L) at 2.554 sec
ZC Freq 3.5 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.778	1.270	1.651	mm/s
ZC Freq	30	85	34	Hz
Time (Rel. to Trig)	0.453	0.232	0.274	sec
Peak Acceleration	0.053	0.066	0.053	g
Peak Displacement	0.009	0.003	0.007	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.934 mm/s at 0.454 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 12:22:21 September 17, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Back Attenuation - Micro.mmb

Serial Number UM13271 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 10, 2020 by InstanTel
File Name UM13271_20200917122221.IDFW

Notes

Location: 9-B
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

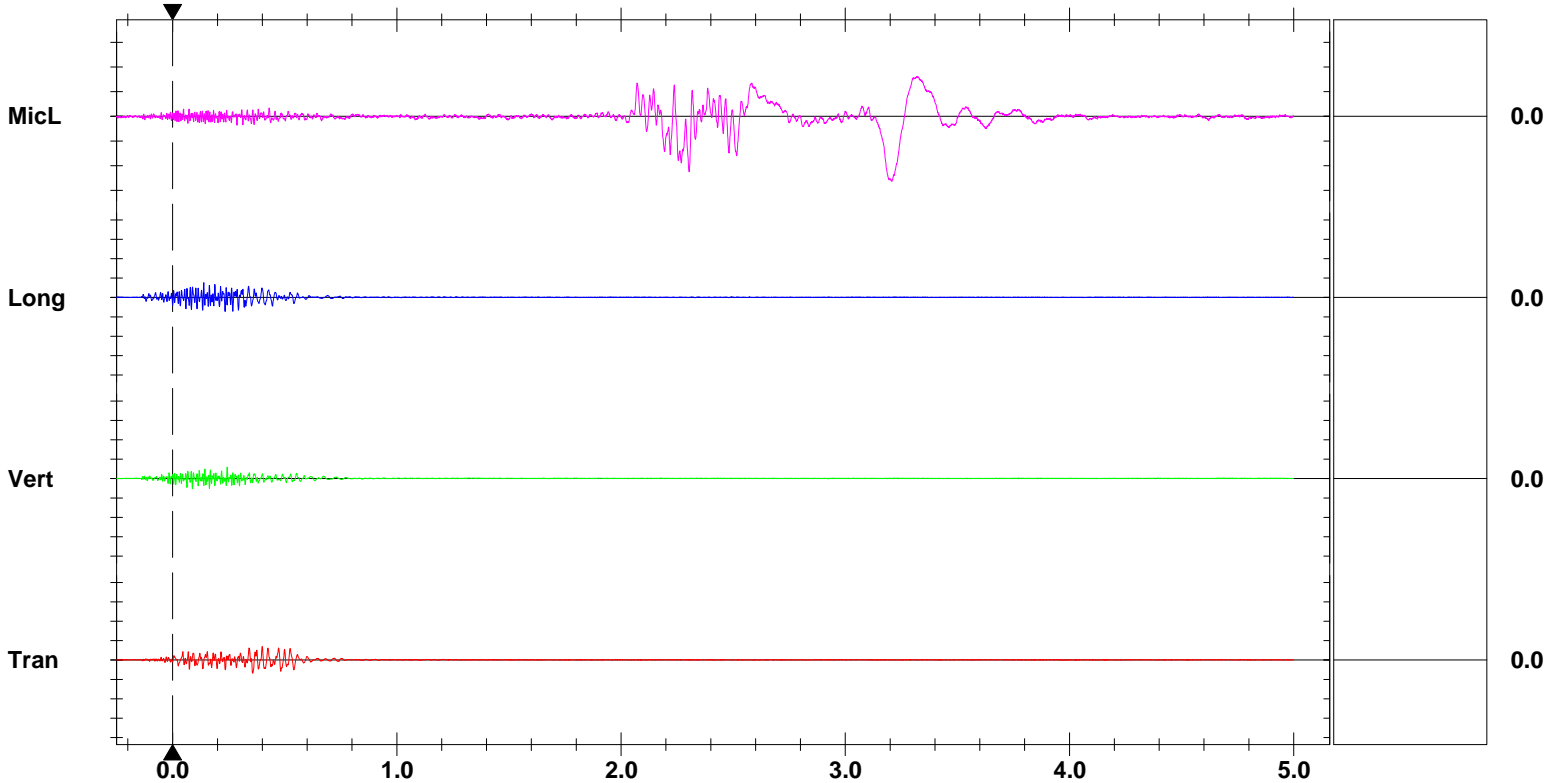
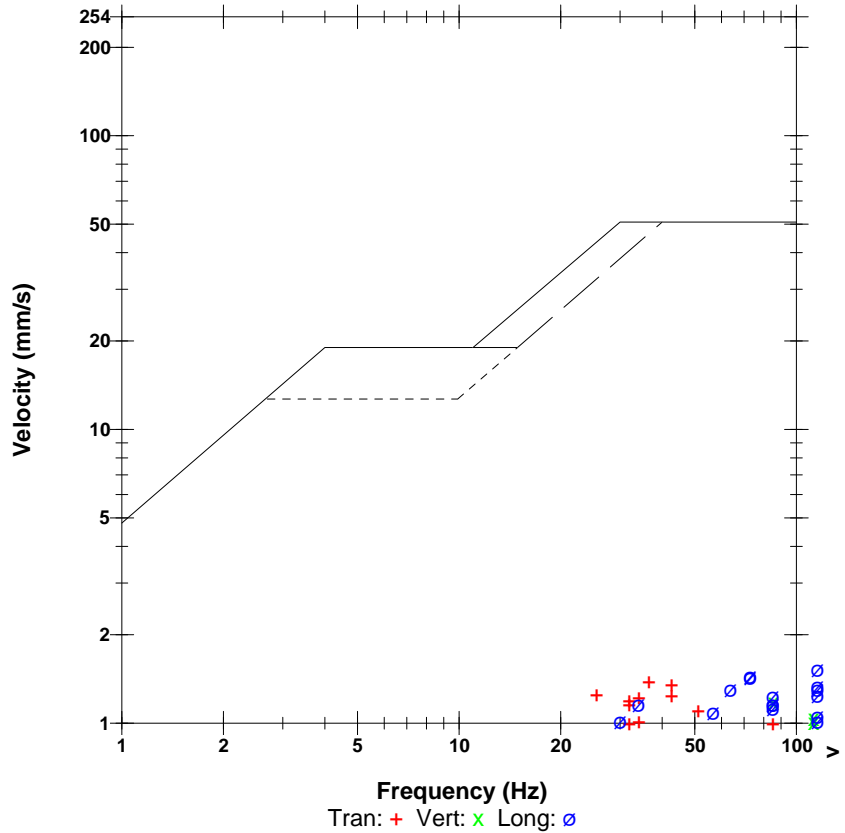
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods..

Microphone Linear Weighting
PSPL 102.4 dB(L) 2.638 pa.(L) at 3.208 sec
ZC Freq 3.8 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.395	1.182	1.529	mm/s
ZC Freq	37	85	>100	Hz
Time (Rel. to Trig)	0.399	0.243	0.139	sec
Peak Acceleration	0.058	0.069	0.095	g
Peak Displacement	0.006	0.002	0.005	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.763 mm/s at 0.234 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Histogram Start Time 12:33:07 July 7, 2020
Histogram Finish Time 15:34:57 July 7, 2020
Number of Intervals 36.37 at 5 minutes
Range Geo:254.0 mm/s
Sample Rate 1024sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM13861 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 3, 2020 by InstanTel
File Name UM13861_20200707123307.IDFH

Notes

Location: 10-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

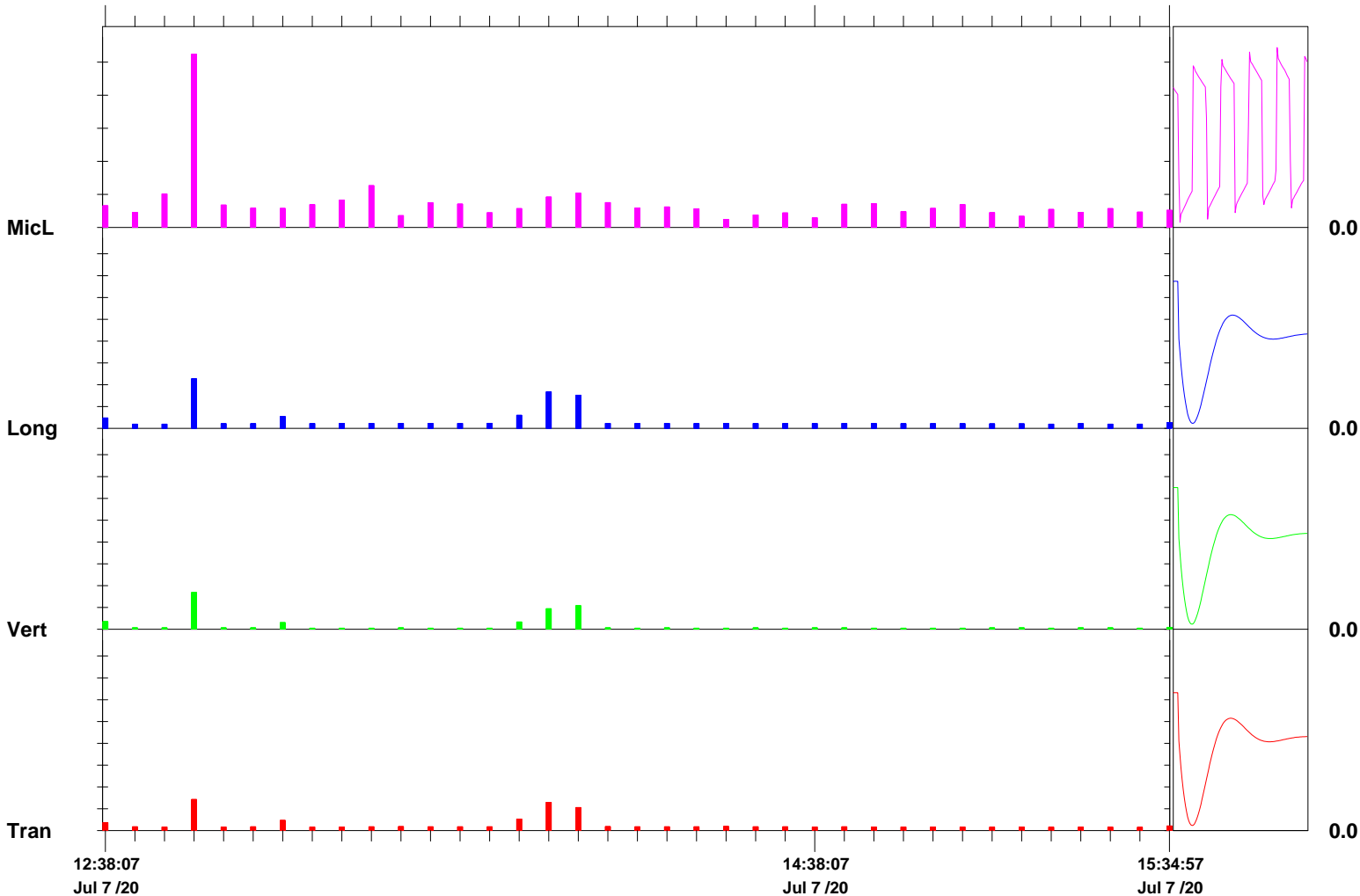
Extended Notes

Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 128.4 dB(L) 52.36 pa.(L) on July 7, 2020 at 12:53:07
ZC Freq 14 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1127 mv)

	Tran	Vert	Long	
PPV	1.419	1.679	2.262	mm/s
ZC Freq	30	30	32	Hz
Date	Jul 7 /20	Jul 7 /20	Jul 7 /20	
Time	12:53:07	12:53:07	12:53:07	
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	6.9	Hz
Overswing Ratio	5.2	4.6	5.0	

Peak Vector Sum 2.298 mm/s on July 7, 2020 at 12:53:07



Time Scale: 5 minutes /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 10.000 pa.(L)/div

Sensor Check

Date/Time Long at 13:02:44 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5059 V 10.72-4.32 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration September 25, 2019 by InstanTel
File Name G059IJ9D.KK0

Notes

Location: 1-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

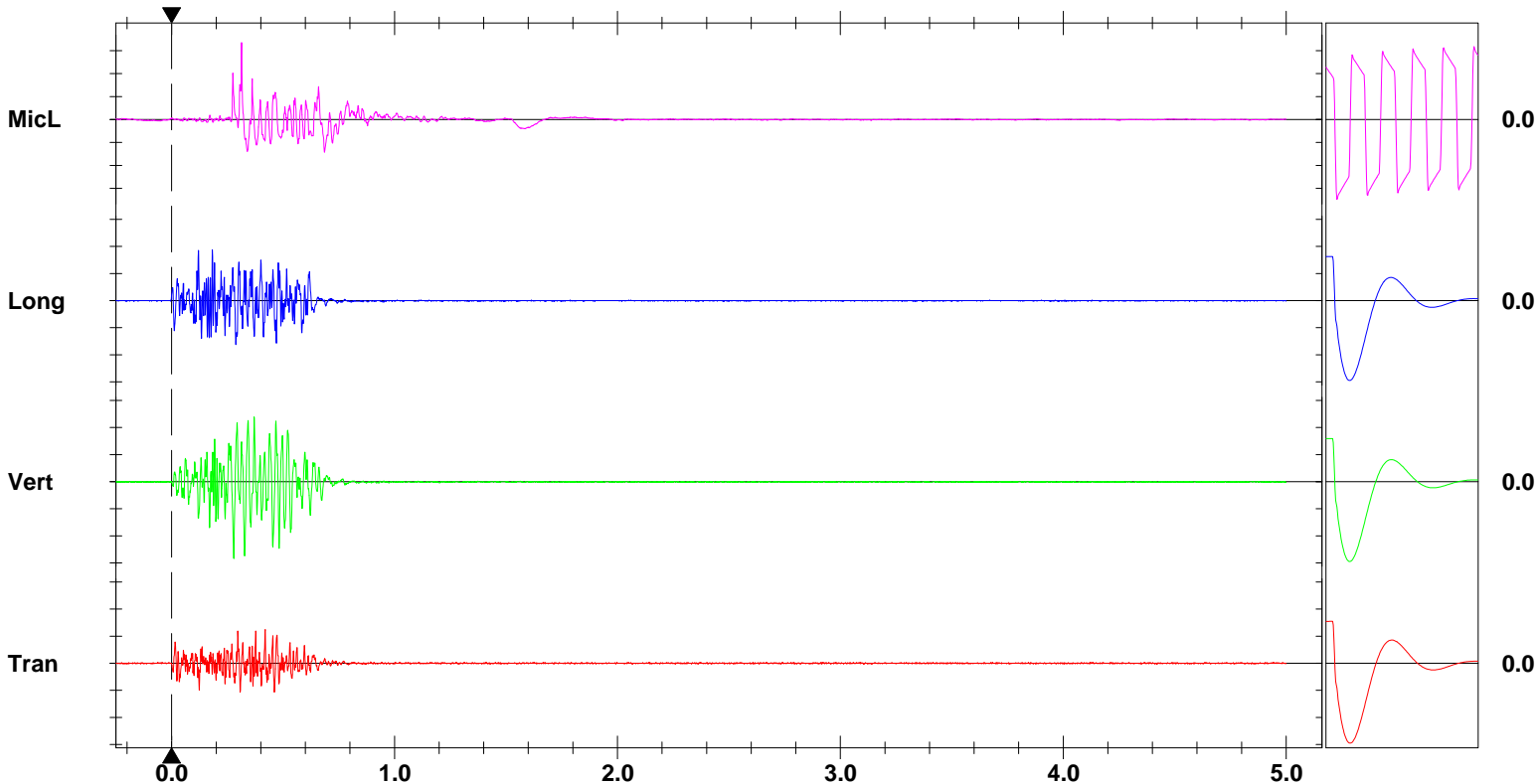
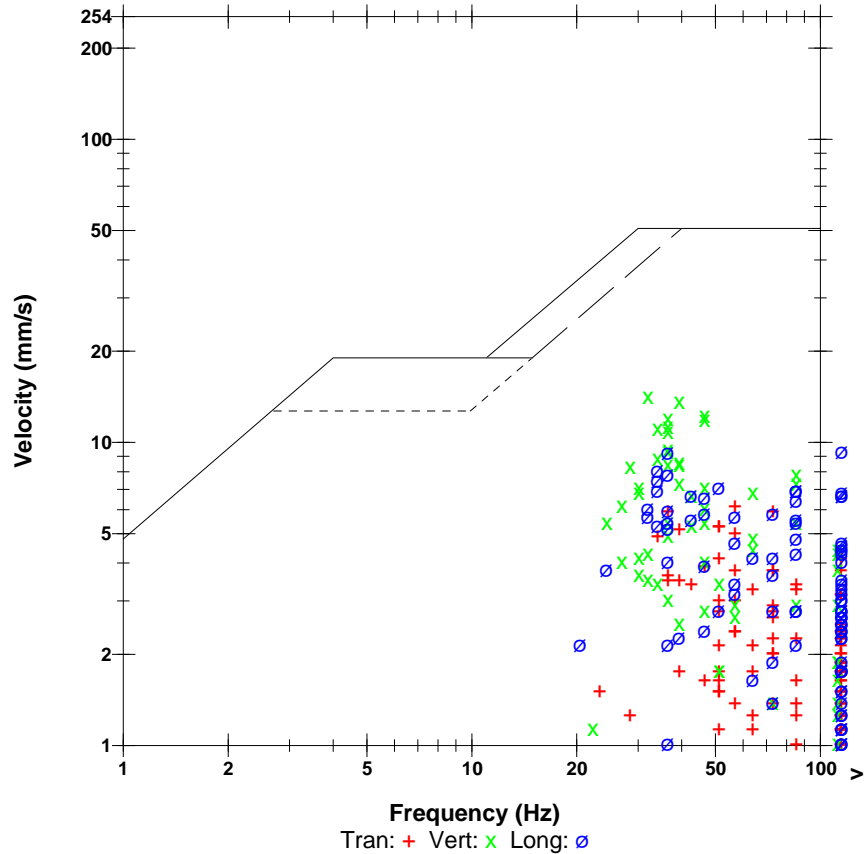
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 138.5 dB(L) 167.5 pa.(L) at 0.313 sec
ZC Freq 22 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 481 mv)

	Tran	Vert	Long	
PPV	6.223	14.22	9.398	mm/s
ZC Freq	57	32	>100	Hz
Time (Rel. to Trig)	0.420	0.279	0.183	sec
Peak Acceleration	0.398	0.437	0.583	g
Peak Displacement	0.018	0.058	0.037	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.6	Hz
Overswing Ratio	3.5	3.6	3.5	

Peak Vector Sum 14.79 mm/s at 0.327 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 50.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:03:11 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5717 V 10.72-4.32 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration August 2, 2019 by InstanTel
File Name G717IJ9D.LB0

Notes

Location: 1-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

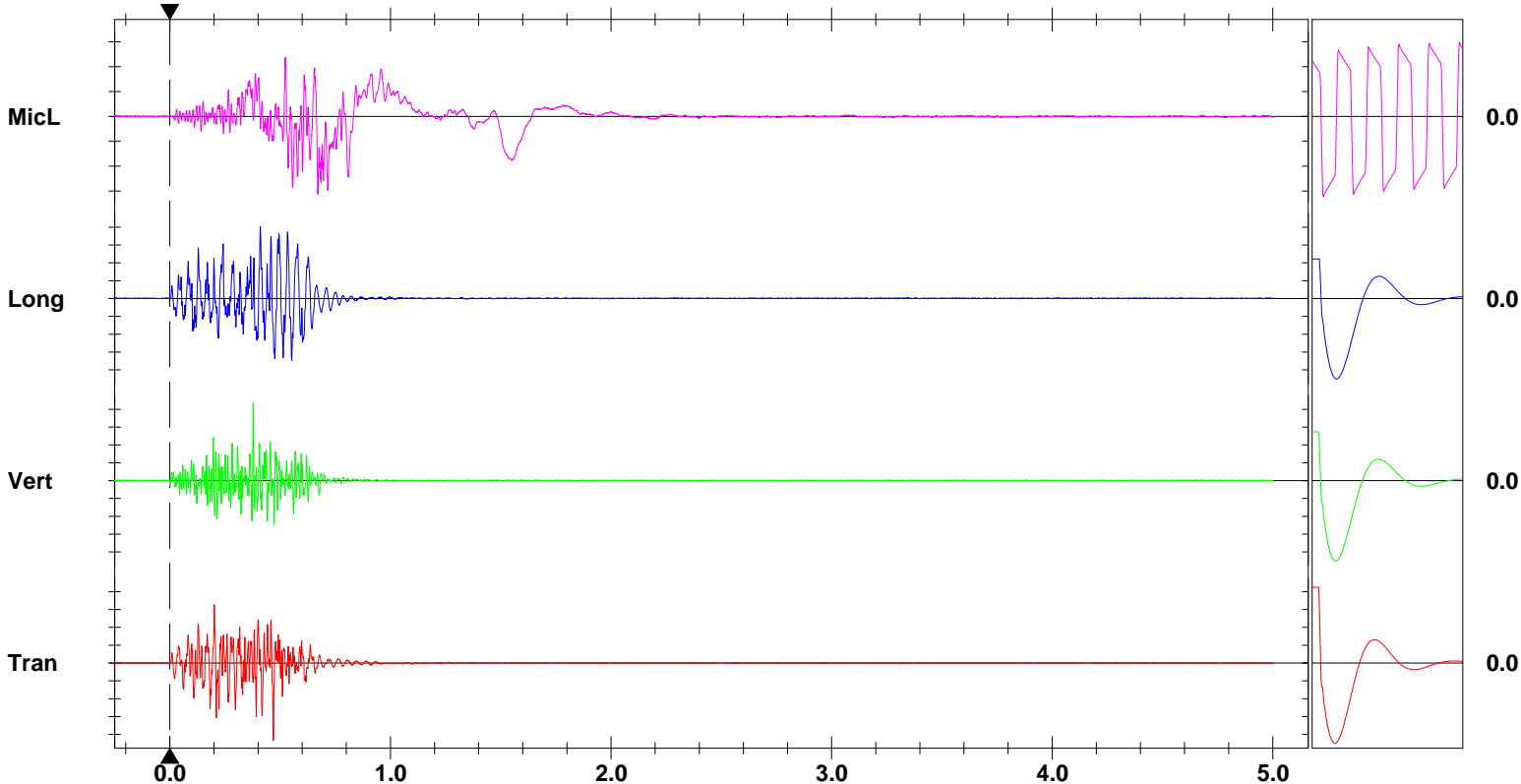
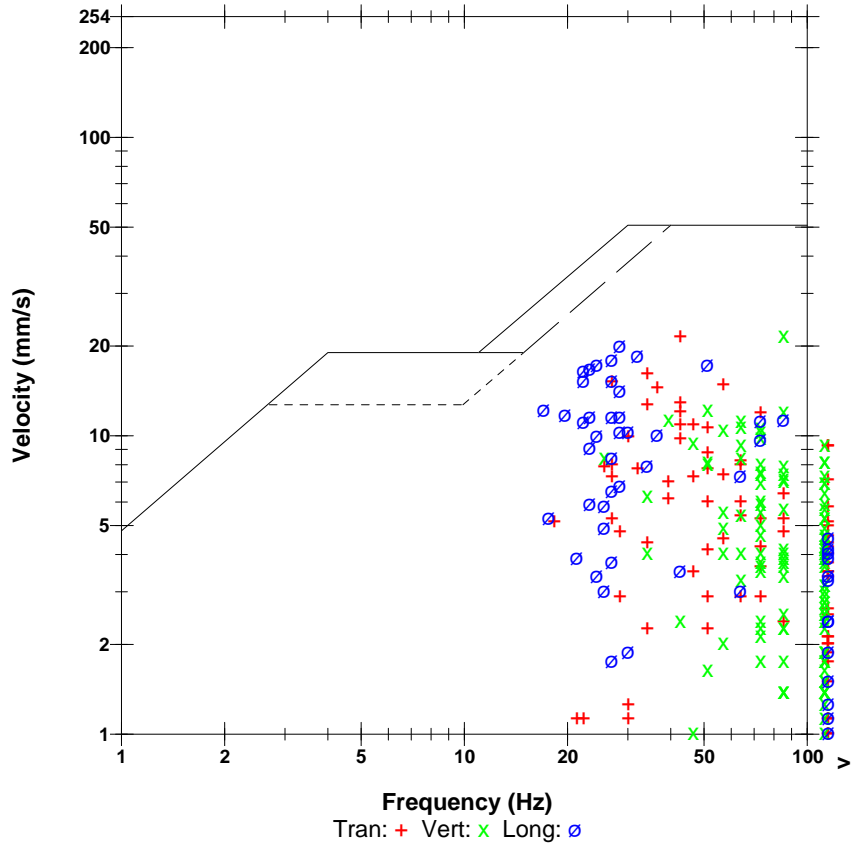
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 123.9 dB(L) 31.25 pa.(L) at 0.671 sec
ZC Freq 5.0 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 486 mv)

	Tran	Vert	Long	
PPV	21.72	21.72	20.19	mm/s
ZC Freq	43	85	28	Hz
Time (Rel. to Trig)	0.469	0.378	0.410	sec
Peak Acceleration	0.848	1.180	0.822	g
Peak Displacement	0.063	0.039	0.113	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.8	7.4	7.2	Hz
Overswing Ratio	3.5	3.8	3.6	

Peak Vector Sum 24.09 mm/s at 0.470 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:03:17 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BK5780 V 10.72-4.32 MiniMate Plus/8
Battery Level 6.5 Volts
Unit Calibration November 19, 2019 by InstanTel
File Name G780IJ9D.LH0

Notes

Location: 2-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

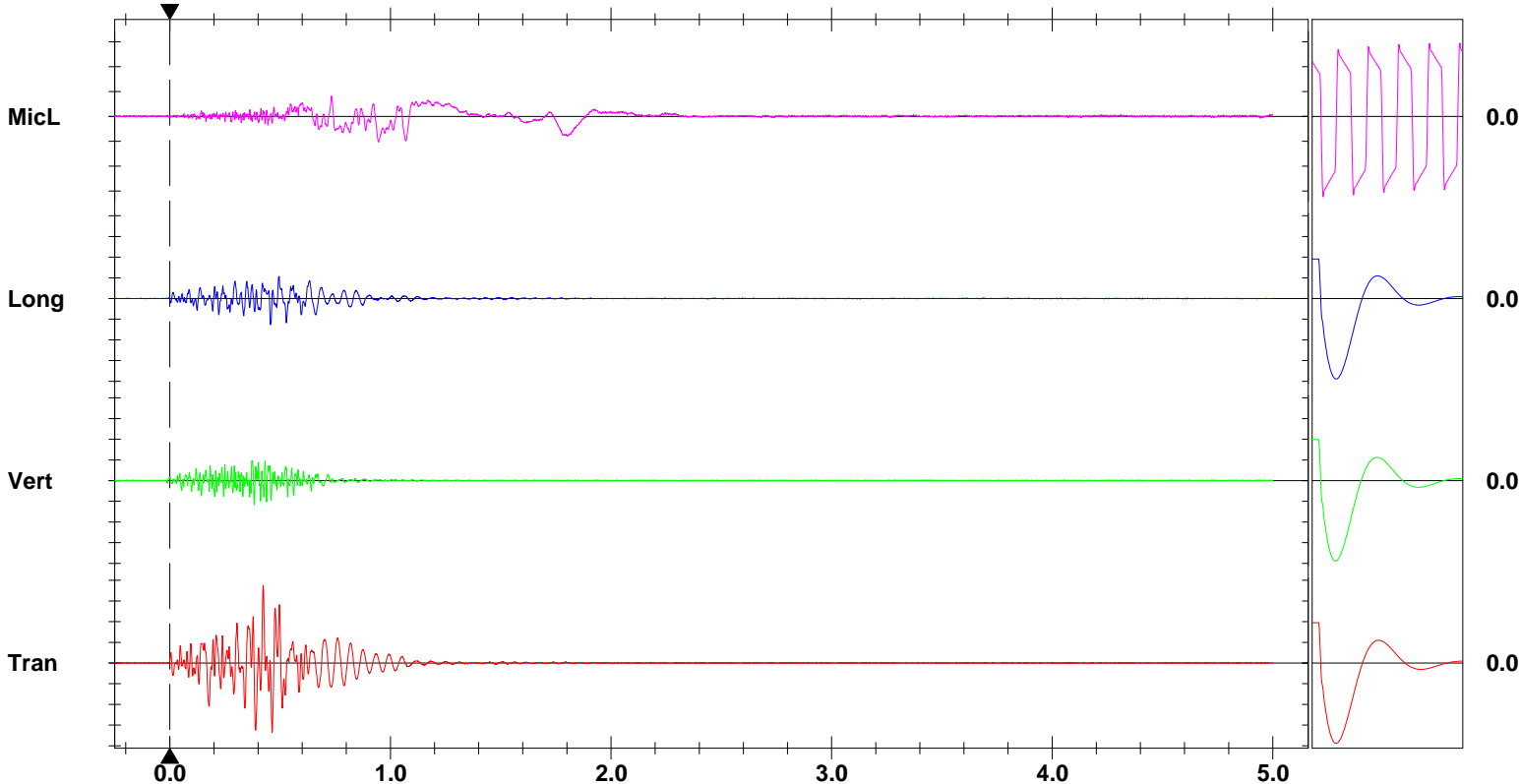
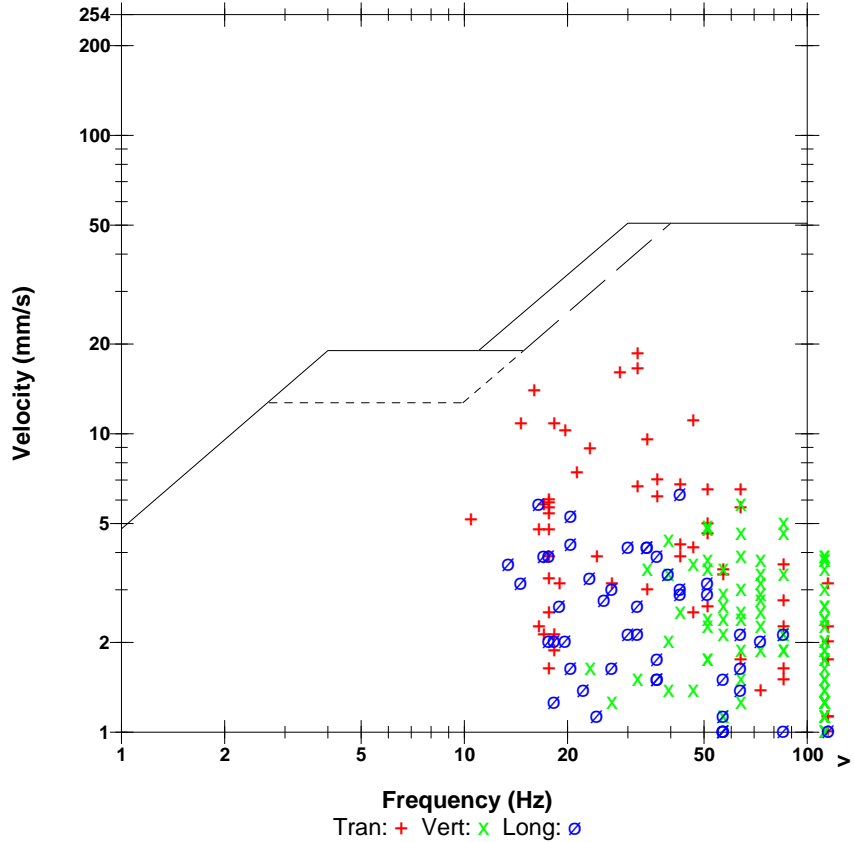
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 114.2 dB(L) 10.25 pa.(L) at 0.945 sec
ZC Freq 5.3 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 493 mv)

	Tran	Vert	Long	
PPV	18.80	5.842	6.350	mm/s
ZC Freq	32	64	43	Hz
Time (Rel. to Trig)	0.423	0.383	0.456	sec
Peak Acceleration	0.411	0.278	0.199	g
Peak Displacement	0.119	0.018	0.035	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.6	7.4	Hz
Overswing Ratio	3.5	3.5	3.6	

Peak Vector Sum 19.07 mm/s at 0.423 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:03:39 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE15858 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration September 12, 2019 by InstanTel
File Name Q858IJ9D.M30

Notes

Location: 5-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

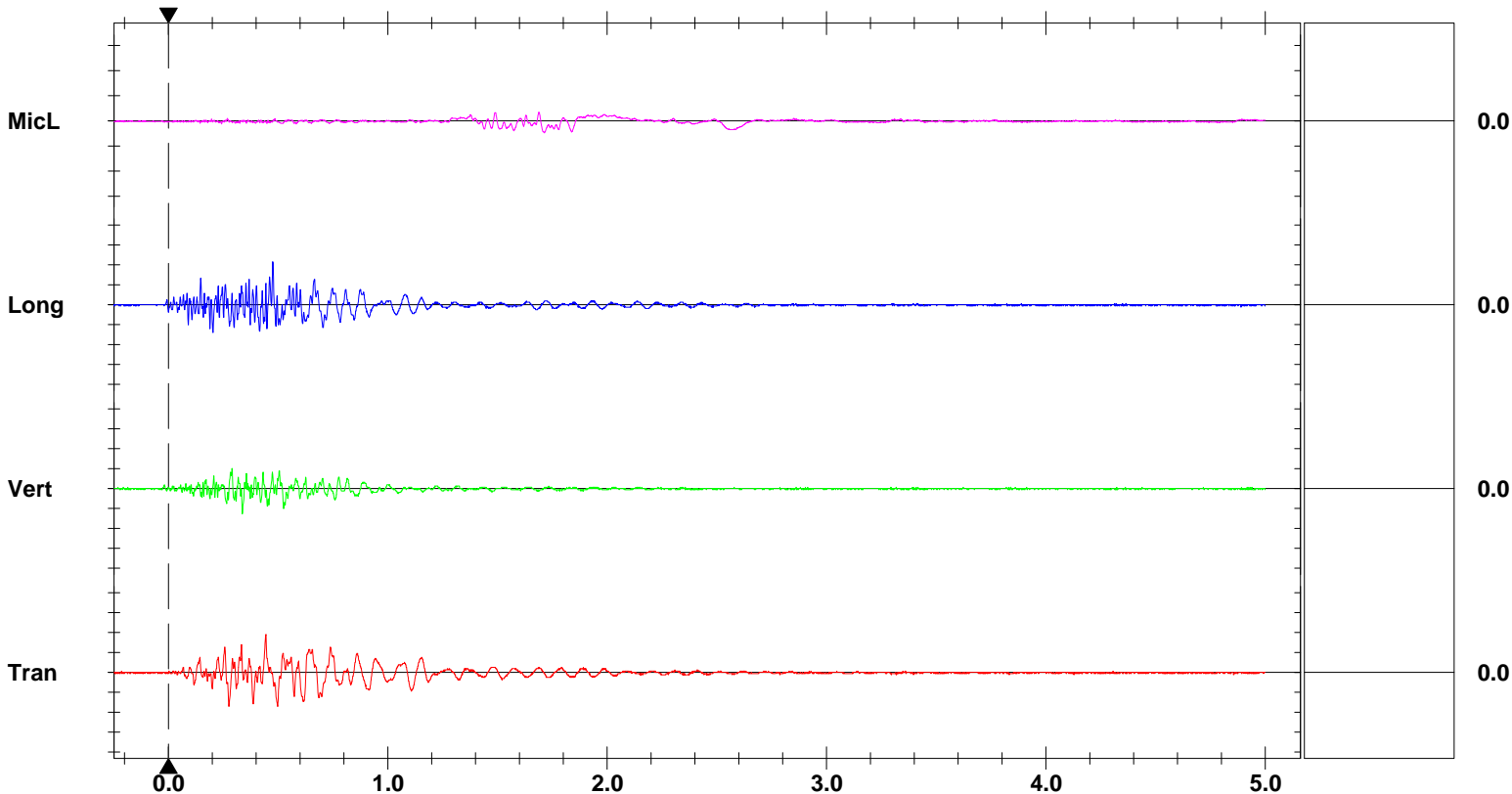
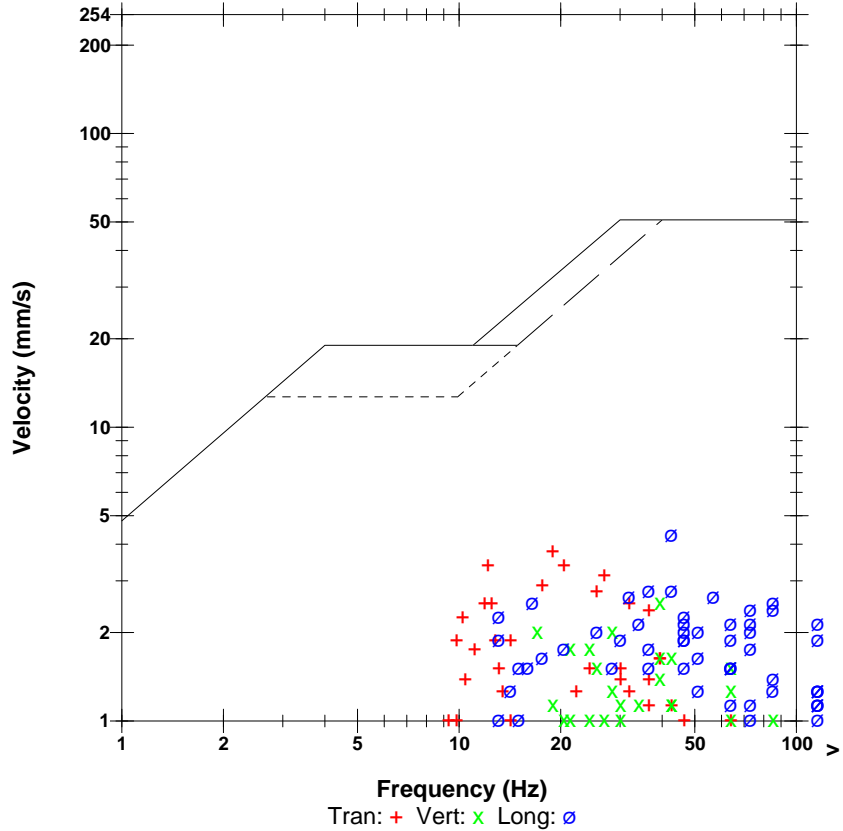
Combo Mode July 7, 2020 10:27:45
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 107.5 dB(L) 4.750 pa.(L) at 1.712 sec
ZC Freq 5.5 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.810	2.540	4.318	mm/s
ZC Freq	19	39	43	Hz
Time (Rel. to Trig)	0.444	0.337	0.476	sec
Peak Acceleration	0.093	0.093	0.146	g
Peak Displacement	0.037	0.015	0.024	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.554 mm/s at 0.476 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:03:42 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE14197 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration May 29, 2020 by InstanTel
File Name P197IJ9D.M60

Notes

Location: 3-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

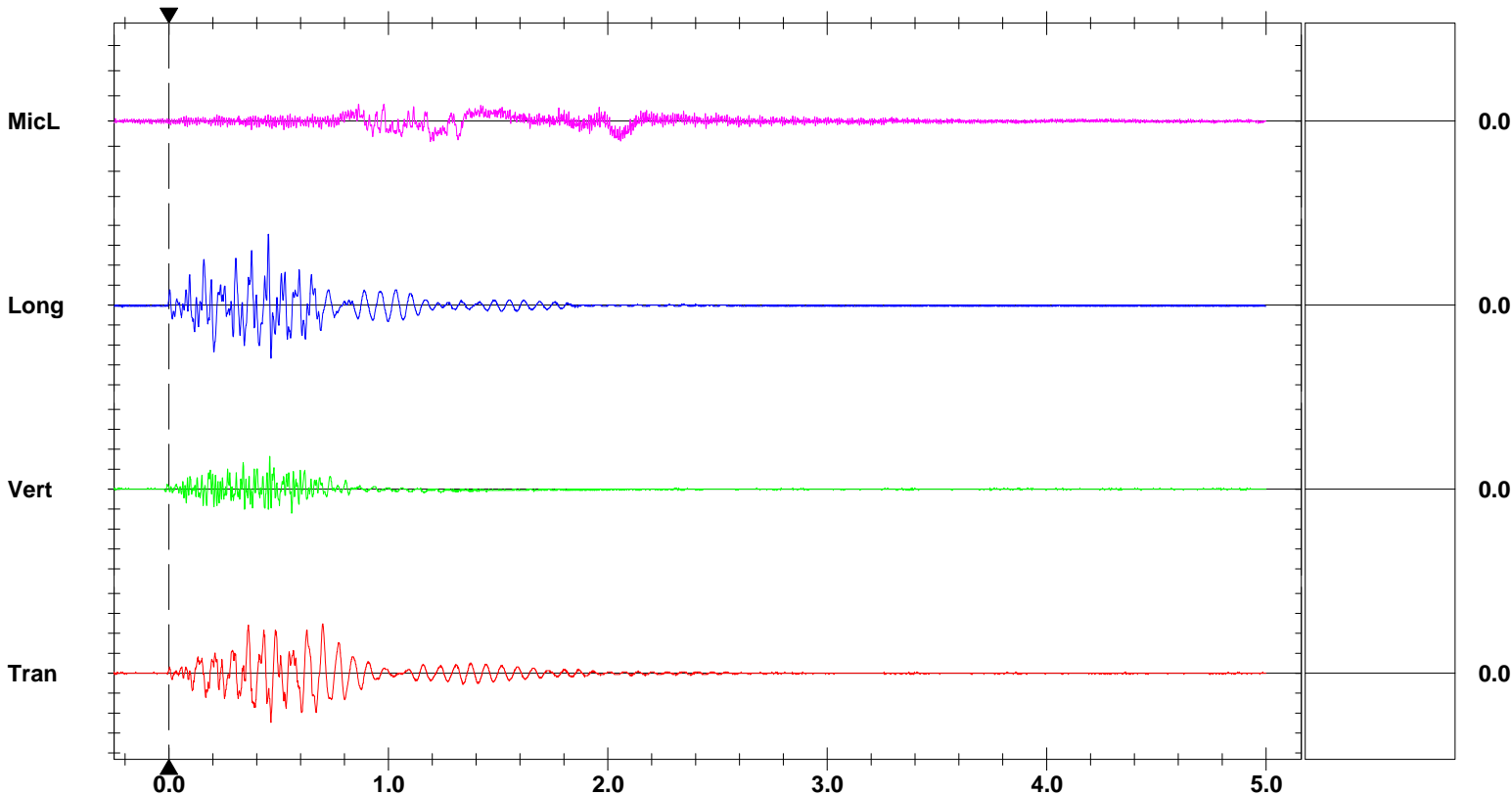
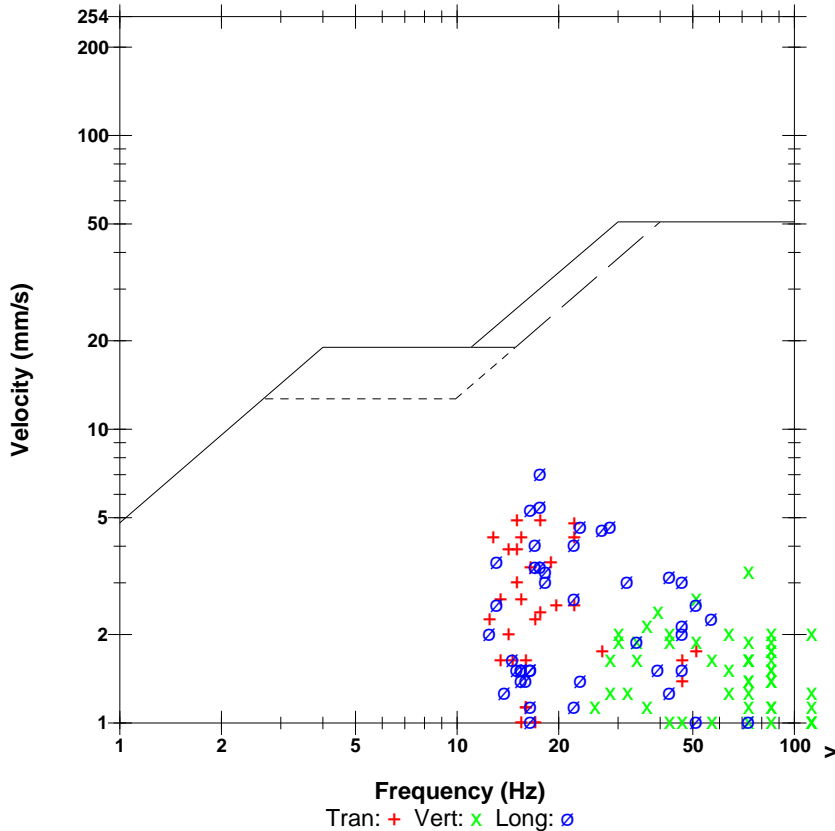
Combo Mode July 7, 2020 10:07:52
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 112.3 dB(L) 8.250 pa.(L) at 1.191 sec
ZC Freq 5.4 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	4.953	3.302	7.112	mm/s
ZC Freq	15	73	18	Hz
Time (Rel. to Trig)	0.465	0.459	0.453	sec
Peak Acceleration	0.106	0.133	0.159	g
Peak Displacement	0.042	0.010	0.039	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 7.638 mm/s at 0.453 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:03:46 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE21128 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration December 10, 2019 by InstanTel
File Name W128IJ9D.MA0

Notes

Location: 3-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

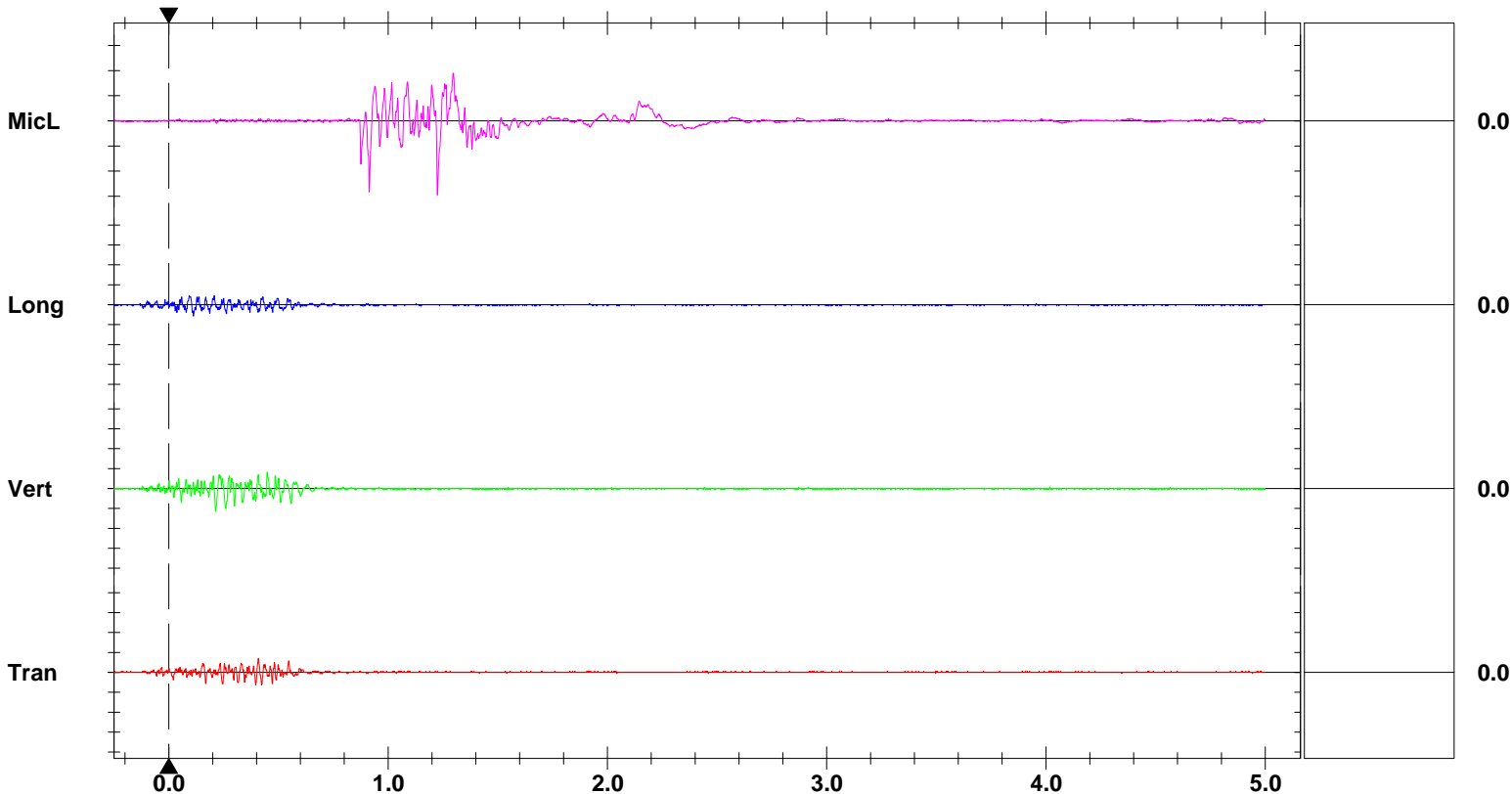
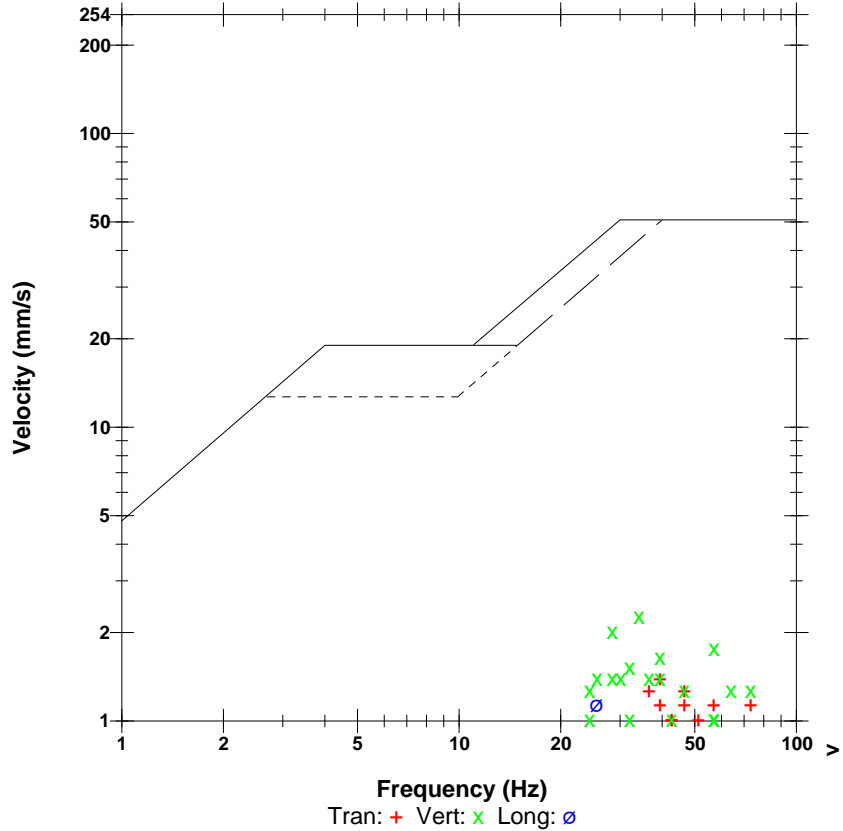
Combo Mode July 7, 2020 11:46:09
 Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 123.4 dB(L) 29.50 pa.(L) at 1.225 sec
ZC Freq 20 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.397	2.286	1.143	mm/s
ZC Freq	39	34	26	Hz
Time (Rel. to Trig)	0.407	0.213	0.112	sec
Peak Acceleration	0.053	0.066	0.053	g
Peak Displacement	0.006	0.011	0.006	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.290 mm/s at 0.213 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:03:47 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE20044 V 10.72-8.17 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration August 30, 2019 by InstanTel
File Name V044IJ9D.MB0

Notes

Location: 2-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

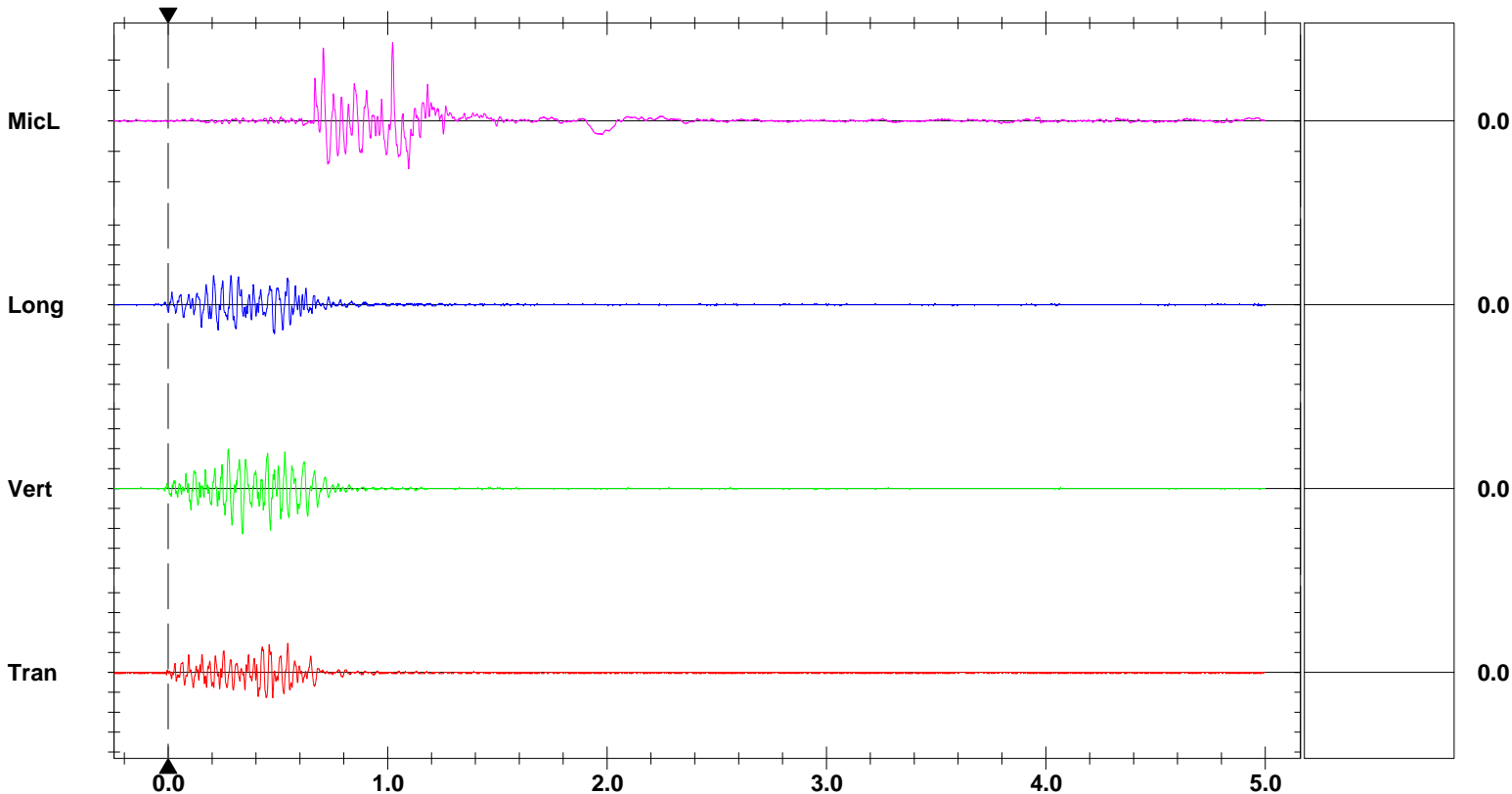
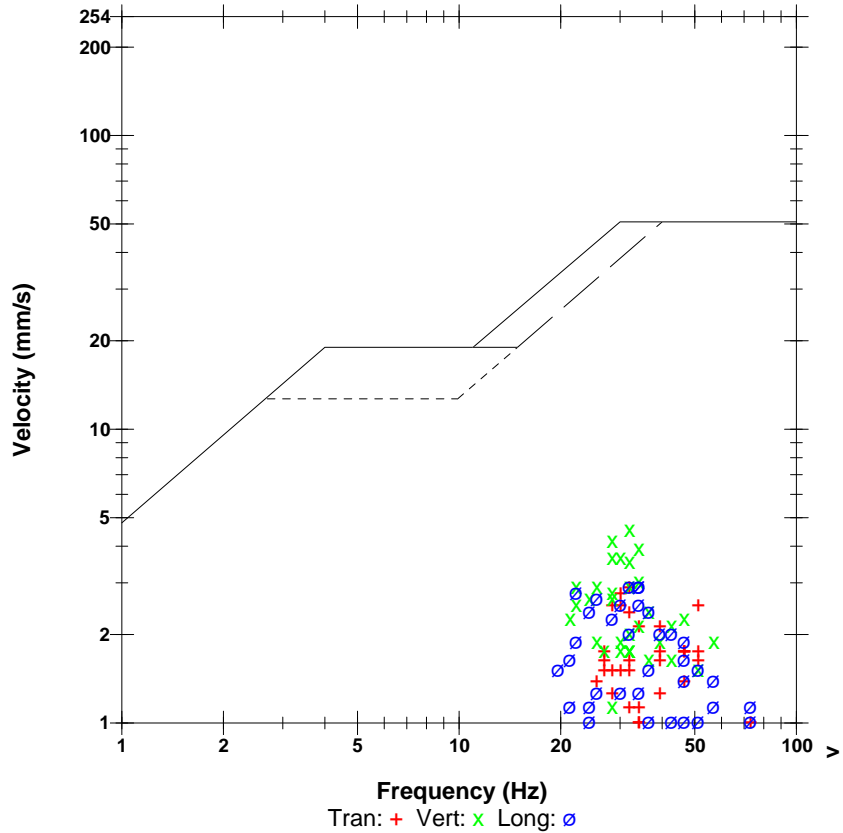
Combo Mode July 7, 2020 11:50:53
 Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 128.2 dB(L) 51.50 pa.(L) at 1.022 sec
ZC Freq 27 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.921	4.572	2.921	mm/s
ZC Freq	32	32	32	Hz
Time (Rel. to Trig)	0.545	0.339	0.206	sec
Peak Acceleration	0.106	0.119	0.106	g
Peak Displacement	0.016	0.022	0.017	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.849 mm/s at 0.466 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:03:59 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13860 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 3, 2020 by InstanTel
File Name UM13860_20200707130359.IDFW

Notes

Location: 8-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

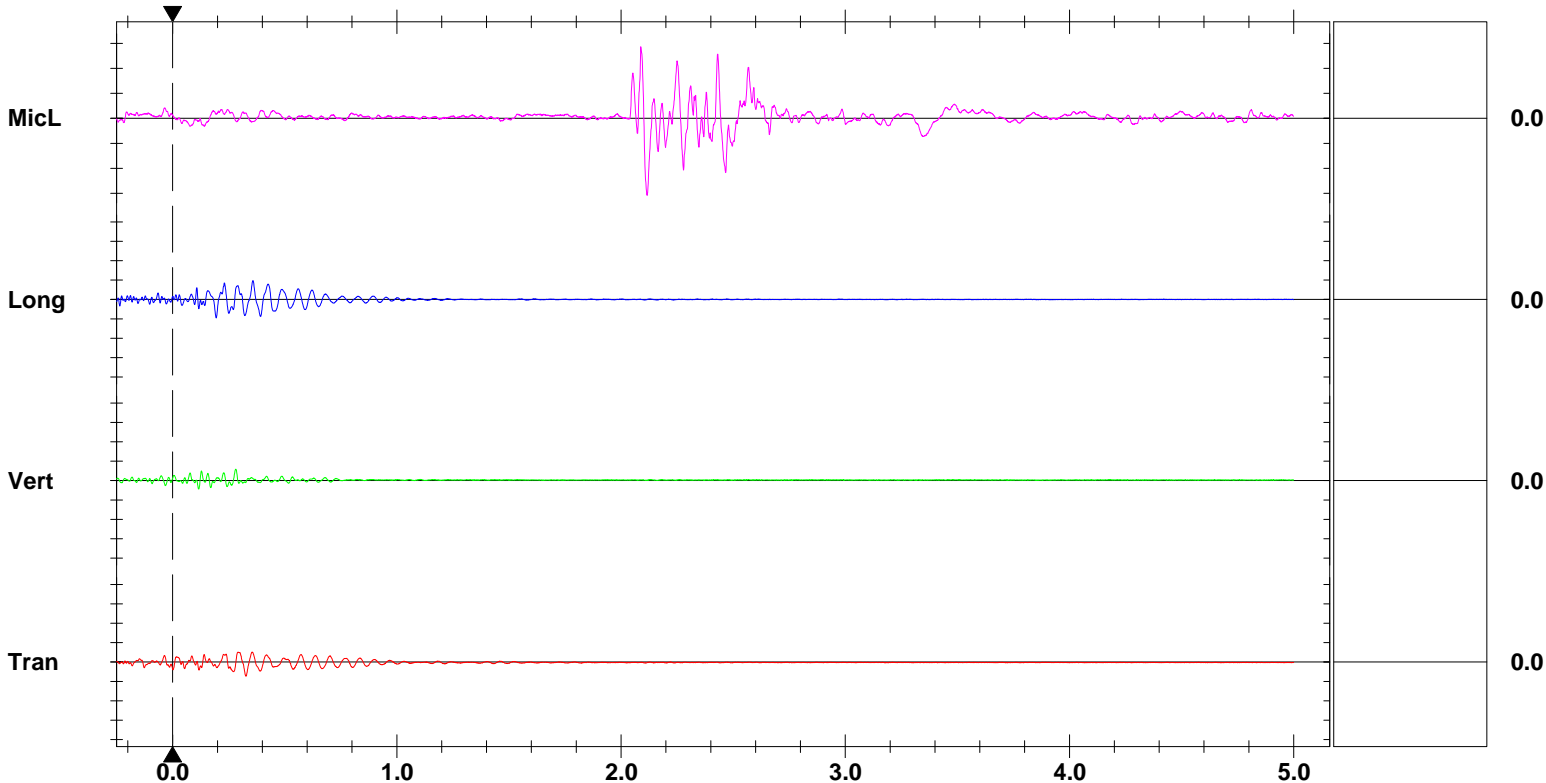
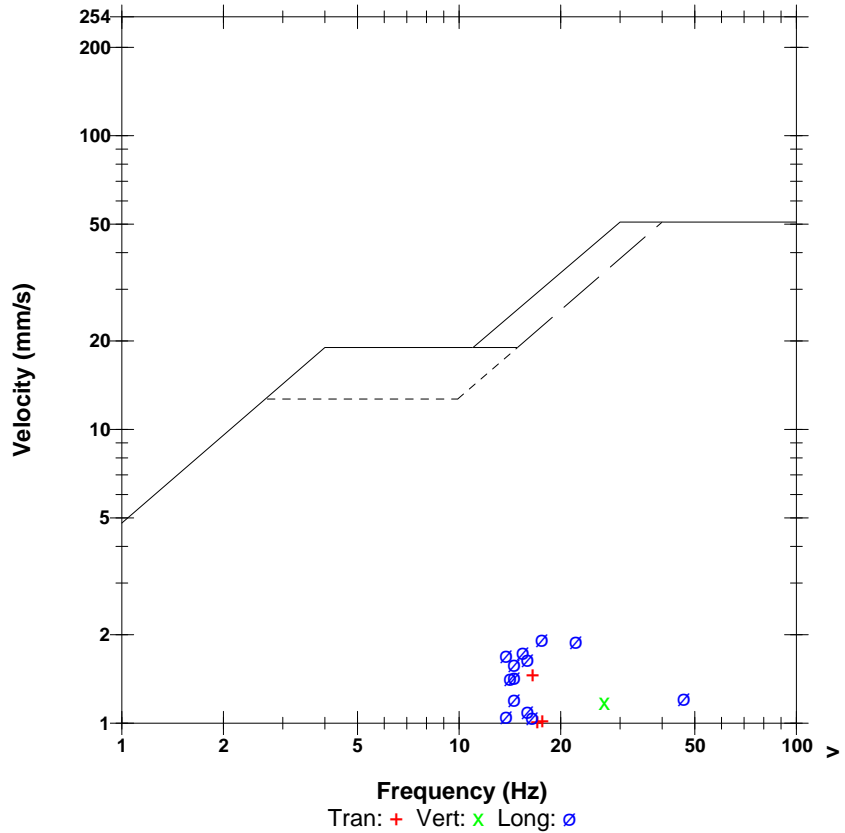
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 109.8 dB(L) 6.160 pa.(L) at 2.116 sec
ZC Freq 14 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.466	1.182	1.939	mm/s
ZC Freq	17	27	18	Hz
Time (Rel. to Trig)	0.327	0.281	0.357	sec
Peak Acceleration	0.022	0.030	0.039	g
Peak Displacement	0.013	0.007	0.017	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.181 mm/s at 0.357 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:04:00 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM13869 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 10, 2019 by InstanTel
File Name UM13869_20200707130400.IDFW

Notes

Location: 5-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

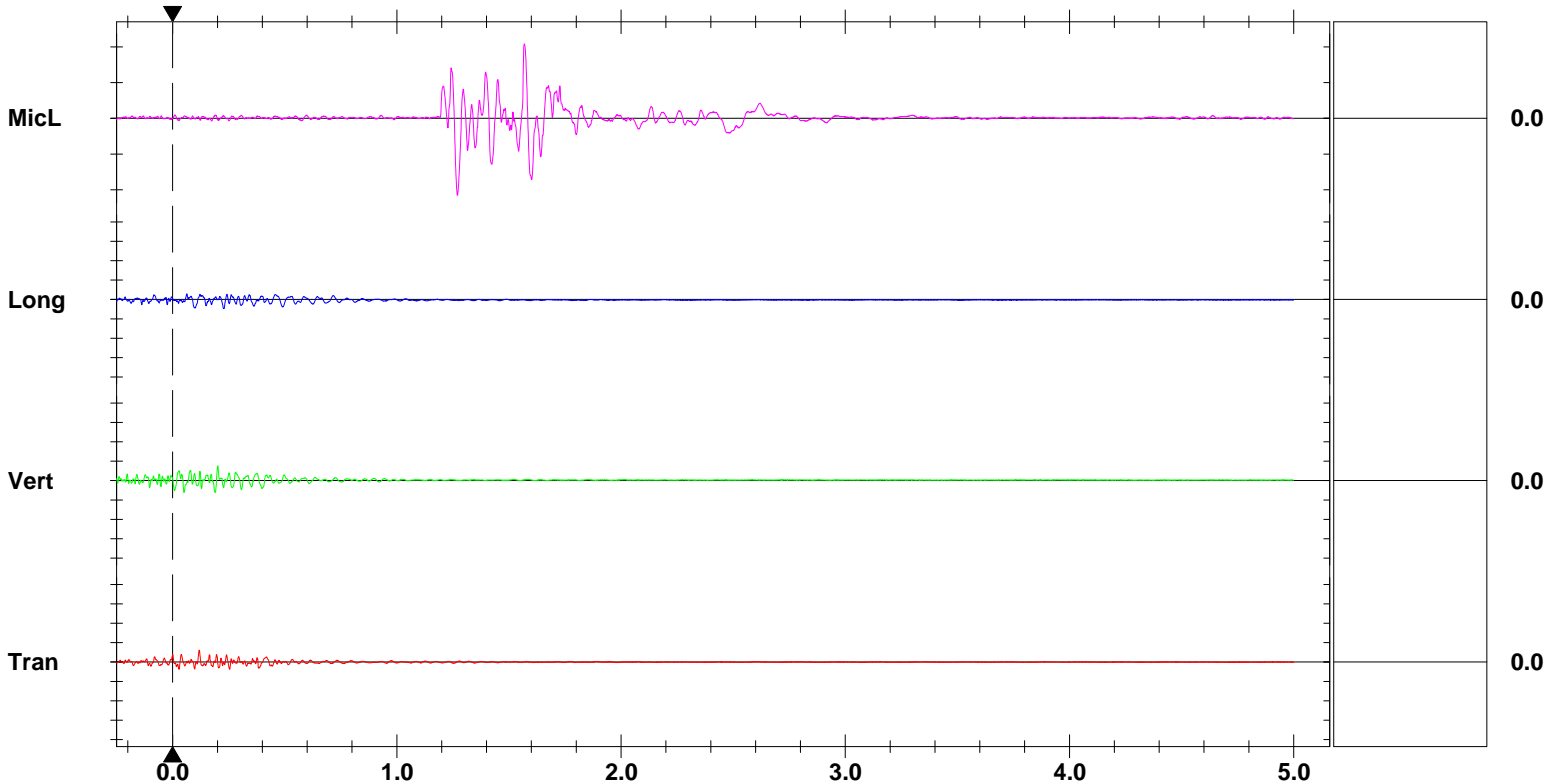
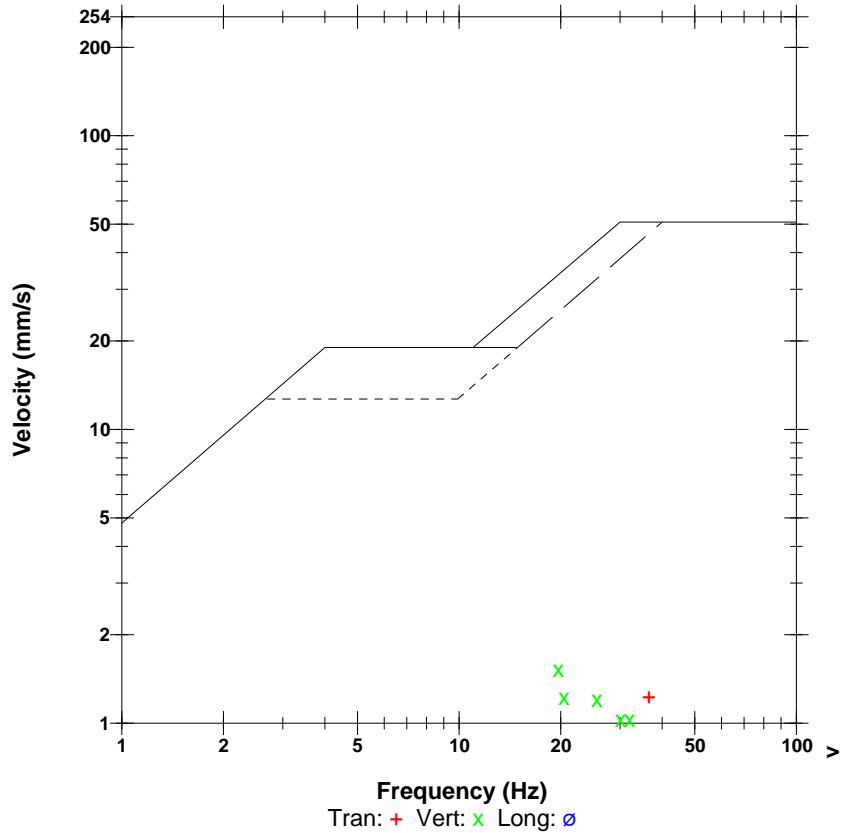
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 114.6 dB(L) 10.77 pa.(L) at 1.270 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.237	1.529	0.946	mm/s
ZC Freq	37	20	27	Hz
Time (Rel. to Trig)	0.118	0.201	0.228	sec
Peak Acceleration	0.044	0.043	0.022	g
Peak Displacement	0.005	0.008	0.008	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.535 mm/s at 0.201 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:04:01 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM10617 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration September 25, 2019 by InstanTel
File Name UM10617_20200707130401.IDFW

Notes

Location: 4-F
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

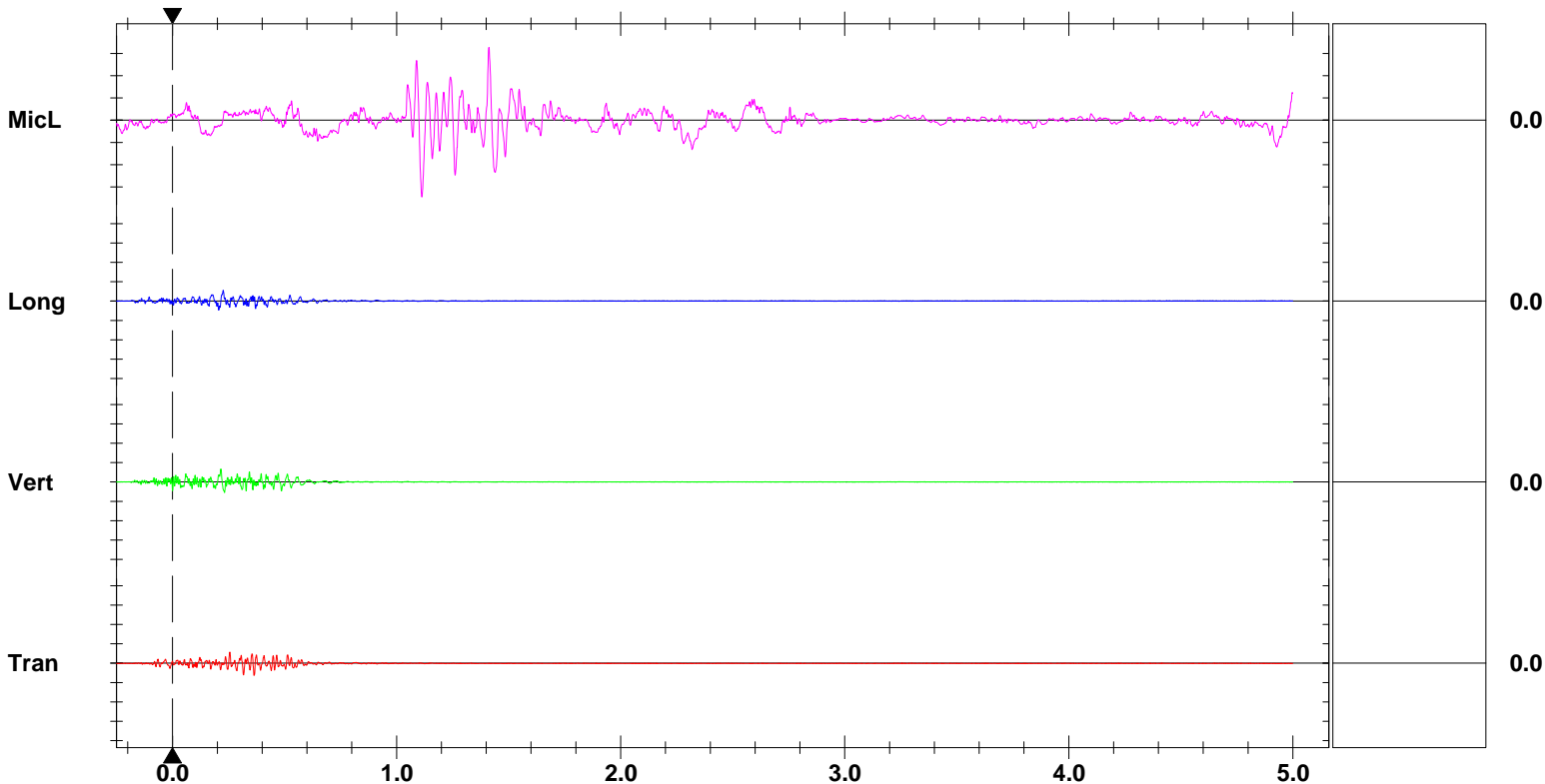
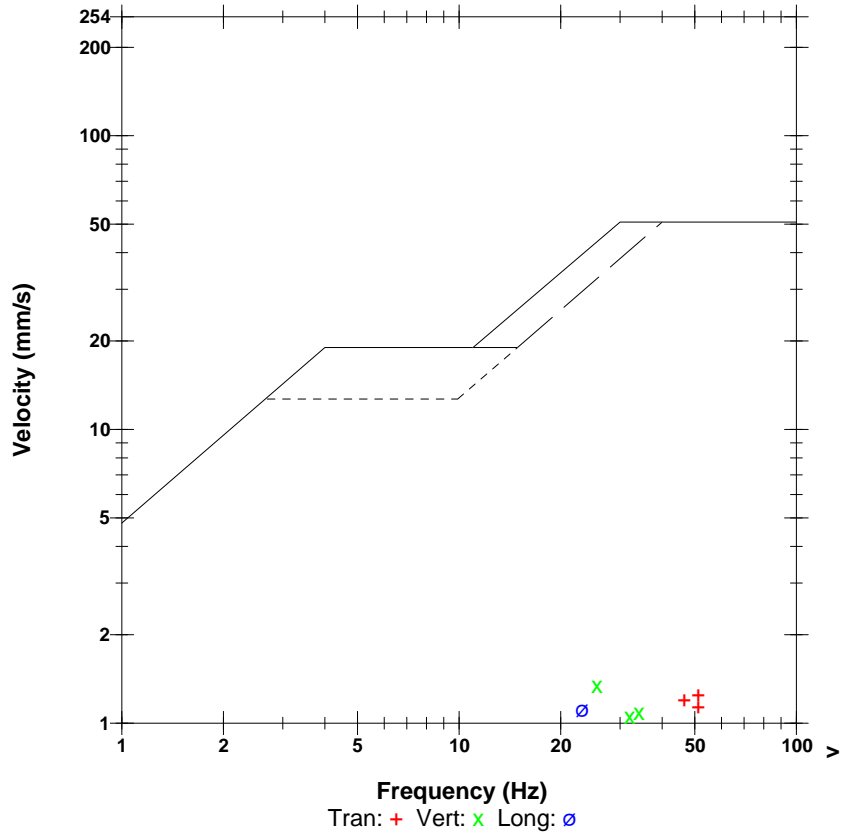
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 118.7 dB(L) 17.28 pa.(L) at 1.112 sec
ZC Freq 18 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.261	1.348	1.119	mm/s
ZC Freq	51	26	23	Hz
Time (Rel. to Trig)	0.363	0.216	0.227	sec
Peak Acceleration	0.086	0.069	0.058	g
Peak Displacement	0.004	0.007	0.006	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.475 mm/s at 0.215 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:04:01 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM13212 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 26, 2020 by InstanTel
File Name UM13212_20200707130401.IDFW

Notes

Location: 7-F
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

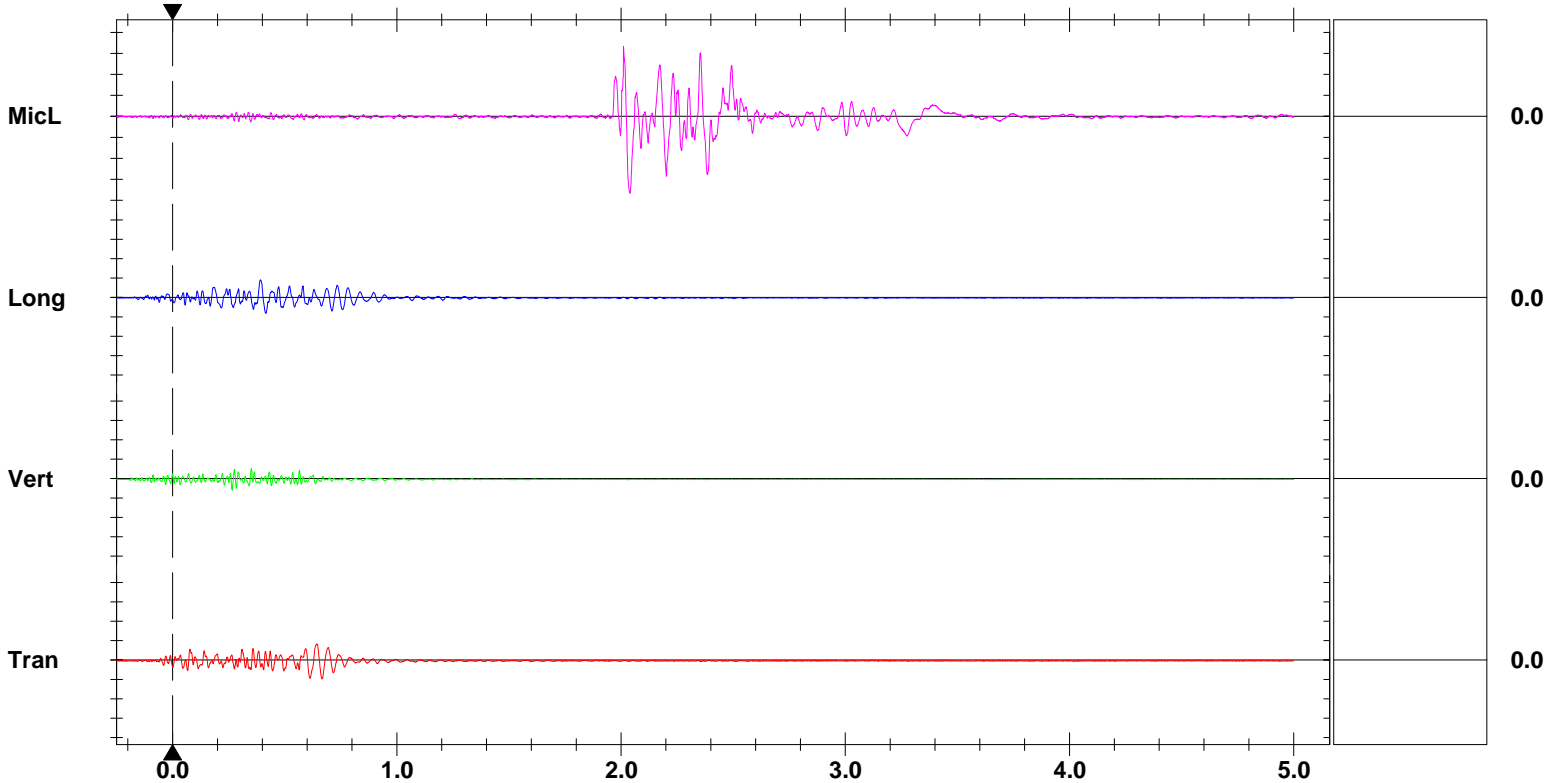
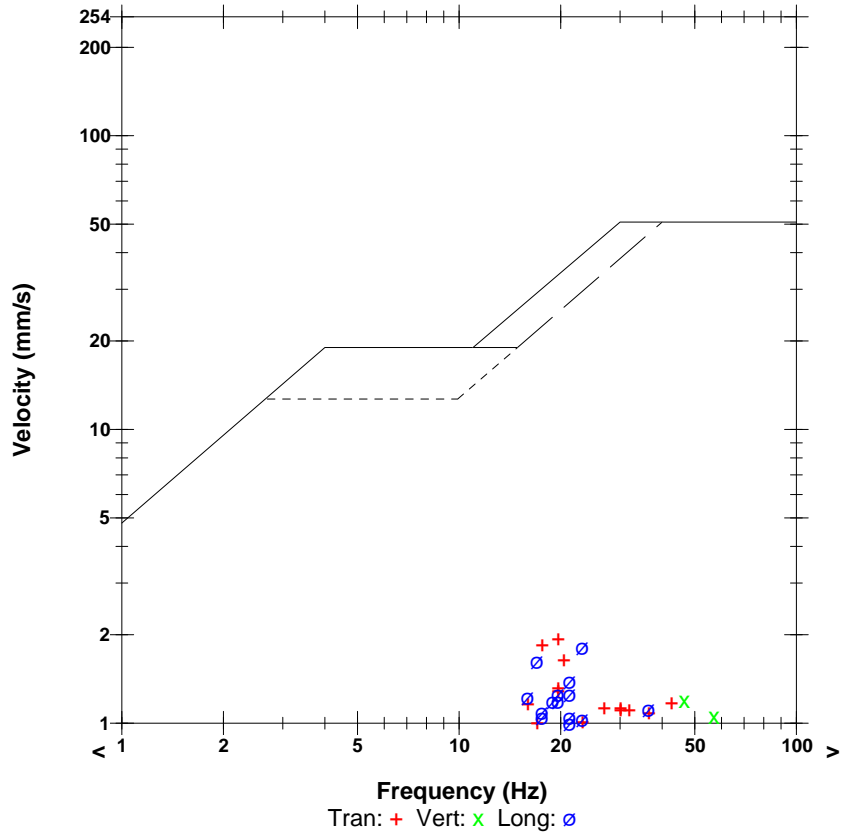
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 111.3 dB(L) 7.339 pa.(L) at 2.039 sec
ZC Freq 13 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.955	1.198	1.821	mm/s
ZC Freq	20	47	23	Hz
Time (Rel. to Trig)	0.667	0.266	0.392	sec
Peak Acceleration	0.051	0.058	0.059	g
Peak Displacement	0.016	0.016	0.038	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.099 mm/s at 0.667 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:04:02 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13831 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 3, 2020 by InstanTel
File Name UM13831_20200707130402.IDFW

Notes

Location: 9-F
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

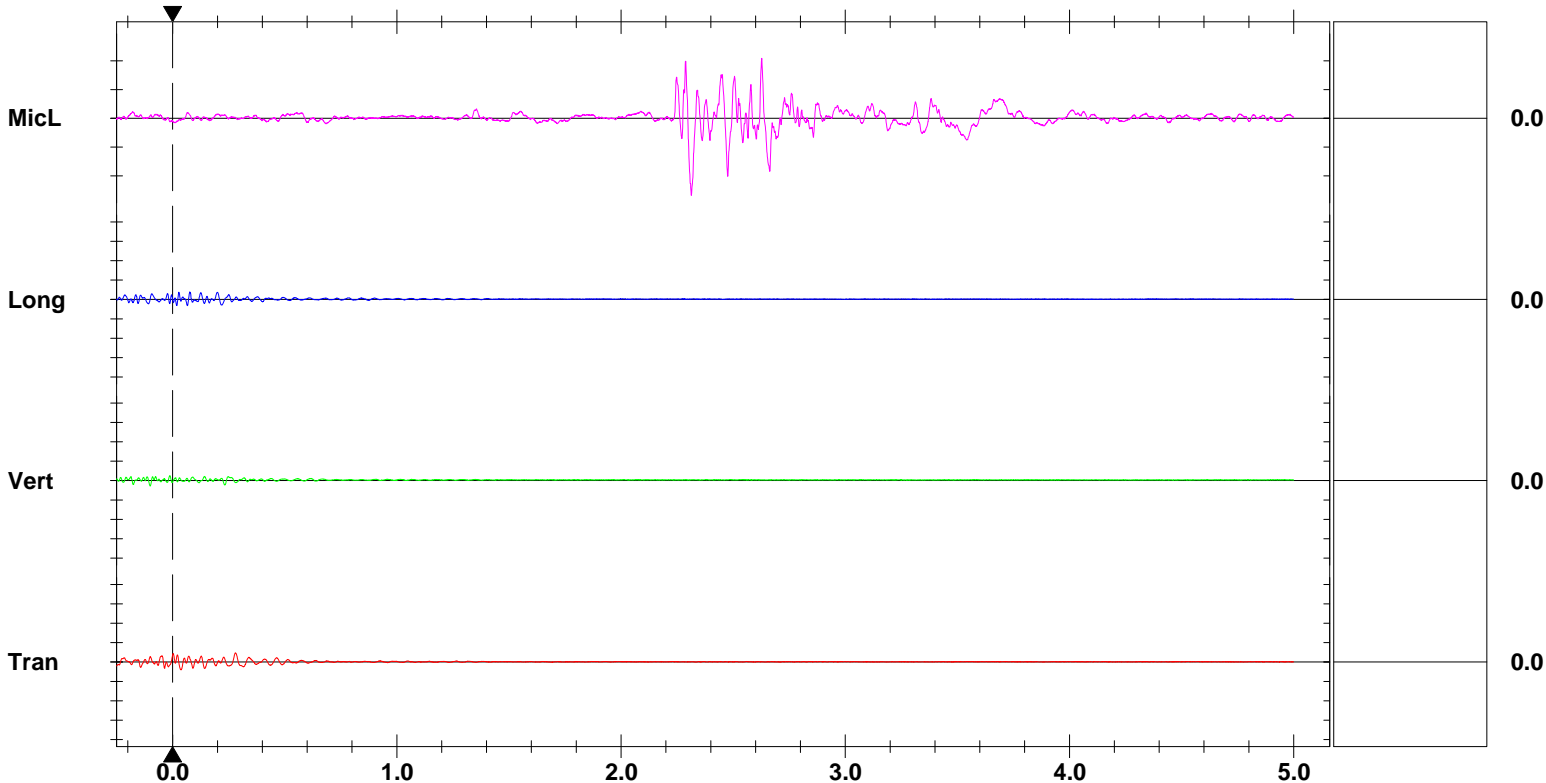
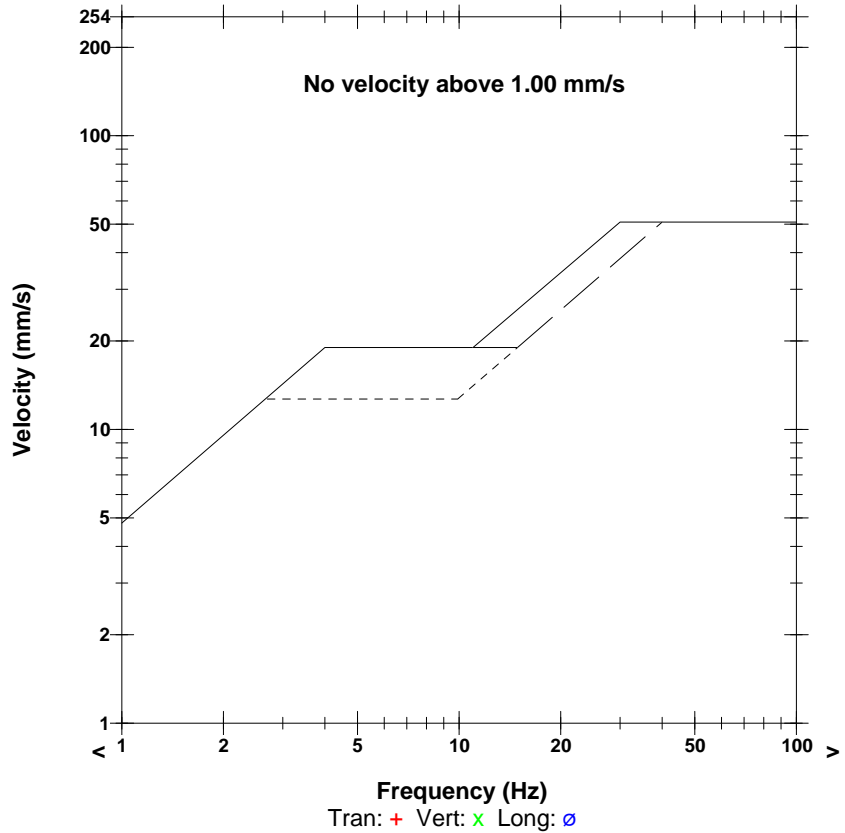
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.operations.

Microphone Linear Weighting
PSPL 108.6 dB(L) 5.353 pa.(L) at 2.313 sec
ZC Freq 15 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	0.954	0.552	0.780	mm/s
ZC Freq	20	39	37	Hz
Time (Rel. to Trig)	0.280	-0.101	0.076	sec
Peak Acceleration	0.021	0.023	0.030	g
Peak Displacement	0.007	0.011	0.020	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 0.992 mm/s at 0.280 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:43:18 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5059 V 10.72-4.32 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration September 25, 2019 by InstanTel
File Name G059IJ9F.G60

Notes

Location: 1-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

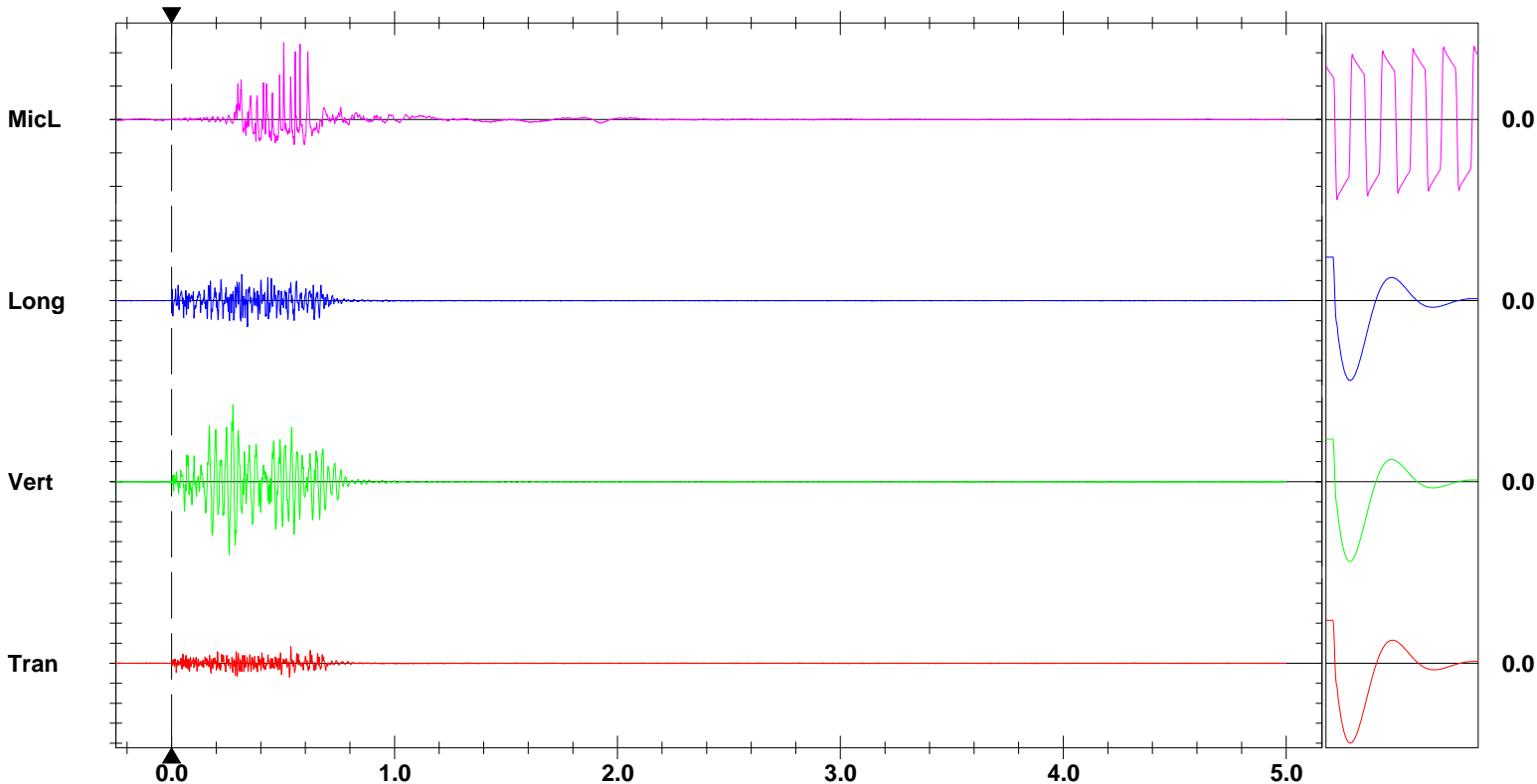
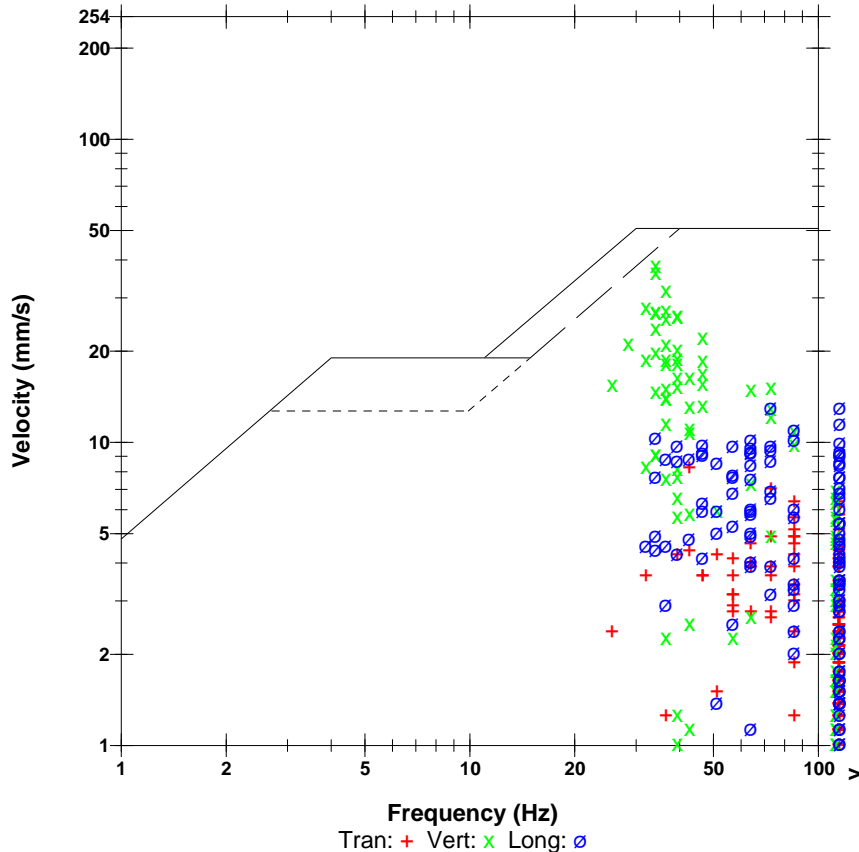
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 141.2 dB(L) 230.3 pa.(L) at 0.503 sec
ZC Freq 64 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 442 mv)

	Tran	Vert	Long	
PPV	8.382	38.48	13.08	mm/s
ZC Freq	43	34	>100	Hz
Time (Rel. to Trig)	0.535	0.275	0.314	sec
Peak Acceleration	0.557	1.167	1.074	g
Peak Displacement	0.015	0.169	0.031	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.5	Hz
Overswing Ratio	3.5	3.6	3.5	

Peak Vector Sum 38.82 mm/s at 0.275 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.000 mm/s/div Mic: 100.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:43:46 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE5717 V 10.72-4.32 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration August 2, 2019 by InstanTel
File Name G717IJ9F.GY0

Notes

Location: 1-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

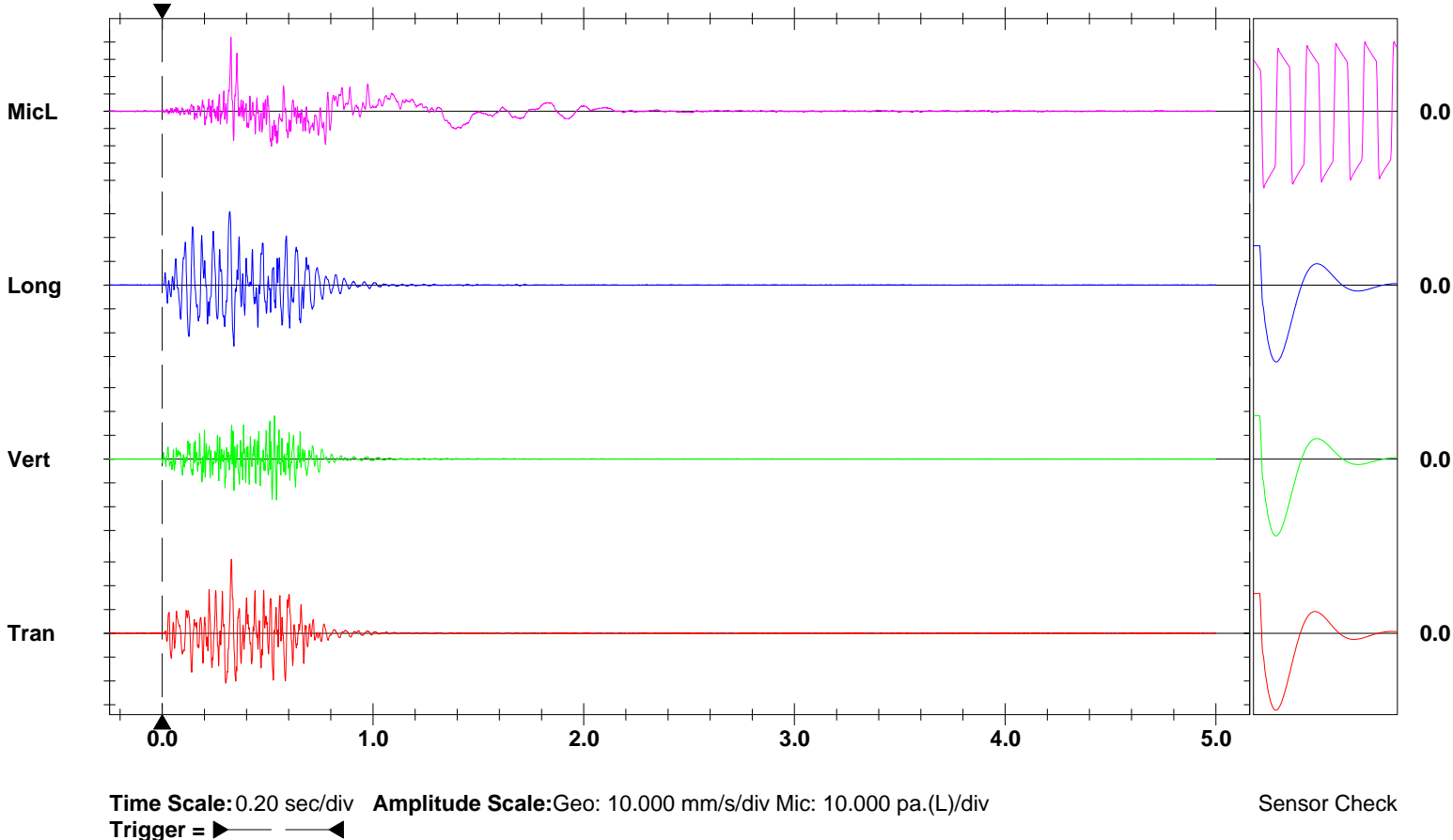
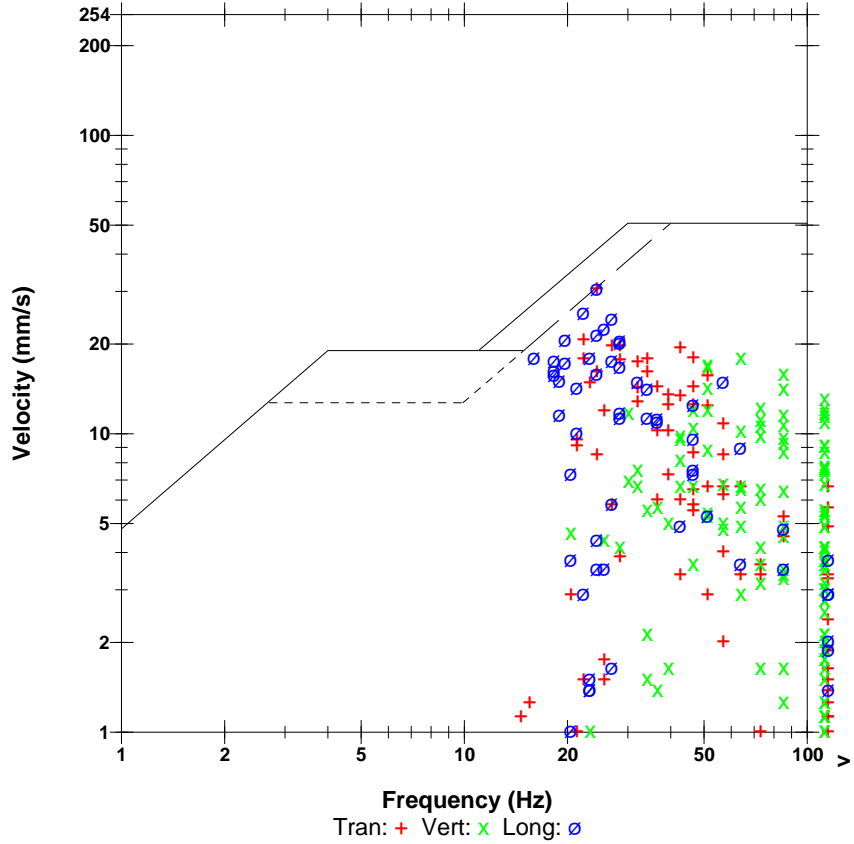
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 126.6 dB(L) 42.75 pa.(L) at 0.326 sec
ZC Freq 19 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 476 mv)

	Tran	Vert	Long	
PPV	31.11	18.16	30.86	mm/s
ZC Freq	24	64	24	Hz
Time (Rel. to Trig)	0.328	0.532	0.319	sec
Peak Acceleration	0.703	1.047	0.636	g
Peak Displacement	0.176	0.045	0.211	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.4	7.3	Hz
Overswing Ratio	3.5	3.8	3.6	

Peak Vector Sum 35.23 mm/s at 0.325 sec

USBM RI8507 And OSMRE



Date/Time Vert at 13:43:52 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BK5780 V 10.72-4.32 MiniMate Plus/8
Battery Level 6.4 Volts
Unit Calibration November 19, 2019 by InstanTel
File Name G780IJ9F.H40

Notes

Location: 2-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

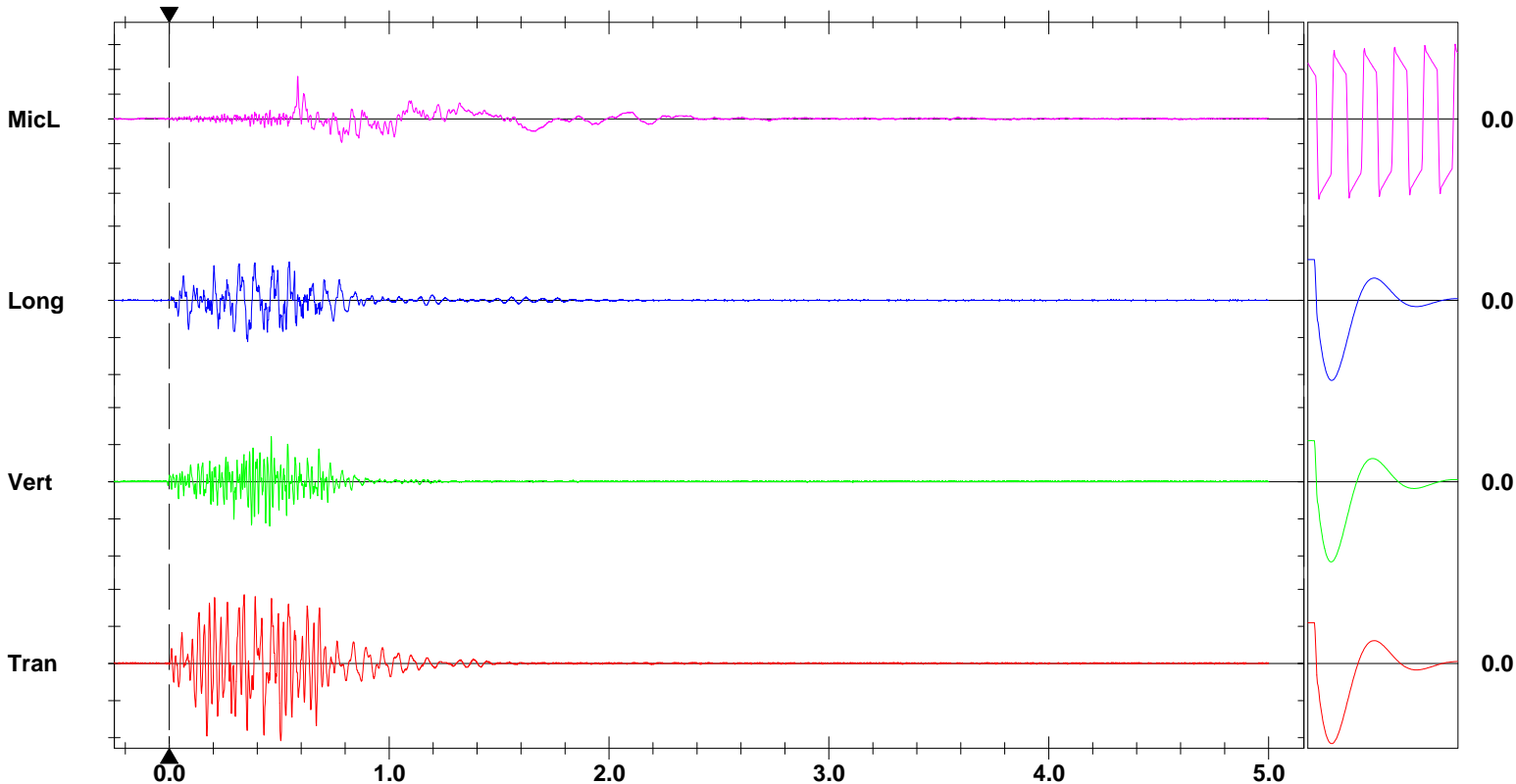
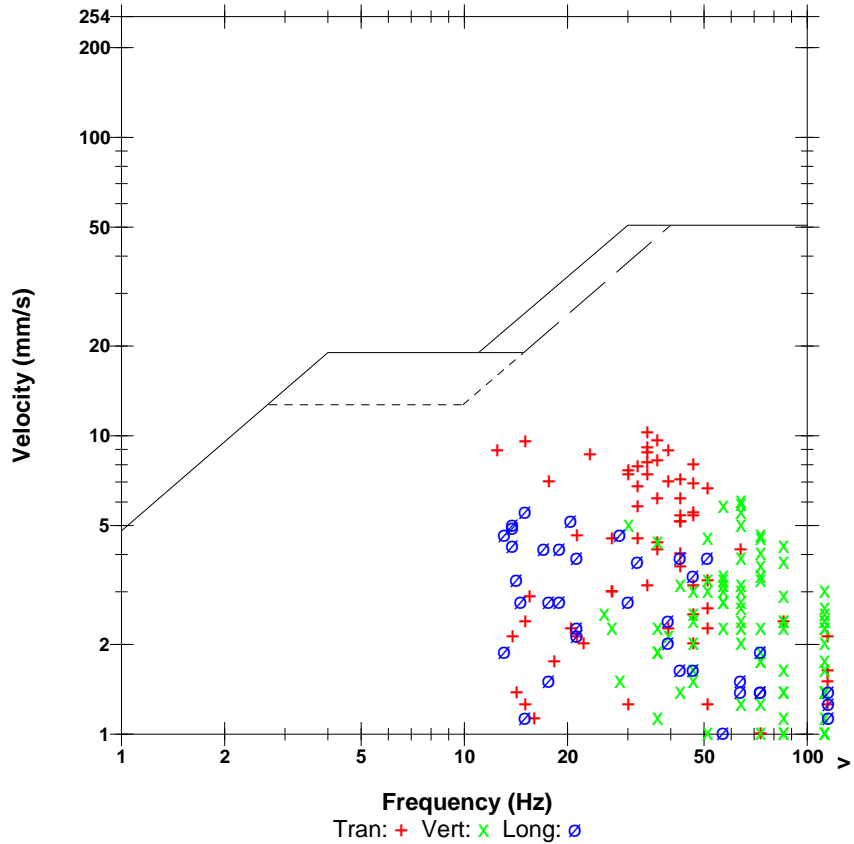
Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 118.7 dB(L) 17.25 pa.(L) at 0.584 sec
ZC Freq 14 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 492 mv)

	Tran	Vert	Long	
PPV	10.41	6.096	5.588	mm/s
ZC Freq	34	64	15	Hz
Time (Rel. to Trig)	0.507	0.464	0.356	sec
Peak Acceleration	0.305	0.345	0.252	g
Peak Displacement	0.068	0.016	0.051	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.6	7.3	Hz
Overswing Ratio	3.5	3.5	3.6	

Peak Vector Sum 10.86 mm/s at 0.431 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:44:17 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE14197 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration May 29, 2020 by InstanTel
File Name P197IJ9F.HTO

Notes

Location: 3-B
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

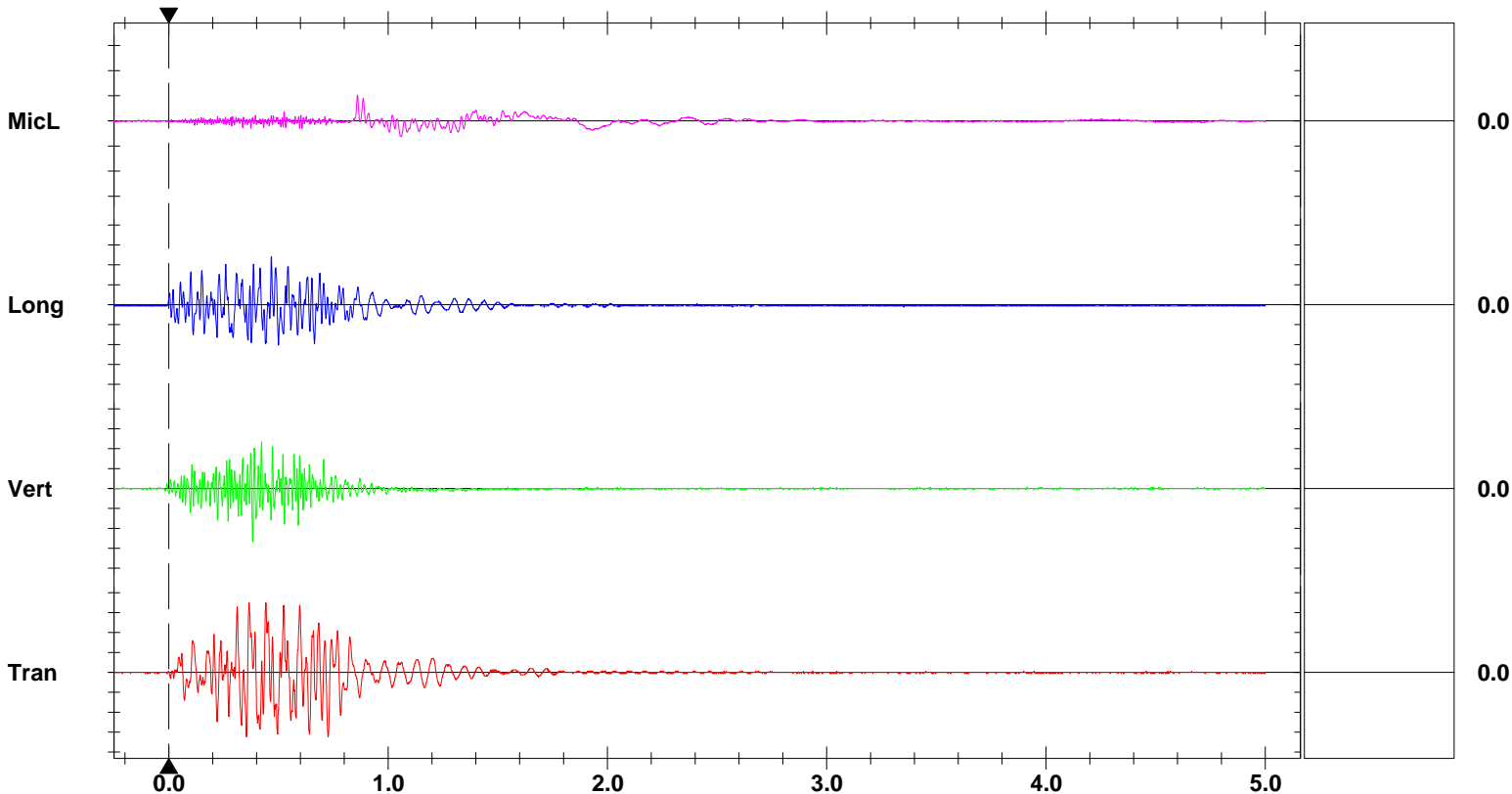
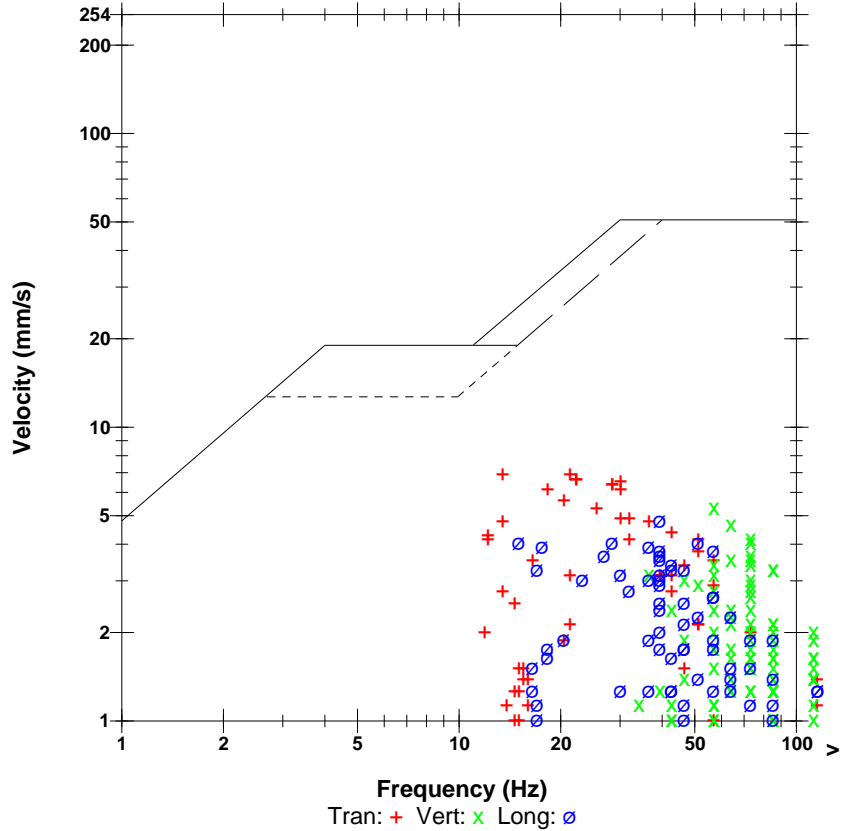
Combo Mode July 7, 2020 10:07:52
 Unit is setup behind the blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 114.2 dB(L) 10.25 pa.(L) at 0.860 sec
ZC Freq 19 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	6.985	5.334	4.826	mm/s
ZC Freq	13	57	39	Hz
Time (Rel. to Trig)	0.366	0.382	0.468	sec
Peak Acceleration	0.199	0.225	0.159	g
Peak Displacement	0.061	0.014	0.033	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 7.896 mm/s at 0.442 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:44:20 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE21128 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration December 10, 2019 by InstanTel
File Name W128IJ9F.HW0

Notes

Location: 3-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

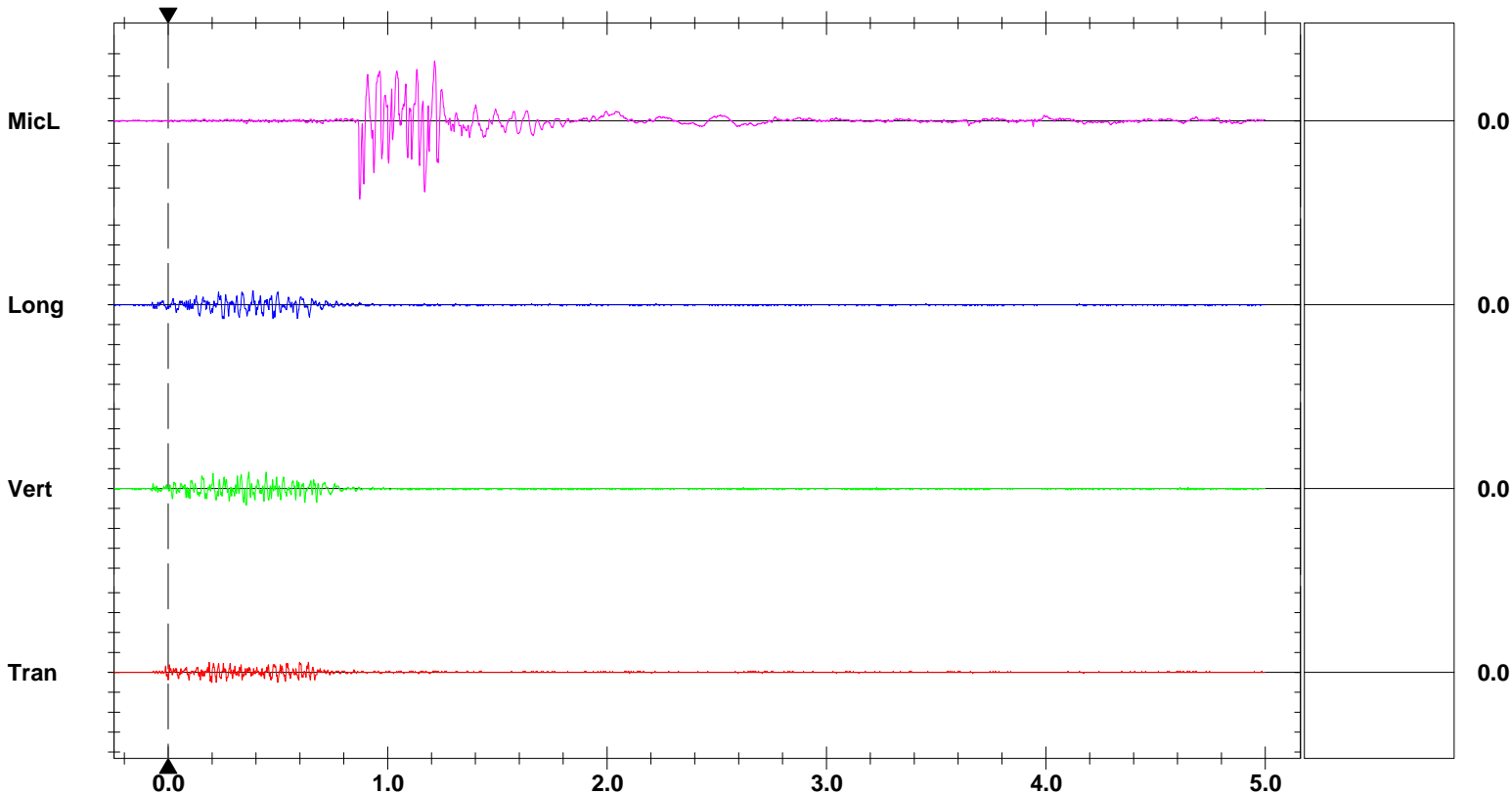
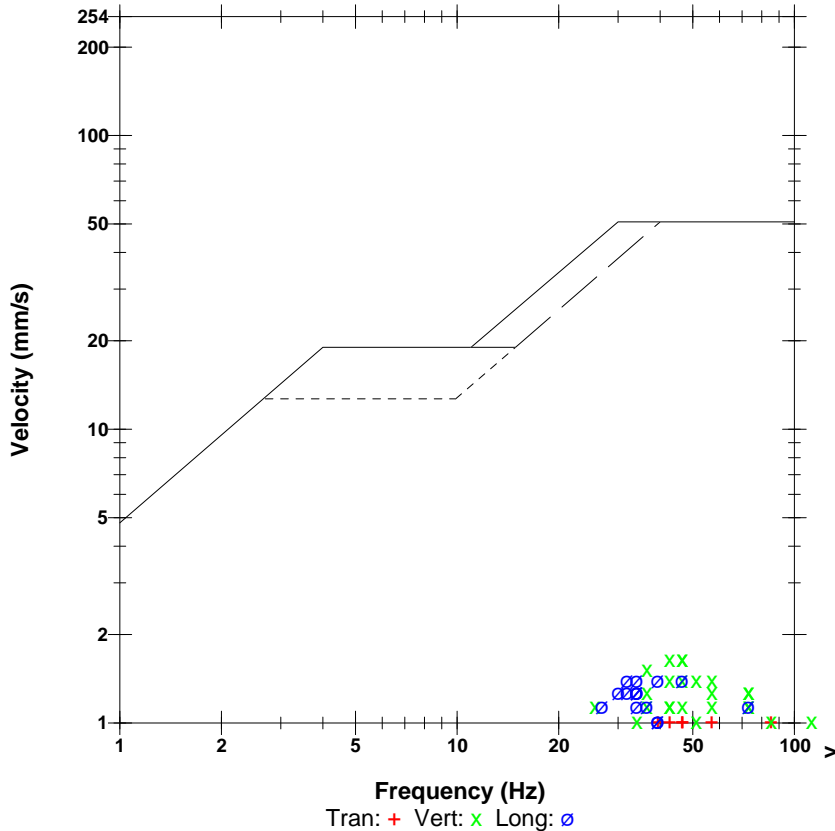
Combo Mode July 7, 2020 11:46:09
 Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 124.9 dB(L) 35.00 pa.(L) at 0.873 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.016	1.651	1.397	mm/s
ZC Freq	85	47	34	Hz
Time (Rel. to Trig)	0.187	0.354	0.247	sec
Peak Acceleration	0.066	0.066	0.053	g
Peak Displacement	0.005	0.006	0.008	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.805 mm/s at 0.254 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:44:21 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862

Serial Number BE20044 V 10.72-8.17 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration August 30, 2019 by InstanTel
File Name V044IJ9F.HX0

Notes

Location: 2-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General Coupled to Ground

Extended Notes

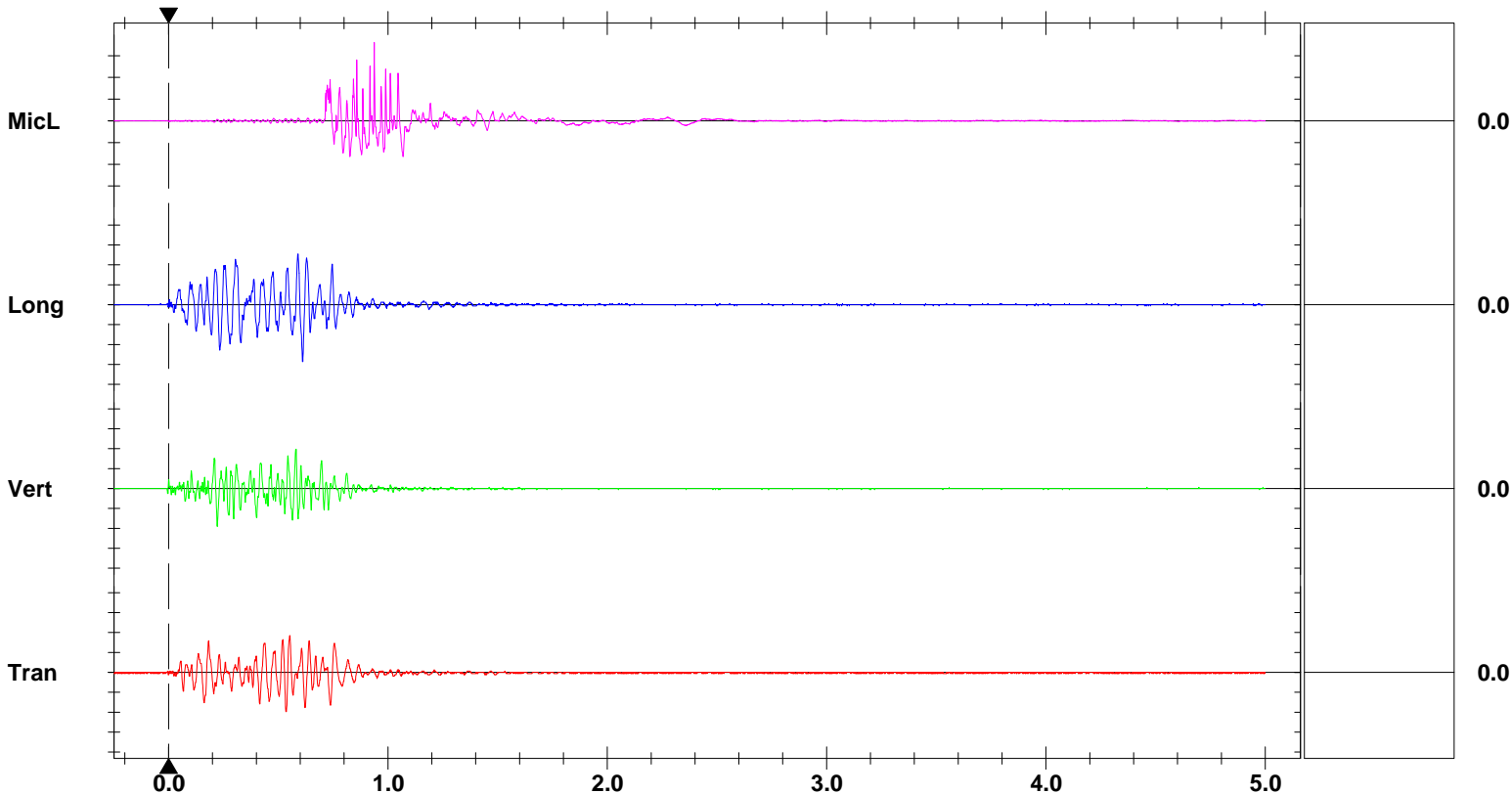
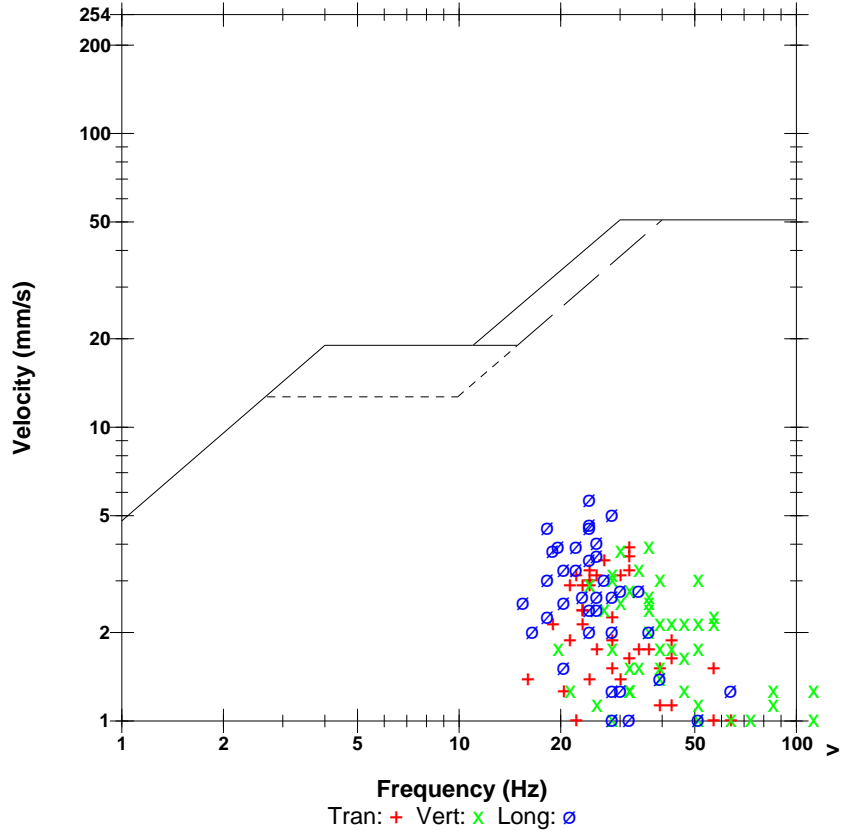
Combo Mode July 7, 2020 13:24:32
 Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 131.2 dB(L) 72.25 pa.(L) at 0.938 sec
ZC Freq 73 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.937	3.937	5.715	mm/s
ZC Freq	32	37	24	Hz
Time (Rel. to Trig)	0.534	0.579	0.610	sec
Peak Acceleration	0.106	0.106	0.106	g
Peak Displacement	0.021	0.017	0.039	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.922 mm/s at 0.610 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:44:33 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13860 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 3, 2020 by InstanTel
File Name UM13860_20200707134433.IDFW

Notes

Location: 8-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

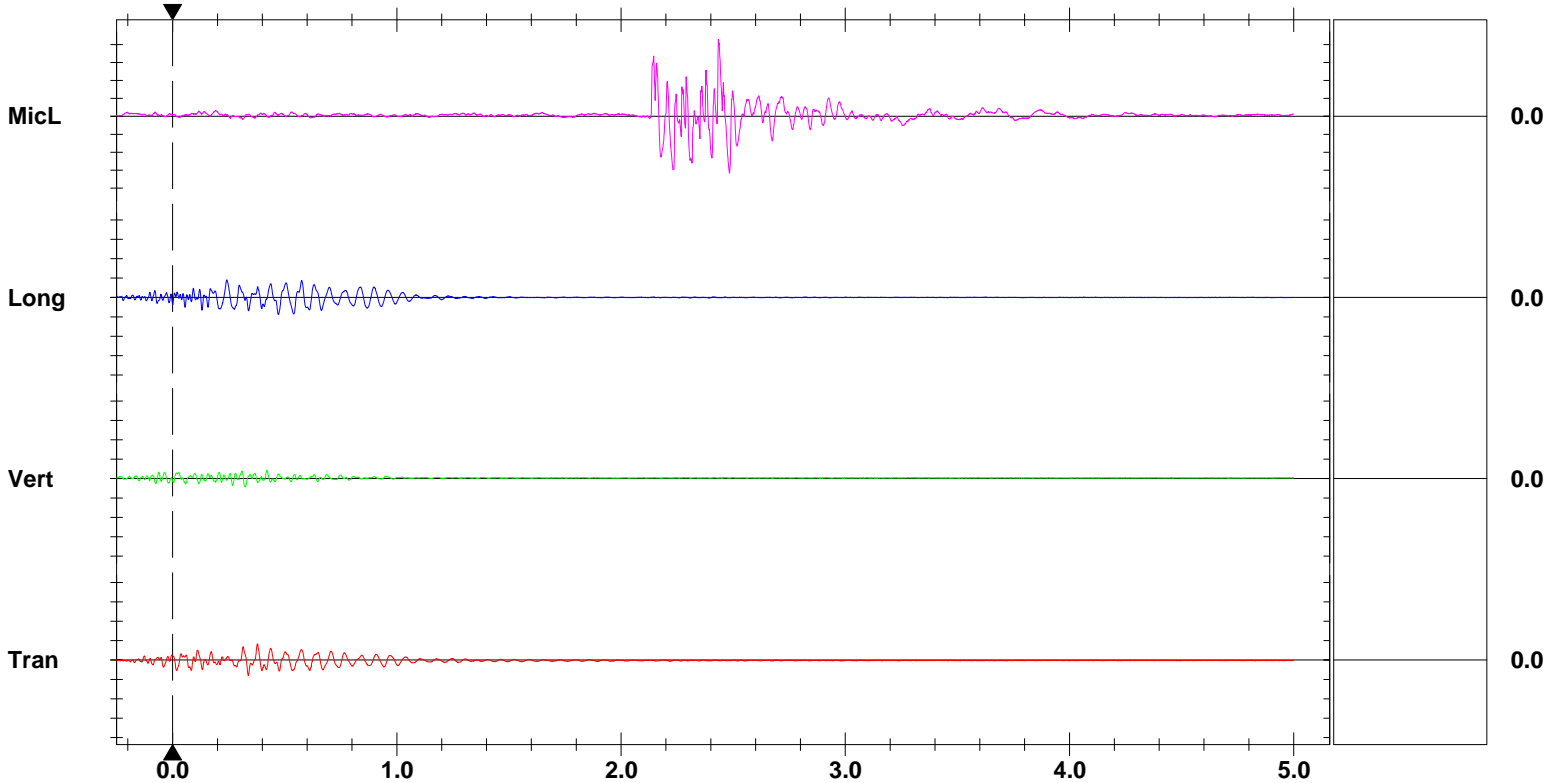
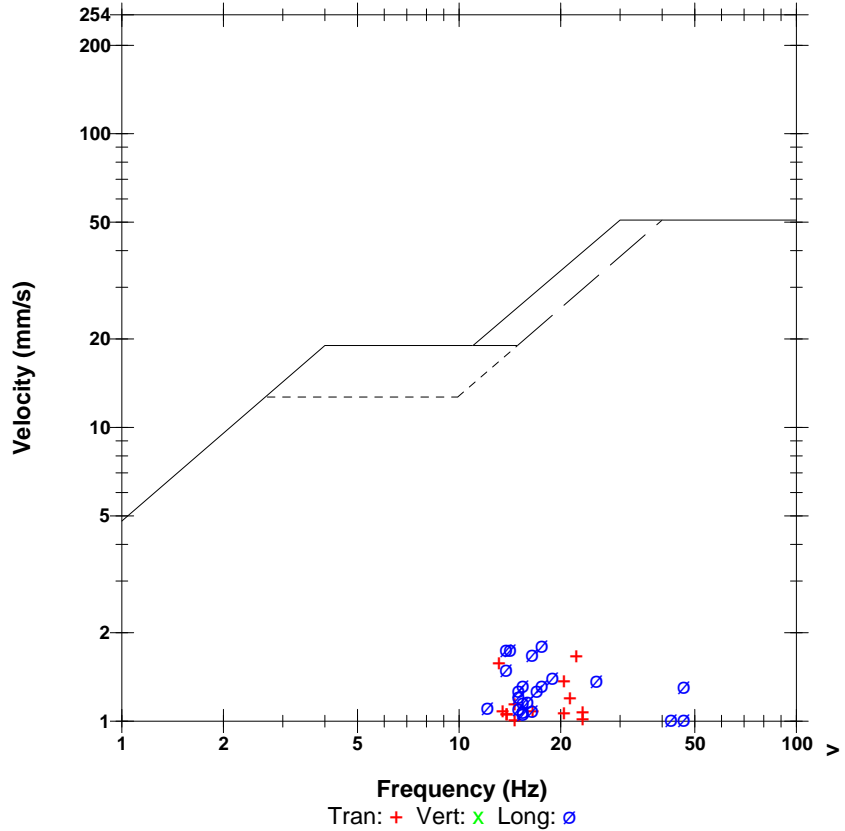
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 112.6 dB(L) 8.580 pa.(L) at 2.434 sec
ZC Freq 15 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.679	0.859	1.813	mm/s
ZC Freq	22	27	18	Hz
Time (Rel. to Trig)	0.378	0.421	0.241	sec
Peak Acceleration	0.033	0.030	0.045	g
Peak Displacement	0.013	0.006	0.016	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.116 mm/s at 0.338 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:44:35 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM12948 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 26, 2020 by InstanTel
File Name UM12948_20200707134435.IDFW

Notes

Location: 6-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

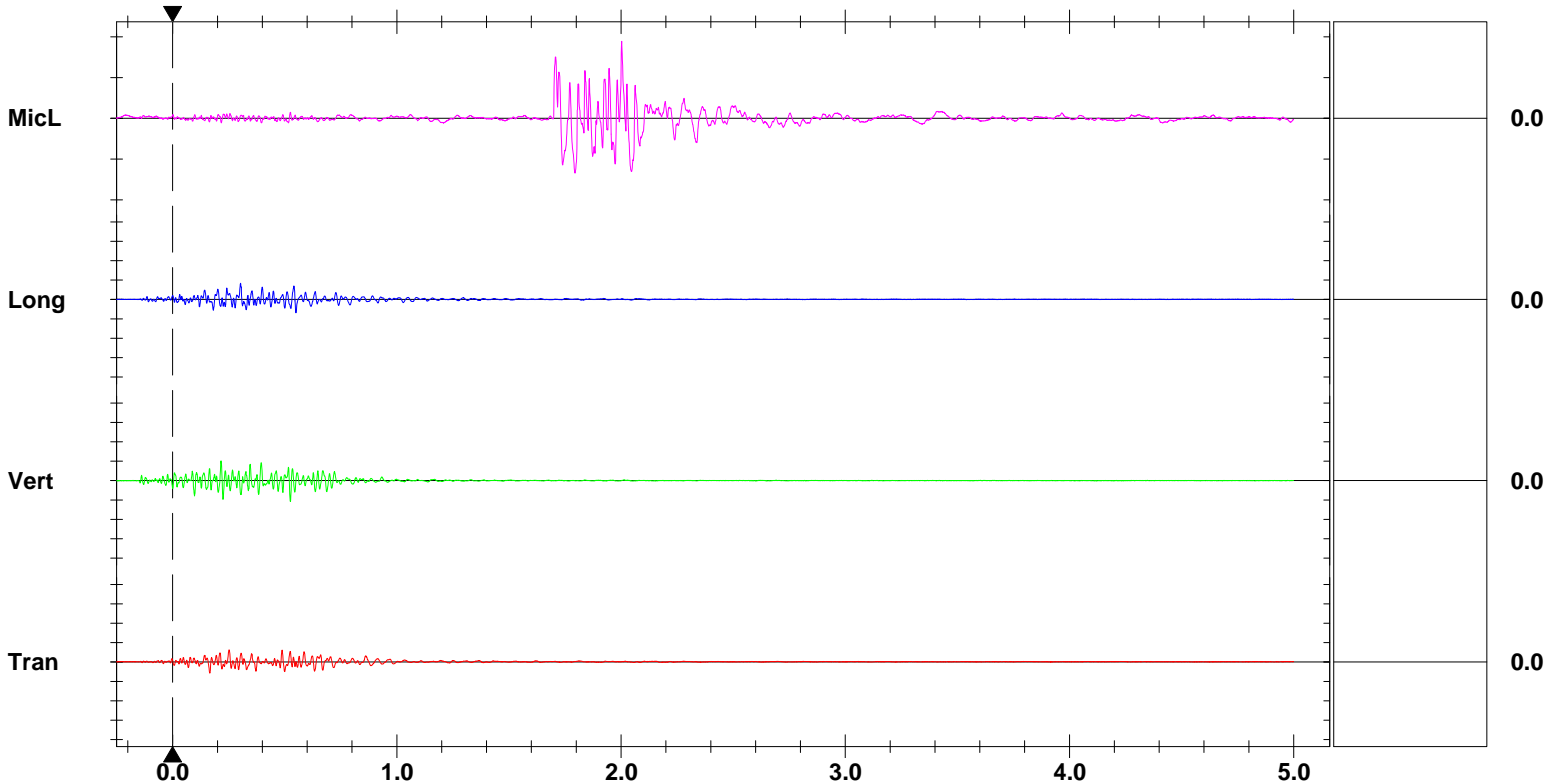
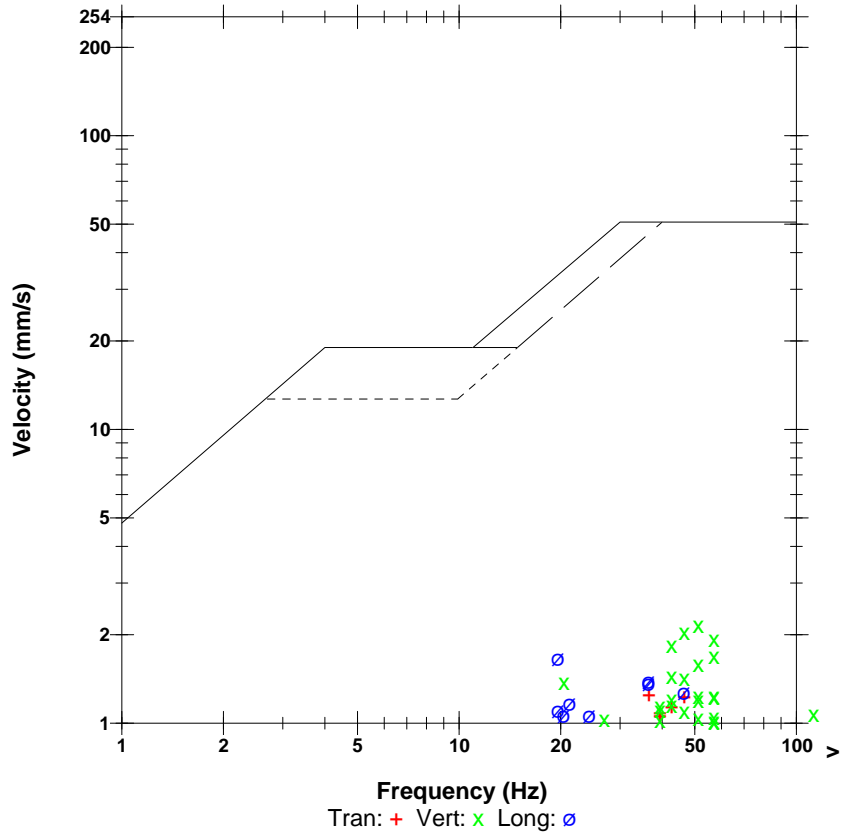
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 113.5 dB(L) 9.449 pa.(L) at 2.003 sec
ZC Freq 22 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.261	2.152	1.671	mm/s
ZC Freq	37	51	20	Hz
Time (Rel. to Trig)	0.252	0.525	0.303	sec
Peak Acceleration	0.061	0.113	0.057	g
Peak Displacement	0.007	0.007	0.008	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.534 mm/s at 0.525 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:44:35 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM13212 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration June 26, 2020 by InstanTel
File Name UM13212_20200707134435.IDFW

Notes

Location: 7-F
 Client: M7862A - Waterford Aggregates
 User Name: Explotech Engineering Ltd.
 General: Coupled to Ground

Extended Notes

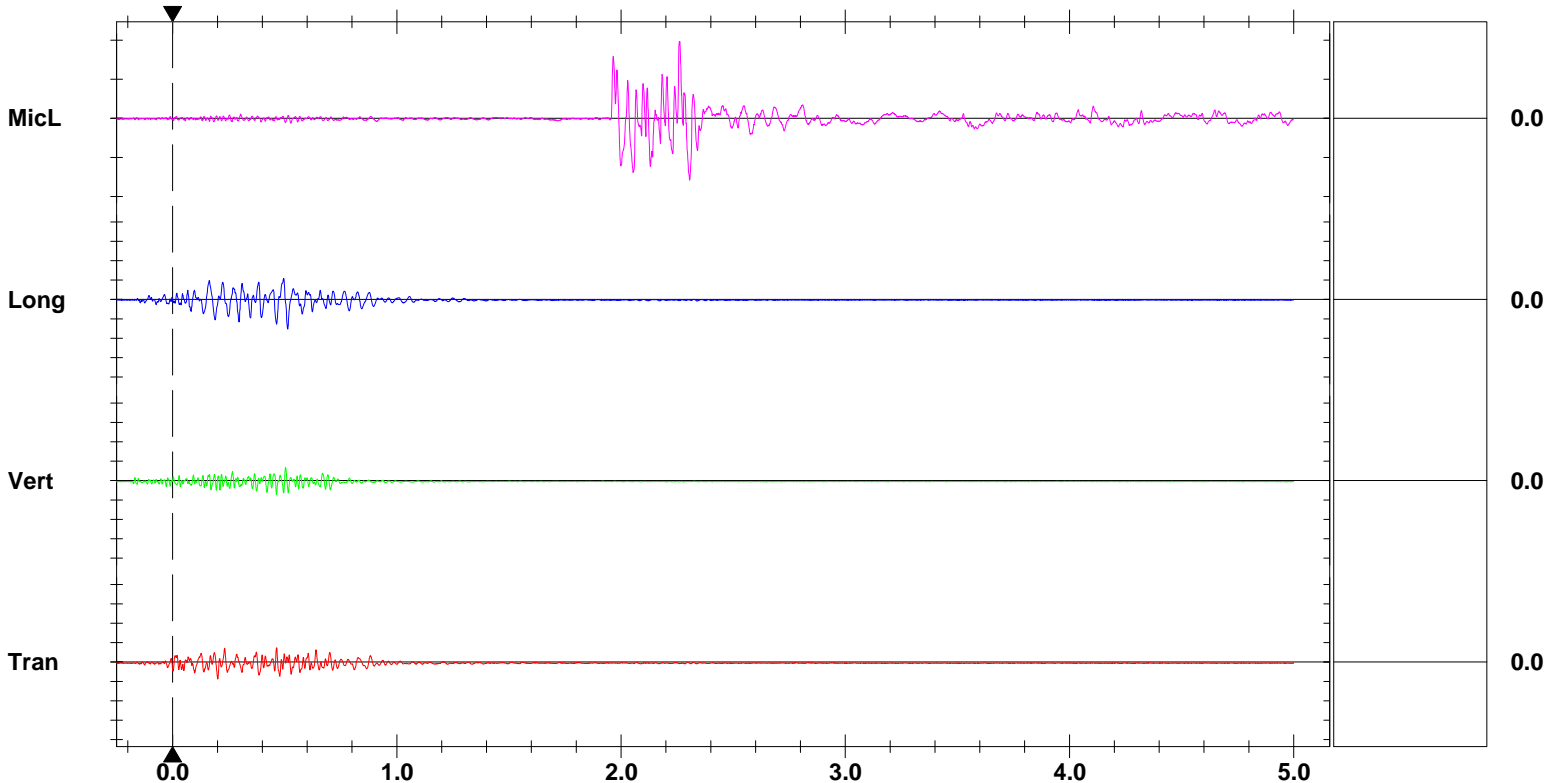
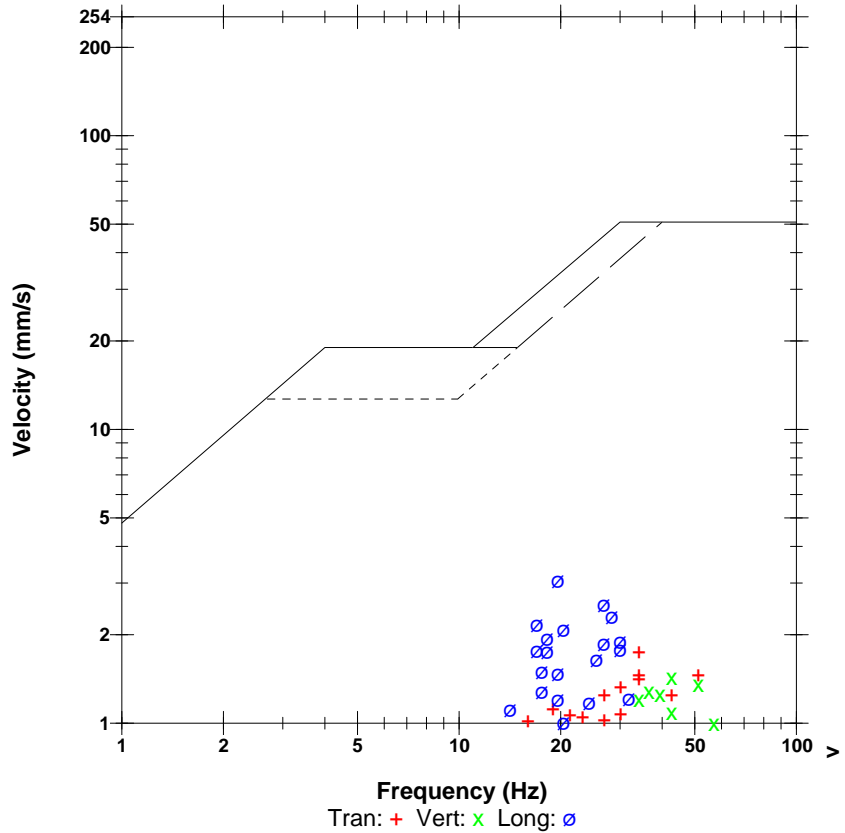
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 113.9 dB(L) 9.852 pa.(L) at 2.261 sec
ZC Freq 24 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.758	1.434	3.066	mm/s
ZC Freq	34	43	20	Hz
Time (Rel. to Trig)	0.201	0.463	0.514	sec
Peak Acceleration	0.051	0.053	0.077	g
Peak Displacement	0.009	0.005	0.017	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.249 mm/s at 0.464 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:44:35 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.MMB

Serial Number UM13869 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 10, 2019 by InstanTel
File Name UM13869_20200707134435.IDFW

Notes

Location: 5-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

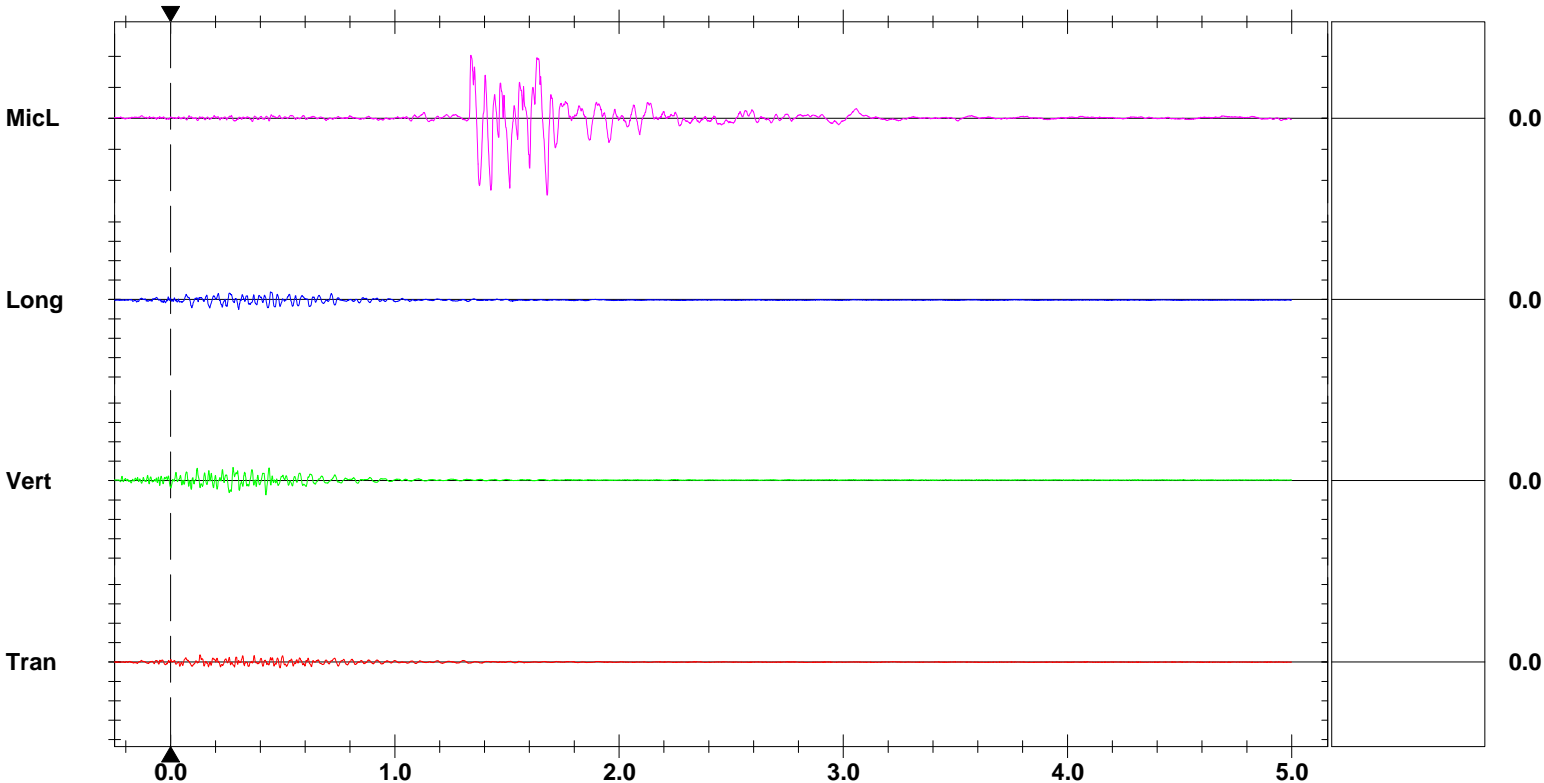
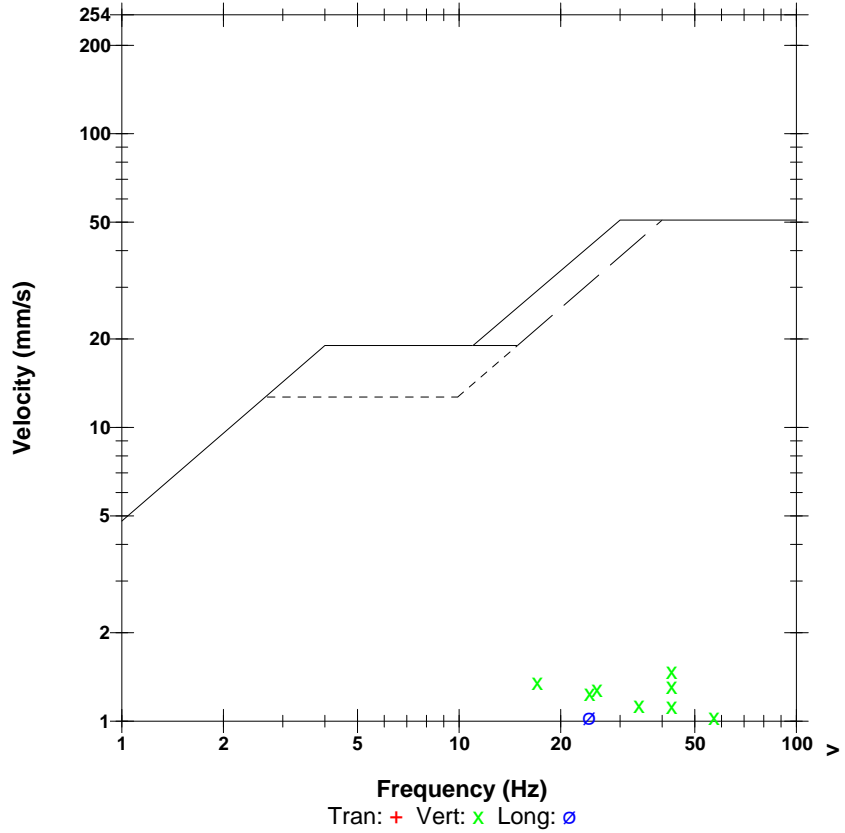
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 115.9 dB(L) 12.41 pa.(L) at 1.680 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	0.749	1.482	1.033	mm/s
ZC Freq	24	43	24	Hz
Time (Rel. to Trig)	0.131	0.425	0.304	sec
Peak Acceleration	0.040	0.065	0.029	g
Peak Displacement	0.004	0.011	0.006	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.494 mm/s at 0.262 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 13:44:36 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM10617 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration September 25, 2019 by InstanTel
File Name UM10617_20200707134436.IDFW

Notes

Location: 4-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

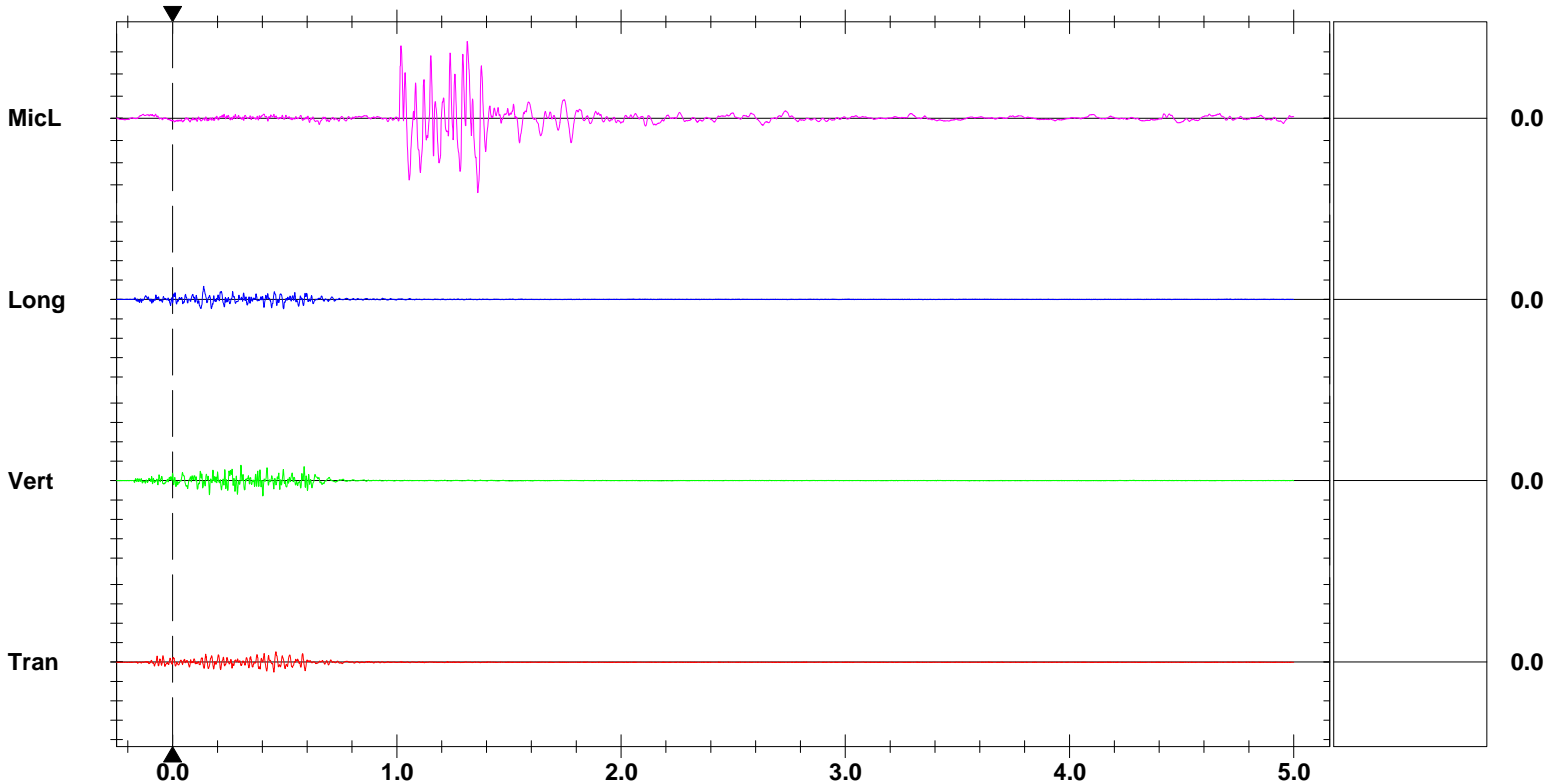
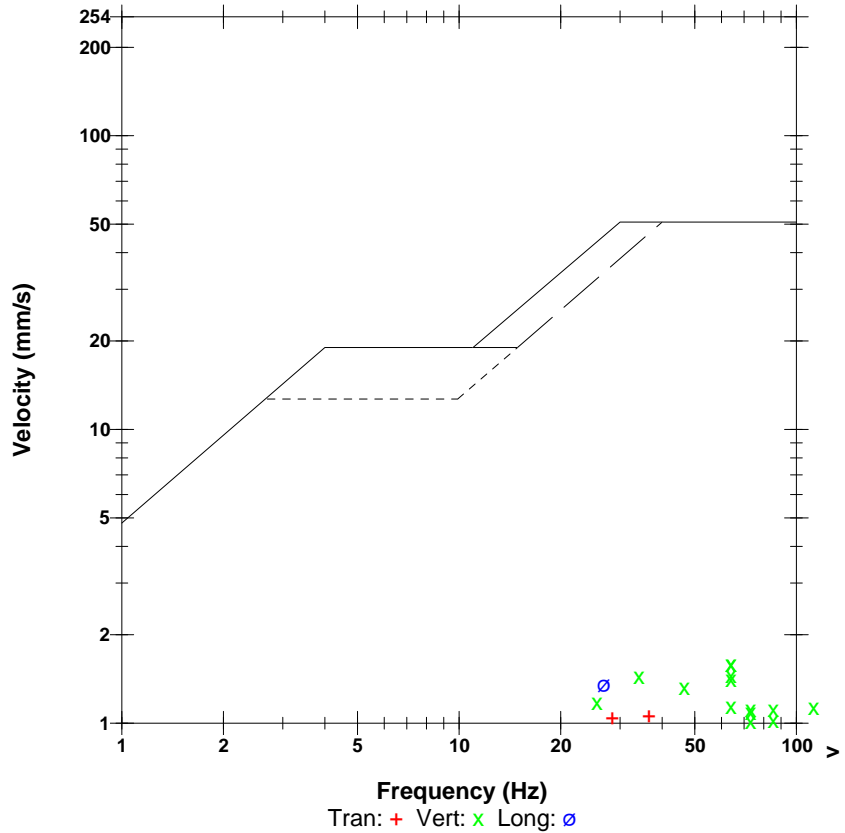
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.

Microphone Linear Weighting
PSPL 118.8 dB(L) 17.35 pa.(L) at 1.313 sec
ZC Freq 24 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.064	1.592	1.364	mm/s
ZC Freq	37	64	27	Hz
Time (Rel. to Trig)	0.461	0.305	0.139	sec
Peak Acceleration	0.060	0.085	0.049	g
Peak Displacement	0.004	0.007	0.007	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.633 mm/s at 0.305 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:44:36 July 7, 2020
Trigger Source Geo: 0.750 mm/s
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 1024 sps
Job Number: 7862
Operator/Setup: Operator/M7862A - Front Attenuation - Micro.mmb

Serial Number UM13831 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration July 3, 2020 by InstanTel
File Name UM13831_20200707134436.IDFW

Notes

Location: 9-F
Client: M7862A - Waterford Aggregates
User Name: Explotech Engineering Ltd.
General: Coupled to Ground

Extended Notes

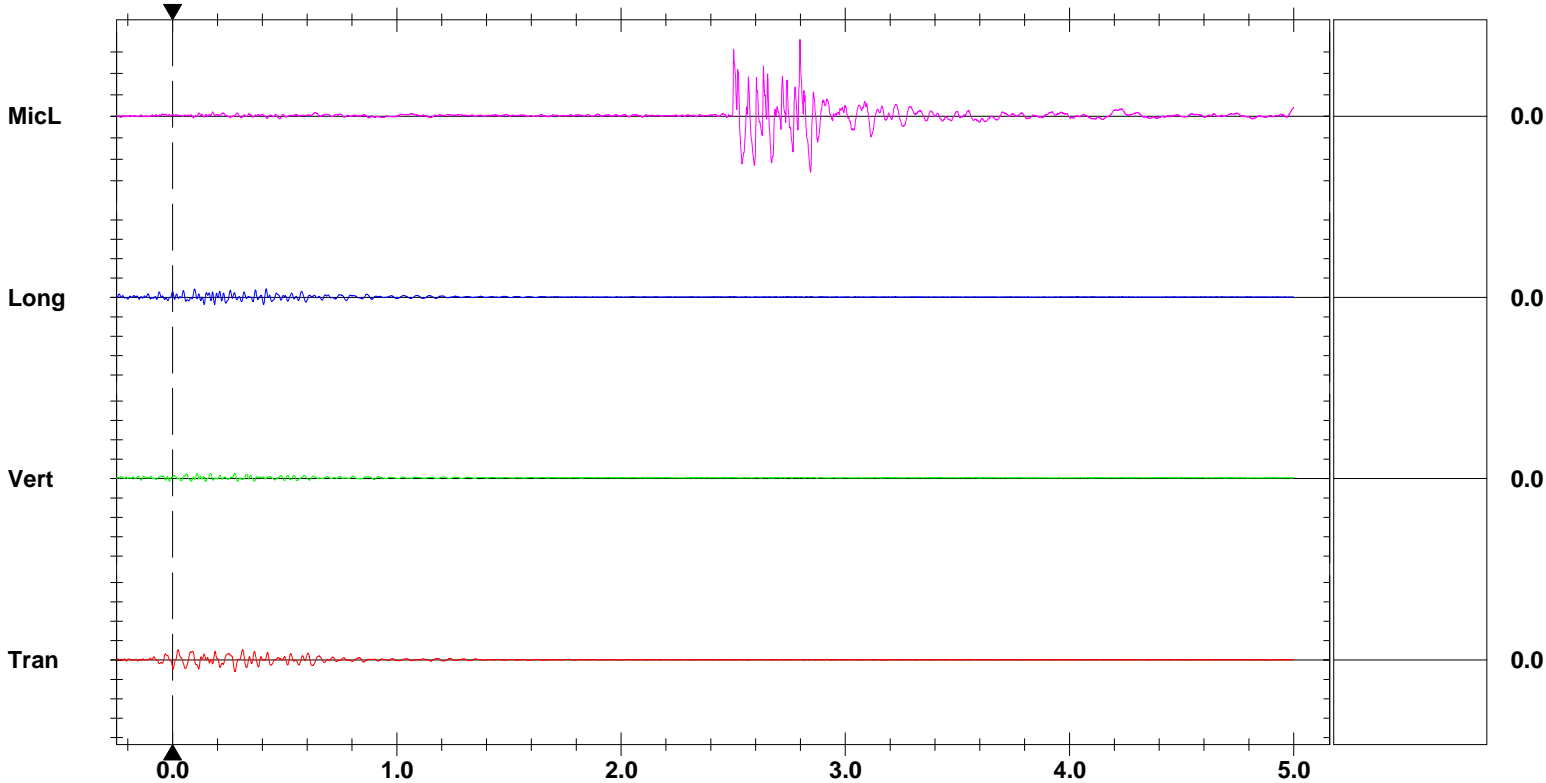
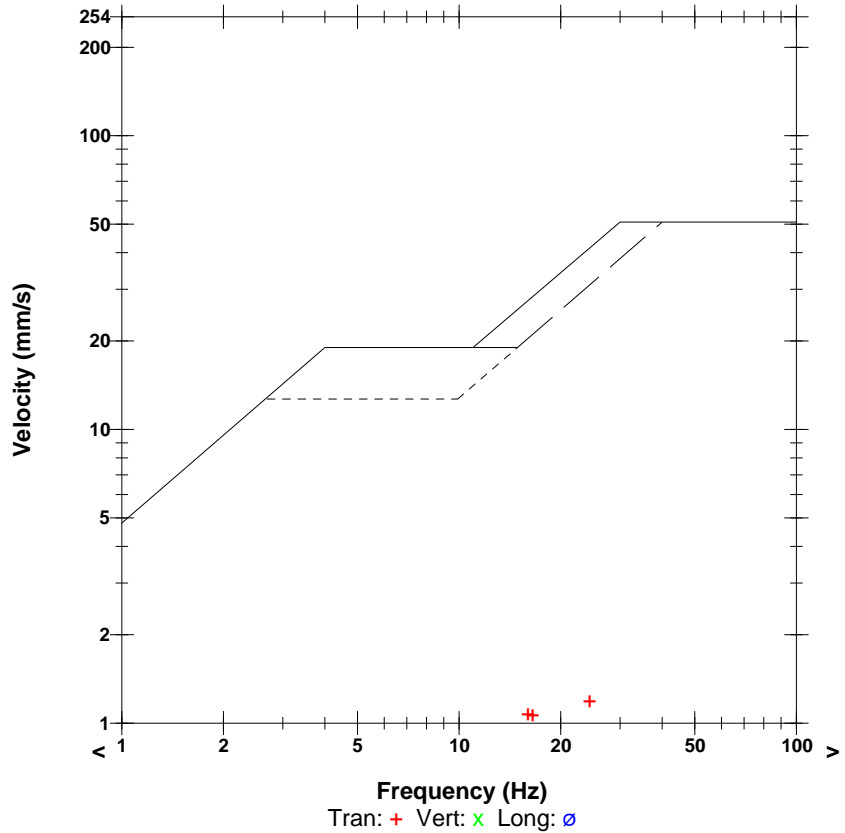
Unit is setup in front of blast for attenuation study for the Law Quarry expansion using standard practice methods.operations.

Microphone Linear Weighting
PSPL 111.1 dB(L) 7.168 pa.(L) at 2.798 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	1.198	0.567	0.899	mm/s
ZC Freq	24	16	34	Hz
Time (Rel. to Trig)	0.277	0.276	0.417	sec
Peak Acceleration	0.035	0.021	0.034	g
Peak Displacement	0.009	0.007	0.026	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 1.395 mm/s at 0.277 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date dd/mm/yy	Blast #	# Holes	Depth (feet)	Tonnes	Seizmograph Locations	Trans.	Vert.	Long.	dB	Weather
28-May-15	2015-01	42	26	13641.50	AE	1.77	1.77	1.39	100.0	A
					A	2.92	1.27	2.41	106.0	A
2-Jun-15	2015-02	78	26.5	25821.60	AI	8.63	3.30	5.58	110.0	F
					AE	3.30	1.77	3.93	117.0	F
16-Jul-15	2015-03	63	26	20462.40	AE	3.04	2.03	3.04	121.0	A
					A	3.55	1.77	3.30	120.0	A
17-Aug-15	2015-04	54	25	16864.60	AE	2.66	1.39	3.42	100.0	A
					A	6.35	6.35	2.79	106.0	A
2-Sep-15	2015-05	66	24.5	20199.90	AJ	No Triggers				I
					A	4.31	1.52	2.54	100.0	I
22-Sep-15	2015-06	49	24	14691.00	AE	2.79	2.28	2.79	119.0	A
					A	4.44	2.54	4.19	109.0	A
1-Oct-15	2015-07	194	9.5	21170.90	A	No Triggers				A
					AE	No Triggers				A
9-Nov-15	2015-08	51	25	16246.20	A	2.79	1.52	3.04	106.0	A
					AE	2.45	4.66	3.91	118.0	A
25-Nov-15	2015-09	48	25.5	15290.50	AJ	4.82	2.54	5.58	112.0	A
					A	2.79	1.65	2.03	100.0	A
8-Dec-15	2015-10	48	25.5	15290.50	A	2.66	1.14	2.79	100.0	F
					AE	1.77	1.01	2.54	117.0	F

Seizmograph Location A= 1st. Pole on Erie Peat

B= 20246 Young Rd.

C= Lake Shore Rd.

D=10615 Hwy#3

E= Cathy Cres

F= Hwy #3 and Quarry Rd.

G= 20214 Townline Rd.

H= 2nd Pole on Erie Peat Rd.

I=3rd Pole on Erie Peat Rd.

J=20355 Erie Peat Rd. "Jullie Ritchies"

K=20160 Hwy #3 Front Lawn Todd Bazinet's

L=20136 Townline Rd. "Alec Balogh's"

M=20148 Hwy 3 Adam Ferri

N=4L23 Lakeshore Rd. Mike McCabe

O=Kwik Mix Property on lawn at corner of Hwy 3 and Kwik Mix Rd.

P=1/2 way down Bessey Rd. on East side of Road

Q=Carol Tennier 15 First Ave South off Hwy #3 Port Colborne

R=Andrew Gillespie 121 North Cres. Port Colborne

S=John Greco 10146 Hwy #3 front lawn

T=Sharron Skea 10285 Lakeshore Rd.

U=Angela Cox 17 First Ave. Port Colborne

V=First Ave Beside No Frills on Berm

W=First Ave Behind No Frills along Fence

X=10257 Crescent Heights, Port Colborne, Judy Kramer

Y=115 Rosemount Ave., Port Colborne, Marcia Turner

Z=230 Rosemount Ave., Port Colborne, Christine Hutcheson

AA=20146 Townline Rd., Port Colborne, Marcia Murdoch

AB=207 Westside Rd., Port Colborne, Walter Clapp

AC=10250 Highway 3, Wainfleet, Beth Robins

AD=Erie Peat Bog

AE=20455 Erie Peat Rd. Behind the quarry

AF=Biederman Rd 1st House on Left

AG=40 Townline Road Hillhouse property

AH=20101 Barrick Rd. Port Colborne

AI=Beside Youngs Rd Water Well

AJ=Youngs St. Test Well

AK=722 Hwy #3 West Main St. Deschamps property

Weather

A= Sunny and Clear

B= Cloudy / Overcast

C= Cloudy / Overcast and Showers

D=Cloudy / Heavy Snow

E=Cloudy/Light snow

F=Partly Cloudy

G=Cloudy/High Clouds

H=Cloudy/Overcast/Light Rain

I=Hazy Hot Humid

J=Light Rain

K=Overcast/Low Clouds

L=Heavy rain



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: August, 18/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres			Feet	Metres
# Holes:	54	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					Total Tonnes:	16524.0

Material Blasted:	Limestone	Explosive / Hole:	56.0 kg	123.0 lb
Density:	2.61 t/m3	Max. kg. / Delay:	56.0 kg	123.0 lb
Max Holes / Delay:	1	Distance to Seis.:	m	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	54				54

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		6642.0	3024.0

Miscellaneous:

Comments:

Approved:

Date:

Aug 17 2015



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 08/17/15
MO DA TH

COMPANY (PERMITTEE) Waterford LOCATION Law. Gray

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"

NO. OF HOLES 54 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING (COLLAR) 7

EXPLOSIVES	TOTAL QUANTITY
<u>H-4100 NP</u>	<u>3080</u>
<u>Orange Cap</u>	<u>54</u>
<u>60' 00' 25/500</u>	<u>54</u>
<u>67ms 20' 00</u>	<u>5</u>

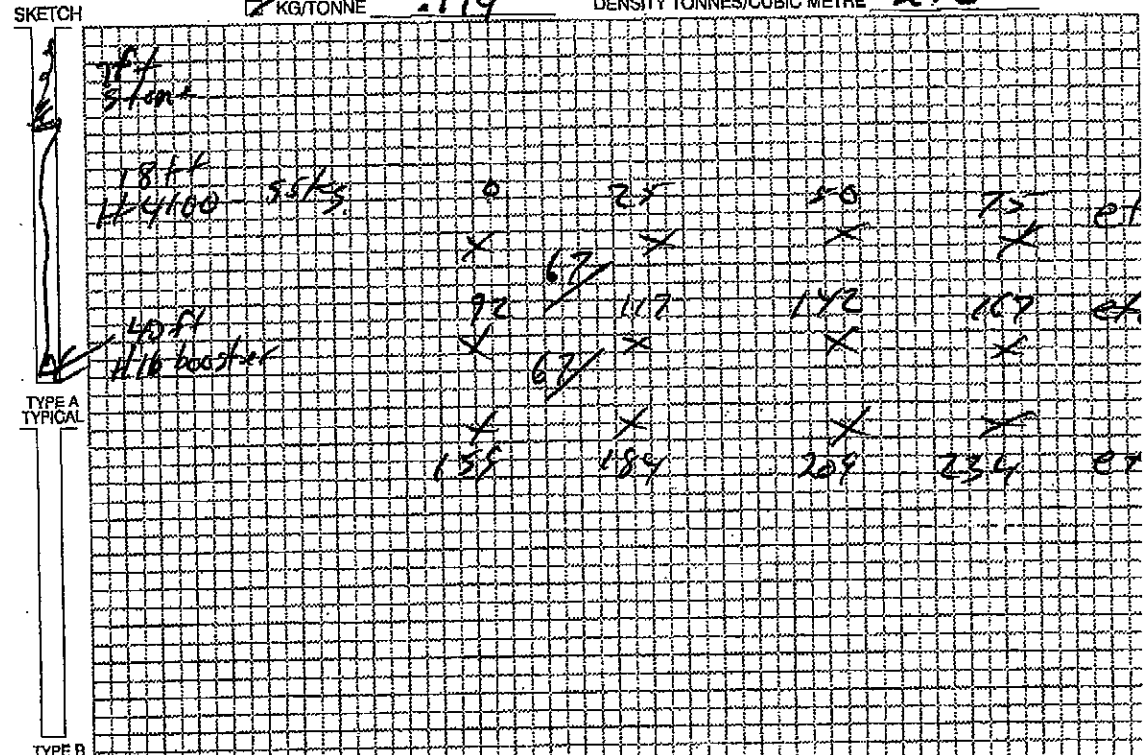
CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER 116 cast
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3000 WEIGHT OF EXPLOSIVES PER HOLE 55

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
DELAY DETONATORS USED (TYPE) 25/500, 67ms

TOTAL NO. TONNES PRODUCED 16800 OR TOTAL CUBIC METRES PRODUCED _____

TOTAL POWDER FACTOR: KG/CUBIC METRE KG/TONNE 1.79 DENSITY TONNES/CUBIC METRE 2.6



PRE-BLAST COMMENTS: 25ms between holes 92ms between rows
42 53 50.6
29 17 31.9

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Gary DeBoer
PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/17/2015 11:39

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: S

Temperature: 25 °C

Terrain: Flat

Wind Velocity: - km/h

Blast Lat./Long.: 42° 53' 50.600" N 79° 17' 31.900" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 335 °

Distance: 666 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Drilling Footage:	411.48 m
No. of Holes:	54	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	54	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	Crushed Stone
				Water Depth:	1.52 m
				Stem Length:	2.13 m
				Area Type:	Conventional
				Method:	Deepest Hole Load

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,460.5 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	53.0 kg	Weight Produced:	16,864.6 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.888 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	53.0 kg	Powder Factor 2:	0.443 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	91.49	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	91.49		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: loader bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]	* ON - 278B-454071 [12/31/2099]	Yes	Yes	Yes	No	No
FARRER	NICHOLAS , J			No	No	No	No	No
LI	JACKSON, A			No	Yes	No	No	No

Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Tyler		Maple Leaf		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No: 2015-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/17/2015 11:39

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11744	Orange Cap DC - 454g (1 lb)	54.00 ea	54.00
10752	SHOCK*STAR DualDelay 12m/40' 25/500	54.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	2,810.00 kg	2,810.00
Total Weight of Explosives (Include Primers) (kg):			2,864.00

COMMENTS / EXPLANATIONS

General Comments: Have video on phone can't attach

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/17/2015 11:39

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

SEISMOGRAPH 1 - SEISMOGRAPH 1

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	08/17/15	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	2.66 mm/s 25.6 Hz
Time:	11:39	Calibration Date:	08/28/14		Vertical:	1.39 mm/s 23.2 Hz
Distance From Blast:	666.29 m	Calibration Signal:			Longitudinal:	3.42 mm/s 19.6 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	---	Hz	PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	100 dB
Location:	20455 Erie Peat Rd				Vector Sum:	3.53 mm/s
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Gary DeBoer, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - SEISMOGRAPH 2

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	08/17/15	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	6.35 mm/s 56.8 Hz
Time:	11:39	Calibration Date:	11/18/14		Vertical:	6.35 mm/s 73.1 Hz
Distance From Blast:	658.98 m	Calibration Signal:			Longitudinal:	2.79 mm/s 42.6 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz	PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	106 dB
Location:	Erie Peat Rd and Hwy 3				Vector Sum:	6.4 mm/s
Lat./Long.:	42° 53' 29.500" N		79° 17' 27.400" W			
Reader and Firm:	Gary DeBoer, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Dec,08/15

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	48	Hole Depth:	24.5	7.46	Burden:	13.0	3.96	m ³ / Hole:	164.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	306.0
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13	Total Tonnes:	14688.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		56.0 kg		123.0 lb		
Density:	2.61 t/m ³		Max. kg. / Delay:		56.0 kg		123.0 lb		
Max Holes / Delay:	1		Distance to Seis.:		m		ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	48				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		5904.0	2688.0

Miscellaneous:

Comments:

Approved: *ES Smith*

Date:



AUSTIN POWDER LTD. BLAST DESIGN



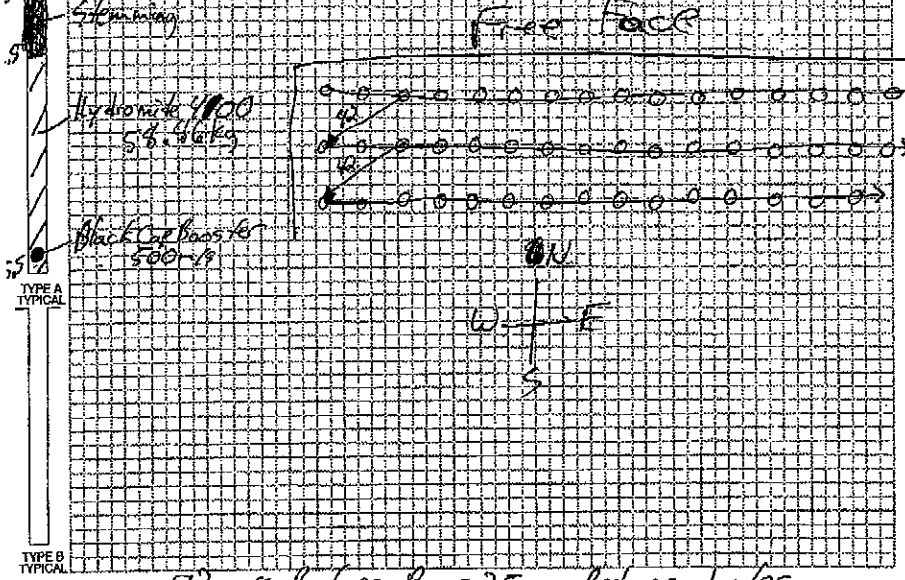
SHOT NO. 2015-10 DATE: 11/18/15
 COMPANY (PERMITTEE) Law Cashed Stone LOCATION Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 48 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH 25.5' FACE HEIGHT 25.5' LENGTH OF STEMMING (COLLAR) 6.5'

EXPLOSIVES TOTAL QUANTITY
40' Dual Delay 25/500 48
20' Quick Delay 4000 5
Hydramite 4100 2925 kg

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap booster 48
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) WEIGHT OF EXPLOSIVES PER HOLE 58.86 kg
 TYPE OF INITIATION SYSTEM: NON-ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Delay

TOTAL NO. TONNES PRODUCED 15.314 tonne OR TOTAL CUBIC METRES PRODUCED 5869 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.49 kg
 SKETCH KG/TONNE 0.16 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92 m/s Between Rows, 25 m/s Between holes
Quarry to be cleared by Foreman prior to blast time

POST-BLAST COMMENTS:

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF-HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No: 2015-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 12/08/2015 14:03

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Partly Cloudy

Wind From: SE

Temperature: 5 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long: 42° 53' 49.500" N 79° 17' 35.900" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 343 °

Structure Lat./Long: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 667 m

LAYOUT

Hole Depth:	7.77 m	Material Blasted:	Limestone	Total Meters Drilled:	373.1 m
No. of Holes:	48	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	48	Face Height:	7.77 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.98 m
				Area Type:	Conventional
				Method:	Specified

(H = 7.77 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,857.5 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	62.0 kg	Weight Produced:	15,290.5 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5,138 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	62.0 kg	Powder Factor 2:	0,508 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	84.65	Rock Density:	2,611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	84.65		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No		Misfire Occurred: No		Protective Cover: Loader Bucket				
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BURNIE	BRANDON			No	Yes	No	No	No
	, A							
FARRER	NICHOLAS			No	No	No	No	No
	, J							
PASSMORE	EDGAR, M			No	No	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jeremy		Maple Leaf Drilling		No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE

(LAW1000-001)

Date/Time: 12/08/2015 14:03

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	48.00 ea	16.32
10752	SHOCK*STAR DualDelay 12m/40' 25/500	48.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	2,960.00 kg	2,960.00
12981	Mini Stem Plug - 6015	48.00 ea	0.00
D0120	Other-Drilling Charges	1,224.00 ea	0.00
Total Weight of Explosives (include Primers) (kg):			2,976.32

COMMENTS / EXPLANATIONS

Claron Merritt

Signature of Blaster in Charge



AUSTIN POWDER LTD.
BLAST REPORT



Blast No.: 2015-10

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 12/08/2015 14:03

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record	Seismograph Type: White Mini-Seis	Transverse: 2.66 mm/s	42.6 Hz
Date: 12/08/15	Trigger Level: 1.02 mm/s 120.00 dB	Vertical: 1.14 mm/s	39.3 Hz
Time: 14:03	Calibration Date: 07/07/15	Longitudinal: 2.79 mm/s	36.5 Hz
Distance From Blast: 647.09 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq: --- Hz	Acoustic: 100 dB	
Readout:	Mic. Min. Freq: --- Hz	Vector Sum: 3.04 mm/s	
Location: Corner Of Erie Peat Rd & Hwy#3			
Lat/Long: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Aaron Merritt, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm: Austin Powder			

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record	Seismograph Type: White Mini-Seis	Transverse: 1.77 mm/s	30.1 Hz
Date: 12/08/15	Trigger Level: 1.02 mm/s 120.00 dB	Vertical: 1.01 mm/s	39.3 Hz
Time: 14:03	Calibration Date: 04/24/15	Longitudinal: 2.54 mm/s	17.0 Hz
Distance From Blast: 666.60 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: NNW	Geophone Min. Freq: --- Hz	Acoustic: 117 dB	
Readout:	Mic. Min. Freq: --- Hz	Vector Sum: 2.66 mm/s	
Location: 20455 Erie Peat Rd			
Lat/Long: 42° 54' 10.240" N	79° 17' 44.300" W		
Reader and Firm: Aaron Merritt, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm: Austin Powder			



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July, 16/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	63	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
Material Blasted: Limestone		Explosive / Hole:		56.0 kg			123.0 lb
Density: 2.61 t/m ³		Max. kg. / Delay:		56.0 kg			123.0 lb
Max Holes / Delay: 1		Distance to Seis.:		m			ft
						Tonnes/Hole:	306.0
						Total Tonnes:	19278.0

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	63				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7749.0	3528.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *July 16/15*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 07/16/05
 MO DA YR
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 63 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 26 FACE HEIGHT 26 LENGTH OF STEMMING (COLLAR) 7'

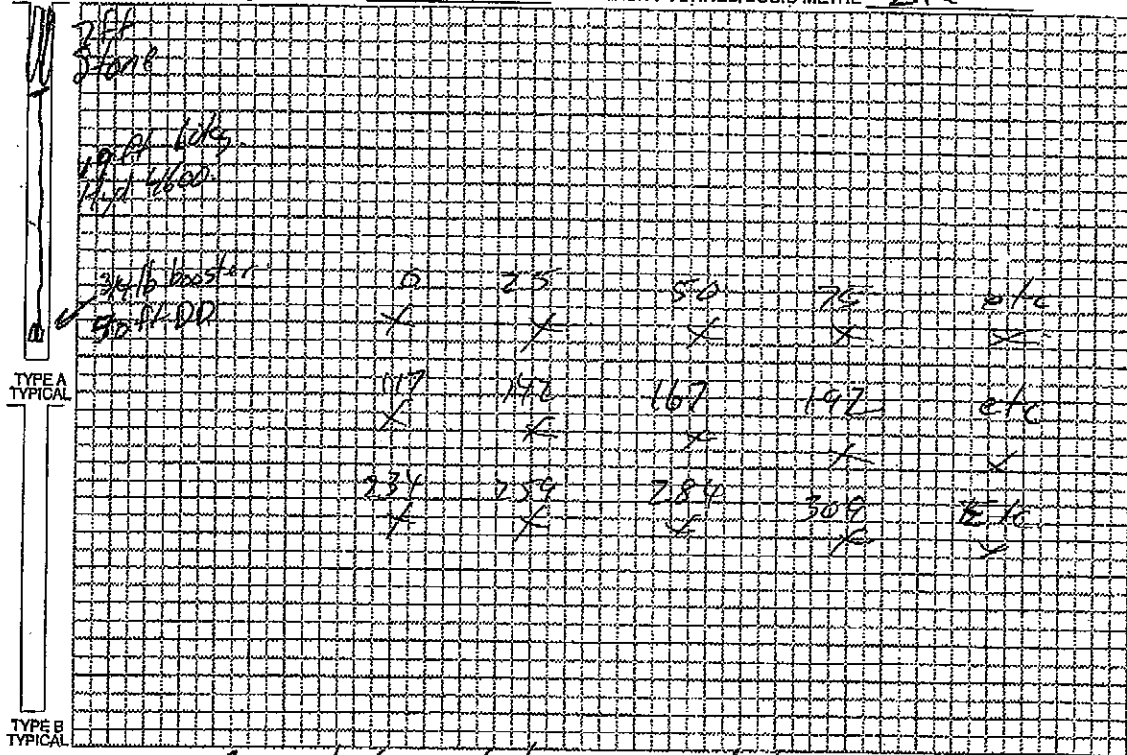
EXPLOSIVES	TOTAL QUANTITY
<u>Hyd 4600</u>	<u>3780</u>
<u>Black Cap Booster</u>	<u>63</u>
<u>50 DD 25/500</u>	<u>63</u>
<u>20' QL 67ms</u>	<u>5</u>

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER 34 lb cast
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3800 WEIGHT OF EXPLOSIVES PER HOLE 60 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 25/500, 67ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 20382 OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE
 SKETCH KG/TONNE .186 DENSITY TONNES/CUBIC METRE 2.6



PRE-BLAST COMMENTS: 25ms between holes 117ms between rows
42 53 50.5
79 17 34.4 Part of Aug 3

POST-BLAST COMMENTS: 11:32
20455 3.04 24.3 3.55 18.2 3.93 05
Erie 2.03 18.9 3.55 VS 1.77 51.2 .02
Peat 3.04 19.6 121 db. 3.30 39.3

BLASTER IN CHARGE Gary DeBoer TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE
 SIGNATURE [Signature]

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/16/2015 11:32

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SSW

Temperature: 20 °C

Terrain: Flat

Wind Velocity: - km/h

Blast Lat./Long.: 42° 53' 50.200" N 79° 17' 34.400" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 340 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 656 m

LAYOUT

Hole Depth:	7.92 m	Material Blasted:	Limestone	Total Drilling Footage:	491.34 m
No. of Holes:	63	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. Holes:	63	Face Height:	7.92 m	Spacing:	3.96 m
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	Crushed Stone
				Water Depth:	0.61 m
				Stem Length:	2.13 m
				Area Type:	Conventional
				Method:	Deepest Hole Load

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,838.8 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	54.5 kg	Weight Produced:	20,462.4 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	6.052 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	54.5 kg	Powder Factor 2:	0.431 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	88.86	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	88.86		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: loader bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]	* ON - 278B-454071 [12/31/2099]	Yes	Yes	Yes	No	No
FARRER	NICHOLAS , J			No	No	No	No	No
VANDEBUSSC HE	MICHAEL, J			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Tyler	Maple Leaf	No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/16/2015 11:32

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	63.00 ea	21.43
10792	SHOCK*STAR Dual-Delay 15m/50' 25/500	63.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11235	Hydromite 4600 Bulk	3,360.00 kg	3,360.00
12981	Mini Stem Plug - 6015	63.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): **3,381.43**

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge



AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/16/2015 11:32

Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

SEISMOGRAPH 1 - SEISMOGRAPH 1

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 07/16/15 Trigger Level: 1.02 mm/s 120.00 dB

Time: 11:32 Calibration Date: 08/28/14

Transverse: 3.04 mm/s 24.3 Hz

Vertical: 2.03 mm/s 18.9 Hz

Distance From Blast: 656.23 m Calibration Signal:

Longitudinal: 3.04 mm/s 19.6 Hz

Direction From Blast: NNW Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz

Acoustic: 121 dB

Location: 20455 Erie Peat Rd

Vector Sum: 3.55 mm/s

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Gary DeBoer, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

SEISMOGRAPH 2 - SEISMOGRAPH 2

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 07/16/15 Trigger Level: 1.02 mm/s 120.00 dB

Time: 11:32 Calibration Date: 11/18/14

Transverse: 3.55 mm/s 18.2 Hz

Vertical: 1.77 mm/s 51.2 Hz

Distance From Blast: 658.06 m Calibration Signal:

Longitudinal: 3.3 mm/s 39.3 Hz

Direction From Blast: SSE Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz

Acoustic: 120 dB

Location: Erie Peat Rd and Hwy 3

Vector Sum: 3.93 mm/s

Lat./Long.: 42° 53' 29.500" N 79° 17' 27.400" W

Reader and Firm: Gary DeBoer, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June, 2/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	60	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	← 0.0 →	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4						
					m ³ / Hole:	164.0	
					Tonnes/Hole:	306.0	
					Total Tonnes:	18360.0	

Material Blasted: Limestone Explosive / Hole: 56.0 kg 123.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 56.0 kg 123.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	60				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7380.0	3360.0

Miscellaneous:

Comments:

Approved:

B. Smith

Date:

June 2/15



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June, 2/15

Location in Quarry: East Face Grey Bench - Second Shot

Layout

		Feet	Metres	Feet	Metres		
# Holes:	60	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	← 0.0 →	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
						Tonnes/Hole:	306.0
						Total Tonnes:	18360.0

Material Blasted: Limestone Explosive / Hole: 56.0 kg 123.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 56.0 kg 123.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	60				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7380.0	3360.0

Miscellaneous:

Comments: Hole counts on shot #1 and #2 are approximate.

Approved: *ES. Smith*

Date: *June 2/15*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 2015-02

DATE: 6/2/15
MO DA YR

COMPANY (PERMITTEE) Low Crushed Stone

LOCATION Grey Bench

TYPE OF MATERIAL BLASTED Limestone

HOLE DIAMETER 4"

NO. OF HOLES 78

NO. OF ROWS 3

BURDEN 13

SPACING 13

DEPTH 26.5'

FACE HEIGHT 26.5'

LENGTH OF STEMMING (COLLAR) 6.5'

EXPLOSIVES

40 Dual Delay 25/500

TOTAL QUANTITY

78

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

20 QuickRelay 42ms 5
Hydromite 4100 4826 kg

TYPE OF PRIMER Black Cap Booster 78

4853 kg

WEIGHT OF EXPLOSIVES PER HOLE 61 kg

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS)

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

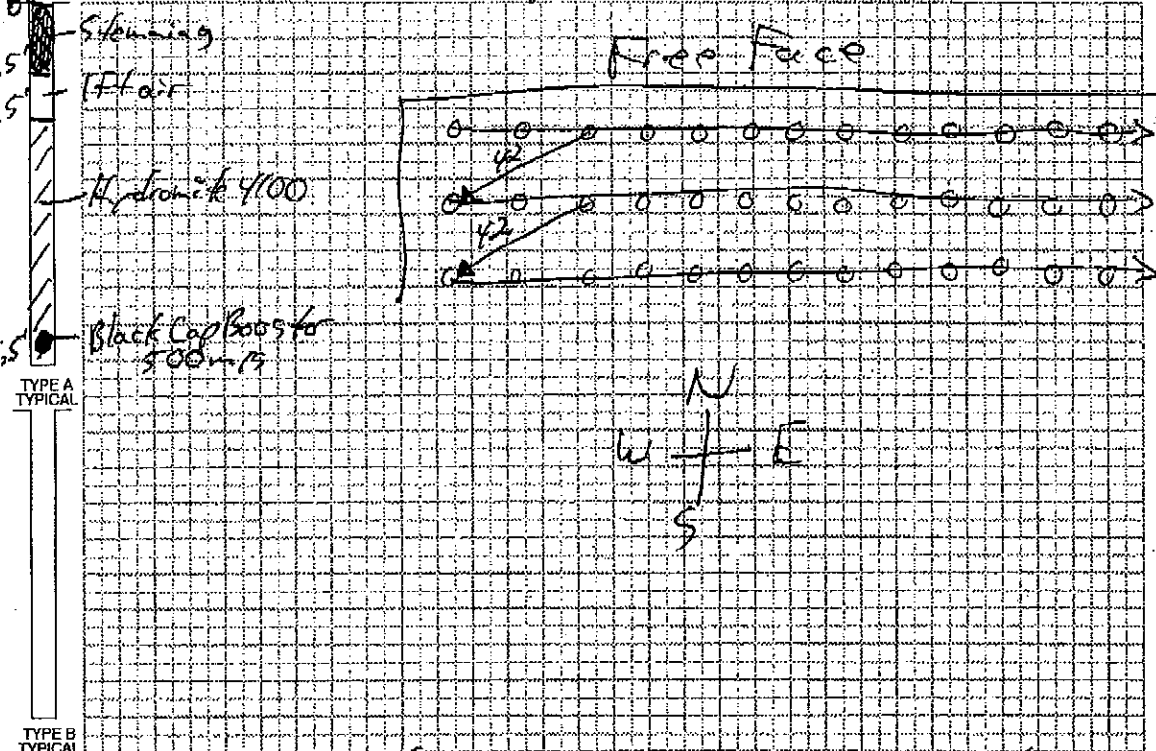
DELAY DETONATORS USED (TYPE) Dual Delay + QuickRelay

TOTAL NO. TONNES PRODUCED 26200 tonne OR TOTAL CUBIC METRES PRODUCED 10,038 m³

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.48 kg

SKETCH KG/TONNE 0.19 kg

DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92m/s Between Rows, 25m/s Between holes

Quarry to be cleared by foreman prior to blast time

POSTBLAST COMMENTS:

BLASTER IN CHARGE Aaron Merritt
PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED

- STEEL SHELTER
- OFF HIGHWAY TRUCK
- BUCKET OF LOADER / SHOVEL
- OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/02/2015 12:21

Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Partly Cloudy

Wind From: S

Temperature: 14 °C

Terrain: Flat

Wind Velocity: 15-19 km/h

Blast Lat./Long.: 42° 53' 51.000" N 79° 17' 32.900" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 336 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 646 m

LAYOUT

Hole Depth:	8.08 m	Material Blasted:	Limestone	Total Drilling Footage:	630.02 m
No. of Holes:	78	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	78	Face Height:	8.08 m	Spacing:	3.96 m
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	1.22 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 8.08 m)

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	9,891.7 m³
Firing Device: Wireless Remote Firing Device	Max. Wt. of Expl. Per 8 ms Interval:	59.2 kg	Weight Produced:	25,821.6 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.594 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	59.2 kg	Powder Factor 2:	0.467 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	83.95	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	83.96		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
DAVIS	JORDAN, T			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Tyler	Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/02/2015 12:21

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	78.00 ea	26.53
10752	SHOCK*STAR DualDelay 12m/40' 25/500	78.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	4,590.00 kg	4,590.00
12981	Mini Stem Plug - 6015	78.00 ea	0.00
D0120	Other-Drilling Charges	2,067.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			4,616.53

COMMENTS / EXPLANATIONS

General Comments: PO#LCS2604

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/02/2015 12:21

PI/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

SEISMOGRAPH 1 - YOUNGS RD WATER WELLS

Data Type:	Seismic Record	Seismograph Type:	White mini-seis			
Date:	06/02/15	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	8.63 mm/s 36.5 Hz
Time:	12:21	Calibration Date:	11/18/14		Vertical:	3.3 mm/s 28.4 Hz
Distance From Blast:	537.06 m	Calibration Signal:			Longitudinal:	5.58 mm/s 25.6 Hz
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz	PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	110 dB
Location:	Youngs Rd Water Wells				Vector Sum:	9.39 mm/s
Lat./Long.:	42° 53' 49.600" N		79° 17' 9.300" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	06/02/15	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	3.3 mm/s 19.6 Hz
Time:	12:21	Calibration Date:	08/28/14		Vertical:	1.77 mm/s 22.2 Hz
Distance From Blast:	645.87 m	Calibration Signal:			Longitudinal:	3.93 mm/s 34.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	---	Hz	PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	117 dB
Location:	20455 Erie Peat Rd				Vector Sum:	4.19 mm/s
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,28/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	60	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4						
						m ³ / Hole:	164.0
						Tonnes/Hole:	306.0
						Total Tonnes:	18360.0

Material Blasted: Limestone Explosive / Hole: 56.0 kg 123.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 56.0 kg 123.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	60				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7380.0	3360.0

Miscellaneous:

Comments:

Approved:

B. Smith

Date:

May 28/15



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 2015-01

DATE: 05/23/15
MO DAY YR

COMPANY (PERMITTEE) Lane Crushed Stone

LOCATION South Wall

TYPE OF MATERIAL BLASTED Limestone

HOLE DIAMETER 4"

NO. OF HOLES 42

NO. OF ROWS 3

BURDEN 13'

SPACING 13'

DEPTH 26'

FACE HEIGHT 26-27

LENGTH OF STEMMING (COLLAR) 6'

EXPLOSIVES

40' Dual Delay 25/500

TOTAL QUANTITY

42

17ms Quick Relay 30'

6

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap 42

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2740 Kg

WEIGHT OF EXPLOSIVES PER HOLE 65 Kg

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) _____

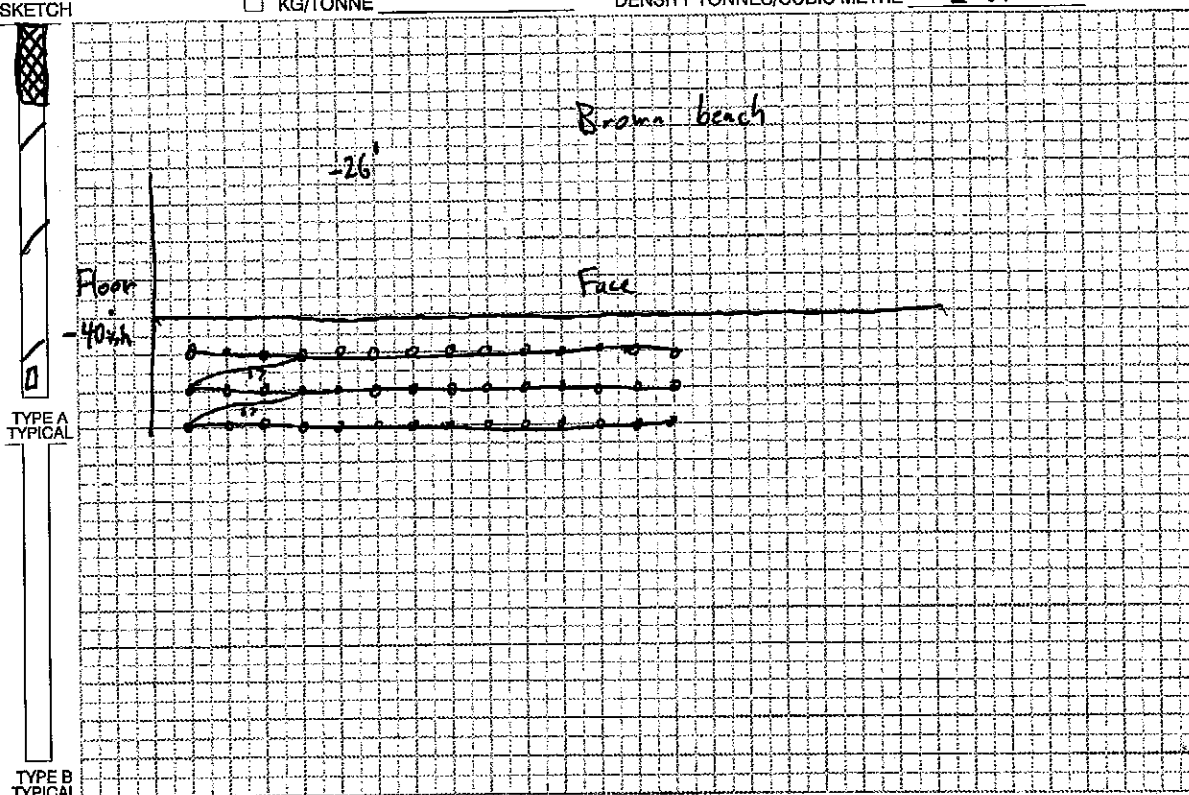
TOTAL NO. TONNES PRODUCED 13 900

OR TOTAL CUBIC METRES PRODUCED 5 326

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.514

SKETCH KG/TONNE

DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: Foreman to clear pit @ blast time.

POST-BLAST COMMENTS: 20455 Exier Peat Rd. 13:37

	1.77 m/s	36.5 Hz	2.92 m/s	30.1 Hz	
100db	1.77	34.3	106db	1.27	51.2
V.S.Z. 5 m/s	1.39	39.3	V.S.Z. 0.4 m/s	2.41	25.6

BLASTER IN CHARGE

Dave Kingsper
Dave Kingsper
SIGNATURE

TYPE OF PROTECTIVE COVER USED

- STEEL SHELTER
- OFF HIGHWAY TRUCK
- BUCKET OF LOADER / SHOVEL
- OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida
ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/28/2015 13:37

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SE

Temperature: 26 °C

Terrain: Flat

Wind Velocity: - km/h

Blast Lat./Long.: 42° 53' 48.100" N 79° 17' 32.700" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 339 °

Distance: 729 m

Structure Lat./Long.: 42° 54' 10.200" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.92 m	Material Blasted:	Limestone	Total Drilling Footage:	332.84 m
No. of Holes:	42	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	42	Face Height:	7.92 m	Spacing:	3.96 m
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,225.8 m ³
Firing Device:	Other	Max. Wt. of Expl. Per 8 ms Interval:	67.5 kg	Weight Produced:	13,641.5 t
Other Method:	DBM	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	4.814 t/kg
Mfg and Model:	DBM Remote Unit	Max. Wt. of Explosive Per Hole:	67.5 kg	Powder Factor 2:	0.542 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	88.79	Rock Density:	2.611 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	88.79		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No		Protective Cover: Loader Bucket			
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
KLINGSPOR	DAVID, A	* ON - 2788-454184 [12/31/2099]		Yes	Yes	Yes	No	No
BRUNET	LEO, A			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
Other Crew Members			Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Tyler Rabideau			Maple Leaf Drilling	No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/28/2015 13:37

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	42.00 ea	14.28
10752	SHOCK*STAR DualDelay 12m/40' 25/500	42.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	6.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
11235	Hydromite 4600 Bulk	2,820.00 kg	2,820.00
Total Weight of Explosives (Include Primers) (kg):			2,834.29

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/28/2015 13:37

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

SEISMOGRAPH 1 - 20455 ERIE PEAT RD.

Data Type:	Seismic Record	Seismograph Type:	Whit MiniSeis II				
Date:	05/28/15	Trigger Level:	1.02 mm/s	---	dB	Transverse:	1.77 mm/s 36.5 Hz
Time:	13:37	Calibration Date:	08/08/15			Vertical:	1.77 mm/s 39.3 Hz
Distance From Blast:	729.39 m	Calibration Signal:				Longitudinal:	1.39 mm/s 39.3 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	100 dB
Location:	20455 Erie Peat Rd.					Vector Sum:	2.15 mm/s
Lat./Long.:	42° 54' 10.200" N		79° 17' 44.100" W				
Reader and Firm:	Dave Klingspor, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - ERIE PEAT RD CORNER

Data Type:	Seismic Record	Seismograph Type:	White MiniSeis II				
Date:	05/28/15	Trigger Level:	1.02 mm/s	122.00	dB	Transverse:	2.92 mm/s 30.1 Hz
Time:	13:37	Calibration Date:	06/26/15			Vertical:	1.27 mm/s 51.2 Hz
Distance From Blast:	586.44 m	Calibration Signal:				Longitudinal:	2.41 mm/s 25.6 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	106 dB
Location:	Erie Peat Rd Corner					Vector Sum:	3.04 mm/s
Lat./Long.:	42° 53' 29.500" N		79° 17' 27.400" W				
Reader and Firm:	Dave Klingspor, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Nov,09/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.5	7.46	Collar:	7.0	2.13
Diameter in:	4						
Material Blasted:		Limestone		Explosive / Hole:		59.0	kg
Density:		2.61 t/m3		Max. kg. / Delay:		59.0	kg
Max Holes / Delay:		1		Distance to Seis.:			m
						130.0	lb
						130.0	lb
							ft
						m3/ Hole:	123.0
						Tonnes/Hole:	319.0
						Total Tonnes:	16269.0

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18.5	130.0	59.0
Total product		6630.0	3009.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *Nov 9/15*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 11/19/15
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey Bench
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH 25.5' FACE HEIGHT 25.5' LENGTH OF STEMMING (COLLAR) 6'

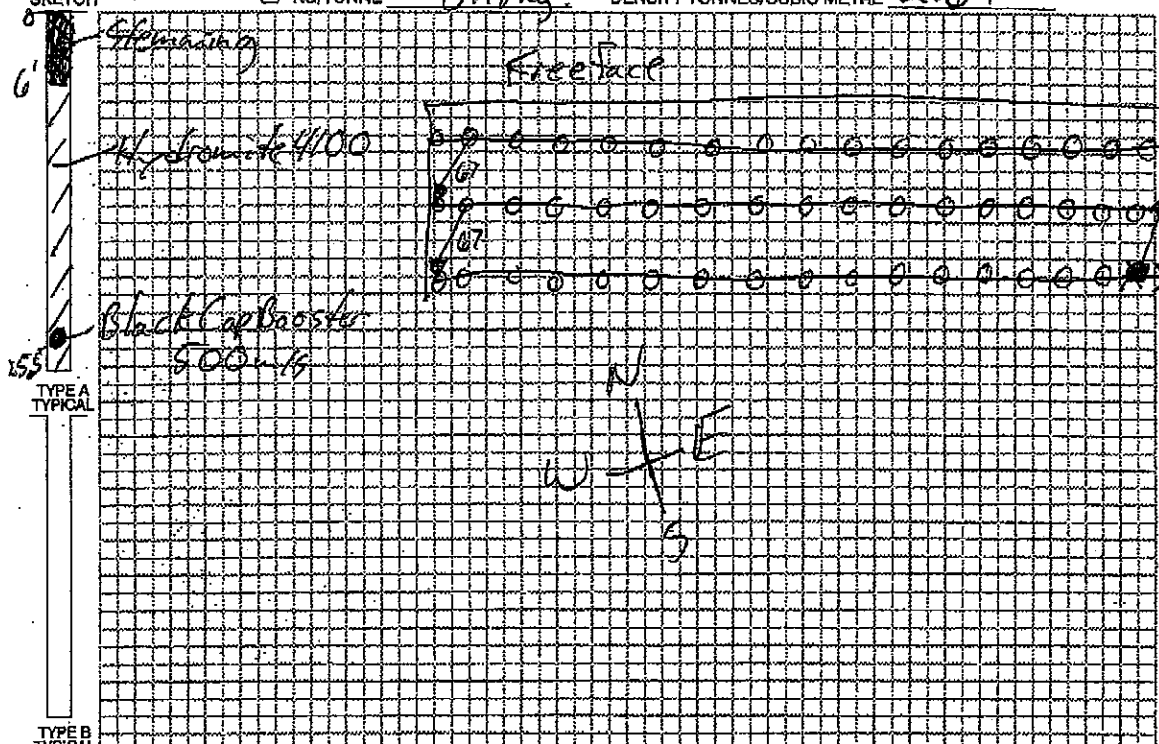
EXPLOSIVES	TOTAL QUANTITY
<u>40' Dual Delay 25/500</u>	<u>51</u>
<u>20' Quick Relay 67/15</u>	<u>5</u>
<u>Hydromite 4/100</u>	<u>3002 kg</u>

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ² = 0.37037 yd ²
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1888 tonne/m ³

TYPE OF PRIMER Black Cap Booster 51
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 58.86 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 16,276 tonne OR TOTAL CUBIC METRES PRODUCED 6236 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.48 kg
 SKETCH KG/TONNE 0.18 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92 m/s Between Rows, 25 m/s Between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE _____

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/09/2015 12:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench South Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NW

Temperature: 10 °C

Terrain: Flat

Wind Velocity: 5-7 km/h

Blast Lat./Long.: 42° 53' 49.799" N 79° 17' 35.900" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 343 °

Distance: 657 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.77 m	Material Blasted:	Limestone	Total Meters Drilled:	396.2 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	51	Face Height:	7.77 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 7.77 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,223.6 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	62.5 kg	Weight Produced:	16,246.2 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.098 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	62.5 kg	Powder Factor 2:	0.512 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	83.16	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	83.16		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
DAVIS	JORDAN, T			No	No	No	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jeremy	Maple Leaf Drilling	No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/09/2015 12:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	3,170.00 kg	3,170.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,900.50 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,187.34

COMMENTS / EXPLANATIONS

Daron Merritt

Signature of Blaster in Charge

BLAST REPORT

310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/09/2015 12:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 11/09/15 Trigger Level: 1.02 mm/s 120.00 dB Transverse: 2.79 mm/s 22.2 Hz

Time: 12:42 Calibration Date: 04/24/15 Vertical: 1.52 mm/s 56.8 Hz

Distance From Blast: 655.93 m Calibration Signal: Longitudinal: 3.04 mm/s 23.2 Hz

Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Mic. Min. Freq.: --- Hz Acoustic: 106 dB

Location: Corner Of Erie Peat Rd & Hwy#3 Vector Sum: 3.81 mm/s

Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 11/09/15 Trigger Level: 1.02 mm/s 120.00 dB Transverse: 2.45 mm/s 34.1 Hz

Time: 12:42 Calibration Date: 08/28/14 Vertical: 4.66 mm/s 32.0 Hz

Distance From Blast: 657.45 m Calibration Signal: Longitudinal: 3.91 mm/s 34.1 Hz

Direction From Blast: NNW Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Mic. Min. Freq.: --- Hz Acoustic: 118 dB

Location: 20455 Erie Peat Rd Vector Sum: 4.66 mm/s

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Nov,25/15

Location in Quarry: East Face Grey Bench

Layout

	Feet	Metres	Feet	Metres						
# Holes:	47	80	Hole Depth:	24.5	7.46	Burden:	13.0	3.96	m ³ / Hole:	164.0
# Rows:	4	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	306.0
Diameter mm:			Face Height:	24.5	7.46	Collar:	7.0	2.13	Total Tonnes:	18360.0
Diameter in:		4								
Material Blasted:	Limestone		Explosive / Hole:	56.0 kg		123.0 lb				
Density:	2.61 t/m ³		Max. kg. / Delay:	56.0 kg		123.0 lb				
Max Holes / Delay:	1		Distance to Seis.:	m		ft				

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	60				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heat-30			
Heat-40			
Heat-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7380.0	3360.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *NOV 24*

Michelle Gallinger

From: Madden, Pat <Pat.Madden@austinpowder.com>
Sent: November-23-15 12:16 PM
To: Michelle Gallinger; Brandon Smith
Subject: Hole count

Good afternoon,

I just want to confirm the hole count for Wednesday's blast. There will be 49 holes.

Thanks, Pat

Patricia Madden ♦ Technical Sales

Austin Powder Limited ♦ 514 Drylake Rd. ♦ Hagersville, ON, N0A 1H0
Office: 905-768-0833 ♦ Toll Free: 800.811-9396 ♦ Cell: 905-517-0764
♦ pat.madden@austinpowder.com



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 11/25/15
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 48 NO. OF ROWS 3 BURDEN 13'
 SPACING 13 DEPTH 25.5' FACE HEIGHT 25.5' LENGTH OF STEMMING 6.5'
 (COLLAR)

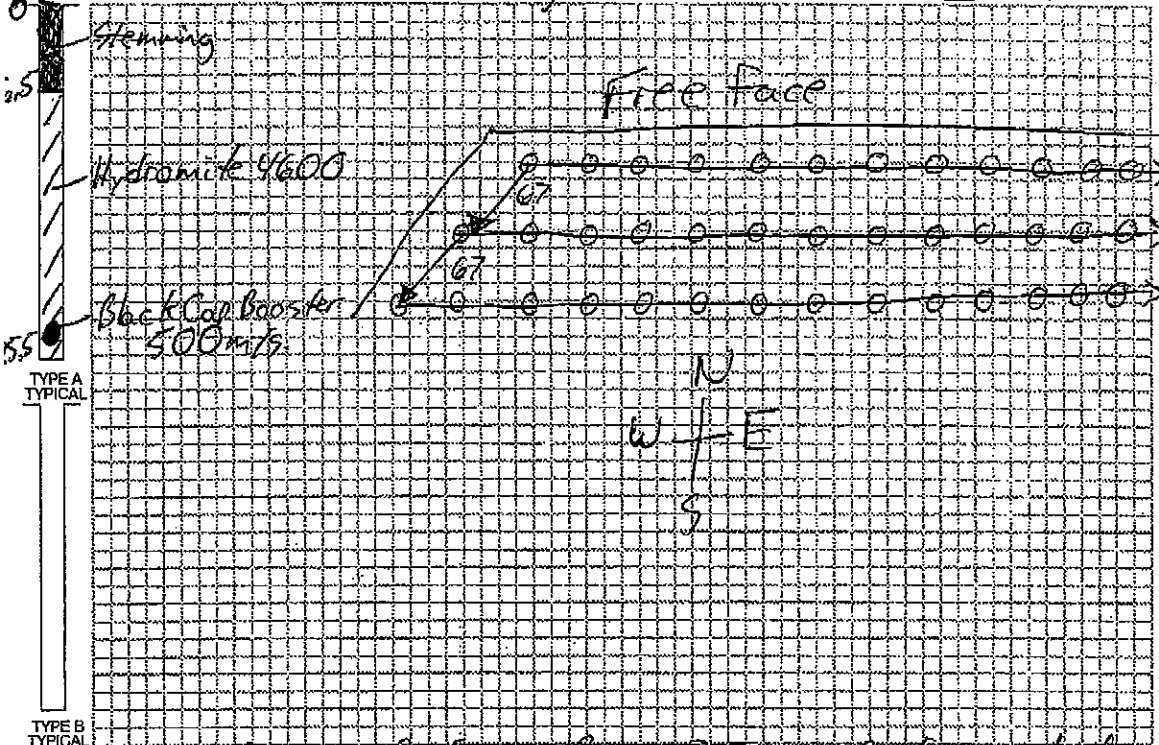
EXPLOSIVES TOTAL QUANTITY
40' Dual Delay 25/500 48
20' Quick Relay 67ms 5
Hydramite 4600 2825kg.

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap Booster 48
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 58.8kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 15,318 tonne OR TOTAL CUBIC METRES PRODUCED 5869 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.48 kg
 SKETCH KG/TONNE 0.18 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92ms Between Rows, 25ms Between holes.
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

AUSTIN POWDER LTD.

BLAST REPORT



310-Onsida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/25/2015 10:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SE

Temperature: 6 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 50.000" N 79° 17' 32.799" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 337 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 675 m

LAYOUT

Hole Depth:	7.77 m	Material Blasted:	Limestone	Total Meters Drilled:	373.1 m
No. of Holes:	48	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	48	Face Height:	7.77 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 7.77 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,857.5 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	56.6 kg	Weight Produced:	15,290.5 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.630 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	56.6 kg	Powder Factor 2:	0.464 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	89.75	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	89.75		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BURNIE	BRANDON, A			No	Yes	No	No	No
LI	JACKSON, A			No	Yes	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	No	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jeremy		Maple Leaf Drilling		No	No	No	Yes	Yes

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/25/2015 10:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	48.00 ea	16.32
10752	SHOCK*STAR DualDelay 12m/40' 25/500	48.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11235	Hydromite 4600 Bulk	2,700.00 kg	2,700.00
12981	Mini Stem Plug - 6015	48.00 ea	0.00
D0120	Other-Drilling Charges	1,224.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,716.32

COMMENTS / EXPLANATIONS

Caron Merritt

Signature of Blaster in Charge

AUSTIN POWDER LTD.**BLAST REPORT**

310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 11/25/2015 10:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

SEISMOGRAPH 1 - YOUNGS RD WATER WELLS

Data Type: Seismic Record Seismograph Type: White mini-seis

Date: 11/25/15

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 4.82 mm/s 26.9 Hz

Time: 10:08

Calibration Date: 04/24/15

Vertical: 2.54 mm/s 64.0 Hz

Distance From Blast: 533.40 m

Calibration Signal:

Longitudinal: 5.58 mm/s 102.4 Hz

Direction From Blast: E

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 112 dB

Location: Youngs Rd Water Wells

Vector Sum: 5.58 mm/s

Lat./Long.: 42° 53' 49.600" N

79° 17' 9.300" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 11/25/15

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 2.79 mm/s 36.5 Hz

Time: 10:08

Calibration Date: 07/07/15

Vertical: 1.65 mm/s 36.5 Hz

Distance From Blast: 641.60 m

Calibration Signal:

Longitudinal: 2.03 mm/s 46.5 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 100 dB

Location: Corner Of Erie Peat Rd & Hwy#3

Vector Sum: 2.79 mm/s

Lat./Long.: 42° 53' 29.800" N

79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Oct,01,15

Location in Quarry: **Top Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	200	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m ³ / Hole:	57.7
# Rows:	9	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	27200.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		11.1 kg		24.5 lb		
Density:	2.4 t/m ³		Max. kg. / Delay:		11.1 kg		24.5 lb		
Max Holes / Delay:	1		Distance to Seis.:		← m →		← ft →		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	200 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6300.0	2800.0

Miscellaneous:

Comments:

Approved: *B. mill*

Date: *Sept. 30/15*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 10/1/15
MO DA YR

COMPANY (PERMITTEE) WATER FORD SAND + GRAVEL LOCATION TOP WHITE ROCK

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4

NO. OF HOLES 194 NO. OF ROWS 10 BURDEN # 13

SPACING # 13 DEPTH 9.5 FACE HEIGHT 9.5 LENGTH OF STEMMING 6
(COLLAR)

EXPLOSIVES TOTAL QUANTITY CONVERSIONS

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>30' DATA DATA 25/50</u>	<u>194</u>	1 mm = 0.03937 in	1 in = 25.4 mm
		1 m = 3.28 ft	1 ft = 0.3048 m
		1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLACK LAD 194 WEIGHT OF EXPLOSIVES PER HOLE 13

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2469

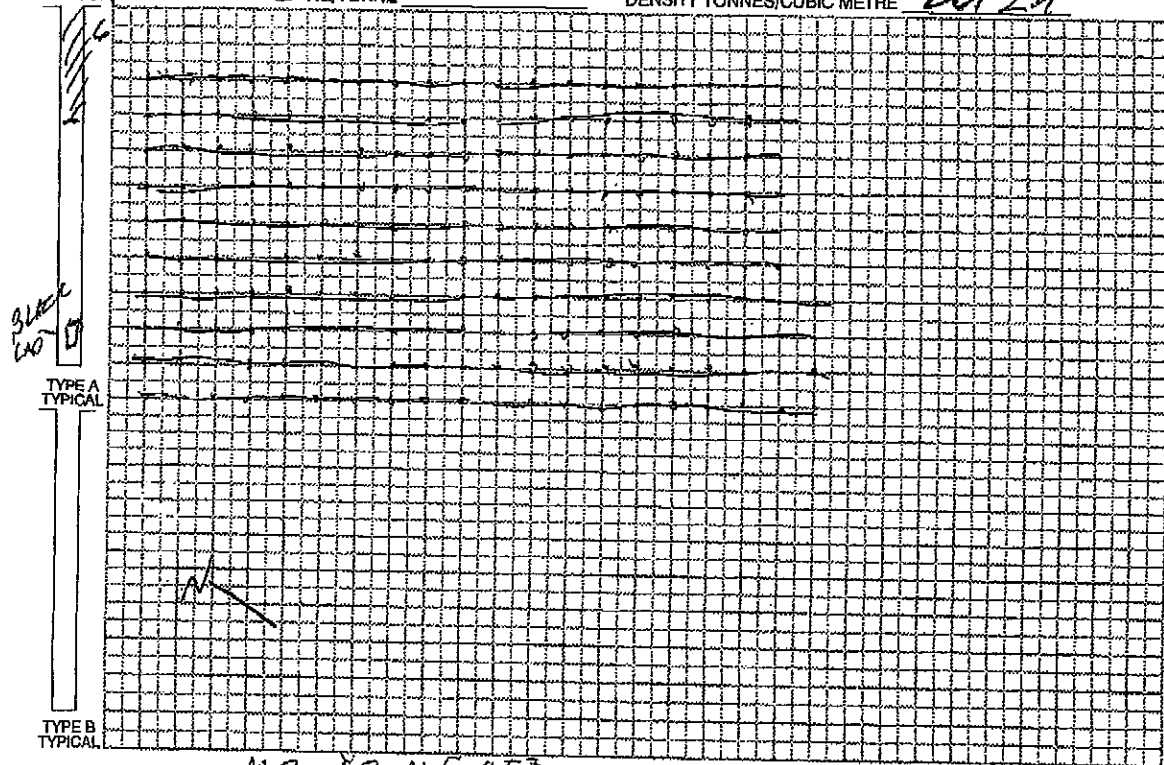
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) 30 QUICK RELAY 17MS

TOTAL NO. TONNES PRODUCED 21432 OR TOTAL CUBIC METRES PRODUCED 9096

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.2

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 42 53 45.953
79 17 33.453

POST-BLAST COMMENTS: PIT FOREMAN TO CLEAR PIT FOR BLAST TIME.
NT. 42 54 04 115 NT 42 53 29 784
79 17 44.660 79 17 27 284
26451

BLASTER IN CHARGE Jordan Davis PRINT SIGNATURE
TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/01/2015 14:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NNE

Temperature: 14 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 45.953" N 79° 17' 33.452" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20451 Erie Peat Rd

Direction/Bearing: 335 °

Structure Type: Dwelling

Distance: 615 m

Structure Lat./Long.: 42° 54' 4.115" N 79° 17' 44.660" W

LAYOUT

Hole Depth:	2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	561.7 m
No. of Holes:	194	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	194	Face Height:	2.90 m	Spacing:	3.96 m
No. of Rows:	10	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear
				Area Type:	Conventional
				Method:	Deepest Hole Load

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	25.2 kg	Volume Produced:	8,819.8 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	25.2 kg	Weight Produced:	21,170.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	8.656 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	12.6 kg	Powder Factor 2:	0.277 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	173.30	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	122.54		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: loader bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DEBOER	GARY, B	* ON - 2788-454071 [12/31/2099]		Yes	No	Yes	No	No
DAVIS	JORDAN, T			No	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	No	No	No
MADDEN	PATRICIA, C			No	Yes	Yes	No	No

Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike		Maple Leaf		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/01/2015 14:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	194.00 ea	65.98
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	194.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	42.00 ea	0.00
11776	Hydromite 4100-NP	2,380.00 kg	2,380.00

Total Weight of Explosives (Include Primers) (kg): 2,445.98

COMMENTS / EXPLANATIONS

General Comments: Camera will not hold a charge

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/01/2015 14:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

SEISMOGRAPH 1 - CORNER OF EIRE PEAT AND HWY #3

Data Type:	No Trigger	Seismograph Type:	---	Transverse:	---	mm/s	---	Hz
Date:	10/01/15	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	---	mm/s	---	Hz
Time:	14:48	Calibration Date:	11/19/14	Longitudinal:	---	mm/s	---	Hz
Distance From Blast:	526.08 m	Calibration Signal:		PPV:	---	mm/s	---	Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Acoustic:	---	dB		
Readout:		Mic. Min. Freq.:	---	Vector Sum:	---	mm/s		
Location:	Erie Peat Rd and Hwy 3							
Lat./Long.:	42° 53' 29.500" N		79° 17' 27.400" W					
Reader and Firm:	Jordan Davis, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:								

SEISMOGRAPH 2 - 20451 EIRE PEAT

Data Type:	No Trigger	Seismograph Type:	MINI WHITE SEIS	Transverse:	---	mm/s	---	Hz
Date:	10/01/15	Trigger Level:	1.01 mm/s 120.00 dB	Vertical:	---	mm/s	---	Hz
Time:	14:48	Calibration Date:	08/08/14	Longitudinal:	---	mm/s	---	Hz
Distance From Blast:	615.39 m	Calibration Signal:		PPV:	---	mm/s	---	Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	---	Acoustic:	---	dB		
Readout:		Mic. Min. Freq.:	---	Vector Sum:	---	mm/s		
Location:	20451 EIRE PEAT							
Lat./Long.:	42° 54' 4.115" N		79° 17' 44.660" W					
Reader and Firm:	Jordan Davis, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:								



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Crushed Stone

Date: Sept 2 2015

Location in Quarry: Gray Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	60	Hole Depth:	25.0	7.62	Burden:	13.0	3.96	m ³ / Hole:	119.6
# Rows:	3	Subdrilling:	← 0.0 →	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	311.1
Diameter mm:		Face Height:	25.0	8.38	Collar:	7.0	2.13	Total Tonnes:	18663.6
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		57.0 kg		125.0 lb		
Density:	2.6	t/m ³		Max. kg. / Delay:		160.0			
Max Holes / Delay:	1		Distance to Seis.:		m		2625.0 ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20' 20'30'		Boosters		Electronic Det
12' -	50' -	9ms -	42ms -	Orange Cap (1 lb) -		24' E-star-
16' -	60' -	17ms -	67ms -	Black Cap (3/4 lb) -		40' E-Star-
24' -	80' -	25ms -	100ms -	Brown Cap (1/2 lb) -		60' E-star-
30' -	100' -	33ms -		E-Star Booster (1 lb) -		80' E-star-
40' -	60					100' E-star-

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Hyd 4100 NP			
Hyd 4600			
Hyd. 4400	18	125.0	57.0
Total product		7500.0	3420.0

Miscellaneous:

Shot # 2015-05

25 ms between hole 92 ms between rows

Approved: *B. Smith*

Gary deboer

Date:

Sept 11/15
~~July 18 2015~~

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/02/2015 11:19

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Hazy Hot and Humid

Wind From: SW

Temperature: 27 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 50.200" N 79° 17' 33.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Compass Point: NNW

Direction/Bearing: 337 °

Distance: 668 m

LAYOUT

Hole Depth:	0.00 m	Material Blasted:	Limestone	Total Meters Drilled:	m
No. of Holes:	66	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	66	Face Height:	0.00 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	0 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 7.47 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,738.2 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	49.1 kg	Weight Produced:	20,199.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	6,230 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	49.1 kg	Powder Factor 2:	0.419 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	95.28	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	95.28		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied in	Chk. Tie-in	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members	Company		In Charge	Tied in	Chk. Tie-in	Driller	Layout	
Jeremy	Maple Leaf Drilling		No	No	No	Yes	Yes	

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA, 1- H0

Blast No.: 2015-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/02/2015 11:19

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	66.00 ea	22.45
10752	SHOCK*STAR DualDelay 12m/40' 25/500	66.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	5.00 ea	0.00
11776	Hydromite 4100-NP	3,220.00 kg	3,220.00
12981	Mini Stem Plug - 6015	66.00 ea	0.00
D0120	Other-Drilling Charges	1,617.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,242.44

COMMENTS / EXPLANATIONS

Daron Merritt

Signature of Blaster in Charge

AUSTIN POWDER LTD.**BLAST REPORT**

310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/02/2015 11:19

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench South Wall

SEISMOGRAPH 1 - YOUNGS RD WATER WELLS

Data Type:	No Trigger	Seismograph Type:	White mini-seis	Transverse:	---	mm/s	---	Hz	
Date:	09/02/15	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	---	mm/s	---	Hz	
Time:	11:19	Calibration Date:	11/18/14	Longitudinal:	---	mm/s	---	Hz	
Distance From Blast:	537.97 m	Calibration Signal:		PPV:	---	mm/s	---	Hz	
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz	Acoustic:	---	dB		
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	---	mm/s		
Location:	Youngs Rd Water Wells								
Lat./Long.:	42° 53' 49.600" N		79° 17' 9.300" W						
Reader and Firm:	Aaron Merritt, AUSTIN POWDER								
Analyst and Firm:									
Installer and Firm:	Austin Powder								

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis	Transverse:	4.31	mm/s	39.3	Hz	
Date:	09/02/15	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	1.52	mm/s	56.8	Hz	
Time:	11:19	Calibration Date:	04/24/15	Longitudinal:	2.54	mm/s	34.1	Hz	
Distance From Blast:	648.61 m	Calibration Signal:		PPV:	---	mm/s	---	Hz	
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz	Acoustic:	100	dB		
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	4.44	mm/s		
Location:	Corner Of Erie Peat Rd & Hwy#3								
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W						
Reader and Firm:	Aaron Merritt, AUSTIN POWDER								
Analyst and Firm:									
Installer and Firm:	Austin Powder								



AUSTIN POWDER LTD. BLAST DESIGN



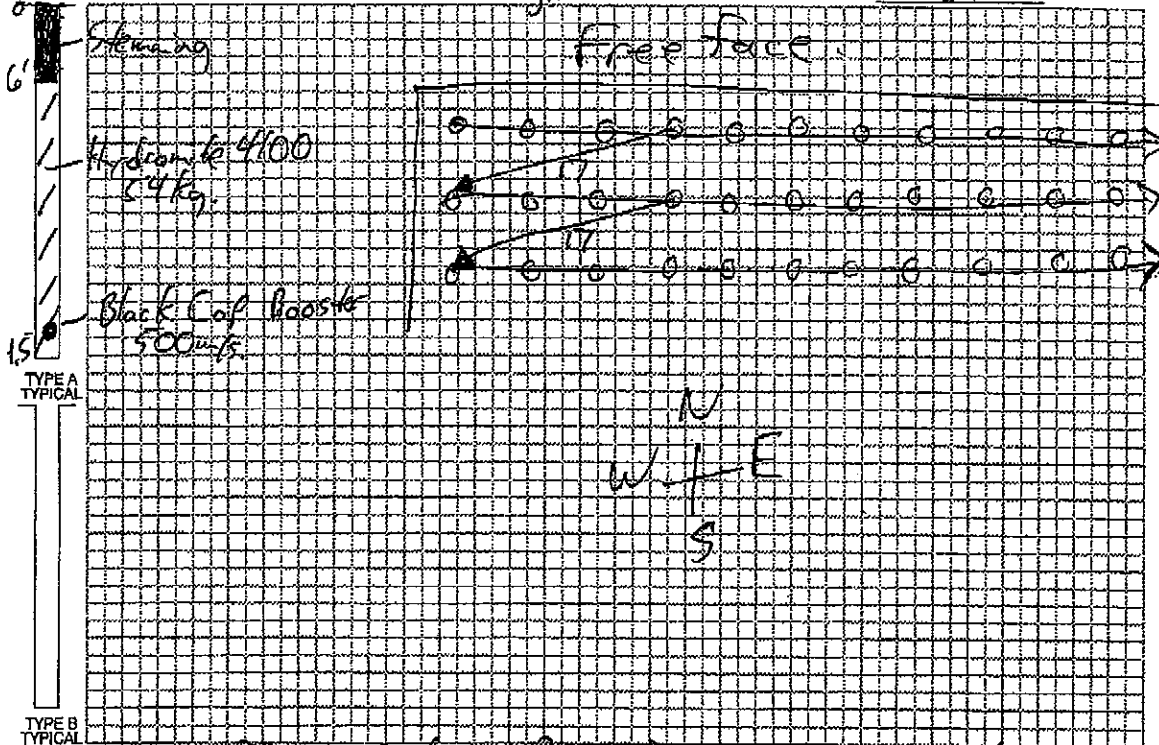
SHOT NO. _____ DATE: 9/12/15
 COMPANY (PERMITTEE) Law Crusted Stone LOCATION South Wall Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 66 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH 24.5' FACE HEIGHT 24.5' LENGTH OF STEMMING 6'
 (COLLAR)

EXPLOSIVES TOTAL QUANTITY
40' Dual Delay 25/500 66
30' Quick Relay 17ms 5
Hydromite 4100 3570 kg.

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m² = 35.32 ft² 1 ft² = 0.0283168 m²
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER Black Cap Booster 66
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 54 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 20,237 tonne OR TOTAL CUBIC METRES PRODUCED 7753 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.46 kg.
 SKETCH KG/TONNE 0.11 kg. DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 2ms Between Rows, 25 ms Between holes
Quarry to be cleared by Foreman prior to blast time
 POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Aaron Merritt
 PRINT: _____
 SIGNATURE: Aaron Merritt

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Sept,22/15

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	54	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
						Tonnes/Hole:	306.0
						Total Tonnes:	16524.0

Material Blasted: Limestone Explosive / Hole: 56.0 kg 123.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 56.0 kg 123.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	54				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		6642.0	3024.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *Sept 21/15*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 2015-06 DATE: 09/22/15
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Gray bench
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 49 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 24 FACE HEIGHT 24 LENGTH OF STEMMING (COLLAR) 7

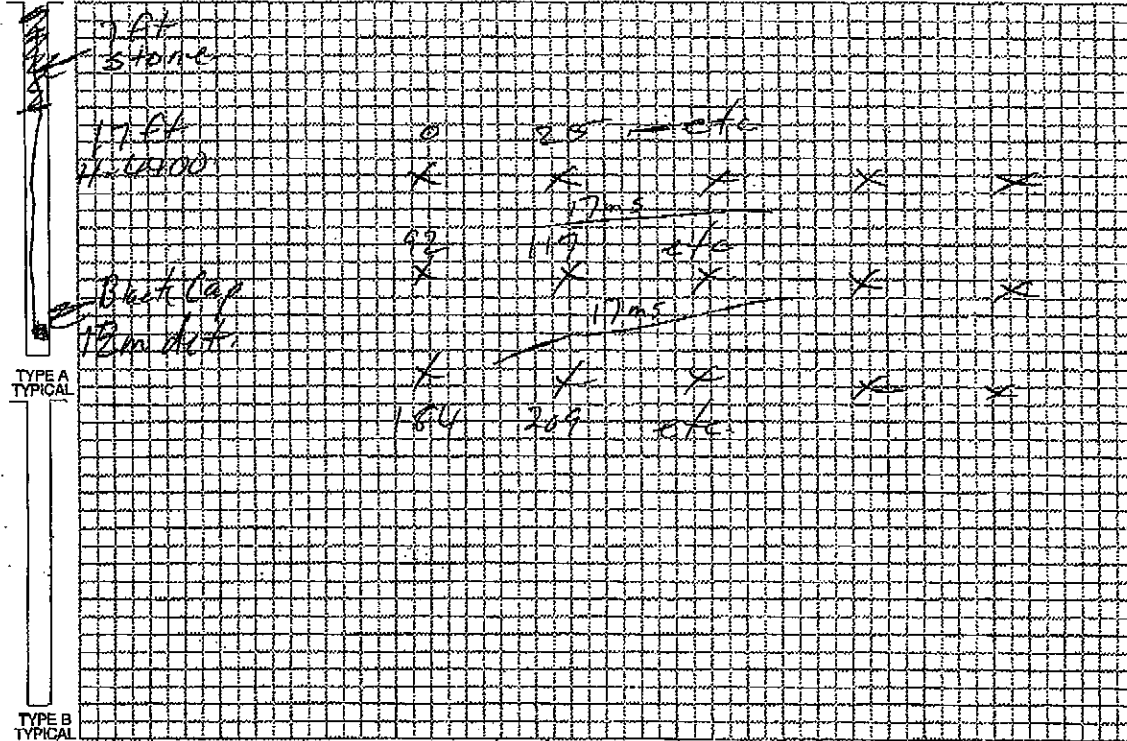
EXPLOSIVES
A-4400
12m DD 25/500
Black Cap Booster
17ms

TOTAL QUANTITY
~~2940~~ 2695
49
49
5

CONVERSIONS
 1 mm = 0.03937 in
 1 m = 3.28 ft
 1 m³ = 35.32 ft³
 1 m³ = 1.308 yd³
 1 yd³ = 27 ft³
 1 kg = 2.2046 lb
 1 tonne = 1.1023 ton
 1 tonne/m³ = 0.842777 ton/yd³
 1 in = 25.4 mm
 1 ft = 0.3048 m
 1 ft³ = 0.0283168 m³
 1 yd³ = 0.764555 m³
 1 ft³ = 0.37037 yd³
 1 lb = 0.454 kg
 1 ton = 0.907185 tonne
 1 ton/yd³ = 1.1888 tonne/m³

TYPE OF PRIMER 3/4 cast
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) ~~2940~~ 2715 WEIGHT OF EXPLOSIVES PER HOLE 55
 TYPE OF INITIATION SYSTEM: NON-ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 25/500, 17ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 14634 OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE
 SKETCH KG/TONNE 1185 DENSITY TONNES/CUBIC METRE 2.6



PRE-BLAST COMMENTS: 25 ms between 92ms between rows
49 53 50.4 cap date Corner Hwy 3rd E. Peet
79 17 31.6 SN. 5990 042415 1148
 POST-BLAST COMMENTS: 20455 on Peet Rd. 4.44 64.0 SN 3031
2.79 17.6 1150 AM 2.54 42.6 0.1 2014 1119
2.28 23.2 119 PB 4.19 73.1
2.79 16.5 3.81 US 5.33 US 1090.6

BLASTER IN CHARGE: Gary DeBoer TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER COMPANY
BLAST SITE CHECKLIST
PRE AND POST**

Handwritten signature

Operation: Law Crushed

Date: Sept 22 2015

Blast Number: 2015-06

Blast Location: Gray

Blasting: Preloading

Prior to loading holes, the following will be performed (Blaster In Charge to complete this checklist):

- Pre-shift safety meeting conducted by Blaster In Charge including discussion of days work plan and site specific requirements. Review of and inspection of required PPE. All potential hazards identified, corrected & reported to mine management.
- APC blasting First-Aid Kit, availability and location(s) discussed during pre-blast safety meeting.
- Blast Site properly signed & posted against unauthorized entry.
- Blast design has been approved by the Plant Manager / Superintendent or their designee, showing the charges to be used, timing, and sequence of the blast, stemming, and scale distance.
- The drilled pattern of 13x13 conforms to that of the approved layout (+/- 2 x borehole diameter).
- Standard Blast Design Number (SBD) used is: _____ (potential customer specific requirement)
- Ensure the actual depth of the holes conforms to the approved blast layout/design.
- De-watering of holes conducted prior to explosives and initiators being placed at holes being dewatered.
- Thoroughly examine the burden on every face hole using a laser profiler.
- Drill logs have been reviewed with Plant Manager / Supervisor or their designee **if** any abnormal circumstances exist.
- From the top of the bench, examine the surface of the blast area for weaknesses in the rock, such as clay pockets, joints, etc.
- N/A From the pit floor, examine the face for signs of caves, joints, excessive backbreak, or over excavation.
- N/A Examine the face for proper relief and/or boulders in the heave area. Inform the Plant Manager / Superintendent or their designee of findings.
- N/A If an electric blasting system is used and there are sources for stray current present, then stray current test must be conducted. Refer to current edition of ISFE Blaster's Handbook for procedures for testing for stray current.
- Notify Plant Manager / Superintendent or their designee of conditions which deviate from the approved blast diagram. Ensure that plans for custom loading have been addressed and documented.
- Discuss proper blocking/notification procedures and other blast site security measures.
- Ensure that all required notices have been given.

Instrument used: _____

Survey Conducted By: *Angie DeR...*
(Blaster In Charge Signature)

Approved By: _____
(Survey, blast design, and blast diagram) (Plant Manager/designee Signature)

Non-Blast Day Event Inspection/Blast Day Event Inspection (For Blasts Conducted Where Customer Checklist is Used)
(Metal & Non-Metal Mines – CFR 30 §56.18002 / 57.18002)

Work Area Inspection, Pre-shift safety meeting conducted, including discussion of days work plan and site specific requirements. Review of and inspection of required PPE. All potential hazards identified, corrected and reported to mine management.

Job Type: Blast Layout Profile Other _____



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/22/2015 11:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SSW

Temperature: 22 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 50.399" N 79° 17' 31.599" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 335 °

Distance: 675 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.32 m	Material Blasted:	Limestone	Total Meters Drilled:	358.4 m
No. of Holes:	49	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	49	Face Height:	7.32 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear
				Area Type:	Conventional
				Method:	First Hole Load

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,627.8 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	52.6 kg	Weight Produced:	14,691.0 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.408 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	52.6 kg	Powder Factor 2:	0.483 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	93.06	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	93.06		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: loader bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]	* ON - 278B-454071 [12/31/2099]	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Tyler	Maple Leaf	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2015-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/22/2015 11:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	49.00 ea	16.66
10752	SHOCK*STAR DualDelay 12m/40' 25/500	49.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	5.00 ea	0.00
09108	Hydromite 4400 -nf	2,560.00 kg	2,560.00
Total Weight of Explosives (Include Primers) (kg):			2,576.66

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2015-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/22/2015 11:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location:

SEISMOGRAPH 1 - SEISMOGRAPH 1

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	09/22/15	Trigger Level:	1.02 mm/s 120.00 dB	Transverse:	2.79 mm/s	17.6 Hz
Time:	11:50	Calibration Date:	04/24/14	Vertical:	2.28 mm/s	23.2 Hz
Distance From Blast:	674.83 m	Calibration Signal:		Longitudinal:	2.79 mm/s	16.5 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz	Acoustic:	119 dB	
Location:	20455 Erie Peat Rd			Vector Sum:	3.81 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Gary DeBoer, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - SEISMOGRAPH 2

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	09/22/15	Trigger Level:	1.02 mm/s 120.00 dB	Transverse:	4.44 mm/s	64.0 Hz
Time:	11:50	Calibration Date:	11/19/14	Vertical:	2.54 mm/s	42.6 Hz
Distance From Blast:	651.97 m	Calibration Signal:		Longitudinal:	4.19 mm/s	73.1 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz	Acoustic:	109 dB	
Location:	Erie Peat Rd and Hwy 3			Vector Sum:	5.33 mm/s	
Lat./Long.:	42° 53' 29.500" N		79° 17' 27.400" W			
Reader and Firm:	Gary DeBoer, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

Date dd/mm/yy	Blast #	# Holes	Depth (feet)	Tonnes	Seizmograph Locations	Trans.	Vert.	Long.	dB	Weather
11-Feb-16	2016-01	100	15.5	7332.80	AE	6.60	3.04	5.08	110.0	A
					A	1.27	0.76	2.28	100.0	A
18-Feb-16	2016-02	107	15.5	7846.20	AE	2.92	1.52	3.55	110.0	A
					A	3.04	1.90	1.65	100.0	A
18-Feb-16	2016-03	120	15.5	8799.30	AE	2.66	1.39	2.79	110.0	A
					A	2.03	0.88	1.39	100.0	A
15-Mar-16	2016-04	114	15.5	8359.30	AE	3.68	1.90	3.04	114.0	J
					A	2.54	0.88	1.27	94	J
17-Mar-16	2016-05	104	15.5	7626.00	AE	1.14	1.27	1.14	118.00	A
					A	No Triggers				A
17-Mar-16	2016-06	112	15.5	8212.70	AE	2.28	1.52	1.77	112.0	A
21-Mar-16	2016-07	105	15.5	8414.30	AE	1.52	1.27	1.14	94.00	G
					A	3.42	1.27	2.03	106.00	G
23-Mar-16	2016-08	110	15.5	8836.10	AE	9.14	2.54	4.69	110.0	J
					A	3.04	1.14	3.42	94.0	J
28-Mar-16	2016-09	104	15.5	8341.00	AE	2.79	1.52	3.30	100.0	J
					A	2.92	1.52	2.54	94.0	J
31-Mar-16	2016-10	107	15.5	8588.50	A	3.42	1.52	3.42	94.0	J
					AE	3.04	1.14	2.28	106.0	J
1-Apr-16	2016-11	104	15.5	8341.10	AE	2.15	1.52	2.28	112.0	G
					A	3.68	1.39	2.79	94.0	G
4-Apr-16	2016-12	105	15.5	8441.90	AE	5.33	2.54	5.08	94.0	G
					A	2.54	1.27	2.15	110.0	G
7-Apr-16	2016-13	103	15.5	8157.70	AE	3.68	2.54	3.81	94.0	G
					A	2.92	1.90	2.79	94.0	G
7-Apr-16	2016-14	45	25	4053.80	A	2.66	1.14	1.27	94.0	G
					AE	3.17	1.52	3.17	94.0	G
12-Apr-16	2016-15	51	24.5	15609.00	A	3.17	1.39	3.55	110.0	G
					AE	3.30	1.27	2.79	117.0	G
12-Apr-16	2016-16	212	9.5	23135.10	A	1.01	0.63	0.50	112.0	G
					AE	1.14	0.25	0.63	100.0	G
21-Apr-16	2016-17	39	24.5	11936.30	A	2.03	1.77	2.15	106.0	K
					AE	3.55	2.28	2.92	122.0	K
28-Apr-16	2016-18	57	26	18513.50	A	3.81	1.77	3.93	110.0	G
					U	0.63	0.38	1.52	94.0	G
29-Apr-16	2016-19	39	24.5	11692.80	U	No Triggers				G
					A	2.41	1.14	2.41	114.0	G
6-May-16	2016-20	63	24.5	19281.90	A	3.55	1.90	3.30	106.00	A
					U	No Triggers				A
6-May-16	2016-21	175	11	22112.90	U	No Triggers				A
					A	3.55	1.90	3.30	106.0	A
12-May-16	2016-22	63	25	19675.30	A	2.54	2.15	2.54	100.00	A
					U	No Triggers				A
17-May-16	2016-23	51	25	15927.70	U	No Triggers				G
					A	2.92	1.65	3.68	110.0	G
27-May-16	2016-24	51	25	15927.70	U	No Triggers				A
					A	2.66	2.15	3.68	100.0	A
1-Jun-16	2016-25	51	25	15927.70	A	3.04	2.03	2.28	94.0	A
					U	No Triggers				A
3-Jun-16	2016-26	50	25	15615.40	U	No Triggers				A
					A	3.93	1.77	5.33	112.00	A
6-Jun-16	2016-27	51	25	15927.70	A	2.79	2.03	4.31	100.0	A
					U	1.52	2.03	4.31	94.0	A
15-Jun-16	2016-28	51	25	15927.70	U	No Triggers				A
					A	3.17	2.66	3.42	94.0	A
27-Jun-16	2016-29	50	25	15615.40	U	0.20	0.46	1.16	102.0	A
					AE	3.81	1.90	5.33	106.0	A
6-Jul-16	2016-30	33	24	9893.90	A	2.54	2.15	3.81	112.0	I
					U	No Triggers				I
12-Jul-16	2016-31	51	25	15927.70	U	2.18	3.38	3.45	107.00	A
					AE	No Triggers				A
19-Jul-16	2016-32	53	25	15890.30	A	No Triggers				A
					U	No Triggers				A
22-Jul-16	2016-33	51	25	15927.70	A	3.68	2.79	2.66	106.0	F
					U	No Triggers				F
22-Jul-16	2016-34	70	37	19145.00	A	8.12	6.35	7.74	114.00	F
					U	No Triggers				F
27-Jul-16	2016-35	57	25	17801.40	U	1.39	0.38	0.63	94.0	A
					A	3.81	2.92	6.22	106.0	A
3-Aug-16	2016-36	51	25	15927.70	A	4.31	3.68	4.31	106.0	A
9-Aug-16	2016-37	55	25	17176.90	U	No Triggers				A
					A	3.04	2.41	2.54	106.00	A
15-Aug-16	2016-38	66	24.5	20199.90	A	2.49	1.90	2.79	112.0	A
					U	No Triggers				A
22-Aug-16	2016-39	57	25	16840.50	U	No Triggers				A
					A	5.84	3.81	3.17	114.0	A
25-Aug-16	2016-40	44	36	18424.90	A	4.31	4.06	5.58	94.0	F

Date dd/mm/yy	Blast #	# Holes	Depth (feet)	Tonnes	Seizmograph Locations	Trans.	Vert.	Long.	dB	Weather
					U	No Triggers				F
31-Aug-16	2016-41	151	11	19080.20	U	No Triggers				F
					A	2.92	2.41	3.68	112.0	F
7-Sep-16	2016-42	44	35.25	18424.90	A	3.04	4.95	7.87	117.0	A
					U	1.52	0.38	0.38	110.0	A
17-Sep-16	2016-43	44	35.5	18185.60	A	4.95	3.81	5.96	114.0	F
					U	No Triggers				F
29-Sep-16	2016-44	43	35.5	17886.50	A	4.82	2.54	5.96	114.0	A
					U	No Triggers				A
30-Sep-16	2016-45	231	11	28848.80	A	1.52	1.39	1.27	114.0	K
					U	No Triggers				K

Seizmograph Location A= 1st. Pole on Erie Peat

B= 20246 Young Rd.

C= Lake Shore Rd.

D=10615 Hwy#3

E= Cathy Cres

F= Hwy #3 and Quarry Rd.

G= 20214 Townline Rd.

H= 2nd Pole on Erie Peat Rd.

I=3rd Pole on Erie Peat Rd.

J=20355 Erie Peat Rd. "Jullie Ritchies"

K=20160 Hwy #3 Front Lawn Todd Bazinet's

L=20136 Townline Rd. "Alec Balogh's"

M=20148 Hwy 3 Adam Ferri

N=4L23 Lakeshore Rd. Mike McCabe

O=Kwik Mix Property on lawn at corner of Hwy 3 and Kwik Mix Rd.

P=1/2 way down Bessey Rd. on East side of Road

Q=Carol Tennier 15 First Ave South off Hwy #3 Port Colborne

R=Andrew Gillespie 121 North Cres. Port Colborne

S=John Greco 10146 Hwy #3 front lawn

T=Sharron Skea 10285 Lakeshore Rd.

U=Angela Cox 17 First Ave. Port Colborne

V=First Ave Beside No Frills on Berm

W=First Ave Behind No Frills along Fence

X=10257 Crescent Heights, Port Colborne, Judy Kramer

Y=115 Rosemount Ave., Port Colborne, Marcia Turner

Z=230 Rosemount Ave., Port Colborne, Christine Hutcheson

AA=20146 Townline Rd., Port Colborne, Marcia Murdoch

AB=207 Westside Rd., Port Colborne, Walter Clapp

AC=10250 Highway 3, Wainfleet, Beth Robins

AD=Erie Peat Bog

AE=20455 Erie Peat Rd. Behind the quarry

AF=Biederman Rd 1st House on Left

AG=40 Townline Road Hillhouse property

AH=20101 Barrick Rd. Port Colborne

AI=Beside Youngs Rd Water Well

AJ=Youngs St. Test Well

AK=722 Hwy #3 West Main St. Deschamps property

Weather

A= Sunny and Clear

B= Cloudy / Overcast

C= Cloudy / Overcast and Showers

D=Cloudy / Heavy Snow

E-Cloudy/Light snow

F=Partly Cloudy

G=Cloudy/High Clouds

H=Cloudy/Overcast/Light Rain

I=Hazy Hot Humid

J=Light Rain

K=Overcast/Low Clouds

L=Heavy rain



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April,04/16

Location in Quarry: Lower Brown Bench

Layout

103

		Feet	Metres	Feet	Metres		
# Holes:	206	Hole Depth:	15.5	4.72	Burden:	8.0	2.44 m3/ Hole: 28.2
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	Tonnes/Hole: 73.3
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	Total Tonnes: 15099.0
Diameter in:	3.5						

Material Blasted: Limestone Explosive / Hole: 24.0 kg 52.5 lb
 Density: 2.61 t/m3 Max. kg. / Delay: 24.0 kg 52.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) - 206
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	206 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		10815.0	4944.0

Miscellaneous:

Comments:

Approved:

B. Smith

Date:

April 1, 2016



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/01/2016 14:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: ENE

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 52.500" N 79° 17' 31.599" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 349 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 556 m

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	491.3 m
No. of Holes:	104	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	104	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.37 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	22.9 kg	Volume Produced:	3,195.3 m ³
Firing Device: E*Star Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	22.9 kg	Weight Produced:	8,341.1 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	6.998 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	11.5 kg	Powder Factor 2:	0.373 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	164.21	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	116.11		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	No	No	No
MOSHER	STEWART, V			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/01/2016 14:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	104.00 ea	35.37
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	104.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	1,156.66 kg	1,156.66
12981	Mini Stem Plug - 6015	104.00 ea	0.00
D0120	Other-Drilling Charges	1,612.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			1,192.03

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/01/2016 14:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	78	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P. † Holes:	78	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	3	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,191.0 m ³
						Total weight for pattern:	5,719.5 t ✓

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	26	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P. † Holes:	26	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	1,004.2 m ³
						Total weight for pattern:	2,621.5 t ✓

† V.P. = Volume Producing

Total blast volume: 3,195.3 m³
Total weight produced: 8,341.0 t

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/01/2016 14:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 2.15 mm/s	26.9 Hz
Date: 04/01/16	Trigger Level: --- mm/s --- dB	Vertical: 1.52 mm/s	36.1 Hz
Time: 14:08	Calibration Date: 09/18/15	Longitudinal: 2.28 mm/s	36.5 Hz
Distance From Blast: 616.61 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: NNW	Geophone Min. Freq.: --- Hz	Acoustic: 112 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 2.41 mm/s	
Location:			
Lat./Long.: 42° 54' 10.240" N	79° 17' 44.100" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 3.68 mm/s	36.5 Hz
Date: 04/01/16	Trigger Level: 1.01 mm/s 120.00 dB	Vertical: 1.39 mm/s	56.8 Hz
Time: 14:08	Calibration Date: 02/04/16	Longitudinal: 2.79 mm/s	64.0 Hz
Distance From Blast: 711.40 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	Acoustic: 94 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 3.93 mm/s	
Location:			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April, 04/16

Location in Quarry: Lower Brown Bench

Layout

103

		Feet	Metres	Feet	Metres		
# Holes:	206	Hole Depth:	15.5	4.72	Burden:	8.0	2.44
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52
Diameter in:	3.5						
		m3/ Hole:					28.2
		Tonnes/Hole:					73.3
		Total Tonnes:					15099.0

Material Blasted: Limestone Explosive / Hole: 24.0 kg 52.5 lb
 Density: 2.61 t/m3 Max. kg. / Delay: 24.0 kg 52.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	206 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		10815.0	4944.0

Miscellaneous:

Comments:

Approved:

B. Smith

Date:

April 1, 2016



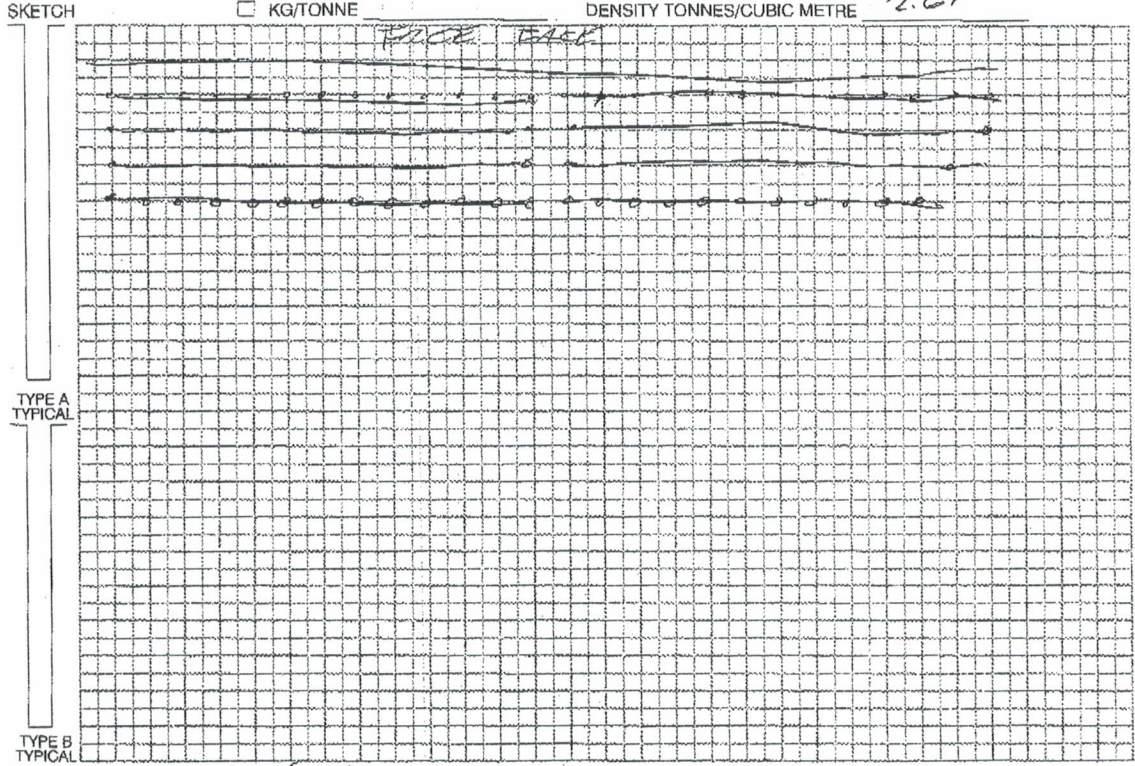
AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 1364 2389 DATE: 01/09/78
 COMPANY (PERMITTEE) LAW QUARRY LOCATION Brown Stone
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5
 NO. OF HOLES 107 NO. OF ROWS 4 BURDEN 4
 SPACING 4 DEPTH 15.5 FACE HEIGHT 19.5 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS
<u>3rd Rate Delay 251500</u>	<u>105</u>	1 mm = 0.03937 in 1 m = 3.28 ft 1 m ³ = 35.32 ft ³ 1 m ³ = 1.308 yd ³ 1 yd ³ = 27 ft ³ 1 kg = 2.2046 lb 1 tonne = 1.1023 ton 1 tonne/m ³ = 0.842777 ton/yd ³
		1 in = 25.4 mm 1 ft = 0.3048 m 1 ft ³ = 0.0283168 m ³ 1 yd ³ = 0.764555 m ³ 1 ft ³ = 0.37037 yd ³ 1 lb = 0.454 kg 1 ton = 0.907185 tonne 1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Blackcat 108-108
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2566 WEIGHT OF EXPLOSIVES PER HOLE 24
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) 7ms Quick Delay
7ms Quick Delay
 TOTAL NO. TONNES PRODUCED: 3723 OR TOTAL CUBIC METRES PRODUCED 3723
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.6 DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS HOLES
109.4ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FOREMAN TO CLEAN PIT FOR BLAST TIME

BLASTER IN CHARGE Jordan Davis
 PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/04/2016 11:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: N

Temperature: -4 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 54.600" N 79° 17' 30.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 345 °

Distance: 498 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	496.2 m
No. of Holes:	105	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	105	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	[See Below]
				Method:	[See Below]
				Water Depth:	3.05 m
				Stem Length:	1.52 m

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	27.8 kg	Volume Produced:	3,233.9 m ³
Firing Device:	Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	27.8 kg	Weight Produced:	8,441.9 t ✓
Other Method:		Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	8.662 t/kg
Mfg and Model:	Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	9.3 kg	Powder Factor 2:	0.301 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	163.49	Rock Density:	2.611 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	94.39		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/04/2016 11:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	105.00 ea	35.71
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	105.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	8.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11235	Hydromite 4600 Bulk	938.94 kg	938.94
12981	Mini Stem Plug - 6015	105.00 ea	0.00
D0120	Other-Drilling Charges	1,628.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			974.65

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/04/2016 11:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	78	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P. † Holes:	78	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	3	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,191.0 m ³
						Total weight for pattern:	5,719.5 t ✓

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	27	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P. † Holes:	27	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	1,042.9 m ³
						Total weight for pattern:	2,722.3 t ✓

† V.P. = Volume Producing

Total blast volume: 3,233.9 m³
Total weight produced: 8,441.8 t



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/04/2016 11:08

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: Mini White Seis

Date: 04/04/16 Trigger Level: --- mm/s --- dB

Time: 11:08 Calibration Date: 02/04/16

Distance From Blast: 572.72 m Calibration Signal:

Direction From Blast: NW Geophone Min. Freq.: --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz

Location:

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Jordan Davis, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

Transverse: 5.33 mm/s 36.5 Hz
Vertical: 2.54 mm/s 36.5 Hz
Longitudinal: 5.08 mm/s 36.5 Hz
PPV: --- mm/s --- Hz
Acoustic: 94 dB
Vector Sum: 5.46 mm/s

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis

Date: 04/04/16 Trigger Level: 1.01 mm/s 120.00 dB

Time: 11:08 Calibration Date: 09/18/15

Distance From Blast: 771.75 m Calibration Signal:

Direction From Blast: SSE Geophone Min. Freq.: --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz

Location:

Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W

Reader and Firm: Jordan Davis, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

Transverse: 2.54 mm/s 56.8 Hz
Vertical: 1.27 mm/s 64.0 Hz
Longitudinal: 2.15 mm/s 30.1 Hz
PPV: --- mm/s --- Hz
Acoustic: 110 dB
Vector Sum: 2.79 mm/s



AUSTIN POWDER LTD. BLAST DESIGN

849



DATE: 04/07/16

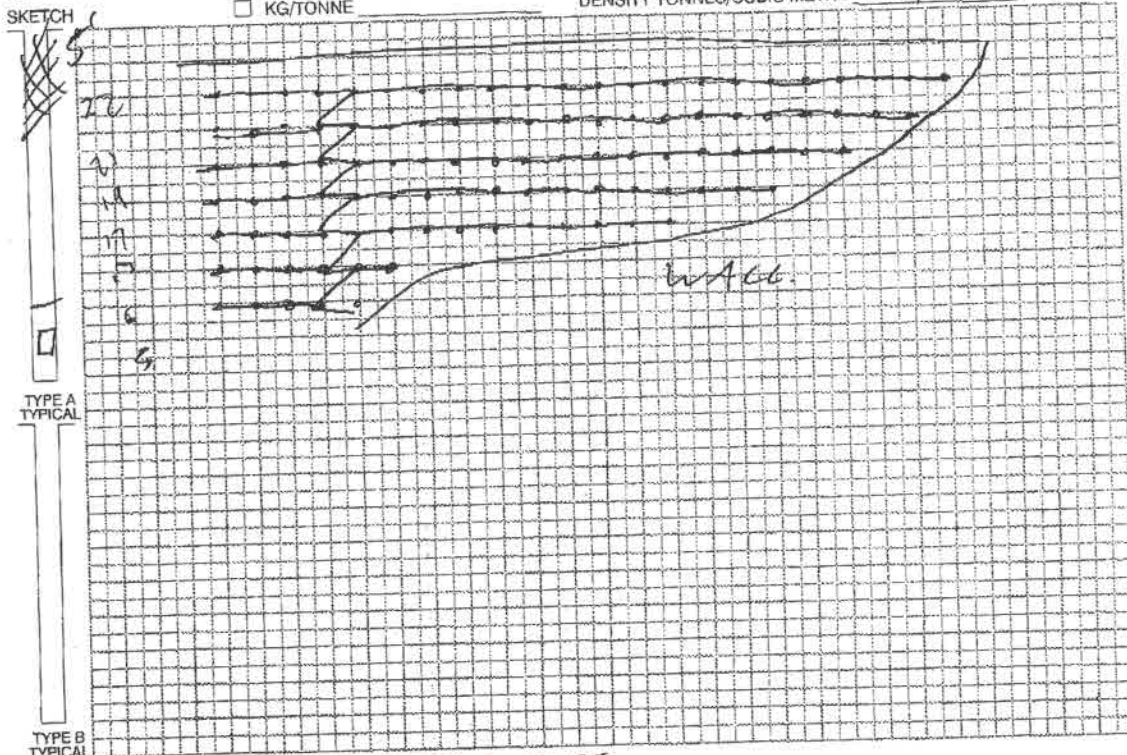
SHOT NO. _____
 COMPANY (PERMITTEE) LAW CRUSHED STONE LOCATION Brown
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5
 NO. OF HOLES 103 NO. OF ROWS 7 BURDEN 8
 SPACING 4 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES	TOTAL QUANTITY
<u>30' Quec Delay 257500</u>	<u>103</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black cap 103
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2472 WEIGHT OF EXPLOSIVES PER HOLE 24KG
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 42ms Quec Delay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 8153 OR TOTAL CUBIC METRES PRODUCED 3123
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.7 KG/TONNE
 DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
84ms BETWEEN ROWS
 POST-BLAST COMMENTS: PIT FORMAN TO CLEAR PIT FOR BLAST TIME

BLASTER IN CHARGE: Jordan Davis
 PRINT: _____
 SIGNATURE: Jordan Davis

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



Blast No.: 2016-13

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: NE

Terrain: Flat

Wind Velocity: 5-15 km/h

Temperature: 4 °C

Blast Lat./Long.: 42° 53' 54.700" N 79° 17' 30.300" W

Compass Point: NNW

Direction/Bearing: 345 °

Distance: 496 m

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

No. of Holes:	103	Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	486.5 m
No. of V.P.† Holes:	103	Subdrilling:	0.00 m	Burden:	[See Below]	Water Depth:	3.05 m
No. of Rows:	[See Below]	Face Height:	4.72 m	Spacing:	[See Below]	Stem Length:	min 1.52 m
Diameter:	88.9 mm	Drilling Angle:	0 °	Back Fill Depth:	4.72 m	Area Type:	[See Below]
		Mats Used:	No	Stem Type:	3/4" Clear Stone	Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	84.2 kg	Volume Produced:	3,125.0 m ³
Firing Device:	Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	84.2 kg	Weight Produced:	8,157.7 t
Other Method:	Estar Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.848 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	28.1 kg	Powder Factor 2:	0.917 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	93.65	Rock Density:	2.611 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	54.07		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
MERRITT	AARON, K			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander		Maple Leaf Drilling		No	No	No	Yes	Yes



AUSTIN POWDER LTD. BLAST REPORT



Blast No.: 2016-13

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	102.00 ea	34.69
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	103.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	13.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	12.00 ea	0.00
11776	Hydromite 4100-NP	2,829.00 kg	2,829.00
12981	Mini Stem Plug - 6015	103.00 ea	0.00
D0120	Other-Drilling Charges	1,596.50 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>2,863.69</u>

COMMENTS / EXPLANATIONS

General Comments: Blocked Hole Det was used for timing. shots were back to back Video of Brown was not captured in Video

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-13

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	81	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P. † Holes:	81	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	6	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,275.3 m ³ ✓
						Total weight for pattern:	5,939.5 t

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	22	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P. † Holes:	22	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	849.7 m ³ ✓
						Total weight for pattern:	2,218.2 t ✓

† V.P. = Volume Producing

Total blast volume: 3,125.0 m³
Total weight produced: 8,157.7 t



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Blast No.: 2016-13

Location: Brown Bench

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 3.68 mm/s	30.1 Hz
Date: 04/07/16	Trigger Level: --- mm/s --- dB	Vertical: 2.54 mm/s	24.3 Hz
Time: 12:47	Calibration Date: 02/04/16	Longitudinal: 3.81 mm/s	73.1 Hz
Distance From Blast: 572.72 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: NW	Geophone Min. Freq.: --- Hz	Acoustic: 94 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 2.66 mm/s	
Location:			
Lat./Long.: 42° 54' 10.240" N	79° 17' 44.100" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 2.92 mm/s	34.1 Hz
Date: 04/07/16	Trigger Level: 1.01 mm/s 120.00 dB	Vertical: 1.9 mm/s	51.2 Hz
Time: 12:47	Calibration Date: 02/04/16	Longitudinal: 2.79 mm/s	73.1 Hz
Distance From Blast: 774.19 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	Acoustic: 94 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 3.17 mm/s	
Location:			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April,06/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	45	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
Material Blasted:	Limestone					Tonnes/Hole:	306.0
Density:	2.61 t/m ³					Total Tonnes:	13770.0
Max Holes / Delay:	1					Explosive / Hole:	56.0 kg
							123.0 lb
						Max. kg. / Delay:	56.0 kg
							123.0 lb
						Distance to Seis.:	m
							ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	45				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		5535.0	2520.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *APR 07-16*



AUSTIN POWDER LTD. BLAST DESIGN



DATE: 07/04/16
MO DA YR

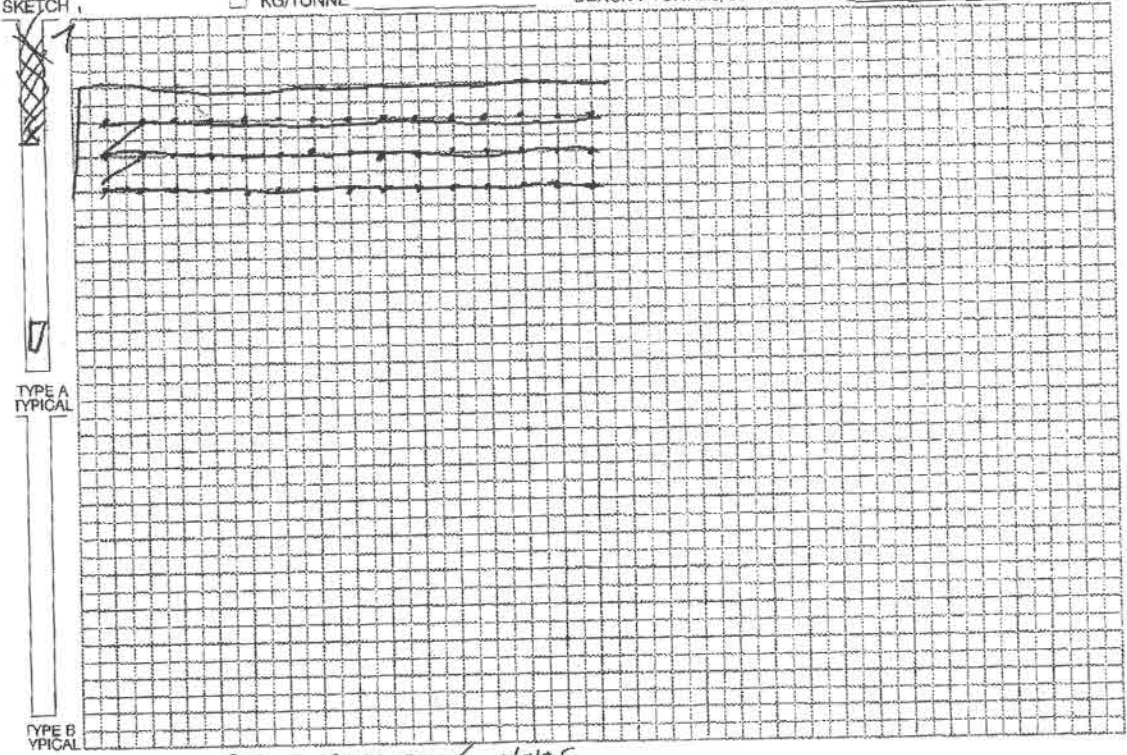
SHOT NO. _____
 COMPANY (PERMITTEE) LAW CHASSED STONE LOCATION 1 GRAY BENCH
 TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 4
 NO. OF HOLES 45 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING (COLLAR) 7

EXPLOSIVES	TOTAL QUANTITY
<u>40' Dual PERM 25/500</u>	<u>45.</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1886 tonne/m ³

TYPE OF PRIMER BLACK CAD 45.
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2577. WEIGHT OF EXPLOSIVES PER HOLE 57kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 37ms Quick Ray (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 14047 OR TOTAL CUBIC METRES PRODUCED 5382
 TOTAL POWDER FACTOR: KG/CUBIC METRE KG/TONNE DENSITY TONNES/CUBIC METRE 261



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FOR MAN TO CLEAN
PIT FOR BLAST TIME

MASTER IN CHARGE Jordan Davis
 SIGNATURE Jordan Davis

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-14

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: NNE

Temperature: 6 °C

Terrain: Flat

Wind Velocity: 5-15 km/h

Blast Lat./Long.: 42° 53' 48.799" N 79° 17' 36.299" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 0 °

Structure Type: Dwelling

Distance: 662 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

	Hole Depth:	7.62 m	Material Blasted: Limestone	Total Meters Drilled:	342.9 m
No. of Holes:	45	Subdrilling:	0.00 m	Water Depth:	0.00 m
No. of V.P.† Holes:	45	Face Height:	7.62 m	Stem Length:	1.98 m
No. of Rows:	3	Drilling Angle:	0 °	Area Type:	Conventional
Diameter:	101.6 mm	Mats Used:	No	Method:	Weighted Average
			Stem Type: 3/4" Clear Stone		

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,383.8 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	61.9 kg	Weight Produced:	14,053.8 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	11.126 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	61.9 kg	Powder Factor 2:	0.234 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	84.12	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	84.12		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
MERRITT	AARON, K			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander		Maple Leaf Drilling		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No.: 2016-14

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	45.00 ea	15.30
10752	SHOCK*STAR DualDelay 12m/40' 25/500	45.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	2,751.00 kg	2,751.00
12981	Mini Stem Plug - 6015	45.00 ea	0.00
D0120	Other-Drilling Charges	1,125.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,766.31

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-14

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/07/2016 12:47

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis		
Date: 04/07/16	Trigger Level: 1.01 mm/s	120.00 dB	Transverse: 2.66 mm/s 26.9 Hz
Time: 12:47	Calibration Date: 09/18/15		Vertical: 1.14 mm/s 34.1 Hz
Distance From Blast: 630.02 m	Calibration Signal:		Longitudinal: 1.27 mm/s 102.4 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 94 dB
Location:			Vector Sum: 2.66 mm/s
Lat./Long.: 42° 53' 29.800" N		79° 17' 26.120" W	
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record	Seismograph Type: Mini White Seis		
Date: 04/07/16	Trigger Level: --- mm/s	--- dB	Transverse: 3.17 mm/s 39.3 Hz
Time: 12:47	Calibration Date: 02/04/16		Vertical: 1.52 mm/s 36.5 Hz
Distance From Blast: 684.89 m	Calibration Signal:		Longitudinal: 3.17 mm/s 64.0 Hz
Direction From Blast: NNW	Geophone Min. Freq.: --- Hz		PPV: --- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 94 dB
Location:			Vector Sum: 3.3 mm/s
Lat./Long.: 42° 54' 10.240" N		79° 17' 44.100" W	
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April, 12/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
						Tonnes/Hole:	306.0
						Total Tonnes:	15606.0

Material Blasted: Limestone Explosive / Hole: 56.0 kg 123.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 56.0 kg 123.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hvd. 4400	17.5	123.0	56.0
Total product		6273.0	2856.0

Miscellaneous:

Comments: Holes range from 24.5' to 25.2'

Approved:

Date:

April 12/16



AUSTIN POWDER LTD. BLAST DESIGN



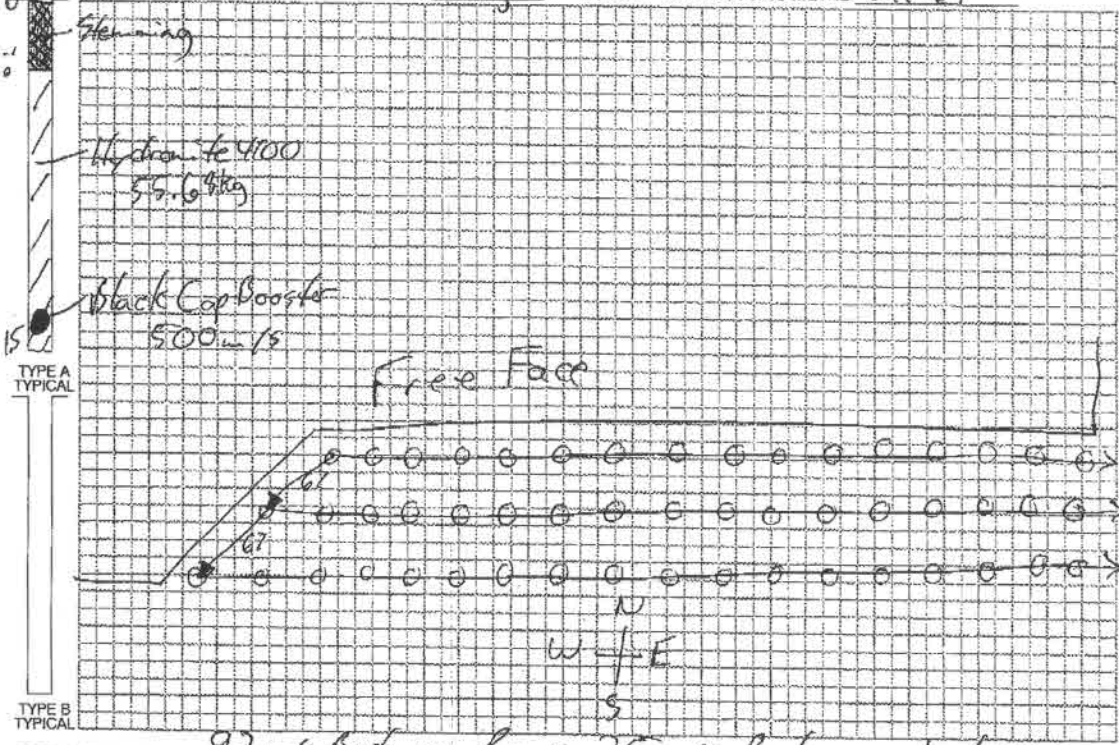
SHOT NO. _____ DATE: 4/12/16
 COMPANY (PERMITTEE) Law Crushed LOCATION Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH 24.5' FACE HEIGHT 24.5' LENGTH OF STEMMING 6'
 (COLLAR)

EXPLOSIVES TOTAL QUANTITY
40' Dual Delay 25/500 51
20' Quick Relay 6hrs 5
Hydromite 4100 2840kg

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m³ = 35.32 ft³ 1 ft³ = 0.0283168 m³
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER Black Cap Booster 51
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 55.68kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 15,637 tonne OR TOTAL CUBIC METRES PRODUCED 5991 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.47kg
 SKETCH KG/TONNE 0.18kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92m/s Between Rows, 25m/s Between holes
Quarry to be cleared by foreman prior to blast time.

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Avron Merritt
 PRINT _____
 SIGNATURE _____

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-15

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: WSW

Temperature: 5 °C

Terrain: Flat

Wind Velocity: 5-15 km/h

Blast Lat./Long.: 42° 53' 49.399" N 79° 17' 33.200" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 338 °

Structure Type: Dwelling

Distance: 689 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.47 m	Material Blasted:	Limestone	Total Meters Drilled:	381.0 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	51	Face Height:	7.47 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

(H = 7.47 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	5,979.5 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	59.6 kg	Weight Produced:	15,609.0 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.140 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	59.6 kg	Powder Factor 2:	0.508 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	89.26	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	89.26		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No			Protective Cover: Loader Bucket		
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	No	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members			Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes			Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-15

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11776	Hydromite 4100-NP	3,020.00 kg	3,020.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,250.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,037.35

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-15

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/12/16 Trigger Level: 1.02 mm/s 120.00 dB

Time: 12:51 Calibration Date: 07/07/15

Distance From Blast: 625.75 m Calibration Signal:

Direction From Blast: SSE Geophone Min. Freq.: --- Hz

Readout: Mic. Min. Freq.: --- Hz

Location: Corner Of Erie Peat Rd & Hwy#3

Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

Transverse:	3.17 mm/s	64.0 Hz
Vertical:	1.39 mm/s	46.5 Hz
Longitudinal:	3.55 mm/s	56.8 Hz
PPV:	--- mm/s	--- Hz
Acoustic:	110 dB	
Vector Sum:	3.68 mm/s	

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/12/16 Trigger Level: 1.02 mm/s 120.00 dB

Time: 12:51 Calibration Date: 09/18/15

Distance From Blast: 688.85 m Calibration Signal:

Direction From Blast: NNW Geophone Min. Freq.: --- Hz

Readout: Mic. Min. Freq.: --- Hz

Location: 20455 Erie Peat Rd

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

Transverse:	3.3 mm/s	30.1 Hz
Vertical:	1.27 mm/s	26.9 Hz
Longitudinal:	2.79 mm/s	30.1 Hz
PPV:	--- mm/s	--- Hz
Acoustic:	117 dB	
Vector Sum:	3.3 mm/s	



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Apr.12,16

Location in Quarry: **Top Bench**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	196	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	9	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4						
Material Blasted:	Limestone		Explosive / Hole:		11.1 kg	24.5 lb	
Density:	2.4	t/m3	Max. kg. / Delay:		11.1 kg	24.5 lb	
Max Holes / Delay:	1		Distance to Seis.:		m	ft	

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	196 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6174.0	2744.0

Miscellaneous:

Comments:

Approved:

Date:

April 12/16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 4/12/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION White Rock
 TYPE OF MATERIAL BLASTED: Limestone HOLE DIAMETER 4"
 NO. OF HOLES ~~20~~ 212 NO. OF ROWS 9 BURDEN 13'
 SPACING 15' DEPTH 9.5' FACE HEIGHT 9.5' LENGTH OF STEMMING 6'
 (COLLAR)

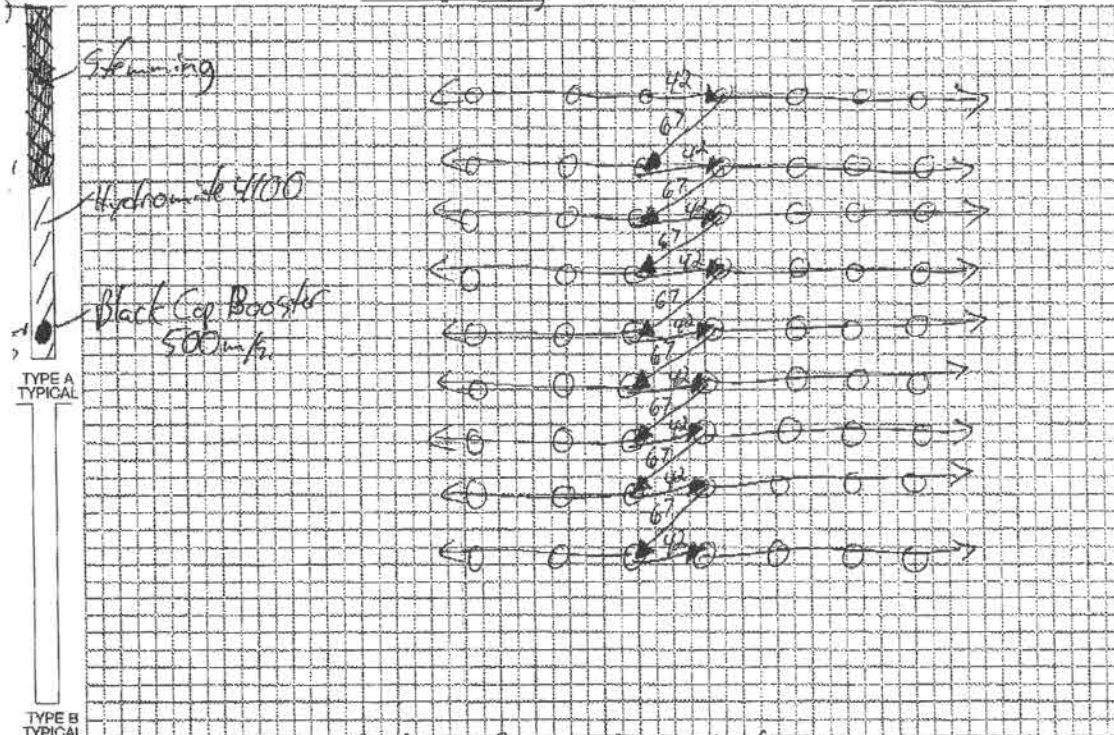
EXPLOSIVES	TOTAL QUANTITY
<u>24 Dual Delay 25/500</u>	<u>20 212</u>
<u>20' Quick Relay 67ms</u>	<u>17</u>
<u>30' Quick Relay 42ms</u>	<u>18</u>
<u>Hydramite 4100</u>	<u>2040kg</u>

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap booster ~~20~~ 212
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 10 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 22,302 tonne OR TOTAL CUBIC METRES PRODUCED 9293 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.23 kg
 SKETCH KG/TONNE 0.09 kg DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 10.9 m/s between rows, 2.5 m/s between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Aaron Merritt
Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:52

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
 Clouds

Wind From: WSW

Temperature: 5 °C

Terrain: Flat

Wind Velocity: 5-15 km/h

Blast Lat./Long.: 42° 53' 46.100" N 79° 17' 32.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 340 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 790 m

LAYOUT

Hole Depth:	2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	613.9 m
No. of Holes:	212	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. [†] Holes:	212	Face Height:	2.90 m	Spacing:	3.96 m
No. of Rows:	9	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

[†] V.P. = Volume Producing

(H = 2.90 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	29.3 kg	Volume Produced:	9,638.1 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	29.3 kg	Weight Produced:	23,135.1 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	11.166 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	9.8 kg	Powder Factor 2:	0.215 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	252.69	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	145.89		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No	
FARRER	NICHOLAS, J			No	No	No	No	No	
LI	JACKSON, A			No	Yes	No	No	No	
PASSMORE	EDGAR, M			No	Yes	Yes	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Rupert				Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:52

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	212.00 ea	72.10
10750	SHOCK*STAR DualDelay 7.3m/24' 25/500	212.00 ea	0.00
01494	30' SHOCK*STAR Quick Relay 42 ms	18.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	19.00 ea	0.00
11776	Hydromite 4100-NP	2,000.00 kg	2,000.00
D0120	Other-Drilling Charges	2,014.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,072.10

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/12/2016 12:52

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/12/16 Trigger Level: 1.02 mm/s 120.00 dB

Time: 12:52 Calibration Date: 07/07/15

Distance From Blast: 523.34 m Calibration Signal:

Direction From Blast: SSE Geophone Min. Freq.: --- Hz

Readout: Mic. Min. Freq.: --- Hz

Location: Corner Of Erie Peat Rd & Hwy#3

Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

Transverse: 1.01 mm/s 46.5 Hz
Vertical: 0.63 mm/s 85.3 Hz
Longitudinal: 0.5 mm/s 51.2 Hz
PPV: --- mm/s --- Hz
Acoustic: 112 dB
Vector Sum: 1.01 mm/s

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/12/16 Trigger Level: 1.02 mm/s 120.00 dB

Time: 12:52 Calibration Date: 09/18/15

Distance From Blast: 790.04 m Calibration Signal:

Direction From Blast: NNW Geophone Min. Freq.: --- Hz

Readout: Mic. Min. Freq.: --- Hz

Location: 20455 Erie Peat Rd

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

Transverse: 1.14 mm/s 30.1 Hz
Vertical: 0.25 mm/s 0.0 Hz
Longitudinal: 0.63 mm/s 34.1 Hz
PPV: --- mm/s --- Hz
Acoustic: 100 dB
Vector Sum: 1.14 mm/s



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April, 21/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	39	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4						
Material Blasted:		Limestone		Explosive / Hole:		56.0	123.0
Density:		2.61 t/m ³		Max. kg. / Delay:		56.0	123.0
Max Holes / Delay:		1		Distance to Seis.:		m	ft
						m ³ / Hole:	164.0
						Tonnes/Hole:	306.0
						Total Tonnes:	11934.0

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	39				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		4797.0	2184.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *APR 21-16*



AUSTIN POWDER LTD. BLAST DESIGN



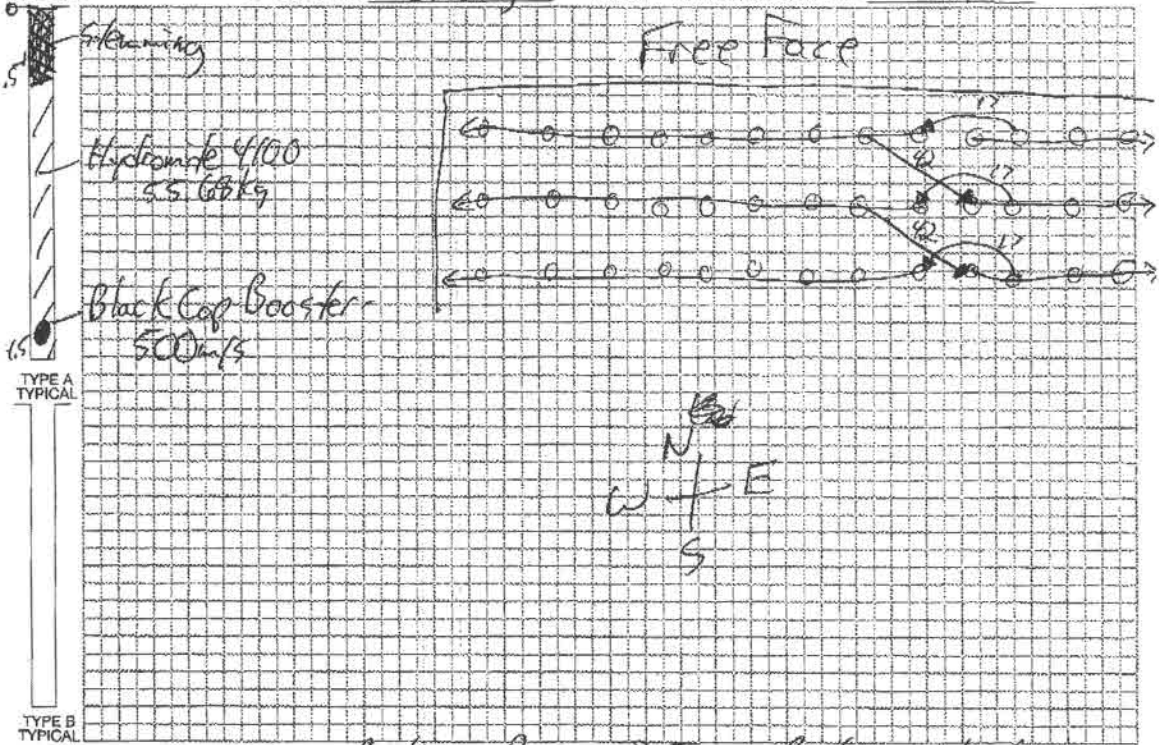
SHOT NO. 2016-17 DATE: 4/21/16
 COMPANY (PERMITTEE) Low Crushed Stone LOCATION Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 39 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH 24.5' FACE HEIGHT 24.5' LENGTH OF STEMMING 6.5'
 (COLLAR)

EXPLOSIVES	TOTAL QUANTITY
<u>40' Dual Delay 25/500</u>	<u>39</u>
<u>30' Quick Relay 17ms</u>	<u>6</u>
<u>30' Quick Relay 42ms</u>	<u>5</u>
<u>Hydromite 4100</u>	<u>2172kg</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap Booster 39
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 55.68kg
 WEIGHT OF EXPLOSIVES PER HOLE
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Dual Delay & Quick Relay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 11,959 tonne OR TOTAL CUBIC METRES PRODUCED 4582m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.47kg
 SKETCH KG/TONNE 0.18kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 109ms Between Rows, 25ms Between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS:

BLASTER IN CHARGE Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-17

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/21/2016 11:32

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Overcast /
Low Clouds

Wind From: S

Temperature: 14 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 49.399" N 79° 17' 33.200" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 338 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 689 m

LAYOUT

Hole Depth:	7.47 m	Material Blasted:	Limestone	Total Meters Drilled:	291.4 m		
No. of Holes:	39	Subdrilling:	0.00 m	Burden:	3.96 m	Water Depth:	max 0.61 m
No. of V.P.† Holes:	39	Face Height:	7.47 m	Spacing:	3.96 m	Stem Length:	min 1.98 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone	Method:	Specified

† V.P. = Volume Producing

(H = 7.47 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	70.2 kg	Volume Produced:	4,572.6 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	70.2 kg	Weight Produced:	11,936.3 t ✓
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	6.476 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	51.5 kg	Powder Factor 2:	0.403 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	96.03	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	82.19		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	No	No	No	No
PASSMORE	EDGAR, M			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-17

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/21/2016 11:32

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	39.00 ea	13.26
10752	SHOCK*STAR DualDelay 12m/40' 25/500	39.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	6.00 ea	0.00
01494	30' SHOCK*STAR Quick Relay 42 ms	5.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
11776	Hydromite 4100-NP	1,830.00 kg	1,830.00
12981	Mini Stem Plug - 6015	39.00 ea	0.00
D0120	Other-Drilling Charges	956.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			1,843.26

COMMENTS / EXPLANATIONS

Arnon Merritt

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-17

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/21/2016 11:32

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/21/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 2.03 mm/s 42.6 Hz

Time: 11:32

Calibration Date: 09/15/15

Vertical: 1.77 mm/s 26.9 Hz

Distance From Blast: 625.75 m

Calibration Signal:

Longitudinal: 2.15 mm/s 30.1 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 106 dB

Location: Corner Of Erie Peat Rd & Hwy#3

Vector Sum: 2.79 mm/s

Lat./Long.: 42° 53' 29.800" N

79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 04/21/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 3.55 mm/s 23.2 Hz

Time: 11:32

Calibration Date: 09/18/15

Vertical: 2.28 mm/s 24.3 Hz

Distance From Blast: 688.85 m

Calibration Signal:

Longitudinal: 2.92 mm/s 18.2 Hz

Direction From Blast: NNW

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 122 dB

Location: 20455 Erie Peat Rd

Vector Sum: 3.68 mm/s

Lat./Long.: 42° 54' 10.240" N

79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April,28/16

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	57	Hole Depth:	26.0	7.46	Burden:	13.0	3.96	m3/ Hole:	125.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	325.0
Diameter mm:		Face Height:	26.0	7.46	Collar:	7.0	2.13	Total Tonnes:	18525.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		60.0 kg		133.0 lb		
Density:	2.61	t/m3	Max. kg. / Delay:		60.0 kg		133.0 lb		
Max Holes / Delay:	1		Distance to Seis.:		m		ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	57				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	133.0	60.0
Total product		7581.0	3420.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *APR 28 - 16.*



AUSTIN POWDER LTD. BLAST DESIGN



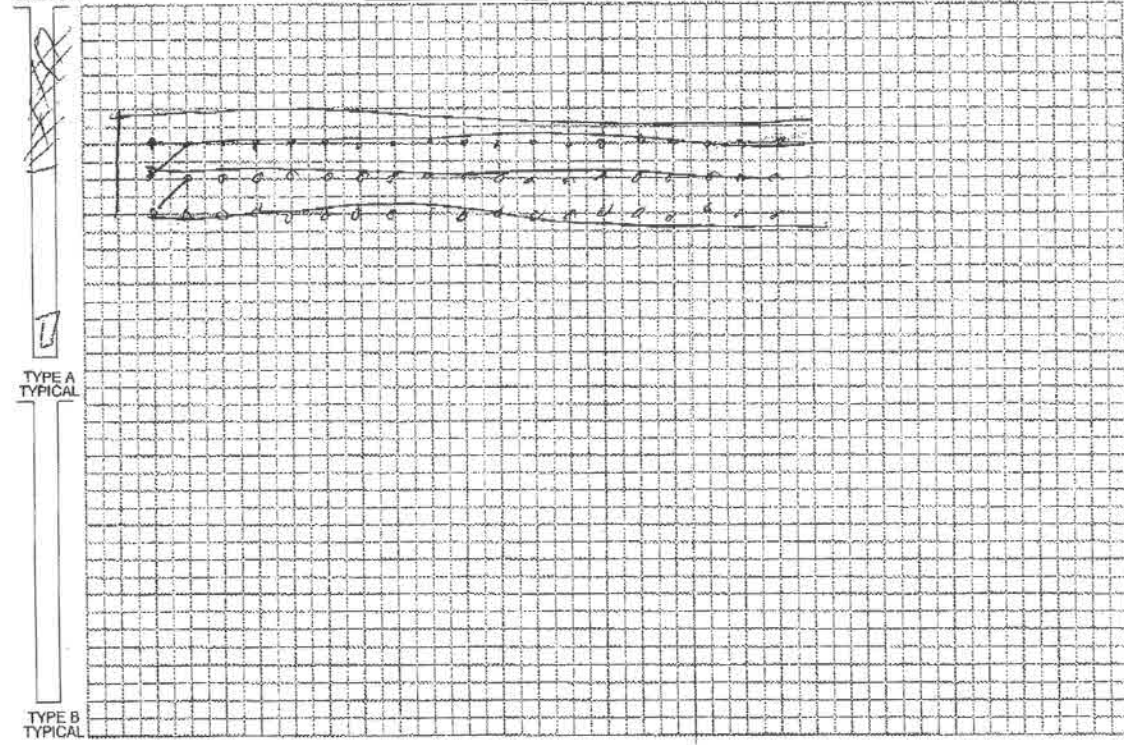
SHOT NO. _____ DATE: 04/28/16
 COMPANY (PERMITTEE) LAW LOCATION GRAY
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 57 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 20 FACE HEIGHT 26 LENGTH OF STEMMING 6
 (COLLAR)

EXPLOSIVES	TOTAL QUANTITY
<u>40' Pure Delay 25/50</u>	<u>57</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLACK CAP
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 7445 WEIGHT OF EXPLOSIVES PER HOLE 6560
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 67ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 18507 OR TOTAL CUBIC METRES PRODUCED 7091
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.4
 SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS:
25m's BETWEEN ROW HOLES
92m's BETWEEN ROWS

POST-BLAST COMMENTS:

BLASTER IN CHARGE Jonathan Perry
 PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-17¹⁹

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/29/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: ENE

Temperature: 11 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.200" N 79° 17' 35.299" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 358 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 680 m

LAYOUT

Hole Depth:	7.47 m	Material Blasted:	Limestone	Total Meters Drilled:	291.4 m
No. of Holes:	39	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	39	Face Height:	7.47 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	82.7 kg	Volume Produced:	4,479.3 m ³
Firing Device:	Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	82.7 kg	Weight Produced:	11,692.8 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.260 t/kg
Mfg and Model:	Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	61.0 kg	Powder Factor 2:	0.497 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	87.07	Rock Density:	2.611 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	74.80		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	Yes	No	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
VANDEBUSSC HE	MICHAEL, J			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-17

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/29/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	39.00 ea	13.26
10752	SHOCK*STAR DualDelay 12m/40' 25/500	39.00 ea	0.00
01494	30' SHOCK*STAR Quick Relay 42 ms	6.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11235	Hydromite 4600 Bulk	2,210.00 kg	2,210.00
12981	Mini Stem Plug - 6015	39.00 ea	0.00
D0120	Other-Drilling Charges	936.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,223.27

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-17

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/29/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: white Mini Seis
Date: 04/29/16 Trigger Level: 1.01 mm/s 120.00 dB Transverse: --- mm/s --- Hz
Time: 10:40 Calibration Date: 07/07/15 Vertical: --- mm/s --- Hz
Distance From Blast: 2,148.23 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: Stacked in front yard Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 04/29/16 Trigger Level: --- mm/s --- dB Transverse: 2.41 mm/s 24.3 Hz
Time: 10:40 Calibration Date: 09/18/15 Vertical: 1.14 mm/s 30.1 Hz
Distance From Blast: 708.96 m Calibration Signal: Longitudinal: 2.41 mm/s 30.1 Hz
Direction From Blast: NNW Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 114 dB
Location: Vector Sum: 2.79 mm/s
Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: April, 28/16

Location in Quarry: East Face Grey Bench: Shot #2

Layout

		Feet	Metres	Feet	Metres		
# Holes:	66	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
		m ³ / Hole:				120.0	
		Tonnes/Hole:				312.0	
		Total Tonnes:				20592.0	

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	66				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		8316.0	3762.0

Miscellaneous:

Comments:

Approved:

B. Smith

Date:

APR 28-16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: / /
MO DA YR

COMPANY (PERMITTEE) Laur Quarry LOCATION GRAY

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4

NO. OF HOLES 39 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 24 FACE HEIGHT 24 LENGTH OF STEMMING 54 G

EXPLOSIVES	TOTAL QUANTITY
<u>40' Royal Demol</u>	<u>38</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1868 tonne/m ³

TYPE OF PRIMER Black Cap

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2052 WEIGHT OF EXPLOSIVES PER HOLE 34

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

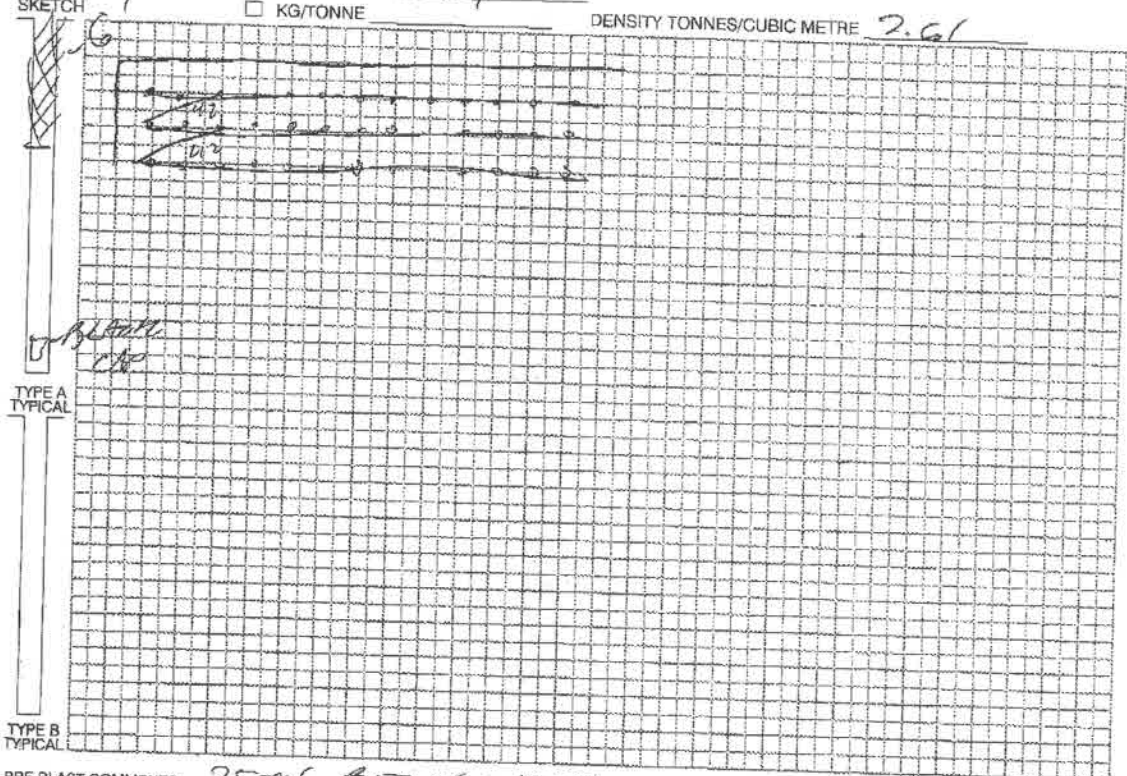
DELAY DETONATORS USED (TYPE) 42ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED 4363

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.4

SKETCH KG/TONNE

DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FOREMAN TO CLEAR
PIT FOR BLAST TIME

BLASTER IN CHARGE Southern PRINT
John O'Neil SIGNATURE

TYPE OF PROTECTIVE COVER USED

STEEL SHELTER OFF HIGHWAY TRUCK

BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/28/2016 12:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: SSE

Temperature: 10 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 49.200" N 79° 17' 33.599" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 355 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 651 m

LAYOUT

Hole Depth:	7.92 m	Material Blasted:	Limestone	Total Meters Drilled:	451.7 m
No. of Holes:	57	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	57	Face Height:	7.92 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,092.2 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	59.4 kg	Weight Produced:	18,513.5 t ✓
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.680 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	59.4 kg	Powder Factor 2:	0.460 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	84.54	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	84.54		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
BURNIE	BRANDON, A			No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
Other Crew Members				In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey				No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/28/2016 12:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	57.00 ea	19.39
10752	SHOCK*STAR DualDelay 12m/40' 25/500	57.00 ea	0.00
01494	30' SHOCK*STAR Quick Relay 42 ms	5.00 ea	0.00
07602	Hydromite 4100 Bulk	3,240.00 kg	3,240.00
12981	Mini Stem Plug - 6015	57.00 ea	0.00
D0120	Other-Drilling Charges	1,482.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,259.39

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-16

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/28/2016 12:48

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 04/28/16 Trigger Level: 1.01 mm/s 120.00 dB Transverse: 3.81 mm/s 85.3 Hz
Time: 12:48 Calibration Date: 09/18/15 Vertical: 1.77 mm/s 60.0 Hz
Distance From Blast: 622.10 m Calibration Signal: Longitudinal: 3.93 mm/s 85.3 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 110 dB
Location: Vector Sum: 4.69 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type: Seismic Record Seismograph Type: white Mini Seis
Date: 04/28/16 Trigger Level: --- mm/s --- dB Transverse: 0.63 mm/s 64.0 Hz
Time: 12:48 Calibration Date: 07/07/15 Vertical: 0.38 mm/s 51.2 Hz
Distance From Blast: 2,115.31 m Calibration Signal: Longitudinal: 1.52 mm/s 56.8 Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 94 dB
Location: Stacked in front yard Vector Sum: 1.52 mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Aug,03,16

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m3/ Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	15912.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		57.0	kg	126.0		lb
Density:	2.61	t/m3	Max. kg. / Delay:		57.0	kg	126.0		lb
Max Holes / Delay:	1		Distance to Seis.:		**	m	**		ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft/ hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

Aug. 2/16



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-36

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/03/2016 13:43

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: N

Temperature: 29 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 46.799" N 79° 17' 30.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 350 °

Distance: 734 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	109.1 kg	Volume Produced:	6,101.6 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	109.1 kg	Weight Produced:	15,927.7 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.776 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	54.6 kg	Powder Factor 2:	0.452 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	99.32	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	70.22		

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 08/03/16	Trigger Level: 1.01 mm/s	---	dB	Transverse: 4.31 mm/s 25.6 Hz
Time: 13:43	Calibration Date: 07/07/16			Vertical: 3.68 mm/s 85.3 Hz
Distance From Blast: 534.01 m	Calibration Signal:			Longitudinal: 4.31 mm/s 36.5 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz			PPV: --- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz			Acoustic: 106 dB
Location:				Vector Sum: 6.22 mm/s
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-36

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/03/2016 13:43

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	No	No	No
CHOLEWA	CHRISTOPHER, R			No	No	No	No	No
LI	JACKSON, A			No	Yes	Yes	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling	No	No	No	Yes	Yes

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	11.00 ea	0.00
07602	Hydromite 4100 Bulk	2,740.00 kg	2,740.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 2,757.35

COMMENTS / EXPLANATIONS

Jordan Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____
 COMPANY (PERMITTEE) Law Quarry LOCATION CLAY
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 15
 SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING 6
 EXPLOSIVES _____ TOTAL QUANTITY _____ (COLLAR) _____

DATE: 09/02/16

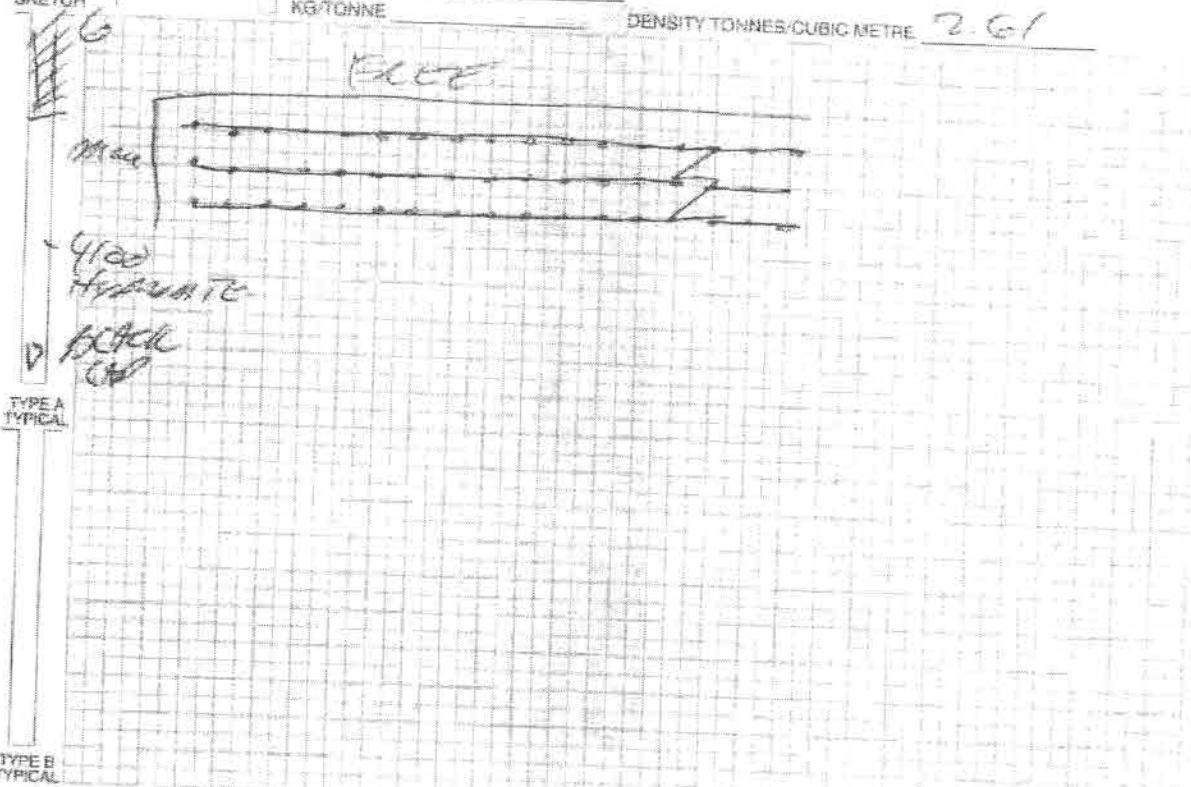
400 gms Quick Delay 51

CONVERSIONS

1 mm = 0.03937 m	1 m = 26.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ² = 1.308 yd ²	1 yd ² = 0.764555 m ²
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1868 tonne/m ³

TYPE OF PRIMER Black Cat 51 WEIGHT OF EXPLOSIVES PER HOLE 3083
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 15922
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Black Cat Quick Delay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 15922 OR TOTAL CUBIC METRES PRODUCED 6100
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5 DENSITY TONNES/CUBIC METRE 2.61
 SKETCH: KG/TONNE



PRE-BLAST COMMENTS: 25ms between holes
84ms between rows

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Jordan Davis
 SIGNATURE: _____

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Aug,09,16

Location in Quarry: **East Face Grey Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m3/ Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	15912.0
Diameter in:	4								
Material Blasted:	Limestone	Explosive / Hole:		57.0 kg			126.0 lb		
Density:	2.61 t/m ³	Max. kg. / Delay:		57.0 kg			126.0 lb		
Max Holes / Delay:	1	Distance to Seis.:		m			ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				51

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved: *[Signature]* Date: Aug 9/16

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-37

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/09/2016 14:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 32 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 46.799" N 79° 17' 30.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 350 °

Structure Type: Dwelling

Distance: 734 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	419.1 m
No. of Holes:	55	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	55	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,580.1 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	58.8 kg	Weight Produced:	17,176.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.404 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	58.8 kg	Powder Factor 2:	0.483 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	95.67	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	95.67		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
DEBOER	GARY, B			No	No	No	No	No
EDDY	MATTHEW, A			No	Yes	No	No	No
MADDEN	PATRICIA, C			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-37

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/09/2016 14:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	55.00 ea	18.71
10752	SHOCK*STAR DualDelay 12m/40' 25/500	55.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	5.00 ea	0.00
07696	Hydromite 4400 Bulk	3,160.00 kg	3,160.00
12981	Mini Stem Plug - 6015	55.00 ea	0.00
D0120	Other-Drilling Charges	1,375.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,178.71

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-37

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/09/2016 14:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: white mini seis			
Date: 08/09/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: --- mm/s	--- Hz
Time: 14:14	Calibration Date: 07/07/15		Vertical: --- mm/s	--- Hz
Distance From Blast: 2,034.24 m	Calibration Signal:		Longitudinal: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz		Acoustic: --- dB	
Location: In front yard			Vector Sum: --- mm/s	
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 08/09/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: 3.04 mm/s	32.0 Hz
Time: 14:14	Calibration Date: 07/07/16		Vertical: 2.41 mm/s	73.0 Hz
Distance From Blast: 534.01 m	Calibration Signal:		Longitudinal: 2.54 mm/s	64.0 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 106 dB	
Location:			Vector Sum: 3.17 mm/s	
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Aug,15,16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	69	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
						m ³ / Hole:	120.0
						Tonnes/Hole:	312.0
						Total Tonnes:	21528.0

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	69				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		8694	3933.0

Miscellaneous:

Comments:



Approved:

Date:

Aug 15 / 16



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-38

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/15/2016 13:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 27 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 45.700" N 79° 17' 32.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 354 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 761 m

LAYOUT	Hole Depth:	7.47 m	Material Blasted:	Limestone	Total Meters Drilled:	492.9 m	
No. of Holes:	66	Subdrilling:	0.00 m	Burden:	3.96 m	Water Depth:	0.00 m
No. of V.P. † Holes:	66	Face Height:	7.47 m	Spacing:	3.96 m	Stem Length:	1.83 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone	Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	123.4 kg	Volume Produced:	7,738.2 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	123.4 kg	Weight Produced:	20,199.9 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	4.960 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	61.7 kg	Powder Factor 2:	0.526 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	96.89	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	68.51		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
CHOLEWA	CHRISTOPHER, R			No	No	No	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-38

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/15/2016 13:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	66.00 ea	22.45
10752	SHOCK*STAR DualDelay 12m/40' 25/500	66.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	11.00 ea	0.00
07602	Hydromite 4100 Bulk	4,050.00 kg	4,050.00
12981	Mini Stem Plug - 6015	66.00 ea	0.00
D0120	Other-Drilling Charges	1,617.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 4,072.45

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-38

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/15/2016 13:14

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	08/15/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	2.79 mm/s 25.6 Hz
Time:	13:14	Calibration Date:	02/03/16			Vertical:	1.9 mm/s 42.6 Hz
Distance From Blast:	511.45 m	Calibration Signal:				Longitudinal:	2.79 mm/s 19.6 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	112 dB
Location:						Vector Sum:	3.17 mm/s
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

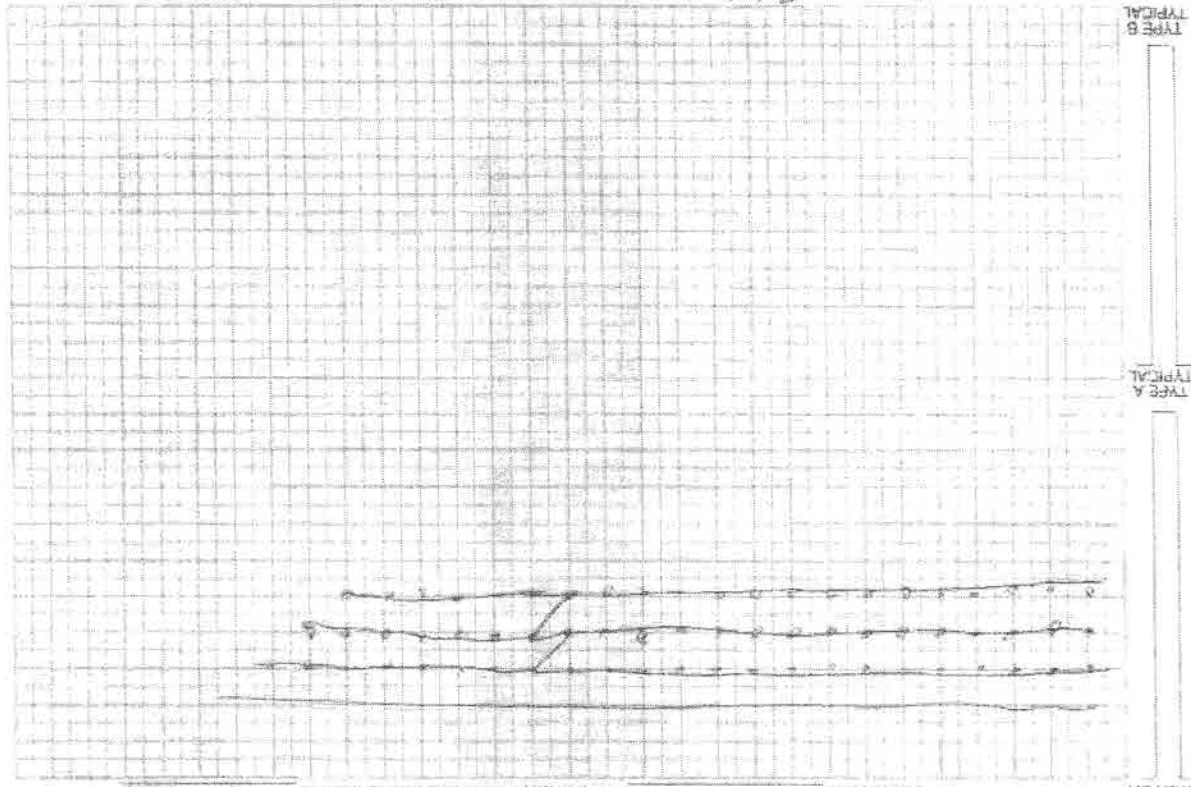
SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	white mini seis				
Date:	08/15/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	---
Time:	13:14	Calibration Date:	07/07/15			Vertical:	---
Distance From Blast:	2,074.47 m	Calibration Signal:				Longitudinal:	---
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz		Acoustic:	---
Location:	In front yard					Vector Sum:	---
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

BLASTER IN CHARGE: *John Lee*
 PRINT: *DLG*
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK OTHER - PLEASE DESCRIBE: _____

POST-BLAST COMMENTS: *PT REPAIRMENT TO CRACK*
Fit for Blast

PRE-BLAST COMMENTS: *250ms BETWEEN HOLE*
25ms BETWEEN ROWS



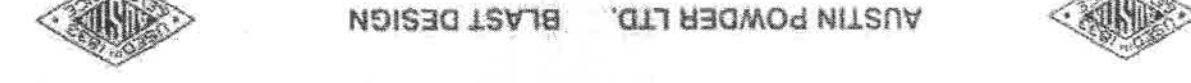
SKETCH: _____
 TOTAL NO. TONNES PRODUCED: *19.66m*
 TOTAL POWDER FACTOR: KG/CUBIC METRE ON TOTAL CUBIC METRES PRODUCED: *7536*

DELAY DETONATORS USED (TYPE): _____
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS): *3608*
 TYPE OF PRIMER: *Blitz*

WEIGHT OF EXPLOSIVES PER HOLE: *58.76*
 EXPLAINED AND IDENTIFIED IN SKETCH: _____
 (SIGNIFICANT VARIATIONS SHOULD BE)

EXPLOSIVES: _____
 TOTAL QUANTITY: _____
 NO. OF HOLES: *63*
 NO. OF ROWS: *3*
 DEPTH: *25*
 FACE HEIGHT: *25*
 LENGTH OF STEMMING (COLLAR): *6*
 BURDEN: *13*
 TYPE OF MATERIAL BASTED: *Low Sulfate*
 HOLE DIAMETER: *4*
 COMPANY (PERMITTED): *Austin Powder*
 LOCATION: *LAH*

SHOT NO: _____
 DATE: *08/15/16*





AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Aug 22/16
 Date: Aug. 19, 16

Location in Quarry: **East Face Grey Bench**

Layout

			Feet	Metres		Feet	Metres		
# Holes:	54	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	16848.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: — m — ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	54				54

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6804	3078.0

Miscellaneous:

Comments:



Approved: *[Signature]*

Date: *Aug 22/16*



AUSTIN POWDER LTD. BLAST DESIGN

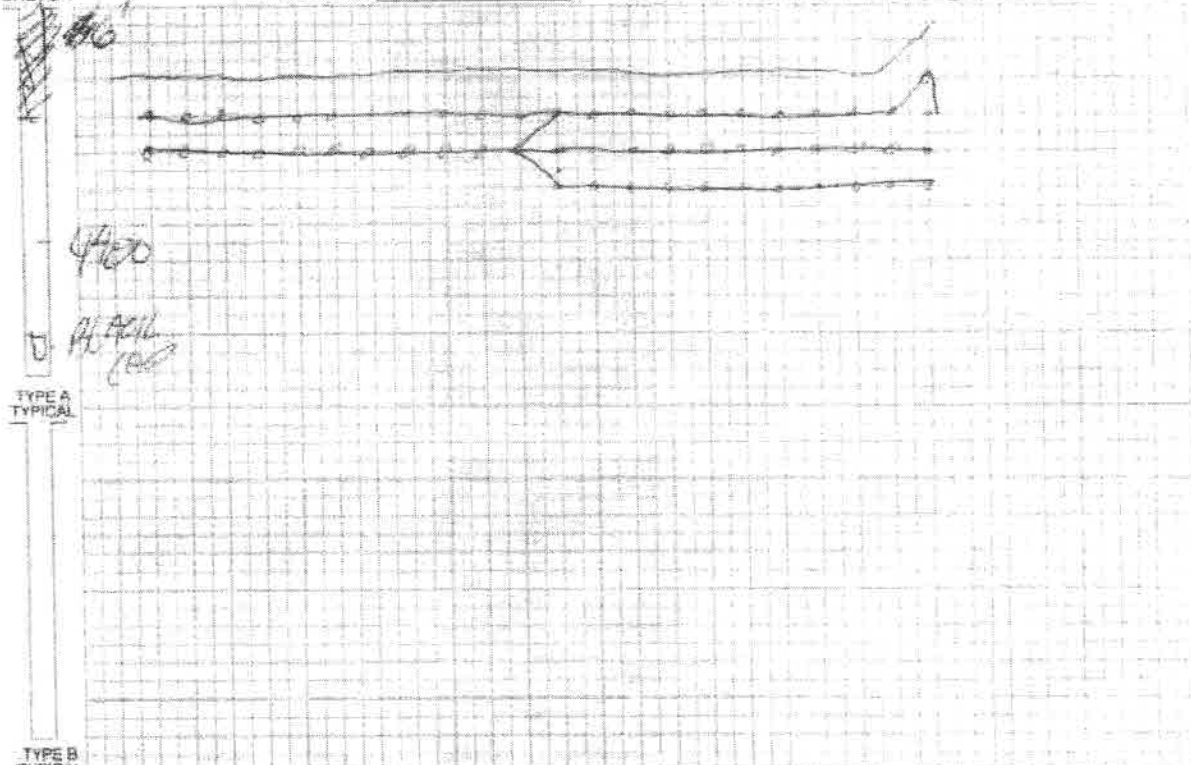


SHOT NO. _____ DATE: 03/27/10
 COMPANY (PERMITTEE) LAW Quarry LOCATION B GARY BEACH
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 57 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING 6
 (COLLAR)

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>40' Dual DEXA</u>	<u>57</u>	1 mm = 0.03937 in	1 in = 25.4 mm
		1 m = 3.28 ft	1 ft = 0.3048 m
		1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ² = 1.308 yd ²	1 yd ² = 0.764555 m ²
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.023 ton	1 ton = 0.907185 tonne
		1 tonne/m ² = 0.842777 ton/yd ²	1 ton/yd ² = 1.1666 tonne/m ²

TYPE OF PRIMER BLACK CAP 57
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3445 WEIGHT OF EXPLOSIVES PER HOLE 60 lb
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) _____

TOTAL NO. TONNES PRODUCED 17795 OR TOTAL CUBIC METRES PRODUCED 6818
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5
 SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.01



PRE-BLAST COMMENTS: 25m spacing between holes
84m spacing between rows

POST-BLAST COMMENTS: PIT FORMED TO CLEAR
PIT FOR BLASTING

BLASTER IN CHARGE: [Signature] PRINT: _____ SIGNATURE: _____
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-39

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/22/2016 11:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: N

Temperature: 21 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 44.600" N 79° 17' 35.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Compass Point: N
Direction/Bearing: 359 °
Distance: 791 m

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	434.3 m
No. of Holes:	57	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	57	Face Height:	7.62 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	169.2 kg	Volume Produced:	6,451.3 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	169.2 kg	Weight Produced:	16,840.6 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	5.560 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	56.4 kg	Powder Factor 2:	0.469 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	105.35	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	60.82		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	Yes	Yes	No	No
KENNEY	DAVID, L			No	No	No	No	No
Other Crew Members				In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander				No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-39

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/22/2016 11:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	57.00 ea	19.39
10752	SHOCK*STAR DualDelay 12m/40' 25/500	57.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	9.00 ea	0.00
07696	Hydromite 4400 Bulk	3,010.00 kg	3,010.00
12981	Mini Stem Plug - 6015	57.00 ea	0.00
D0120	Other-Drilling Charges	1,396.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,029.38

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-39

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/22/2016 11:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

Pattern: 1

No. of Holes:	52	Hole Depth:	7.62 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P.† Holes:	52	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Weighted Average
No. of Rows:	4	Face Height:	7.62 m				
Drilling Angle:	0 °					Total volume for pattern:	6,221.2 m ³
						Total weight for pattern:	16,240.0 t

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	5	Hole Depth:	7.62 m	Burden:	1.52 m	Area Type:	Conventional
No. of V.P.† Holes:	5	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	7.62 m				
Drilling Angle:	0 °					Total volume for pattern:	230.1 m ³
						Total weight for pattern:	600.6 t

† V.P. = Volume Producing

Total blast volume: 6,451.3 m³
Total weight produced: 16,840.5 t

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-39

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/22/2016 11:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: white mini seis
Date: 08/22/16 Trigger Level: 1.01 mm/s --- dB Transverse: --- mm/s --- Hz
Time: 11:07 Calibration Date: 07/07/15 Vertical: --- mm/s --- Hz
Distance From Blast: 2,138.17 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: In front yard Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 08/22/16 Trigger Level: 1.01 mm/s --- dB Transverse: 5.84 mm/s 64.0 Hz
Time: 11:07 Calibration Date: 02/03/16 Vertical: 3.81 mm/s 73.1 Hz
Distance From Blast: 503.83 m Calibration Signal: Longitudinal: 3.17 mm/s 46.5 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 114 dB
Location: Vector Sum: 6.6 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Aug,26,16

Location in Quarry: **East Face Combined Bench**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	44	Hole Depth:	36.0	7.46	Burden:	13.0	3.96
# Rows:	2	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	36.0	7.46	Collar:	8.0	2.44
Diameter in:	4						
					m3/ Hole:		172.0
					Tonnes/Hole:		449.0
					Total Tonnes:		19756.0

Material Blasted: Limestone Explosive / Hole: 89.0 kg 196.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 89.0 kg 196.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	44 80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	6				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	196.0	89.0
Total product		8624.0	3916.0

Miscellaneous:

Comments:

There are 6 holes at 26' on the ledge that will go with this shot.

Approved: *[Signature]*

Date: *Aug 26 / 16*



AUSTIN POWDER LTD. BLAST DESIGN



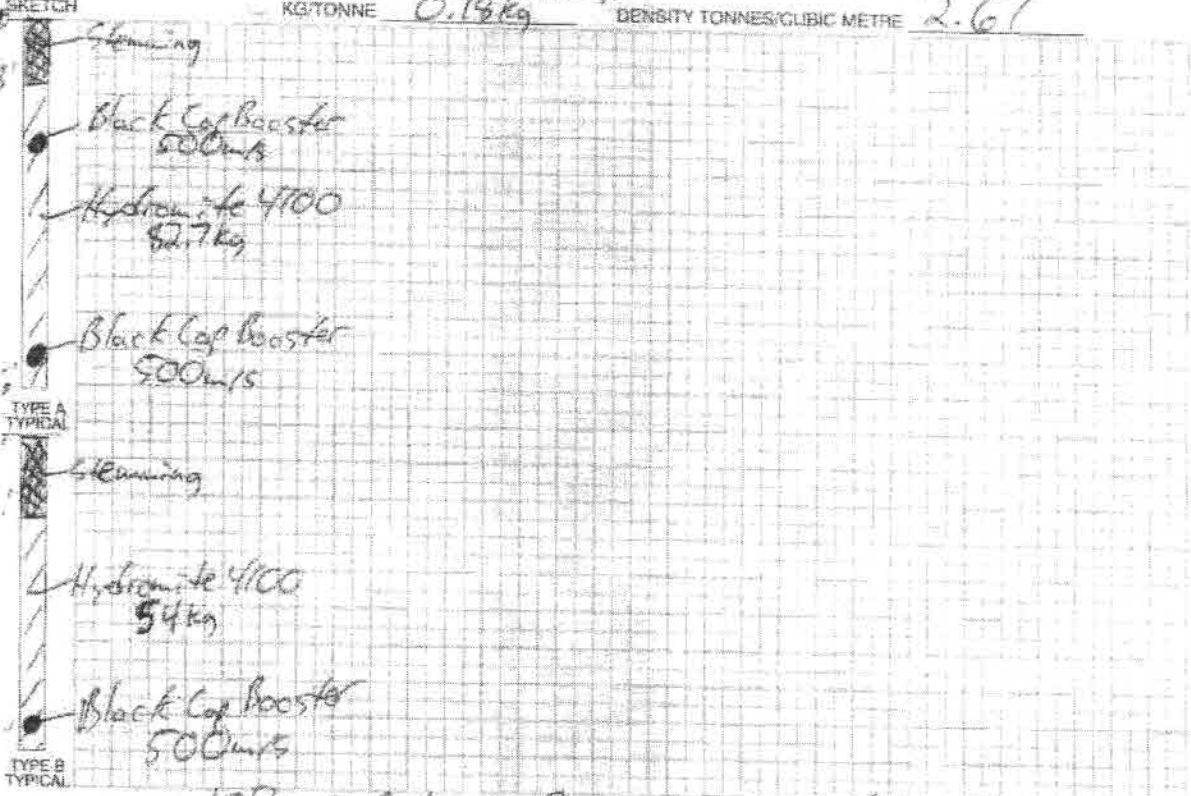
SHOT NO. 2016-40 DATE: 8/26/16
 COMPANY (PERMITTEE) Low Crushed Stone LOCATION White/Krey Bench
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 44 NO. OF ROWS 2 BURDEN 13'
 SPACING 13' DEPTH 36'/25' FACE HEIGHT 36'/25' LENGTH OF STEMMING 8'/6'

EXPLOSIVES TOTAL QUANTITY
~~60~~ 30 Dual Delay 25/500 44
~~30~~ 20 Quick Delay 4/25 4
30 Quick Delay 6/25 3
 Hydramite 4100 3525 kg

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m² = 35.32 ft² 1 ft² = 0.0283168 m²
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd = 27 ft 1 ft = 0.37037 yd
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.642777 ton/yd³ 1 ton/yd³ = 1.566 tonne/m³

TYPE OF PRIMER Black Cap Booster 64
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 827kg / 54kg
 TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Delay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 19,274 tonnes OR TOTAL CUBIC METRES PRODUCED 7384³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.47kg
 SKETCH: KG/TONNE 0.18kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 109m/s Between Rows, 25m/s Between holes
Quarry to be cleared by forscan prior to blast time

POST-BLAST COMMENTS:

BLASTER IN CHARGE: Aaron Merritt
 SIGNATURE: Aaron Merritt

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-40

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/26/2016 10:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White/Grey Combined
Bench

ENVIRONMENT

Method Used: Lat./Long.

Temperature: 25 °C

Blast Lat./Long.: 42° 53' 44.730" N 79° 17' 34.359" W

Weather: Partly Cloudy

Wind From: SW

Terrain: Flat

Wind Velocity: 10-15 km/h

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Compass Point: NNW

Direction/Bearing: 344 °

Distance: 817 m

LAYOUT

Hole Depth: 7.62-10.97 m	Material Blasted: Limestone	Total Meters Drilled: 469.4 m
No. of Holes: 44	Subdrilling: 0.00 m	Burden: [See Below]
No. of V.P.† Holes: 44	Face Height: 7.62-10.97 m	Spacing: [See Below]
No. of Rows: [See Below]	Drilling Angle: 0 °	Back Fill Depth: 0.00 m
Diameter: 101.6 mm	Mats Used: No	Stem Type: 3/4 Clear Stone
		Water Depth: max 1.83 m
		Stem Length: min 1.98 m
		Area Type: [See Below]
		Method: [See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks: 0.0 kg	Volume Produced: 7,369.8 m ³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval: 89.6 kg	Weight Produced: 18,424.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval: 1	Powder Factor 1: 5.772 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole: 89.6 kg	Powder Factor 2: 0.433 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge): 86.37	Rock Density: 2.500 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay): 86.37	

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-40

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/26/2016 10:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White/Grey Combined
Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	64.00 ea	21.77
02450	SHOCK*STAR DualDelay 18m/60' 25/500	44.00 ea	0.00
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	20.00 ea	0.00
01849	30' SHOCK*STAR Quick Relay 67 ms	3.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	4.00 ea	0.00
07602	Hydromite 4100 Bulk	3,170.00 kg	3,170.00
12981	Mini Stem Plug - 6015	44.00 ea	0.00
D0120	Other-Drilling Charges	1,540.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>3,191.76</u>

COMMENTS / EXPLANATIONS

Claron Merritt

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-40

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/26/2016 10:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White/Grey Combined
Bench

Pattern: 1

No. of Holes:	40	Hole Depth:	10.97 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P. † Holes:	40	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Weighted Average
No. of Rows:	2	Face Height:	10.97 m				
Drilling Angle:	0 °					Total volume for pattern:	6,891.2 m ³
† V.P. = Volume Producing						Total weight for pattern:	17,228.4 t

Pattern: 2

No. of Holes:	4	Hole Depth:	7.62 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P. † Holes:	4	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Weighted Average
No. of Rows:	2	Face Height:	7.62 m				
Drilling Angle:	0 °					Total volume for pattern:	478.6 m ³
† V.P. = Volume Producing						Total weight for pattern:	1,196.4 t

Total blast volume: 7,369.7 m³
Total weight produced: 18,424.9 t



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-40

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/26/2016 10:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White/Grey Combined
Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis	Transverse:	4.31 mm/s	85.3 Hz
Date:	08/26/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	4.06 mm/s	56.8 Hz
Time:	10:51	Calibration Date:	02/04/16	Longitudinal:	5.58 mm/s	85.3 Hz
Distance From Blast:	497.13 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	Acoustic:	94 dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	6.98 mm/s	
Location:	Corner Of Erie Peat Rd & Hwy#3					
Lat./Long.:	42° 53' 29.800" N	79° 17' 26.120" W				
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	White mini-Seis	Transverse:	--- mm/s	--- Hz
Date:	08/26/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	--- mm/s	--- Hz
Time:	10:51	Calibration Date:	09/18/15	Longitudinal:	--- mm/s	--- Hz
Distance From Blast:	2,112.87 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	E	Geophone Min. Freq.:	--- Hz	Acoustic:	--- dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	--- mm/s	
Location:	17 First Ave Front Yard					
Lat./Long.:	42° 53' 37.200" N	79° 16' 1.800" W				
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Aug,30,16

Location in Quarry: **Top Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	152	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m ³ / Hole:	57.7
# Rows:	8	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	20672.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 11.1 kg 24.5 lb
 Density: 2.4 t/m³ Max. kg. / Delay: 11.1 kg 24.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	152 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		4788.0	2128.0

Miscellaneous:

Comments:

Approved:

Don [Signature]

Date:

Aug 31 / 16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 2016-41 DATE: 9/31/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Whitelock
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 15R NO. OF ROWS 8 BURDEN 13'
 SPACING 13' DEPTH 11' FACE HEIGHT 11' LENGTH OF STEMMING 6'
 (COLLAR)

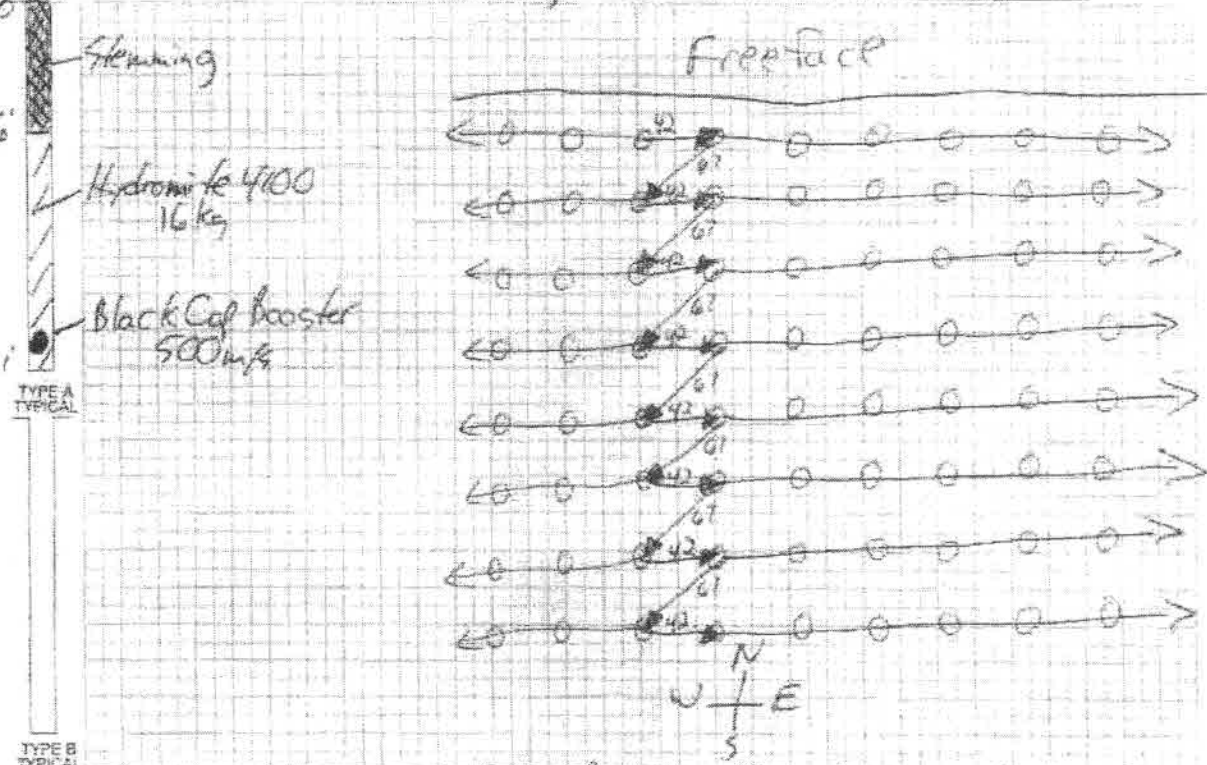
EXPLOSIVES 30 Dual Delay 25/500 TOTAL QUANTITY 15R
Hydromite 4100 2418 kg

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ² = 35.32 ft ²	1 ft ² = 0.0283168 m ²
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.27037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.199 tonne/m ³

TYPE OF PRIMER Black Cap Booster 15R
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 16kg
 TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

TOTAL NO. TONNES PRODUCED 16,281 tonne OR TOTAL CUBIC METRES PRODUCED 6784 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.35 kg
 SKETCH KG/TONNE 0.15 kg DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS 109 m/s between rows, 25 m/s between holes
Quarry to be cleared by foramen prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-41

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/31/2016 10:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long. Weather: Partly Cloudy Wind From: SW
 Temperature: 25 °C Terrain: Flat Wind Velocity: - km/h
 Blast Lat./Long.: 42° 53' 45.100" N 79° 17' 31.400" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd Compass Point: NNW
 Structure Type: Dwelling Direction/Bearing: 339 °
 Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W Distance: 828 m

LAYOUT

Hole Depth:	3.35 m	Material Blasted:	Limestone	Total Meters Drilled:	506.3 m
No. of Holes:	151	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	151	Face Height:	3.35 m	Spacing:	3.96 m
No. of Rows:	8	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.30 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 3.35 m)

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	35.0 kg	Volume Produced:	7,948.8 m ³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	35.0 kg	Weight Produced:	19,080.2 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	7.224 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	17.5 kg	Powder Factor 2:	0.332 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	197.86	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	139.91		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No
MINOR	CARMEN, R			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling			No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-41

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/31/2016 10:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	151.00 ea	51.36
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	151.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	15.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	16.00 ea	0.00
07602	Hydromite 4100 Bulk	2,590.00 kg	2,590.00
D0120	Other-Drilling Charges	1,661.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,641.35

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-41

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 08/31/2016 10:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: White mini-Seis			
Date: 08/31/16	Trigger Level: 1.02 mm/s 120.00 dB	Transverse: --- mm/s	---	Hz
Time: 10:20	Calibration Date: 09/18/15	Vertical: --- mm/s	---	Hz
Distance From Blast: 2,047.34 m	Calibration Signal:	Longitudinal: --- mm/s	---	Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz	PPV: --- mm/s	---	Hz
Readout:	Mic. Min. Freq.: --- Hz	Acoustic: --- dB		
Location: 17 First Ave Front Yard		Vector Sum: --- mm/s		
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W			
Reader and Firm: Aaron Merritt, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm: Austin Powder				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record	Seismograph Type: White Mini-Seis			
Date: 08/31/16	Trigger Level: 1.02 mm/s 120.00 dB	Transverse: 2.92 mm/s	32.0	Hz
Time: 10:20	Calibration Date: 02/04/16	Vertical: 2.41 mm/s	64.0	Hz
Distance From Blast: 487.07 m	Calibration Signal:	Longitudinal: 3.68 mm/s	46.5	Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	PPV: --- mm/s	---	Hz
Readout:	Mic. Min. Freq.: --- Hz	Acoustic: 112 dB		
Location: Corner Of Erie Peat Rd & Hwy#3		Vector Sum: 4.19 mm/s		
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Aaron Merritt, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm: Austin Powder				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Feb,11/16

Location in Quarry: **Revised Lower Brown Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	100	Hole Depth:	15.5	4.72	Burden:	8.0	2.44	m ³ / Hole:	28.2
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44	Tonnes/Hole:	73.3
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52	Total Tonnes:	7330.0
Diameter in:	3.5								

Material Blasted: Limestone Explosive / Hole: 24.0 kg 52.5 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 24.0 kg 52.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5250.0	2400.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *Feb 10/16*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 02/11/16

COMPANY (PERMITTEE) WATERFORD SAND & GRAVEL LOCATION BOTTOM BURNET

TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 3-5

NO. OF HOLES 100 NO. OF ROWS 4 BURDEN 8

SPACING 8 DEPTH 15 FACE HEIGHT 15 LENGTH OF STEMMING (COLLAR) 4.5

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>30' DUAL PERMITS</u>	<u>100</u>	1 mm = 0.03937 in	1 in = 25.4 mm
		1 m = 3.28 ft	1 ft = 0.3048 m
		1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1886 tonne/m ³

TYPE OF PRIMER BLACK CAP 100

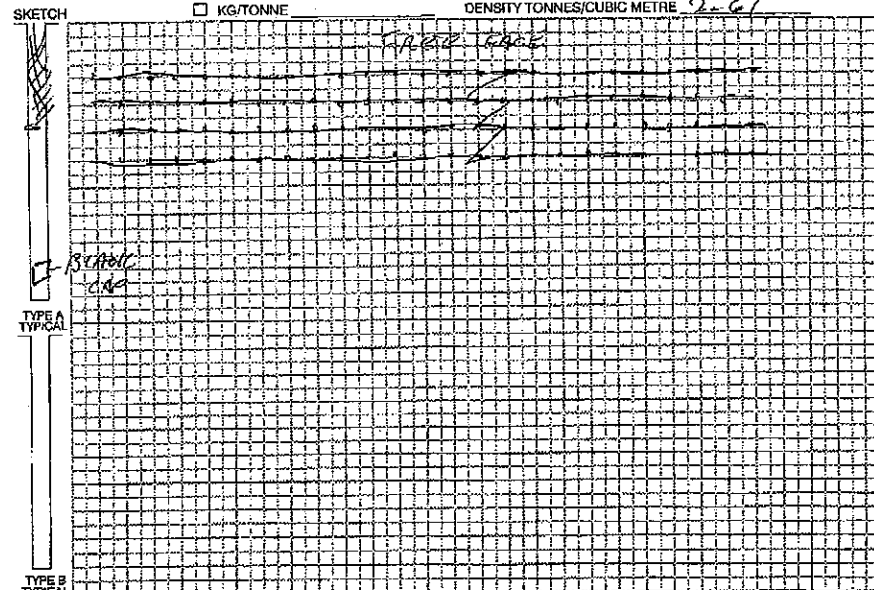
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 7.396 kg WEIGHT OF EXPLOSIVES PER HOLE 23 kg

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) 67ms 42ms @ coll

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED 2715

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.8 KG/TONNE _____ DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 42 83 55 994 N
879 17 32 432 W.

POST-BLAST COMMENTS: 25ms BETWEEN HOLES
109 BETWEEN ROWS.

BLASTER IN CHARGE FORDAN DAVIS
FORDAN DAVIS SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE PAH



AUSTIN POWDER LTD.
BLAST REPORT



Blast No.: 2016-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/11/2016 14:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long. Weather: Clear Wind From: NNE
Temperature: -10 °C Terrain: Flat Wind Velocity: 5-10 km/h
Blast Lat./Long.: 42° 53' 55.994" N 79° 17' 32.431" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd Compass Point: NNW
Structure Type: Dwelling Direction/Bearing: 349 °
Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W Distance: 447 m

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	472.4 m
No. of Holes:	100	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P.† Holes:	100	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	83.8 kg	Volume Produced:	2,809.1 m³
Firing Device:	Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	83.8 kg	Weight Produced:	7,332.8 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.624 t/kg
Mfg and Model:	Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	27.9 kg	Powder Factor 2:	0.995 kg/m³
Initiation Settings:		Scaled Distance Factor (max charge):	84.48	Rock Density:	2.611 t/m³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	48.77		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No		Protective Cover: Loader Bucket			
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	Yes	Yes	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer		Maple Leaf Drilling		No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/11/2016 14:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	100.00 ea	34.01
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	100.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	8.00 ea	0.00
11235	Hydromite 4600 Bulk	2,760.00 kg	2,760.00
12981	Mini Stem Plug - 6015	100.00 ea	0.00
D0120	Other-Drilling Charges	1,550.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,794.01

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No.: 2016-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/11/2016 14:51

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis			
Date:	02/11/16	Trigger Level:	--- mm/s	--- dB	Transverse:	6.6 mm/s 28.4 Hz
Time:	14:51	Calibration Date:	02/04/16		Vertical:	3.04 mm/s 34.1 Hz
Distance From Blast:	513.28 m	Calibration Signal:			Longitudinal:	5.08 mm/s 42.6 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s --- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	110 dB
Location:					Vector Sum:	7.23 mm/s
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis			
Date:	02/11/16	Trigger Level:	--- mm/s	--- dB	Transverse:	1.27 mm/s 73.1 Hz
Time:	14:51	Calibration Date:	02/03/16		Vertical:	0.76 mm/s 36.5 Hz
Distance From Blast:	820.83 m	Calibration Signal:			Longitudinal:	2.28 mm/s 46.5 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s --- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	100 dB
Location:					Vector Sum:	2.28 mm/s
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Feb, 16/16

Location in Quarry: Lower Brown Bench

Layout		Feet	Metres	Feet	Metres			
# Holes:	108	Hole Depth:	15.5	Burden:	8.0	2.44	m ³ / Hole:	28.2
# Rows:	4	Subdrilling:	0.0	Spacing:	8.0	2.44	Tonnes/Hole:	73.3
Diameter mm:		Face Height:	15.5	Collar:	5.0	1.52	Total Tonnes:	7916.0
Diameter in:	3.5							
Material Blasted:	Limestone		Explosive / Hole:	24.0 kg			52.5 lb	
Density:	2.61	1/m ³	Max. kg. / Delay:	24.0 kg			52.5 lb	
Max Holes / Delay:	1		Distance to Seis.:	m			ft	

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	108 100' -	33ms -			Green Cap (1/4 lb) -
40' -					108

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hvd. 4400	12	52.5	24.0
Total product		5670.0	2592.0

Miscellaneous:

Comments:

Approved:

Date:

Feb 16, 2016



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 2/18/16

COMPANY (PERMITTEE) Law Crushed Stone LOCATION Batham Brown Bench

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5"

NO. OF HOLES 107 NO. OF ROWS 4 BURDEN 8'

SPACING 8' DEPTH 15.5' FACE HEIGHT 15.5' LENGTH OF STEMMING (COLLAR) 5'

EXPLOSIVES 30' Dual Delay 25/500 TOTAL QUANTITY 107

20' Quick Relay 4m/s 7
Hydromite 4100 2553 kg.

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

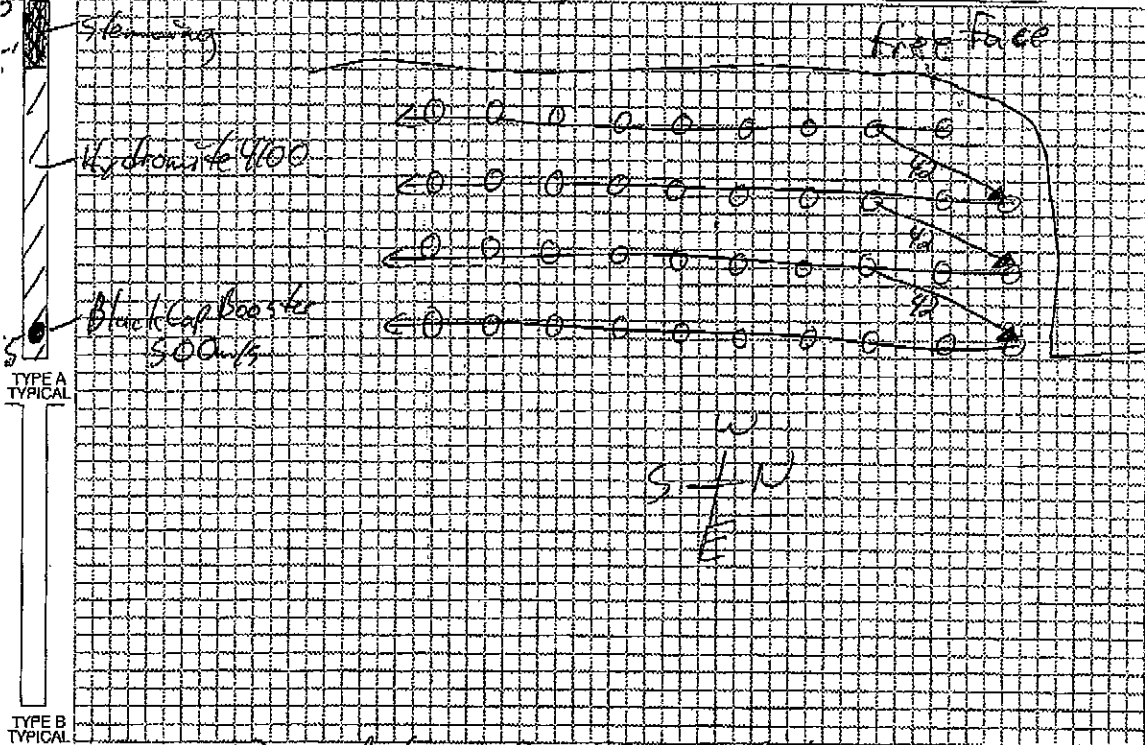
TYPE OF PRIMER Black Cap booster 107

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 23.86 kg

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 7360 tonnes OR TOTAL CUBIC METRES PRODUCED 3.012 m³

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.84 kg
SKETCH KG/TONNE 0.32 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92 m/s Between Rows, 25 m/s Between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Avon Merritt
PRINT Avon Merritt
SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



Blast No.: 2016-02

310-Oneida
ON, Hagersville, Canada N0A 1- H0

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/18/2016 11:27

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

ENVIRONMENT

Method Used: Lat./Long.

Temperature: -6 °C

Blast Lat./Long.: 42° 53' 55.100" N 79° 17' 33.400" W

Weather: Clear

Terrain: Flat

Wind From: S

Wind Velocity: 2-5 km/h

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Compass Point: NNW

Direction/Bearing: 392 °

Distance: 526 m

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	505.4 m
No. of Holes:	107	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P. † Holes:	107	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 4.72 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. In Overlapped Decks:	0.7 kg	Volume Produced:	3,005.7 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	23.1 kg	Weight Produced:	7,846.2 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	3.182 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	23.1 kg	Powder Factor 2:	0.821 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	109.64	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	109.64		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BURNIE	BRANDON, A			No	Yes	Yes	No	No
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]	* ON - 278B-454071 [12/31/2099]	No	Yes	No	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	No	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nickolas Farrer		Maple Leaf Drilling		No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/18/2016 11:27

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	107.00 ea	36.39
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	107.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	2,430.00 kg	2,430.00
12981	Mini Stem Plug - 6015	107.00 ea	0.00
D0120	Other-Drilling Charges	1,659.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,466.39

COMMENTS / EXPLANATIONS

Caron Merritt

Signature of Blaster in Charge

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
 (LAW1000-001)

Date/Time: 02/18/2016 11:27

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	02/18/16	Trigger Level:	1.02 mm/s 120.00 dB	Transverse:	2.92 mm/s	32.0 Hz
Time:	11:27	Calibration Date:	07/07/15	Vertical:	1.52 mm/s	32.0 Hz
Distance From Blast:	526.39 m	Calibration Signal:		Longitudinal:	3.55 mm/s	30.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s	--- Hz
Readout:		Mic. Min. Freq.:	--- Hz	Acoustic:	110 dB	
Location:	20455 Erie Peat Rd			Vector Sum:	4.31 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis			
Date:	02/18/16	Trigger Level:	1.02 mm/s 120.00 dB	Transverse:	3.04 mm/s	34.1 Hz
Time:	11:27	Calibration Date:	09/15/15	Vertical:	1.9 mm/s	73.1 Hz
Distance From Blast:	797.97 m	Calibration Signal:		Longitudinal:	1.65 mm/s	46.5 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s	--- Hz
Readout:		Mic. Min. Freq.:	--- Hz	Acoustic:	100 dB	
Location:	Corner Of Erie Peat Rd & Hwy#3			Vector Sum:	3.17 mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Feb,18/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	112	Hole Depth:	15.5	4.72	Burden:	8.0	2.44
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52
Diameter in:	3.5						
					m3/ Hole:		28.2
					Tonnes/Hole:		73.3
					Total Tonnes:		8210.0

Material Blasted: Limestone Explosive / Hole: 24.0 kg 52.5 lb
 Density: 2.61 t/m3 Max. kg. / Delay: 24.0 kg 52.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	112 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5880.0	2688.0

Miscellaneous:

Comments: This will be in addition to the blast originally booked for the 16th

Approved:

Date:

Feb. 18. 2016



AUSTIN POWDER LTD. BLAST DESIGN



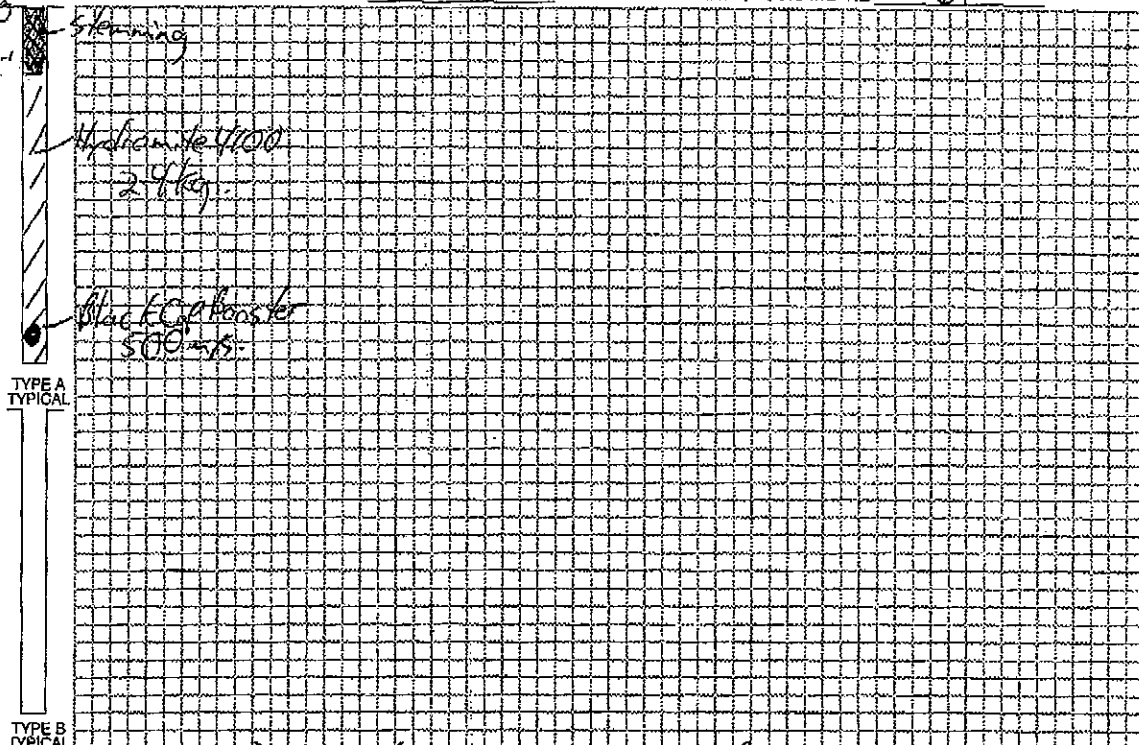
SHOT NO. _____ DATE: 2/18/16
 COMPANY (PERMITTEE) Low Crushed Stone LOCATION Bottom Bench
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5"
 NO. OF HOLES 120 NO. OF ROWS 4 BURDEN 8'
 SPACING 8' DEPTH 15.5' FACE HEIGHT 15.5' LENGTH OF STEMMING 5'
 (COLLAR)

EXPLOSIVES TOTAL QUANTITY
30' Dual Delay 25/500 120
20' Quick Relay 42ms 7
Hydramite 4100 2600 kg

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m³ = 35.32 ft³ 1 ft³ = 0.0283168 m³
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907186 tonne
 1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER Black Cap booster 120
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 24 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE: _____
 SKETCH: * KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms between holes, 92ms between rows
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/18/2016 14:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: S

Temperature: 4 °C

Terrain: Flat

Wind Velocity: 2-5 km/h

Blast Lat./Long.: 42° 53' 52.700" N 79° 17' 34.299" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 337 °

Distance: 585 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	566.9 m
No. of Holes:	120	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P.† Holes:	120	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 4.72 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	3,370.8 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	22.0 kg	Weight Produced:	8,799.3 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	3.332 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	22.0 kg	Powder Factor 2:	0.784 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	124.74	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	124.75		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BURNIE	BRANDON, A			No	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
Jeremy		Maple Leaf Drilling	No	No	No	Yes	Yes	

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/18/2016 14:30

Pr/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	120.00 ea	40.81
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	120.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	2,600.00 kg	2,600.00
12981	Mini Stem Plug - 6015	120.00 ea	0.00
D0120	Other-Drilling Charges	1,850.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): **2,640.81**

COMMENTS / EXPLANATIONS

Caron Merritt

Signature of Blaster in Charge

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/18/2016 14:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 02/18/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 2.66 mm/s 28.4 Hz

Time: 14:30

Calibration Date: 07/07/15

Vertical: 1.39 mm/s 34.1 Hz

Distance From Blast: 585.22 m

Calibration Signal:

Longitudinal: 2.79 mm/s 39.3 Hz

Direction From Blast: NNW

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 110 dB

Location: 20455 Erie Peat Rd

Vector Sum: 3.17 mm/s

Lat./Long.: 42° 54' 10.240" N

79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 02/18/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 2.03 mm/s 32.0 Hz

Time: 14:30

Calibration Date: 09/15/15

Vertical: 0.88 mm/s 128.0 Hz

Distance From Blast: 730.61 m

Calibration Signal:

Longitudinal: 1.39 mm/s 73.1 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 100 dB

Location: Corner Of Erie Peat Rd & Hwy#3

Vector Sum: 2.03 mm/s

Lat./Long.: 42° 53' 29.800" N

79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July,27/16

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	15912.0
Diameter in:	4								

Material Blasted: Limestone
 Density: 2.61 t/m³
 Max Holes / Delay: 1

Explosive / Hole: 57.0 kg 126.0 lb
 Max. kg. / Delay: 57.0 kg 126.0 lb
 Distance to Seis.: ** m ** ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				51

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

July 27/16

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-35

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/27/2016 11:26

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 28 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 46.700" N 79° 17' 30.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 349 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 739 m

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	442.0 m
No. of Holes:	58	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	57	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	83.3 kg	Volume Produced:	6,819.4 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	83.3 kg	Weight Produced:	17,801.4 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1.57	Powder Factor 1:	5.528 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	56.1 kg	Powder Factor 2:	0.472 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	98.58	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	80.90		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
CHOLEWA	CHRISTOPHER, R			No	No	No	No	No
EDDY	MATTHEW, A			No	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	No	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-35

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/27/2016 11:26

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	59.00 ea	20.07
10752	SHOCK*STAR DualDelay 12m/40' 25/500	59.00 ea	0.00
01849	30' SHOCK*STAR Quick Relay 67 ms	5.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
07602	Hydromite 4100 Bulk	3,200.00 kg	3,200.00
12981	Mini Stem Plug - 6015	58.00 ea	0.00
D0120	Other-Drilling Charges	1,450.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,220.06

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-35

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/27/2016 11:26

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: Seismic Record	Seismograph Type: white mini seis			
Date: 07/27/16	Trigger Level: 1.01 mm/s	--- dB	Transverse:	1.39 mm/s 42.6 Hz
Time: 11:26	Calibration Date: 07/07/15		Vertical:	0.38 mm/s 64.0 Hz
Distance From Blast: 2,022.35 m	Calibration Signal:		Longitudinal:	0.63 mm/s 73.1 Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV:	--- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic:	94 dB
Location: In front yard			Vector Sum:	1.39 mm/s
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 07/27/16	Trigger Level: 1.01 mm/s	--- dB	Transverse:	3.81 mm/s 25.6 Hz
Time: 11:26	Calibration Date: 02/03/16		Vertical:	2.92 mm/s 85.3 Hz
Distance From Blast: 528.83 m	Calibration Signal:		Longitudinal:	6.22 mm/s 56.8 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV:	--- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic:	106 dB
Location:			Vector Sum:	6.85 mm/s
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July,06,16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	35	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
Material Blasted:	Limestone	Explosive / Hole:	57.0	kg		126.0	lb
Density:	2.61 t/m3	Max. kg. / Delay:	57.0	kg		126.0	lb
Max Holes / Delay:	1	Distance to Seis.:	**	m		**	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	35				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		4410.0	1995.0

Miscellaneous:

Comments: Hole count is approximate as drilling is not complete

Approved:

Date:



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 2016-30 DATE: 7/16/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Gray Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 33 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 24' FACE HEIGHT 24' LENGTH OF STEMMING (COLLAR) 6.5'

EXPLOSIVES TOTAL QUANTITY

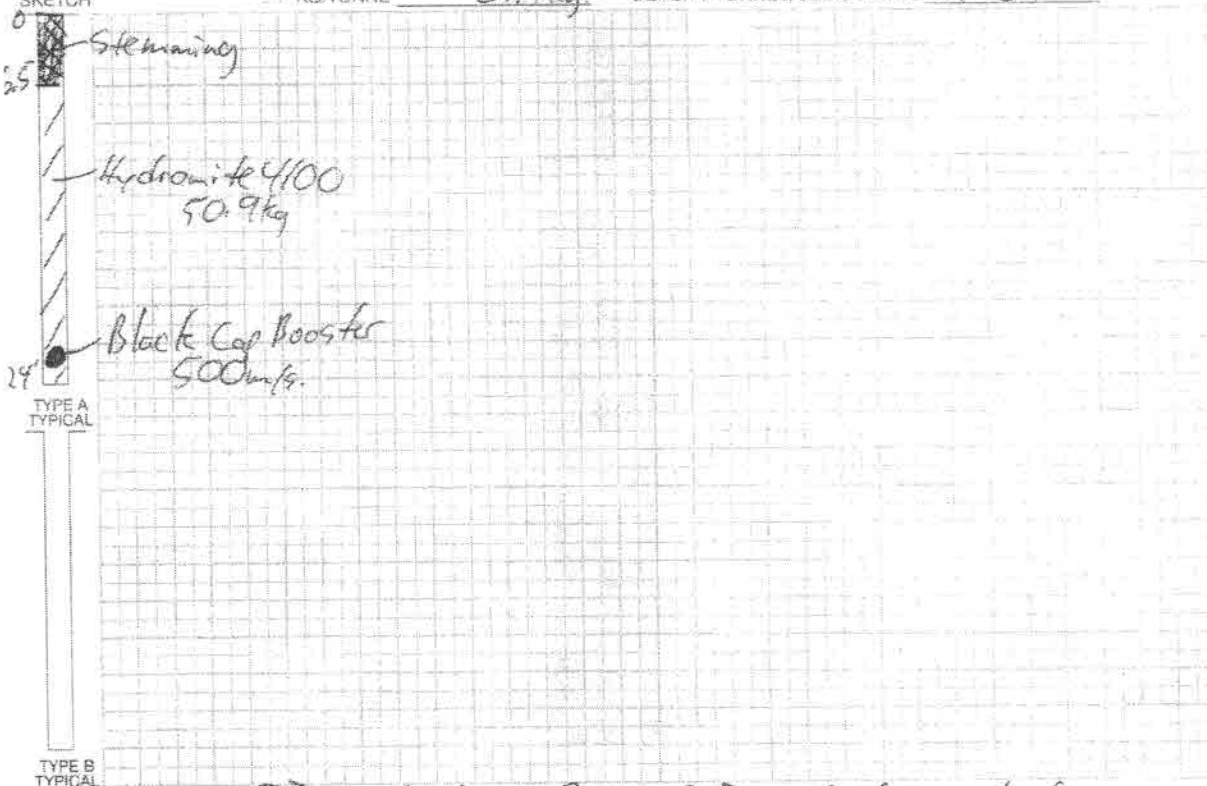
40' Dual Delay 25k500 33
20' Quick Relay 42k15 5
Hydromite 4100 1680 kg

CONVERSIONS

1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m³ = 35.32 ft³ 1 ft³ = 0.0283168 m³
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1860 tonne/m³

TYPE OF PRIMER Black Cap Booster 33
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE: 50.9 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 9,912 tonne OR TOTAL CUBIC METRES PRODUCED 3798 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.44 kg
 SKETCH KG/TONNE 0.17 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92m/s Between Rows, 25m/s Between holes

Quarry to be cleared by Foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Avon Merritt PRINT Avon Merritt SIGNATURE
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-30

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/06/2016 15:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Hazy Hot and Humid

Wind From: SW

Temperature: 30 °C

Terrain: Flat

Wind Velocity: 12-18 km/h

Blast Lat./Long.: 42° 53' 47.500" N 79° 17' 29.799" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 335 °

Structure Type: Dwelling

Distance: 773 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.32 m	Material Blasted:	Limestone	Total Meters Drilled:	241.4 m
No. of Holes:	33	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	33	Face Height:	7.32 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.98 m
				Area Type:	Conventional
				Method:	Specified

(H = 7.32 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	3,790.1 m ³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	48.2 kg	Weight Produced:	9,893.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	6.218 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	48.2 kg	Powder Factor 2:	0.420 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	111.32	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	111.32		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No	
LI	JACKSON, A			No	No	No	No	No	
PASSMORE	EDGAR, M			No	No	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nickolas Farrer				Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-30

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/06/2016 15:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	33.00 ea	11.22
10752	SHOCK*STAR DualDelay 12m/40' 25/500	33.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	1,580.00 kg	1,580.00
12981	Mini Stem Plug - 6015	33.00 ea	0.00
D0120	Other-Drilling Charges	792.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>1,591.22</u>

COMMENTS / EXPLANATIONS

Claron Merritt

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-30

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/06/2016 15:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis	Transverse:	2.54 mm/s	85.3 Hz
Date:	07/06/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	2.15 mm/s	73.1 Hz
Time:	15:16	Calibration Date:	09/15/15	Longitudinal:	3.81 mm/s	64.0 Hz
Distance From Blast:	552.60 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	Acoustic:	112 dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	4.44 mm/s	
Location:	Corner Of Erie Peat Rd & Hwy#3					
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	White mini-Seis	Transverse:	--- mm/s	--- Hz
Date:	07/06/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	--- mm/s	--- Hz
Time:	15:16	Calibration Date:	02/04/16	Longitudinal:	--- mm/s	--- Hz
Distance From Blast:	2,021.74 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	E	Geophone Min. Freq.:	--- Hz	Acoustic:	--- dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	--- mm/s	
Location:	17 First Ave Front Yard					
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W			
Reader and Firm:	Aaron Merritt, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July, 12/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
					m ³ / Hole:	120.0	
					Tonnes/Hole:	312.0	
					Total Tonnes:	15912.0	

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft


Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:  Date: July 11/16.



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-31

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/12/2016 14:02

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NE

Temperature: 31 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 34.400" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 357 °

Structure Type: Dwelling

Distance: 712 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	Crushed Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	110.0 kg	Volume Produced:	6,101.6 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	110.0 kg	Weight Produced:	15,927.7 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.972 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	55.0 kg	Powder Factor 2:	0.437 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	95.96	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	67.85		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
DEBOER	GARY, B			No	Yes	Yes	No	No
KENNEY	DAVID, L			No	No	No	No	No
LI	JACKSON, A			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer	Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No.: 2016-31

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/12/2016 14:02

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	11.00 ea	0.00
07696	Hydromite 4400 Bulk	2,650.00 kg	2,650.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,250.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,667.35

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-31

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/12/2016 14:02

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: Seismic Record	Seismograph Type: white mini seis			
Date: 07/12/16	Trigger Level: 1.01 mm/s	---	dB	Transverse: 2.18 mm/s 42.7 Hz
Time: 14:02	Calibration Date: 08/20/15			Vertical: 3.38 mm/s 18.3 Hz
Distance From Blast: 2,123.54 m	Calibration Signal:			Longitudinal: 3.45 mm/s 39.4 Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz			PPV: --- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz			Acoustic: 107 dB
Location: In front yard				Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N		79° 16' 1.800" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type: No Trigger	Seismograph Type: Mini White Seis			
Date: 07/12/16	Trigger Level: 1.01 mm/s	---	dB	Transverse: --- mm/s --- Hz
Time: 14:02	Calibration Date: 09/18/15			Vertical: --- mm/s --- Hz
Distance From Blast: 744.32 m	Calibration Signal:			Longitudinal: --- mm/s --- Hz
Direction From Blast: NNW	Geophone Min. Freq.: --- Hz			PPV: --- mm/s --- Hz
Readout:	Mic. Min. Freq.: --- Hz			Acoustic: --- dB
Location:				Vector Sum: --- mm/s
Lat./Long.: 42° 54' 10.240" N		79° 17' 44.100" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER LTD. BLAST DESIGN



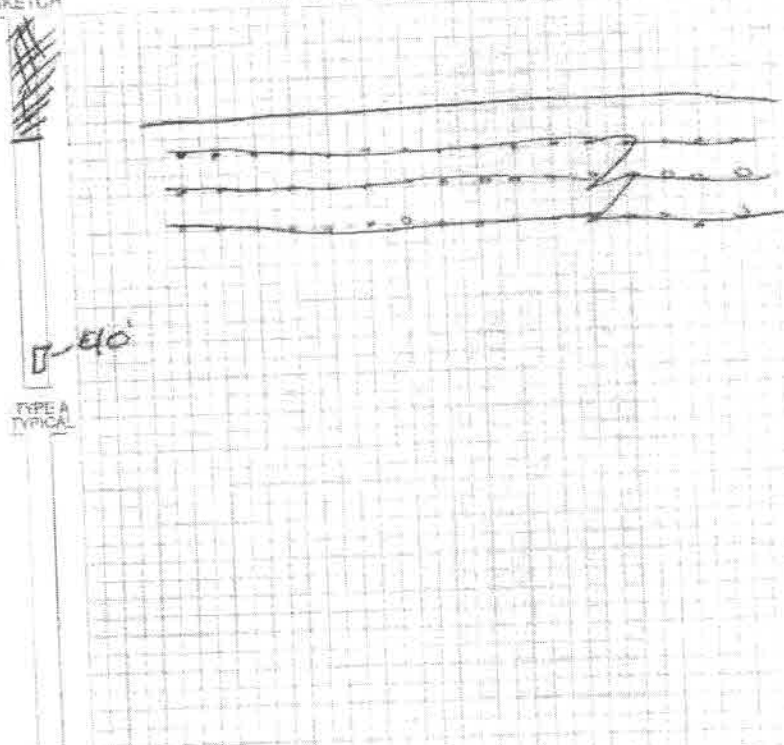
DATE 10/1/84

SHOT NO. _____
 COMPANY (PERMITTEE) LAW CRUSHER STONE LOCATION GRAY
 TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 41
 NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING G
 (COLLAR)

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>40' Dura 1024 2900</u>	<u>51</u>	1 mm = 0.03937 in	1 m = 25.4 mm
<u>20' Quic 1024 42ms</u>	<u>11</u>	1 m = 3.28 ft	1 ft = 0.3048 m
<u>4400 Hydramite</u>		1 m ² = 35.32 ft ²	1 ft ² = 0.092903 m ²
		1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
		1 yd = 27 ft	1 ft = 0.37037 yd
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Buterco 51
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2724 WEIGHT OF EXPLOSIVES PER HOLE 54
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) _____ (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

TOTAL NO. TONNES PRODUCED 15427 OR TOTAL CUBIC METRES PRODUCED 6101
 TOTAL POWDER FACTOR KG/CUBIC METRE 0.4 DENSITY TONNE/CUBIC METRE 2.61
 SKETCH



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
84 BETWEEN ROWS

POST-BLAST COMMENTS: 1 FT FURTHER TO ELECTRIC PIT
FOR BLAST TIME

BLASTER IN CHARGE Son Du DAVIS PRINT SIGNATURE
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF-HIGHWAY TRUCK
 BUCKET OF LOADER-SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July, 19/16

Location in Quarry: **East Face Grey Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	15912.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

July 19/16



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-32

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/19/2016 15:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 34.400" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 357 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 712 m

LAYOUT

	Hole Depth:	7.32 m	Material Blasted: Limestone	Total Meters Drilled:	387.7 m
No. of Holes:	53	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	53	Face Height:	7.32 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 2.13 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,087.2 m³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	52.0 kg	Weight Produced:	15,890.3 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	6.362 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	52.0 kg	Powder Factor 2:	0.411 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	98.69	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	98.69		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
DEBOER	GARY, B			No	No	No	No	No
KENNEY	DAVID, L			No	No	No	No	No
LI	JACKSON, A			No	Yes	Yes	No	No
<hr/>								
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer	Maple Leaf Drilling			No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-32

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/19/2016 15:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	53.00 ea	18.03
10752	SHOCK*STAR DualDelay 12m/40' 25/500	53.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	2,480.00 kg	2,480.00
12981	Mini Stem Plug - 6015	53.00 ea	0.00
D0120	Other-Drilling Charges	1,325.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,498.02

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-32

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/19/2016 15:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	No Trigger	Seismograph Type:	---	Transverse:	---	mm/s	---	Hz		
Date:	07/19/16	Trigger Level:	1.01 mm/s	---	dB	Vertical:	---	mm/s	---	Hz
Time:	15:06	Calibration Date:	08/20/15	Longitudinal:	---	mm/s	---	Hz		
Distance From Blast:	568.76 m	Calibration Signal:		PPV:	---	mm/s	---	Hz		
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz	Acoustic:	---	dB			
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	---	mm/s			
Location:										
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W							
Reader and Firm:	Jordan Davis, AUSTIN POWDER									
Analyst and Firm:										
Installer and Firm:										

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	white mini seis	Transverse:	---	mm/s	---	Hz		
Date:	07/19/16	Trigger Level:	1.01 mm/s	---	dB	Vertical:	---	mm/s	---	Hz
Time:	15:06	Calibration Date:	07/07/15	Longitudinal:	---	mm/s	---	Hz		
Distance From Blast:	2,123.54 m	Calibration Signal:		PPV:	---	mm/s	---	Hz		
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz	Acoustic:	---	dB			
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	---	mm/s			
Location:	In front yard									
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W							
Reader and Firm:	Jordan Davis, AUSTIN POWDER									
Analyst and Firm:										
Installer and Firm:										



AUSTIN POWDER LTD. BLAST DESIGN



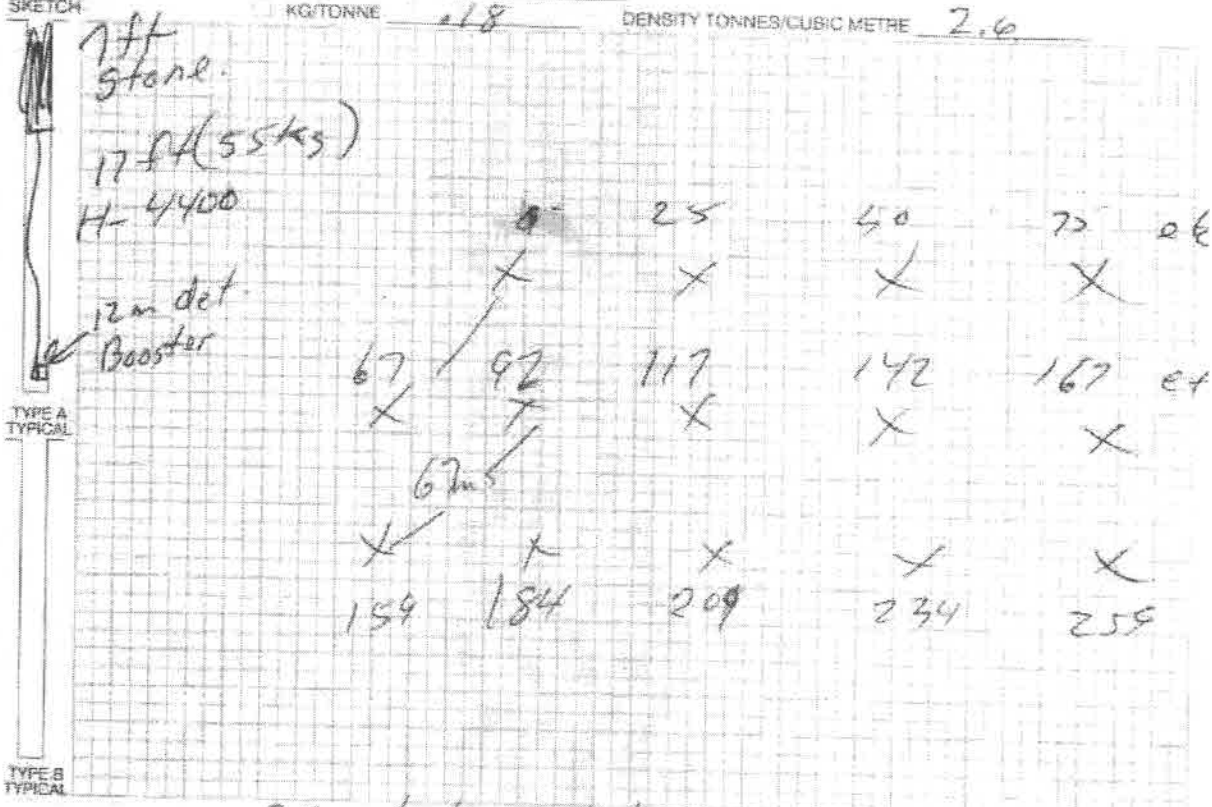
SHOT NO. _____ DATE: 07/19/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 53 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 24 FACE HEIGHT 24 LENGTH OF STEMMING (COLLAR) 74

EXPLOSIVES TOTAL QUANTITY
4400 2860
Black Cap Booster 53
12m OD 25/500 53
67ms 5

CONVERSIONS
 1 mm = 0.03937 in
 1 m = 3.28 ft
 1 m² = 36.32 ft²
 1 m³ = 1.308 yd³
 1 yd = 37 ft
 1 kg = 2.2046 lb
 1 tonne = 1.1023 ton
 1 tonne/m³ = 0.842777 ton/yd³
 1 in = 25.4 mm
 1 ft = 0.3048 m
 1 ft² = 0.0283168 m²
 1 yd³ = 0.764555 m³
 1 ft = 0.37037 yd
 1 lb = 0.454 kg
 1 ton = 0.907185 tonne
 1 ton/yd³ = 1.1586 tonne/m³

TYPE OF PRIMER _____
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2860 WEIGHT OF EXPLOSIVES PER HOLE 55
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 25/500, 67ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 15828 OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE
 SKETCH: KG/TONNE 1.8 DENSITY TONNES/CUBIC METRE 2.6



PRE-BLAST COMMENTS: 25ms between holes
92ms between rows

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Jason Davis PRINT _____ SIGNATURE _____
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER PLEASE DESCRIBE _____



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July,22/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4					Total Tonnes:	15912.0
Material Blasted:		Limestone		Explosive / Hole:		57.0	kg
Density:		2.61	t/m3	Max. kg. / Delay:		57.0	kg
Max Holes / Delay:		1		Distance to Seis.:		m	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				51

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

July 21/16



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: July 22 2016

Location in Quarry: Full Face

Layout

		Feet	Metres	Feet	Metres		
# Holes:	69	Hole Depth:	37.0	11.28	Burden:	10.0	3.05
# Rows:	2	Subdrilling:	0.0	0.00	Spacing:	10.0	3.05
Diameter mm:		Face Height:	37.0	8.38	Collar:	6.0	1.83
Diameter in:	4						
Material Blasted:	Limestone		Explosive / Hole:	90.0 kg	198.0 lb		
Density:	2.6	t/m3	Max. kg. / Delay:	100.0			
Max Holes / Delay:	1		Distance to Seis.:	400.0 m	3600.0 ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20' 20'30'		Boosters		Electronic Det
12' -	50' -	69	9ms -	42ms -	5	24' E-star-
16' -	60' -		17ms -	67ms -		40' E-Star-
24' -	69 80' -		25ms -	100ms -		60' E-star-
30' -	100' -		33ms -			80' E-star-
40' -						100' E-star-

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Hyd 4100 NP			
Hyd 4600			
Hyd. 4400	30	200.0	90.0
Total product		13800.0	6210.0

Miscellaneous:

Approved:
Gary deboer

Date: July 19 2011

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-33

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:04

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Partly Cloudy

Wind From: SW

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 46.600" N 79° 17' 34.400" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 343 °

Structure Type: Dwelling

Distance: 762 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.98 m
				Area Type:	Conventional
				Method:	Specified

(H = 7.62 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	109.7 kg	Volume Produced:	6,101.6 m ³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	109.7 kg	Weight Produced:	15,927.7 t ✓
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.694 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	54.8 kg	Powder Factor 2:	0.459 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	102.89	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	72.75		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	No	No	No	No
Other Crew Members				In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes				Company: Maple Leaf Drilling	No	No	No	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-33

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:04

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
01849	30' SHOCK*STAR Quick Relay 67 ms	5.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	6.00 ea	0.00
07602	Hydromite 4100 Bulk	2,780.00 kg	2,780.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 2,797.34

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-33

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:04

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis
Date: 07/22/16 Trigger Level: 1.02 mm/s 120.00 dB Transverse: 3.68 mm/s 25.6 Hz
Time: 11:04 Calibration Date: 02/03/16 Vertical: 2.79 mm/s 56.8 Hz
Distance From Blast: 551.38 m Calibration Signal: Longitudinal: 2.66 mm/s 46.5 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: 106 dB
Location: Corner Of Erie Peat Rd & Hwy#3 Vector Sum: 4.44 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Aaron Merritt, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Austin Powder

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: White mini-Seis
Date: 07/22/16 Trigger Level: 1.02 mm/s 120.00 dB Transverse: --- mm/s --- Hz
Time: 11:04 Calibration Date: 07/07/15 Vertical: --- mm/s --- Hz
Distance From Blast: 2,120.80 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: 17 First Ave Front Yard Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Aaron Merritt, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Austin Powder

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-34

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: East Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SW

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 41.399" N 79° 17' 44.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 12 °

Structure Type: Dwelling

Distance: 911 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	11.28 m	Material Blasted:	Limestone	Total Meters Drilled:	789.4 m
No. of Holes:	70	Subdrilling:	0.00 m	Burden:	3.05 m
No. of V.P.† Holes:	70	Face Height:	11.28 m	Spacing:	3.05 m
No. of Rows:	2	Drilling Angle:	0 °	Back Fill Depth:	11.28 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	184.3 kg	Volume Produced:	7,334.1 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	184.3 kg	Weight Produced:	19,145.0 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	3.022 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	95.2 kg	Powder Factor 2:	0.864 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	93.36	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	67.10		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	No	No	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
KENNEY	DAVID, L			No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-34

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: East Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	138.00 ea	46.93
11171	50' SHOCK*STAR Dual-Delay 25/475	70.00 ea	0.00
10750	SHOCK*STAR DualDelay 7.3m/24' 25/500	69.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	7.00 ea	0.00
07696	Hydromite 4400 Bulk	6,310.00 kg	6,310.00
12981	Mini Stem Plug - 6015	69.00 ea	0.00
D0120	Other-Drilling Charges	2,590.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			6,356.93

COMMENTS / EXPLANATIONS

General Comments: Extra det was used for timing

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-34

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 07/22/2016 11:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: East Wall

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis			
Date:	07/22/16	Trigger Level:	1.01 mm/s	---	dB	Transverse: 8.12 mm/s 32.0 Hz
Time:	11:06	Calibration Date:	02/03/16			Vertical: 6.35 mm/s 56.8 Hz
Distance From Blast:	549.55 m	Calibration Signal:				Longitudinal: 7.74 mm/s 23.2 Hz
Direction From Blast:	SE	Geophone Min. Freq.:	---	Hz		PPV: --- mm/s --- Hz
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic: 114 dB
Location:						Vector Sum: 9.52 mm/s
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	white mini seis			
Date:	07/22/16	Trigger Level:	1.01 mm/s	---	dB	Transverse: --- mm/s --- Hz
Time:	11:06	Calibration Date:	07/07/15			Vertical: --- mm/s --- Hz
Distance From Blast:	2,333.85 m	Calibration Signal:				Longitudinal: --- mm/s --- Hz
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz		PPV: --- mm/s --- Hz
Readout:		Mic. Min. Freq.:	---	Hz		Acoustic: --- dB
Location:	In front yard					Vector Sum: --- mm/s
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						



AUSTIN POWDER LTD. BLAST DESIGN

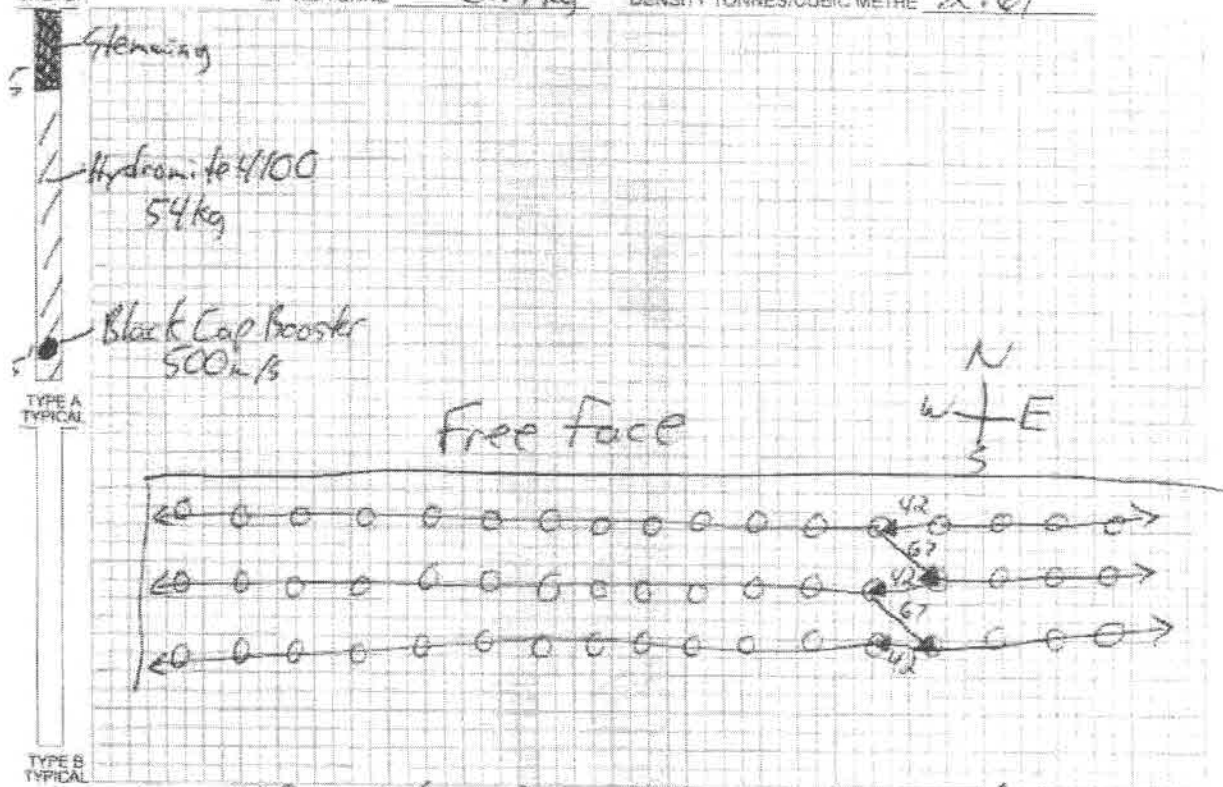


SHOT NO. 2016-33 DATE 7/22/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey Beach
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 13'
 SPACING 13 DEPTH 25' FACE HEIGHT 25' LENGTH OF STEMMING (COLLAR) 6.5'

EXPLOSIVES TOTAL QUANTITY
40' Dual Delay 25/500 51
20' Quick Relay 42lbs 6
30' Quick Relay 67lbs 5
Hydramite 4100 2759 kg

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m³ = 35.32 ft³ 1 ft³ = 0.0283168 m³
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER Black Cap Booster 51
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 54kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay
 TOTAL NO. TONNES PRODUCED 15,956 tonnes OR TOTAL CUBIC METRES PRODUCED 6114 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.45 kg
 SKETCH KG/TONNE 0.17 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 109m/s between rows, 25m/s between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINTED NAME
Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June 01/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
Material Blasted: Limestone		Explosive / Hole:		57.0	kg	126.0	lb
Density: 2.61 t/m ³		Max. kg. / Delay:		57.0	kg	126.0	lb
Max Holes / Delay: 1		Distance to Seis.:			m		ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

May 31/16



AUSTIN POWDER LTD. BLAST

DA.

SHOT NO. _____

COMPANY (PERMITTEE) L. J. LAY LOCATION PA. CLAY

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4

NO. OF HOLES 50 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 5 FACE HEIGHT 25 LENGTH OF STEMMING (COLLAR) 6

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

5 40' Pure DELAY 250 50

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.542777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLACK AP 50

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3141 WEIGHT OF EXPLOSIVES PER HOLE 63

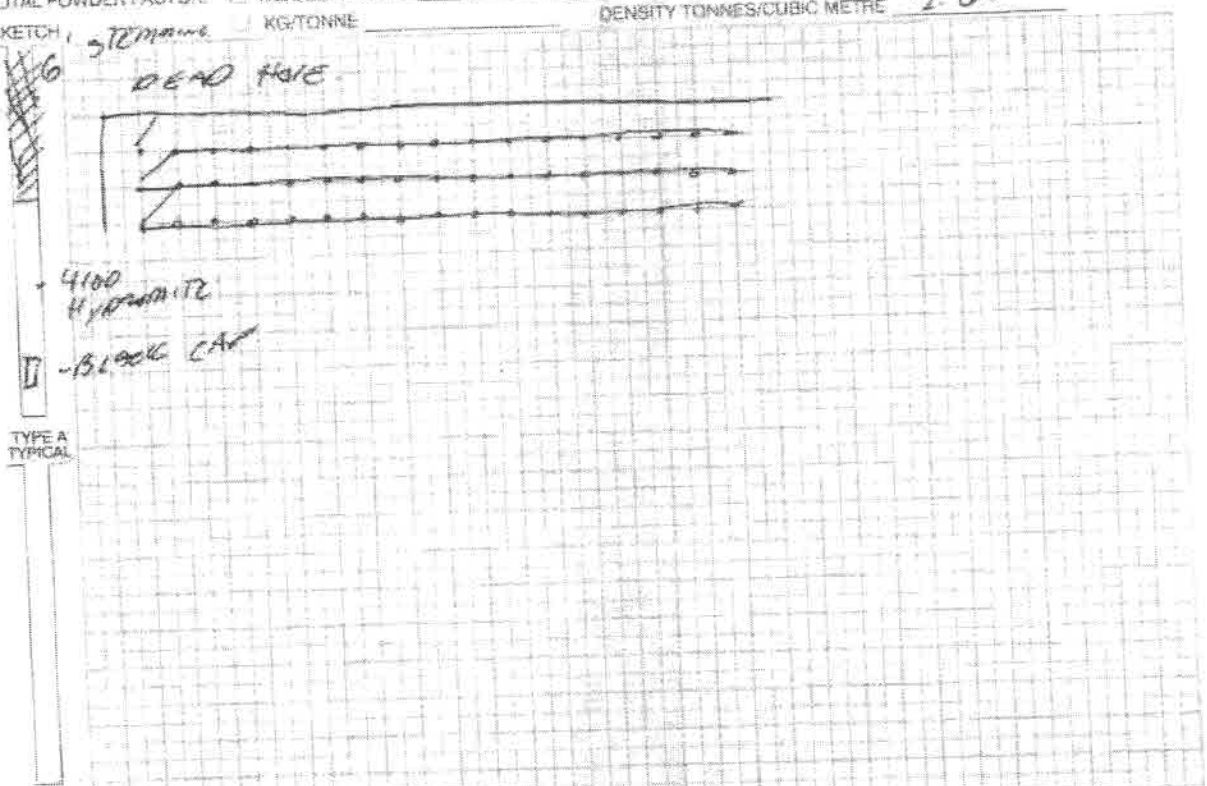
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

DELAY DETONATORS USED (TYPE) 67ms Quince Relay (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 15610 OR TOTAL CUBIC METRES PRODUCED 5981

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5 KG/TONNE

SKETCH: STEMMING DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25 ms BETWEEN HOLES
92 ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FORMATION TO CLEAR PIT
FOR BLAST TIME

BLASTER IN CHARGE: S. J. Davis PRINT _____ SIGNATURE _____

TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE _____



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-25

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/01/2016 10:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NE

Temperature: 19 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 29.200" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 347 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 727 m

LAYOUT	Hole Depth:	7.62 m	Material Blasted: Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	110.1 kg	Volume Produced:	6,101.6 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	110.1 kg	Weight Produced:	15,927.7 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.674 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	55.0 kg	Powder Factor 2:	0.460 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	97.98	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	69.28		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN,	* ON - N/A		Yes	Yes	Yes	No	No	
LI	JACKSON,	A		No	No	No	No	No	
PASSMORE	EDGAR, M			No	Yes	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes				Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



Blast No.: 2016-25

310-Oneida
ON, Hagersville, Canada N0A 1- H0
Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/01/2016 10:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	6.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	2,790.00 kg	2,790.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,807.35

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-25

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/01/2016 10:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis

Date: 06/01/16 Trigger Level: 1.01 mm/s 120.00 dB

Time: 10:05 Calibration Date: 09/18/15

Distance From Blast: 541.32 m

Calibration Signal:

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

Readout: Display Only

Mic. Min. Freq.: --- Hz

Location:

Lat./Long.: 42° 53' 29.800" N

79° 17' 26.120" W

Reader and Firm: Jordan Davis, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

Transverse:	3.04 mm/s	30.1 Hz
Vertical:	2.03 mm/s	51.2 Hz
Longitudinal:	2.28 mm/s	42.6 Hz
PPV:	--- mm/s	--- Hz
Acoustic:	94 dB	
Vector Sum:	3.42 mm/s	

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: mini white seis

Date: 06/01/16 Trigger Level: 1.01 mm/s --- dB

Time: 10:05 Calibration Date: 07/07/15

Distance From Blast: 2,006.80 m

Calibration Signal:

Direction From Blast: E

Geophone Min. Freq.: --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Location: In front yard

Lat./Long.: 42° 53' 37.200" N

79° 16' 1.800" W

Reader and Firm: Jordan Davis, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

Transverse:	--- mm/s	--- Hz
Vertical:	--- mm/s	--- Hz
Longitudinal:	--- mm/s	--- Hz
PPV:	--- mm/s	--- Hz
Acoustic:	--- dB	
Vector Sum:	--- mm/s	

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-26

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/03/2016 10:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: N

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.299" N 79° 17' 29.799" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 348 °

Structure Type: Dwelling

Distance: 691 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	381.0 m
No. of Holes:	50	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	50	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	147.6 kg	Volume Produced:	5,982.0 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	147.6 kg	Weight Produced:	15,615.4 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	6.060 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	73.8 kg	Powder Factor 2:	0.431 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	80.43	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	56.87		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
EDDY	MATTHEW, A			No	Yes	Yes	No	No	
KENNEY	DAVID, L			No	No	No	No	No	
PASSMORE	EDGAR, M			No	Yes	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes				Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-26

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/03/2016 10:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	50.00 ea	17.01
10752	SHOCK*STAR DualDelay 12m/40' 25/500	50.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	7.00 ea	0.00
07602	Hydromite 4100 Bulk	2,560.00 kg	2,560.00
12981	Mini Stem Plug - 6015	50.00 ea	0.00
D0120	Other-Drilling Charges	1,250.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,577.00

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-26

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/03/2016 10:06

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: mini white seis			
Date: 06/03/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: --- mm/s	--- Hz
Time: 10:06	Calibration Date: 07/07/15		Vertical: --- mm/s	--- Hz
Distance From Blast: 2,025.70 m	Calibration Signal:		Longitudinal: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz		Acoustic: --- dB	
Location: In front yard			Vector Sum: --- mm/s	
Lat./Long.: 42° 53' 37.200" N		79° 16' 1.800" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 06/03/16	Trigger Level: 1.01 mm/s	120.00 dB	Transverse: 3.93 mm/s	30.1 Hz
Time: 10:06	Calibration Date: 09/18/15		Vertical: 1.77 mm/s	46.5 Hz
Distance From Blast: 576.99 m	Calibration Signal:		Longitudinal: 5.33 mm/s	46.5 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 112 dB	
Location:			Vector Sum: 5.46 mm/s	
Lat./Long.: 42° 53' 29.800" N		79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June 03/16

Location in Quarry: *Mandy*
East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *June 3-19*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 06/06/01
MO DA

COMPANY (PERMITTEE) Law Quarry

LOCATION Gray Benefit

TYPE OF MATERIAL BLASTED Lime Stone

HOLE DIAMETER 4

NO. OF HOLES 51

NO. OF ROWS 3

BURDEN 13

SPACING 13

DEPTH 25

FACE HEIGHT 25

LENGTH OF STEMMING 5
(COLLAR)

EXPLOSIVES

TOTAL QUANTITY

40' Dura Detry

51

CONVERSIONS

1 mm = 0.03937 in

1 in = 25.4 mm

1 m = 3.28 ft

1 ft = 0.3048 m

1 m³ = 35.32 ft³

1 ft³ = 0.0283168 m³

1 m³ = 1.308 yd³

1 yd³ = 0.764555 m³

1 yd³ = 27 ft³

1 ft³ = 0.37037 yd³

1 kg = 2.2046 lb

1 lb = 0.454 kg

1 tonne = 1.1023 ton

1 ton = 0.907185 tonne

1 tonne/m³ = 0.842777 ton/yd³

1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER BLACK CAP 51

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3083

WEIGHT OF EXPLOSIVES PER HOLE 60

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

DELAY DETONATORS USED (TYPE) _____

(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

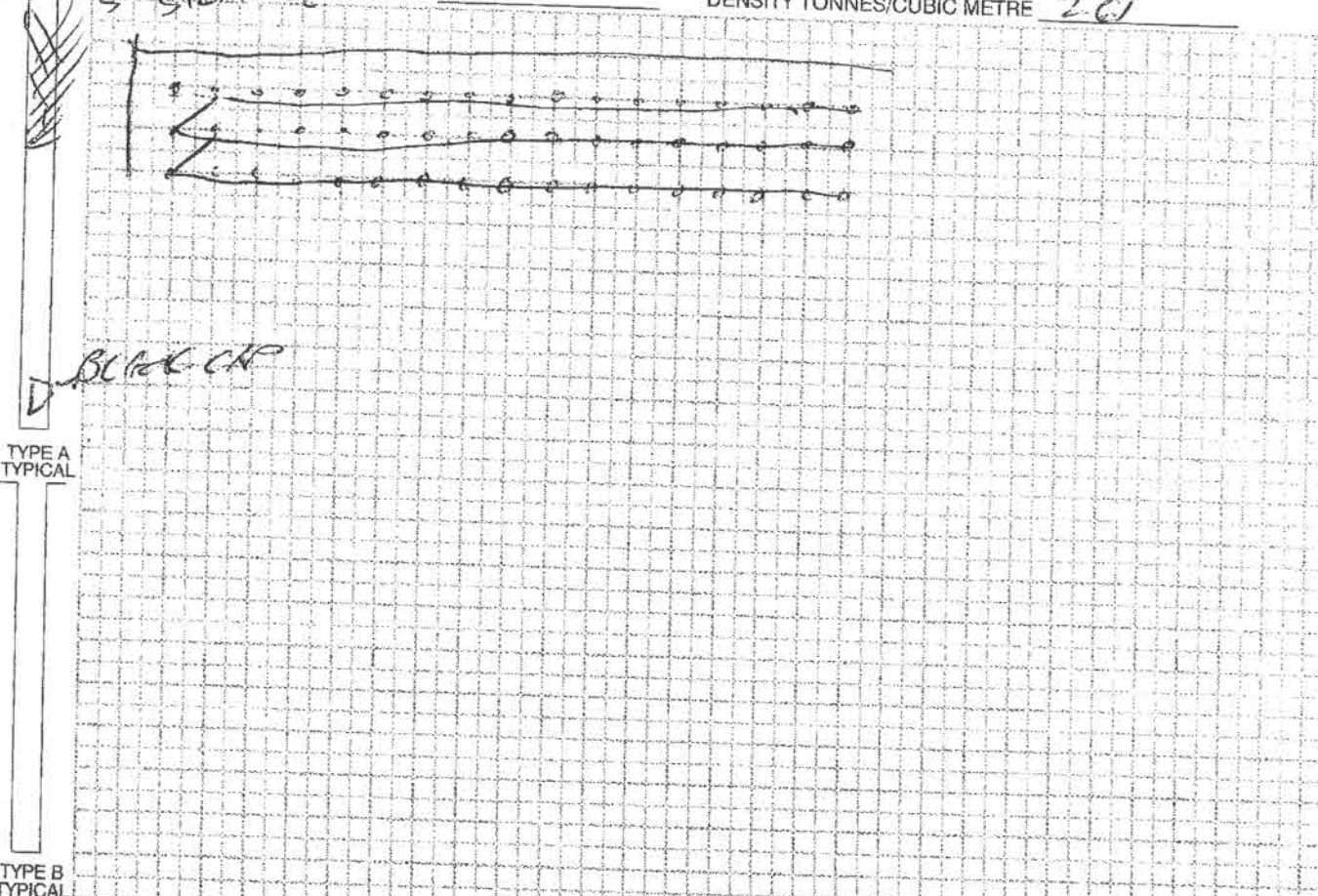
TOTAL NO. TONNES PRODUCED 15 922

OR TOTAL CUBIC METRES PRODUCED 6100

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5

SKETCH STEMMING KG/TONNE _____

DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES

92ms BETWEEN ROWS

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-27

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/06/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 22 °C

Terrain: Flat

Wind Velocity: 20-25 km/h

Blast Lat./Long.: 42° 53' 48.299" N 79° 17' 29.799" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 348 °

Distance: 691 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,101.6 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	52.7 kg	Weight Produced:	15,927.7 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	6.108 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	52.7 kg	Powder Factor 2:	0.427 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	95.14	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	95.14		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: **No** Misfire Occurred: **No** Protective Cover: **Loader Bucket**

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
KENNEY	DAVID, L			No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-27

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/06/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	2,590.00 kg	2,590.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,607.34

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-27

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/06/2016 10:40

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 06/06/16 Trigger Level: 1.01 mm/s 120.00 dB Transverse: 2.79 mm/s 64.0 Hz
Time: 10:40 Calibration Date: 09/18/15 Vertical: 2.03 mm/s 46.5 Hz
Distance From Blast: 576.99 m Calibration Signal: Longitudinal: 4.31 mm/s 85.3 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 100 dB
Location: Vector Sum: 4.31 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type: Seismic Record Seismograph Type: mini white seis
Date: 06/06/16 Trigger Level: 1.01 mm/s --- dB Transverse: 1.52 mm/s 42.6 Hz
Time: 10:40 Calibration Date: 07/07/15 Vertical: 2.03 mm/s 46.5 Hz
Distance From Blast: 2,025.70 m Calibration Signal: Longitudinal: 4.31 mm/s 85.3 Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 94 dB
Location: In front yard Vector Sum: 1.52 mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June 15/16

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	15912.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

June 15/2016

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-28

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/15/2016 10:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.	Weather: Clear	Wind From: SSE
Temperature: 22 °C	Terrain: Flat	Wind Velocity: 1-5 km/h
Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 34.400" W		

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd	Compass Point: N
Structure Type: Dwelling	Direction/Bearing: 357 °
Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W	Distance: 712 m

LAYOUT

Hole Depth: 7.62 m	Material Blasted: Limestone	Total Meters Drilled: 388.6 m
No. of Holes: 51	Subdrilling: 0.00 m	Burden: 3.96 m
No. of V.P.† Holes: 51	Face Height: 7.62 m	Spacing: 3.96 m
No. of Rows: 3	Drilling Angle: 0 °	Back Fill Depth: 0.00 m
Diameter: 101.6 mm	Mats Used: No	Stem Type: 3/4" Clear Stone
		Water Depth: 0.00 m
		Stem Length: 1.83 m
		Area Type: Conventional
		Method: Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks: 118.7 kg	Volume Produced: 6,101.6 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval: 118.7 kg	Weight Produced: 15,927.7 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval: 2	Powder Factor 1: 5.262 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole: 59.4 kg	Powder Factor 2: 0.496 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge): 92.37	Rock Density: 2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay): 65.32	

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-28

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/15/2016 10:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	6.00 ea	0.00
07602	Hydromite 4100 Bulk	3,010.00 kg	3,010.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,027.34

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-28

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/15/2016 10:07

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: ---
Date: 06/15/16 Trigger Level: 1.01 mm/s --- dB Transverse: --- mm/s --- Hz
Time: 10:07 Calibration Date: 07/07/15 Vertical: --- mm/s --- Hz
Distance From Blast: 2,123.54 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: In front yard Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 06/15/16 Trigger Level: 1.01 mm/s 120.00 dB Transverse: 3.17 mm/s 52.0 Hz
Time: 10:07 Calibration Date: 09/18/15 Vertical: 2.66 mm/s 35.3 Hz
Distance From Blast: 568.76 m Calibration Signal: Longitudinal: 3.42 mm/s 52.2 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 94 dB
Location: Vector Sum: 4.69 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 06/15/16

COMPANY (PERMITTEE) LAW Quarry LOCATION CRAY

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4

NO. OF HOLES 51 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING (COLLAR) 6

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>40' Quik decay</u>	<u>51</u>	1 ml = 0.03937 in	1 ft = 25.4 mm
<u>20' Quik decay 42</u>	<u>36</u>	1 m = 3.28 ft	1 ft = 0.3048 m
<u>20' Quik decay 67</u>	<u>5</u>	1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
<u>4000 Dynamite</u>		1 m ² = 1.308 yd ²	1 yd ³ = 0.765565 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1985 tonne/m ³

TYPE OF PRIMER _____

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3093 WEIGHT OF EXPLOSIVES PER HOLE 60 kg

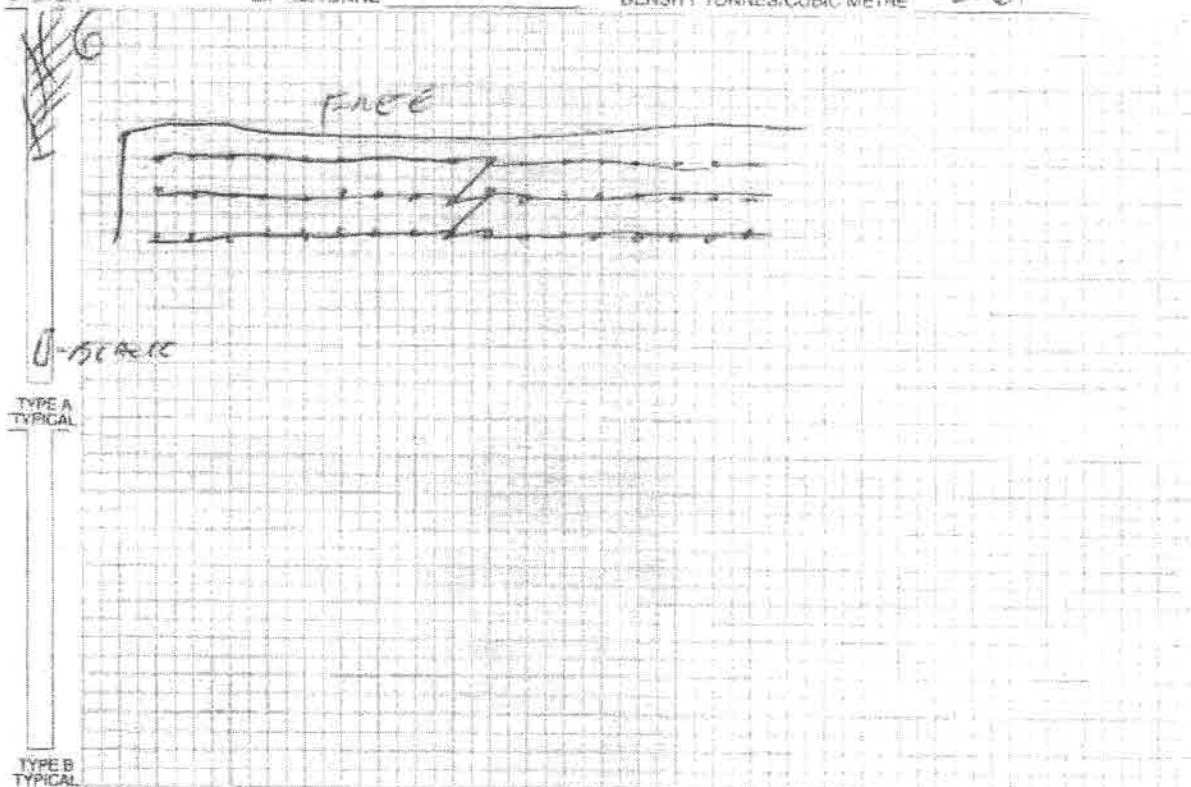
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

DELAY DETONATORS USED (TYPE) _____ (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 15 427 OR TOTAL CUBIC METRES PRODUCED 6100

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5

SKETCH KG/TONNE _____ DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS
104 BETWEEN ROWS

POST-BLAST COMMENTS: PIT FOREMAN TO CLEAR PIT
FOR BLAST

BLASTER IN CHARGE: [Signature]
PRINT _____
SIGNATURE _____

TYPE OF PROTECTIVE COVER USED

STEEL SHELTER OFF HIGHWAY TRUCK

BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: June 27/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	120.0
						Tonnes/Hole:	312.0
						Total Tonnes:	15912.0
Material Blasted:	Limestone		Explosive / Hole:		57.0 kg	126.0 lb	
Density:	2.61 t/m ³			Max. kg. / Delay:	57.0 kg	126.0 lb	
Max Holes / Delay:	1			Distance to Seis.:	← m →	← ft →	

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved:

Date:

June 27/16



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-29

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/27/2016 12:57

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NE

Temperature: 24 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 34.400" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 357 °

Structure Type: Dwelling

Distance: 712 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	381.0 m
No. of Holes:	50	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	50	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	111.1 kg	Volume Produced:	5,982.0 m³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	111.1 kg	Weight Produced:	15,615.4 t
Other Method: remote blasting	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.624 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	55.5 kg	Powder Factor 2:	0.464 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	95.50	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	67.53		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
DEBOER	GARY, B			No	No	No	No	No
EDDY	MATTHEW, A			No	Yes	No	No	No
LI	JACKSON, A			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-29

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/27/2016 12:57

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	50.00 ea	17.01
10282	40' SHOCK*STAR Dual-Delay 25/475	50.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	11.00 ea	0.00
07602	Hydromite 4100 Bulk	2,760.00 kg	2,760.00
12981	Mini Stem Plug - 6015	50.00 ea	0.00
D0120	Other-Drilling Charges	1,250.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,777.01

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-29

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 06/27/2016 12:57

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

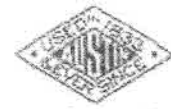
Data Type:	Seismic Record	Seismograph Type:	Mini White Seis			
Date:	06/27/16	Trigger Level:	1.01 mm/s	120.00 dB	Transverse:	0.2 mm/s 51.2 Hz
Time:	12:57	Calibration Date:	09/18/15		Vertical:	0.461 mm/s 42.7 Hz
Distance From Blast:	568.76 m	Calibration Signal:			Longitudinal:	1.16 mm/s 36.6 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s --- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	102 dB
Location:					Vector Sum:	--- mm/s
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis			
Date:	06/27/16	Trigger Level:	--- mm/s	--- dB	Transverse:	3.81 mm/s 42.6 Hz
Time:	12:57	Calibration Date:	09/18/15		Vertical:	1.9 mm/s 42.6 Hz
Distance From Blast:	744.32 m	Calibration Signal:			Longitudinal:	5.33 mm/s 34.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s --- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	106 dB
Location:					Vector Sum:	0.46 mm/s
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE 1/24/70
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Grey
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 50 NO. OF ROWS 3 BURDEN 13
 SPACING 13 DEPTH 25 FACE HEIGHT 25 LENGTH OF STEMMING (COLLAR) 65

EXPLOSIVES	TOTAL QUANTITY
<u>H-4100</u>	<u>3000</u>
<u>Black Cap Booster</u>	<u>50</u>
<u>40 Ft OD</u>	<u>50</u>
<u>67ms OR</u>	<u>5</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ² = 35.32 ft ²	1 ft ² = 0.092903 m ²
1 m ³ = 1.358 yd ³	1 yd ³ = 0.764555 m ³
1 yd ² = 27 ft ²	1 ft ² = 0.076537 m ²
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.942777 ton/yd ³	1 ton/yd ³ = 1.0566 tonne/m ³

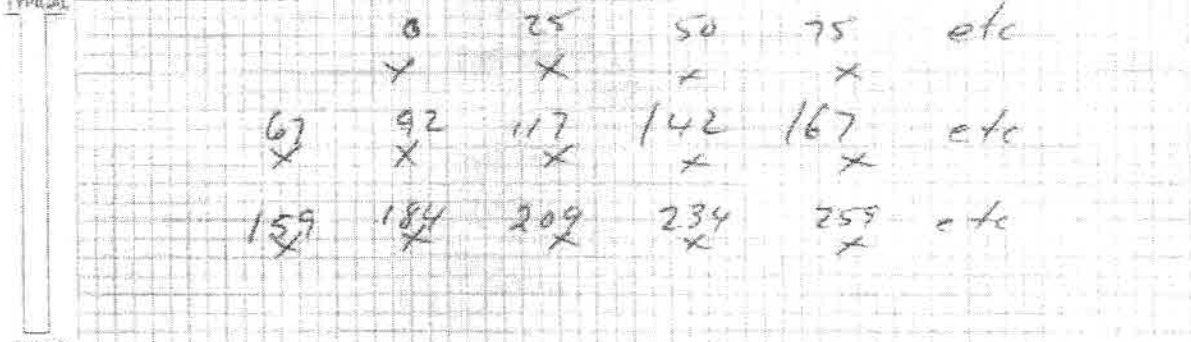
TYPE OF PRIMER 3/4 lb cast
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3000 WEIGHT OF EXPLOSIVES PER HOLE 60
 TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) 25/500, 67ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 15558 OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE _____
 SKETCH TONNE 0.193 DENSITY TONNES/CUBIC METRE 2.6

6.5 ft clear stone

H-4100 60kg
 18 SET
 40 Ft OD
 + Black Cap Booster

TYPE A TYPICAL



TYPE B TYPICAL

PRE-BLAST COMMENTS: 25ms between holes
92ms between rows

POST-BLAST COMMENTS _____

BLASTER IN CHARGE _____ PRINT _____ SIGNATURE _____
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUCKET OF LOADEN SHOVEL OTHER PLEASE DESCRIBE _____



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Mar,15/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	110	Hole Depth:	15.5	4.72	Burden:	8.0	2.44
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52
Diameter in:	3.5						
		m ³ / Hole:					28.2
		Tonnes/Hole:					73.3
		Total Tonnes:					8063.0

Material Blasted: Limestone Explosive / Hole: 24.0 kg 52.5 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 24.0 kg 52.5 lb
 Max Holes / Delay: 1 Distance to Seis.: _____ m _____ ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	110 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5775.0	2640.0

Miscellaneous:

Comments:

Approved:

Date:

Mar 14, 2016



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 03/15/16
MO DA YR

COMPANY (PERMITTEE) LAW & CRUSHED STONE. LOCATION BOTTOM BENCH.

TYPE OF MATERIAL BLASTED LIME STONE. HOLE DIAMETER 3.5

NO. OF HOLES 110 NO. OF ROWS 4 BURDEN 8

SPACING 8 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING 5.5
(COLLAR)

EXPLOSIVES TOTAL QUANTITY

30' Quick Delay NO 114

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1808 tonne/m ³

TYPE OF PRIMER BLACK CAP NO. 114

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2500 KG WEIGHT OF EXPLOSIVES PER HOLE 22 KG

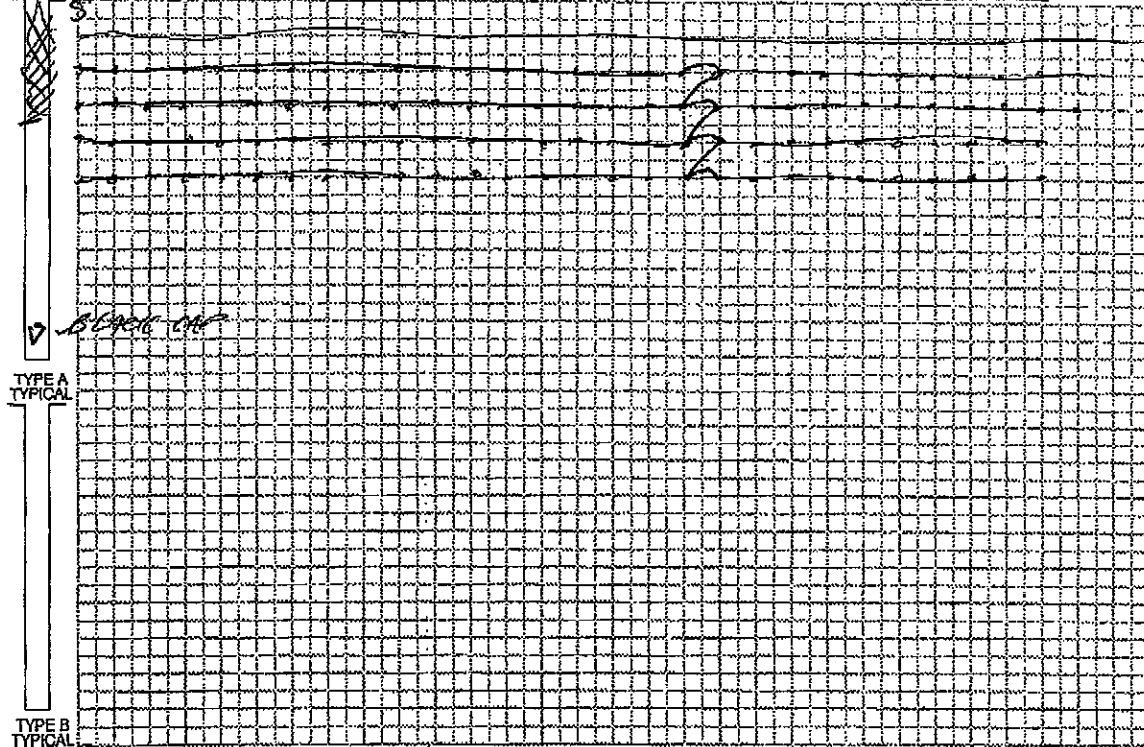
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) 20' Quick Delay 42ms
20' Quick Delay 67ms

TOTAL NO. TONNES PRODUCED 9263 OR TOTAL CUBIC METRES PRODUCED 3089

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.8

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
84ms BETWEEN ROWS.

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE JORDAN DAVIS
SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/15/2016 11:49

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Light Rain

Wind From: NNE

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 56.500" N 79° 17' 32.200" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 348 °

Distance: 432 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	538.6 m
No. of Holes:	114	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P.† Holes:	114	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	74.2 kg	Volume Produced:	3,202.3 m³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	74.2 kg	Weight Produced:	8,359.3 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.966 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	24.7 kg	Powder Factor 2:	0.880 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	86.92	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	50.19		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway		Maple Leaf Drilling		No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/15/2016 11:49

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	114.00 ea	38.77
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	114.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	8.00 ea	0.00
11776	Hydromite 4100-NP	2,780.00 kg	2,780.00
12981	Mini Stem Plug - 6015	112.00 ea	0.00
D0120	Other-Drilling Charges	1,767.50 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,818.77

COMMENTS / EXPLANATIONS

John Jones

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/15/2016 11:49

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: Mini White Seis

Date: 03/15/16 Trigger Level: --- mm/s --- dB Transverse: 3.68 mm/s 36.5 Hz

Time: 11:49 Calibration Date: 09/18/15 Vertical: 1.9 mm/s 23.2 Hz

Distance From Blast: 502.62 m Calibration Signal: Longitudinal: 3.04 mm/s 26.9 Hz

Direction From Blast: NW Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 114 dB

Location: Vector Sum: 4.19 mm/s

Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Reader and Firm: Nick Farrer, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis

Date: 03/15/16 Trigger Level: --- mm/s --- dB Transverse: 2.54 mm/s 46.5 Hz

Time: 11:49 Calibration Date: 02/04/16 Vertical: 0.88 mm/s 39.3 Hz

Distance From Blast: 835.46 m Calibration Signal: Longitudinal: 1.27 mm/s 26.9 Hz

Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 94 dB

Location: Vector Sum: 2.54 mm/s

Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W

Reader and Firm: Nick Farrer, AUSTIN POWDER

Analyst and Firm:

Installer and Firm:

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Mar,17/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	100	Hole Depth:	15.5	4.72	Burden:	8.0	2.44
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52
Diameter in:	3.5					m ³ / Hole:	28.2
Material Blasted:	Limestone					Tonnes/Hole:	73.3
Density:	2.61 t/m ³					Total Tonnes:	7330.0
Max Holes / Delay:	1						
		Explosive / Hole:		24.0 kg			52.5 lb
		Max. kg. / Delay:		24.0 kg			52.5 lb
		Distance to Seis.:		m			ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft/hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5250.0	2400.0

Miscellaneous:

Comments:

Approved: *[Signature]*

Date: Mar 16/16

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Mar,17/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres			Feet	Metres		
# Holes:	112	Hole Depth:	15.5	4.72	Burden:	8.0	2.44	m ³ / Hole:	28.2
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44	Tonnes/Hole:	73.3
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52	Total Tonnes:	8210.0
Diameter in:	3.5								

Material Blasted:	Limestone	Explosive / Hole:	24.0	kg	52.5	lb	
Density:	2.61	t/m ³	Max. kg. / Delay:	24.0	kg	52.5	lb
Max Holes / Delay:	1		Distance to Seis.:		m		ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	112 100' -	33ms -			Green Cap (1/4 lb) -
40' -					112

	Pt / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5880.0	2688.0

Miscellaneous:

Comments:

If conditions are good, we will blast two shots.

Approved:

Date: Mar. 16 / 16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 03/17/16
MO DA YR

COMPANY (PERMITTEE) WATER FORD SAND & GRAVEL LOCATION Bayton Bench

TYPE OF MATERIAL BLASTED LIME STONE HOLE DIAMETER 3.5

NO. OF HOLES 100 NO. OF ROWS 4 BURDEN 8

SPACING 4 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING 5
(COLLAR)

EXPLOSIVES TOTAL QUANTITY

30' Dura Detry 2500 150

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1888 tonne/m ³

TYPE OF PRIMER ORANGE CAP 100

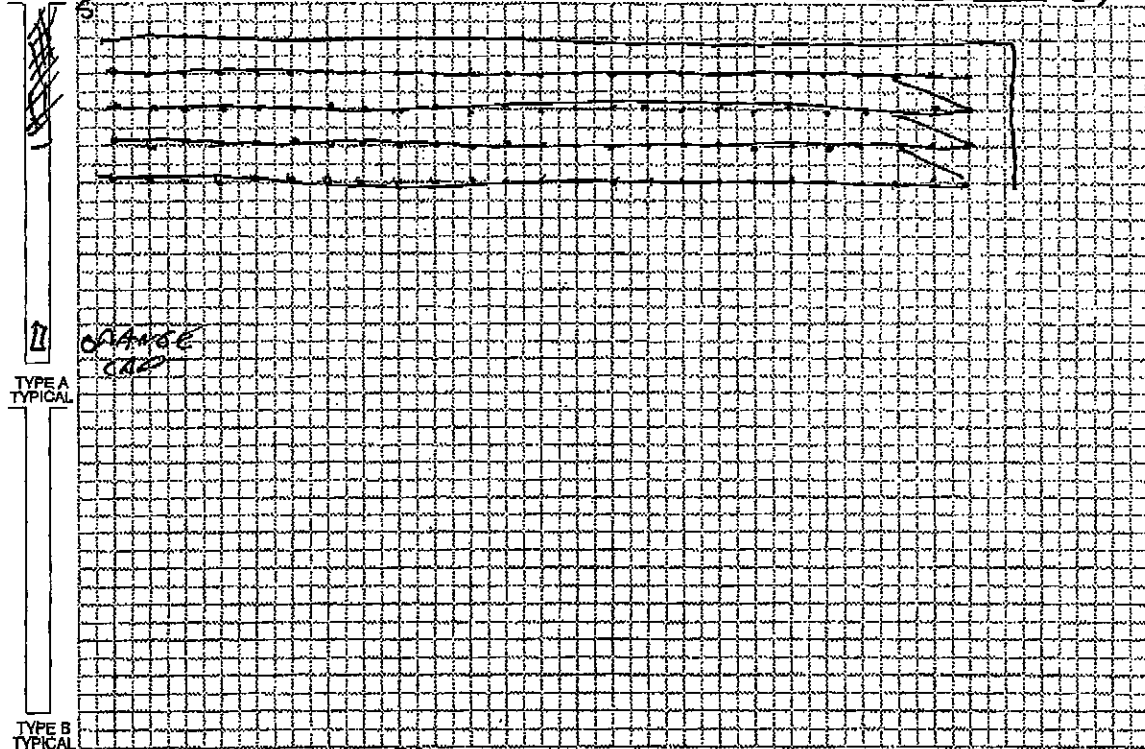
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2386 WEIGHT OF EXPLOSIVES PER HOLE 23

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
DELAY DETONATORS USED (TYPE) 4 hrs Dura Detry (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 800.2 OR TOTAL CUBIC METRES PRODUCED 3066

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.7

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 800.2/3066 = 2.61



PRE-BLAST COMMENTS: 25' ANS BETWEEN ROWS
92' ANS BETWEEN ROWS

POST-BLAST COMMENTS: PUT FILL ON TO CLEAR PIT FOR BLAST TIME

BLASTER IN CHARGE Jordan Davis
PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED

- STEEL SHELTER
- OFF HIGHWAY TRUCK
- BUCKET OF LOADER / SHOVEL
- OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 03/17/16
MO DA YR

COMPANY (PERMITTEE) LAW SAND & GRAVEL LOCATION BOTTOM BENCH.

TYPE OF MATERIAL BLASTED LIME STONE HOLE DIAMETER 3.5

NO. OF HOLES 112 NO. OF ROWS 4 BURDEN 4

SPACING 4 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES TOTAL QUANTITY

30' Quick RELAY 257600 112

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER ORANGE CAP 112

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2576 WEIGHT OF EXPLOSIVES PER HOLE 23

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE

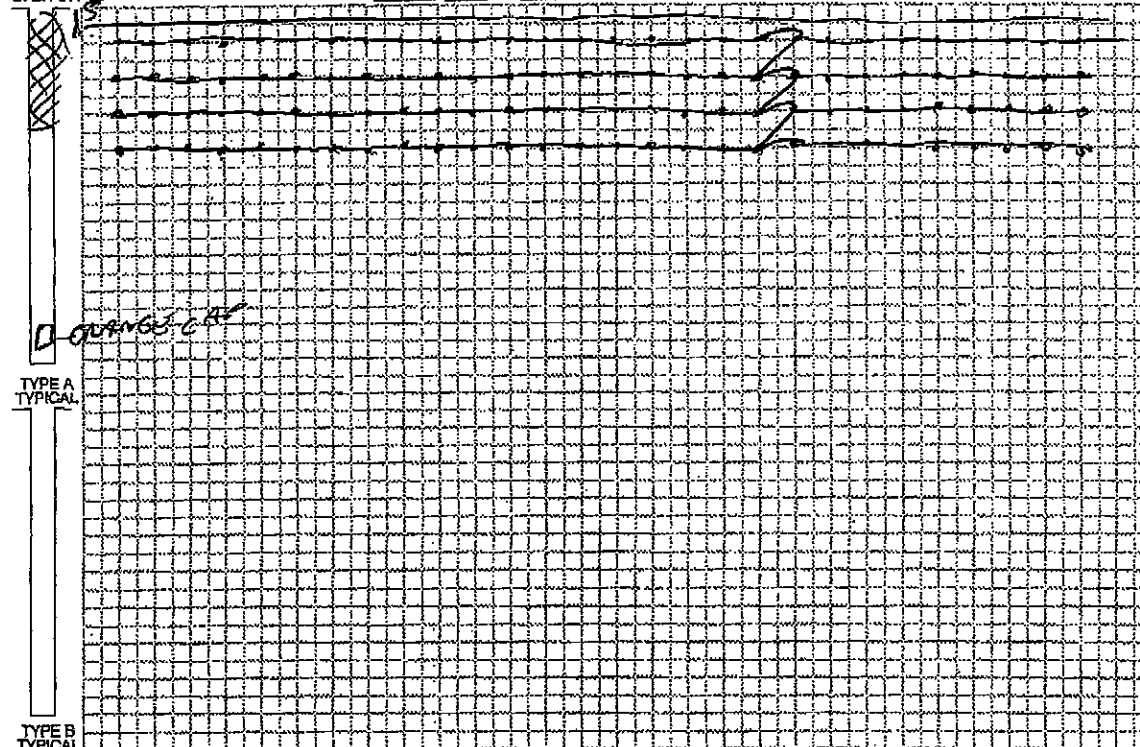
DELAY DETONATORS USED (TYPE) C7 Quick RELAY EXPLAINED AND IDENTIFIED IN SKETCH.)

42ms Quick RELAY

TOTAL NO. TONNES PRODUCED 9210 OR TOTAL CUBIC METRES PRODUCED 3145

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.7

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS
42ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FORMAN TO CLEAR PIT
FOR BLAST TIME.

BLASTER IN CHARGE SORDAN PARIS
PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/17/2016 09:55

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SSW

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 52.600" N 79° 17' 32.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 351 °

Structure Type: Dwelling

Distance: 550 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	491.3 m
No. of Holes:	104	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P.† Holes:	104	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	4.72 m
				Stem Length:	1.52 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	55.3 kg	Volume Produced:	2,921.4 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	55.3 kg	Weight Produced:	7,626.0 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	2.650 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	27.7 kg	Powder Factor 2:	0.985 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	104.54	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	73.92		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
BURNIE	BRANDON, A			No	Yes	Yes	No	No	
LI	JACKSON, A			No	Yes	No	No	No	
VANDENBUSSC HE	MICHAEL, J			No	Yes	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer				Maple Leaf Drilling	No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/17/2016 09:55

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11744	Orange Cap DC - 454g (1 lb)	104.00 ea	47.16
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	104.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11235	Hydromite 4600 Bulk	2,830.00 kg	2,830.00
12981	Mini Stem Plug - 6015	104.00 ea	0.00
D0120	Other-Drilling Charges	1,546.50 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,877.16

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/17/2016 09:55

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/17/16	Trigger Level:	--- mm/s	--- dB	Transverse:	1.14 mm/s	36.5 Hz
Time:	09:55	Calibration Date:	09/18/15		Vertical:	1.27 mm/s	36.5 Hz
Distance From Blast:	604.72 m	Calibration Signal:			Longitudinal:	1.14 mm/s	30.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	118 dB	
Location:					Vector Sum:	1.39 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	No Trigger	Seismograph Type:	Mini White Seis				
Date:	03/17/16	Trigger Level:	1.01 mm/s	120.00 dB	Transverse:	--- mm/s	--- Hz
Time:	09:55	Calibration Date:	02/04/16		Vertical:	--- mm/s	--- Hz
Distance From Blast:	718.41 m	Calibration Signal:			Longitudinal:	--- mm/s	--- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:		Mic. Min. Freq.:	--- Hz		Acoustic:	--- dB	
Location:					Vector Sum:	--- mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/17/2016 12:24

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SSE

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 56.899" N 79° 17' 32.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 349 °

Structure Type: Dwelling

Distance: 419 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	529.1 m
No. of Holes:	112	Subdrilling:	0.00 m	Burden:	2.44 m
No. of V.P. † Holes:	112	Face Height:	4.72 m	Spacing:	2.44 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	Crushed Stone
				Water Depth:	4.72 m
				Stem Length:	1.52 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	72.3 kg	Volume Produced:	3,146.1 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	72.3 kg	Weight Produced:	8,212.7 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	3.044 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	24.1 kg	Powder Factor 2:	0.858 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	85.32	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	49.26		

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 03/17/16	Trigger Level: --- mm/s	--- dB	Transverse:	2.28 mm/s 26.9 Hz
Time: 12:24	Calibration Date: 09/18/15		Vertical:	1.52 mm/s 32.0 Hz
Distance From Blast: 488.59 m	Calibration Signal:		Longitudinal:	1.77 mm/s 25.6 Hz
Direction From Blast: NW	Geophone Min. Freq.: --- Hz		PPV:	--- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic:	112 dB
Location:			Vector Sum:	2.54 mm/s
Lat./Long.: 42° 54' 10.240" N	79° 17' 44.100" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/17/2016 12:24

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
BURNIE	BRANDON, , A			No	Yes	No	No	No
LI	JACKSON, A			No	No	No	No	No
VANDEBUSSC HE	MICHAEL, J			No	No	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer		Maple Leaf Drilling		No	No	No	Yes	Yes

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11744	Orange Cap DC - 454g (1 lb)	112.00 ea	50.79
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	112.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	8.00 ea	0.00
11235	Hydromite 4600 Bulk	2,648.00 kg	2,648.00
12981	Mini Stem Plug - 6015	112.00 ea	0.00
D0120	Other-Drilling Charges	1,743.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,698.79

COMMENTS / EXPLANATIONS

Jordan Davis

Signature of Blaster in Charge

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Mar,21/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres	Feet	Metres				
# Holes:	104	Hole Depth:	15.5	4.72	Burden:	8.0	2.44	m ³ / Hole:	28.2
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44	Tonnes/Hole:	73.3
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52	Total Tonnes:	7623.0
Diameter in:	3.5								
Material Blasted:	Limestone		Explosive / Hole:		24.0	kg	52.5	lb	
Density:	2.61	v/m ³	Max. kg. / Delay:		24.0	kg	52.5	lb	
Max Holes / Delay:	1		Distance to Seis.:						ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	104 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5408.0	2496.0

Miscellaneous:

Comments:

Approved:  Date: Mar 21/16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 03/22/16

COMPANY (PERMITTEE) LAW CRUSHED STONE LOCATION BOTTOM BENCH

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5

NO. OF HOLES 1095 NO. OF ROWS 4 BURDEN 8

SPACING 6 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING (COLLAR) 4.5

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS
<u>30' Dual Delay 25/500</u>	<u>1095 1095</u>	1 mm = 0.03937 in 1 m = 3.28 ft 1 m ³ = 35.32 ft ³ 1 m ³ = 1.308 yd ³ 1 yd ³ = 27 ft ³ 1 kg = 2.2046 lb 1 tonne = 1.1023 ton 1 tonne/m ³ = 0.842777 ton/yd ³
		1 in = 25.4 mm 1 ft = 0.3048 m 1 ft ³ = 0.0283168 m ³ 1 yd ³ = 0.764555 m ³ 1 ft ³ = 0.37037 yd ³ 1 lb = 0.454 kg 1 ton = 0.907185 tonne 1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER ORANGE CAP 1095

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2725 WEIGHT OF EXPLOSIVES PER HOLE 25

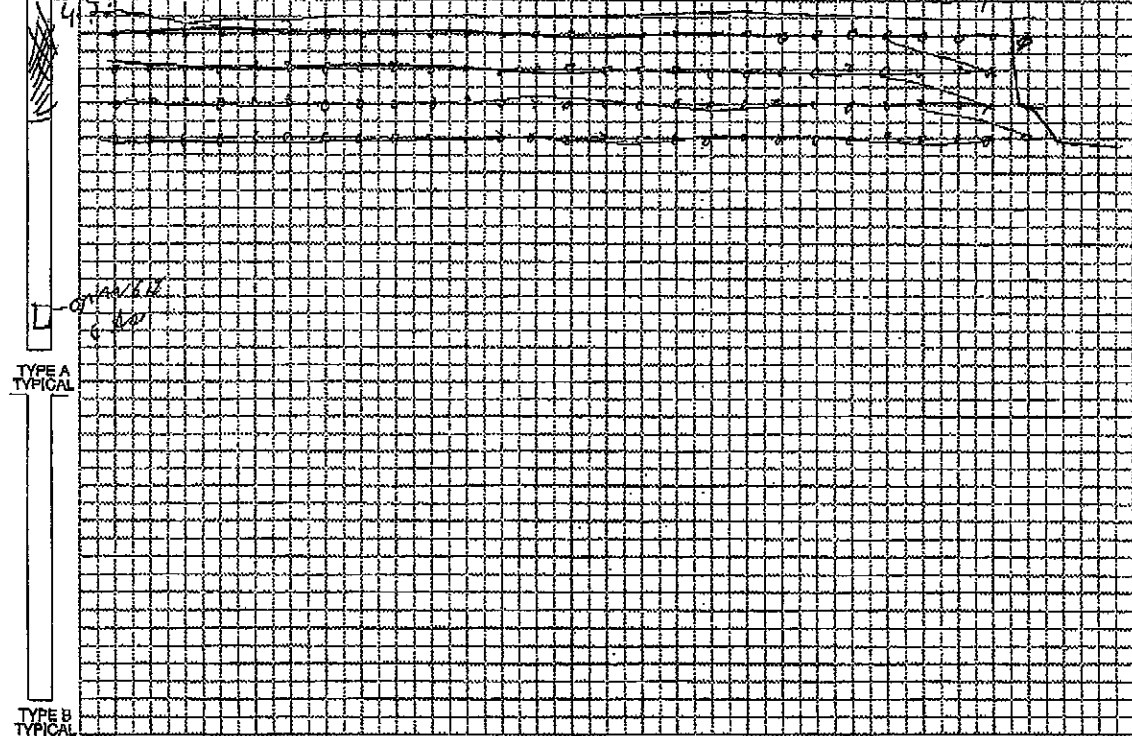
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

DELAY DETONATORS USED (TYPE) 30' Dual Delay 17ms (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 7696 OR TOTAL CUBIC METRES PRODUCED 3061

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.4 (3411)

SKETCH: KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FORMAN TO CLEAR PIT FOR BLAST TIME

BLASTER IN CHARGE JORDAN DAVIS PRINT

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2016 14:28

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: ENE

Temperature: 3 °C

Terrain: Flat

Wind Velocity: 5-1 km/h

Blast Lat./Long.: 42° 53' 54.500" N 79° 17' 32.600" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 351 °

Distance: 491 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	496.2 m
No. of Holes:	105	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	105	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	51.2 kg	Volume Produced:	3,223.4 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	51.2 kg	Weight Produced:	8,414.3 t
Other Method: EStar Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	3.130 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	25.6 kg	Powder Factor 2:	0.834 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	97.12	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	68.67		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
BURNIE	BRANDON, A			No	Yes	Yes	No	No	
LI	JACKSON, A			No	No	No	No	No	
VANDENBUSSCHE	MICHAEL, J			No	Yes	Yes	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Nick Farrer				Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE

(LAW1000-001)

Date/Time: 03/21/2016 14:28

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11744	Orange Cap DC - 454g (1 lb)	105.00 ea	47.62
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	105.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	7.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
11235	Hydromite 4600 Bulk	2,640.00 kg	2,640.00
12981	Mini Stem Plug - 6015	105.00 ea	0.00
D0120	Other-Drilling Charges	1,621.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,687.62

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2016 14:28

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	26	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P.† Holes:	26	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	1,004.2 m ³
† V.P. = Volume Producing						Total weight for pattern:	2,621.5 t

Pattern: 2

No. of Holes:	79	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P.† Holes:	79	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	3	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,219.1 m ³
† V.P. = Volume Producing						Total weight for pattern:	5,792.9 t

Total blast volume: 3,223.4 m³
Total weight produced: 8,414.3 t



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2016 14:28

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/21/16	Trigger Level:	--- mm/s	--- dB	Transverse:	1.52 mm/s	46.5 Hz
Time:	14:28	Calibration Date:	09/18/15		Vertical:	1.27 mm/s	28.4 Hz
Distance From Blast:	551.38 m	Calibration Signal:			Longitudinal:	1.14 mm/s	24.3 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	94 dB	
Location:					Vector Sum:	1.77 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/21/16	Trigger Level:	1.01 mm/s	120.00 dB	Transverse:	3.42 mm/s	36.5 Hz
Time:	14:28	Calibration Date:	02/04/16		Vertical:	1.27 mm/s	64.0 Hz
Distance From Blast:	776.33 m	Calibration Signal:			Longitudinal:	2.03 mm/s	64.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	106 dB	
Location:					Vector Sum:	3.42 mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Mar,23/16

Location in Quarry: Lower Brown Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	112	Hole Depth:	15.5	4.72	Burden:	8.0	2.44
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52
Diameter in:	3.5						
Material Blasted:		Limestone		Explosive / Hole:		24.0	kg
Density:		2.61 t/m ³		Max. kg. / Delay:		24.0	kg
Max Holes / Delay:		1		Distance to Seis.:		m	ft
				Explosive / Hole:		52.5	lb
				Max. kg. / Delay:		52.5	lb
				Distance to Seis.:		m	ft


Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	112 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		5680.0	2688.0

Miscellaneous:

Comments: If conditions are good, we will blast two shots.

Approved: 

Date: Mar 23 / 16



AUSTIN POWDER LTD. BLAST DESIGN

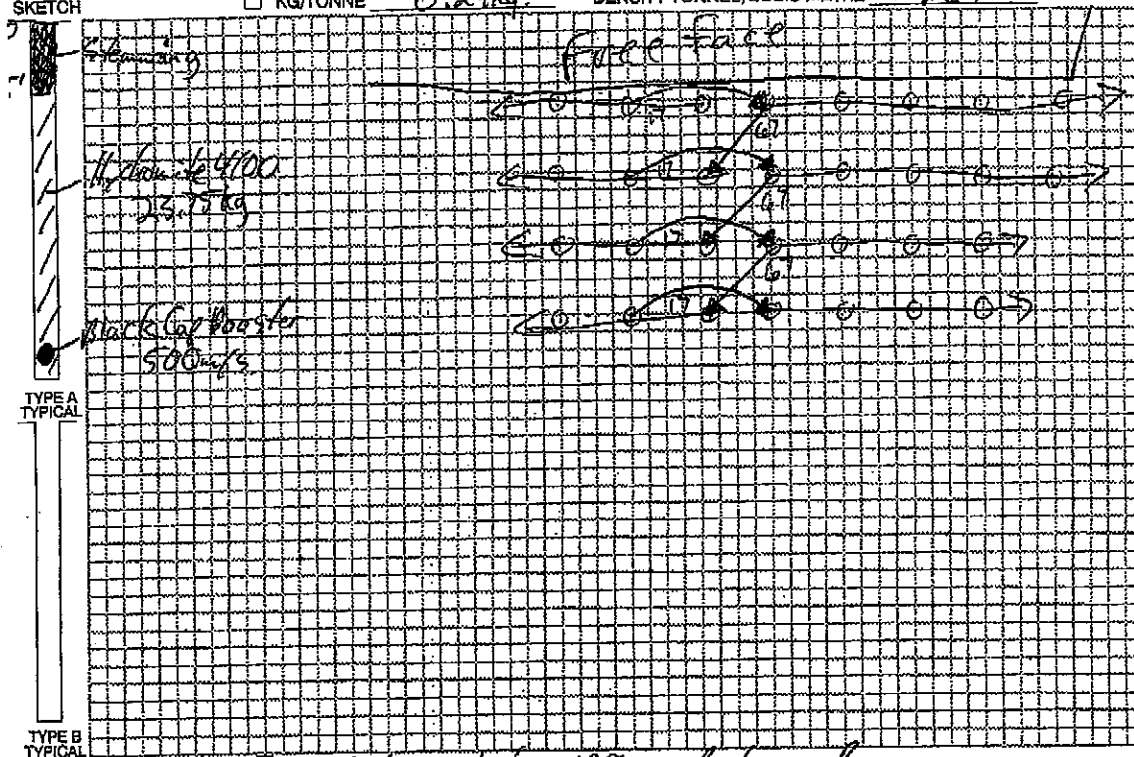


SHOT NO. 2016-08 DATE: 3/23/16
 COMPANY (PERMITTEE) Law Crushed Stone LOCATION Bottom Bench East wall
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5"
 NO. OF HOLES 110 NO. OF ROWS 4 BURDEN 11 7/8'
 SPACING 8' DEPTH 15.5' FACE HEIGHT 15.5' LENGTH OF STEMMING (COLLAR) 5'

EXPLOSIVES	TOTAL QUANTITY
<u>30' Dual Delay 25/500</u>	<u>110</u>
<u>20' Quick Relay 67m/s</u>	<u>4</u>
<u>30' Quick Relay 17m/s</u>	<u>4</u>
<u>Hydramite 4100</u>	<u>2613 kg</u>

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2048 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.942777 ton/yd ³	1 ton/yd ³ = 1.1886 tonne/m ³

TYPE OF PRIMER Black Cap Booster 110
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 23.75 kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay
 TOTAL NO. TONNES PRODUCED 4850 tonnes OR TOTAL CUBIC METRES PRODUCED 3391 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.77 kg
 SKETCH KG/TONNE 0.29 kg DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25m/s Between holes, 109m/s Between Rows.
Quarry to be cleared by foreman prior to blast time
 POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Avron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/23/2016 10:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench East Wall

ENVIRONMENT

Method Used: Lat./Long.

Weather: Light Rain

Wind From: W

Temperature: 4 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 56.200" N 79° 17' 31.400" W

NEAREST PROTECTED STRUCTURE

Compass Point: NW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 326 °

Structure Type: Dwelling

Distance: 520 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	519.7 m
No. of Holes:	110	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P.† Holes:	110	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	1.22 m
				Stem Length:	1.52 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	80.1 kg	Volume Produced:	3,384.9 m³
Firing Device: Wireless Remote Firing Device	Max. Wt. of Expl. Per 8 ms Interval:	80.1 kg	Weight Produced:	8,836.1 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	3.008 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	26.7 kg	Powder Factor 2:	0.868 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	100.69	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	58.13		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BURNIE	BRANDON, A			No	Yes	Yes	No	No
DAVIS	JORDAN, T	* ON - N/A	* ON - N/A	No	Yes	No	No	No
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]	* ON - 278B-454071 [12/31/2099]	No	No	No	No	No
LI	JACKSON, A			No	No	No	No	No
Other Crew Members				In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Rupert				No	No	No	Yes	Yes

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No: 2016-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/23/2016 10:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench East Wall

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	110.00 ea	37.41
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	110.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	8.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	2,900.00 kg	2,900.00
12981	Mini Stem Plug - 6015	110.00 ea	0.00
D0120	Other-Drilling Charges	1,705.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,937.41

COMMENTS / EXPLANATIONS

Daron Merritt

Signature of Blaster in Charge

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/23/2016 10:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench East Wall

Pattern: 1

No. of Holes:	28	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P. [†] Holes:	28	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Specified
No. of Rows:	1	Face Height:	4.72 m				(H = 4.72 m)
Drilling Angle:	0 °					Total volume for pattern:	1,081.5 m ³
						Total weight for pattern:	2,823.1 t ✓

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	82	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P. [†] Holes:	82	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Specified
No. of Rows:	3	Face Height:	4.72 m				(H = 4.72 m)
Drilling Angle:	0 °					Total volume for pattern:	2,303.4 m ³
						Total weight for pattern:	6,012.8 t ✓

† V.P. = Volume Producing

Total blast volume: 3,384.9 m³
Total weight produced: 8,836.0 t

AUSTIN POWDER LTD.**BLAST REPORT**

310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE

(LAW1000-003)

Date/Time: 03/23/2016 10:50

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Bottom Bench East Wall

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 03/23/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 9.14 mm/s 28.4 Hz

Time: 10:50

Calibration Date: 09/18/15

Vertical: 2.54 mm/s 26.9 Hz

Distance From Blast: 520.29 m

Calibration Signal:

Longitudinal: 4.69 mm/s 39.3 Hz

Direction From Blast: NW

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 110 dB

Location: 20455 Erie Peat Rd

Vector Sum: 9.27 mm/s

Lat./Long.: 42° 54' 10.240" N

79° 17' 44.100" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis

Date: 03/23/16

Trigger Level: 1.02 mm/s 120.00 dB

Transverse: 3.04 mm/s 32.0 Hz

Time: 10:50

Calibration Date: 02/04/16

Vertical: 1.14 mm/s 51.2 Hz

Distance From Blast: 823.26 m

Calibration Signal:

Longitudinal: 3.42 mm/s 46.5 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout:

Mic. Min. Freq.: --- Hz

Acoustic: 94 dB

Location: Corner Of Erie Peat Rd & Hwy#3

Vector Sum: 4.57 mm/s

Lat./Long.: 42° 53' 29.800" N

79° 17' 26.120" W

Reader and Firm: Aaron Merritt, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Austin Powder



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Mar,23/16

Location in Quarry: Lower Brown Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	105	Hole Depth:	15.5	4.72	Burden:	8.0	2.44	m ³ / Hole:	28.2
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	8.0	2.44	Tonnes/Hole:	73.3
Diameter mm:		Face Height:	15.5	3.96	Collar:	5.0	1.52	Total Tonnes:	7697.0
Diameter in:	3.5								

Material Blasted: Limestone
 Density: 2.61 t/m³
 Max Holes / Delay: 1

Explosive / Hole: 24.0 kg 52.5 lb
 Max. kg. / Delay: 24.0 kg 52.5 lb
 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	105 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	12	52.5	24.0
Total product		7875.0	2625.0

Miscellaneous:

Comments:

Approved: *[Signature]*

Date: Mar 23/16



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 03/28/16

COMPANY (PERMITTEE) LAW CLUSTED STONE LOCATION BOTTOM BENCH

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 3.5

NO. OF HOLES 4 NO. OF ROWS 4 BURDEN 8

SPACING 4 DEPTH 15.5 FACE HEIGHT 15.5 LENGTH OF STEMMING (COLLAR) 4.5

EXPLOSIVES TOTAL QUANTITY

30' Pure DELAY 25600 104

ESTAL Sismic 1

TYPE OF PRIMER Black cap 104

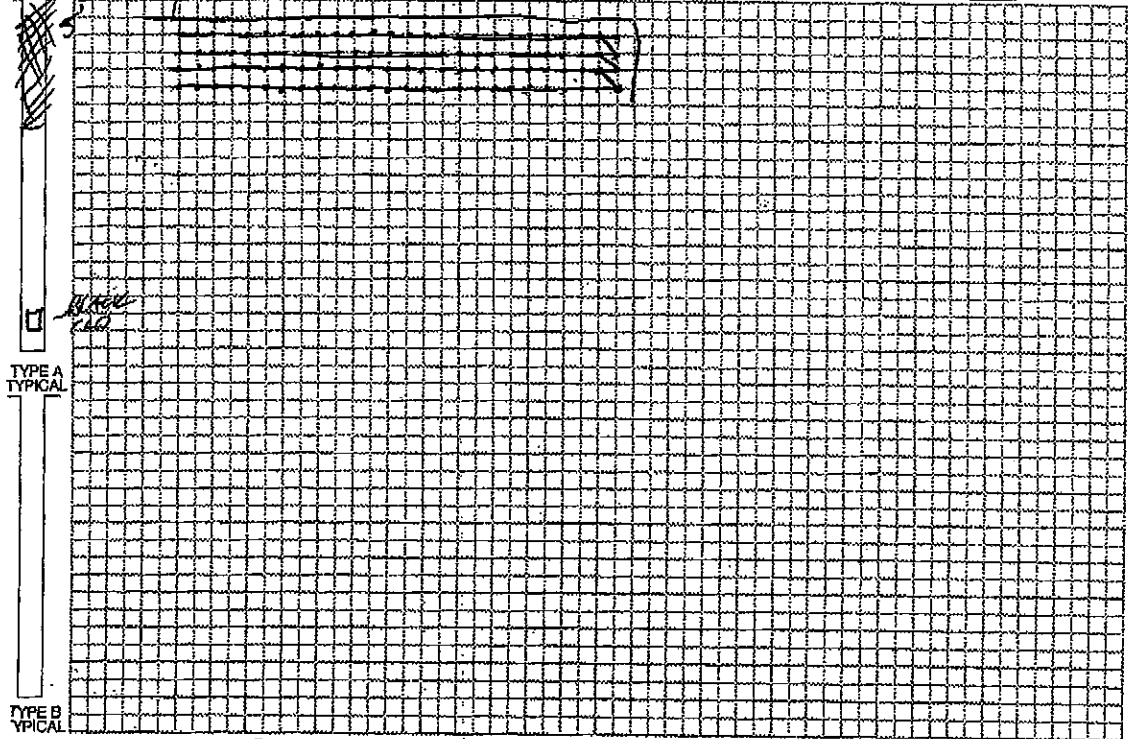
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2363 WEIGHT OF EXPLOSIVES PER HOLE 22.66

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
DELAY DETONATORS USED (TYPE) 67ms Quick Delay 20'

TOTAL NO. TONNES PRODUCED 8338 OR TOTAL CUBIC METRES PRODUCED 3194

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.7

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT FORMER TO CLEAN PIT FOR BLAST TIME

LASTER IN CHARGE Jordan Davis PRINT
Jordan Davis SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

AUSTIN POWDER LTD.

BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/28/2016 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Light Rain

Wind From: SE

Temperature: 3 °C

Terrain: Flat

Wind Velocity: 15-20 km/h

Blast Lat./Long.: 42° 53' 52.500" N 79° 17' 31.600" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 349 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 556 m

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	491.3 m
No. of Holes:	104	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	104	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.37 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	58.4 kg	Volume Produced:	3,195.3 m³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	58.4 kg	Weight Produced:	8,341.1 t
Other Method: Estar Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	2.748 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	29.2 kg	Powder Factor 2:	0.950 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	102.91	Rock Density:	2.611 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	72.77		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	No	No	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander	Maple Leaf Drilling			No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/28/2016 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	104.00 ea	35.37
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	104.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	3,000.00 kg	3,000.00
12981	Mini Stem Plug - 6015	104.00 ea	0.00
D0120	Other-Drilling Charges	1,612.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 3,035.37

COMMENTS / EXPLANATIONS

Jordan Cross

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/28/2016 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	26	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P.† Holes:	26	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	1,004.2 m ³
† V.P. = Volume Producing						Total weight for pattern:	2,621.5 t ✓

Pattern: 2

No. of Holes:	78	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P.† Holes:	78	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	3	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,191.0 m ³
† V.P. = Volume Producing						Total weight for pattern:	5,719.5 t ✓

Total blast volume: 3,195.3 m³
Total weight produced: 8,341.0 t

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/28/2016 11:13

Plt/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/28/16	Trigger Level:	--- mm/s	--- dB	Transverse:	2.79 mm/s	30.1 Hz
Time:	11:13	Calibration Date:	09/18/15		Vertical:	1.52 mm/s	39.3 Hz
Distance From Blast:	616.61 m	Calibration Signal:			Longitudinal:	3.3 mm/s	34.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	100 dB	
Location:					Vector Sum:	3.3 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/28/16	Trigger Level:	1.01 mm/s	120.00 dB	Transverse:	2.92 mm/s	39.3 Hz
Time:	11:13	Calibration Date:	02/04/16		Vertical:	1.52 mm/s	46.5 Hz
Distance From Blast:	711.40 m	Calibration Signal:			Longitudinal:	2.54 mm/s	42.6 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	94 dB	
Location:					Vector Sum:	3.68 mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/31/2016 10:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Light Rain

Wind From: SE

Temperature: 6 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 52.500" N 79° 17' 31.600" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 349 °

Distance: 556 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	4.72 m	Material Blasted:	Limestone	Total Meters Drilled:	505.4 m
No. of Holes:	107	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P. † Holes:	107	Face Height:	4.72 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	88.9 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.52 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	75.9 kg	Volume Produced:	3,290.1 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	75.9 kg	Weight Produced:	8,588.6 t
Other Method: Estar Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	3.174 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	25.3 kg	Powder Factor 2:	0.823 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	110.55	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	63.83		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
BURNIE	BRANDON, A			No	Yes	No	No	No	
LI	JACKSON, A			No	Yes	No	No	No	
PASSMORE	EDGAR, M			No	Yes	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike Alexander				Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/31/2016 10:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	107.00 ea	36.39
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	107.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	8.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
11776	Hydromite 4100-NP	2,670.00 kg	2,670.00
12981	Mini Stem Plug - 6015	112.00 ea	0.00
D0120	Other-Drilling Charges	1,658.50 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,706.39

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/31/2016 10:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

Pattern: 1

No. of Holes:	80	Hole Depth:	4.72 m	Burden:	2.44 m	Area Type:	Conventional
No. of V.P. † Holes:	80	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	3	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	2,247.2 m ³
† V.P. = Volume Producing						Total weight for pattern:	5,866.2 t ✓

Pattern: 2

No. of Holes:	27	Hole Depth:	4.72 m	Burden:	3.35 m	Area Type:	Conventional
No. of V.P. † Holes:	27	Subdrilling:	0.00 m	Spacing:	2.44 m	Method:	Weighted Average
No. of Rows:	1	Face Height:	4.72 m				
Drilling Angle:	0 °					Total volume for pattern:	1,042.9 m ³
† V.P. = Volume Producing						Total weight for pattern:	2,722.3 t ✓

Total blast volume: 3,290.1 m³
Total weight produced: 8,588.5 t



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/31/2016 10:16

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Brown Bench

SEISMOGRAPH 1 - 20455 ERIE PEAT RD

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/31/16	Trigger Level:	--- mm/s	--- dB	Transverse:	3.42 mm/s	32.1 Hz
Time:	10:16	Calibration Date:	02/04/16		Vertical:	1.52 mm/s	26.9 Hz
Distance From Blast:	616.61 m	Calibration Signal:			Longitudinal:	3.42 mm/s	34.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	94 dB	
Location:					Vector Sum:	3.68 mm/s	
Lat./Long.:	42° 54' 10.240" N		79° 17' 44.100" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	03/31/16	Trigger Level:	1.01 mm/s	120.00 dB	Transverse:	3.04 mm/s	56.8 Hz
Time:	10:16	Calibration Date:	09/18/15		Vertical:	1.14 mm/s	73.1 Hz
Distance From Blast:	711.40 m	Calibration Signal:			Longitudinal:	2.28 mm/s	56.8 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz		PPV:	--- mm/s	--- Hz
Readout:	Display Only	Mic. Min. Freq.:	--- Hz		Acoustic:	106 dB	
Location:					Vector Sum:	3.17 mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,06/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	63	Hole Depth:	24.5	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	24.5	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	164.0
Material Blasted:	Limestone			Explosive / Hole:	56.0	kg	123.0
Density:	2.61 t/m ³			Max. kg. / Delay:	56.0	kg	123.0
Max Holes / Delay:	1			Distance to Seis.:		m	
						Tonnes/Hole:	306.0
						Total Tonnes:	19278.0

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	63				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	17.5	123.0	56.0
Total product		7749.0	3528.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *May 05-16*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: 5/16/16
 COMPANY (PERMITTEE) Law Quarry LOCATION Grey Bench
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"
 NO. OF HOLES 63 NO. OF ROWS 3 BURDEN 13'
 SPACING 13' DEPTH _____ FACE HEIGHT _____ LENGTH OF STEMMING 6'
 (COLLAR)

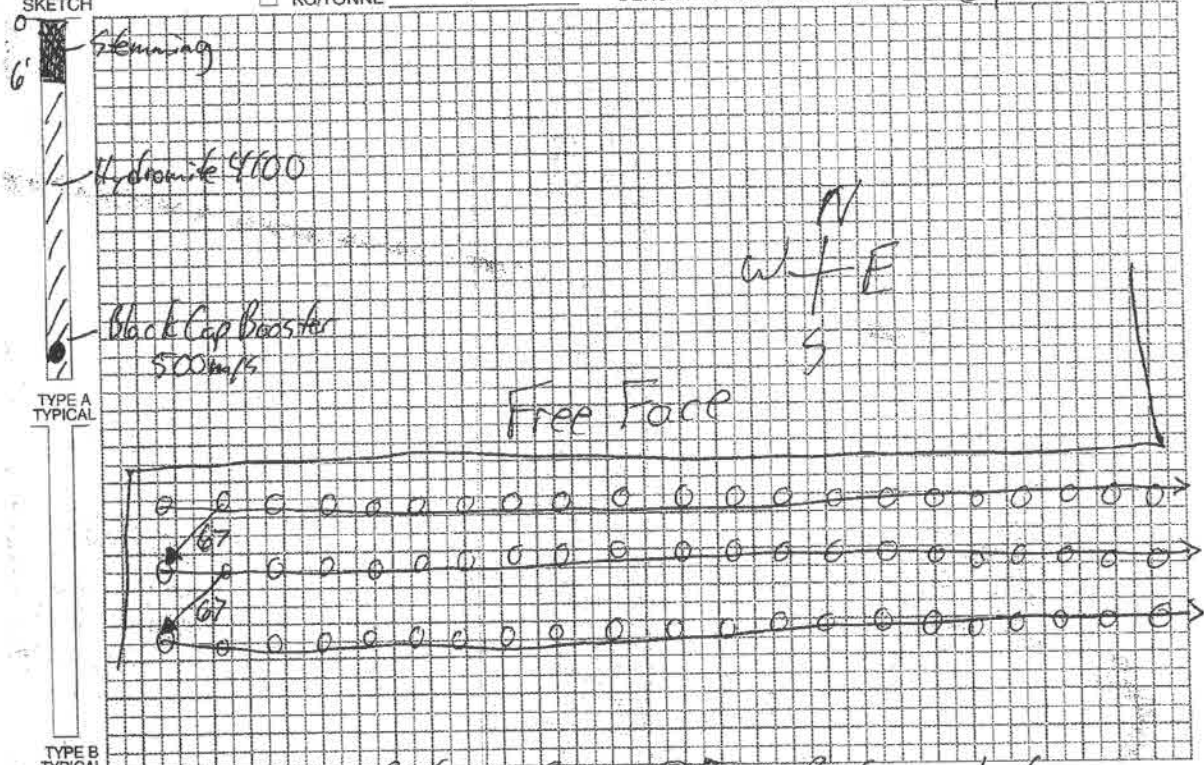
EXPLOSIVES TOTAL QUANTITY
40' Dual Relay 25/500 63
30' Quick Relay 67ms 5
Hydromite 4100

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER Black Cap Booster 63
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE _____
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Relay + Quick Relay

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED _____
 TOTAL POWDER FACTOR: KG/CUBIC METRE _____ DENSITY TONNES/CUBIC METRE 2.61
 SKETCH KG/TONNE



PRE-BLAST COMMENTS: 2m between rows, 25m between holes
Open end shot.
Quarry to be cleared by Foreman prior to blast time
 POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
 PRINT Aaron Merritt
 SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-20

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NE

Temperature: 19 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.799" N 79° 17' 32.299" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 337 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 714 m

LAYOUT

Hole Depth:	7.47 m	Material Blasted:	Limestone	Total Meters Drilled:	470.6 m
No. of Holes:	63	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	63	Face Height:	7.47 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.83 m
				Area Type:	Conventional
				Method:	Specified

(H = 7.47 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,386.5 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	58.2 kg	Weight Produced:	19,281.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.384 t/kg
Mfg and Model: Royal Arms	Max. Wt. of Explosive Per Hole:	58.2 kg	Powder Factor 2:	0.485 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	93.58	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	93.58		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-20

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	63.00 ea	21.43
10752	SHOCK*STAR DualDelay 12m/40' 25/500	63.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	3,560.00 kg	3,560.00
12981	Mini Stem Plug - 6015	63.00 ea	0.00
D0120	Other-Drilling Charges	1,544.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,581.43

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-20

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Grey Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis	Transverse:	3.55 mm/s	51.2 Hz
Date:	05/06/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	1.9 mm/s	73.1 Hz
Time:	11:01	Calibration Date:	09/15/15	Longitudinal:	3.3 mm/s	39.3 Hz
Distance From Blast:	602.89 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	Acoustic:	106 dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	3.93 mm/s	
Location:	Corner Of Erie Peat Rd & Hwy#3					
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Jodan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	White mini-Seis	Transverse:	--- mm/s	--- Hz
Date:	05/06/16	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	--- mm/s	--- Hz
Time:	11:01	Calibration Date:	07/07/15	Longitudinal:	--- mm/s	--- Hz
Distance From Blast:	2,084.22 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	E	Geophone Min. Freq.:	--- Hz	Acoustic:	--- dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	--- mm/s	
Location:	17 First Ave Front Yard					
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W			
Reader and Firm:	Jodan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Austin Powder					



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,06,16

Location in Quarry: **Top Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	184	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m3/ Hole:	57.7
# Rows:	9	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	25024.0
Diameter in:	4								
Material Blasted:	Limestone				Explosive / Hole:	11.1 kg	24.5 lb		
Density:	2.4	t/m3			Max. kg. / Delay:	11.1 kg	24.5 lb		
Max Holes / Delay:	1					Distance to Seis.:	m	ft	

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	184 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		5796.0	2576.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *May 05-16*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 05/06/16
MO DA YR

COMPANY (PERMITTEE) Law Clusted Stone LOCATION in #172

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4

NO. OF HOLES 200 NO. OF ROWS 8 BURDEN 13

SPACING 13 DEPTH 10 FACE HEIGHT 10 LENGTH OF STEMMING (COLLAR) 5

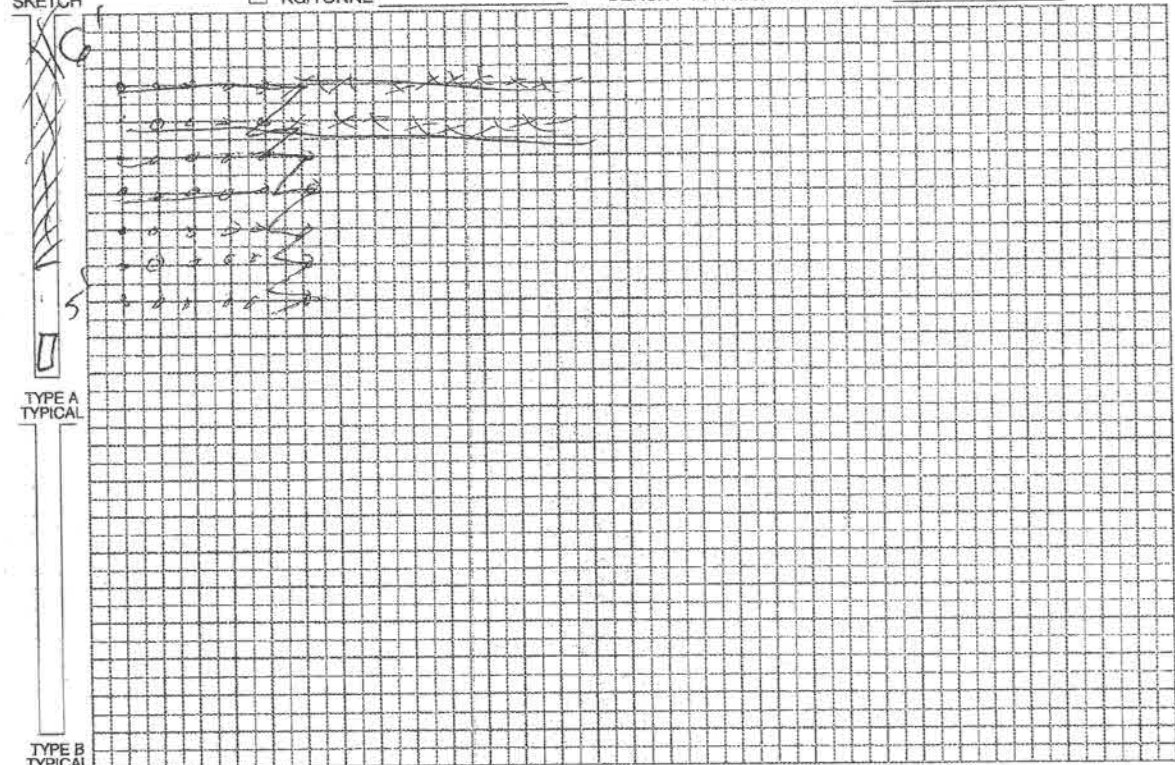
EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>24' Duke Army</u>	<u>175</u>	1 mm = 0.03937 in	1 in = 25.4 mm
<u>30' Quick n' Dirty</u>	<u>10</u>	1 m = 3.28 ft	1 ft = 0.3048 m
<u>67ms Quick n' Dirty</u>	<u>15</u>	1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER R.L. 40 175
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3181 WEIGHT OF EXPLOSIVES PER HOLE 13

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) _____
TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED 10 826

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.3 DENSITY TONNES/CUBIC METRE 2.6
 KG/TONNE



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT CLEARED BY PIT FOREMAN FOR BLAST FACE

BLASTER IN SOMAN MANS PRINT
CHARGE J. Brown SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-21

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Top Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: NE

Temperature: 19 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 45.200" N 79° 17' 34.200" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 357 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 774 m

LAYOUT

Hole Depth:	3.35 m	Material Blasted:	Limestone	Total Meters Drilled:	586.7 m
No. of Holes:	175	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	175	Face Height:	3.35 m	Spacing:	3.96 m
No. of Rows:	8	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average
				Water Depth:	0.00 m
				Stem Length:	1.83 m

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	32.2 kg	Volume Produced:	9,212.2 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	32.2 kg	Weight Produced:	22,112.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	7.842 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	16.1 kg	Powder Factor 2:	0.306 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	192.72	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	136.28		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	No	No	No	No
BURNIE	BRANDON, A			No	Yes	No	No	No
EDDY	MATTHEW, A			No	Yes	No	No	No
LI	JACKSON, A			No	Yes	No	No	No
MERRITT	AARON, K			No	Yes	Yes	No	No
VANDEBUSSCHE	MICHAEL, J			No	No	No	No	No
<hr style="border-top: 1px dashed black;"/>								
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-21

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Top Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	175.00 ea	59.52
10750	SHOCK*STAR DualDelay 7.3m/24' 25/500	175.00 ea	0.00
01494	30' SHOCK*STAR Quick Relay 42 ms	16.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	15.00 ea	0.00
11235	Hydromite 4600 Bulk	2,760.00 kg	2,760.00
12981	Mini Stem Plug - 6015	175.00 ea	0.00
D0120	Other-Drilling Charges	1,925.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 2,819.52

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-21

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/06/2016 11:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Top Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: ---			
Date: 05/06/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: --- mm/s	--- Hz
Time: 11:01	Calibration Date: 07/07/15		Vertical: --- mm/s	--- Hz
Distance From Blast: 2,111.04 m	Calibration Signal:		Longitudinal: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz		Acoustic: --- dB	
Location: Stacked in front yard			Vector Sum: --- mm/s	
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 05/06/16	Trigger Level: 1.01 mm/s	120.00 dB	Transverse: 3.55 mm/s	51.2 Hz
Time: 11:01	Calibration Date: 09/18/15		Vertical: 1.9 mm/s	73.1 Hz
Distance From Blast: 509.32 m	Calibration Signal:		Longitudinal: 3.3 mm/s	39.3 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 106 dB	
Location:			Vector Sum: 3.93 mm/s	
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER LTD.
EXPLOSIFS AUSTIN LTÉE
 P.O. BOX 700, 514 DRY LAKE ROAD
 HAGERSVILLE, ONTARIO N0A 1H0
 905-768-0833 FAX: 905-768-0838

DELIVERY TICKET BILLET DE LIVRAISON	E	40947
CROSS REFERENCE NO DE RÉFÉRENCE	BL	

SOLD TO / FACTURÉ À
LAW QUARRY
144 WELLMAN ST
PORT COLBORNE

SHIP TO / LIVRÉ À

TRANSFER / DÉPLACER	
FROM / DE	TO / À
TRANSPORTATION ONLY / TRANSPORT SEULEMENT	

ORDER DATE / DATE DE COMMANDE	CUSTOMER ORDER NO / NO DE COMMANDE	DATE REQUIRED / DATE REQUISE	DATE SHIPPED / DATE EXPÉDIÉE
			06/05/2016
SHIPPED VIA / TRANSPORTEUR	SHIPPED FROM / EMPLACEMENT	F.O.B. / F.A.B.	MAGAZINE LIC. NO. / NO DE POWDRIÈRE
APL	ONEIDA		

DESCRIPTION	QUANTITY SHIPPED QTE EXPÉDIÉE	U/M	DATE SHIP CODE DATE DE FABRICATION	MAG. NO.	QTY RETURNED QTE RETOURNÉ	MAG. NO.	QTY USED QTE UTILISÉ
BLASTED ROCK + DRILLING							
BLAST # 2016-20	19 281	TONNE					
13' x 13' x 24.5'							
BLAST # 2016-21	22 112	TONNE					
B							
3 x 13 x 11							
MINI STEM PLUG	238						

- DELIVERY CHARGE / FRAIS DE LIVRAISON
 LABOUR CHARGE / FRAIS DE TRAVAIL

TIME ARRIVED / ARRIVÉE:

TIME DEPARTED / DEPART:

John D. ...
 SHIPPER / EXPÉDITEUR

RECEIVED BY / REÇU PAR

EASON FOR SHIPMENT / : CUSTOMER ORDER / COMMANDE DU CLIENT
 AISON DE TRANSPORT
 HITE/BLANC - OFFICE/BUREAU YELLOW/JAUNE - RECEIPT COPY/COPIE DU CONNAISSEMENT

PACKING GROUP II / GROUPE D'EMBALLAGE II

PINK/ROSE - CARRIER/PORTEUR GREEN/VERT - CUSTOMER/CLIENT



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May, 12/16

Location in Quarry: East Face Grey Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	60	Hole Depth:	25.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	120.0
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	312.0
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13	Total Tonnes:	18720.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	60				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		7560.0	3420.0

Miscellaneous:

Comments: Hole count is approx.

Approved: *B. Smith*

Date: *May 12-16*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE 05/12/16

COMPANY (PERMITTEE) LAW Quarry LOCATION GRAV

TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 4

NO. OF HOLES 63 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 24 FACE HEIGHT 24 LENGTH OF STEMMING (COLLAR) 6

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS
<u>40' Pow Delay</u>	<u>67</u>	1 mm = 0.03937 in 1 m = 3.28 ft 1 in = 25.4 mm 1 ft = 0.3048 m 1 m ³ = 1.358 yd ³ 1 yd ³ = 27 ft ³ 1 kg = 2.2046 lb 1 tonne = 1.1023 ton 1 tonne/m ³ = 0.842777 ton/yd ³
<u>320' Quinc nearby 67ms</u>	<u>5</u>	1 lb = 25.4 mm 1 ft = 0.3048 m 1 ft ² = 0.092903 m ² 1 yd ² = 0.764555 m ² 1 m ² = 1.358 yd ² 1 yd ² = 0.320837 m ² 1 lb = 0.454 kg 1 ton = 0.907185 tonne 1 ton/yd ³ = 1.1966 tonne/m ³

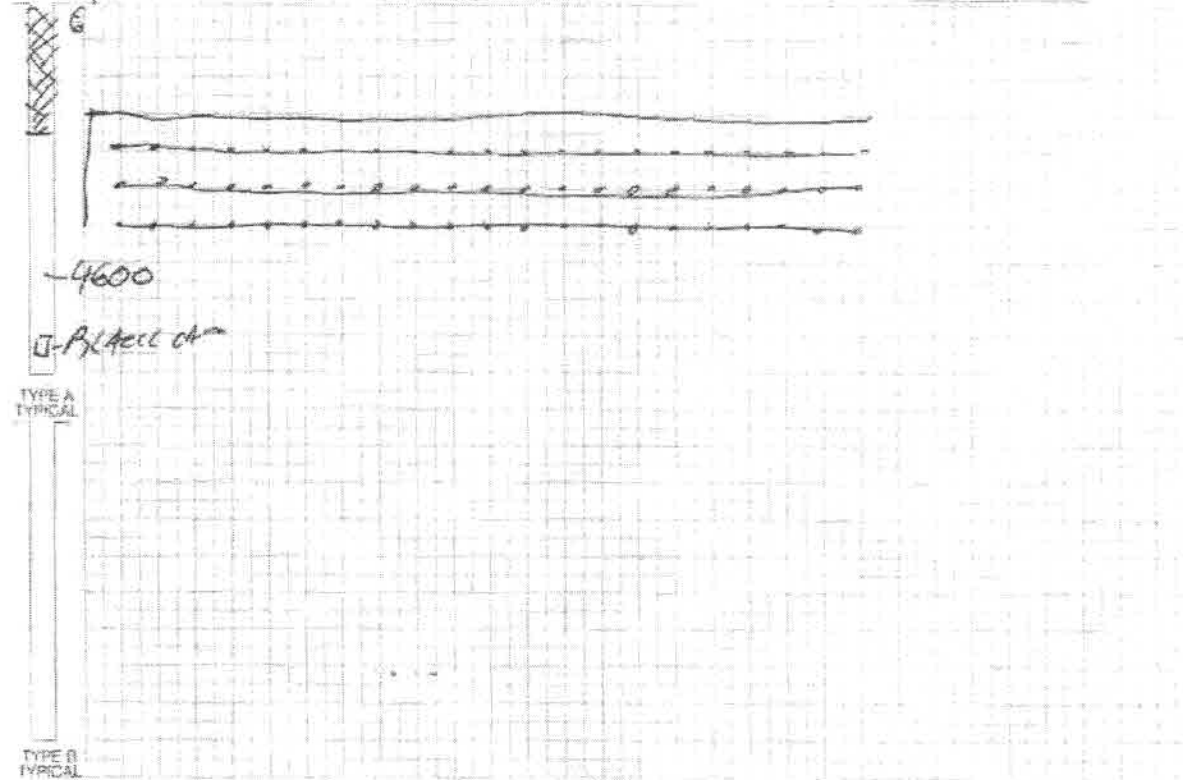
TYPE OF PRIMER Blax cap 63 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3608 WEIGHT OF EXPLOSIVES PER HOLE 57

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

DELAY DETONATORS USED (TYPE) _____

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED 7536

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.7 SKETCH 1 KG/TONNE _____ DENSITY TONNES/CUBIC METRE 261



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: SANDY DAVIS PRINT J.M.D. SIGNATURE

TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF-HIGHWAY TRUCK BUCKET OF LOADER / SHOVEL OTHER PLEASE DESCRIBE _____

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-22

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/12/2016 13:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WNW

Temperature: 17 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.500" N 79° 17' 31.000" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 350 °

Structure Type: Dwelling

Distance: 680 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	480.1 m
No. of Holes:	63	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	63	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,537.2 m ³
Firing Device: Shot Shell Igniter	Max. Wt. of Expl. Per 8 ms Interval:	56.7 kg	Weight Produced:	19,675.3 t ✓
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.510 t/kg
Mfg and Model: Royal Arms Pen Shooter	Max. Wt. of Explosive Per Hole:	56.7 kg	Powder Factor 2:	0.474 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	90.32	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	90.31		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
BURNIE	BRANDON, , A			No	No	No	No	No	
LI	JACKSON, A			No	Yes	No	No	No	
VANDENBUSSC HE	MICHAEL, J			No	No	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes				Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-22

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/12/2016 13:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	63.00 ea	21.43
10752	SHOCK*STAR DualDelay 12m/40' 25/500	63.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	5.00 ea	0.00
11235	Hydromite 4600 Bulk	3,550.00 kg	3,550.00
12981	Mini Stem Plug - 6015	63.00 ea	0.00
D0120	Other-Drilling Charges	1,575.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,571.43

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-22

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/12/2016 13:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis	Transverse:	2.54 mm/s	26.9 Hz
Date:	05/12/16	Trigger Level:	1.01 mm/s 120.00 dB	Vertical:	2.15 mm/s	64.0 Hz
Time:	13:35	Calibration Date:	09/18/15	Longitudinal:	2.54 mm/s	30.1 Hz
Distance From Blast:	587.65 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	Acoustic:	100 dB	
Readout:	Display Only	Mic. Min. Freq.:	--- Hz	Vector Sum:	3.55 mm/s	
Location:						
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	---	Transverse:	--- mm/s	--- Hz
Date:	05/12/16	Trigger Level:	1.01 mm/s --- dB	Vertical:	--- mm/s	--- Hz
Time:	13:35	Calibration Date:	07/07/15	Longitudinal:	--- mm/s	--- Hz
Distance From Blast:	2,053.74 m	Calibration Signal:		PPV:	--- mm/s	--- Hz
Direction From Blast:	E	Geophone Min. Freq.:	--- Hz	Acoustic:	--- dB	
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	--- mm/s	
Location:	In front yard					
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W			
Reader and Firm:	Jordan Davis, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:						



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,17/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	120.0
						Tonnes/Hole:	312.0
						Total Tonnes:	15912.0
Material Blasted:	Limestone		Explosive / Hole:		57.0	kg	126.0
Density:	2.61	t/m ³	Max. kg. / Delay:		57.0	kg	126.0
Max Holes / Delay:	1		Distance to Seis.:		m		ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved: *B. Smith*

[Signature]
Date: *May 16. 16.*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE 05/17/16

COMPANY (PERMITTEE) LAW QUARRY

LOCATION GRAY

TYPE OF MATERIAL BLASTED LIMESTONE

HOLE DIAMETER 4

NO. OF HOLES 51

NO. OF ROWS 3

BURDEN 13

SPACING 13

DEPTH 25

FACE HEIGHT 25

LENGTH OF STEMMING (COLLAR) 6

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

40' Pure Delay 2500s 51

1 mm = 0.03937 in

1 in = 25.4 mm

1 m = 3.28 ft

1 ft = 0.3048 m

1 m² = 35.32 ft²

1 ft² = 0.0283168 m²

1 m³ = 1.308 yd³

1 yd³ = 0.764555 m³

1 yd³ = 27 ft³

1 ft³ = 0.37037 yd³

1 Kg = 2.2046 lb

1 lb = 0.454 kg

1 tonne = 1.1023 ton

1 ton = 0.907185 tonne

1 tonne/m³ = 0.842777 ton/yd³

1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER BLACK CAP 51

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3060

WEIGHT OF EXPLOSIVES PER HOLE 60

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE): _____

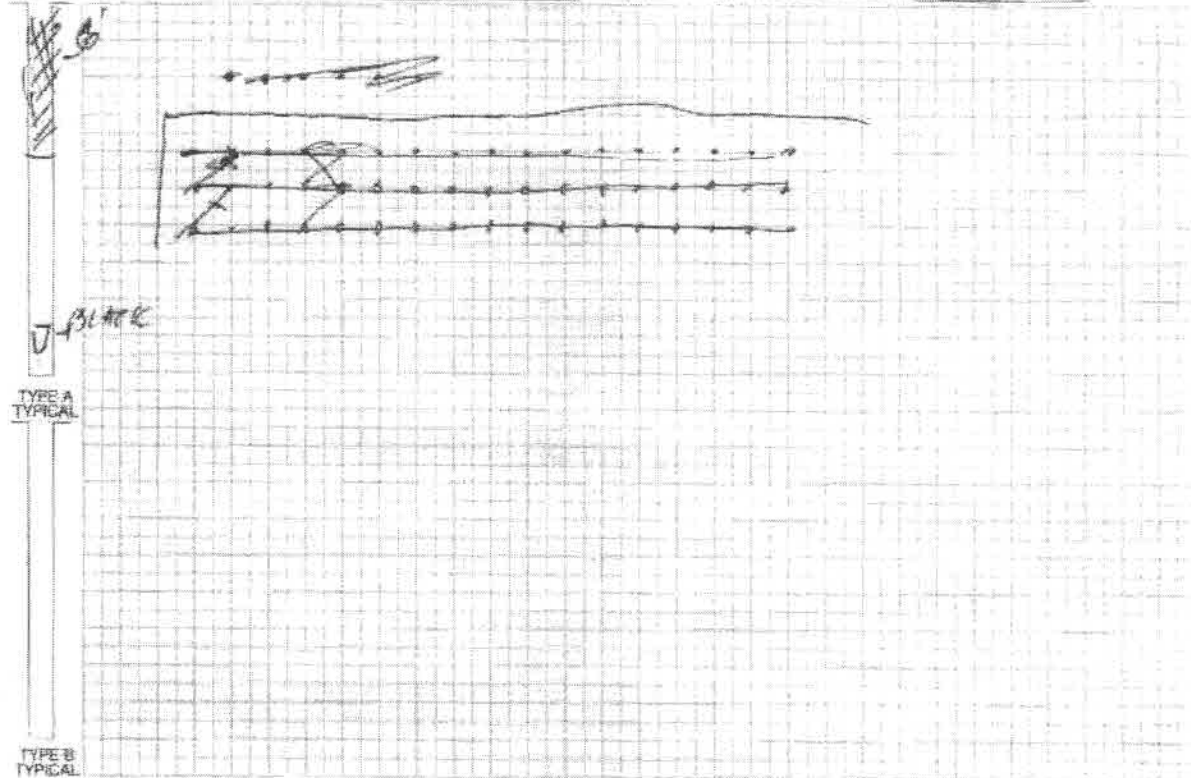
TOTAL NO. TONNES PRODUCED _____

OR TOTAL CUBIC METRES PRODUCED 6100

TOTAL POWDER FACTOR: KG/CUBIC METRE 207

SKETCH KG/TONNE

DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS 25 m3 BETWEEN A HOLES.
92 BETWEEN ROWS

POST-BLAST COMMENTS PIT FOR MAN TO CLEAR PIT FOR BLAST TIME

BLASTER IN CHARGE Sandra Davis
PRINT
[Signature]
SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-23

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/17/2016 10:38

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: WSW

Temperature: 9 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.000" N 79° 17' 33.700" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 355 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 688 m

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	127.6 kg	Volume Produced:	6,101.6 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	127.6 kg	Weight Produced:	15,927.7 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	4.936 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	63.8 kg	Powder Factor 2:	0.529 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	86.16	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	60.92		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
VANDEBUSSCHE	MICHAEL, J			No	Yes	No	No	No
Other Crew Members			Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes			Maple Leaf Drilling	No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-23

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/17/2016 10:38

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	6.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
11235	Hydromite 4600 Bulk	3,210.00 kg	3,210.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,227.35

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-23

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/17/2016 10:38

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: ---			
Date: 05/17/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: --- mm/s	--- Hz
Time: 10:38	Calibration Date: 07/07/15		Vertical: --- mm/s	--- Hz
Distance From Blast: 2,111.65 m	Calibration Signal:		Longitudinal: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz		Acoustic: --- dB	
Location: In front yard			Vector Sum: --- mm/s	
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 05/17/16	Trigger Level: 1.01 mm/s	120.00 dB	Transverse: 2.92 mm/s	39.3 Hz
Time: 10:38	Calibration Date: 09/18/15		Vertical: 1.65 mm/s	73.1 Hz
Distance From Blast: 587.35 m	Calibration Signal:		Longitudinal: 3.68 mm/s	42.6 Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 110 dB	
Location:			Vector Sum: 3.68 mm/s	
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,27/16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	51	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4					m ³ / Hole:	120.0
						Tonnes/Hole:	312.0
						Total Tonnes:	15912.0

Material Blasted: Limestone Explosive / Hole: 57.0 kg 126.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 57.0 kg 126.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	51				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		6426.0	2907.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *May 26-16*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 05/27/16
MO DA YR

COMPANY (PERMITTEE) L. L. LAU LOCATION CRAY

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 41

NO. OF HOLES 50 NO. OF ROWS 3 BURDEN 13

SPACING 13 DEPTH 5 FACE HEIGHT 25 LENGTH OF STEMMING 6
(COLLAR)

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

EXPLOSIVES	TOTAL QUANTITY
<u>5 40' PUAL DELAY 25/50</u>	<u>50</u>

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLACK CAP 50

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3141

WEIGHT OF EXPLOSIVES PER HOLE 63

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC

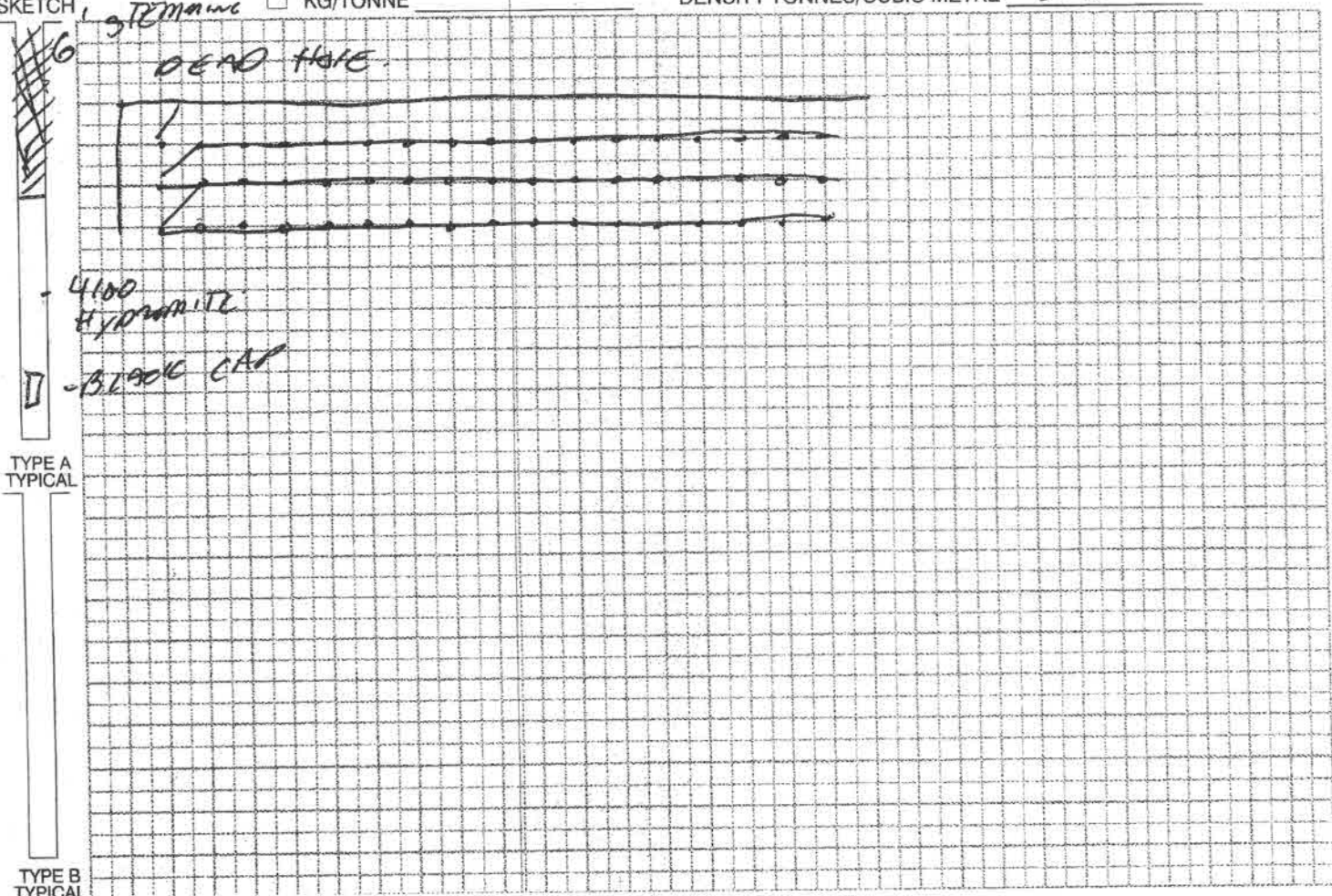
(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) 67ms Quick Delay

TOTAL NO. TONNES PRODUCED 15610 OR TOTAL CUBIC METRES PRODUCED 5981

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5

SKETCH STEMMING KG/TONNE DENSITY TONNES/CUBIC METRE 2.61





AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-24

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/27/2016 09:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast Lat./Long.: 42° 53' 47.200" N 79° 17' 29.200" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 347 °

Structure Type: Dwelling

Distance: 727 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62 m	Material Blasted:	Limestone	Total Meters Drilled:	388.6 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	51	Face Height:	7.62 m	Spacing:	3.96 m
No. of Rows:	3	Drilling Angle:	0 °	Back Fill Depth:	7.62 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average
				Stem Length:	min 1.83 m

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	6,101.6 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	62.1 kg	Weight Produced:	15,927.7 t ✓
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.126 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	62.1 kg	Powder Factor 2:	0.509 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	92.22	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	92.21		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No			Protective Cover: Drill		
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
EDDY	MATTHEW, A			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members		Company		In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes		Maple Leaf Drilling		No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-24

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/27/2016 09:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	50.00 ea	17.01
10752	SHOCK*STAR DualDelay 12m/40' 25/500	50.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	5.00 ea	0.00
07602	Hydromite 4100 Bulk	3,090.00 kg	3,090.00
12981	Mini Stem Plug - 6015	50.00 ea	0.00
D0120	Other-Drilling Charges	1,275.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,107.00

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-24

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/27/2016 09:35

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: mini white seis			
Date: 05/27/16	Trigger Level: 1.01 mm/s	--- dB	Transverse: --- mm/s	--- Hz
Time: 09:35	Calibration Date: 07/07/15		Vertical: --- mm/s	--- Hz
Distance From Blast: 2,006.80 m	Calibration Signal:		Longitudinal: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz		Acoustic: --- dB	
Location: In front yard			Vector Sum: --- mm/s	
Lat./Long.: 42° 53' 37.200" N		79° 16' 1.800" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 05/27/16	Trigger Level: 1.01 mm/s	120.00 dB	Transverse: 2.66 mm/s	--- Hz
Time: 09:35	Calibration Date: 09/18/15		Vertical: 2.15 mm/s	--- Hz
Distance From Blast: 541.32 m	Calibration Signal:		Longitudinal: 3.68 mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz		PPV: --- mm/s	--- Hz
Readout: Display Only	Mic. Min. Freq.: --- Hz		Acoustic: 100 dB	
Location:			Vector Sum: 3.81 mm/s	
Lat./Long.: 42° 53' 29.800" N		79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Oct,04,16

Location in Quarry: East Face Grey Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	44	Hole Depth:	25.0	7.46	Burden:	13.0	3.96
# Rows:	3	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	25.0	7.46	Collar:	7.0	2.13
Diameter in:	4						
m3/ Hole:	120.0						
Tonnes/Hole:	312.0						
Total Tonnes:	13728.0						
Material Blasted:	Limestone	Explosive / Hole:	57.0	kg		126.0	lb
Density:	2.61 t/m ³	Max. kg. / Delay:	57.0	kg		126.0	lb
Max Holes / Delay:	1	Distance to Seis.:	**	m		**	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	44				44

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	126.0	57.0
Total product		5544	2508.0

Miscellaneous:

Comments:



Approved:  Date: Oct 4 / 16



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Oct,04,16

Location in Quarry: **Top Bench**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	120	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m ³ / Hole:	57.7
# Rows:	9	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	16320.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 11.1 kg 24.5 lb
 Density: 2.4 t/m³ Max. kg. / Delay: 11.1 kg 24.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'			Boosters	
12' -	50' -	9ms -	42ms -	14	Orange Cap (1 lb) -	
16' -	60' -	17ms -	67ms -	12	Black Cap (3/4 lb) - 120	
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -	
30' -	120 100' -	33ms -			Green Cap (1/4 lb) -	
40' -						

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		3780.0	1680.0

Miscellaneous:

Comments:

Approved: *[Signature]*

Date: *Oct. 4 / 16*

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-46

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 20 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 48.299" N 79° 17' 29.798" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 348 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 691 m

LAYOUT

Hole Depth:	8.23 m	Material Blasted:	Limestone	Total Meters Drilled:	419.7 m
No. of Holes:	51	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. [†] Holes:	51	Face Height:	8.23 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	125.9 kg	Volume Produced:	6,589.7 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	125.9 kg	Weight Produced:	17,201.9 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	5.502 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	62.9 kg	Powder Factor 2:	0.475 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	87.10	Rock Density:	2.611 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	61.59		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
VAN RAVENSWAAY	JEREMY, P			No	Yes	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-46

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	51.00 ea	17.35
10752	SHOCK*STAR DualDelay 12m/40' 25/500	51.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	7.00 ea	0.00
07696	Hydromite 4400 Bulk	3,109.00 kg	3,109.00
12981	Mini Stem Plug - 6015	51.00 ea	0.00
D0120	Other-Drilling Charges	1,377.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>3,126.34</u>

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-46

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray Bench

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: white mini seis	Transverse: --- mm/s	--- Hz
Date: 10/04/16	Trigger Level: 1.01 mm/s	Vertical: --- mm/s	--- Hz
Time: 12:36	Calibration Date: 05/02/16	Longitudinal: --- mm/s	--- Hz
Distance From Blast: 2,025.70 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz	Acoustic: --- dB	
Readout:	Mic. Min. Freq.: --- Hz	Vector Sum: --- mm/s	
Location: In front yard			
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 3.3 mm/s	42.6 Hz
Date: 10/04/16	Trigger Level: 1.01 mm/s	Vertical: 2.28 mm/s	56.8 Hz
Time: 12:36	Calibration Date: 09/15/15	Longitudinal: 3.3 mm/s	73.1 Hz
Distance From Blast: 576.99 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	Acoustic: 118 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 3.93 mm/s	
Location:			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-47

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 20 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 44.300" N 79° 17' 33.800" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 356 °

Distance: 802 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	3.35 m	Material Blasted:	Limestone	Total Meters Drilled:	335.3 m
No. of Holes:	100	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. [†] Holes:	100	Face Height:	3.35 m	Spacing:	3.96 m
No. of Rows:	5	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	1/2" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	25.9 kg	Volume Produced:	5,264.1 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	25.9 kg	Weight Produced:	12,636.0 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	9.988 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	13.0 kg	Powder Factor 2:	0.240 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	222.82	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	157.56		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
VAN RAVENSWAAY	JEREMY, P			No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-47

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	100.00 ea	34.01
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	100.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	9.00 ea	0.00
07696	Hydromite 4400 Bulk	1,231.00 kg	1,231.00
D0120	Other-Drilling Charges	1,100.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			1,265.01

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-47

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 10/04/2016 12:36

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - 17 FIRST AVE

Data Type: No Trigger	Seismograph Type: white mini seis	Transverse: --- mm/s	--- Hz
Date: 10/04/16	Trigger Level: 1.01 mm/s --- dB	Vertical: --- mm/s	--- Hz
Time: 12:36	Calibration Date: 05/02/16	Longitudinal: --- mm/s	--- Hz
Distance From Blast: 2,098.85 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: E	Geophone Min. Freq.: --- Hz	Acoustic: --- dB	
Readout:	Mic. Min. Freq.: --- Hz	Vector Sum: --- mm/s	
Location: In front yard			
Lat./Long.: 42° 53' 37.200" N	79° 16' 1.800" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 0.0 mm/s	0.0 Hz
Date: 10/04/16	Trigger Level: 1.01 mm/s --- dB	Vertical: 0.0 mm/s	0.0 Hz
Time: 12:36	Calibration Date: 02/03/16	Longitudinal: 0.12 mm/s	0.0 Hz
Distance From Blast: 480.06 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	Acoustic: 110 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 0.12 mm/s	
Location:			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE 10/04/16

COMPANY (PERMITTEE) LAW QUARRY LOCATION _____

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 41

NO. OF HOLES 51 NO. OF ROWS 4 BURDEN 13

SPACING 13 DEPTH 27 FACE HEIGHT 27 LENGTH OF STEMMING (COLLAR) 6

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>40' Dual Delay</u>	<u>51</u>	1 m = 0.03937 in	1 in = 25.4 mm
<u>20' 42ms</u>	<u>7</u>	1 m = 3.28 ft	1 ft = 0.3048 m
<u>4108 Hydramite</u>		1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ³ = 1.358 yd ³	1 yd ³ = 0.764555 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLAZIC to 51

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2500 WEIGHT OF EXPLOSIVES PER HOLE 54.90

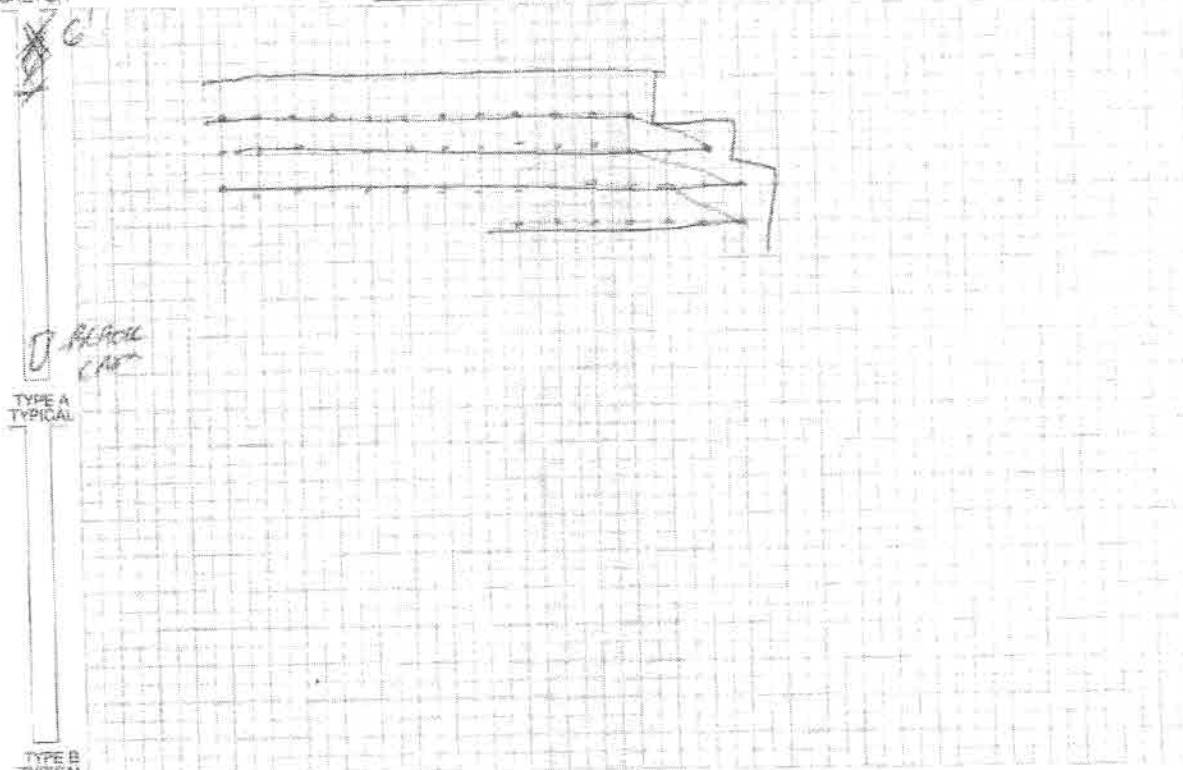
TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE

DELAY DETONATORS USED (TYPE) DUAL DELAY QUICK DELAY EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 17.96 OR TOTAL CUBIC METRES PRODUCED 6588

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.6

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE



PRE-BLAST COMMENTS 25 ms BETWEEN ROWS

92 ms BETWEEN ROWS

POST-BLAST COMMENTS PIT FOREMAN

TO CHECK PIT

FOR BUTT TIME

BLASTER IN CHARGE SONIAH PARS
PRINT SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER LTD. BLAST DESIGN

DATE: 1 / 1 / 11SHOT NO. _____
COMPANY (PERMITTEE) LAZ LOCATION W HITETYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 4NO. OF HOLES 100 NO. OF ROWS 5 BURDEN 1.7SPACING 1.3 DEPTH 11 FACE HEIGHT 11 LENGTH OF STEMMING (COLLAR) 6

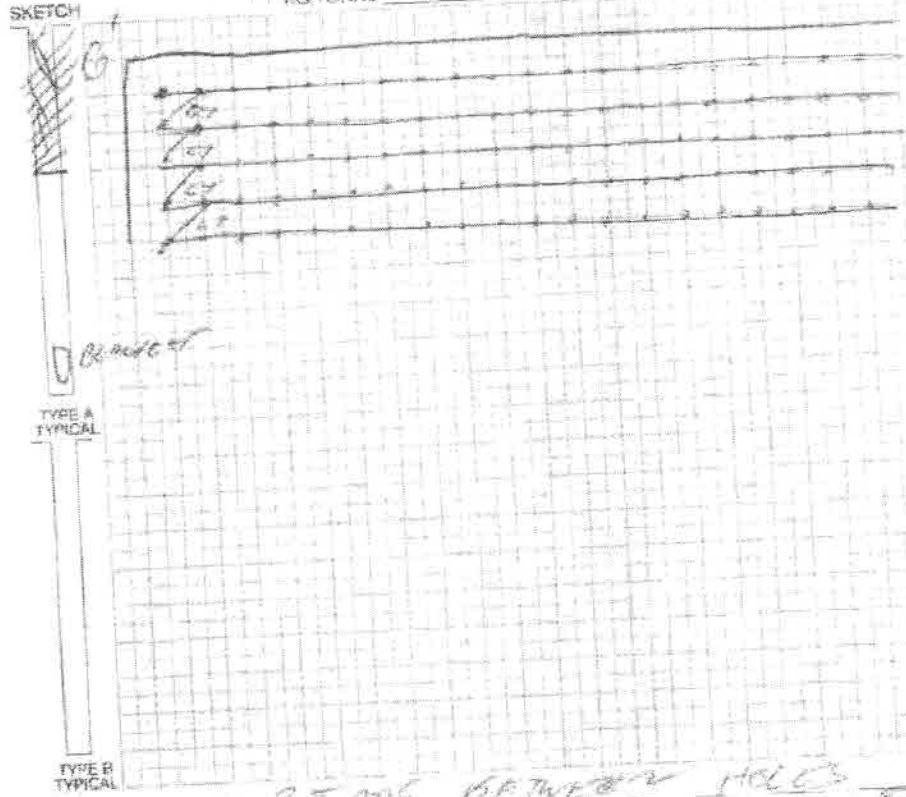
EXPLOSIVES TOTAL QUANTITY CONVERSIONS

30 Dual Delay 100
67ms Quad Delay 9

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.27037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER BLACK 100 WEIGHT OF EXPLOSIVES PER HOLE 12 KGTOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 1200
TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONICDELAY DETONATORS USED (TYPE) DUAL DELAY
100ms DELAY

(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 12031 OR TOTAL CUBIC METRES PRODUCED 5263TOTAL POWDER FACTOR: KG/CUBIC METRE 0.4 DENSITY TONNES/CUBIC METRE 2.4
 KG/TONNEPRE-BLAST COMMENTS: 25ms BETWEEN ROWS
92ms BETWEEN ROWSPOST-BLAST COMMENTS: RIT FOREMAN
TO CLEAR RIT
FOR BLAST TIMEBLASTER IN CHARGE [Signature] TYPE OF PROTECTIVE COVER USED STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Sept, 19, 16

Location in Quarry: East Face Combined Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	44	Hole Depth:	36.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	172.0
# Rows:	2	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	449.0
Diameter mm:		Face Height:	36.0	7.46	Collar:	8.0	2.44	Total Tonnes:	19756.0
Diameter in:	4								

Material Blasted: Limestone Explosive / Hole: 89.0 kg 196.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 89.0 kg 196.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	44	17ms -	67ms -	4 Black Cap (3/4 lb) -
24' -	44 80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	6				50

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	196.0	89.0
Total product		8624.0	3916.0

Miscellaneous:

Comments:

There are 6 holes at 26' on the ledge that will go with this shot.

Approved:  Date: Sept 19 / 16



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-43

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/19/2016 10:58

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Partly Cloudy

Wind From: S

Temperature: 25 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 44.399" N 79° 17' 36.099" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 347 °

Structure Type: Dwelling

Distance: 818 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

LAYOUT

Hole Depth:	7.62-10.82 m	Material Blasted:	Limestone	Total Meters Drilled:	463.3 m
No. of Holes:	44	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P.† Holes:	44	Face Height:	7.62-10.82 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	max 2.44 m
				Stem Length:	min 1.98 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,274.1 m ³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	84.7 kg	Weight Produced:	18,185.6 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.082 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	84.7 kg	Powder Factor 2:	0.492 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	88.86	Rock Density:	2.500 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	88.87		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling			No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-43

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/19/2016 10:58

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	83.00 ea	28.23
10792	SHOCK*STAR Dual-Delay 15m/50' 25/500	44.00 ea	0.00
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	39.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	3.00 ea	0.00
07696	Hydromite 4400 Bulk	3,550.00 kg	3,550.00
12981	Mini Stem Plug - 6015	44.00 ea	0.00
D0120	Other-Drilling Charges	1,520.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,578.23

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-43

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/19/2016 10:58

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

Pattern: 1

No. of Holes:	40	Hole Depth:	10.82 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P. † Holes:	40	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Specified
No. of Rows:	2	Face Height:	10.82 m				(H = 10.82 m)
Drilling Angle:	0 °					Total volume for pattern:	6,795.5 m ³
						Total weight for pattern:	16,989.2 t

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	4	Hole Depth:	7.62 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P. † Holes:	4	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Specified
No. of Rows:	2	Face Height:	7.62 m				(H = 7.62 m)
Drilling Angle:	0 °					Total volume for pattern:	478.6 m ³
						Total weight for pattern:	1,196.4 t

† V.P. = Volume Producing

Total blast volume: 7,274.0 m³
Total weight produced: 18,185.6 t

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 2016-43

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/19/2016 10:58

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	Seismic Record	Seismograph Type:	White Mini-Seis				
Date:	09/19/16	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	4.95 mm/s	24.3 Hz
Time:	10:58	Calibration Date:	09/02/16		Vertical:	3.81 mm/s	85.3 Hz
Distance From Blast:	504.14 m	Calibration Signal:			Longitudinal:	5.96 mm/s	64.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz	PPV:	---	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	114 dB	
Location:	Corner Of Erie Peat Rd & Hwy#3				Vector Sum:	6.98 mm/s	
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Aaron Merritt, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Austin Powder						

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	White mini-Seis				
Date:	09/19/16	Trigger Level:	1.02 mm/s	120.00 dB	Transverse:	---	---
Time:	10:58	Calibration Date:	02/09/16		Vertical:	---	---
Distance From Blast:	2,150.97 m	Calibration Signal:			Longitudinal:	---	---
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz	PPV:	---	---
Readout:		Mic. Min. Freq.:	---	Hz	Acoustic:	---	---
Location:	17 First Ave Front Yard				Vector Sum:	---	---
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W				
Reader and Firm:	Aaron Merritt, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:	Austin Powder						



AUSTIN POWDER LTD. BLAST DESIGN



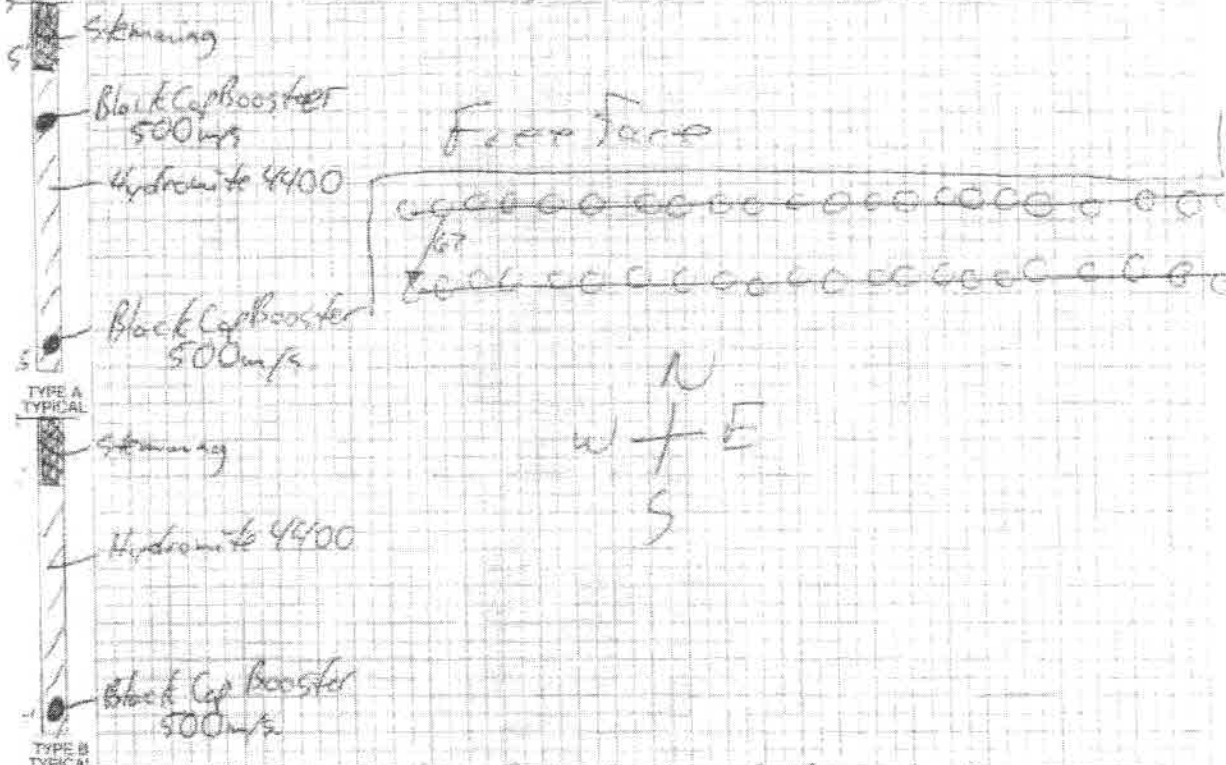
SHOT NO. 2016-43 DATE: 9/19/16
 COMPANY (PERMITTEE): Low Crushed Stone LOCATION: Combined Bench
 TYPE OF MATERIAL BLASTED: Limestone HOLE DIAMETER: 4"
 NO. OF HOLES: 44 NO. OF ROWS: 2 BURDEN: 13'
 SPACING: 13' DEPTH: 35.5' FACE HEIGHT: 35.5' LENGTH OF STEMMING (COLLAR): 6.5'

EXPLOSIVES TOTAL QUANTITY
50' Dual Delay 25/500 44
30' Dual Delay 25/500 40
20' Quick Relay 67ms 3
Hydramite 4400 3850kg

CONVERSIONS
 1 mm = 0.03937 in 1 in = 25.4 mm
 1 m = 3.28 ft 1 ft = 0.3048 m
 1 m² = 35.32 ft² 1 ft² = 0.0283168 m²
 1 m³ = 1.308 yd³ 1 yd³ = 0.764555 m³
 1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
 1 kg = 2.2046 lb 1 lb = 0.454 kg
 1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
 1 tonne/m³ = 0.942777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER: Black Cap Booster 84
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS): _____ WEIGHT OF EXPLOSIVES PER HOLE: 87.5kg
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE): Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED: 15,711 tonne OR TOTAL CUBIC METRES PRODUCED: 7485 m³
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.51kg
 SKETCH: KG/TONNE 0.2kg DENSITY TONNES/CUBIC METRE 2.5



PRE-BLAST COMMENTS: 92ms Between Rows, 25ms Between holes
Quarry to be cleared by Foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: Aaron Merritt
 PRINT: _____
 SIGNATURE: Aaron Merritt

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER / PLEASE DESCRIBE

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Sept, 29, 16

Location in Quarry: East Face Combined Bench

Layout

		Feet	Metres	Feet	Metres		
# Holes:	44	Hole Depth:	36.0	7.46	Burden:	13.0	3.96
# Rows:	2	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	36.0	7.46	Collar:	8.0	2.44
Diameter in:	4					m ³ / Hole:	172.0
						Tonnes/Hole:	449.0
						Total Tonnes:	19756.0

Material Blasted: Limestone Explosive / Hole: 89.0 kg 196.0 lb
 Density: 2.61 t/m³ Max. kg. / Delay: 89.0 kg 196.0 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	44 80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	6				50

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	196.0	89.0
Total product		8624.0	3916.0

Miscellaneous:

Comments:

There are 6 holes at 26' on the ledge that will go with this shot.

Approved:

Date:

Sept 29/16



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-44

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/29/2016 10:46

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: ENE

Temperature: 21 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 44.299" N 79° 17' 33.799" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 356 °

Structure Type: Dwelling

Distance: 802 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62-10.82 m	Material Blasted:	Limestone	Total Meters Drilled:	455.7 m
No. of Holes:	43	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	43	Face Height:	7.62-10.82 m	Spacing:	3.96 m
No. of Rows:	2	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

(H = 10.60 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.0 kg	Volume Produced:	7,154.4 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	83.0 kg	Weight Produced:	17,886.5 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	5.142 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	83.0 kg	Powder Factor 2:	0.486 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	88.03	Rock Density:	2.500 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	88.03		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
DEBOER	GARY, B			No	No	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
MINOR	CARMEN, R			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes	Maple Leaf Drilling	No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-44

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/29/2016 10:46

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	83.00 ea	28.23
11171	50' SHOCK*STAR Dual-Delay 25/475	43.00 ea	0.00
10750	SHOCK*STAR DualDelay 7.3m/24' 25/500	40.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	3.00 ea	0.00
13817	Hydromite 4100S Bulk	3,450.00 kg	3,450.00
12981	Mini Stem Plug - 6015	43.00 ea	0.00
D0120	Other-Drilling Charges	1,526.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			3,478.23

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-44

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/29/2016 10:46

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Combined Bench

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	09/29/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	4.82 mm/s 56.8 Hz
Time:	10:46	Calibration Date:	02/03/16			Vertical:	2.54 mm/s 56.8 Hz
Distance From Blast:	480.06 m	Calibration Signal:				Longitudinal:	5.96 mm/s 102.4 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	114 dB
Location:						Vector Sum:	0.12 mm/s
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	No Trigger	Seismograph Type:	white mini seis				
Date:	09/29/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	---
Time:	10:46	Calibration Date:	05/02/16			Vertical:	---
Distance From Blast:	2,098.85 m	Calibration Signal:				Longitudinal:	---
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz		Acoustic:	---
Location:	In front yard					Vector Sum:	---
Lat./Long.:	42° 53' 37.200" N		79° 16' 1.800" W				
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE: / /

COMPANY (PERMITTEE) LAZ CRAYED STONE LOCATION COMBINED BEACH

TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 4

NO. OF HOLES 43 NO. OF ROWS 2 BURDEN 13

SPACING 13 DEPTH 36 FACE HEIGHT 36 LENGTH OF STEMMING 6.5
(COLLAR)

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

50' 475. 43
24' 500. 43.

1 mm = 0.03937 in 1 m = 26.4 mm
1 m = 3.28 ft 1 ft = 0.3048 m
1 m³ = 35.32 ft³ 1 ft³ = 0.0283168 m³
1 m² = 1.308 yd² 1 yd² = 0.764555 m²
1 yd³ = 27 ft³ 1 ft³ = 0.37037 yd³
1 kg = 2.2046 lb 1 lb = 0.454 kg
1 tonne = 1.1023 ton 1 ton = 0.907185 tonne
1 tonne/m³ = 0.842777 ton/yd³ 1 ton/yd³ = 1.1866 tonne/m³

TYPE OF PRIMER BLACKCAP 86

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 3956 WEIGHT OF EXPLOSIVES PER HOLE 92kg

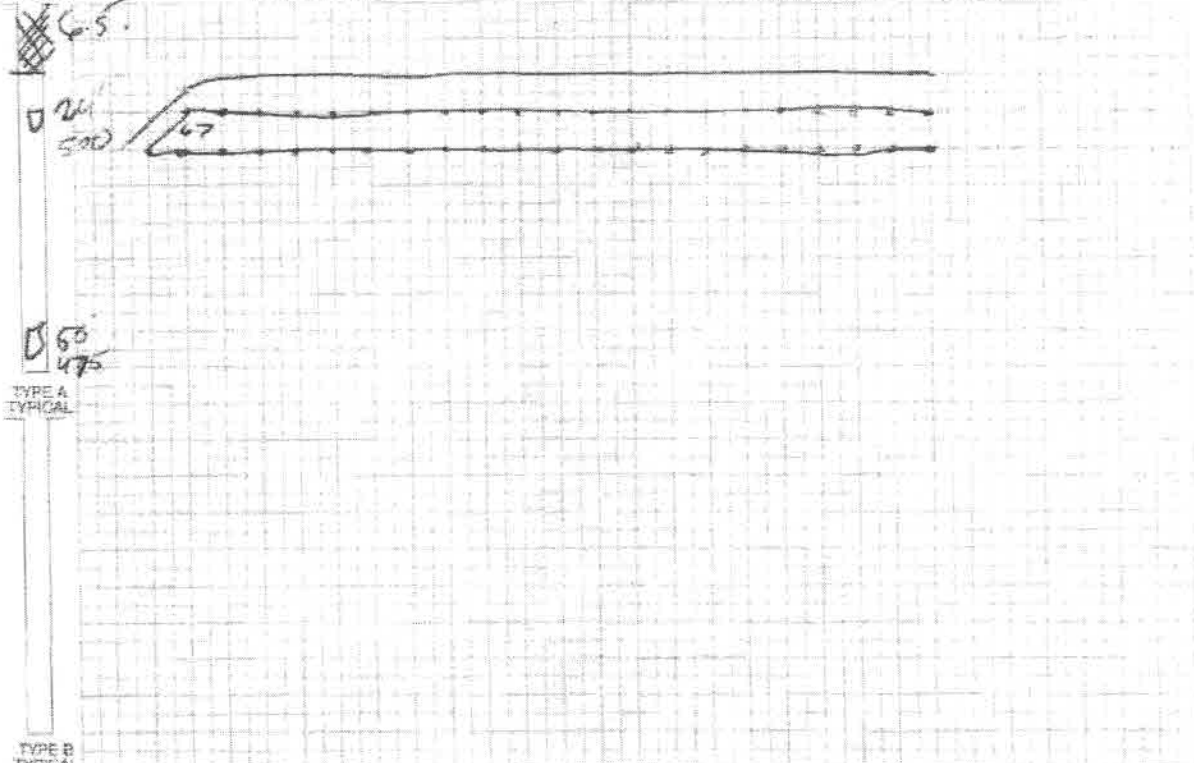
TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
(SIGNIFICANT VARIATIONS SHOULD BE

DELAY DETONATORS USED (TYPE) Quick RELAY EXPLAINED AND IDENTIFIED IN SKETCH.)
Dark DELAY

TOTAL NO. TONNES PRODUCED 19332 OR TOTAL CUBIC METRES PRODUCED 7406

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.5

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 92ms BETWEEN ROWS.
250ms BETWEEN HOLES.

POST-BLAST COMMENTS: PIT FOREMAN
TO CLEAR PIT
FOR BLAST

BLASTER IN CHARGE: TOM DAVIS
PRINT: _____
SIGNATURE: TOM DAVIS

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Sept,30,16

Location in Quarry: **Top Bench**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	231	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	9	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4					m ³ / Hole:	57.7
Material Blasted:		Limestone		Explosive / Hole:		11.1 kg	24.5 lb
Density:		2.4 t/m ³		Max. kg. / Delay:		11.1 kg	24.5 lb
Max Holes / Delay:		1		Distance to Seis.:		m	ft
						Total Tonnes:	31416.0

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	231 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		7276.5	3234.0

Miscellaneous:

Comments:

Approved: *[Signature]*

Date: *Sept 30 / 16*

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-45

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/30/2016 13:29

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Overcast /
Low Clouds

Wind From: ENE

Temperature: 17 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 44.299" N 79° 17' 33.799" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Compass Point: N

Direction/Bearing: 356 °

Distance: 802 m

LAYOUT

Hole Depth:	3.35 m	Material Blasted:	Limestone	Total Meters Drilled:	774.5 m
No. of Holes:	231	Subdrilling:	0.00 m	Burden:	[See Below]
No. of V.P.† Holes:	231	Face Height:	3.35 m	Spacing:	[See Below]
No. of Rows:	[See Below]	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	1/2" Clear Stone
				Water Depth:	3.35 m
				Stem Length:	min 1.83 m
				Area Type:	[See Below]
				Method:	[See Below]

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	16.1 kg	Volume Produced:	12,018.3 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	16.1 kg	Weight Produced:	28,848.8 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	23.528 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	5.7 kg	Powder Factor 2:	0.102 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	334.78	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	199.65		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
VAN RAVENSWAAY	JEREMY, P			No	Yes	Yes	No	Yes
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway	Maple Leaf Drilling			No	No	No	No	No



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-45

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/30/2016 13:29

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	231.00 ea	78.56
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	232.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	19.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	16.00 ea	0.00
07696	Hydromite 4400 Bulk	1,147.59 kg	1,147.59
D0120	Other-Drilling Charges	2,541.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			1,226.15

COMMENTS / EXPLANATIONS

General Comments: Extra Det Was used for Timing

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-45

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/30/2016 13:29

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

Pattern: 1

No. of Holes:	226	Hole Depth:	3.35 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P.† Holes:	226	Subdrilling:	0.00 m	Spacing:	3.96 m	Method:	Weighted Average ✓
No. of Rows:	16	Face Height:	3.35 m				
Drilling Angle:	0 °					Total volume for pattern:	11,896.9 m ³
						Total weight for pattern:	28,557.2 t

† V.P. = Volume Producing

Pattern: 2

No. of Holes:	5	Hole Depth:	3.35 m	Burden:	3.96 m	Area Type:	Conventional
No. of V.P.† Holes:	5	Subdrilling:	0.00 m	Spacing:	1.83 m	Method:	Weighted Average ✓
No. of Rows:	5	Face Height:	3.35 m				
Drilling Angle:	0 °					Total volume for pattern:	121.5 m ³
						Total weight for pattern:	291.6 t

† V.P. = Volume Producing

Total blast volume: 12,018.4 m³
Total weight produced: 28,848.8 t

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-45

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/30/2016 13:29

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 09/30/16 Trigger Level: 1.01 mm/s --- dB Transverse: 1.52 mm/s 64.0 Hz
Time: 13:29 Calibration Date: 02/03/16 Vertical: 1.39 mm/s 42.6 Hz
Distance From Blast: 480.06 m Calibration Signal: Longitudinal: 1.27 mm/s 64.0 Hz
Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 114 dB
Location: Vector Sum: 1.65 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type: No Trigger Seismograph Type: white mini seis
Date: 09/30/16 Trigger Level: 1.01 mm/s --- dB Transverse: --- mm/s --- Hz
Time: 13:29 Calibration Date: 05/02/16 Vertical: --- mm/s --- Hz
Distance From Blast: 2,098.85 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: E Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: In front yard Vector Sum: --- mm/s
Lat./Long.: 42° 53' 37.200" N 79° 16' 1.800" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE 1/11/11
 COMPANY (PERMITTEE) Law LOCATION LAH. 72
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 230 NO. OF ROWS 16 BURDEN 13
 SPACING 13 DEPTH 11 FACE HEIGHT 11 LENGTH OF STEMMING 6
 EXPLOSIVES _____ TOTAL QUANTITY _____

CONVERSIONS

1 mm = 0.03937 in	1 m = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.23 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1868 tonne/m ³

TYPE OF PRIMER Black 230
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2300 WEIGHT OF EXPLOSIVES PER HOLE 10
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) _____ (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED _____ OR TOTAL CUBIC METRES PRODUCED 172200
 TOTAL POWDER FACTOR _____ KG/CUBIC METRE 0.4
 SKETCH _____ KG/TONNE _____ DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 25m3 BETWEEN HOLES

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Southern Law
 PRINT _____ SIGNATURE _____

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Sept,07,16

Location in Quarry: East Face Combined Bench

Layout

		Feet		Metres		Feet		Metres	
# Holes:	44	Hole Depth:	36.0	7.46	Burden:	13.0	3.96	m ³ / Hole:	172.0
# Rows:	2	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	449.0
Diameter mm:		Face Height:	36.0	7.46	Collar:	8.0	2.44	Total Tonnes:	19756.0
Diameter in:	4								

Material Blasted: Limestone
 Density: 2.61 t/m³
 Max Holes / Delay: 1

Explosive / Hole: 89.0 kg 196.0 lb
 Max. kg. / Delay: 89.0 kg 196.0 lb
 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	6	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	4	Black Cap (3/4 lb) -
24' -	44 80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	100' -	33ms -			Green Cap (1/4 lb) -
40' -	6				

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	18	196.0	89.0
Total product		8624.0	3916.0

Miscellaneous:

Comments:

There are 6 holes at 26' on the ledge that will go with this shot.

Approved:

Date:

Sept 21/16

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-42

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/07/2016 14:10

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray/ White Combined

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 26 °C

Terrain: Flat

Wind Velocity: 10-20 km/h

Blast Lat./Long.: 42° 53' 44.600" N 79° 17' 35.500" W

NEAREST PROTECTED STRUCTURE

Compass Point: N

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 359 °

Structure Type: Dwelling

Distance: 791 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	7.62-10.97 m	Material Blasted:	Limestone	Total Meters Drilled:	469.4 m
No. of Holes:	44	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. Holes:	44	Face Height:	7.62-10.97 m	Spacing:	3.96 m
No. of Rows:	2	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

(H = 10.67 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	88.6 kg	Volume Produced:	7,369.8 m³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	88.6 kg	Weight Produced:	18,424.9 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	9.780 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	44.3 kg	Powder Factor 2:	0.256 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	118.85	Rock Density:	2.500 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	84.04		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout	
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No	
LI	JACKSON, A			No	No	No	No	No	
PASSMORE	EDGAR, M			No	Yes	No	No	No	
Other Crew Members				Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Bailey Holmes				Maple Leaf Drilling	No	No	No	Yes	Yes



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-42

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/07/2016 14:10

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray/ White Combined

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	84.00 ea	28.57
10792	SHOCK*STAR Dual-Delay 15m/50' 25/500	44.00 ea	0.00
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	40.00 ea	0.00
01849	30' SHOCK*STAR Quick Relay 67 ms	3.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	4.00 ea	0.00
07696	Hydromite 4400 Bulk	1,855.19 kg	1,855.19
12981	Mini Stem Plug - 6015	44.00 ea	0.00
D0120	Other-Drilling Charges	1,540.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>1,883.76</u>

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 2016-42

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 09/07/2016 14:10

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: Gray/ White Combined

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis						
Date:	09/07/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	3.04 mm/s	25.6 Hz	
Time:	11:12	Calibration Date:	02/03/16			Vertical:	4.95 mm/s	73.1 Hz	
Distance From Blast:	503.83 m	Calibration Signal:				Longitudinal:	7.87 mm/s	73.1 Hz	
Direction From Blast:	SSE	Geophone Min. Freq.:	---	Hz		PPV:	---	mm/s	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	117 dB		
Location:						Vector Sum:	8.5 mm/s		
Lat./Long.:	42° 53' 29.800" N								79° 17' 26.120" W
Reader and Firm:	Jordan Davis, AUSTIN POWDER								
Analyst and Firm:									
Installer and Firm:									

SEISMOGRAPH 2 - 17 FIRST AVE

Data Type:	Seismic Record	Seismograph Type:	white mini seis						
Date:	09/07/16	Trigger Level:	1.01 mm/s	---	dB	Transverse:	1.52 mm/s	46.5 Hz	
Time:	11:12	Calibration Date:	05/02/16			Vertical:	0.38 mm/s	56.8 Hz	
Distance From Blast:	2,138.17 m	Calibration Signal:				Longitudinal:	0.38 mm/s	39.3 Hz	
Direction From Blast:	E	Geophone Min. Freq.:	---	Hz		PPV:	---	mm/s	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	110 dB		
Location:	In front yard					Vector Sum:	1.52 mm/s		
Lat./Long.:	42° 53' 37.200" N								79° 16' 1.800" W
Reader and Firm:	Jordan Davis, AUSTIN POWDER								
Analyst and Firm:									
Installer and Firm:									



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____
 COMPANY (PERMITTEE) PORT KAITUMA QUARRY LOCATION Blans
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 90 NO. OF ROWS 4 BURDEN 9
 SPACING 9 DEPTH 14.5 FACE HEIGHT 19.5 LENGTH OF STEMMING (COLLAR) 5
 EXPLOSIVES _____ TOTAL QUANTITY _____

DATE: 1/1/11

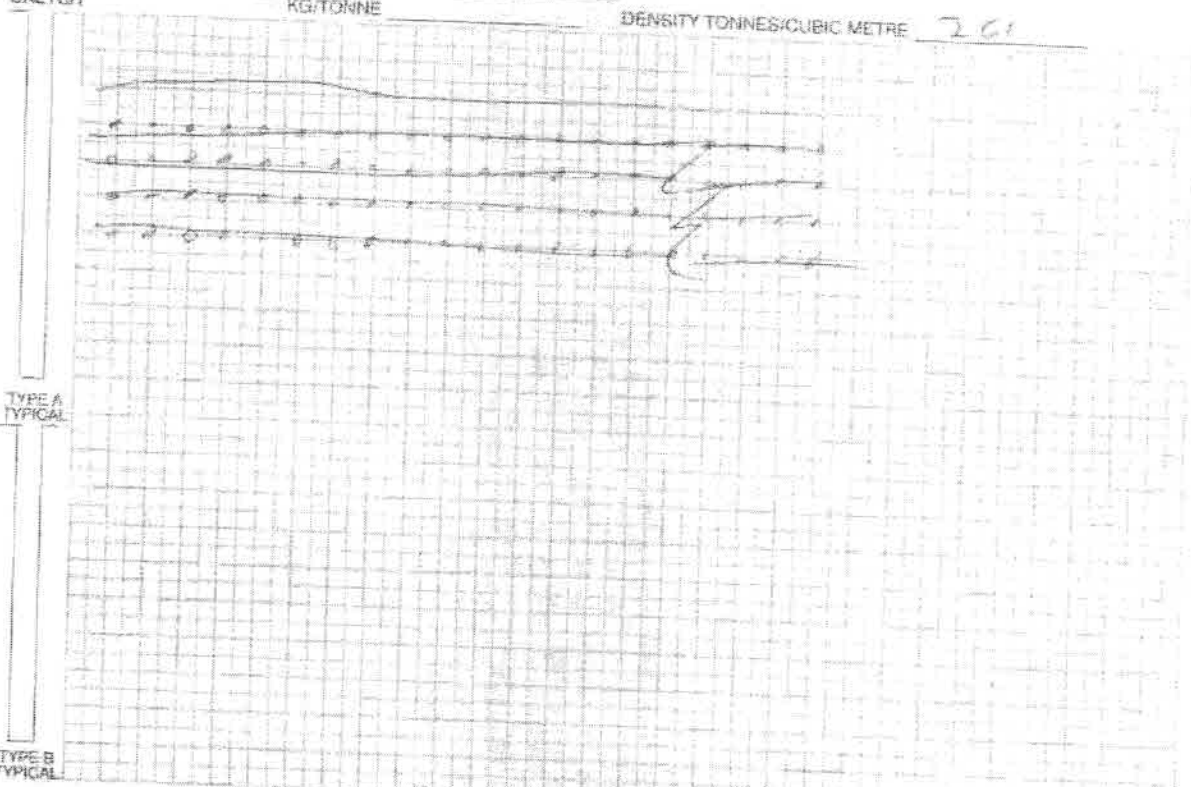
30 DUNE PRAY 80

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ² = 35.32 ft ²	1 ft ² = 0.0283168 m ²
1 m ³ = 1.358 yd ³	1 yd ³ = 0.764555 m ³
1 yd = 27 ft	1 ft = 0.37037 yd
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1868 tonne/m ³

TYPE OF PRIMER Butex 40 90
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2000 WEIGHT OF EXPLOSIVES PER HOLE 35
 TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
 DELAY DETONATORS USED (TYPE) _____ (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 6447 OR TOTAL CUBIC METRES PRODUCED 2000
 TOTAL POWDER FACTOR KG/CUBIC METRE e
 SKETCH KG/TONNE _____ DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS
109 BETWEEN ROWS

POST-BLAST COMMENTS _____

BLASTER IN CHARGE Southern
 PRINT _____
 SIGNATURE _____

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER: PLEASE DESCRIBE

Seizomograph Location

- A= 1st. Pole on Erie Peat
- B= 20246 Young Rd.
- C= Lake Shore Rd.
- D=10615 Hwy#3
- E= Cathy Cres
- F= Hwy #3 and Quarry Rd.
- G= 20214 Townline Rd.
- H= 2nd Pole on Erie Peat Rd.
- I=3rd Pole on Erie Peat Rd.
- J=20355 Erie Peat Rd. "Jullie Ritchies"
- K=20160 Hwy #3 Front Lawn Todd Bazinet's
- L=20136 Townline Rd. "Alec Balogh's"
- M=20148 Hwy 3 Adam Ferri
- N=4L23 Lakeshore Rd. Mike McCabe
- O=Kwik Mix Property on lawn at corner of Hwy 3 and Kwik Mix Rd.
- P=1/2 way down Bessey Rd. on East side of Road
- Q=Carol Tennier 15 First Ave South off Hwy #3 Port Colborne
- R=Andrew Gillespie 121 North Cres. Port Colborne
- S=John Greco 10146 Hwy #3 front lawn
- T=Sharron Skea 10285 Lakeshore Rd.
- U=Angela Cox 17 First Ave. Port Colborne
- V=First Ave Beside No Frills on Berm
- W=First Ave Behind No Frills along Fence
- X=10257 Crescent Heights, Port Colborne, Judy Kramer
- Y=115 Rosemount Ave., Port Colborne, Marcia Turner
- Z=230 Rosemount Ave., Port Colborne, Christine Hutcheson
- AA=20146 Townline Rd., Port Colborne, Marcia Murdoch
- AB=207 Westside Rd., Port Colborne, Walter Clapp
- AC=10250 Highway 3, Wainfleet, Beth Robins
- AD=Erie Peat Bog
- AE=20455 Erie Peat Rd. Behind the quarry
- AF=Biederman Rd 1st House on Left
- AG=40 Townline Road Hillhouse property
- AH=20101 Barrick Rd. Port Colborne
- AI=Beside Youngs Rd Water Well
- AJ=Youngs St. Test Well
- AK=722 Hwy #3 West Main St. Deschamps property
- AL=678 Barrick Rd. Port Colborne
- AM=2035 Youngs Rd.
- AN=Cr. of Hwy 3 and Erie Peat Rd.
- AO=SW corner of Kwik Mix Building

Weather

- A= Sunny and Clear
- B= Cloudy / Overcast
- C= Cloudy / Overcast and Showers
- D=Cloudy / Heavy Snow
- E=Cloudy/Light snow
- F=Partly Cloudy
- G=Cloudy/High Clouds
- H=Cloudy/Overcast/Light Rain
- I=Hazy Hot Humid
- J=Light Rain
- K=Overcast/Low Clouds
- L=Heavy rain



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Apr,13,17

Location in Quarry: **Top Bench:**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	188	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4						
						m3/ Hole:	57.7
						Tonnes/Hole:	136.0
						Total Tonnes:	25568.0

Material Blasted: Limestone Explosive / Hole: 11.1 kg 24.5 lb
 Density: 2.4 t/m3 Max. kg. / Delay: 11.1 kg 24.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	188 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		5828.0	2613.0

Miscellaneous:

Comments:

Approved: *[Signature]*

Date: *Apr 13 / 17*

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 04-13-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/13/2017 11:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Overcast /
Low Clouds

Wind From: S

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 4-6 km/h

Blast Lat./Long.: 42° 53' 40.800" N 79° 17' 35.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Compass Point: NNW

Direction/Bearing: 347 °

Distance: 929 m

LAYOUT

Hole Depth:	3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	585.2 m
No. of Holes:	192	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	192	Face Height:	3.05 m	Spacing:	3.96 m
No. of Rows:	6	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	1.52 m
				Stem Length:	1.68 m
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 3.05 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	40.1 kg	Volume Produced:	9,188.3 m ³
Firing Device: Other	Max. Wt. of Expl. Per 8 ms Interval:	40.1 kg	Weight Produced:	22,055.5 t
Other Method: Remote Blasting Machine	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	8.598 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	13.4 kg	Powder Factor 2:	0.279 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	254.16	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	146.74		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BELCOSKI	MICHAEL, S			No	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	No	No	No
MINOR	CARMEN, R			No	Yes	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jeremy	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 04-13-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/13/2017 11:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	192.00 ea	65.30
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	192.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	11.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	12.00 ea	0.00
07602	Hydromite 4100 Bulk	2,500.00 kg	2,500.00
D0120	Other-Drilling Charges	1,920.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,565.30

COMMENTS / EXPLANATIONS

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 04-13-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/13/2017 11:42

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record Seismograph Type: White Mini-Seis
Date: 04/13/17 Trigger Level: 1.02 mm/s 110.00 dB Transverse: 1.39 mm/s 39.3 Hz
Time: 11:42 Calibration Date: 05/02/16 Vertical: 1.52 mm/s 56.8 Hz
Distance From Blast: 400.51 m Calibration Signal: Longitudinal: 1.77 mm/s 42.6 Hz
Direction From Blast: SE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: 116 dB
Location: Corner Of Erie Peat Rd & Hwy#3 Vector Sum: 1.9 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Aaron Merritt, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Austin Powder

SEISMOGRAPH 2 - 678 BARRICK RD

Data Type: No Trigger Seismograph Type: White mini-Seis
Date: 04/13/17 Trigger Level: 1.02 mm/s 110.00 dB Transverse: --- mm/s --- Hz
Time: 11:42 Calibration Date: 11/07/16 Vertical: --- mm/s --- Hz
Distance From Blast: 2,404.26 m Calibration Signal: Longitudinal: --- mm/s --- Hz
Direction From Blast: NE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Mic. Min. Freq.: --- Hz Acoustic: --- dB
Location: 678 Barrick Rd spiked in front yard Vector Sum: --- mm/s
Lat./Long.: 42° 54' 36.000" N 79° 16' 20.700" W
Reader and Firm: Aaron Merritt, AUSTIN POWDER
Analyst and Firm:
Installer and Firm: Austin Powder

Corner of Erie PeatRd and HWY#3

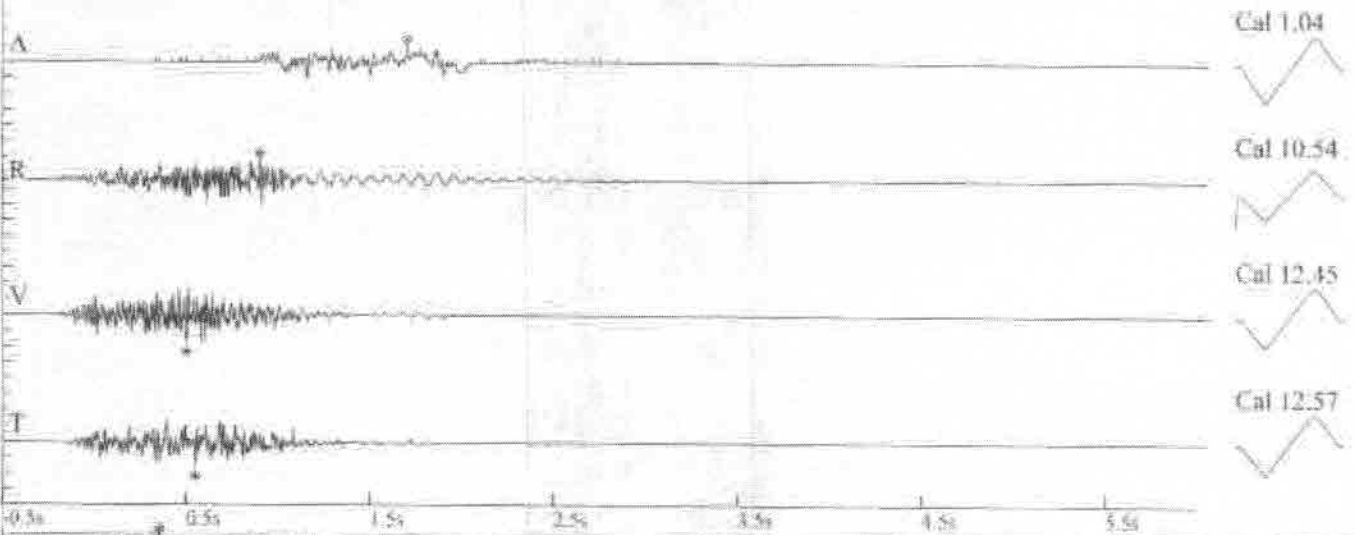
File Name: 599020170413135.dth
Number: 155
Date: 4/13/2013
Time: 11:42
Serial Number: 5990
Seismic Trigger: 1.016 mm/sec
Acoustic Trigger: 106.411
Sample Rate: 1024
Duration: 6.0 seconds
Pre-Trigger: 0.50 seconds
Gain: 2x
Voltage: 6.0

Amplitudes and Frequencies

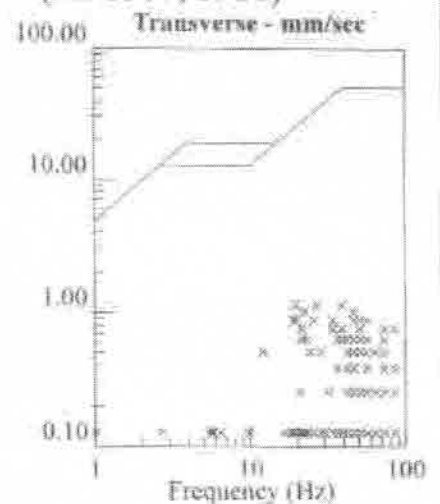
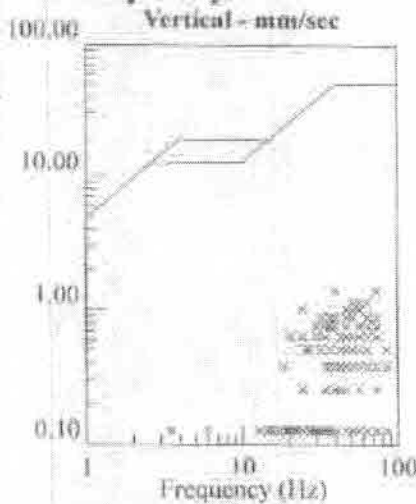
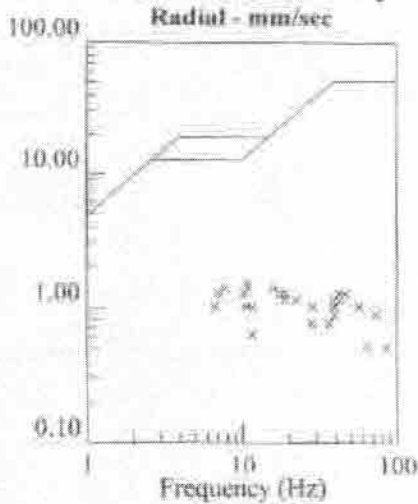
Acoustic: 116 dB, 0.12 Mb @ 4.0 Hz
Radial: 1.778 mm/sec @ 42.6Hz
Vertical: 1.524 mm/sec @ 56.8Hz
Transverse: 1.397 mm/sec @ 39.3Hz
Vector Sum: 1.905 mm/sec

Graph Information

Duration: -0.500 s To: 6.000 s
Acoustic Scale: 126 dB
Seismic Scale: 3.60 mm/sec (0.900 mm/sec/div)
Time Intervals at: 1.00 s



VS Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)





AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Apr,19,17

Location in Quarry: **Top Bench:**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	204	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4				m3/ Hole:	57.7	
					Tonnes/Hole:	136.0	
					Total Tonnes:	25568.0	

Material Blasted: Limestone Explosive / Hole: 11.1 kg 24.5 lb
 Density: 2.4 t/m3 Max. kg. / Delay: 11.1 kg 24.5 lb
 Max Holes / Delay: 1 Distance to Seis.: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	10	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	12	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	204 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6426.0	2856.0

Miscellaneous:

Comments:

Approved: Date: Apr 19/17



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 04/19/17

COMPANY (PERMITTEE) LAN

LOCATION IN HOLE ROCK

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 12"

NO. OF HOLES 203 NO. OF ROWS 4 BURDEN 13

SPACING 13 DEPTH 9.5 FACE HEIGHT 9.5 LENGTH OF STEMMING 5
(COLLAR)

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

<u>30' Dual Delay 7500</u>	<u>203</u>
<u>20' Cottons Quince Blast</u>	<u>7</u>
<u>10m Extra Sensitive</u>	<u>1</u>
<u>4400 Hypromite</u>	

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ² = 1.308 yd ²	1 yd ² = 0.764555 m ²
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.166 tonne/m ³

TYPE OF PRIMER BLACK CAP 203-

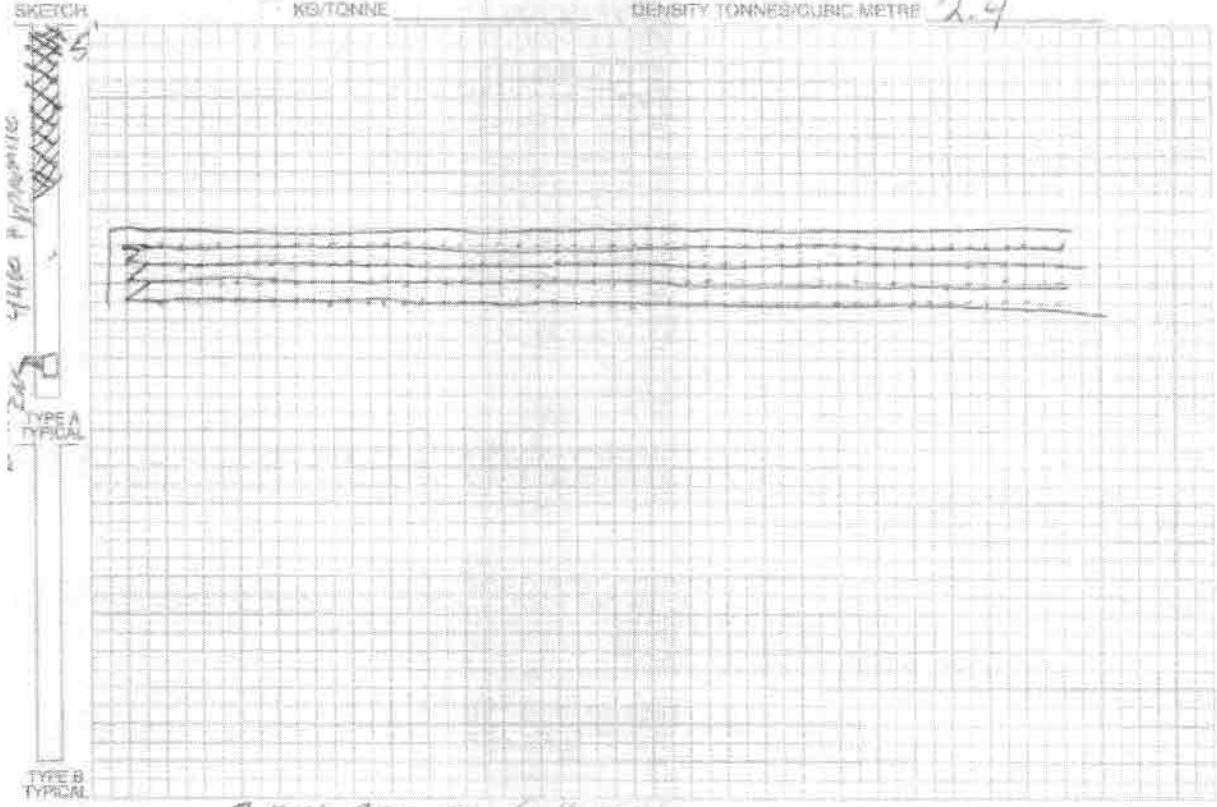
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2436 WEIGHT OF EXPLOSIVES PER HOLE 12

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) DUAL DELAY
DUAL DELAY

TOTAL NO. TONNES PRODUCED 22146 OR TOTAL CUBIC METRES PRODUCED 9227

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.2 DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 25ms BETWEEN HOLES
92ms BETWEEN ROWS

POST-BLAST COMMENTS: PIT Foreman TO clear PIT
FOR BLAST TIME!

BLASTER IN CHARGE: [Signature]
SIGNATURE

TYPE OF PROTECTIVE COVER USED:
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 04/19/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/19/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Light Rain

Wind From: ENE

Temperature: 11 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 40.600" N 79° 17' 44.400" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 11 °

Distance: 935 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	1.83-2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	548.3 m
No. of Holes:	196	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	196	Face Height:	1.83-2.90 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

(H = 2.80 m)

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	24.9 kg	Volume Produced:	8,609.2 m ³
Firing Device:	Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	24.9 kg	Weight Produced:	20,665.5 t
Other Method:	Remote Blating Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	9.118 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	12.4 kg	Powder Factor 2:	0.263 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	265.17	Rock Density:	2.400 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	187.50		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway	Maple Leaf Drilling	No	No	No	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 04/19/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/19/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	196.00 ea	66.66
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	201.00 ea	0.00
11240	500' SHOCK*STAR Lead-In-Line	1.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
07696	Hydromite 4400 Bulk	2,200.00 kg	2,200.00
D0120	Other-Drilling Charges	1,800.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			<u>2,266.66</u>

COMMENTS / EXPLANATIONS

General Comments: Extra Dets were used as a safety for holes with stuck Boosters

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 04/19/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 04/19/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - 678 BARRICK RD

Data Type: No Trigger	Seismograph Type: ---	Transverse: --- mm/s	--- Hz
Date: 04/19/17	Trigger Level: 1.02 mm/s 110.00 dB	Vertical: --- mm/s	--- Hz
Time: 12:30	Calibration Date: 09/02/16	Longitudinal: --- mm/s	--- Hz
Distance From Blast: 2,558.49 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: NE	Geophone Min. Freq.: --- Hz	Acoustic: --- dB	
Readout:	Mic. Min. Freq.: --- Hz	Vector Sum: --- mm/s	
Location:			
Lat./Long.: 42° 54' 36.000" N	79° 16' 20.500" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 1.39 mm/s	46.5 Hz
Date: 04/19/17	Trigger Level: 1.01 mm/s --- dB	Vertical: 1.14 mm/s	32.0 Hz
Time: 12:30	Calibration Date: 11/18/16	Longitudinal: 0.88 mm/s	26.3 Hz
Distance From Blast: 532.18 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: ESE	Geophone Min. Freq.: --- Hz	Acoustic: 94 dB	
Readout: Display Only	Mic. Min. Freq.: --- Hz	Vector Sum: 1.53 mm/s	
Location:			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm:			

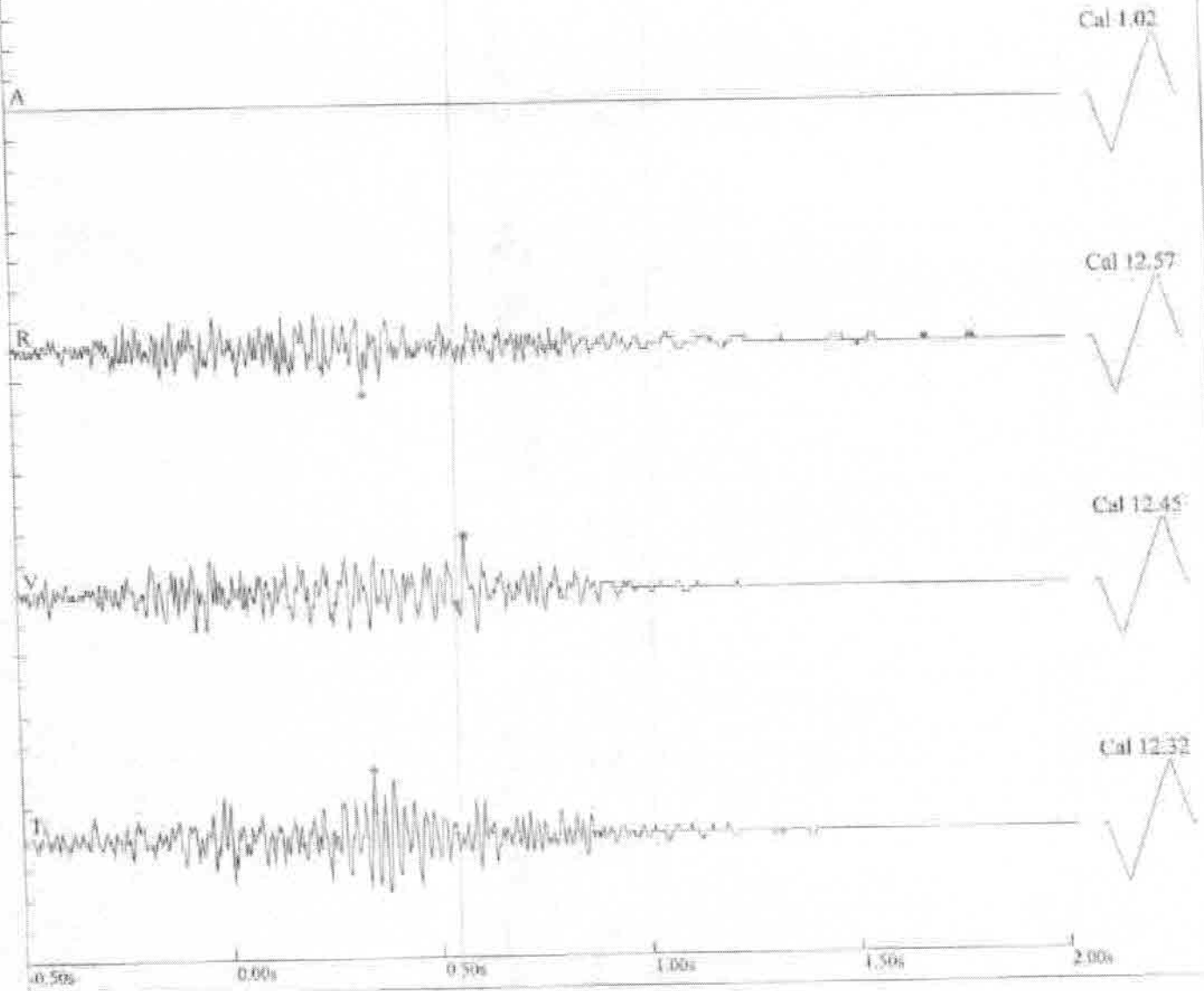
File Name: 500120170410001.dbr
Number: 1991
Date: 4/19/2017
Time: 11:30
Serial Number: 2001
Seismic Trigger: 1.016 mm/sec
Acoustic Trigger: 100 dB
Sample Rate: 1024
Duration: 2.0 Seconds
Pre-Trigger: 0.50 Seconds
Gain: 1x
Voltage: 0.1

Amplitudes and Frequencies

Acoustic: <100 dB, <0.02 Mb @ 0.0 Hz
Radial: 0.889 mm/sec @ 24.3Hz
Vertical: 1.143 mm/sec @ 32.0Hz
Transverse: 1.397 mm/sec @ 46.5Hz

Graph Information

Duration: -0.500 s To: 2.000 s
Acoustic Scale: 126 dB
Seismic Scale: 2.80 mm/sec (0.700 mm/sec/div)
Time Intervals at: 0.50 s



BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE August 9 2017 TIME 3:35 pm
CONTRACT / JOB # J18064C
LOCATION Port Colbourne (middle beach)

BLASTER Zack Pollock
Please Print
SIGNATURE Zack Pollock

EXPLOSIVES: **No 022291**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4"
NO. OF HOLES 54
NO. OF DELAYS 1
MAX. LOAD PER DELAY 60.8 Kgs max
HOLES PER SERIES 54
POWDER FACTOR 0.49 Kgs/m³

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>3285 Kgs</u>
2) <u>AES 8oz Boosters</u>	<u>54 units</u>
3) .....	.....

DETONATORS / INITIATORS:

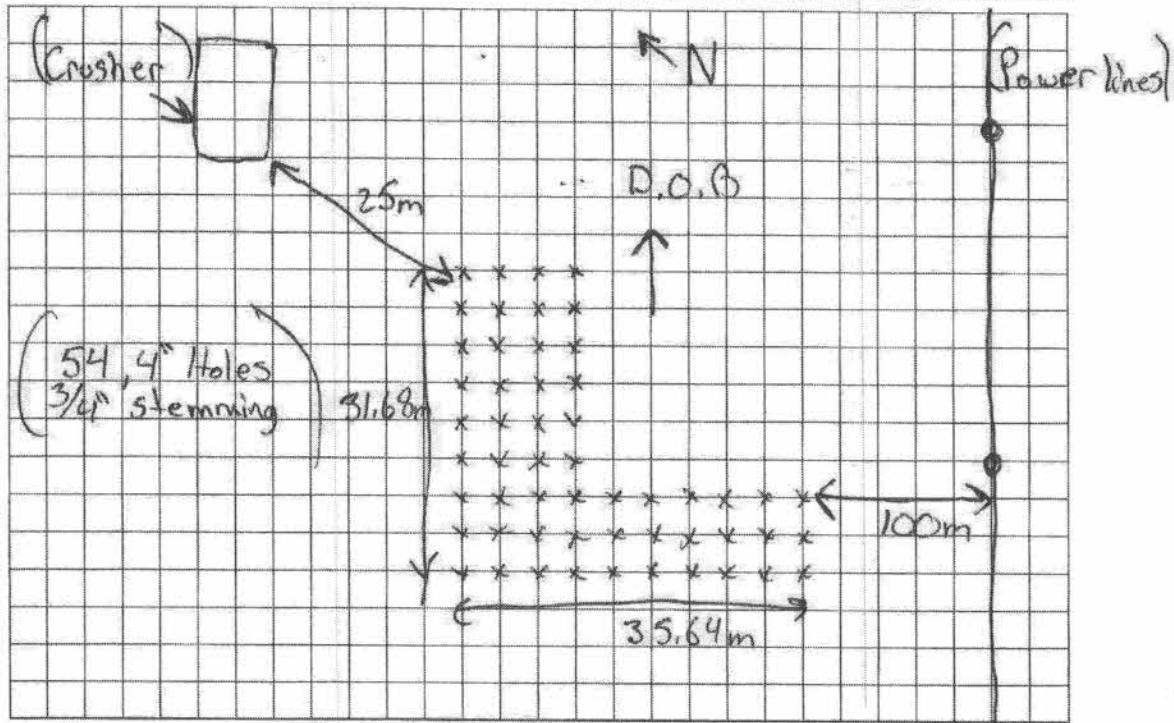
TYPE	LENGTH	# UNITS
1) <u>Nitroeng 200ms</u>	<u>15m</u>	<u>54</u>
2) <u>Nitroeng 109ms</u>	<u>6m</u>	<u>20</u>
3) <u>None</u>	<u>42ms</u>	<u>3</u>

LOADING:

COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0m

DIMENSIONS:

WIDTH 35.64 m @ widest point
LENGTH 31.68 m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good
Approx 6700m³, 17437 Ton
P.O.# LCS-335-1
HAZARDS & DISTANCE: Crusher @ 25m
IS THERE A GUARDING PLAN & PROCEDURE? YES NO
ARE GUARDS IN PLACE? YES NO
WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO
CUT SHEET #'s: 008420

FLYROCK DAMAGE: no
MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR
SEISMIC DATA: UNIT #'s
WIND DIRECTION VELOCITY: W @ 10km/h
ATMOSPHERIC CONDITIONS: Sunny/clear
BULK USED? YES NO
BULK TRUCK NUMBER's
BULK TRUCK DRIVER Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project J18064C
 Location Port Colbourne (middle Bench)
 Blast Date August 8th 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) Production (open)
 Name of Blaster Zeck Pollock
 Blast Report # 022291
 Previous Blast Report # Reviewed 022290

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

500		meters
100		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
1 km+		meters
Y	(N)	attach correspondence
200		meters
500		meters
300		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

45	(AM)	time 3:00pm
5		ea
0		ea
(Y)	(N)	
(Y)	(N)	

Post Blast

Considerations

Output Flyrock (if yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

10		meters
		mm/s
		dB
Good	Bad	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	(N)
Y	(N)

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

MINING - CONSTRUCTION

DATE Aug 9 2017 TIME 3:00 pm
CONTRACT / JOB # J18064C
LOCATION Port Colbourne middle Bench

BLASTER Kevin M. H. O
SIGNATURE [Signature]

EXPLOSIVES: **No 022346**

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4"
NO. OF HOLES 54
NO. OF DELAYS 54
MAX. LOAD PER DELAY 60.8 Kgs
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>3293.2</u>
2) <u>8oz Booster</u>	<u>54</u>
3)	

DETONATORS / INITIATORS:

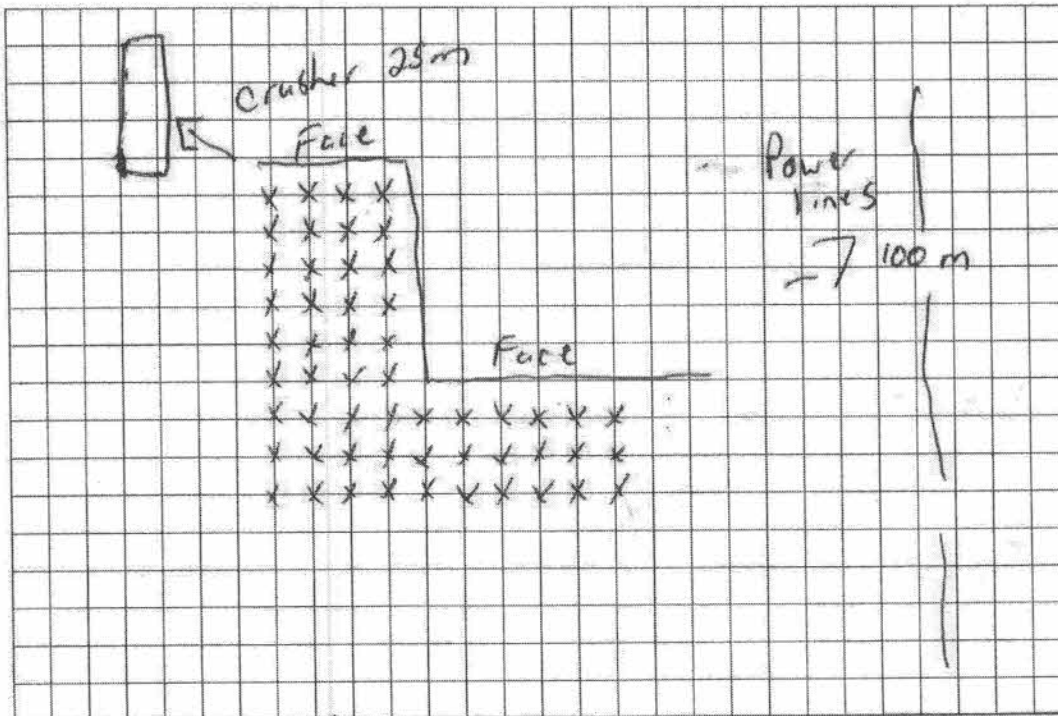
TYPE	LENGTH	# UNITS
1) <u>N. Ho Energy 25</u>	<u>15m</u>	<u>54</u>
2) <u>Jumpers 109/42</u>	<u>6m</u>	<u>24</u>
3) <u>Elek Det</u>	<u>3m</u>	<u>1</u>

LOADING:

COLLAR 213m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 8oz Booster
SUBGRADE

DIMENSIONS:

WIDTH
LENGTH
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton = 17437.43

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008420

BULK USED? YES NO

BULK TRUCK NUMBER'S

BULK TRUCK DRIVER

Seismograph Report

Date	August 8th, 2017	
Client	Waterford Sand & Gravel	
Quarry Name	Law Crushed Stone Quarry	
Location	Hydro pole across from 2035 Youngs Road X	
Company	Consbec Inc	
Name of User	Kevin Mcphee	
Seismograph Serial Number	BA10985	
Blast Report Number	22291	
Time of Blast	15:23	
Trigger Levels	Mic	1 mm/s
	Geo	115 dB(L)
Results	Mic	unknown
	Tran	unknown
	Vert	unknown
	Long	unknown

Comments:

The seismograph did not produce a report for unknown reasons.

Consbec will proceed to look in to the reason for no events being recorded.

Date/Time Tran at 15:23:15 August 8, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 0404 V 5.52 BlastMate II/477
Battery Level 6.4 Volts
Unit Calibration August 31, 2016 by InstanTel
File Name B404H0L1.ER0

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 Converted: August 9, 2017 16:09:28 (V10.20)

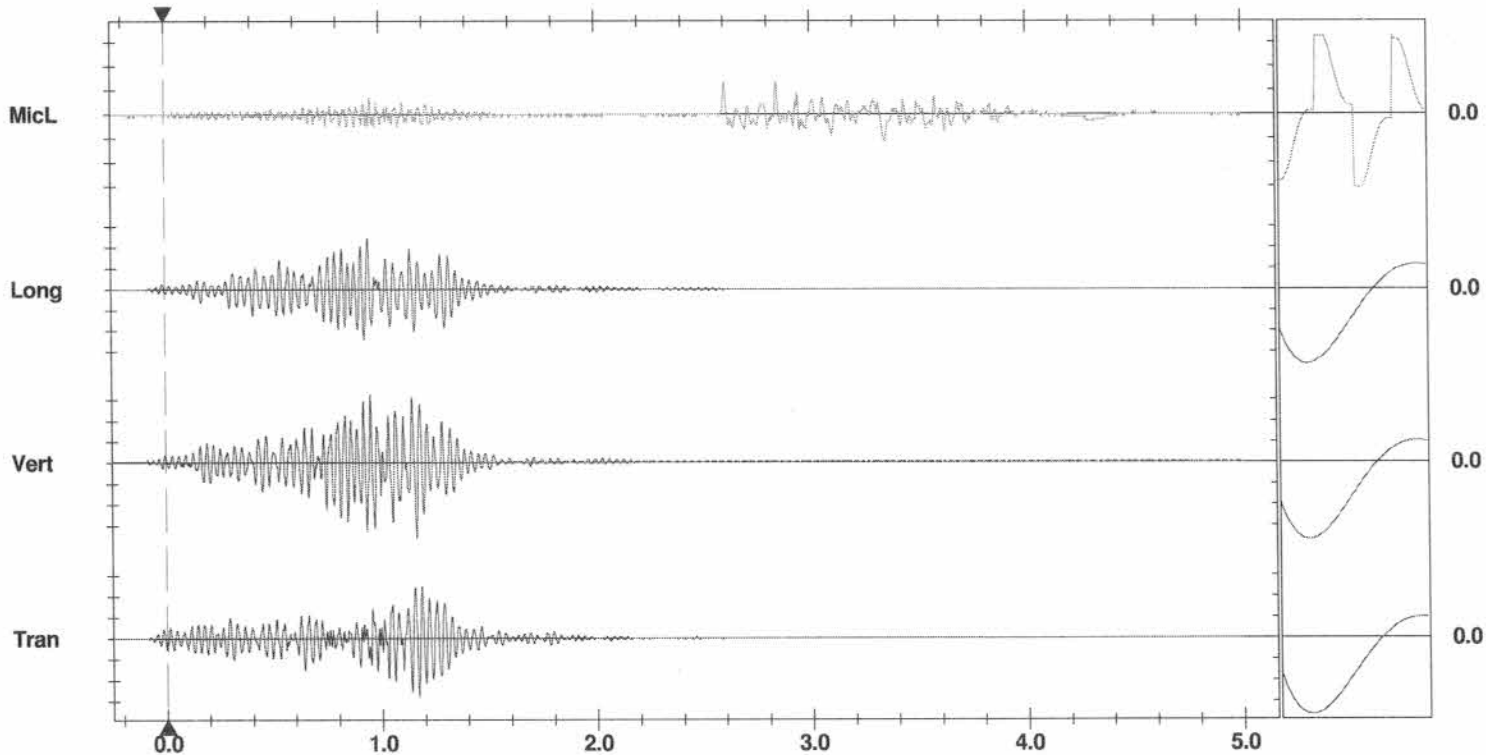
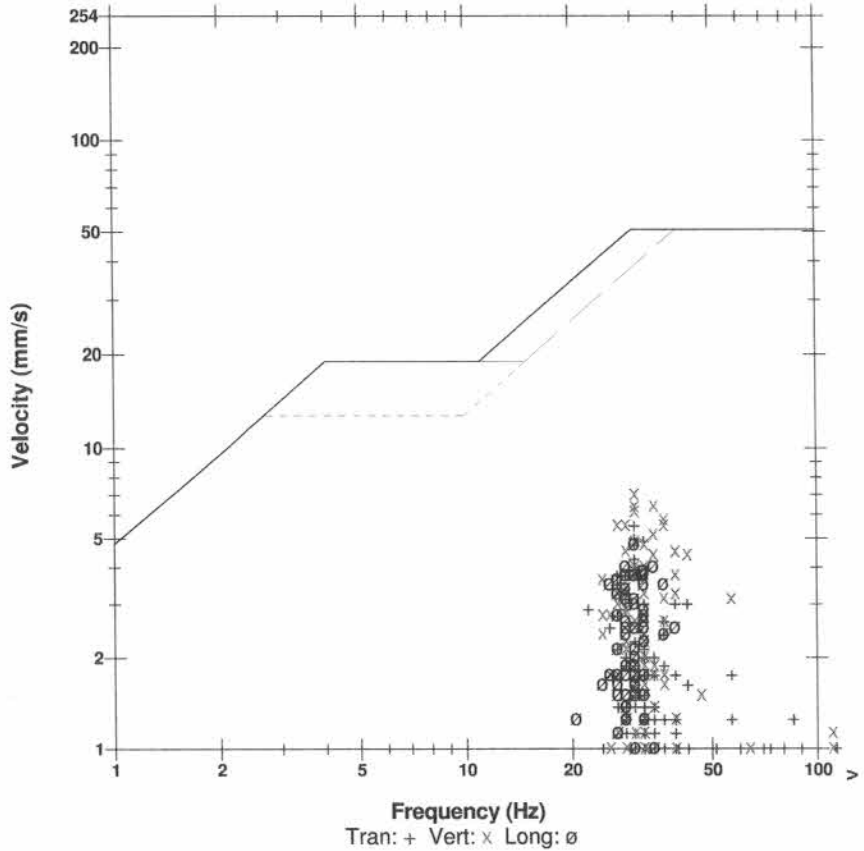
Extended Notes
 40 Townline Road S

Microphone Linear Weighting
PSPL 110.2 dB(L) at 2.604 sec
ZC Freq 24 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 523 mv)

	Tran	Vert	Long	
PPV	5.59	7.11	4.83	mm/s
ZC Freq	32	30	30	Hz
Time (Rel. to Trig)	1.170	1.164	0.928	sec
Peak Acceleration	0.119	0.186	0.106	g
Peak Displacement	0.0279	0.0341	0.0257	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.8	8.1	Hz
Overswing Ratio	3.7	3.7	3.5	

Peak Vector Sum 7.68 mm/s at 1.165 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 5.00 pa.(L)/div
Trigger =

Sensor Check

MINING + CONSTRUCTION

DATE August 9 2017 TIME 9:35am
CONTRACT / JOB # J18064C
LOCATION Port Colborne (middle Bend)

BLASTER Zack Pollock
Please Print
SIGNATURE Zack Pollock

EXPLOSIVES: **No 022292**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4"
NO. OF HOLES 51
NO. OF DELAYS 1
MAX. LOAD PER DELAY 60.8 kgs
HOLES PER SERIES 51
POWDER FACTOR 0.49 kgs/m³

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3116 kgs</u>
2) <u>AES 200gr Boosters</u>	<u>51 units</u>
3) .....	.....

LOADING:

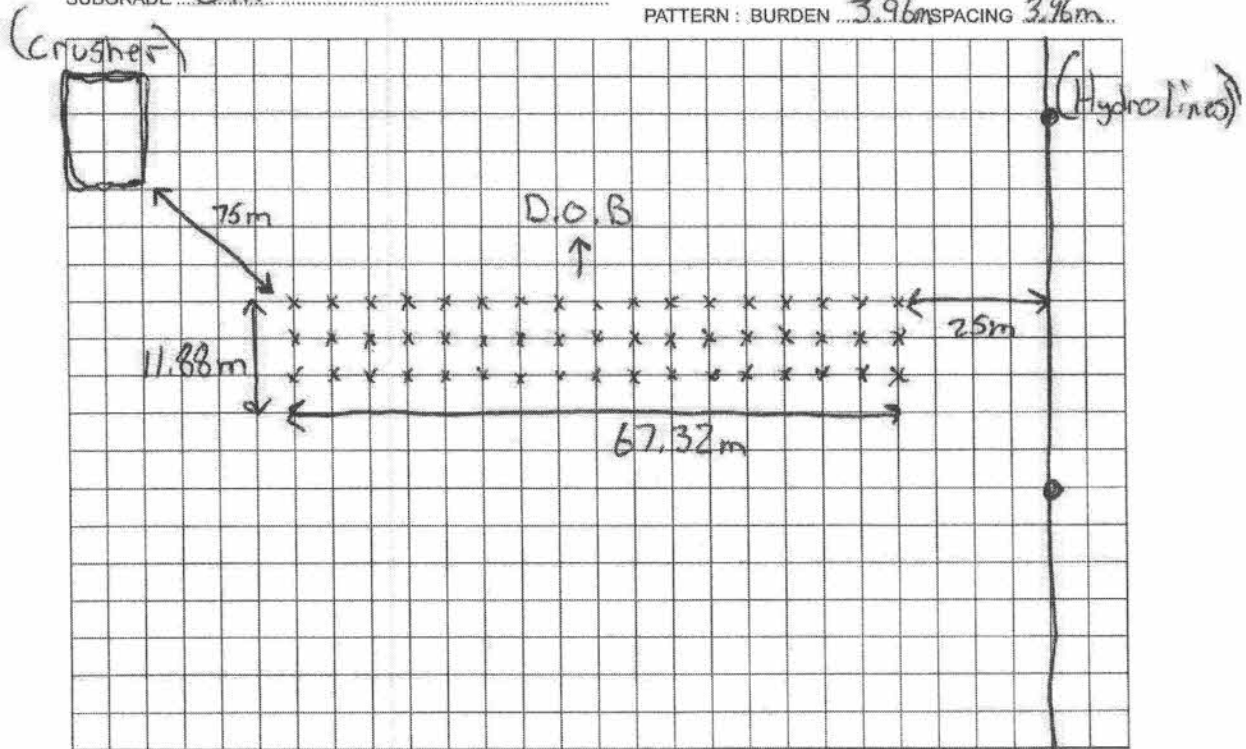
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Mining 200ms</u>	<u>15m</u>	<u>51</u>
2) <u>Nitro 109ms</u>	<u>6m</u>	<u>3</u>
3) <u>Electric 0ms</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH 67.32m @ widest point
LENGTH 11.88m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

NOTES / REMARKS: good
P.O # LCS - 3352
Approx: 6334 m³, 16469 Ton
HAZARDS & DISTANCE: Hydro lines @ 25m
IS THERE A GUARDING PLAN & PROCEDURE? YES NO
ARE GUARDS IN PLACE? YES NO
WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO
CUT SHEET #'s: CO 8418

POST BLAST REPORT

FLYROCK DAMAGE: no
MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR
SEISMIC DATA: UNIT #'s
WIND DIRECTION VELOCITY: W @ 5km/h
ATMOSPHERIC CONDITIONS: Sunny/clear
BULK USED? YES NO
BULK TRUCK NUMBER's: 135
BULK TRUCK DRIVER: Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project J18064C
 Location Port Colbourne (middle Bench)
 Blast Date August 9 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022347 292
 Previous Blast Report # Reviewed 022346

Blast Area

Considerations

Designated Blast Area 500 meters
 Hydro/Bell Distance to blast 25 meters
 Notification of blasting required in writing Y N attach correspondence
 Request permission to re-route/shut down Y N attach correspondence
 Request utility representative to attend blast Y N attach correspondence
 Gas/Water Distance to blast 1 km meters
 Notification of blasting required in writing Y N attach correspondence
 Roads/Highways Distance to blast 500 meters
 Construction Workers Distance to blast 500 meters
 Property Owners Distance to blast 500 meters
 Notification of blasting required in writing Y N attach correspondence
 Evacuation required in writing Y N attach correspondence
 MTO evacuation approval received in writing Y N attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast yes ^{AM} time 9:15am
 Number of guards 5 ea
 Quantity (# of) blasting mats 0 ea
 Audible warning device used such as cannister or air horn Y N
 Pre-blast survey complete Y N

Post Blast

Considerations

Output Flyrock (If yes, give distance) 25 meters
 Vibration (reading) mm/s
 Airblast (reading) dB
 Fragmentation Good Bad
 Movement Y N

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman Y N
 Notify Head Office to investigate inquiries Y N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

DATE 9 Aug 2017 TIME 11 am
CONTRACT / JOB # 5180646
LOCATION Port Colborne middle bench

BLASTER Kevin McCre
SIGNATURE [Signature]

EXPLOSIVES: **No 022347**

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4 1/2
NO. OF HOLES 51
NO. OF DELAYS 51
MAX. LOAD PER DELAY 60.8 Kg
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3100.8 Kgs</u>
2) <u>8oz Booster</u>	<u>51</u>
3)	

LOADING:

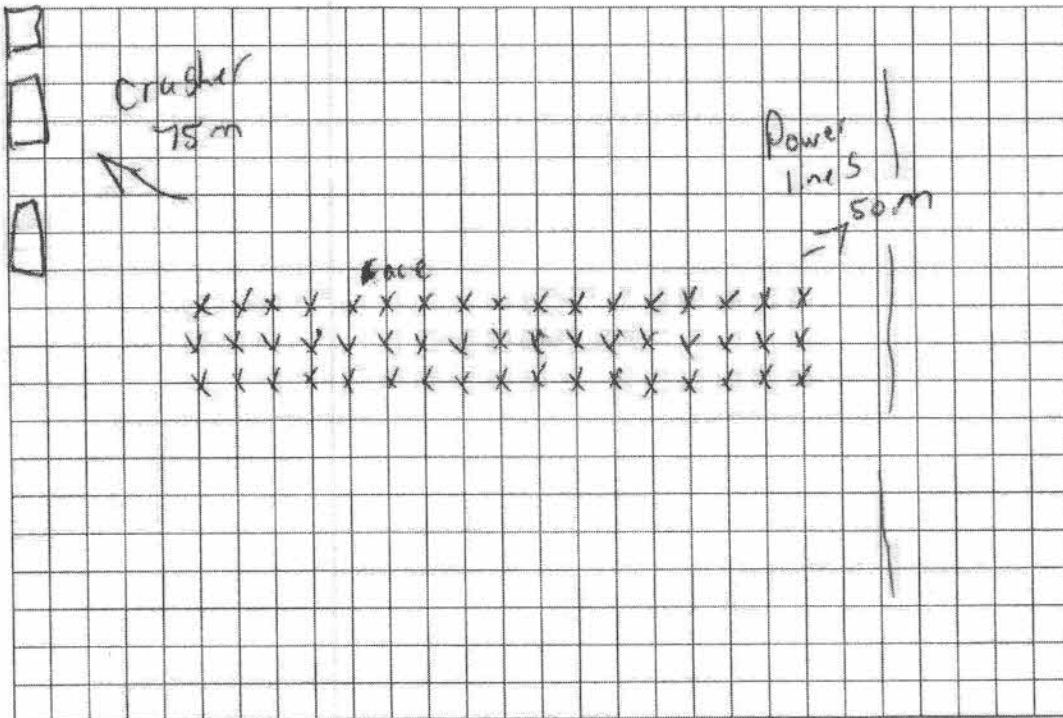
COLLAR 213m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 8oz Booster
SUBGRADE

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitro Energy 25/500</u>	<u>15m</u>	<u>51</u>
2) <u>Jumper S. 42/109</u>	<u>6m</u>	<u>15</u>
3) <u>Elco Det</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH
LENGTH
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN : BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:
Est Tonnage = 16469

FLYROCK DAMAGE:

HAZARDS & DISTANCE : See diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008418

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER

CUT SHEET

DATE: _____

No 008418

JOB # 518064C Low Crushed Stone
 JOB LOCATION: Post Colbourne Middle Bench

DRILLER: Kevin M Price

PATTERN: 13x13

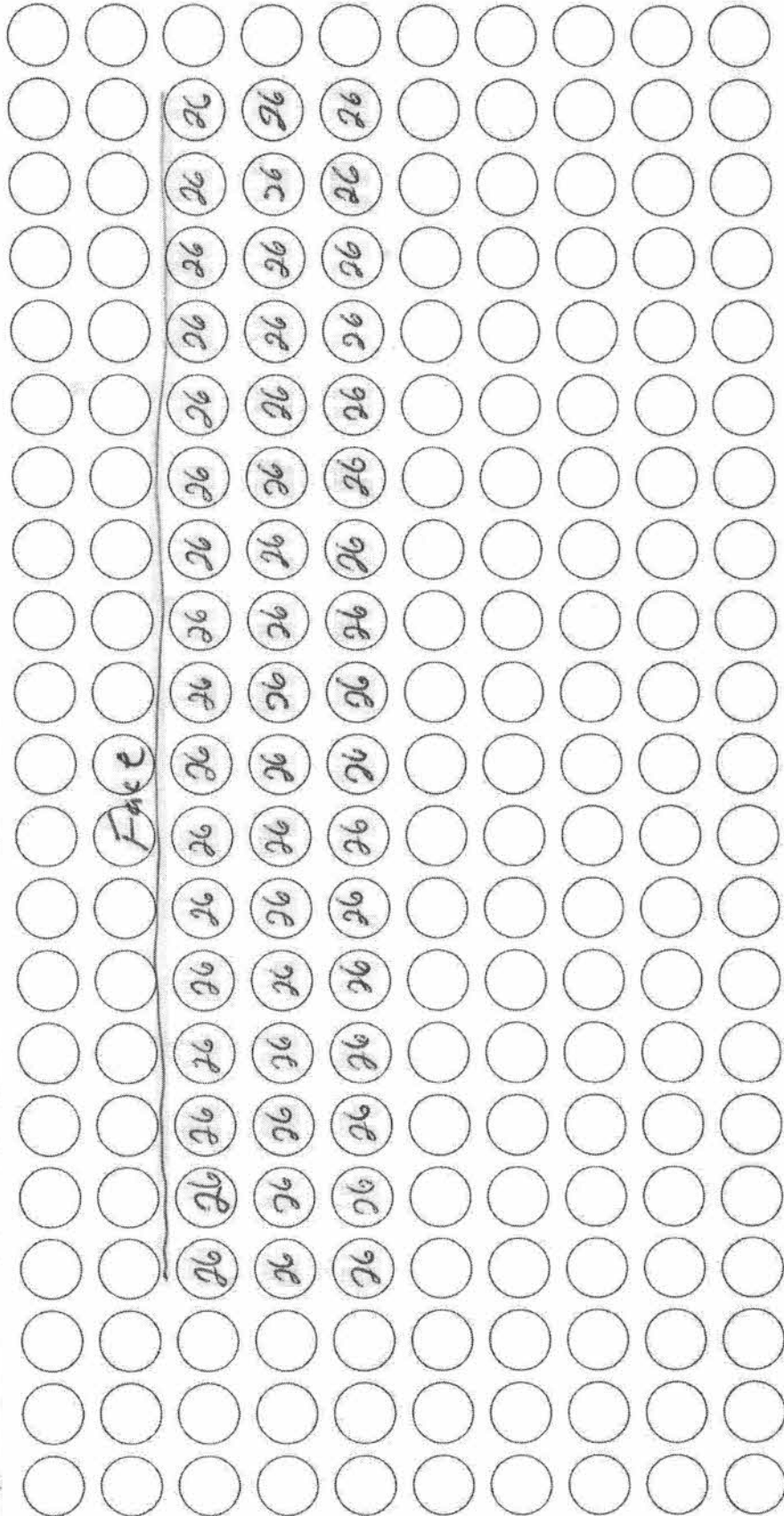
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 51 holes = 404.04 m

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____



Date/Time Long at 09:32:39 August 9, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.0 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985H0KL.6F0

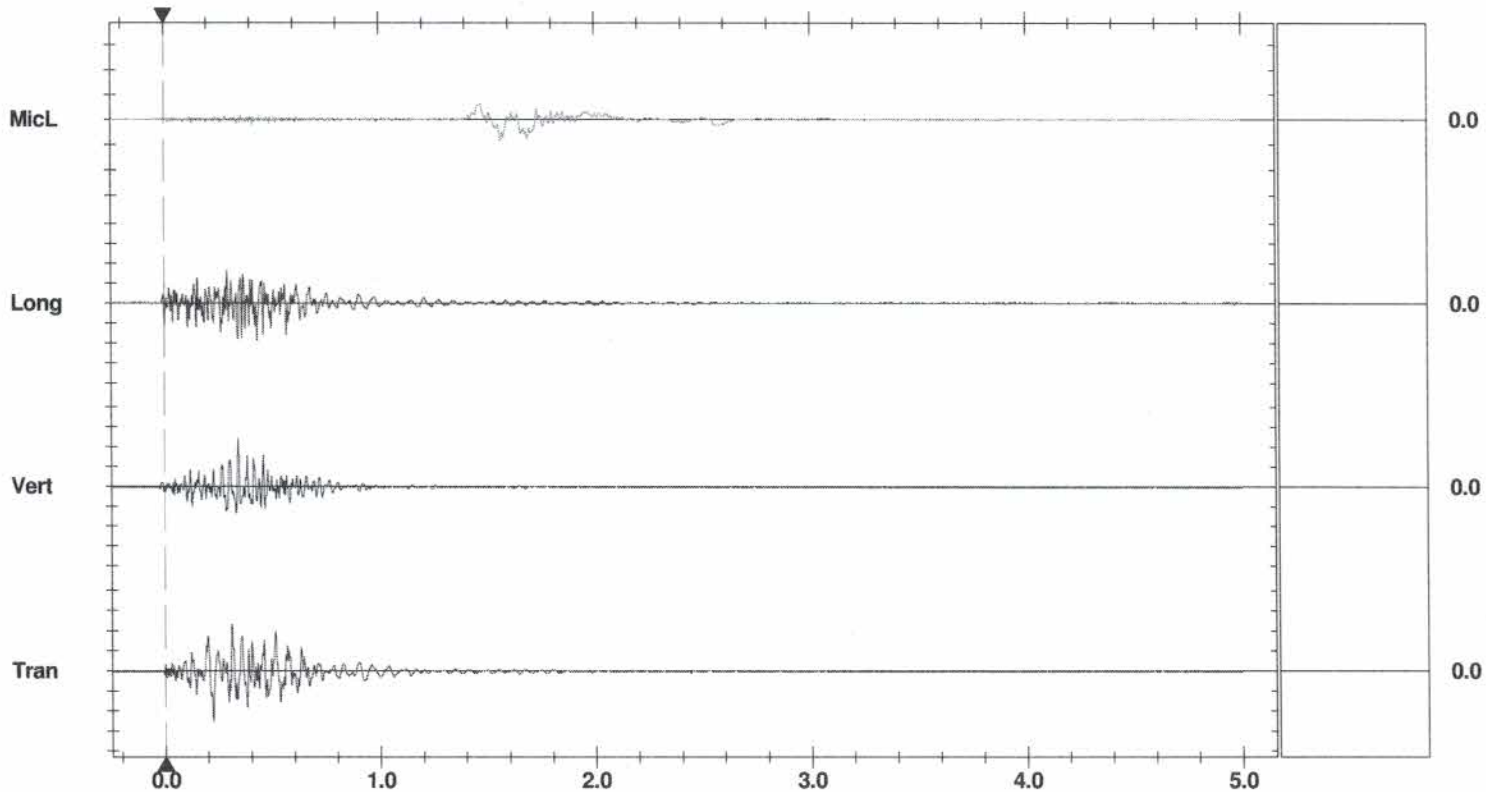
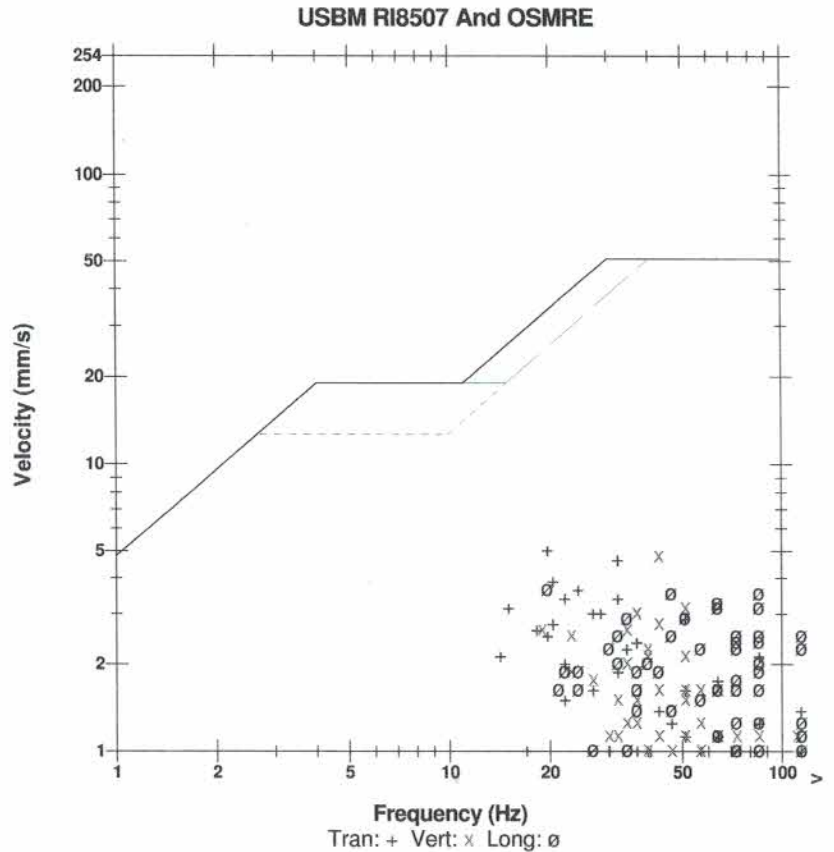
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes
 Combo Mode August 9, 2017 08:42:29
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 112.6 dB(L) at 1.565 sec
ZC Freq 7.6 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.08	4.83	3.68	mm/s
ZC Freq	20	43	20	Hz
Time (Rel. to Trig)	0.222	0.344	0.432	sec
Peak Acceleration	0.146	0.133	0.186	g
Peak Displacement	0.0311	0.0173	0.0181	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 6.01 mm/s at 0.344 sec



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

Histogram Start Time 08:42:29 August 9, 2017
Histogram Finish Time 09:55:22 August 9, 2017
Number of Intervals 874 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 5.9 Volts (Battery Low)
Unit Calibration April 9, 2017 by InstanTEL
File Name L985H0KI.U70

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

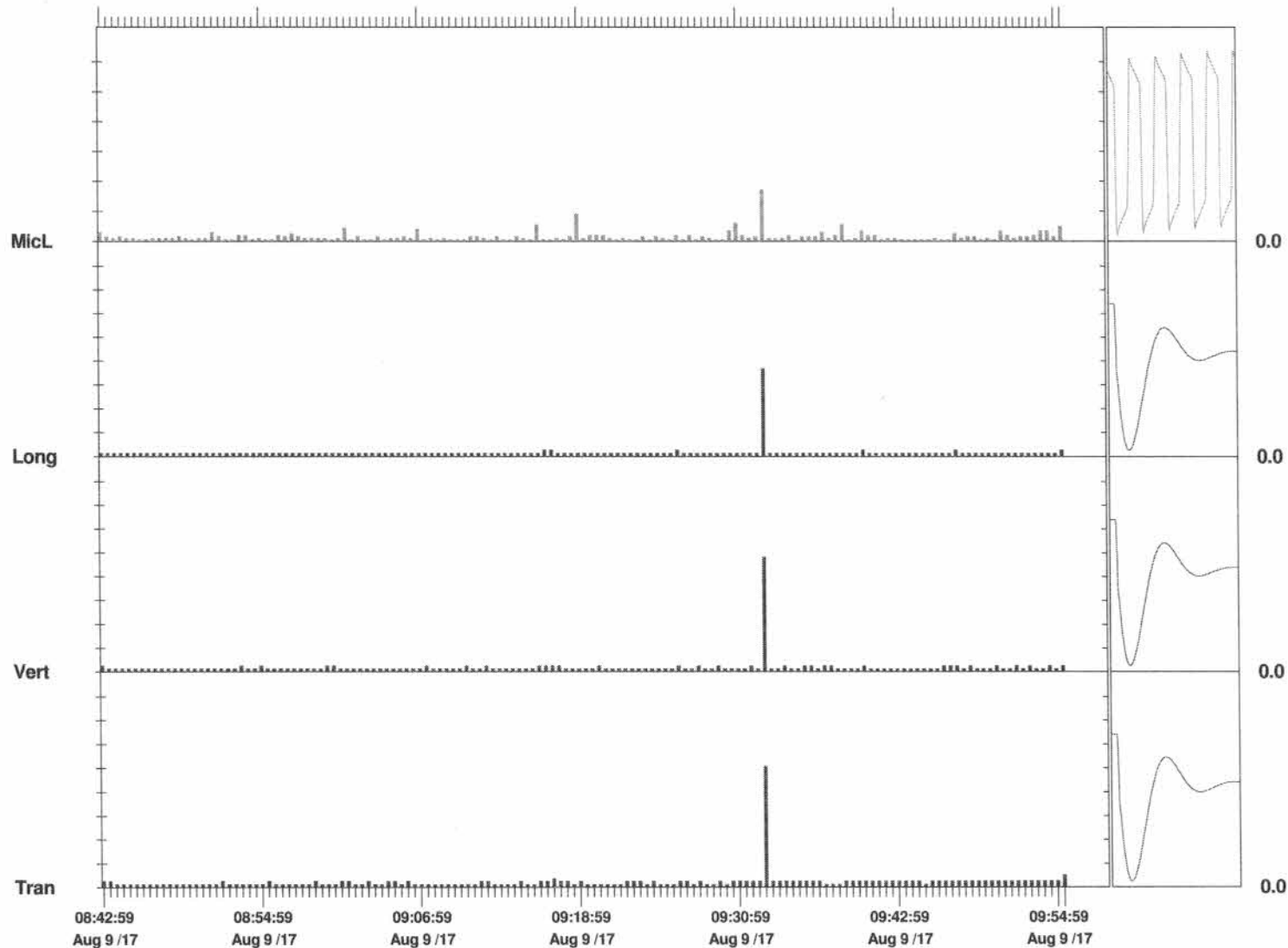
Extended Notes

Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 112.6 dB(L) on August 9, 2017 at 09:32:44
ZC Freq 7.6 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 532 mv)

	Tran	Vert	Long	
PPV	5.08	4.83	3.68	mm/s
ZC Freq	20	43	20	Hz
Date	Aug 9 /17	Aug 9 /17	Aug 9 /17	
Time	09:32:44	09:32:44	09:32:44	
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.7	7.4	Hz
Overswing Ratio	3.7	3.7	3.8	

Peak Vector Sum 6.01 mm/s on August 9, 2017 at 09:32:44



Time Scale: 30 seconds /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 5.00 pa.(L)/div

Sensor Check

Date/Time Vert at 09:36:07 August 9, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 Converted: August 9, 2017 16:09:28 (V10.20)

Extended Notes

40 Townline Road S

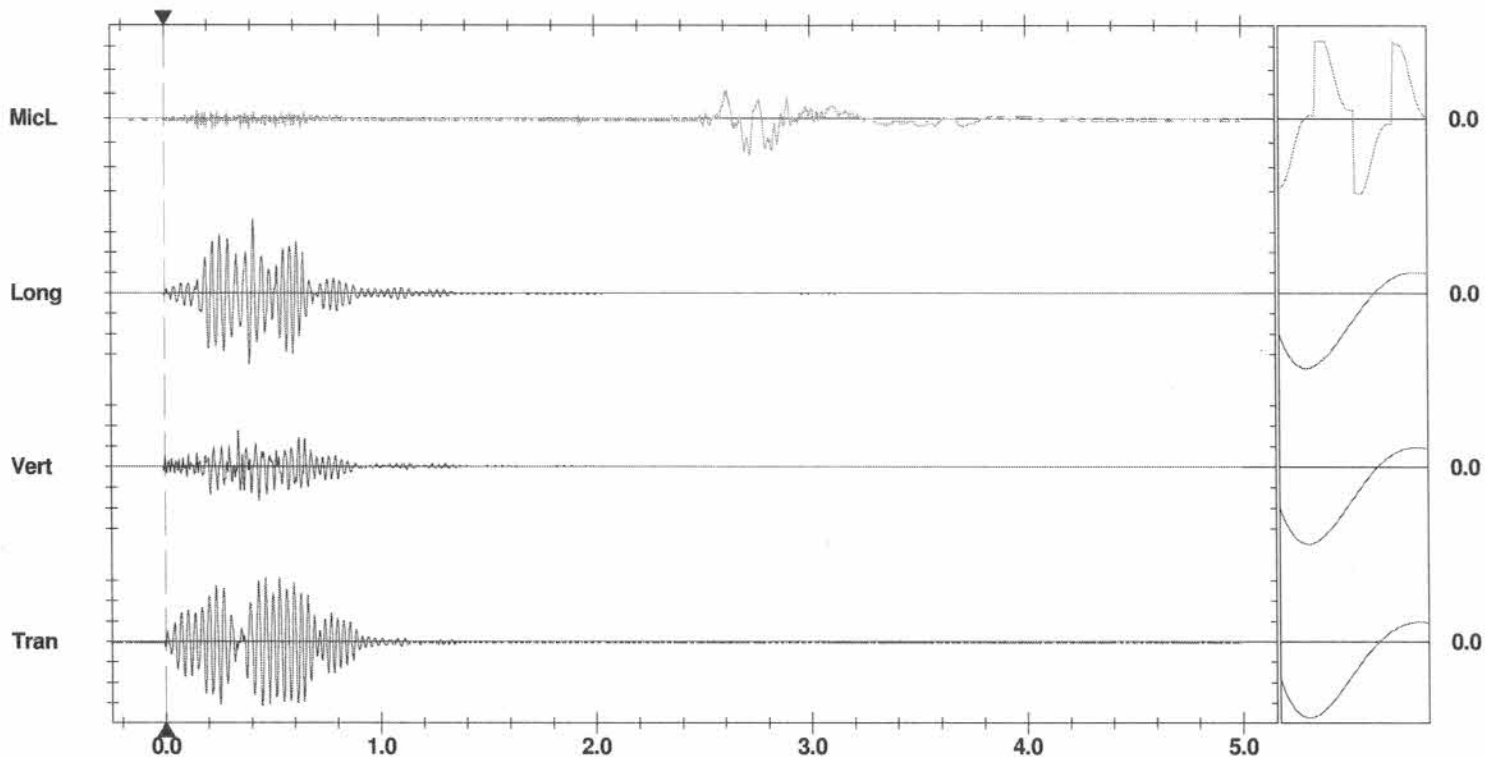
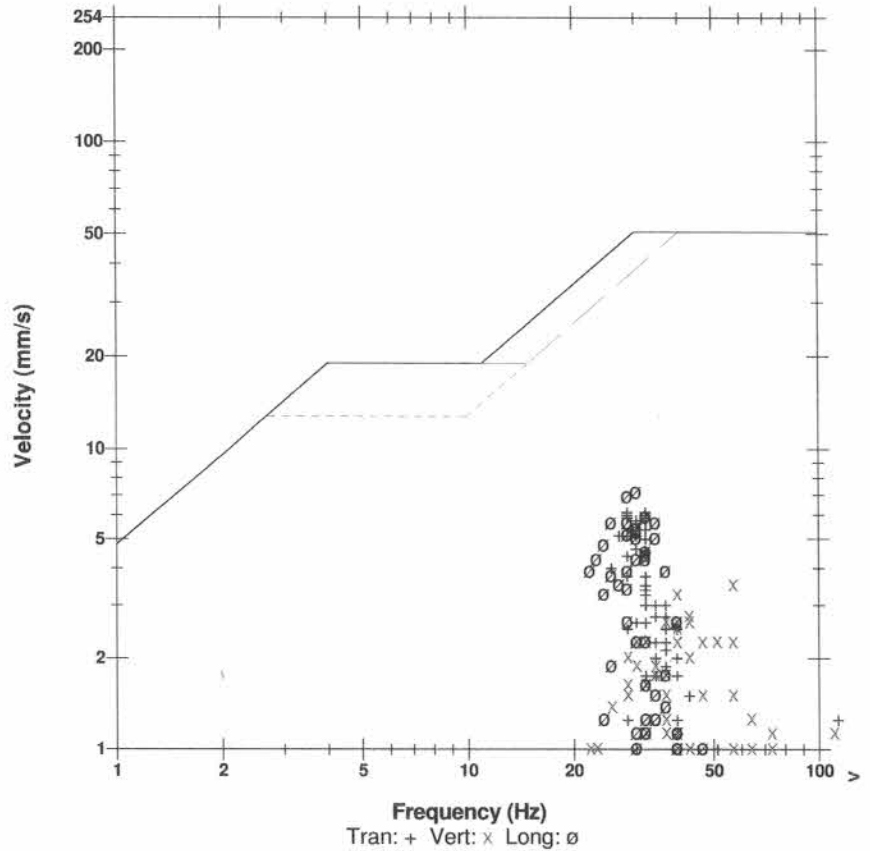
Microphone Linear Weighting
PSPL 111.5 dB(L) at 2.720 sec
ZC Freq 9.1 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 521 mv)

	Tran	Vert	Long	
PPV	6.22	3.56	7.24	mm/s
ZC Freq	30	51	28	Hz
Time (Rel. to Trig)	0.448	0.343	0.415	sec
Peak Acceleration	0.146	0.119	0.133	g
Peak Displacement	0.0356	0.0118	0.0360	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.7	8.0	Hz
Overswing Ratio	3.8	3.8	3.6	

Peak Vector Sum 8.84 mm/s at 0.415 sec

Serial Number 0404 V 5.52 BlastMate II/477
Battery Level 6.4 Volts
Unit Calibration August 31, 2016 by InstanTel
File Name B404H0MG.070

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 5.00 pa.(L)/div
Trigger = ▶ ◀

Sensor Check

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE August 21 2017 TIME 3:00pm
CONTRACT / JOB # J18064C
LOCATION Port Colbourne (middle Bench)

BLASTER Zack Pollock
Please Print
SIGNATURE [Signature]
EXPLOSIVES: **No 022293**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4
NO. OF HOLES 45
NO. OF DELAYS 6max
MAX. LOAD PER DELAY 60.8 kgs
HOLES PER SERIES 45
POWDER FACTOR 0.53 kgs/m³

TYPE/BLEND kgs/ # units
1) Emulsion 273.6 kgs
2) AES 200gr Boosters 45 units
3)

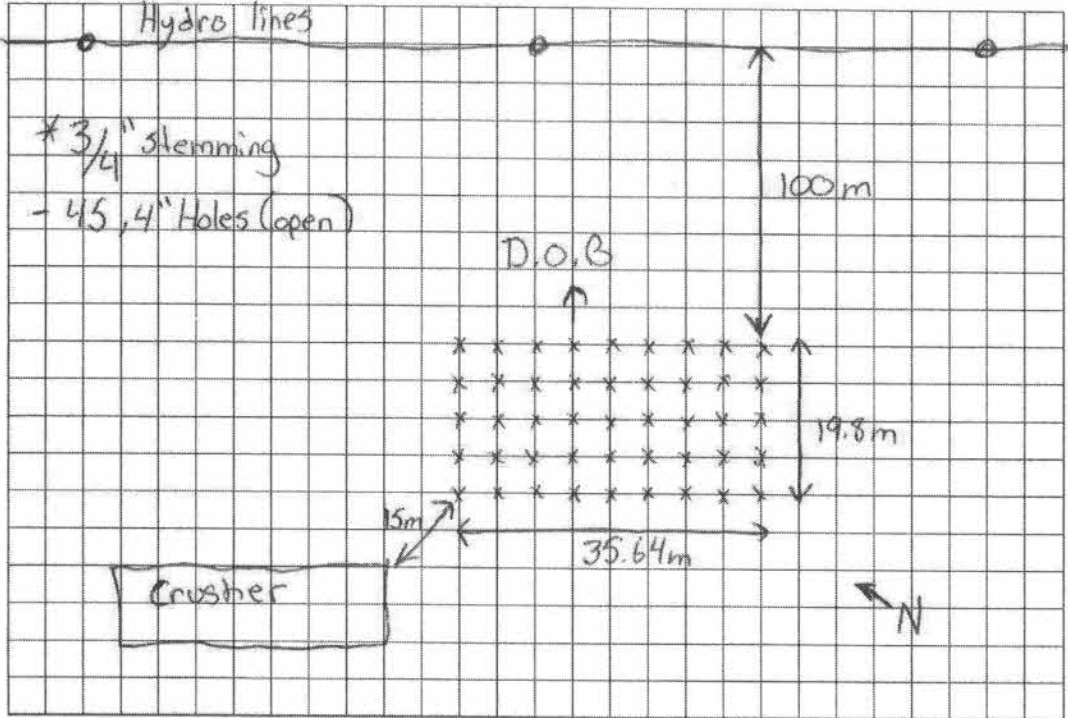
LOADING:

COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD 200gr AES Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitro.org 250ms</u>	<u>15m</u>	<u>45</u>
2) <u>Nitro.org 109m</u>	<u>9m</u>	<u>8</u>
3) <u>Nonel 42ms</u>	<u>6m</u>	<u>5</u>

DIMENSIONS: Electric 0ms 3m 1
WIDTH 35.64m @ widest point
LENGTH 19.8m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good
Approx 5080m³

FLYROCK DAMAGE: no

HAZARDS & DISTANCE: Hydro lines @ 100m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 10km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny/clear

CUT SHEET #'s 10207

BULK USED? YES NO

BULK TRUCK NUMBER'S 135

BULK TRUCK DRIVER Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project Port Colbourne
 Location middle bench
 Blast Date August 21 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022293
 Previous Blast Report # Reviewed 022292

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

100	meters	
100	meters	
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
1000+	meters	
Y	<input checked="" type="radio"/> N	attach correspondence
250	meters	
250	meters	
1000	meters	
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

yes	<input checked="" type="radio"/> AM	time 2:30pm
5		ea
0		ea
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

15	meters
	mm/s
	dB
<input checked="" type="radio"/> Good	<input checked="" type="radio"/> Bad
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE 21 Aug 2017 TIME 3:15 pm
CONTRACT / JOB # 511064E
LOCATION Port Colbourne middle beach

BLASTER Kevin M Phee
SIGNATURE [Signature]

EXPLOSIVES: 24026

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4"
NO. OF HOLES 45
NO. OF DELAYS 45
MAX. LOAD PER DELAY 60.8 Kgs
HOLES PER SERIES
POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2736 Kgs</u>
2) <u>80Z Booster</u>	<u>45 ea</u>
3)	

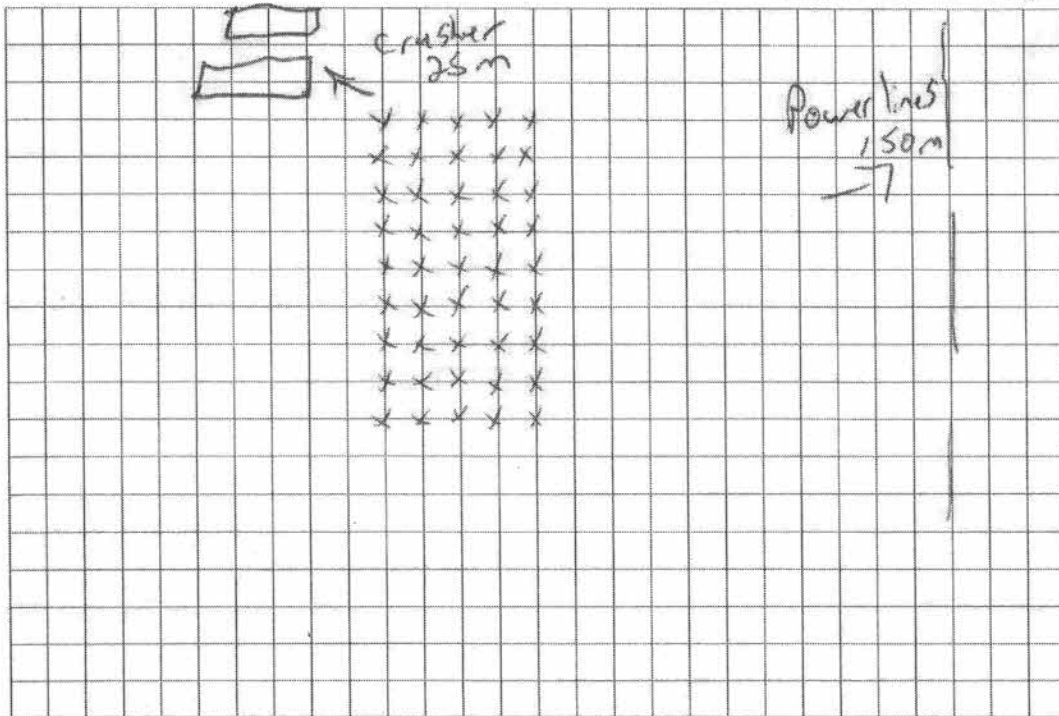
DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Ultra Energy 25</u>	<u>15m</u>	<u>45</u>
2) <u>Sumperc 10905</u>	<u>6m</u>	<u>12</u>
3) <u>Jumper 4205</u>	<u>6m</u>	<u>10</u>
<u>Electric</u>	<u>3m</u>	<u>1</u>

LOADING:

COLLAR 2.13m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 80Z Booster
SUBGRADE

DIMENSIONS:
WIDTH
LENGTH
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:
Est Tonnes = 14531
P.O.# LCS-3370
HAZARDS & DISTANCE: See Diagram
IS THERE A GUARDING PLAN & PROCEDURE? YES (circled) NO
ARE GUARDS IN PLACE? YES NO (circled)
WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES (circled) NO
CUT SHEET #'s: 10207

FLYROCK DAMAGE:
MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR
SEISMIC DATA: UNIT #'s
WIND DIRECTION VELOCITY:
ATMOSPHERIC CONDITIONS:
BULK USED? YES NO
BULK TRUCK NUMBER's
BULK TRUCK DRIVER

Date/Time Tran at 14:54:14 August 21, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985H178.2E0

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

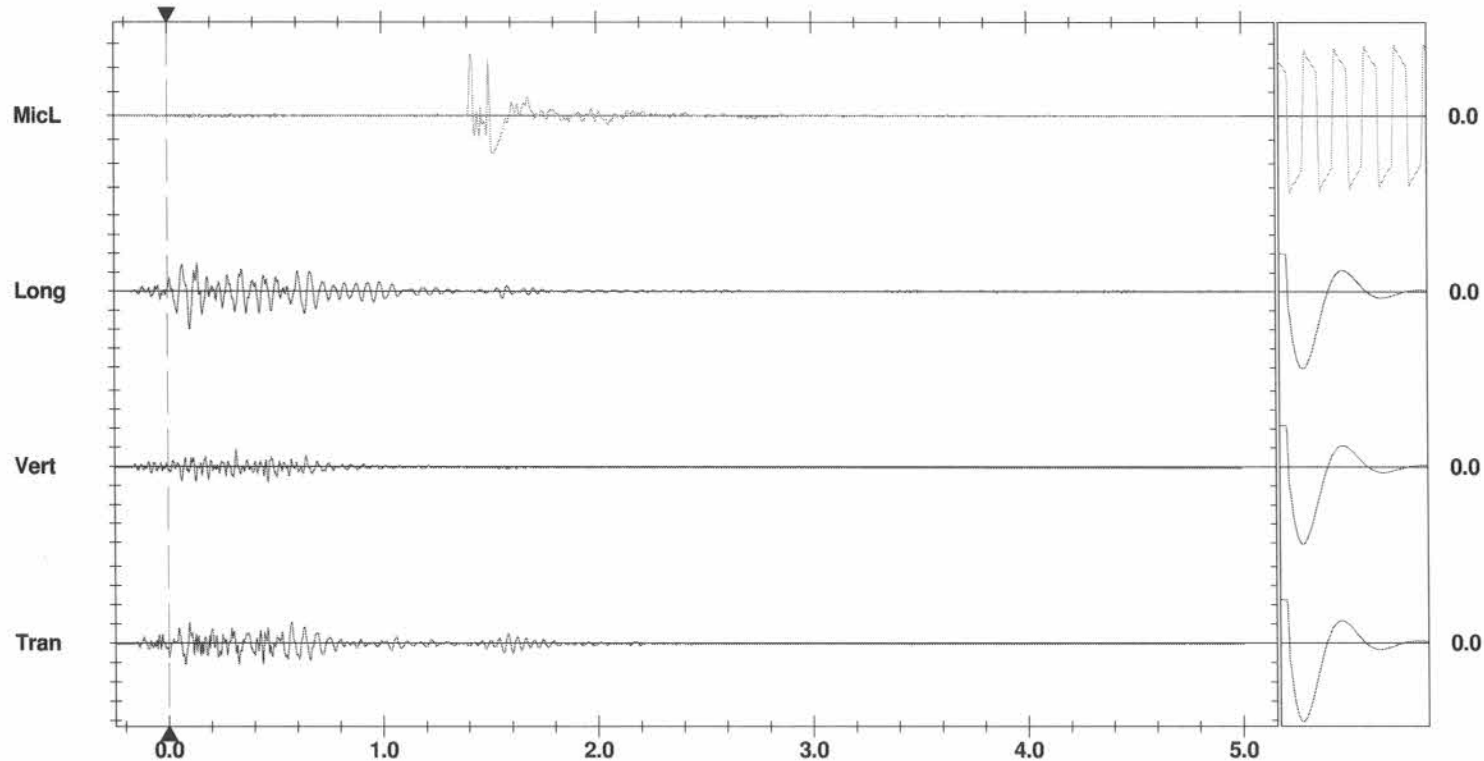
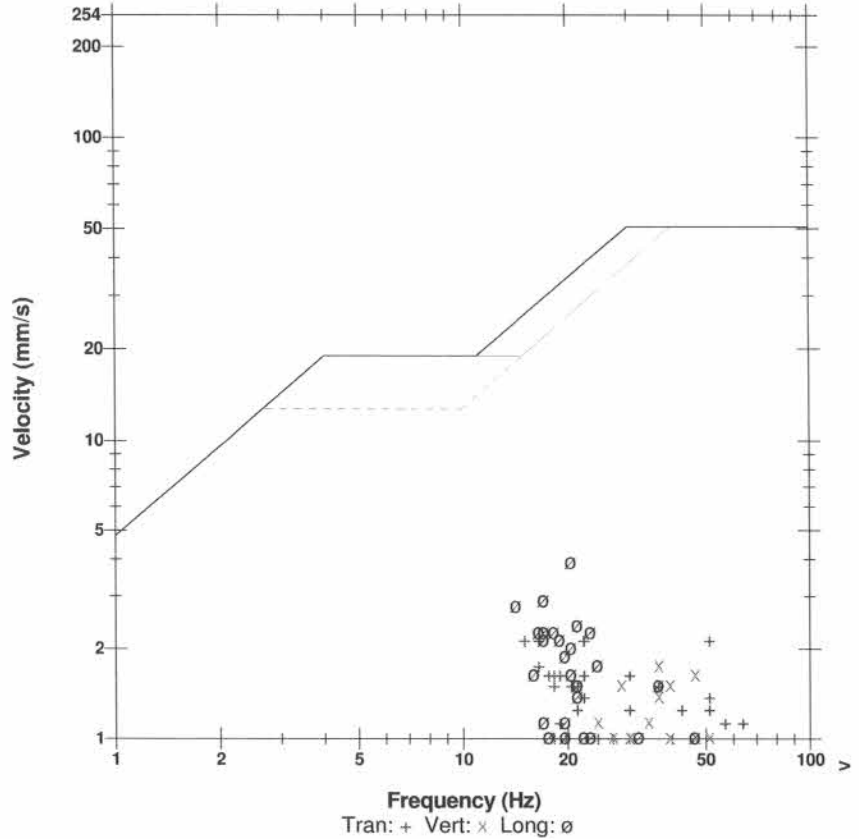
Extended Notes
 Combo Mode August 21, 2017 13:59:34
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 122.1 dB(L) at 1.414 sec
ZC Freq 17 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 485 mv)

	Tran	Vert	Long	
PPV	2.16	1.78	3.94	mm/s
ZC Freq	17	37	20	Hz
Time (Rel. to Trig)	0.076	0.317	0.103	sec
Peak Acceleration	0.0663	0.0530	0.0663	g
Peak Displacement	0.0184	0.00794	0.0278	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.6	7.5	Hz
Overswing Ratio	3.5	3.8	3.7	

Peak Vector Sum 4.01 mm/s at 0.103 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 14:54:13 August 21, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration July 13, 2017 by InstanTEL
File Name __TEMP.EVT

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

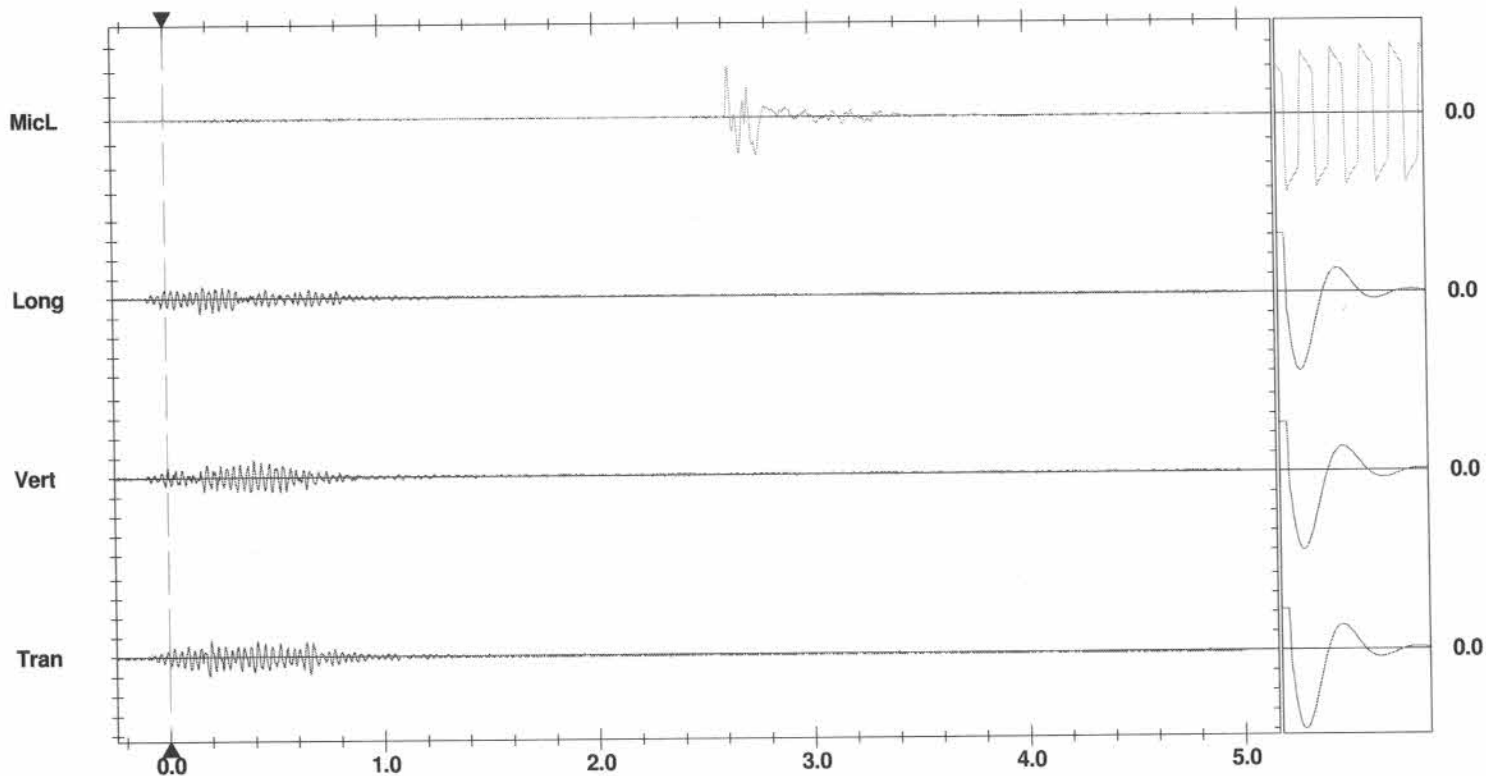
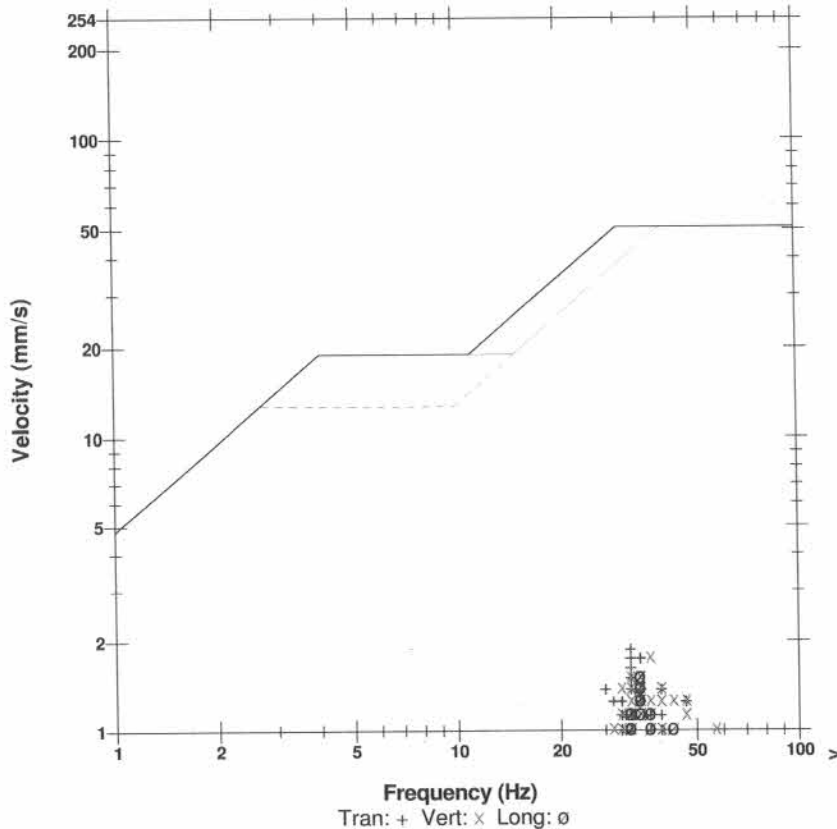
Extended Notes
 Combo Mode August 21, 2017 14:04:34
 40 Townline Road S

Microphone Linear Weighting
PSPL 120.3 dB(L) at 2.626 sec
ZC Freq 13 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 506 mv)

	Tran	Vert	Long	
PPV	1.90	1.78	1.52	mm/s
ZC Freq	32	37	34	Hz
Time (Rel. to Trig)	0.185	0.402	0.161	sec
Peak Acceleration	0.0530	0.0530	0.0398	g
Peak Displacement	0.00992	0.00763	0.00651	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.7	8.3	Hz
Overswing Ratio	3.3	3.4	3.4	

Peak Vector Sum 2.39 mm/s at 0.186 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE August 22 2017 TIME 10:17am
CONTRACT / JOB # J18064C
LOCATION Port Colbourne (middle bench)

BLASTER Zack Pollock
Please Print
SIGNATURE Zack Pollock
EXPLOSIVES: **No 022294**

DESIGN:

BLAST TYPE Production Open
SIZE OF HOLES 4"
NO. OF HOLES 60
NO. OF DELAYS
MAX. LOAD PER DELAY 60.8 Kgs
HOLES PER SERIES 60
POWDER FACTOR 0.48 kgs/m³

TYPE/BLEND kgs/# units
1) Emulsion 3648 kgs
2) AES 200g Boosters 60 units
3)

LOADING:

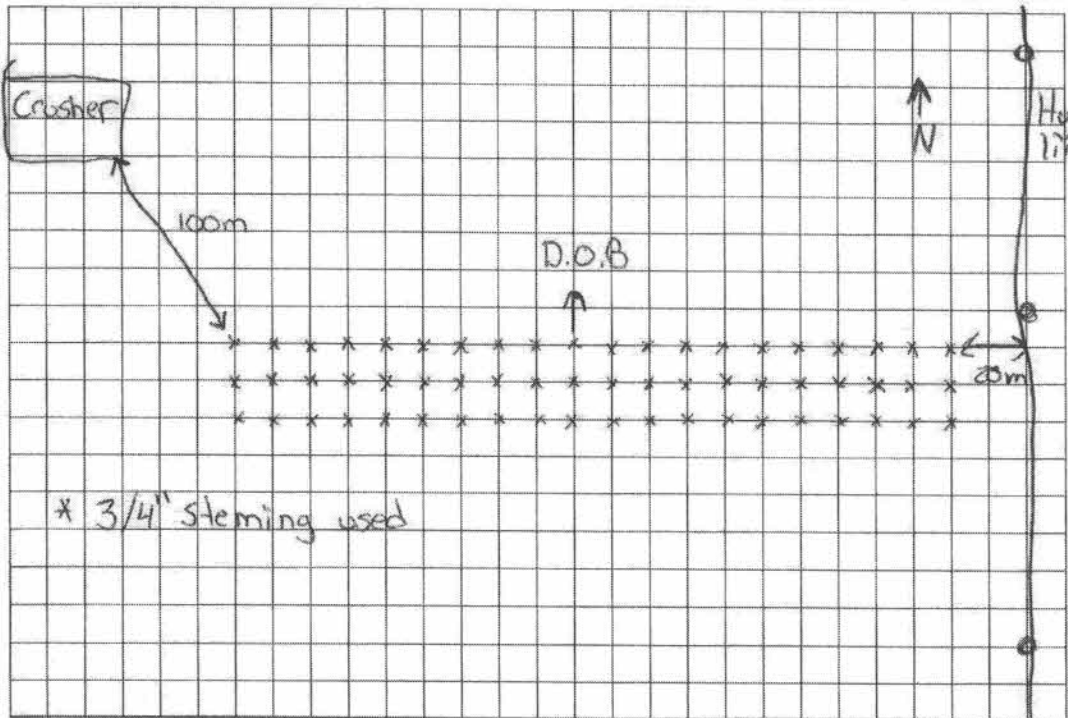
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200g Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE LENGTH # UNITS
1) Nitro eng 2500ms 15m 60
2) Nitro eng 109ms 9m 4
3) None 42ms 6m 3

DIMENSIONS:

WIDTH 79.2m @ widest point
LENGTH 11.89m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN: BURDEN 3.96m SPACING 3.96m



* 3/4" stemming used

PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

PO* L.C.S.3372
Approx. 7451.89 m³

FLYROCK DAMAGE: no

HAZARDS & DISTANCE: Hydro lines @ 20m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 15km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Cloudy

CUT SHEET #'s: 10209

BULK USED? YES NO

BULK TRUCK NUMBER'S: 134

BULK TRUCK DRIVER: Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project J18064C
 Location Port Colbourne (middle bench)
 Blast Date August 22 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022294
 Previous Blast Report # Reviewed 022293

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

100		meters
70		meters
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
1000+		meters
Y	<input checked="" type="radio"/> N	attach correspondence
300		meters
300		meters
1000+		meters
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence
Y	<input checked="" type="radio"/> N	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

yes	<input checked="" type="radio"/> AM	time 10:00 am
5		ea
0		ea
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

15		meters
		mm/s
		dB
<input checked="" type="radio"/> Good	<input checked="" type="radio"/> Bad	
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N
<input checked="" type="radio"/> Y	<input checked="" type="radio"/> N

Changes

What is required to reduce undesirables ? _____

Blast Report #

~~CUT SHEET~~ # 022294



CUT SHEET

DATE: August 22 2017

JOB # J18064C

No. 09806

JOB LOCATION: Fort Colborne (middle bench)

DRILLER: Blaster: Zack Pollock

PATTERN: 3.96m x 3.96m (4°)

SUB-DRILL (ft.): 0m

TOTAL FOOTAGE (ft.): 60 Holes

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____

○ 359	○ 225	○ 200	○ 175	○ 150	○ 125	○ 100	○ 75	○ 50	○ 25	○ 0	○ 42	○ 67	○ 92	○ 117	○ 142	○ 167	○ 192	○ 217	○ 242
○ 468	○ 334	○ 309	○ 284	○ 259	○ 234	○ 209	○ 184	○ 159	○ 134	○ 109	○ 151	○ 176	○ 201	○ 226	○ 251	○ 276	○ 301	○ 326	○ 351
○ 577	○ 443	○ 418	○ 393	○ 368	○ 343	○ 318	○ 293	○ 268	○ 243	○ 218	○ 243	○ 268	○ 293	○ 318	○ 343	○ 368	○ 393	○ 418	○ 443
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

CUT SHEET # _____

BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE 22 Aug 2017 TIME 11:00 am
CONTRACT / JOB # J18064C
LOCATION Port Colbourne Middle Beach

BLASTER Kevin M'Phoe
Please Print
SIGNATURE [Signature]

EXPLOSIVES: 24027

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4"
NO. OF HOLES 60
NO. OF DELAYS 60
MAX. LOAD PER DELAY 60.8 Kgs
HOLES PER SERIES
POWDER FACTOR.....

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3648 Kgs</u>
2) <u>8oz Booster</u>	<u>60 ea</u>
3) .....	.....

DETONATORS / INITIATORS:

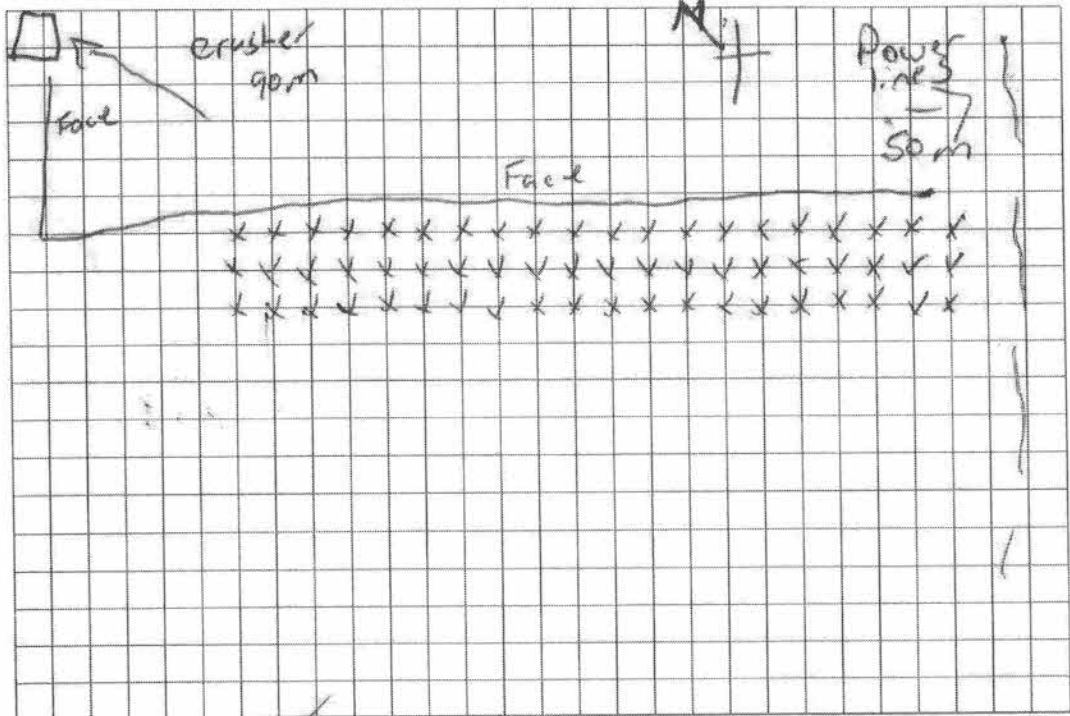
TYPE	LENGTH	# UNITS
1) <u>M.tra Energy 25</u>	<u>15m</u>	<u>60</u>
2) <u>Jumper 5 109ms</u>	<u>6m</u>	<u>10</u>
3) <u>Jumper 42ms</u>	<u>6m</u>	<u>6</u>
<u>Electric Del</u>	<u>3m</u>	<u>1</u>

LOADING:

COLLAR 213m and adjusted according
COLUMN LOAD Emulsion
TOE LOAD 8oz Booster
SUBGRADE

DIMENSIONS:

WIDTH
LENGTH.....
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est tons = 19374

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See Diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s.....

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s.....

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER

Date/Time Long at 10:16:10 August 22, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.0 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985H18P.UY0

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

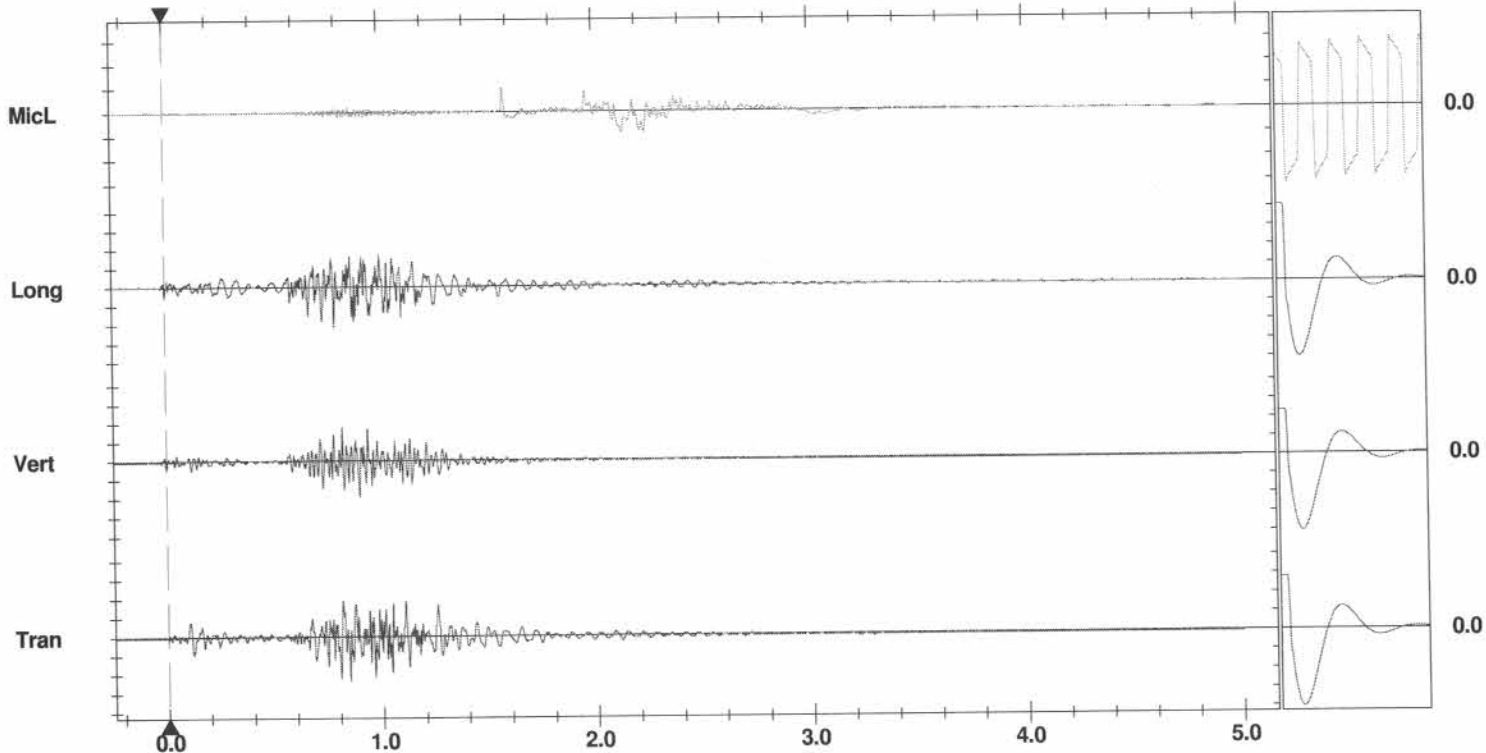
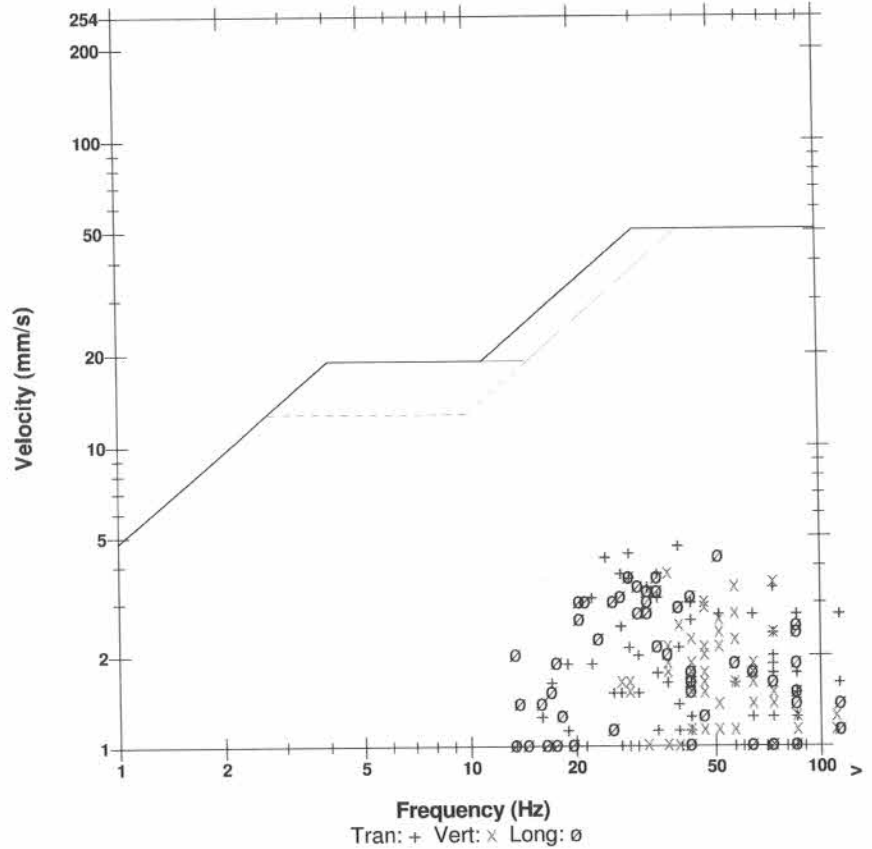
Extended Notes
 Combo Mode August 22, 2017 09:30:54
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 114.0 dB(L) at 1.583 sec
ZC Freq 27 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 539 mv)

	Tran	Vert	Long	
PPV	4.70	3.81	4.32	mm/s
ZC Freq	39	37	51	Hz
Time (Rel. to Trig)	0.845	0.898	0.789	sec
Peak Acceleration	0.199	0.146	0.172	g
Peak Displacement	0.0224	0.0133	0.0241	mm
Sensor Check	Passed	Passed	Passed	
Frequency	8.1	7.6	8.1	Hz
Overswing Ratio	3.5	3.7	3.5	

Peak Vector Sum 5.04 mm/s at 0.938 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 10:16:09 August 22, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration July 13, 2017 by InstanTel
File Name __TEMP.EVT

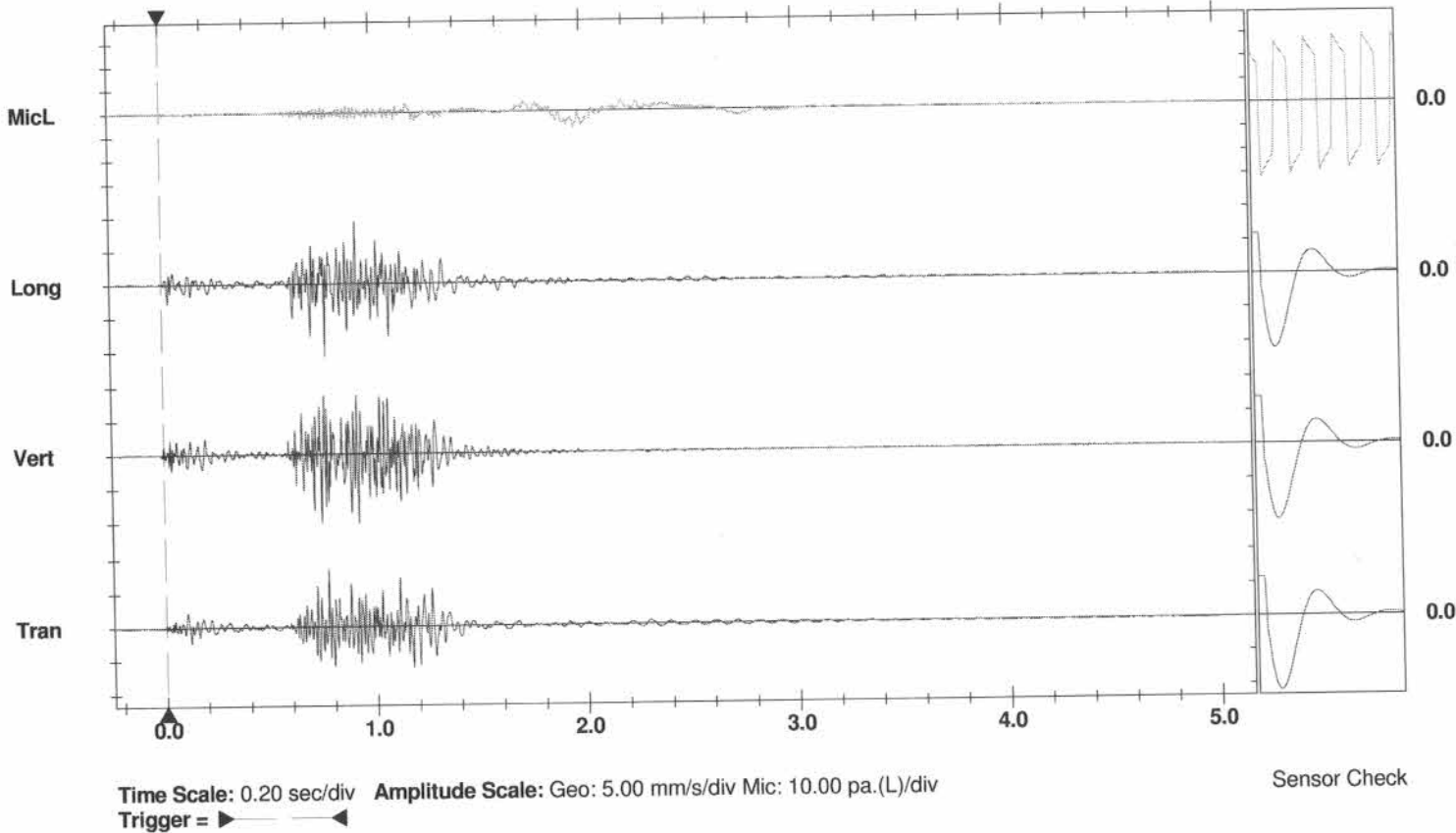
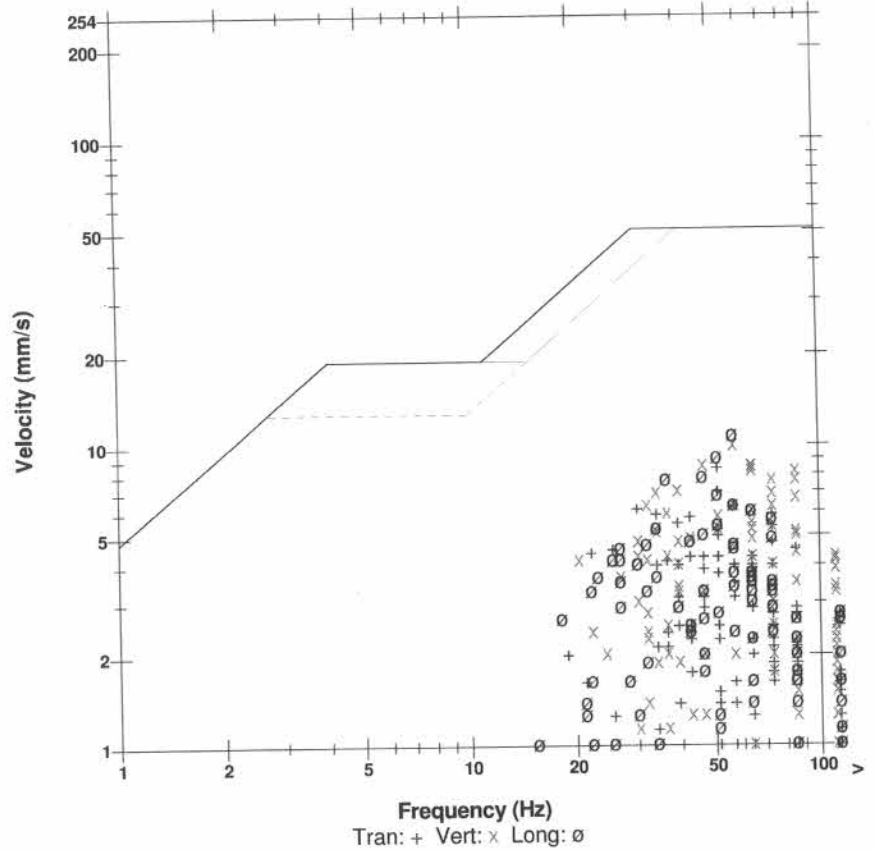
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes
 Combo Mode August 22, 2017 09:40:47
 40 Townline Road S Corner of Erie Peat Rd & Highway 3 telephone pole

Microphone Linear Weighting
PSPL 110.9 dB(L) at 1.969 sec
ZC Freq 3.3 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 526 mv)

	Tran	Vert	Long	
PPV	8.51	10.0	10.8	mm/s
ZC Freq	51	57	57	Hz
Time (Rel. to Trig)	0.774	0.748	0.773	sec
Peak Acceleration	0.318	0.490	0.384	g
Peak Displacement	0.0282	0.0291	0.0271	mm
Sensor Check	Passed	Passed	Passed	
Frequency	8.1	7.8	8.1	Hz
Overswing Ratio	3.2	3.4	3.4	
Peak Vector Sum	15.2 mm/s at 0.773 sec			

USBM RI8507 And OSMRE



BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE August 30th 2017 TIME 10:07am
CONTRACT / JOB # J18064C
LOCATION middle Bench, Port Colborne

BLASTER Zack Pollock
Please Print
SIGNATURE [Signature]

EXPLOSIVES: **No 022296**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4.25"
NO. OF HOLES 27
NO. OF DELAYS
MAX. LOAD PER DELAY 68.78 Kgs max
HOLES PER SERIES
POWDER FACTOR 0.41 Kgs/m³

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>18.52 Kgs</u>
2) <u>AES 200gr Boosters</u>	<u>27 units</u>
3) .....	.....

LOADING:

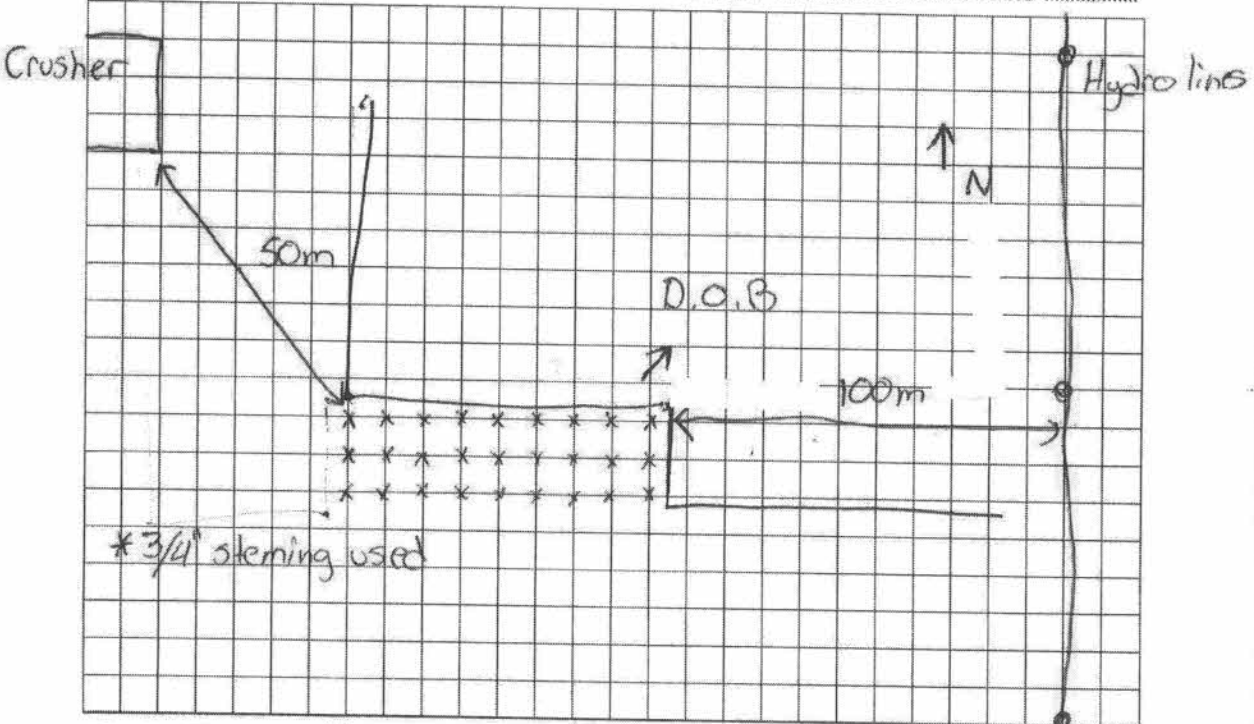
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitrocellulose</u>	<u>15m</u>	<u>27</u>
2) <u>Nitrocellulose</u>	<u>9m</u>	<u>9</u>
3) <u>Electric Cms</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH 41.13m @ widest point
LENGTH 13.71m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 4.57 SPACING 4.57



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good
Approx 4466 m³

FLYROCK DAMAGE: no

HAZARDS & DISTANCE: Hydro lines @ 100m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 5km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny / Clear

CUT SHEET #s: 10210

BULK USED? YES NO

BULK TRUCK NUMBER'S: 134

BULK TRUCK DRIVER: Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project J18064C
 Location Middle Bench Part Colbourne
 Blast Date August 30th 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022296
 Previous Blast Report # Reviewed 022295

Blast Area

Considerations

Designated Blast Area 100 meters
 Hydro/Bell Distance to blast 100 meters
 Notification of blasting required in writing Y (N) attach correspondence
 Request permission to re-route/shut down Y (N) attach correspondence
 Request utility representative to attend blast Y (N) attach correspondence
 Gas/Water Distance to blast NA meters
 Notification of blasting required in writing Y (N) attach correspondence
 Roads/Highways Distance to blast 500 meters
 Construction Workers Distance to blast 500 meters
 Property Owners Distance to blast NA meters
 Notification of blasting required in writing Y (N) attach correspondence
 Evacuation required in writing Y (N) attach correspondence
 MTO evacuation approval received in writing Y (N) attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast 9:30 ^{AM}/_{PM} time
 Number of guards 5 ea
 Quantity (# of) blasting mats 0 ea
 Audible warning device used such as cannister or air horn (Y) (N)
 Pre-blast survey complete (Y) (N)

Post Blast

Considerations

Output Flyrock (If yes, give distance) 10 meters
 Vibration (reading) mm/s
 Airblast (reading) dB
 Fragmentation (Good) (Bad)
 Movement (Y) (N)

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman Y (N)
 Notify Head Office to investigate inquiries (Y) (N)

Changes

What is required to reduce undesirables ? _____

SAFETY TALK

Date: Aug 30 2017 Time: 7:00 am Location: Port Colborne Job No. J18004C

Topics Discussed, Demonstrations or Inspections:

- Ensure To wear all your ppe at all times including hard hats boots, glasses High visible clothing and gloves when required
- No smoking around explosives at any time and ensure safe handling practices are adhered to at all times
- circle check your vehicles every morning

"SAFETY MATTERS"

Attendance:

Print

Zack Pollock

Brandon Graham

Jordan Gilmore

MARCEL PIETTE

Sign

Zack Pollock

Brandon Graham

Jordan Gilmore

Marcel Piette

Print: Kevin McPhie

FOREMAN: Sign: *[Signature]*

Date/Time Long at 10:06:27 August 30, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration July 13, 2017 by InstanTel
File Name N758H1NI.QR0

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes

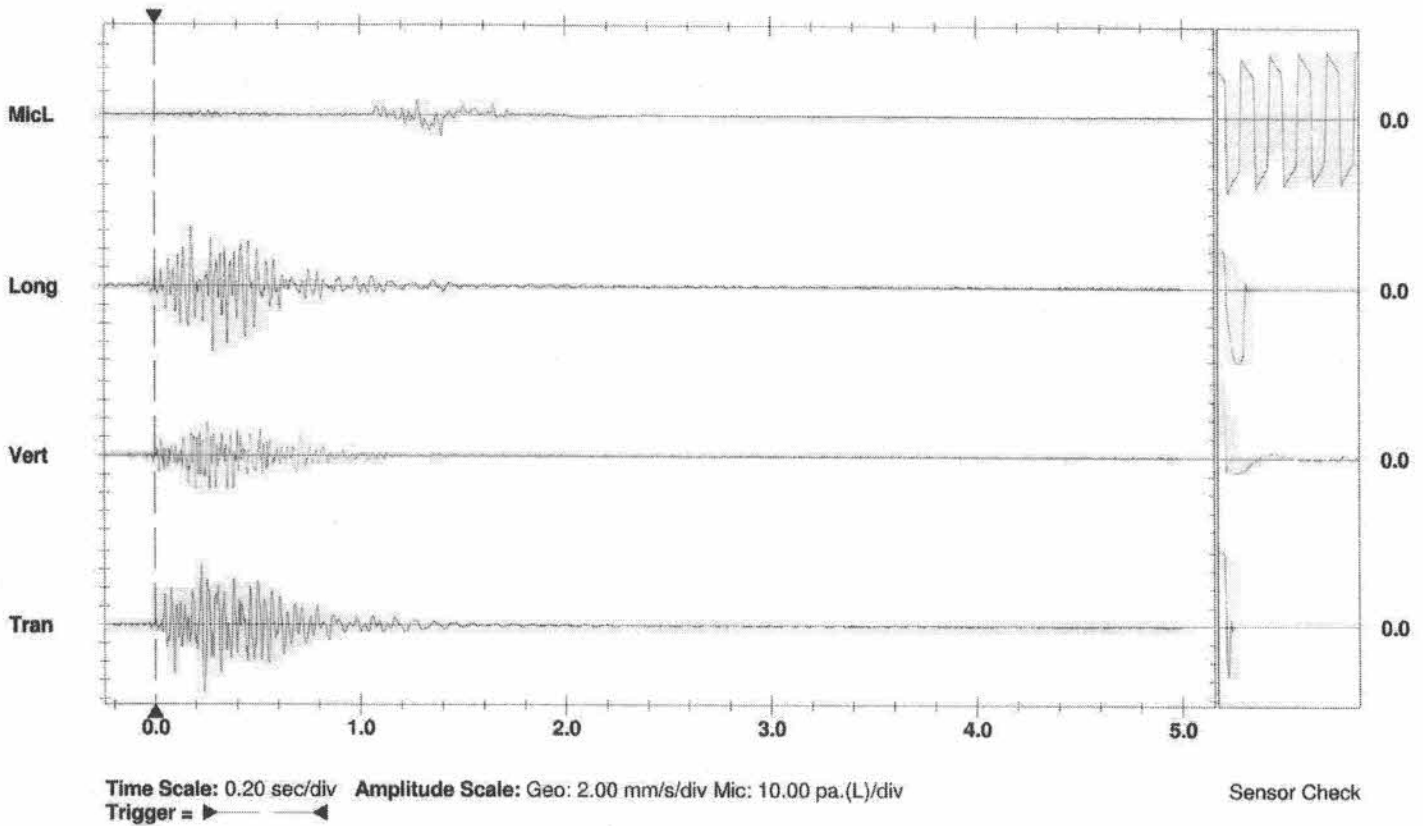
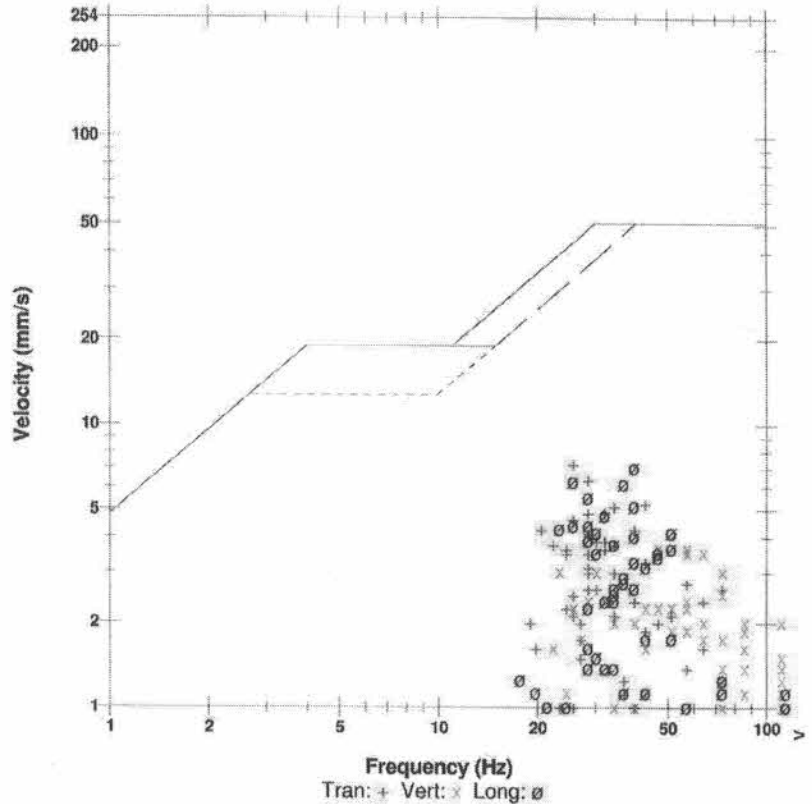
Combo Mode August 30, 2017 08:36:50
 Telephone pole on the corner of Erie Peat Road & Highway 3

Microphone Linear Weighting
PSPL 113.1 dB(L) at 1.396 sec
ZC Freq 13 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 536 mv)

	Tran	Vert	Long	
PPV	7.37	3.68	7.11	mm/s
ZC Freq	26	57	39	Hz
Time (Rel. to Trig)	0.240	0.200	0.285	sec
Peak Acceleration	0.239	0.159	0.199	g
Peak Displacement	0.0487	0.0140	0.0324	mm
Sensor Check	Check	Check	Check	
Frequency	60.2	8.8	14.0	Hz
Overswing Ratio	110.0	2.3	35.7	

Peak Vector Sum 8.23 mm/s at 0.240 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 10:05:38 August 30, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.0 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985H1NI.PE0

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes

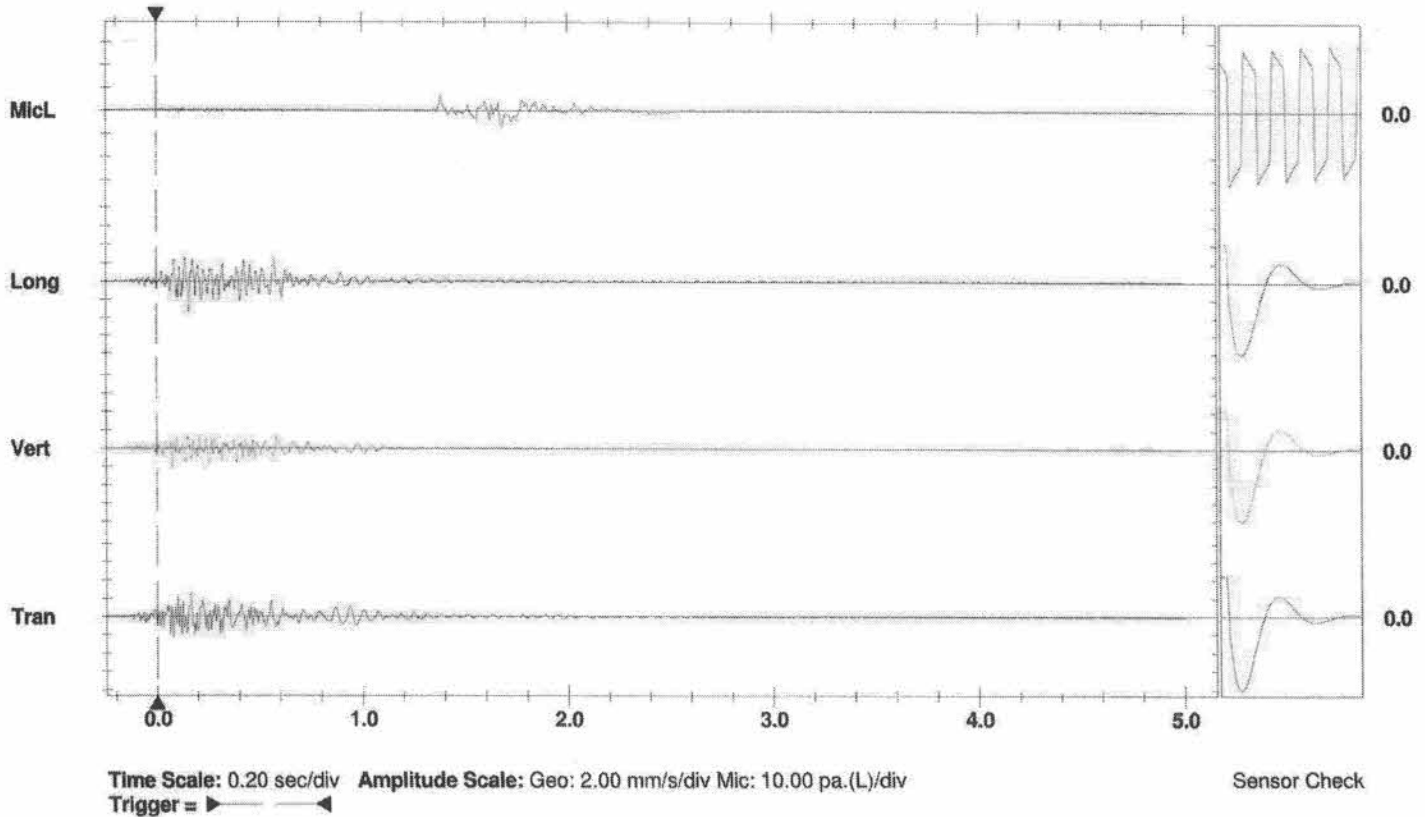
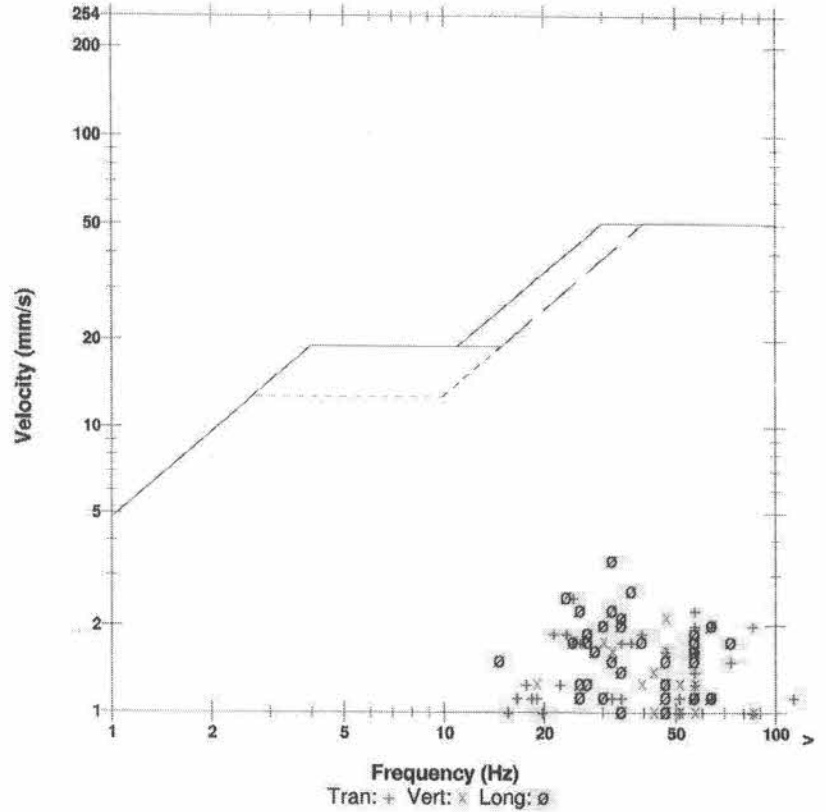
Combo Mode August 30, 2017 08:39:26
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 111.8 dB(L) at 1.678 sec
ZC Freq 5.2 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 578 mv)

	Tran	Vert	Long	
PPV	2.54	2.16	3.43	mm/s
ZC Freq	24	47	32	Hz
Time (Rel. to Trig)	0.166	0.075	0.157	sec
Peak Acceleration	0.106	0.0663	0.0795	g
Peak Displacement	0.0148	0.00949	0.0161	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.7	7.4	Hz
Overswing Ratio	3.7	3.8	3.9	

Peak Vector Sum 3.62 mm/s at 0.159 sec

USBM R18507 And OSMRE



BLAST LOG

DESIGN

REPORT

MINING + CONSTRUCTION

BLASTER Kevin M. P. R.
Please Print
SIGNATURE [Signature]

DATE TIME

CONTRACT / JOB # J18064C

LOCATION Middle Beach Port Colbourne

EXPLOSIVES: **No 022348**

DESIGN:

BLAST TYPE Quarry Open

SIZE OF HOLES 4.25 inch

NO. OF HOLES 27

NO. OF DELAYS 27

MAX. LOAD PER DELAY 68.78 Kgs

HOLES PER SERIES 1

POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>1857 Kgs</u>
2) <u>802 Booster</u>	
3)	

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Ultra Energy 25</u>	<u>15m</u>	<u>27</u>
2) <u>Sampler 100ms</u>	<u>6m</u>	<u>5</u>
3) <u>Impact 42m</u>		

DIMENSIONS:

LOADING:

COLLAR 2.13m and adjusted accordingly

COLUMN LOAD Emulsion

TOE LOAD 802 Booster

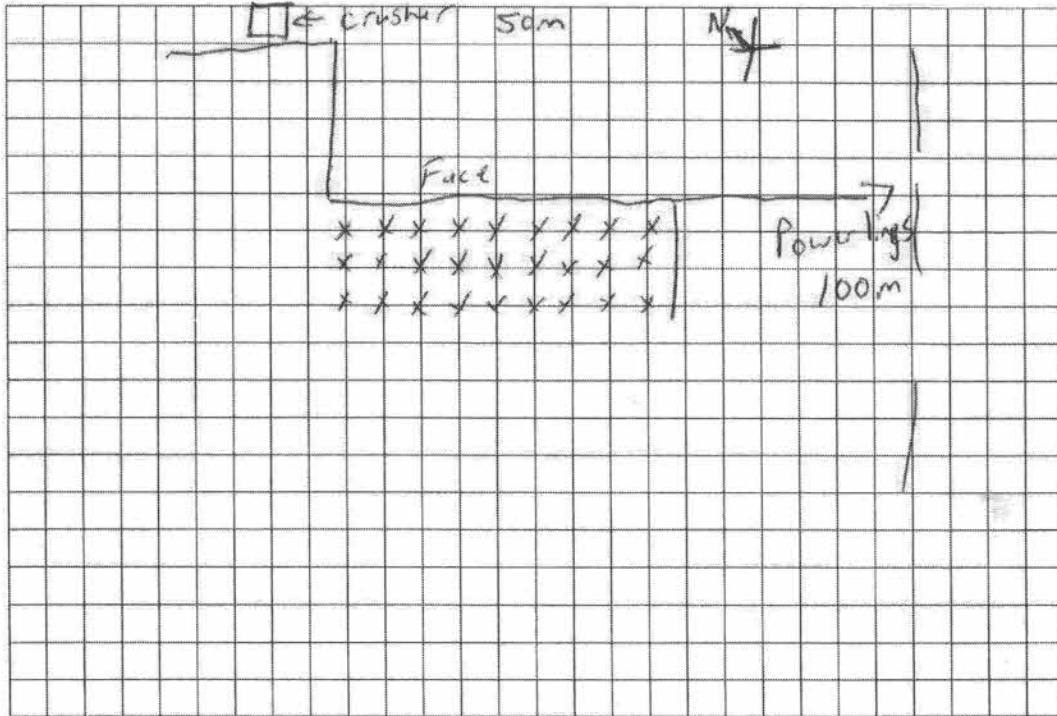
SUBGRADE

WIDTH

LENGTH

AVE CUT 7.92 AVE. DRILL DEPTH 7.92

PATTERN : BURDEN 4.57 SPACING 4.57



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

Est Tonnage = 11,611

HAZARDS & DISTANCE: See Diagram

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

ARE GUARDS IN PLACE? YES NO

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

CUT SHEET #'s: 10210

FLYROCK DAMAGE:

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

SEISMIC DATA: UNIT #'s

WIND DIRECTION VELOCITY:

ATMOSPHERIC CONDITIONS:

BULK USED? YES NO

BULK TRUCK NUMBER'S

BULK TRUCK DRIVER

BLAST LOG

DESIGN

REPORT

MINING+CONSTRUCTION

DATE August 30th 2017 TIME 11:22 am

CONTRACT / JOB # 518064C

LOCATION Middle Bench, Port Colborne

BLASTER Zack Pollock
Please Print

SIGNATURE [Signature]

EXPLOSIVES: **No 022297**

DESIGN:

BLAST TYPE Production (open)

SIZE OF HOLES 4

NO. OF HOLES 60

NO. OF DELAYS

MAX. LOAD PER DELAY 60.8kgs

HOLES PER SERIES

POWDER FACTOR 0.49kgs/m³

LOADING:

COLLAR 2m Accordingly

COLUMN LOAD Emulsion

TOE LOAD AES 200gr Boosters

SUBGRADE 0m

TYPE/BLEND	kgs/ # units
1) Emulsion	3648kgs
2) AES 200gr Boosters	60 units
3)	

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) Nitroeng 25koms	15m	60
2) Nitroeng 109ms	9m	15
3) Nonel 42ms	6m	10

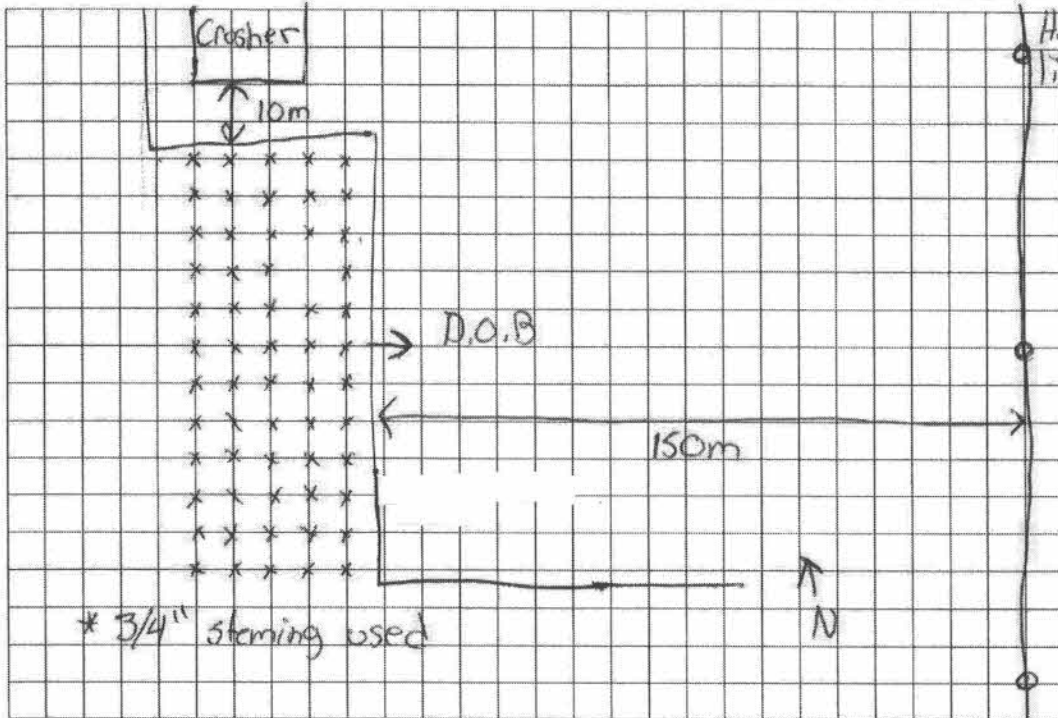
DIMENSIONS: Electr & Cms 3m 1

WIDTH 47.52m @ widest point

LENGTH 19.8m @ longest point

AVE CUT 7.92m AVE. DRILL DEPTH 7.92m

PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good
Approx 745) m³

FLYROCK DAMAGE: no

HAZARDS & DISTANCE: Hydro lines @ 150m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 5km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny/clear

CUT SHEET #'s 10211

BULK USED? YES NO

BULK TRUCK NUMBER'S 134

BULK TRUCK DRIVER Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project J18064C
 Location Middle Bench Port Colborne
 Blast Date August 30 2017
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022297
 Previous Blast Report # Reviewed 022296

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

100		meters
150		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
N.A		meters
Y	(N)	attach correspondence
500		meters
300		meters
400		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

11:00	(AM/PM)	time
5		ea
0		ea
(Y)	(N)	
(Y)	(N)	

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

10		meters
		mm/s
		dB
(Good)	(Bad)	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman

Y	(N)
---	-----

 Notify Head Office to investigate inquiries

Y	(N)
---	-----

Changes

What is required to reduce undesirables ? _____

Date/Time Long at 11:22:42 August 30, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration July 13, 2017 by InstanTel
File Name N758H1NM.9U0

Extended Notes

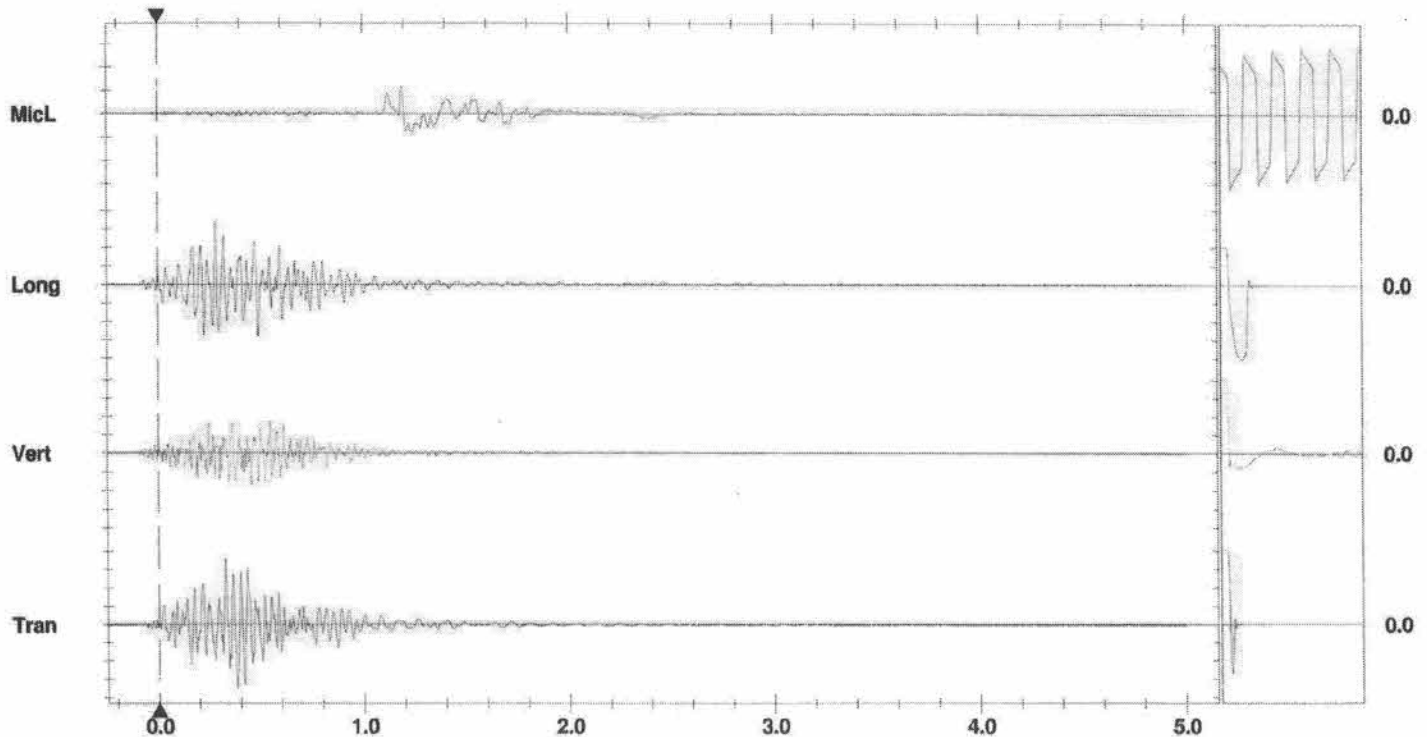
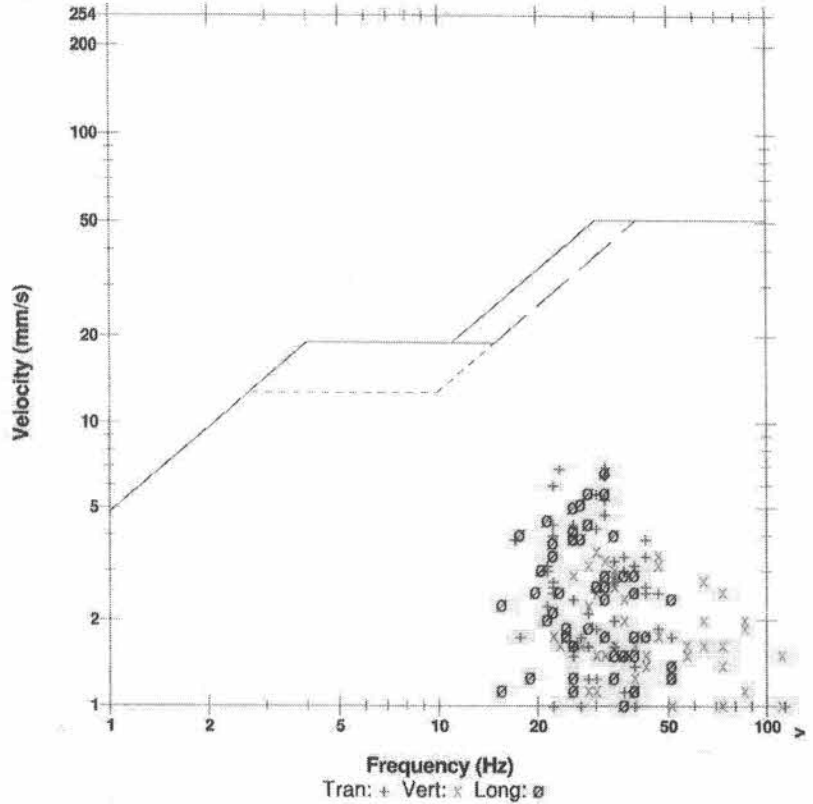
Combo Mode August 30, 2017 08:36:50
 Telephone pole on the corner of Erie Peat Road & Highway 3

Microphone Linear Weighting
PSPL 115.2 dB(L) at 1.190 sec
ZC Freq 21 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 536 mv)

	Tran	Vert	Long	
PPV	7.11	3.56	6.73	mm/s
ZC Freq	32	30	32	Hz
Time (Rel. to Trig)	0.325	0.547	0.282	sec
Peak Acceleration	0.159	0.146	0.172	g
Peak Displacement	0.0430	0.0165	0.0348	mm
Sensor Check	Check	Check	Check	
Frequency	60.2	8.8	14.0	Hz
Overswing Ratio	110.0	2.3	35.7	

Peak Vector Sum 8.73 mm/s at 0.325 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 11:21:53 August 30, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.0 Volts
Unit Calibration April 9, 2017 by Instantel
File Name L985H1NM.8H0

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

Extended Notes

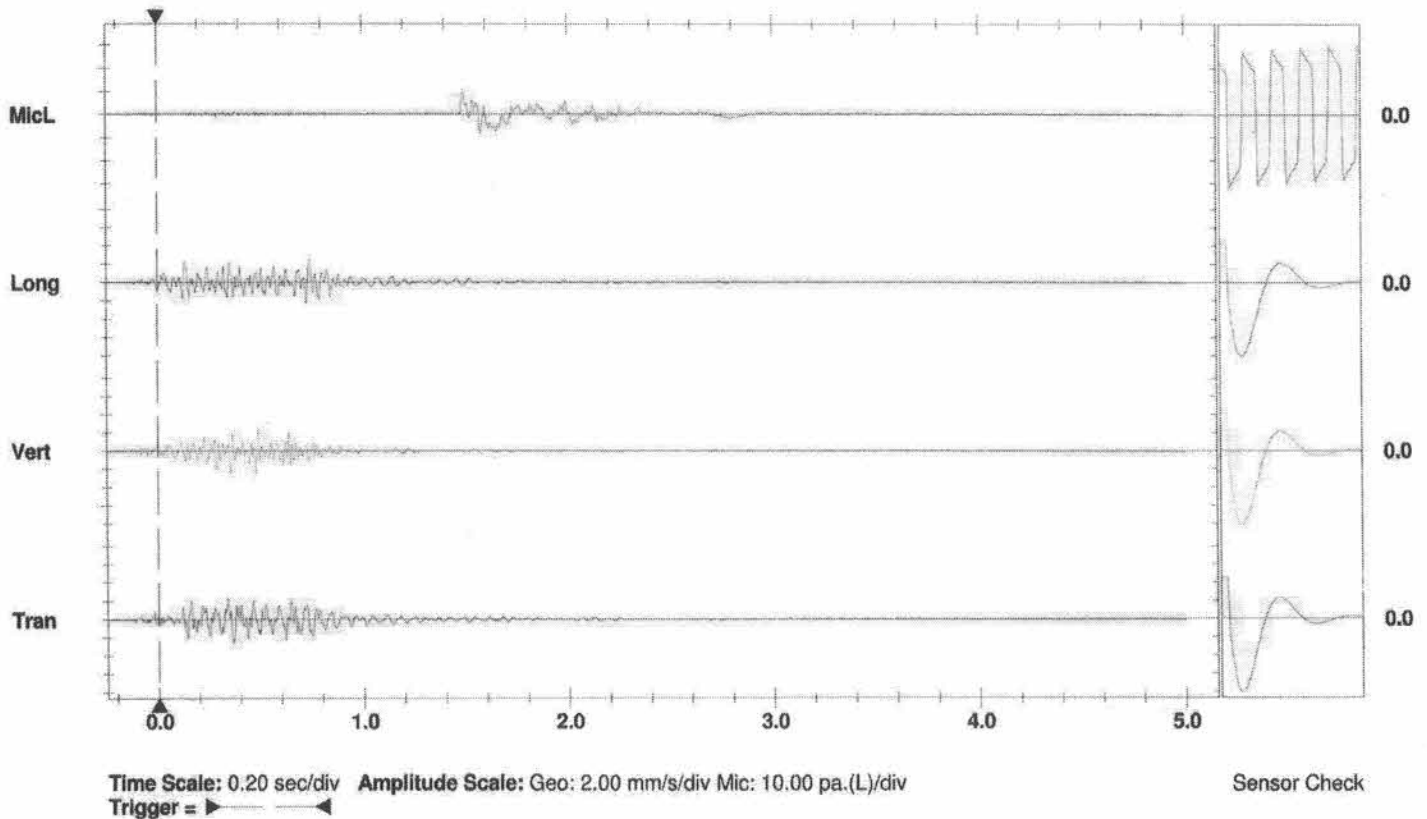
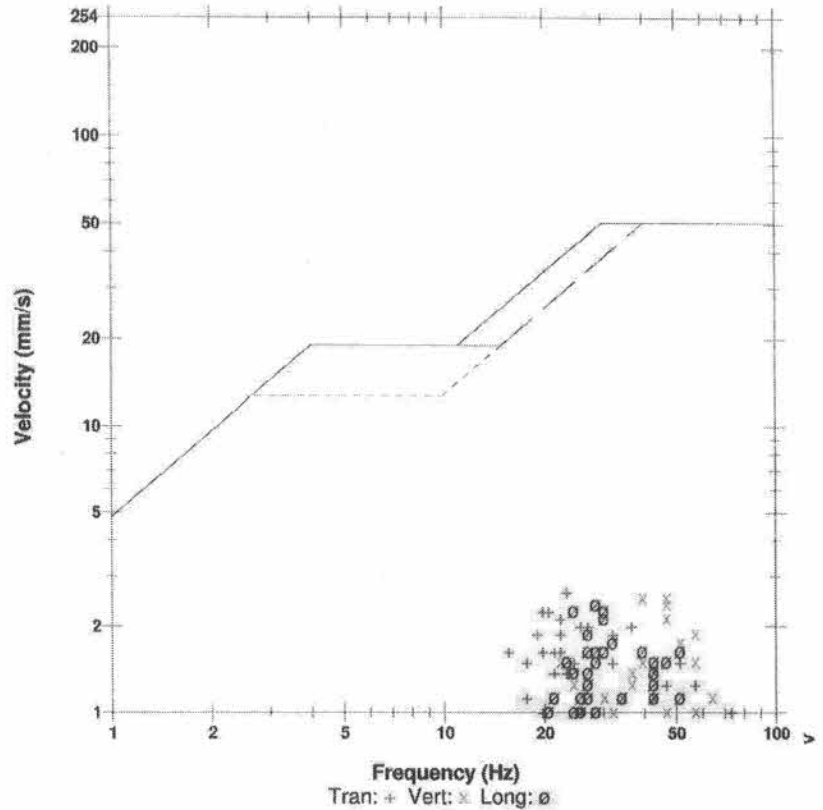
Combo Mode August 30, 2017 08:39:26
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 113.8 dB(L) at 1.488 sec
ZC Freq 13 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 578 mv)

	Tran	Vert	Long	
PPV	2.67	2.54	2.41	mm/s
ZC Freq	23	39	28	Hz
Time (Rel. to Trig)	0.359	0.354	0.741	sec
Peak Acceleration	0.0795	0.0795	0.0663	g
Peak Displacement	0.0211	0.00974	0.0146	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.7	7.4	Hz
Overswing Ratio	3.7	3.8	3.9	

Peak Vector Sum 3.24 mm/s at 0.354 sec

USBM R18507 And OSMRE



BLAST LOG

DESIGN

REPORT

MINING+CONSTRUCTION

BLASTER Kevin M. Phoe
Please Print
SIGNATURE [Signature]

DATE TIME

CONTRACT / JOB # J180640

LOCATION Port Colbourne middle Beach

EXPLOSIVES: **No 022349**

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4 1/2
NO. OF HOLES 60
NO. OF DELAYS 60
MAX. LOAD PER DELAY 60.8 Kg
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND kgs/ # units
1) Emulsion 3649 Kg S
2) 802 Booster 60
3)

LOADING:

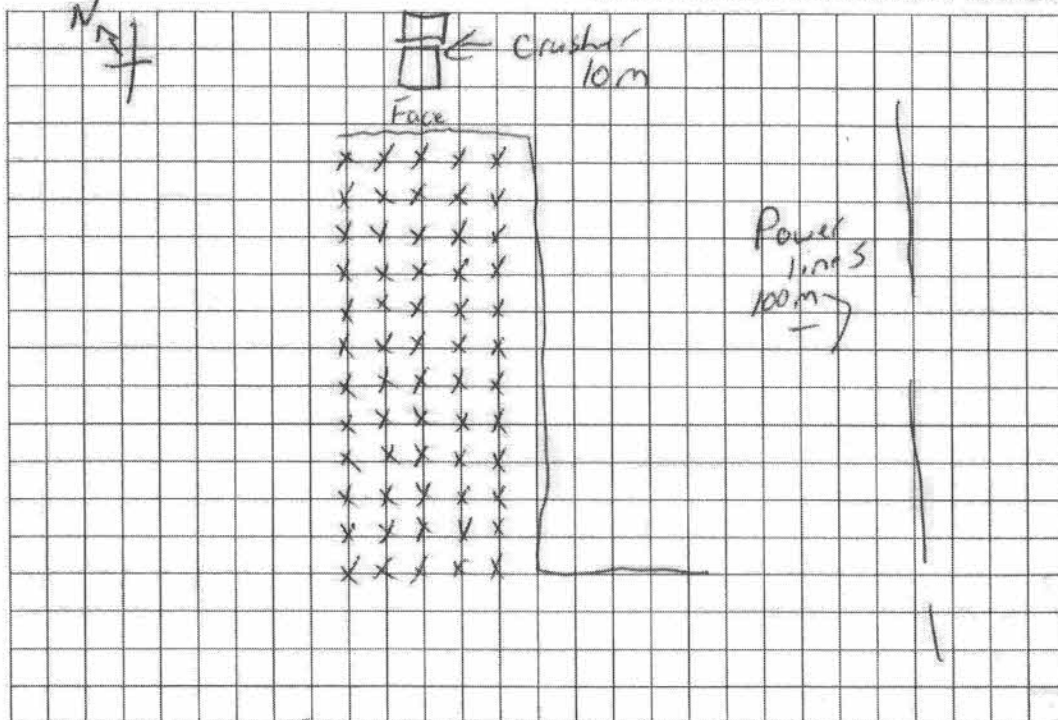
COLLAR 213m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 802 Booster
SUBGRADE ✓

DETONATORS / INITIATORS:

TYPE LENGTH # UNITS
1) Nitro Energy 25 15m 60
2) Jumpers 104ms 6m 5
3) Jumpers 42ms 6m 5
Electric Det 3m 1

DIMENSIONS:

WIDTH
LENGTH
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN : BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est tones = 19374.93

FLYROCK DAMAGE:

HAZARDS & DISTANCE: see Diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s: 10211

BULK USED? YES NO

BULK TRUCK NUMBER'S

BULK TRUCK DRIVER

CUT SHEET # _____

CUT SHEET



DATE: _____
No. 10211

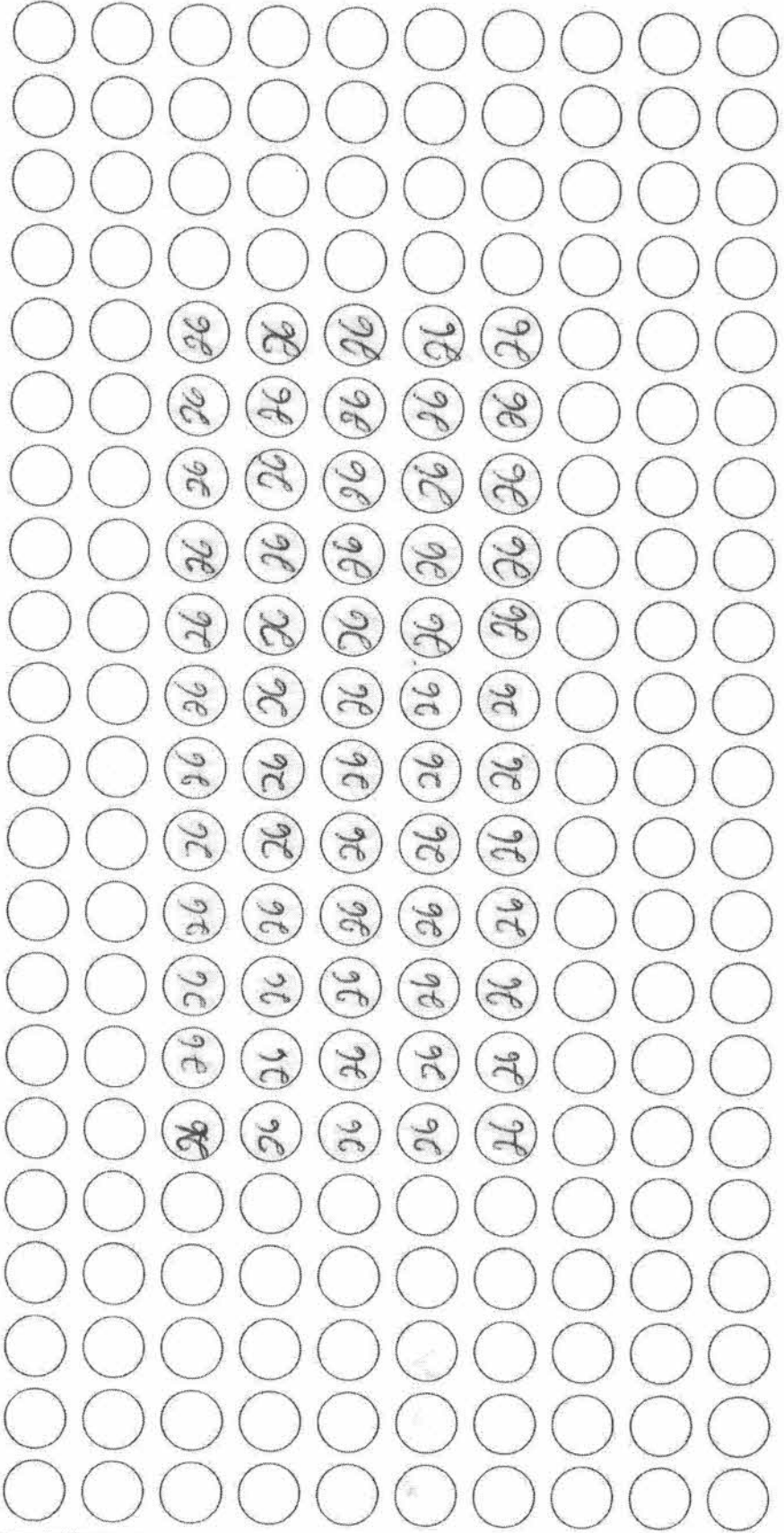
JOB # 518 064C Low Crested Stone
JOB LOCATION: Middle Beach Port Colborne
DRILLER: Kevin Myhal
PATTERN: 13X13
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 60 holes 1560'

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____



CUT SHEET # _____



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Feb,21,17

Location in Quarry: **Top Bench:Shot #1**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	195	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4						
					m3/ Hole:		57.7
					Tonnes/Hole:		136.0
					Total Tonnes:		26520.0

Material Blasted: Limestone Explosive / Hole: 11.1 kg 24.5 lb
 Density: 2.4 t/m3 Max. kg. / Delay: 11.1 kg 24.5 lb
 Max Holes / Delay: 1 Distance to Seis: m ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	195 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6142.0	2730.0

Miscellaneous:

Comments:

Approved:

B. Mankin

Date:

[Signature]
Feb 16-17

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 02/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/21/2017 12:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 10 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 41.899" N 79° 17' 32.299" W

NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 20455 Erie Peat Rd

Direction/Bearing: 354 °

Structure Type: Dwelling

Distance: 878 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	579.1 m
No. of Holes:	200	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	200	Face Height:	2.90 m	Spacing:	3.96 m
No. of Rows:	5	Drilling Angle:	0 °	Back Fill Depth:	0.61 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	1.52 m
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	58.0 kg	Volume Produced:	9,092.5 m ³
Firing Device:	Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	58.0 kg	Weight Produced:	21,825.7 t
Other Method:	Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	7.610 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	14.5 kg	Powder Factor 2:	0.316 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	230.71	Rock Density:	2.400 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	115.35		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No		Protective Cover:		Loader Bucket	
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
LANE	LAVERN, G			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
Other Crew Members			Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway			Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 02/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/21/2017 12:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	200.00 ea	68.02
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	200.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	19.00 ea	0.00
07696	Hydromite 4400 Bulk	2,800.00 kg	2,800.00
D0120	Other-Drilling Charges	1,900.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,868.02

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 02/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 02/21/2017 12:20

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - YOUNG STREET TEST WELL

Data Type: No Trigger	Seismograph Type: White Mini Sies	Transverse: --- mm/s	--- Hz	
Date: 02/21/17	Trigger Level: 1.01 mm/s	120.00 dB	Vertical: --- mm/s	--- Hz
Time: 12:20	Calibration Date: 02/03/16	Longitudinal: --- mm/s	--- Hz	
Distance From Blast: 568.76 m	Calibration Signal:	PPV: --- mm/s	--- Hz	
Direction From Blast: ENE	Geophone Min. Freq.: --- Hz	Acoustic: --- dB	Vector Sum: --- mm/s	
Readout:	Mic. Min. Freq.: --- Hz			
Location:				
Lat./Long.: 42° 53' 49.260" N	79° 17' 9.310" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis	Transverse: 1.9 mm/s	56.8 Hz	
Date: 02/21/17	Trigger Level: 1.01 mm/s	--- dB	Vertical: 1.39 mm/s	73.1 Hz
Time: 12:20	Calibration Date: 11/18/16	Longitudinal: 3.42 mm/s	64.0 Hz	
Distance From Blast: 398.98 m	Calibration Signal:	PPV: --- mm/s	--- Hz	
Direction From Blast: SSE	Geophone Min. Freq.: --- Hz	Acoustic: 117 dB	Vector Sum: 3.55 mm/s	
Readout: Display Only	Mic. Min. Freq.: --- Hz			
Location:				
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER LTD. BLAST DESIGN



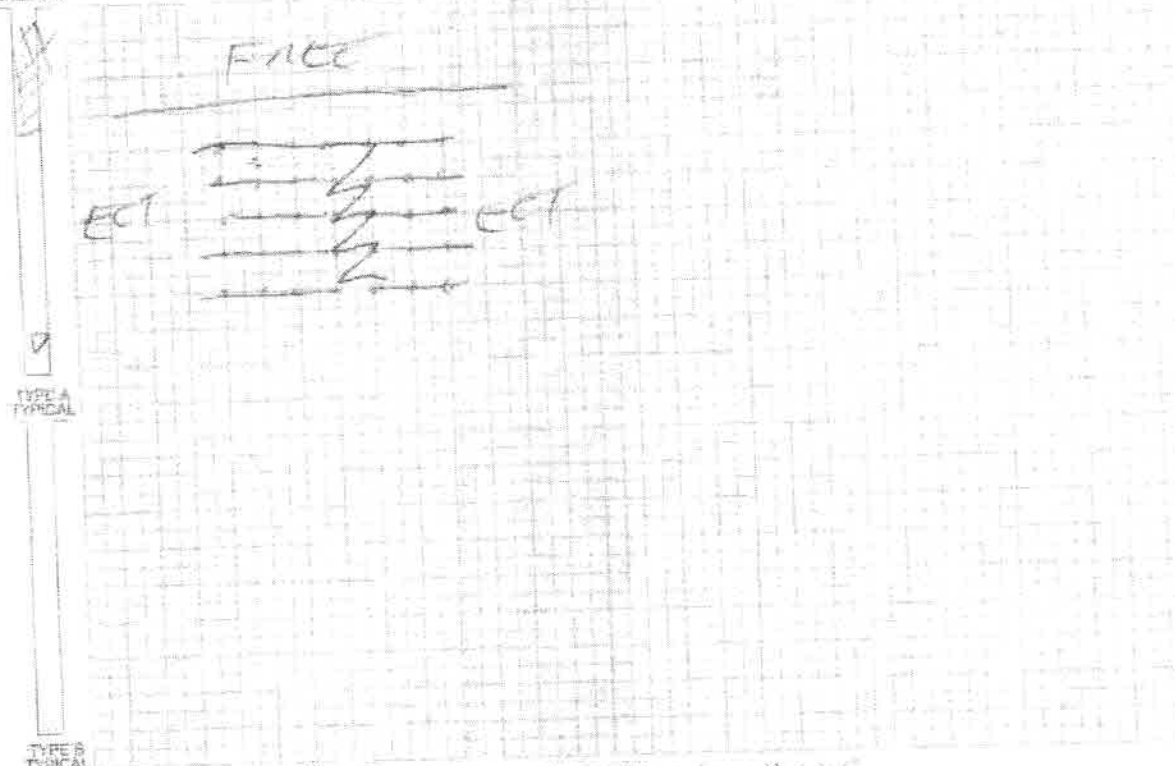
DATE 02/19/17

SHOT NO. _____
 COMPANY (PERMITTEE) Law (C) 1987-88 Stone LOCATION WH-2 ROCK
 TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4
 NO. OF HOLES 195 NO. OF ROWS 5 BURDEN 13
 SPACING 13 DEPTH 10 FACE HEIGHT 10 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>30' DMC ORNG</u>	<u>195</u>	1 mm = 0.03937 in	1 m = 25.4 mm
<u>20' 942 MS</u>	<u>19</u>	1 m = 3.28 ft	1 ft = 0.3048 m
		1 m ² = 36.32 ft ²	1 ft ² = 0.0283168 m ²
		1 m ³ = 1.356 yd ³	1 yd ³ = 0.764555 m ³
		1 yd = 37 ft	1 ft = 0.37037 yd
		1 kg = 2.2046 lb	1 lb = 0.453 kg
		1 tonne = 1.1023 ton	1 ton = 0.907105 tonne
		1 tonne/m ³ = 0.842177 ton/yd ³	1 ton/yd ³ = 1.196 tonne/m ³

TYPE OF PRIMER RUSTIC 2935 WEIGHT OF EXPLOSIVES PER HOLE 12
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2340
 TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) None DMC

TOTAL NO. TONNES PRODUCED 22392 OR TOTAL CUBIC METRES PRODUCED 9350
 TOTAL POWDER FACTOR KG/CUBIC METRE 0.3
 SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 2.0



PRE-BLAST COMMENTS: 9 25 MS BETWEEN HOLES
84 MS BETWEEN ROWS

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE: [Signature] PRINT: _____ SIGNATURE: _____
 TYPE OF PROTECTIVE COVER USED: STEEL SHELTER OFF HIGHWAY TRUCK BUNKER OF LOADER/SKIDEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Jan,31,17

Location in Quarry: **Top Bench:Shot #1**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	195	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m ³ / Hole:	57.7
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	26520.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		11.1 kg		24.5 lb		
Density:	2.4	t/m ³	Max. kg. / Delay:		11.1 kg		24.5 lb		
Max Holes / Delay:	1		Distance to Seis.:		m		ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	195 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6142.0	2730.0

Miscellaneous: Main body of the blast is 5 rows deep however, there are 5 extra rows in the one corner of the blast.

Comments:

Approved:

Date:

Jan-31/17

AUSTIN POWDER PRE-BLAST DESIGN



Customer: Law Quarry

Date: Jan,31,17

Location in Quarry: Top Bench:Shot #2

Layout

		Feet	Metres	Feet	Metres		
# Holes:	202	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	6	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4					m ³ / Hole:	57.7
Material Blasted:	Limestone					Tonnes/Hole:	136.0
Density:	2.4 t/m ³					Total Tonnes:	27472.0
Max Holes / Delay:	1						
		Explosive / Hole:		11.1 kg	24.5 lb		
		Max. kg. / Delay:		11.1 kg	24.5 lb		
		Distance to Seis.:		m	ft		

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	202 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6363.0	2828.0

Miscellaneous:

Comments:

Approved:

Date:

Jan 31 / 17



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 01/31/2017/A

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 01/31/2017 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 1 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long: 42° 53' 41.500" N 79° 17' 40.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 5 °

Structure Lat./Long: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 892 m

LAYOUT

Hole Depth:	3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	594.4 m
No. of Holes:	195	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. Holes:	195	Face Height:	3.05 m	Spacing:	3.96 m
No. of Rows:	5	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.83 m
				Area Type:	Conventional
				Method:	Weighted Average

* V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	33.2 kg	Volume Produced:	9,331.9 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	33.2 kg	Weight Produced:	22,400.1 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	10.496 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	11.1 kg	Powder Factor 2:	0.229 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	267.89	Rock Density:	2,400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	154.67		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No			Misfire Occurred: No		Protective Cover: Loader Bucket			
Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	No	No	No	No
MERRITT	AARON, K			No	Yes	Yes	No	No
MINOR	CARMEN, R			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
VAN RAVENSWAAY	JEREMY, P			No	Yes	Yes	Yes	Yes

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 01/31/2017/A

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 01/31/2017 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	195.00 ea	66.32
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	195.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
00788	SHOCK*STAR Lead-in-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	9.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	10.00 ea	0.00
07602	Hydromite 4100 Bulk	2,068.00 kg	2,068.00
Total Weight of Explosives (Include Primers) (kg)			2,134.32

COMMENTS / EXPLANATIONS

[Handwritten Signature]

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 01/31/2017/A

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 01/31/2017 11:13

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record	Seismograph Type: Mini White Seis			
Date: 01/31/17	Trigger Level: 1.01 mm/s	---	dB	Transverse: 1.39 mm/s 30.1 Hz
Time: 11:13	Calibration Date: 11/18/16			Vertical: 0.88 mm/s 56.8 Hz
Distance From Blast: 479.15 m	Calibration Signal:			Longitudinal: 1.14 mm/s 51.2 Hz
Direction From Blast: SE	Geophone Min. Freq: --- Hz			PPV: --- mm/s --- Hz
Readout: Display Only	Mic. Min. Freq: --- Hz			Acoustic: 110 dB
Location:				Vector Sum: 1.52 mm/s
Lat./Long.: 42° 53' 29.800" N		79° 17' 26.120" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

SEISMOGRAPH 2 - YOUNG STREET TEST WELL

Data Type: No Trigger	Seismograph Type: White Mini Seis			
Date: 01/31/17	Trigger Level: 1.01 mm/s	120.00	dB	Transverse: --- mm/s --- Hz
Time: 14:11	Calibration Date: 02/03/16			Vertical: --- mm/s --- Hz
Distance From Blast: 736.40 m	Calibration Signal:			Longitudinal: --- mm/s --- Hz
Direction From Blast: ENE	Geophone Min. Freq: --- Hz			PPV: --- mm/s --- Hz
Readout:	Mic. Min. Freq: --- Hz			Acoustic: --- dB
Location:				Vector Sum: --- mm/s
Lat./Long.: 42° 53' 49.260" N		79° 17' 9.310" W		
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				



AUSTIN POWDER LTD. BLAST REPORT



310-Oneida

ON, Hagersville, Canada NDA 1- H0

Blast No.: 01/31/2017/B

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-003)

Date/Time: 01/31/2017 14:11

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Cloudy / High
Clouds

Wind From: WSW

Temperature: -1 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 41.500" N 79° 17' 40.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 5 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 892 m

LAYOUT

Hole Depth:	1.83 - 3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	609.6 m
No. of Holes:	208	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. ¹ Holes:	208	Face Height:	1.83 - 3.05 m	Spacing:	3.96 m
No. of Rows:	6	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average
					(H = 2.93 m)

¹ V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	45.8 kg	Volume Produced:	9,571.1 m ³
Firing Device:	Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	45.8 kg	Weight Produced:	22,974.4 t
Other Method:	Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	10.382 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	11.4 kg	Powder Factor 2:	0.231 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	263.70	Rock Density:	2,400 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	131.85		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
FARRER	NICHOLAS, J			No	Yes	Yes	No	No
MERRITT	AARON, K			No	Yes	Yes	No	No
MINOR	CARMEN, R			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	Yes	No	No
VAN RAVENSWAAY	JEREMY, P			No	No	No	Yes	Yes



AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1 - H0

Blast No.: 01/31/2017/B

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 01/31/2017 14:11

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	208.00 ea	70.74
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	208.00 ea	0.00
01492	30' SHOCK*STAR Quick Relay 17 ms	12.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	11.00 ea	0.00
07602	Hydromite 4100 Bulk	2,142.00 kg	2,142.00
Total Weight of Explosives (Include Primers) (kg):			2,212.74

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 01/31/2017/B

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 01/31/2017 14:11

PIU/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PLAT & HWY83

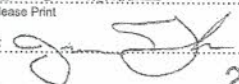
Data Type:	Seismic Record	Seismograph Type:	Mini White Seis				
Date:	01/31/17	Trigger Level:	1.01 mm/s	---	dB	Transverse:	1.27 mm/s 36.5 Hz
Time:	14:11	Calibration Date:	11/18/16			Vertical:	1.01 mm/s 34.1 Hz
Distance From Blast:	479.15 m	Calibration Signal:				Longitudinal:	0.76 mm/s 30.1 Hz
Direction From Blast:	SE	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	114 dB
Location:						Vector Sum:	1.27 mm/s
Lat./Long.:	42° 53' 29.800" N						
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

SEISMOGRAPH 2 - YOUNG STREET TEST WELL

Data Type:	No Trigger	Seismograph Type:	White Mini Seis				
Date:	01/31/17	Trigger Level:	1.01 mm/s	120.00	dB	Transverse:	---
Time:	14:11	Calibration Date:	02/03/16			Vertical:	---
Distance From Blast:	736.40 m	Calibration Signal:				Longitudinal:	---
Direction From Blast:	ENE	Geophone Min. Freq.:	---	Hz		PPV:	---
Readout:		Mic. Min. Freq.:	---	Hz		Acoustic:	---
Location:						Vector Sum:	---
Lat./Long.:	42° 53' 49.260" N						
Reader and Firm:	Jordan Davis, AUSTIN POWDER						
Analyst and Firm:							
Installer and Firm:							

MINING+CONSTRUCTION

DATE July 19/17 TIME 9:55am
 CONTRACT / JOB # low G. crush stn.
 LOCATION Port Colborne

BLASTER James Graham
Please Print
 SIGNATURE 
 EXPLOSIVES: **23460**

DESIGN:

BLAST TYPE Production
 SIZE OF HOLES 4 inch
 NO. OF HOLES 48
 NO. OF DELAYS 48
 MAX. LOAD PER DELAY 58.9
 HOLES PER SERIES single
 POWDER FACTOR

TYPE/BLEND kgs/ # units
 1) Emulsion 3000kg
 2) Sens. booster 10kg / 3/4 case
 3)

LOADING:

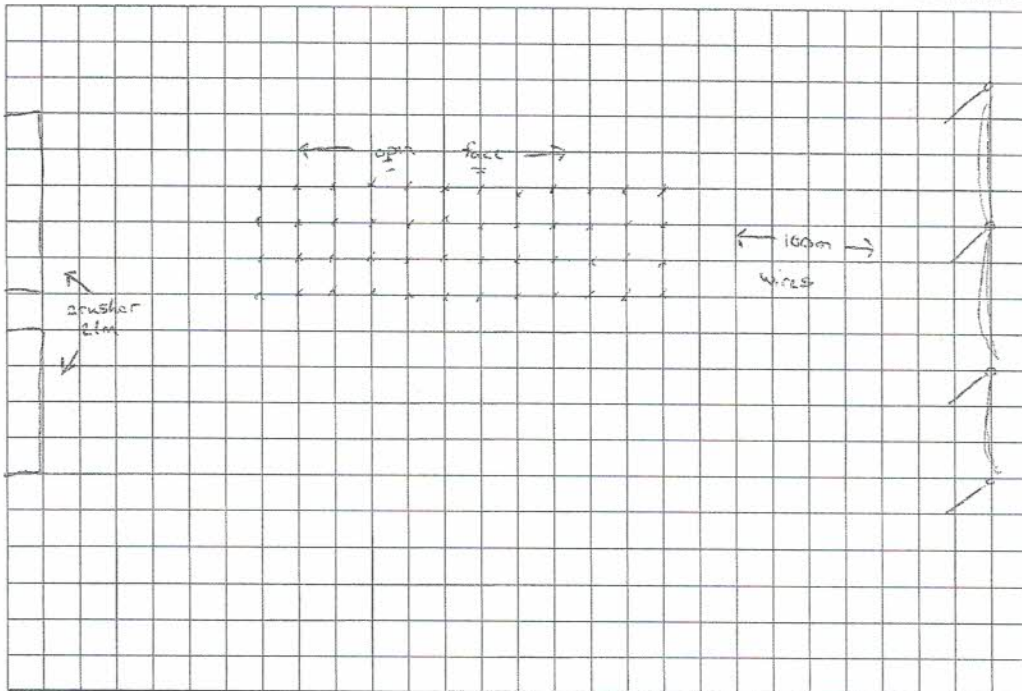
COLLAR 7ft according
 COLUMN LOAD emulsion
 TOE LOAD Sens. booster
 SUBGRADE 0

DETONATORS / INITIATORS:

	TYPE	LENGTH	# UNITS
1)	<u>None / 25/50</u>	<u>Soft</u>	
2)	<u>Mico 109/33ms</u>	<u>20ft</u>	<u>15</u>
3)	<u>6lac</u>	<u>12ft</u>	<u>1</u>

DIMENSIONS:

WIDTH
 LENGTH
 AVE CUT 26 AVE. DRILL DEPTH 26
 PATTERN: BURDEN 13 SPACING 13



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: all good

FLYROCK DAMAGE: none

HAZARDS & DISTANCE: crusher rim / 100m wires

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: gd UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: calm

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: sun / cloud

CUT SHEET #'s

BULK USED? YES NO

BULK TRUCK NUMBER'S 131

BULK TRUCK DRIVER Dave White

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project bound rough stone
 Location Port Colborne
 Blast Date July 10/07
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) pro
 Name of Blaster James G. Gal
 Blast Report # 23460
 Previous Blast Report # Reviewed yes

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

300		meters
100		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
6		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
600		meters
600		meters
6		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

	AM	PM	time
4			ea
0			ea
<input checked="" type="checkbox"/>		N	
<input checked="" type="checkbox"/>		N	

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN

REPORT

DATE TIME

CONTRACT / JOB # J1806 4C

LOCATION Port Colborne Low Cracked stone

DESIGN:

BLAST TYPE Quarry OPEN

SIZE OF HOLES 4"

NO. OF HOLES 48

NO. OF DELAYS 48

MAX. LOAD PER DELAY 60.8 KgS

HOLES PER SERIES 1

POWDER FACTOR

LOADING:

COLLAR 2.13m and adjusted according

COLUMN LOAD Emulsion

TOE LOAD 8oz Ready Booster

SUBGRADE

BLASTER Kevin M Phel
Please Print

SIGNATURE [Signature]

EXPLOSIVES: **No 022340**

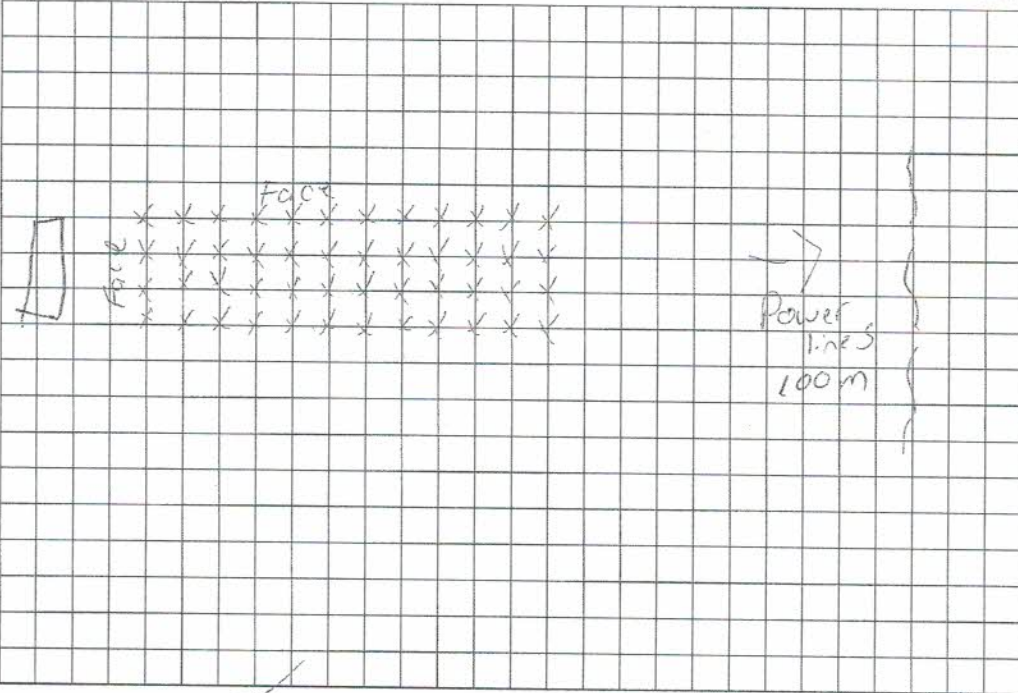
TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2918.4 KgS</u>
2) <u>8oz Booster</u>	<u>48 ea</u>
3) .....	.....

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitra Energy 25 sec</u>	<u>15m</u>	<u>48</u>
2) <u>Jumper 109ms</u>	<u>6m</u>	<u>6</u>
3) <u>Jumper 42ms</u>	<u>6m</u>	<u>11</u>

DIMENSIONS:

WIDTH 15.84 m
 LENGTH 47.52 m
 AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
 PATTERN : BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est ton = 15 499

HAZARDS & DISTANCE: see diagram

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

ARE GUARDS IN PLACE? YES NO

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

CUT SHEET #'s 008 410

FLYROCK DAMAGE:

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

SEISMIC DATA: UNIT #'s

WIND DIRECTION VELOCITY:

ATMOSPHERIC CONDITIONS:

BULK USED? YES NO

BULK TRUCK NUMBER'S

BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: _____

JOB # 518064C

No 008410

JOB LOCATION: Port Colborne middle bench

DRILLER: Kevin Mphel

PATTERN: 13+13

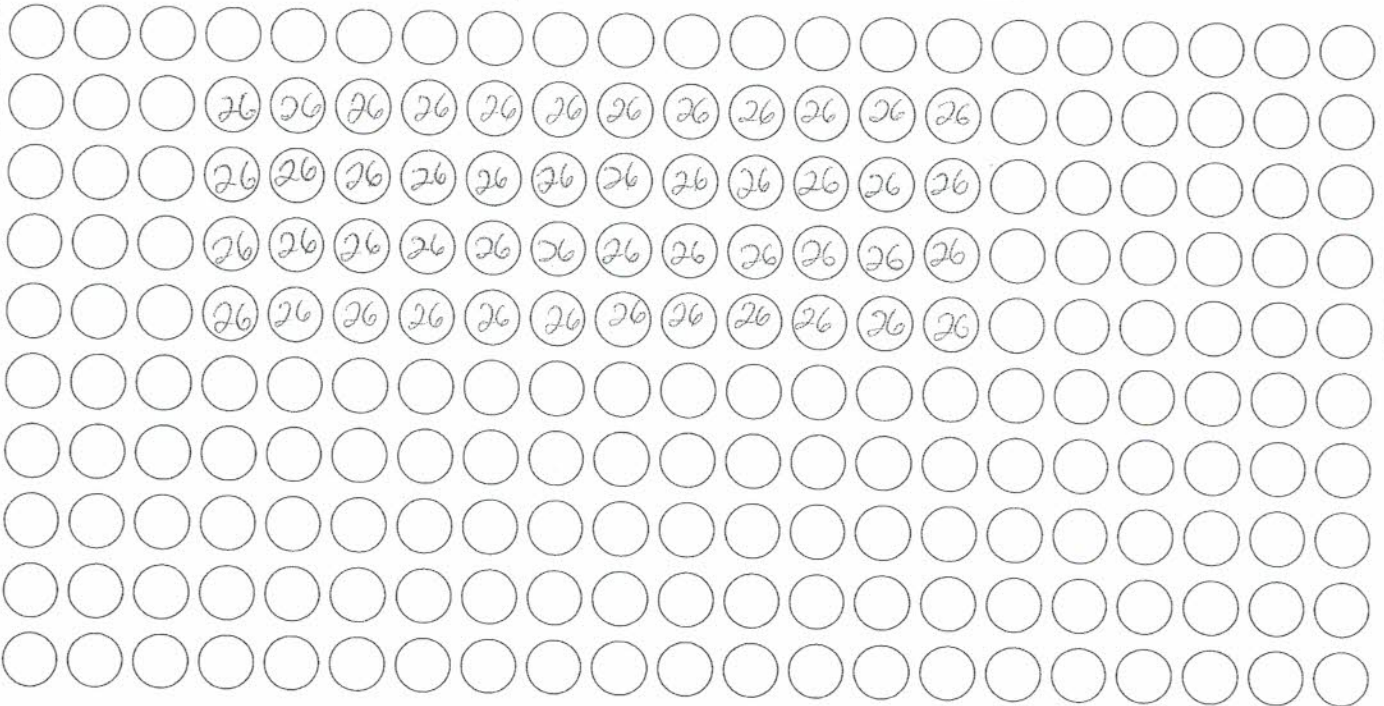
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 48 holes = 1248'

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #



CUT SHEET # _____

Date/Time Tran at 09:55:35 July 10, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZ12.8N0

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

Extended Notes

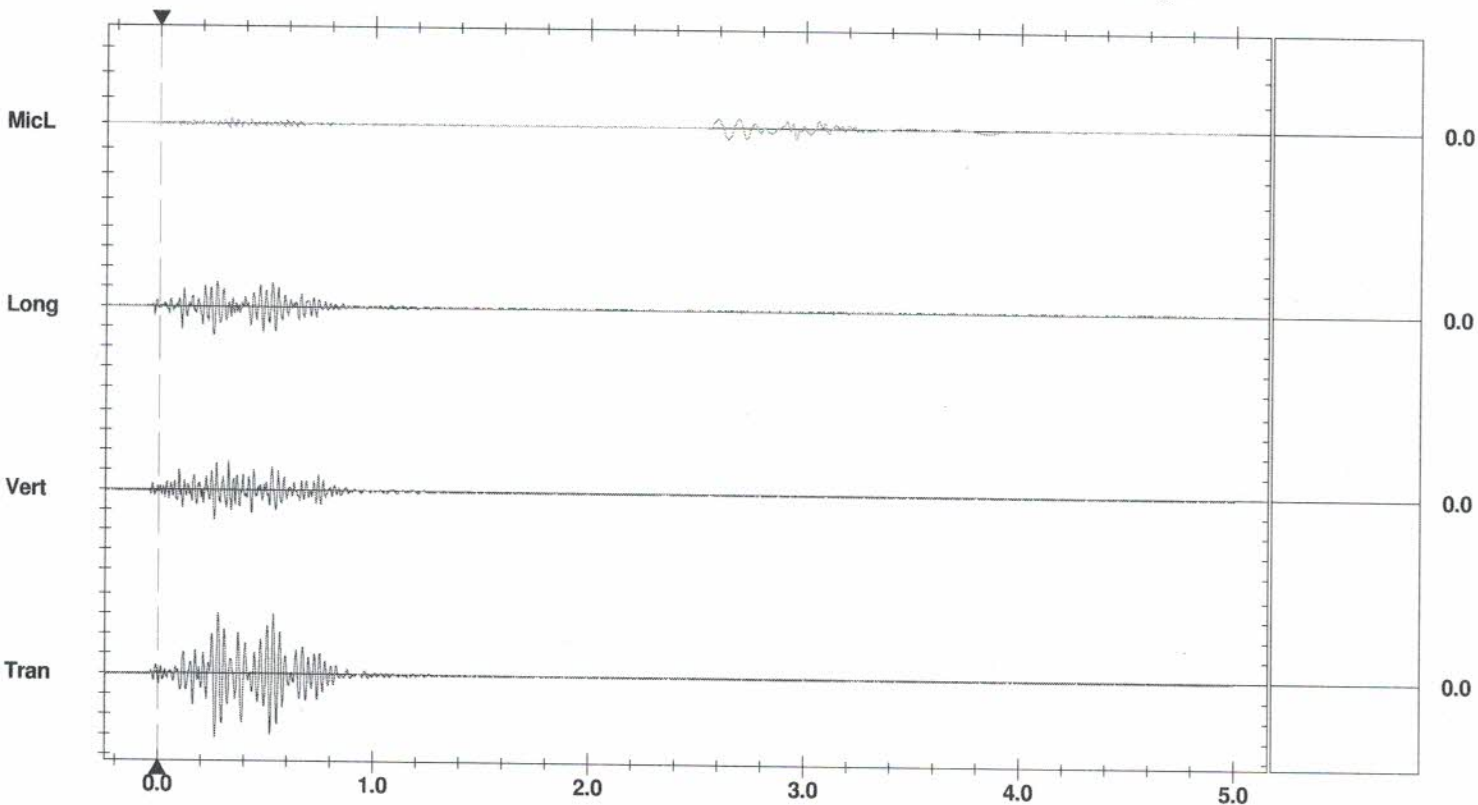
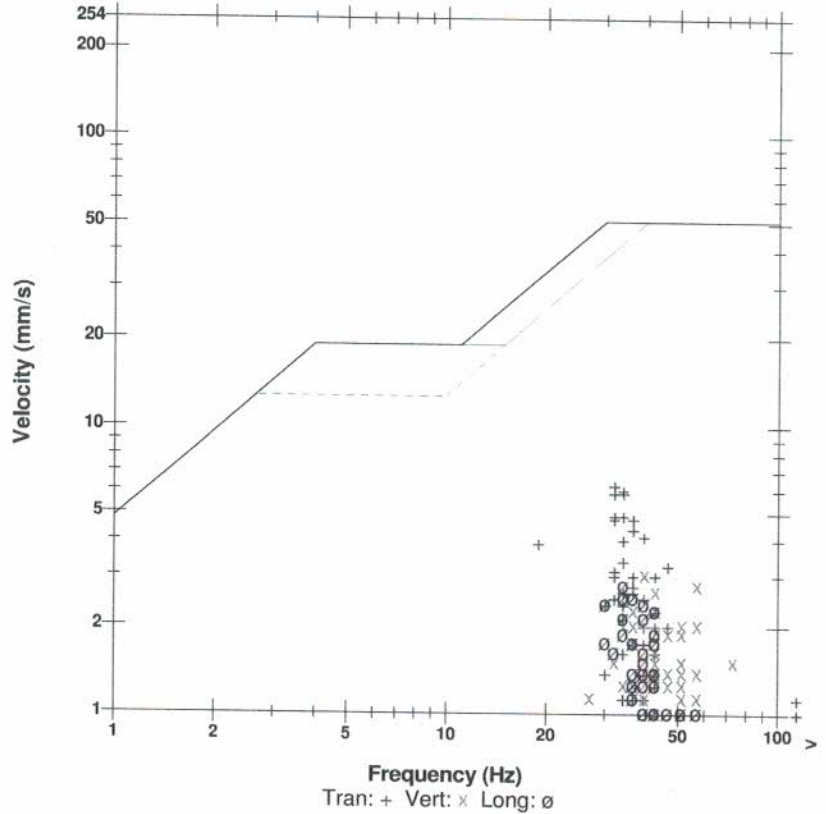
Combo Mode July 10, 2017 09:16:24
 40 Townline Road S

Microphone Linear Weighting
PSPL 107.5 dB(L) at 2.639 sec
ZC Freq 10 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	6.35	3.05	2.79	mm/s
ZC Freq	32	39	34	Hz
Time (Rel. to Trig)	0.266	0.259	0.251	sec
Peak Acceleration	0.146	0.0928	0.0795	g
Peak Displacement	0.0327	0.0123	0.0138	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 6.81 mm/s at 0.268 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 09:55:35 July 10, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GZ12.8N0

Notes

location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes

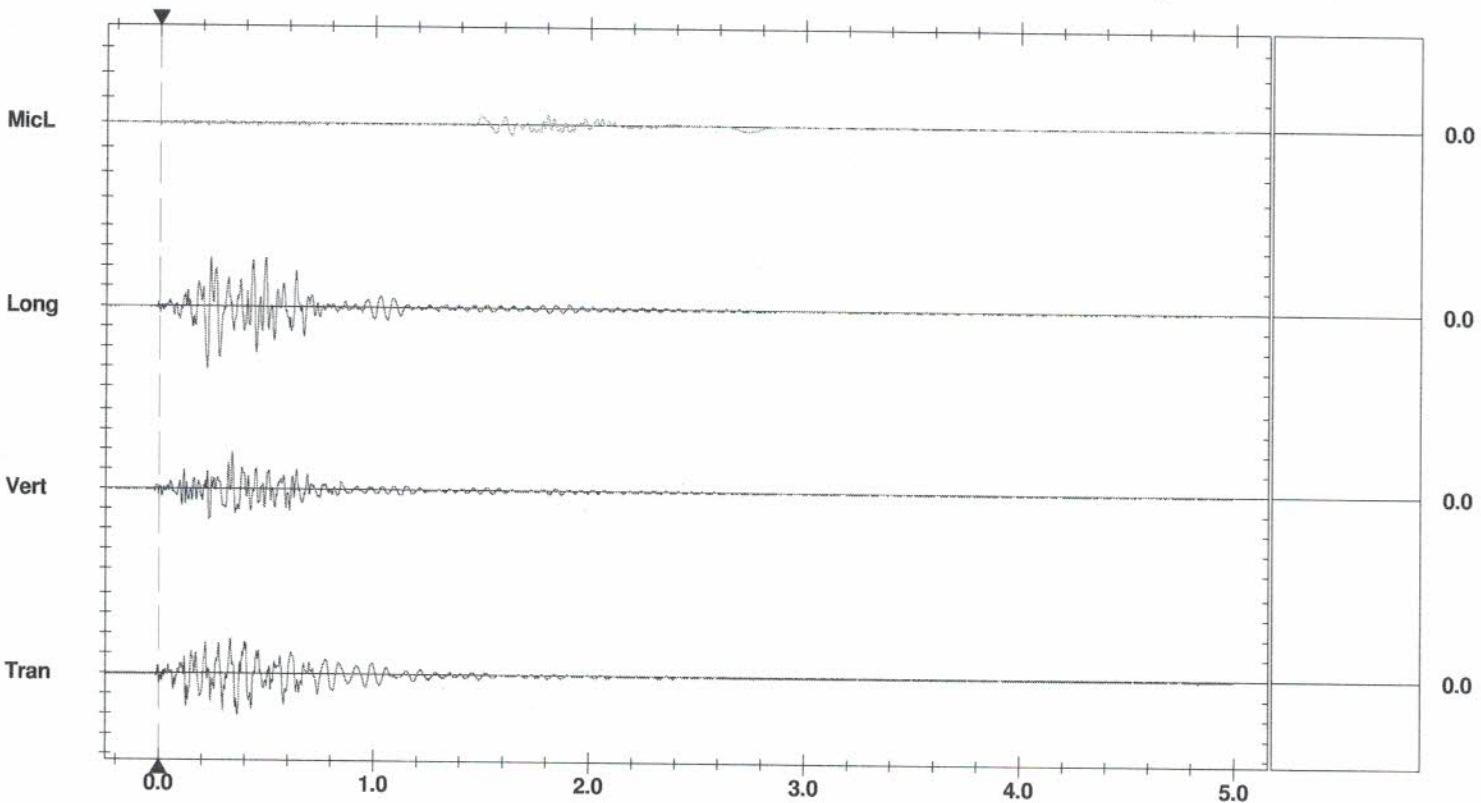
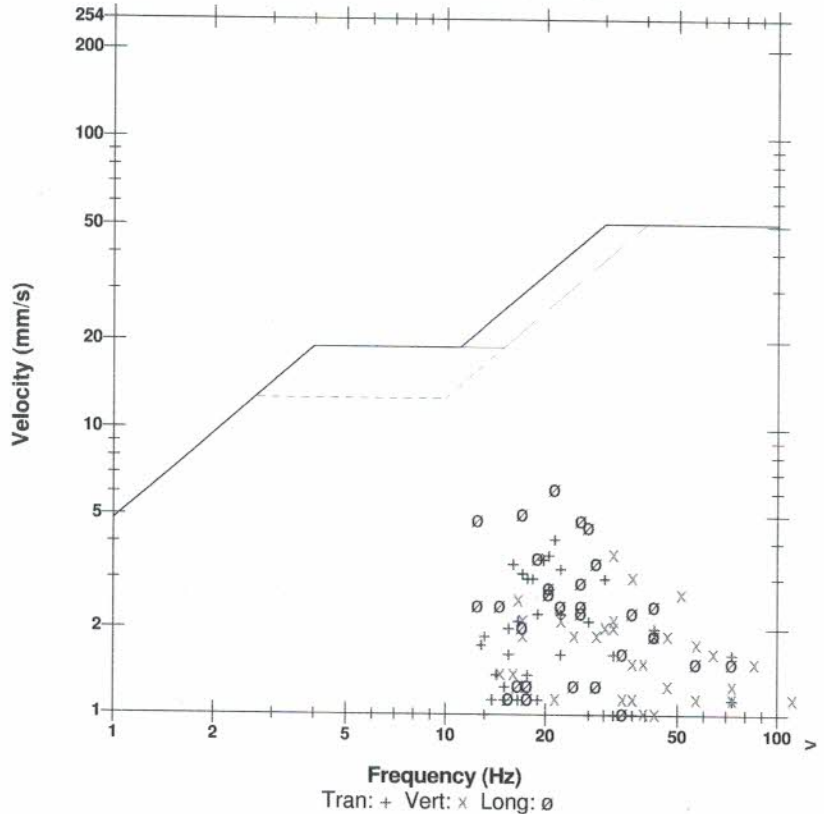
Combo Mode July 10, 2017 09:08:07
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 107.0 dB(L) at 1.633 sec
ZC Freq 16 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	4.19	3.68	6.22	mm/s
ZC Freq	21	32	21	Hz
Time (Rel. to Trig)	0.365	0.341	0.222	sec
Peak Acceleration	0.133	0.106	0.119	g
Peak Displacement	0.0331	0.0259	0.0496	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 6.28 mm/s at 0.222 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

BLAST LOG

DATE July 10/17 TIME 11:05am
 CONTRACT / JOB # band of crush stage
 LOCATION Port Colborne

BLASTER James Gahan
Please Print
 SIGNATURE [Signature]
 EXPLOSIVES: **23461**

DESIGN:

BLAST TYPE Production
 SIZE OF HOLES 4 inch
 NO. OF HOLES 32
 NO. OF DELAYS 32
 MAX. LOAD PER DELAY 58.9kg
 HOLES PER SERIES single
 POWDER FACTOR

TYPE/BLEND kgs/# units
 1) Emulsion 2000kg
 2) Banner booster 5.5kg/14 case
 3)

DETONATORS / INITIATORS:

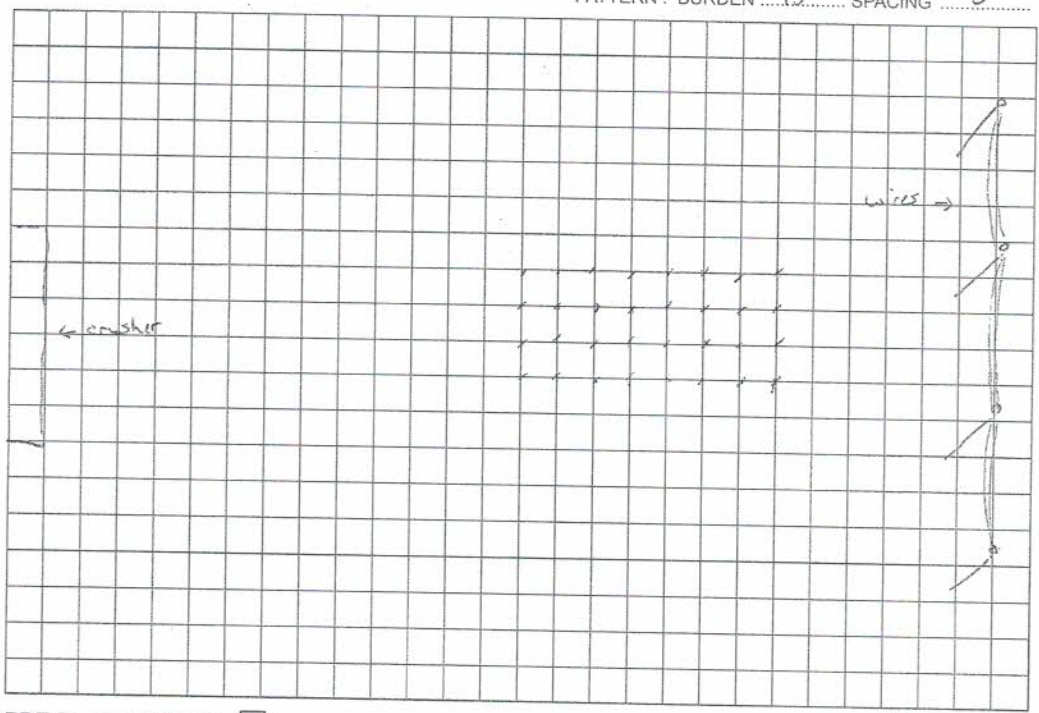
	TYPE	LENGTH	# UNITS
1)	<u>Nonel 25/300</u>	<u>50ft</u>	
2)	<u>Nonel 102mz</u>	<u>20ft</u>	<u>10</u>
3)	<u>Elec</u>	<u>12ft</u>	<u>1</u>

LOADING:

COLLAR 7ft according
 COLUMN LOAD emulsion
 TOE LOAD Banner booster
 SUBGRADE o.f.t.

DIMENSIONS:

WIDTH
 LENGTH
 AVE CUT 26 AVE. DRILL DEPTH 26
 PATTERN: BURDEN 13 SPACING 13



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

FLYROCK DAMAGE:

HAZARDS & DISTANCE: 50m crusher / 100m wires

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: gd UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: s/w

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: sun/cloud

CUT SHEET #'s

BULK USED? YES NO

BULK TRUCK NUMBER's 151

BULK TRUCK DRIVER Dave White

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project haul/crush stone
 Location Pact Colburn
 Blast Date July 10/17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) pro
 Name of Blaster James Graham
 Blast Report # 23461
 Previous Blast Report # Reviewed yes

Blast Area Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

300			meters
100			meters
Y	<input checked="" type="checkbox"/>		attach correspondence
Y	<input checked="" type="checkbox"/>		attach correspondence
Y	<input checked="" type="checkbox"/>		attach correspondence
			meters
Y	<input checked="" type="checkbox"/>		attach correspondence
600			meters
500			meters
			meters
Y	<input checked="" type="checkbox"/>		attach correspondence
Y	<input checked="" type="checkbox"/>		attach correspondence
Y	<input checked="" type="checkbox"/>		attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast.....
 Number of guards
 Quantity (# of) blasting mats.....
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

	AM	PM	time
4			ea
0			ea
<input checked="" type="checkbox"/>		N	
<input checked="" type="checkbox"/>		N	

Post Blast Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading).....
 Airblast (reading).....
 Fragmentation.....
 Movement

		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action Notify Site Supervisor / Job Foreman

Y	N
---	---

 Notify Head Office to investigate inquiries

Y	N
---	---

Changes What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE Monday 10 July 2017 TIME 12:30
 CONTRACT / JOB # 518064C
 LOCATION Port Colborne Low Crushed stone

BLASTER Kevin M. Phee
Please Print
 SIGNATURE [Signature]

EXPLOSIVES: **No 022341**

DESIGN:

BLAST TYPE Quarry open
 SIZE OF HOLES 4 1/2"
 NO. OF HOLES 32
 NO. OF DELAYS 32
 MAX. LOAD PER DELAY 60.8 Kg
 HOLES PER SERIES 1
 POWDER FACTOR

TYPE/BLEND kgs/# units
 1) Emulsion 1945.6 Kg
 2) 8oz Booster 32
 3)

DETONATORS / INITIATORS:

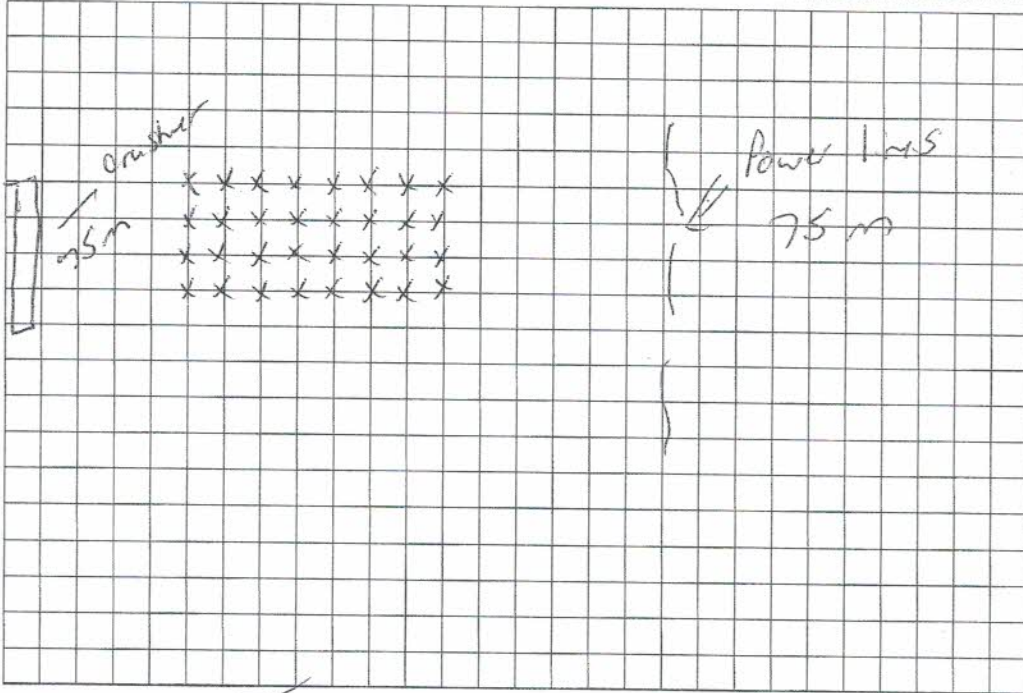
TYPE LENGTH # UNITS
 1) Nitro Energy 15m 32
 2) Jumper 6m 9
 3) Elec Det 3m 1

LOADING:

COLLAR 2.132 m and adjusted accordingly
 COLUMN LOAD Emulsion
 TOE LOAD 8oz Booster
 SUBGRADE N/A

DIMENSIONS:

WIDTH 15.84
 LENGTH 31.68
 AVE CUT 7.92 AVE. DRILL DEPTH 7.92
 PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est tons
10,333
PO # LCS-3320
 HAZARDS & DISTANCE: See Diagram
 IS THERE A GUARDING PLAN & PROCEDURE? YES NO
 ARE GUARDS IN PLACE? YES NO
 WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO
 CUT SHEET #s: 009411

FLYROCK DAMAGE:
 MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR
 SEISMIC DATA: UNIT #'s
 WIND DIRECTION VELOCITY:
 ATMOSPHERIC CONDITIONS:
 BULK USED? YES NO
 BULK TRUCK NUMBER's
 BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: July 10 2017

JOB # 518064C

No 008411

JOB LOCATION: Port Colborne Low Crushed Stone

DRILLER: Kevin M. Phel

PATTERN: 13x13

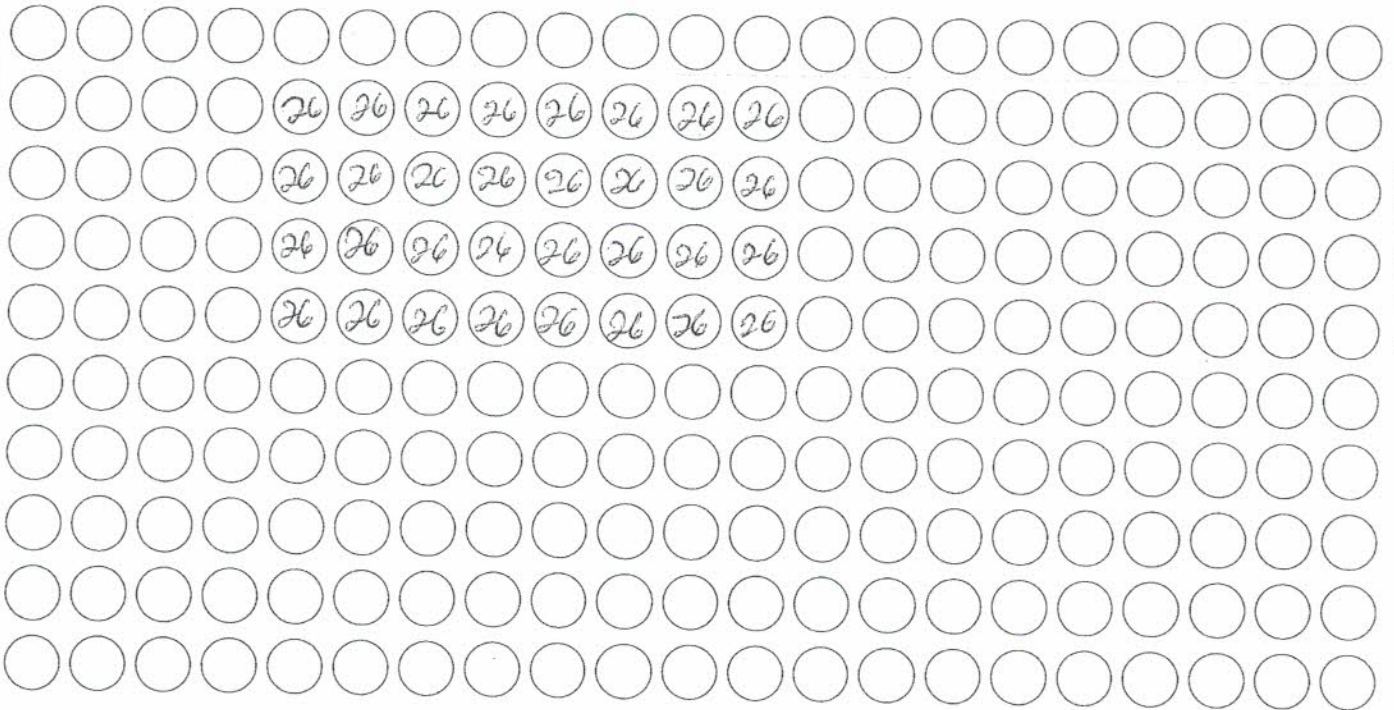
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 832

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #



CUT SHEET # _____

Date/Time Vert at 11:07:42 July 10, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZ15.KU0

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

Extended Notes

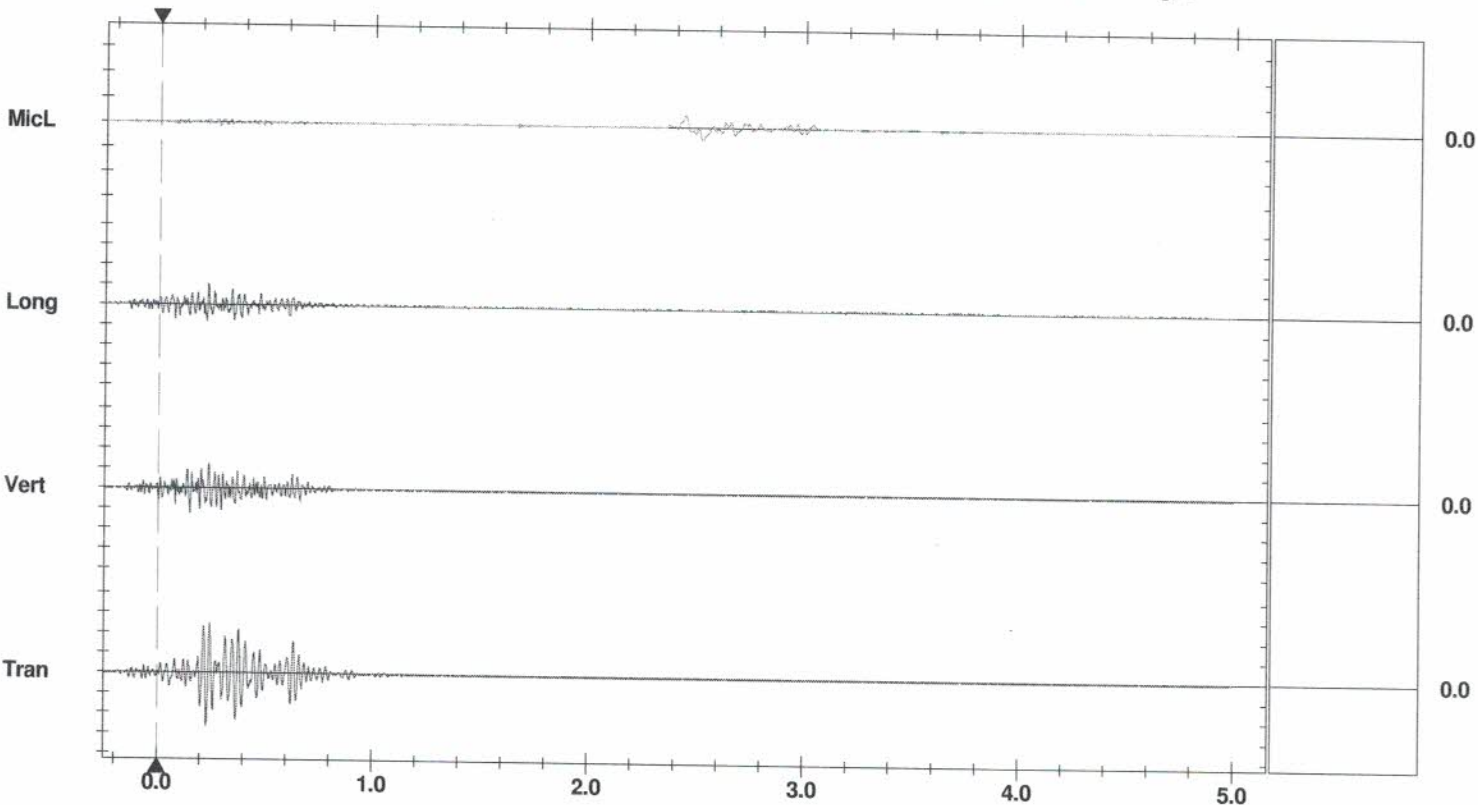
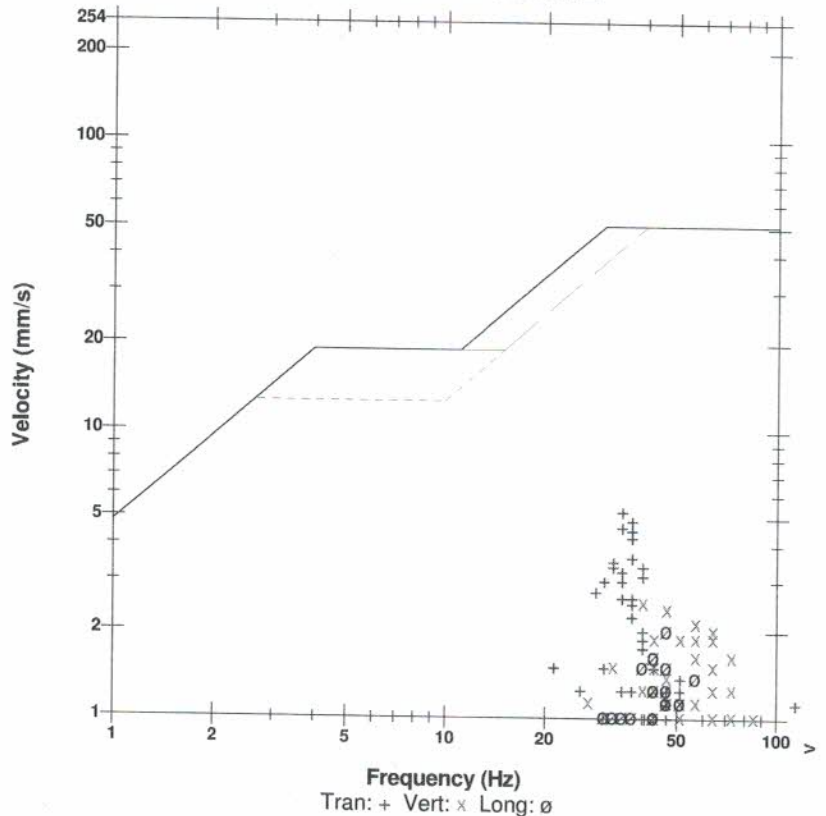
Combo Mode July 10, 2017 09:16:24
 40 Townline Road S

Microphone Linear Weighting
PSPL 108.0 dB(L) at 2.438 sec
ZC Freq 11 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.33	2.54	2.03	mm/s
ZC Freq	34	39	47	Hz
Time (Rel. to Trig)	0.229	0.148	0.229	sec
Peak Acceleration	0.133	0.0928	0.0928	g
Peak Displacement	0.0257	0.00868	0.00775	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.76 mm/s at 0.229 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 11:07:41 July 10, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GZ15.KT0

Notes
 location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

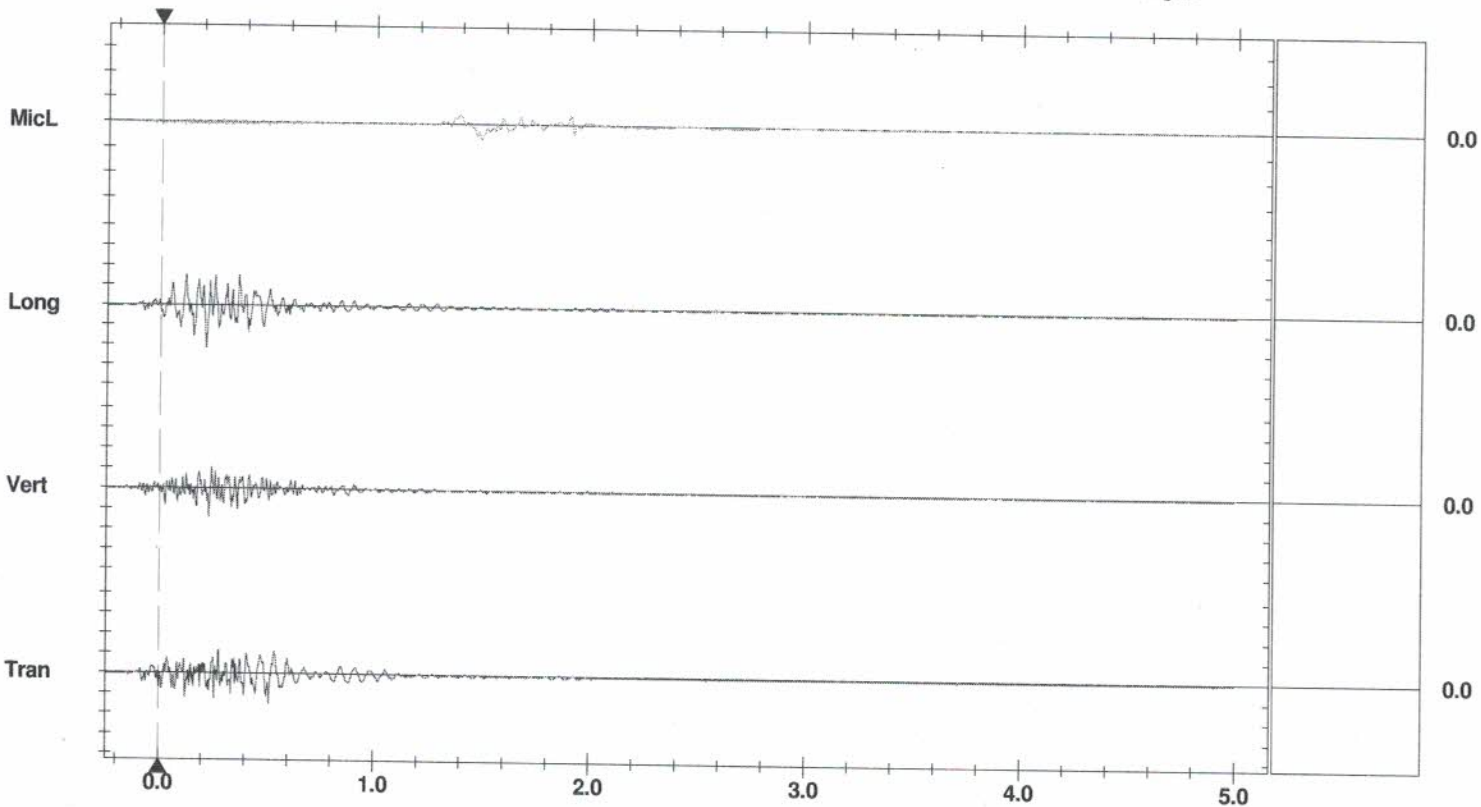
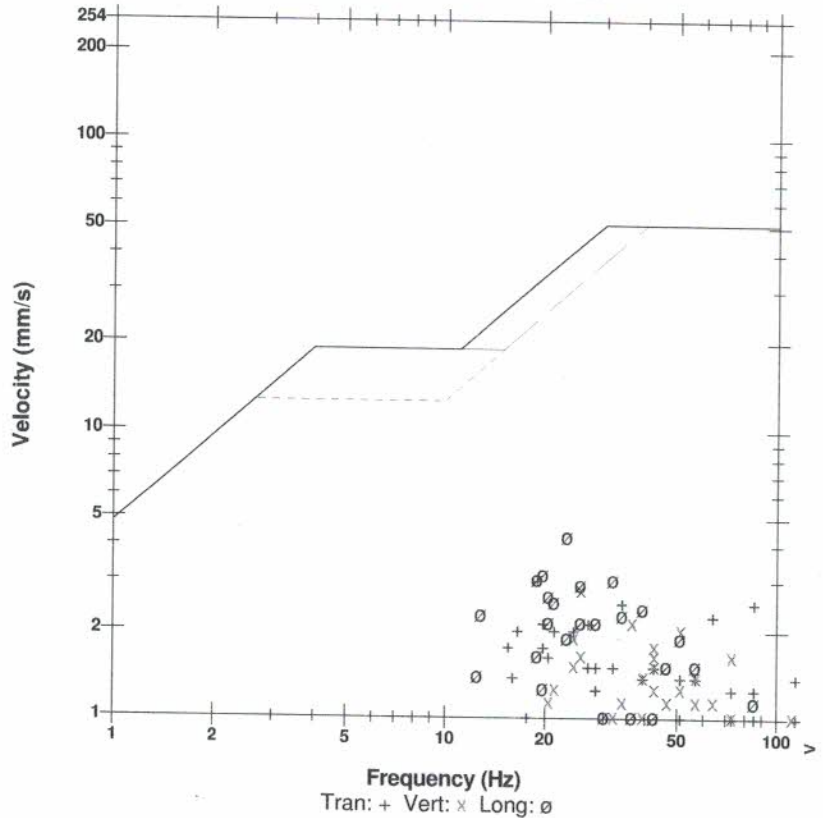
Extended Notes
 Combo Mode July 10, 2017 10:01:01
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 109.2 dB(L) at 1.484 sec
ZC Freq 4.3 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.05	2.79	4.32	mm/s
ZC Freq	19	26	23	Hz
Time (Rel. to Trig)	0.514	0.229	0.213	sec
Peak Acceleration	0.146	0.0795	0.0928	g
Peak Displacement	0.0205	0.0130	0.0236	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.40 mm/s at 0.214 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

MINING + CONSTRUCTION

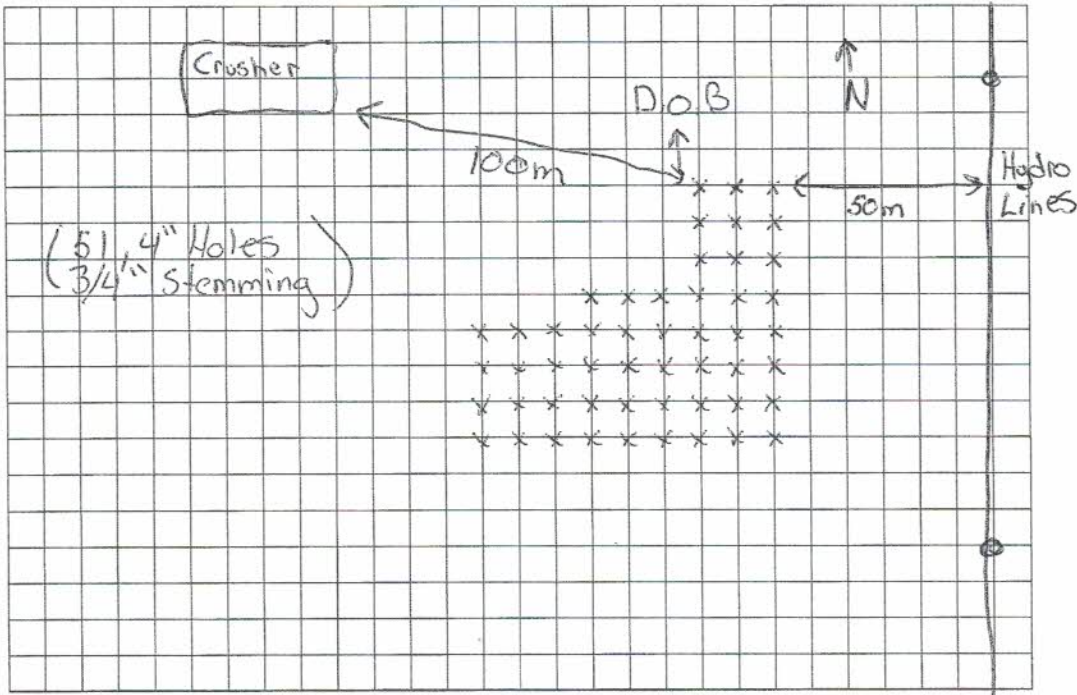
DATE July 18 2017 TIME 10:00am
 CONTRACT / JOB # J18064C
 LOCATION Law. Crushed Stone
DESIGN: Port Colbourne, ON
 BLAST TYPE Quarry open
 SIZE OF HOLES 4"
 NO. OF HOLES 51
 NO. OF DELAYS 51
 MAX. LOAD PER DELAY 60.8 Kgs
 HOLES PER SERIES 1
 POWDER FACTOR 0.53 kgs/m³
LOADING:
 COLLAR 2m Accessingly
 COLUMN LOAD Emulsion
 TOE LOAD Brown Cap 8oz Boosters
 SUBGRADE 0

BLASTER Zack Pallock
Please Print
 SIGNATURE Zack Pallock
EXPLOSIVES: Nº 022285

TYPE/BLEND kgs / # units
 1) Emulsion 3470 kgs
 2) Brown Cap 8oz Boosters 51 units
 3)

DETONATORS / INITIATORS:
 TYPE LENGTH # UNITS
 1) Nitroerg 25/80ms 15m 51
 2) Nonel Eztl 42ms 6m 10
 3) Nonel Eztl 109ms 6m 16
DIMENSIONS: Electric 3m 1

WIDTH 31.69m @ widest point
 LENGTH 35.69m @ longest point
 AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
 PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good

FLYROCK DAMAGE: none

HAZARDS & DISTANCE: Hydro lines @ 50m

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: 12 km/h SW

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny, Clear

CUT SHEET #'s: 008412

BULK USED? YES NO

BULK TRUCK NUMBER's: 131

BULK TRUCK DRIVER: Dave

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project Low Crushed Stone
 Location Pt. Colborne, ON
 Blast Date July 18 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production
 Name of Blaster Zack Pollock
 Blast Report # 022285
 Previous Blast Report # Reviewed 022284

Blast Area

Considerations

Designated Blast Area meters
 Hydro/Bell Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Request permission to re-route/shut down attach correspondence
 Request utility representative to attend blast attach correspondence
 Gas/Water Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Roads/Highways Distance to blast meters
 Construction Workers Distance to blast meters
 Property Owners Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Evacuation required in writing attach correspondence
 MTO evacuation approval received in writing

500		meters
50		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
1000		meters
Y	(N)	attach correspondence
70		meters
300		meters
400		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards ea
 Quantity (# of) blasting mats ea
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

yes	AM	time 9:50
5		ea
0		ea
(Y)	N	
(Y)	N	

Post Blast

Considerations

Output Flyrock (If yes, give distance) meters
 Vibration (reading) mm/s
 Airblast (reading) dB
 Fragmentation
 Movement
 (Good) (Bad)
 (Y) (N)

20		meters
		mm/s
		dB
(Good)	(Bad)	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN

REPORT

DATE TIME

CONTRACT / JOB # J18.06.4C

LOCATION Lane Const. Stone

DESIGN: Port Colbourne

BLAST TYPE Quarry open

SIZE OF HOLES 4"

NO. OF HOLES 51

NO. OF DELAYS 51

MAX. LOAD PER DELAY 60.8 Kg

HOLES PER SERIES 1

POWDER FACTOR

LOADING:

COLLAR 2.13m and adjusted accordingly

COLUMN LOAD Emulsion

TOE LOAD 8oz Booster

SUBGRADE

BLASTER Kevin M. Phee
Please Print

SIGNATURE [Signature]

EXPLOSIVES: No 022342

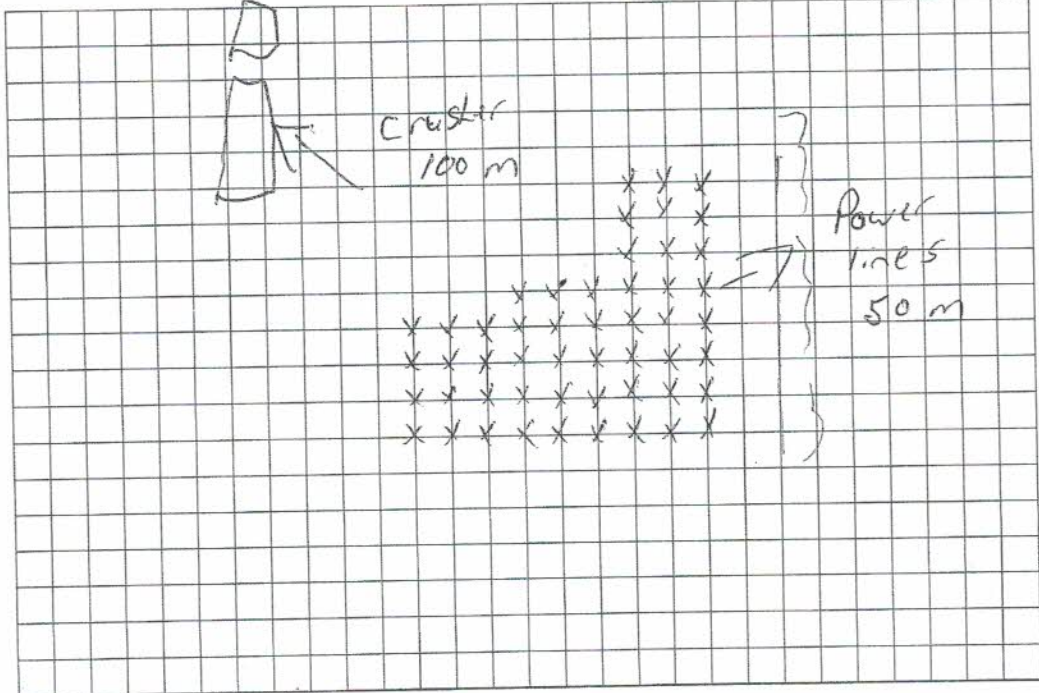
TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3100.8 Kg</u>
2) <u>8oz Booster</u>	<u>51 ea</u>
3) .....	.....

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitro Energy</u>	<u>15m</u>	<u>51</u>
2) <u>Jumper 109/42ms</u>	<u>6m</u>	<u>15</u>
3) <u>Electric Det</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH	<u>31.68m</u>
LENGTH	<u>35.64</u>
AVE CUT	<u>7.92</u>
AVE. DRILL DEPTH	<u>7.92</u>
PATTERN: BURDEN	<u>3.96</u>
SPACING	<u>3.96</u>



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton = 16,469

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See Diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008412

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: _____

JOB # J18064C Low Crushed Stone

No 008412

JOB LOCATION: Port Colbourne middle Bench

DRILLER: Kevin McPhee

PATTERN: 13x13

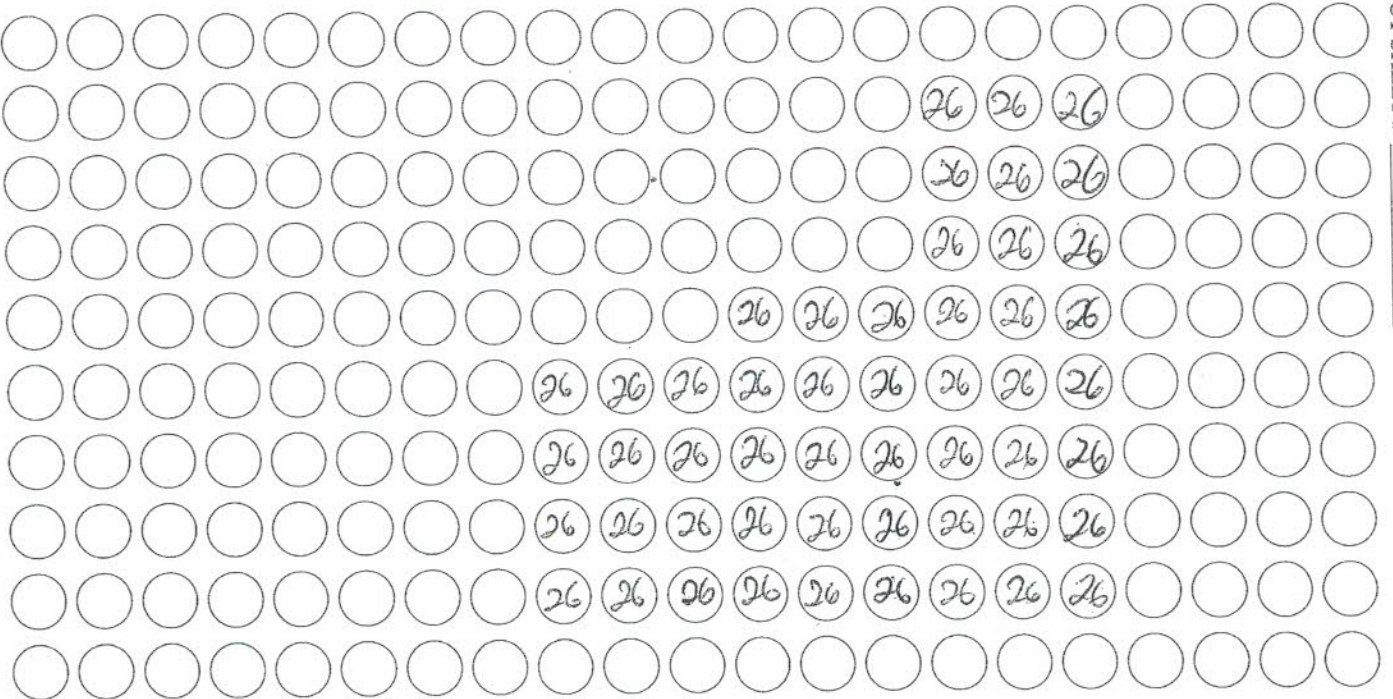
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 51 holes 1326'

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #



CUT SHEET # _____

Date/Time Long at 09:58:20 July 18, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.2 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZFV.P80

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

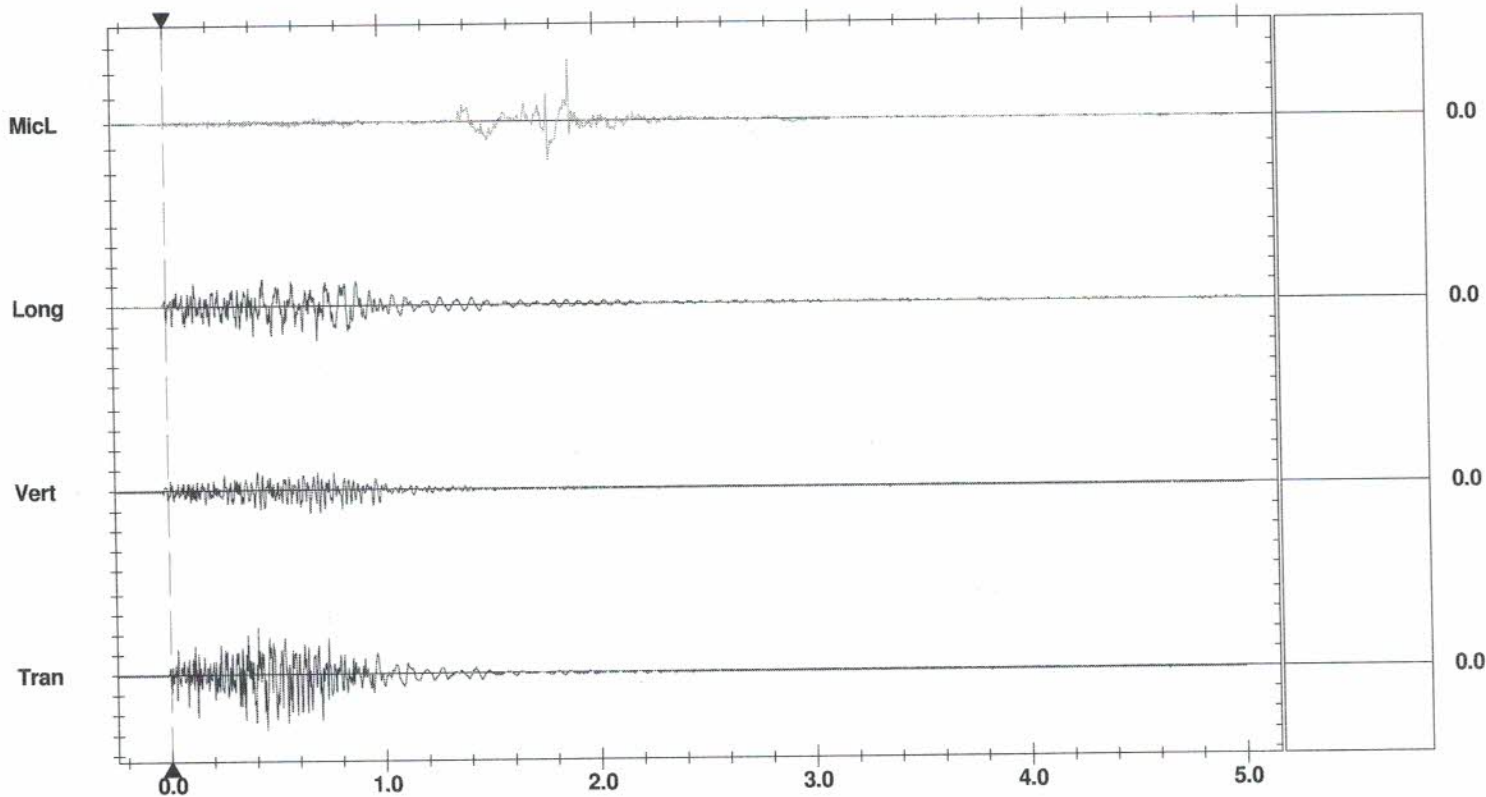
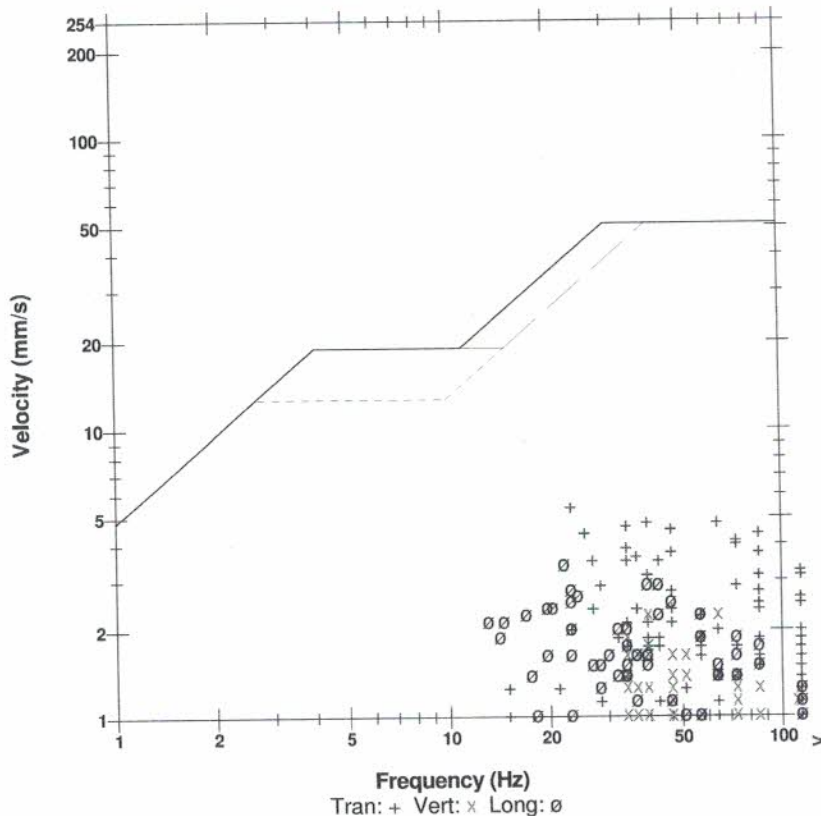
Extended Notes
 Combo Mode July 18, 2017 09:27:17
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 121.7 dB(L) at 1.883 sec
ZC Freq 10 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.46	2.29	3.43	mm/s
ZC Freq	23	39	22	Hz
Time (Rel. to Trig)	0.444	0.660	0.704	sec
Peak Acceleration	0.212	0.0928	0.133	g
Peak Displacement	0.0280	0.00806	0.0272	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.72 mm/s at 0.704 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

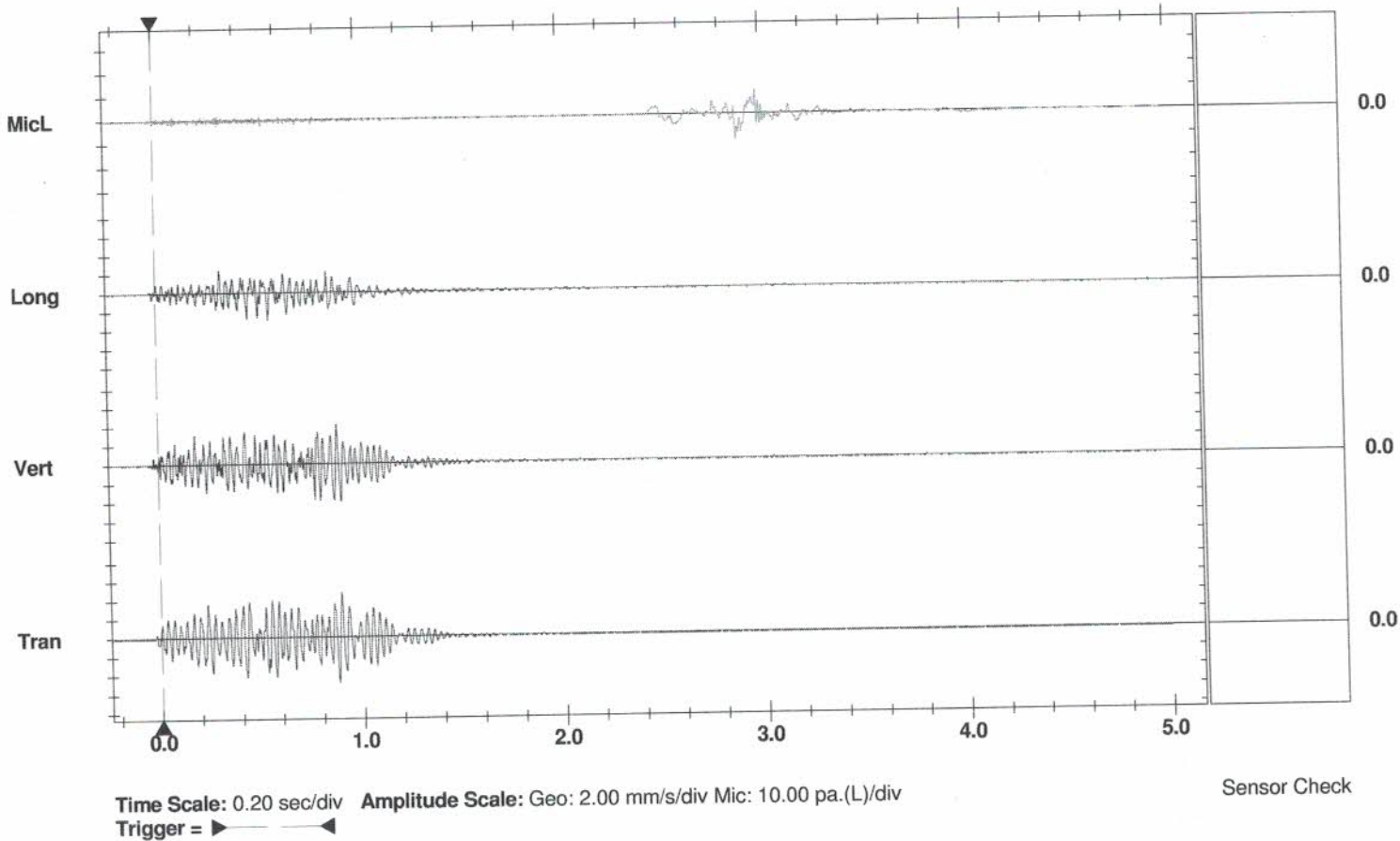
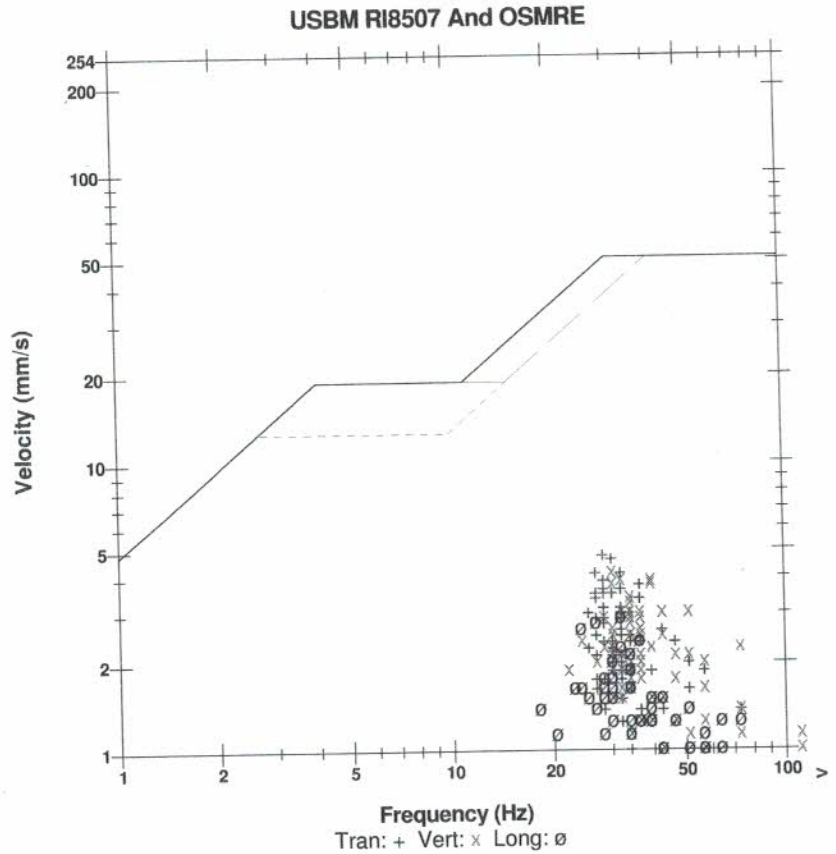
Date/Time Tran at 09:58:21 July 18, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps
Notes
 location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GZFV.P90

Extended Notes
 Combo Mode July 18, 2017 09:33:57
 40 Townline Road S

Microphone Linear Weighting
PSPL 114.6 dB(L) at 2.886 sec
ZC Freq 10 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	4.83	4.19	2.92	mm/s
ZC Freq	28	30	32	Hz
Time (Rel. to Trig)	0.876	0.883	0.556	sec
Peak Acceleration	0.119	0.133	0.0795	g
Peak Displacement	0.0257	0.0211	0.0130	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	
Peak Vector Sum	5.21 mm/s at 0.896 sec			



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

MINING + CONSTRUCTION

DATE July 18 2017 TIME 11:30am
 CONTRACT / JOB # J.19064C
 LOCATION Part Colbourne, Middle Bench

BLASTER Zack Pollock
Please Print
 SIGNATURE Zack Pollock

EXPLOSIVES: **№ 022286**

DESIGN:

BLAST TYPE Quarry (open)
 SIZE OF HOLES 4"
 NO. OF HOLES 43
 NO. OF DELAYS 43
 MAX. LOAD PER DELAY 60.8 kg max
 HOLES PER SERIES 1
 POWDER FACTOR 0.34 Kgs/m³

TYPE/BLEND kgs / # units
 1) Emulsion 19.70 Kgs
 2) Brown Cap 8oz Boosters 43 units
 3)

DETONATORS / INITIATORS:

	TYPE	LENGTH	# UNITS
1)	<u>Nitro 30ms</u>	<u>15m</u>	<u>43</u>
2)	<u>Nonel E2H 109ms</u>	<u>6m</u>	<u>10</u>
3)	<u>Electric 0ms</u>	<u>3m</u>	<u>1</u>

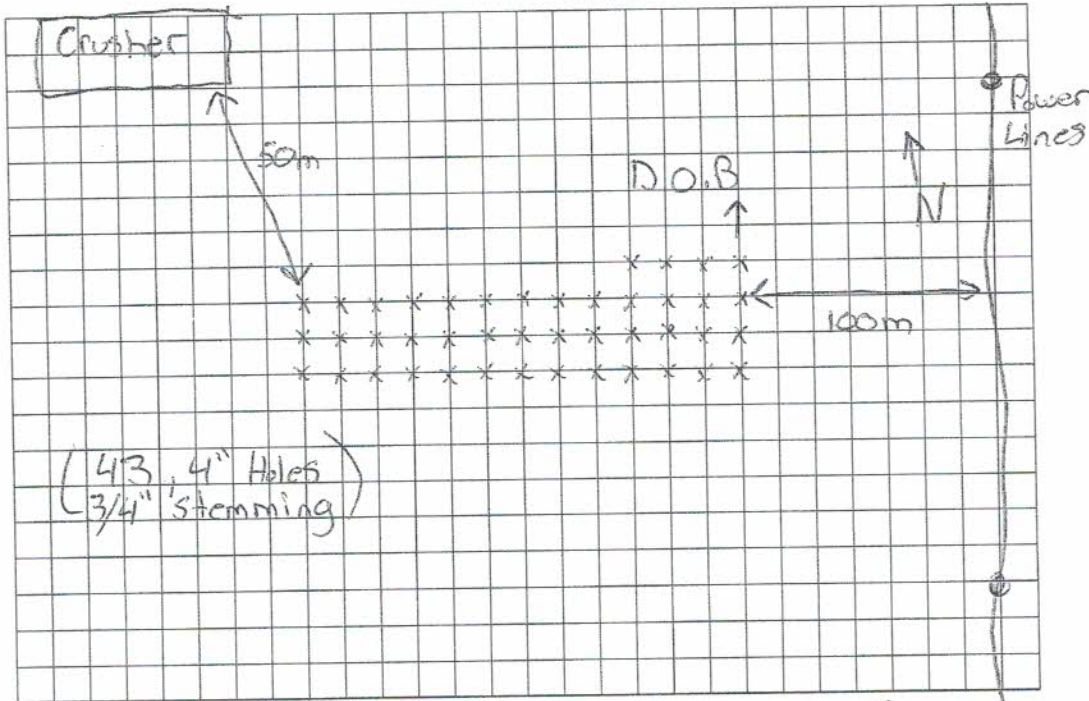
LOADING:

COLLAR 2 m Accordingly
 COLUMN LOAD Emulsion
 TOE LOAD Brown Cap 8oz Boosters
 SUBGRADE 0 m

DIMENSIONS:

WIDTH 47.52 m @ widest point
 LENGTH

AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
 PATTERN : BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good

FLYROCK DAMAGE: no

HAZARDS & DISTANCE :

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 12km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny / clear

CUT SHEET #'s 008413

BULK USED? YES NO

BULK TRUCK NUMBER's 131

BULK TRUCK DRIVER Dave

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project Low Coastal Stone
 Location Pt. Colborn, ON
 Blast Date July 18 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production
 Name of Blaster Zack Billock
 Blast Report # 022286
 Previous Blast Report # Reviewed 022285

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

500	500	meters
100	100	meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
1100	1100	meters
Y	(N)	attach correspondence
100	100	meters
300	300	meters
400	400	meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast.....
 Number of guards
 Quantity (# of) blasting mats.....
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

405	AM	time	1120
5		ea	
0		ea	
(Y)	(N)		
(Y)	(N)		

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading).....
 Airblast (reading).....
 Fragmentation.....
 Movement

10	10	meters
		mm/s
		dB
Good	Bad	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	(N)
Y	(N)

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN

REPORT

BLASTER Kevin M. Phee
Please Print

SIGNATURE [Signature]

DATE TIME

CONTRACT / JOB # 518.06.4E Low costed stone

LOCATION Port Colbourne middle Bench

EXPLOSIVES: **№ 022343**

DESIGN:

BLAST TYPE Quarry Open

SIZE OF HOLES 4"

NO. OF HOLES 43

NO. OF DELAYS 43

MAX. LOAD PER DELAY 60.8 Kg

HOLES PER SERIES

POWDER FACTOR

	TYPE/BLEND	kgs / # units
1)	<u>Emulsion</u>	<u>2614.4 Kgs</u>
2)	<u>8oz Booster</u>	<u>43 ea</u>
3)	.....	.....

DETONATORS / INITIATORS:

	TYPE	LENGTH	# UNITS
1)	<u>Nitro Energy</u>	<u>15 m</u>	<u>43</u>
2)	<u>Jumper 109/4ms</u>	<u>6 m</u>	<u>15</u>
3)	<u>Electric Det</u>	<u>3 m</u>	<u>1</u>

LOADING:

COLLAR 2.13 m and adjusted accordingly

COLUMN LOAD Emulsion

TOE LOAD 8oz Booster

SUBGRADE

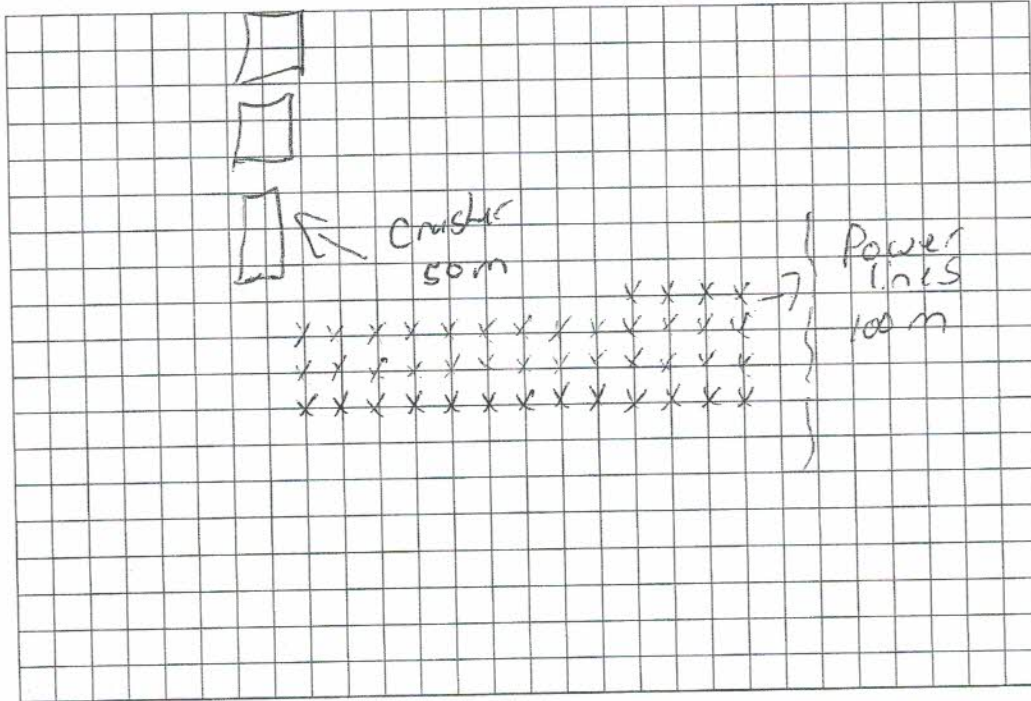
DIMENSIONS:

WIDTH

LENGTH

AVE CUT 7.92 AVE. DRILL DEPTH 7.92

PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton = 13885

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008413

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



CUT SHEET # _____

CUT SHEET



DATE: _____

JOB # J18 064C

No 008413

JOB LOCATION: Low crushed stone middle Bench

DRILLER: Kevin McPhee

PATTERN: 13x13

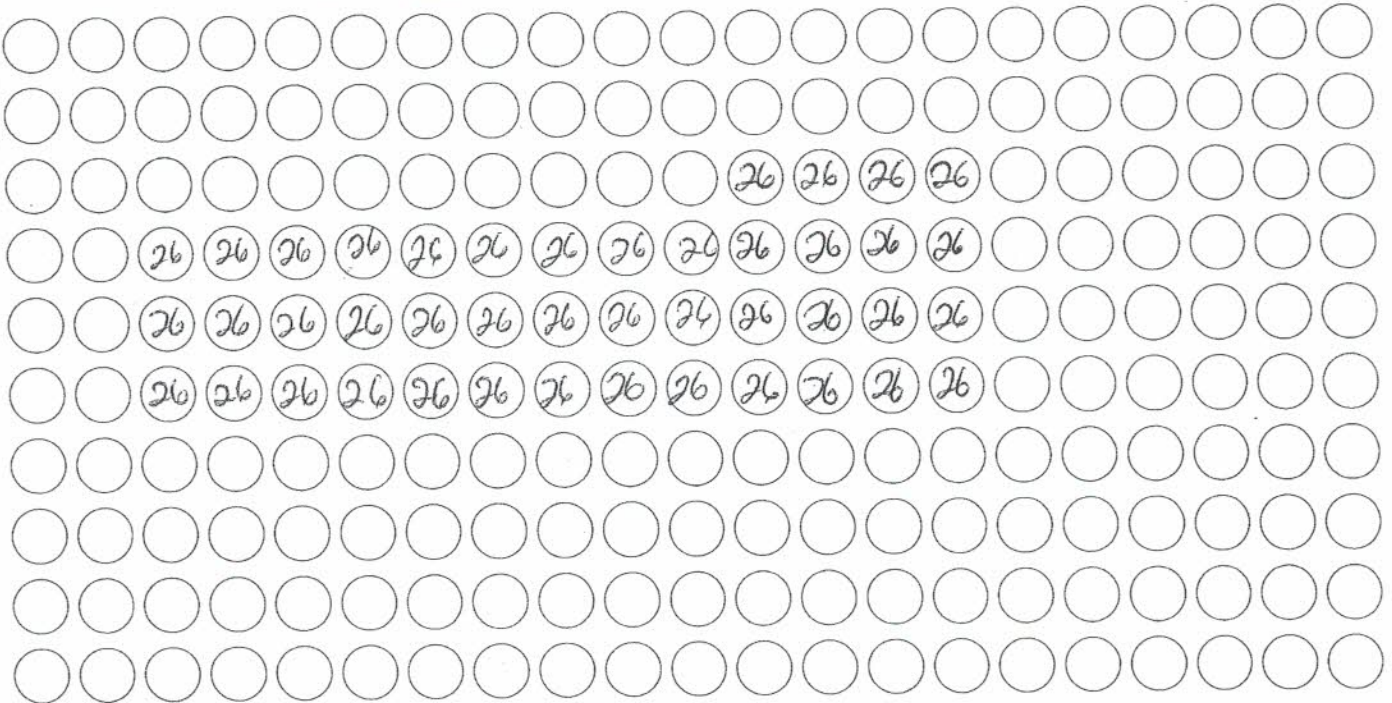
SUB-DRILL (ft.): ✓

TOTAL FOOTAGE (ft.): 43 holes = 1119'

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #



CUT SHEET # _____

Date/Time Tran at 11:29:26 July 18, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GZFZ.X20

Notes
 location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

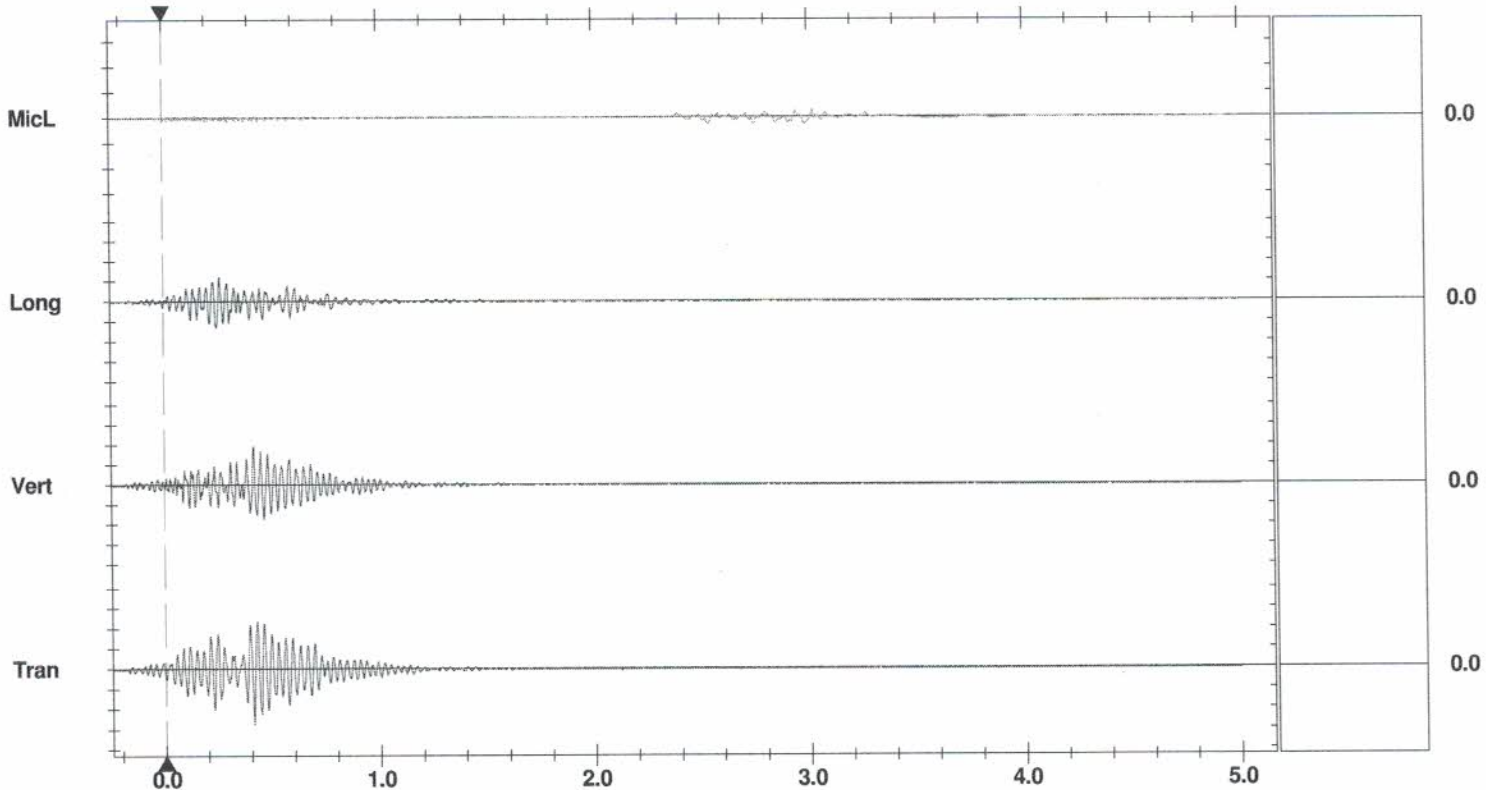
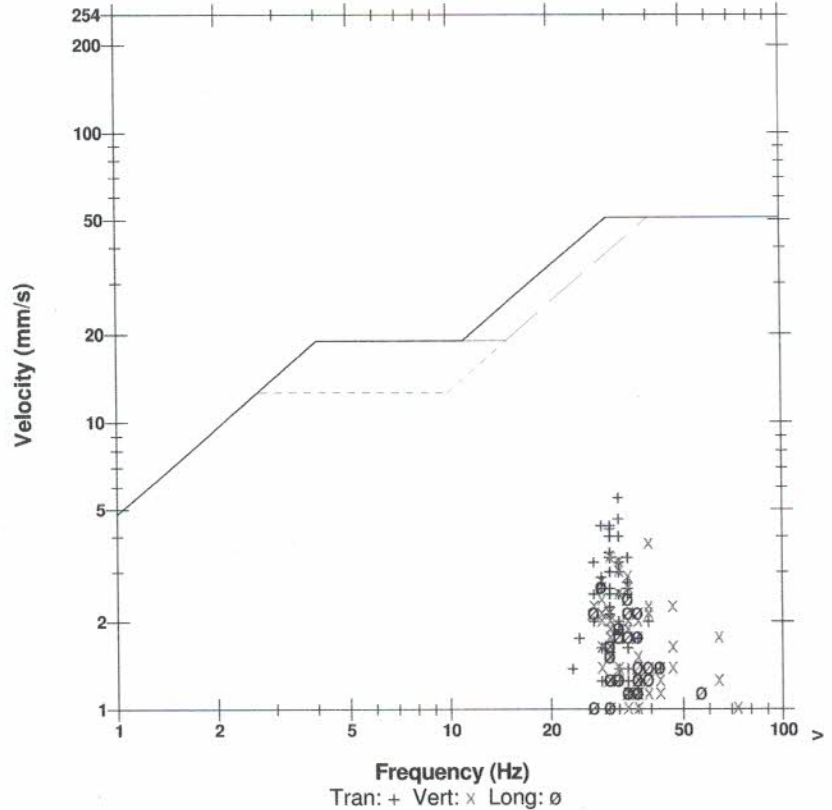
Extended Notes
 Combo Mode July 18, 2017 10:03:48
 40 Townline Road S

Microphone Linear Weighting
PSPL 103.5 dB(L) at 2.988 sec
ZC Freq 14 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.59	3.81	2.67	mm/s
ZC Freq	32	39	28	Hz
Time (Rel. to Trig)	0.410	0.416	0.247	sec
Peak Acceleration	0.119	0.0928	0.0795	g
Peak Displacement	0.0249	0.0168	0.0156	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.64 mm/s at 0.411 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 11:29:25 July 18, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.2 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZFZ.X10

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

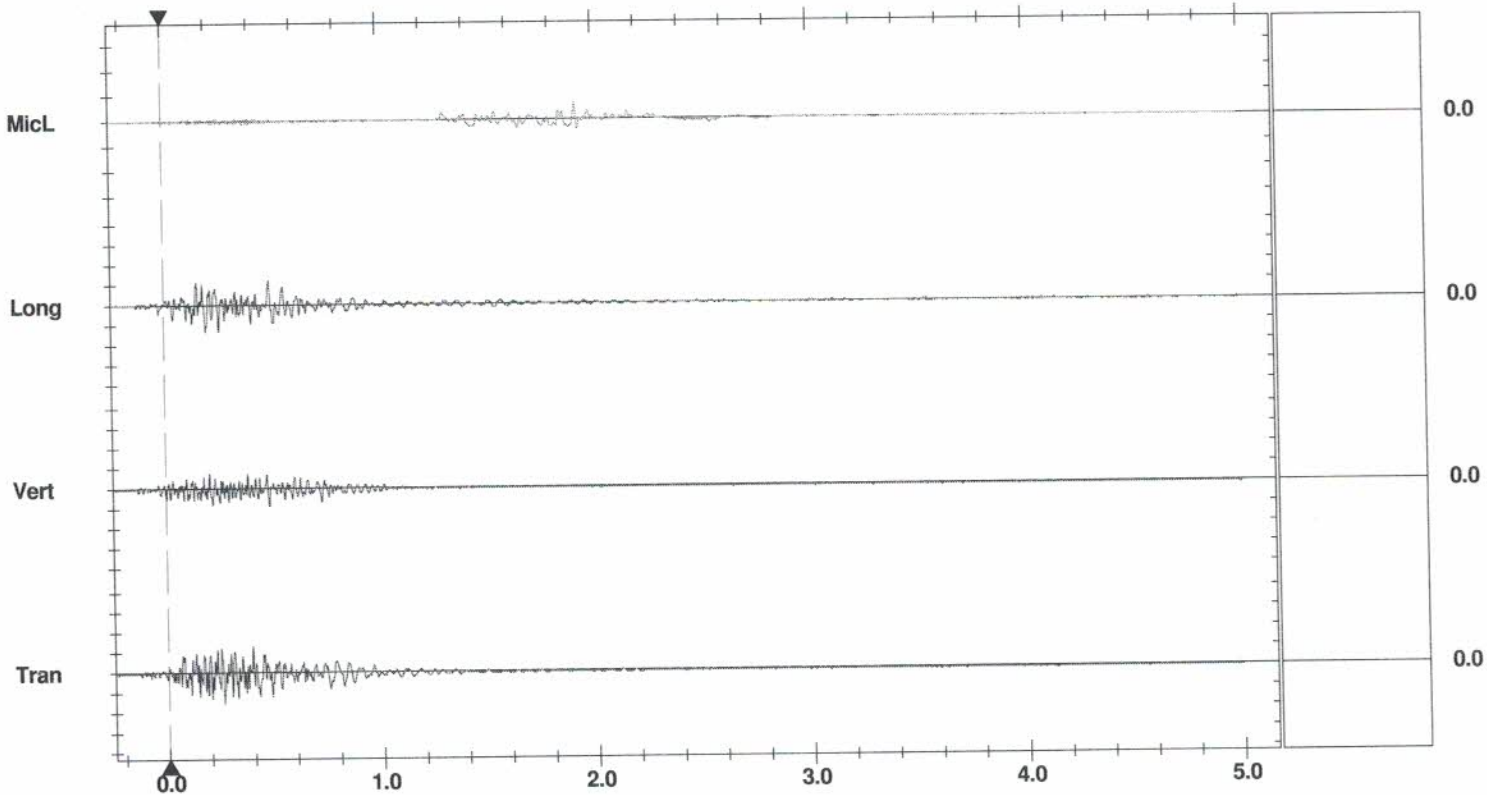
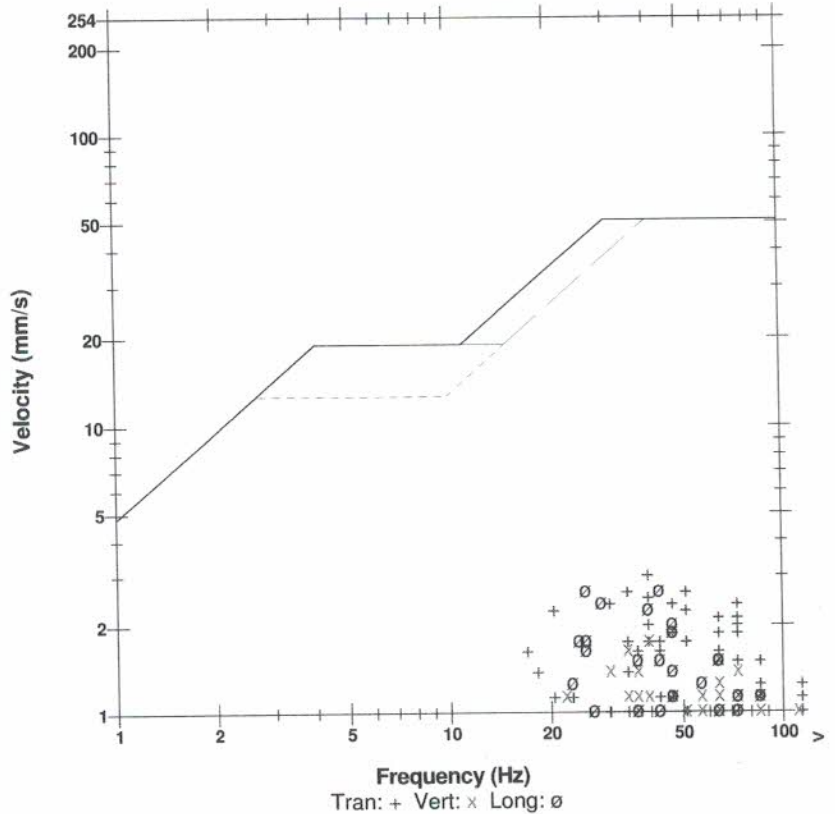
Extended Notes
 Combo Mode July 18, 2017 09:27:17
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 109.9 dB(L) at 1.925 sec
ZC Freq 28 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.05	1.78	2.67	mm/s
ZC Freq	39	39	26	Hz
Time (Rel. to Trig)	0.258	0.479	0.193	sec
Peak Acceleration	0.133	0.0663	0.0795	g
Peak Displacement	0.0148	0.00707	0.0162	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.70 mm/s at 0.258 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE July 26 2017 TIME 10:51am
CONTRACT / JOB # J18064C
LOCATION Port Colbourne

BLASTER Zack Pollock
Please Print
SIGNATURE [Signature]

EXPLOSIVES: **No 022289**

DESIGN:

BLAST TYPE Quarry Production (open)
SIZE OF HOLES 4"
NO. OF HOLES 44
NO. OF DELAYS 1
MAX. LOAD PER DELAY 56.81 kgs max
HOLES PER SERIES 11
POWDER FACTOR 0.45 kgs/m³

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2500 Kgs</u>
2) <u>AES 200gr Boosters</u>	<u>44</u>
3) .....	.....

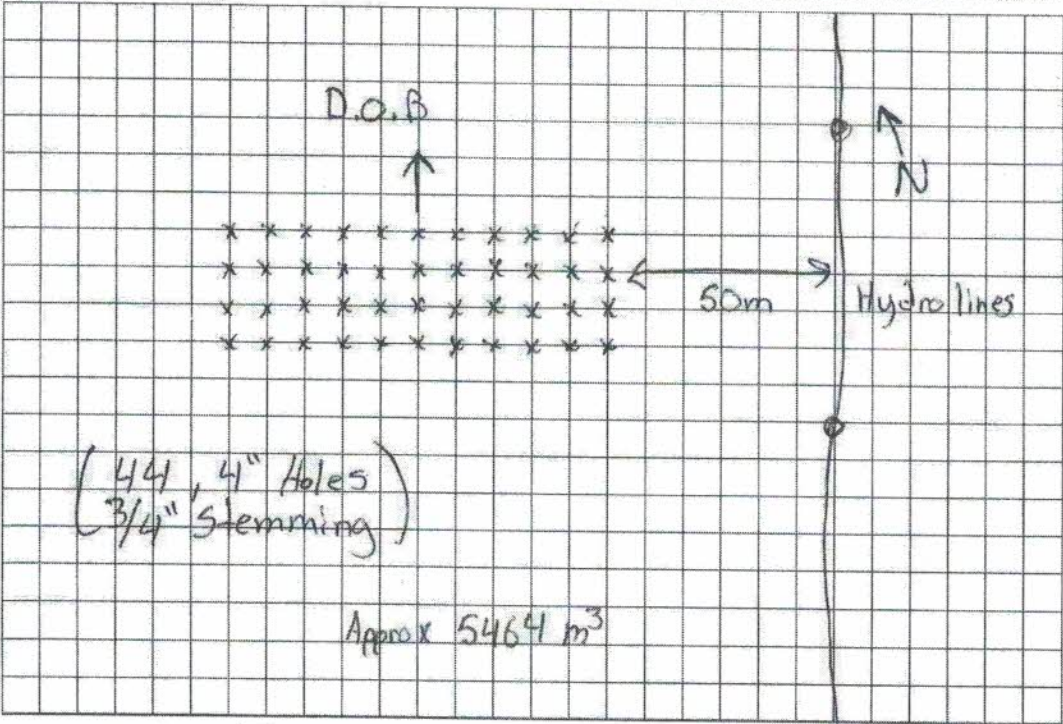
LOADING:

COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nonel Bat 250ms</u>	<u>15m</u>	<u>44</u>
2) <u>Nonel Bat 109ms</u>	<u>6m</u>	<u>6</u>
3) <u>Nonel Bat 42ms</u>	<u>6m</u>	<u>4</u>

DIMENSIONS: Electric 3m 1
WIDTH 15.84m @ widest point
LENGTH 43.56m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good

FLYROCK DAMAGE: none

HAZARDS & DISTANCE: Hydro lines @ 50m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: W @ 5km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny / clear

CUT SHEET #'s: 008414

BULK USED? YES NO

BULK TRUCK NUMBER'S: 134

BULK TRUCK DRIVER: Dave

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING + CONSTRUCTION

General

Project J18064C
 Location Port Colbourne
 Blast Date July 26 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022289
 Previous Blast Report # Reviewed 022288

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

500		meters
50		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
1 Km		meters
Y	(N)	attach correspondence
500		meters
500		meters
1 Km		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

yes	AM	PM	time	1040
3			ea	
0			ea	
(Y)	(N)			
(Y)	(N)			

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

10		meters
		mm/s
		dB
Good	Bad	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	(N)
Y	(N)

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE TIME

CONTRACT / JOB # 518.06.4C

LOCATION Port Colbourne middle Beach

BLASTER Kevin Mpho
Please Print

SIGNATURE [Signature]

EXPLOSIVES: **No 022345**

DESIGN:

BLAST TYPE Quarry Open

SIZE OF HOLES 44

NO. OF HOLES 44

NO. OF DELAYS 44

MAX. LOAD PER DELAY 60.8 Kgs

HOLES PER SERIES

POWDER FACTOR

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>26.75 Kgs</u>
2) <u>802 Booster</u>	<u>44</u>
3) .....	.....

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Miko Energy</u>	<u>15m</u>	<u>44</u>
2) <u>Jumper S 109/42ms</u>	<u>6m</u>	<u>19</u>
3) <u>Elec Det</u>	<u>3m</u>	<u>1</u>

LOADING:

COLLAR 2/3 m and adjusted accordingly

COLUMN LOAD Emulsion

TOE LOAD 802 Booster

SUBGRADE

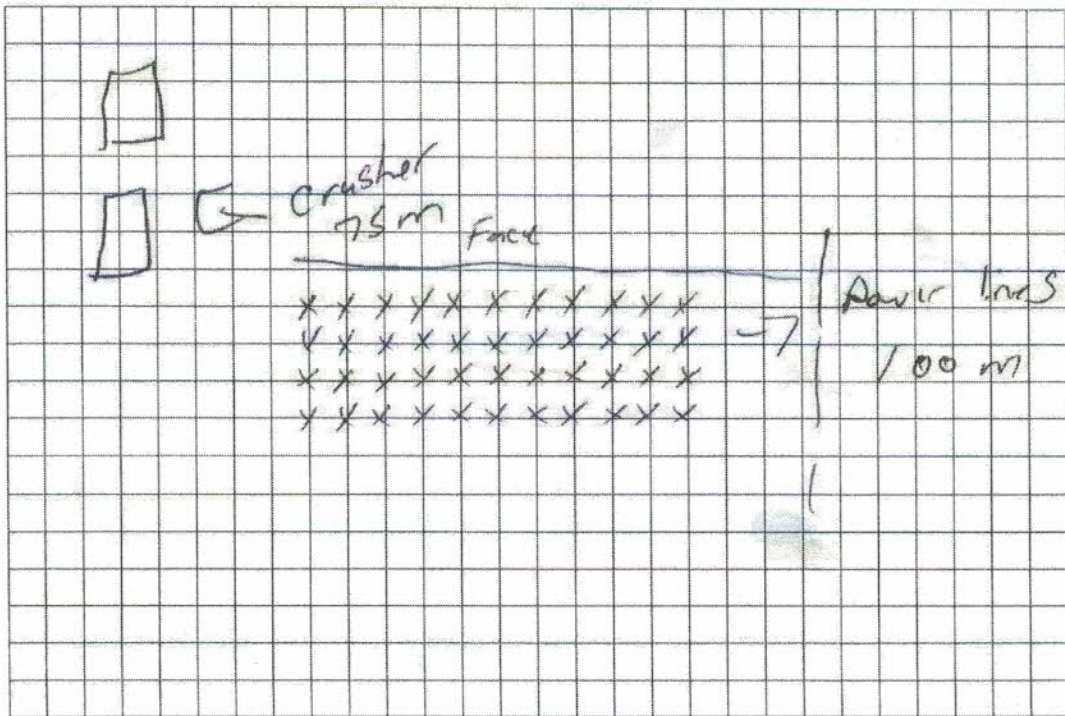
DIMENSIONS:

WIDTH

LENGTH

AVE CUT 7.92 AVE. DRILL DEPTH 7.92

PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton 1420

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s.....

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008.414

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: _____

JOB # 519 064C

No 008414

JOB LOCATION: Port Colbourne

DRILLER: Kevin M Phee

PATTERN: 13x13

SUB-DRILL (ft.): ✓

TOTAL FOOTAGE (ft.): 1144

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #

			26	26	26	26	26	26	26	26	26								
			26	26	26	26	26	26	26	26	26								
			26	26	26	26	26	26	26	26	26								
			26	26	26	26	26	26	26	26	26								

CUT SHEET # _____

Date/Time Long at 10:50:22 July 26, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZUR.FY0

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

Extended Notes

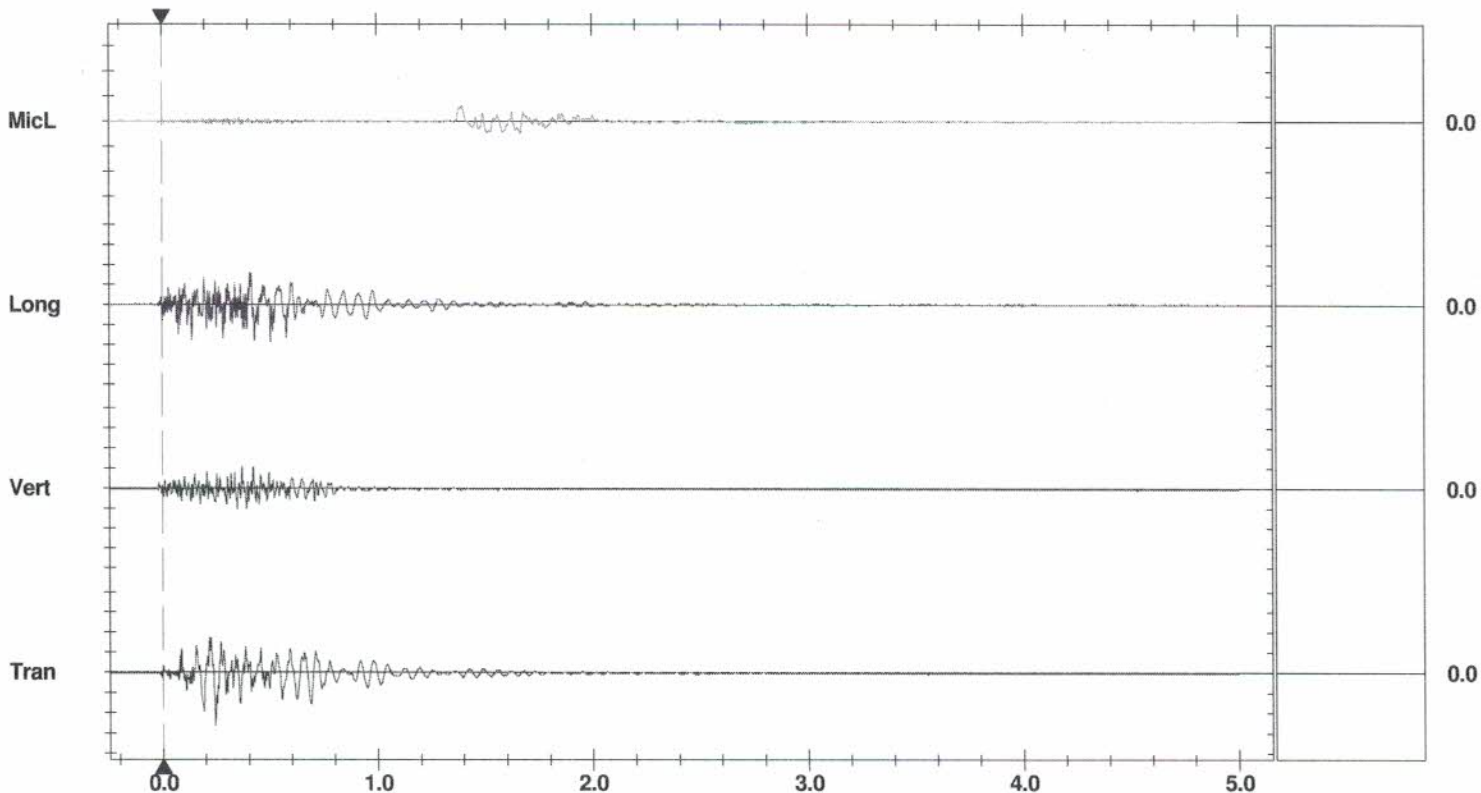
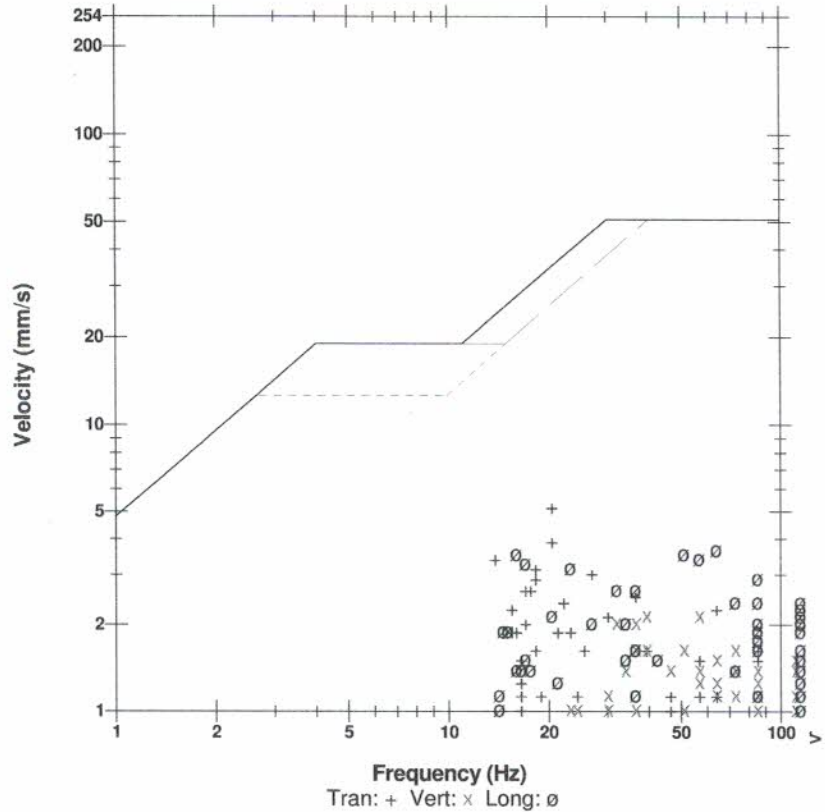
Combo Mode July 26, 2017 10:07:07
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 109.2 dB(L) at 1.394 sec
ZC Freq 11 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.21	2.16	3.68	mm/s
ZC Freq	20	39	64	Hz
Time (Rel. to Trig)	0.244	0.370	0.505	sec
Peak Acceleration	0.106	0.0928	0.159	g
Peak Displacement	0.0311	0.00707	0.0217	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 5.36 mm/s at 0.244 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:51:01 July 26, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.2 Volts
Unit Calibration July 13, 2017 by Instantel
File Name N758GZUR.H10

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes

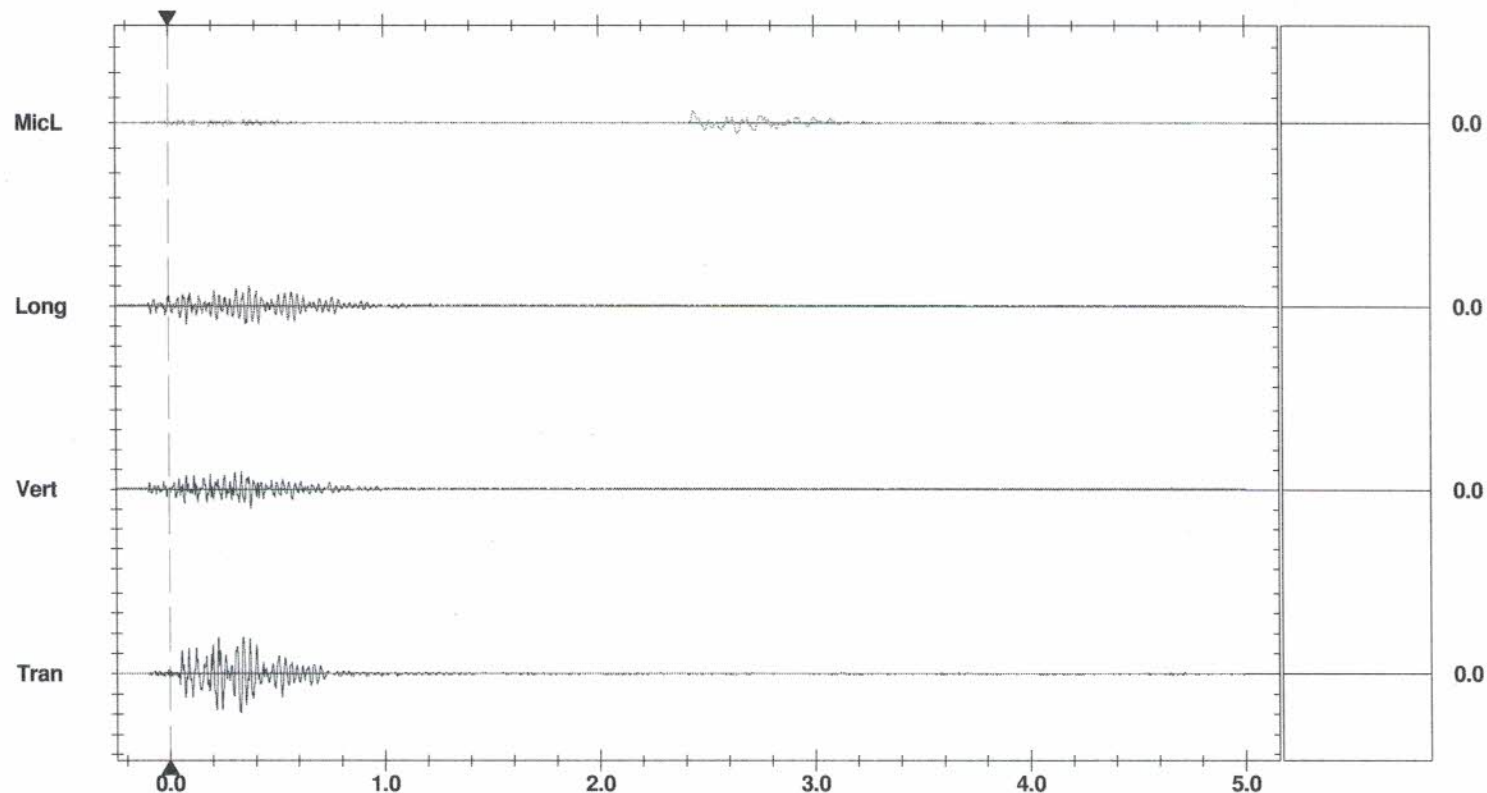
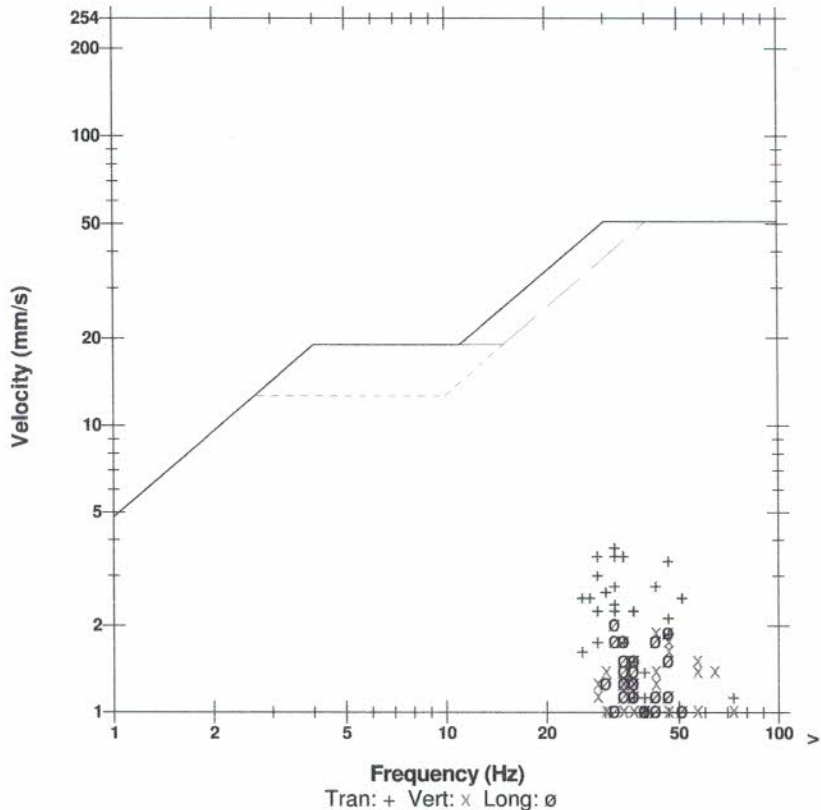
Combo Mode July 26, 2017 10:13:25
 40 Townlines Road S

Microphone Linear Weighting
PSPL 108.0 dB(L) at 2.438 sec
ZC Freq 9.5 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.81	1.90	2.03	mm/s
ZC Freq	32	43	32	Hz
Time (Rel. to Trig)	0.326	0.379	0.374	sec
Peak Acceleration	0.133	0.0663	0.0663	g
Peak Displacement	0.0202	0.00744	0.00955	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.09 mm/s at 0.326 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE July 26 2017 TIME 12:00 p.m.
CONTRACT / JOB # J18064C
LOCATION Port Colbourne

BLASTER Zack Collock
Please Print
SIGNATURE [Signature]

EXPLOSIVES: **No 022290**

DESIGN:

BLAST TYPE Quarry Production (open)
SIZE OF HOLES 4"
NO. OF HOLES 44
NO. OF DELAYS 1
MAX. LOAD PER DELAY 59 Kgs max
HOLES PER SERIES 11
POWDER FACTOR 0.47 Kgs/m³

TYPE/BLEND	kgs / # units
1) Emulsion	2600 Kgs
2) AES 200 gr Boosters	44 units
3)	

LOADING:

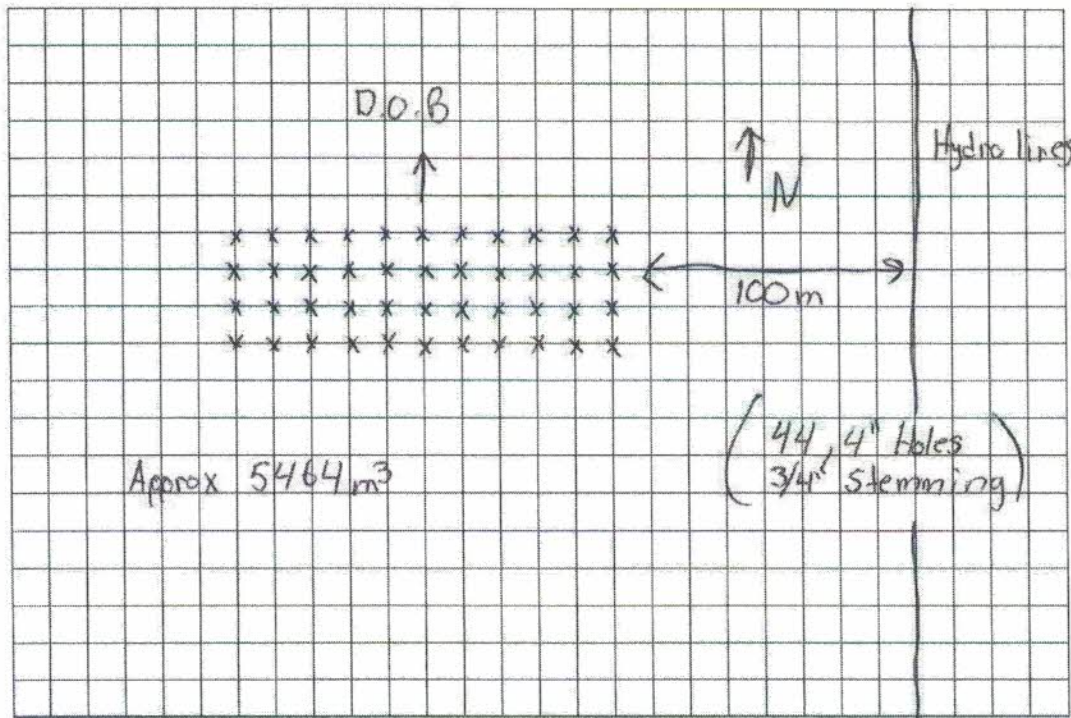
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) Nonel Ezdet 220ms	15m	44
2) Nonel Eztl 109ms	6m	5
3) Electric 0ms	3m	1

DIMENSIONS:

WIDTH 15.84m @ widest point
LENGTH 43.56m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN: BURDEN 3.96m SPACING 3.96m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: good

FLYROCK DAMAGE: no

HAZARDS & DISTANCE: Hydro lines @ 100m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: w @ 5km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny/clear

CUT SHEET #'s 008415

BULK USED? YES NO

BULK TRUCK NUMBER's 134

BULK TRUCK DRIVER Dave

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project T18064C
 Location Port Colborne
 Blast Date July 26 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) Production (open)
 Name of Blaster Zack Pollock
 Blast Report # 022290
 Previous Blast Report # Reviewed 022289

Blast Area

Considerations

Designated Blast Area 500 meters
 Hydro/Bell Distance to blast 100 meters
 Notification of blasting required in writing Y N attach correspondence
 Request permission to re-route/shut down Y N attach correspondence
 Request utility representative to attend blast Y N attach correspondence
 Gas/Water Distance to blast 1 km meters
 Notification of blasting required in writing Y N attach correspondence
 Roads/Highways Distance to blast 500 meters
 Construction Workers Distance to blast 500 meters
 Property Owners Distance to blast 1 km meters
 Notification of blasting required in writing Y N attach correspondence
 Evacuation required in writing Y N attach correspondence
 MTO evacuation approval received in writing Y N attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast 11:50 ^{AM} time
 Number of guards 3 ea
 Quantity (# of) blasting mats 0 ea
 Audible warning device used such as cannister or air horn Y N
 Pre-blast survey complete Y N

Post Blast

Considerations

Output Flyrock (If yes, give distance) 10 meters
 Vibration (reading) mm/s
 Airblast (reading) dB
 Fragmentation Good Bad
 Movement Y N

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman Y N
 Notify Head Office to investigate inquiries Y N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

DATE TIME
CONTRACT / JOB # 718064C
LOCATION Port Colbourne Middle Beach

BLASTER Kevin Mphoe
Please Print
SIGNATURE [Signature]
EXPLOSIVES: **No 022344**

DESIGN:

BLAST TYPE Quarry open
SIZE OF HOLES 4"
NO. OF HOLES 44
NO. OF DELAYS 44
MAX. LOAD PER DELAY 60.8 Kg
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>2675 Kg.5</u>
2) <u>802 Booster</u>	<u>44</u>
3) .....	.....

LOADING:

COLLAR 2.13 m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 802 Booster
SUBGRADE

DETONATORS / INITIATORS:

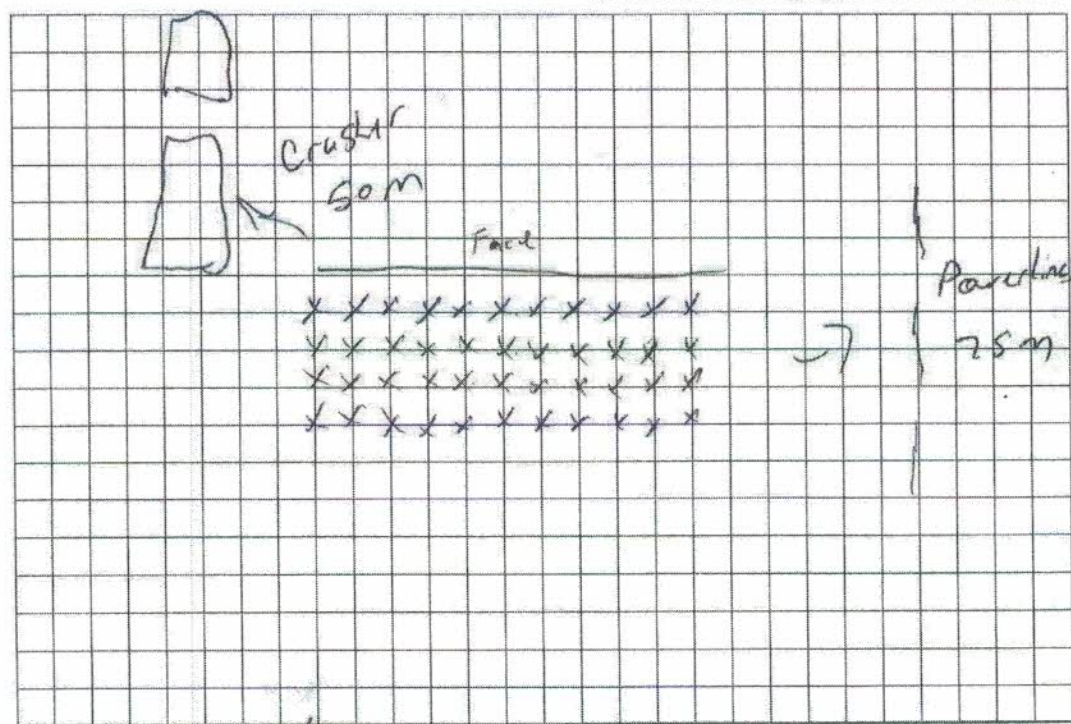
TYPE	LENGTH	# UNITS
1) <u>Nitro Energy</u>	<u>15m</u>	<u>44</u>
2) <u>5mm per 5 100/425 gm</u>	<u>6m</u>	<u>19</u>
3) <u>electric Det</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH

LENGTH

AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est. Ton 14 208

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s: 008415

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: _____

JOB # 518 06 44
 JOB LOCATION: Port Colbourne Low Crusted Stone
 DRILLER: Kevin Mitchell
 PATTERN: 13x13
 SUB-DRILL (ft.): /
 TOTAL FOOTAGE (ft.): 1144

No 008415

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #

○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	26	26	26	26	26	26	26	26	26	26	○	○	○	○	○	○	○
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○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

CUT SHEET # _____

Date/Time Tran at 12:03:17 July 26, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GZUU.TH0

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes

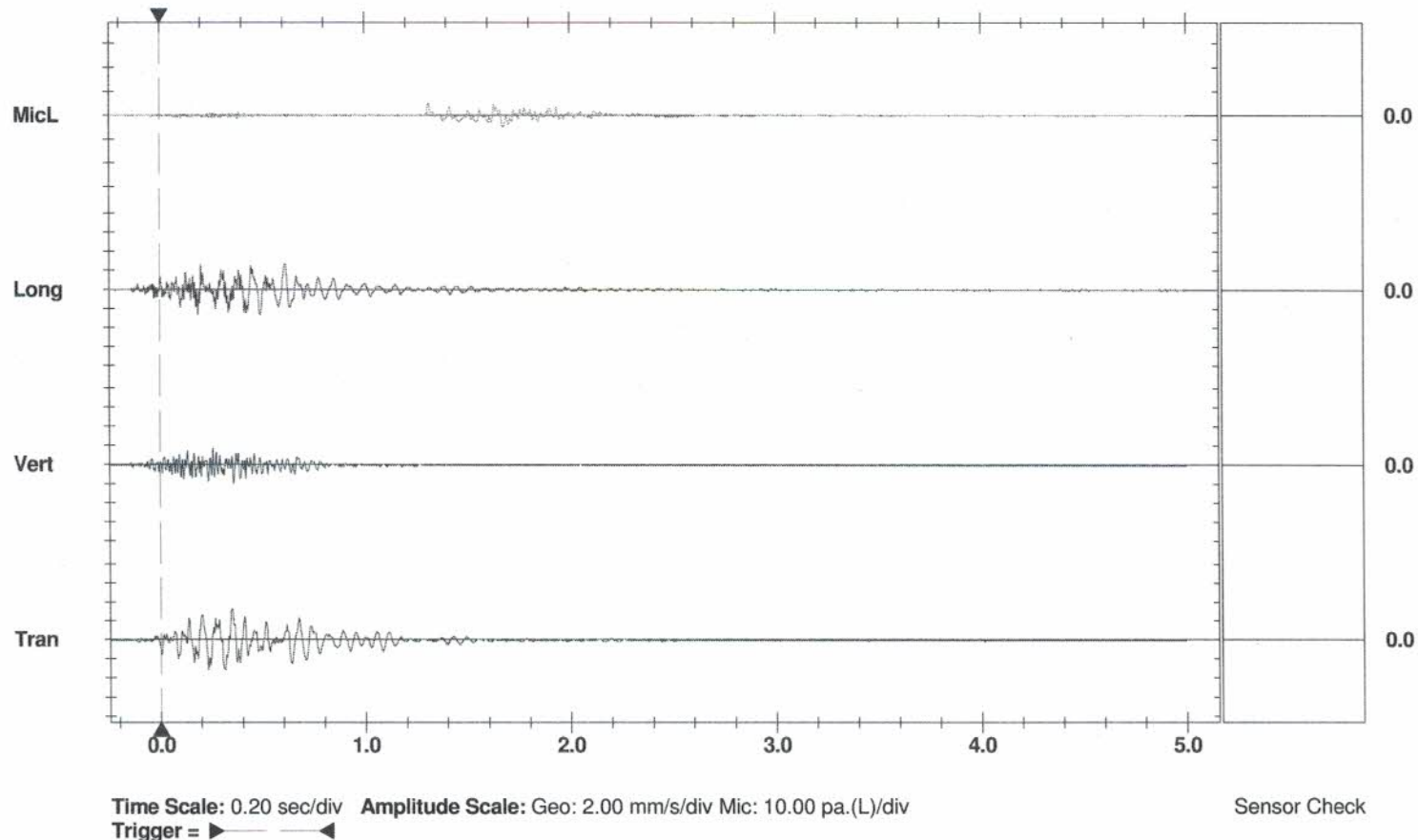
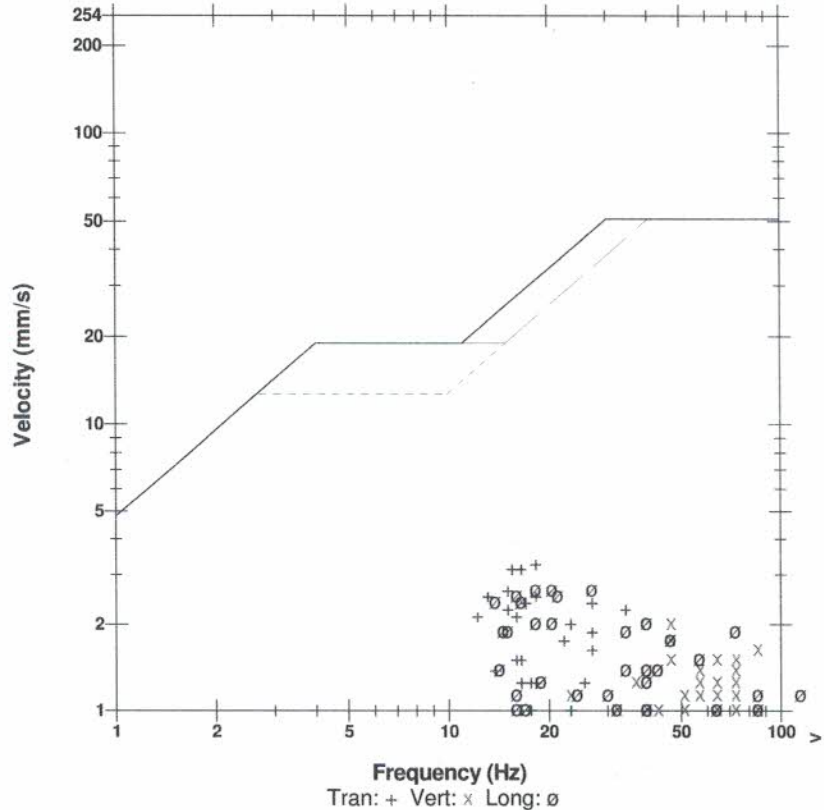
Combo Mode July 26, 2017 10:07:07
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 108.4 dB(L) at 1.313 sec
ZC Freq 13 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.30	2.03	2.67	mm/s
ZC Freq	18	47	27	Hz
Time (Rel. to Trig)	0.347	0.358	0.187	sec
Peak Acceleration	0.0795	0.0795	0.106	g
Peak Displacement	0.0319	0.00726	0.0247	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.88 mm/s at 0.313 sec

USBM RI8507 And OSMRE



Date/Time Vert at 12:03:56 July 26, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.2 Volts
Unit Calibration July 13, 2017 by InstanTel
File Name N758GZUU.UK0

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes

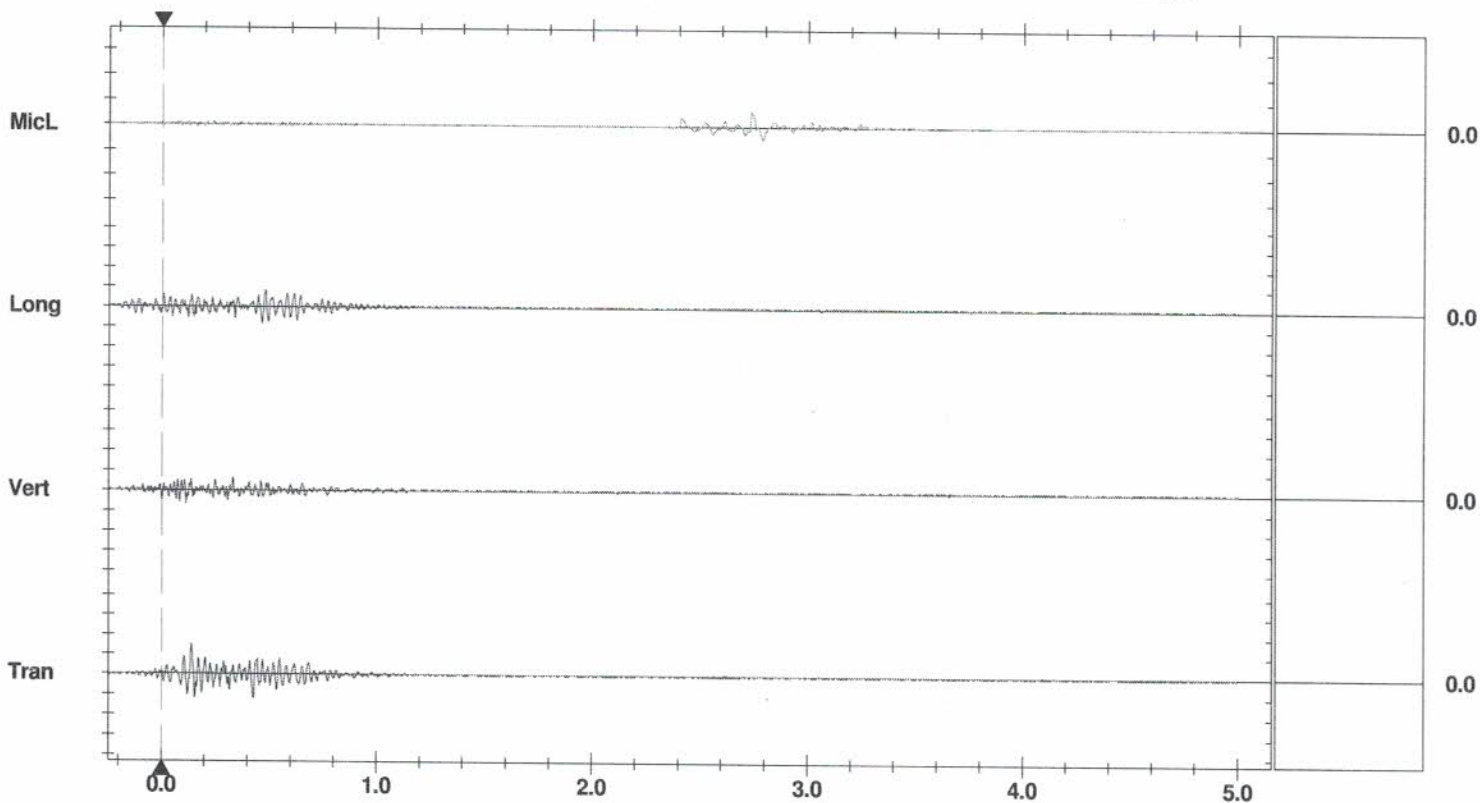
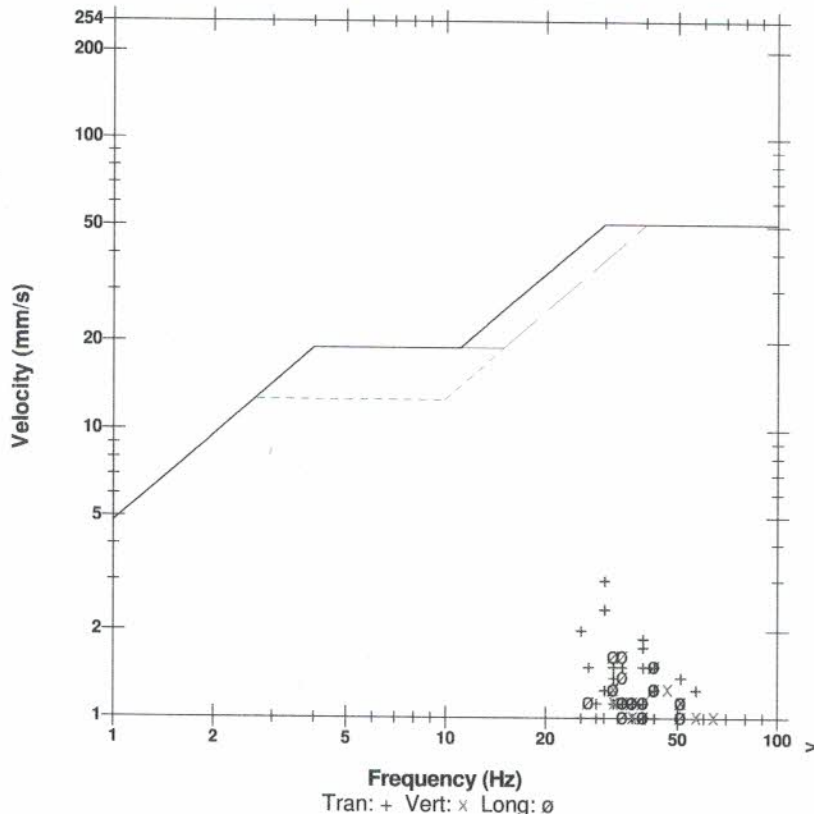
Combo Mode July 26, 2017 10:13:25
 40 Townlines Road S

Microphone Linear Weighting
PSPL 109.2 dB(L) at 2.737 sec
ZC Freq 20 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.05	1.27	1.65	mm/s
ZC Freq	30	32	32	Hz
Time (Rel. to Trig)	0.139	0.113	0.464	sec
Peak Acceleration	0.0795	0.0530	0.0530	g
Peak Displacement	0.0146	0.00496	0.00763	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 3.34 mm/s at 0.138 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

BLAST LOG

MINING+CONSTRUCTION

Date of Blast
DATE *To be Determined* TIME
CONTRACT / JOB # *J18064C LCS-3282*
LOCATION *Port Colbourne Middle Beach*

BLASTER *Kevin Moore*
Please Print
SIGNATURE *[Signature]*

No 022333

DESIGN:

BLAST TYPE *Quarry (Open)*
SIZE OF HOLES *1"*
NO. OF HOLES *51*
NO. OF DELAYS *51*
MAX. LOAD PER DELAY *69 Kgs*
HOLES PER SERIES *1*
POWDER FACTOR

EXPLOSIVES:

TYPE/BLEND	kgs/ # units
1) <i>Emulsion</i>	<i>3264 Kg</i>
2) <i>802 Booster</i>	<i>51ea</i>
3)	

DETONATORS / INITIATORS:

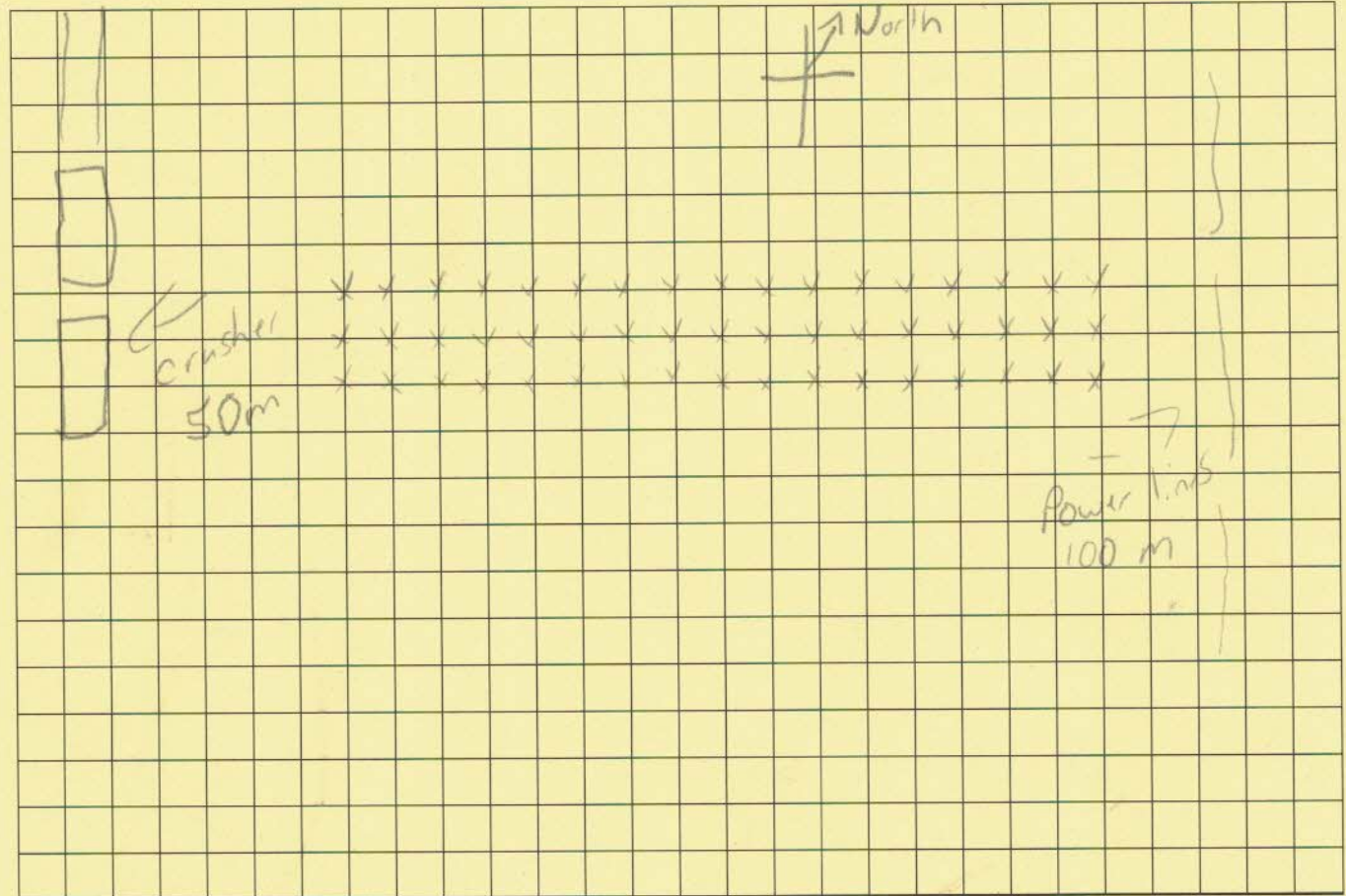
TYPE	LENGTH	# UNITS
1) <i>pl.0 Energy 25/500</i>	<i>12m</i>	<i>51</i>
2) <i>Jumper 9205</i>	<i>6m</i>	<i>9</i>
3) <i>Elec Pel</i>	<i>3m</i>	<i>1</i>

LOADING:

COLLAR *6-7" and adjusted accordingly*
COLUMN LOAD *Emulsion*
TOE LOAD *802 Booster*
SUBGRADE *N/A*

DIMENSIONS:

WIDTH *11.88m*
LENGTH *67.34m*
AVE CUT *26"* AVE. DRILL DEPTH *26"*
PATTERN : BURDEN *3.96m* SPACING *3.96m*



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: *Est Ton = 16468*

FLYROCK DAMAGE:



MINING + CONSTRUCTION

CUT SHEET # _____

CUT SHEET

DATE: _____



Nº 005970

JOB # J180646

JOB LOCATION: Port Colborne Middle Beach

DRILLER: Kevin Magee

PATTERN: 13 x 13 W/A

SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 1326' (51 holes)

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____

○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
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○	○	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	○	○
○	○	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	○	○

CUT SHEET # _____

MINING+CONSTRUCTION

DATE Jun 1, 17 TIME 11:18 a.m.
 CONTRACT / JOB # Miller
 LOCATION Port Colborne

BLASTER James Graham
Please Print
 SIGNATURE 

№ 022744

DESIGN:

BLAST TYPE Production
 SIZE OF HOLES 4
 NO. OF HOLES 51
 NO. OF DELAYS 51
 MAX. LOAD PER DELAY 58.9kg
 HOLES PER SERIES single
 POWDER FACTOR.....

EXPLOSIVES:

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>3,270kg</u>
2) <u>Sensitizer</u>	<u>12kg / 3/4 case</u>
3) .....	.....

DETONATORS / INITIATORS:

	TYPE	LENGTH	# UNITS
1)	<u>Nitro 55/500</u>	<u>15m</u>	<u>51</u>
2)	<u>Nitro 109m2</u>	<u>6m</u>	<u>10</u>
3)	<u>51cc</u>	<u>3.6m</u>	<u>1</u>

LOADING:

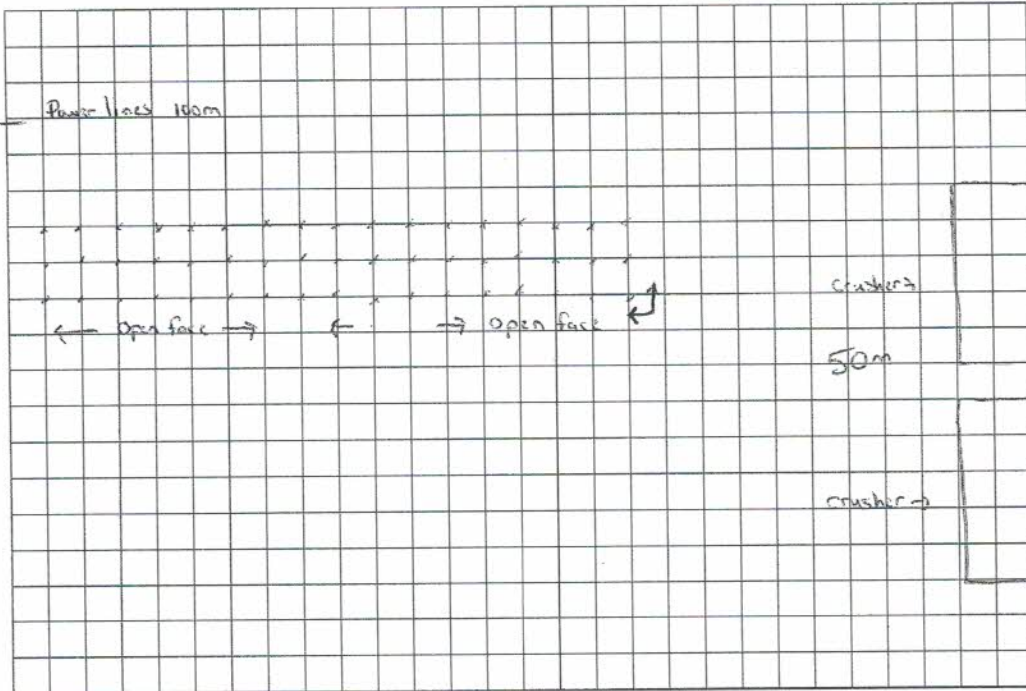
COLLAR 7ft & ascending
 COLUMN LOAD emulsion
 TOE LOAD Sensitizer
 SUBGRADE off

DIMENSIONS:

WIDTH

LENGTH.....

AVE CUT 7.5m AVE. DRILL DEPTH 782
 PATTERN : BURDEN 3.9m SPACING 3.9m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: all good

FLYROCK DAMAGE: none

HAZARDS & DISTANCE : 50m crusher / 100m wires

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s.....

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: South

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: sun / clear

CUT SHEET #'s.....

BULK USED? YES NO

BULK TRUCK NUMBER's 141

BULK TRUCK DRIVER Dave White

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project Miller
 Location Parkvalley
 Blast Date Jun 11/17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) pro
 Name of Blaster James Graham
 Blast Report # 022744
 Previous Blast Report # Reviewed yes

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

200		meters
100		meters
Y	N	attach correspondence
Y	N	attach correspondence
Y	N	attach correspondence
0		meters
Y	N	attach correspondence
500		meters
0		meters
Y	N	attach correspondence
Y	N	attach correspondence
Y	N	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

	AM	PM	time
4			ea
0			ea
0	N		
0	N		

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

None		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes

What is required to reduce undesirables ? _____



CUT SHEET # _____

MINING+CONSTRUCTION

CUT SHEET

DATE: BLASTED

JOB # J18064C

JOB LOCATION: Post Colbourne Middle Bench

DRILLER: Kevin McPhee

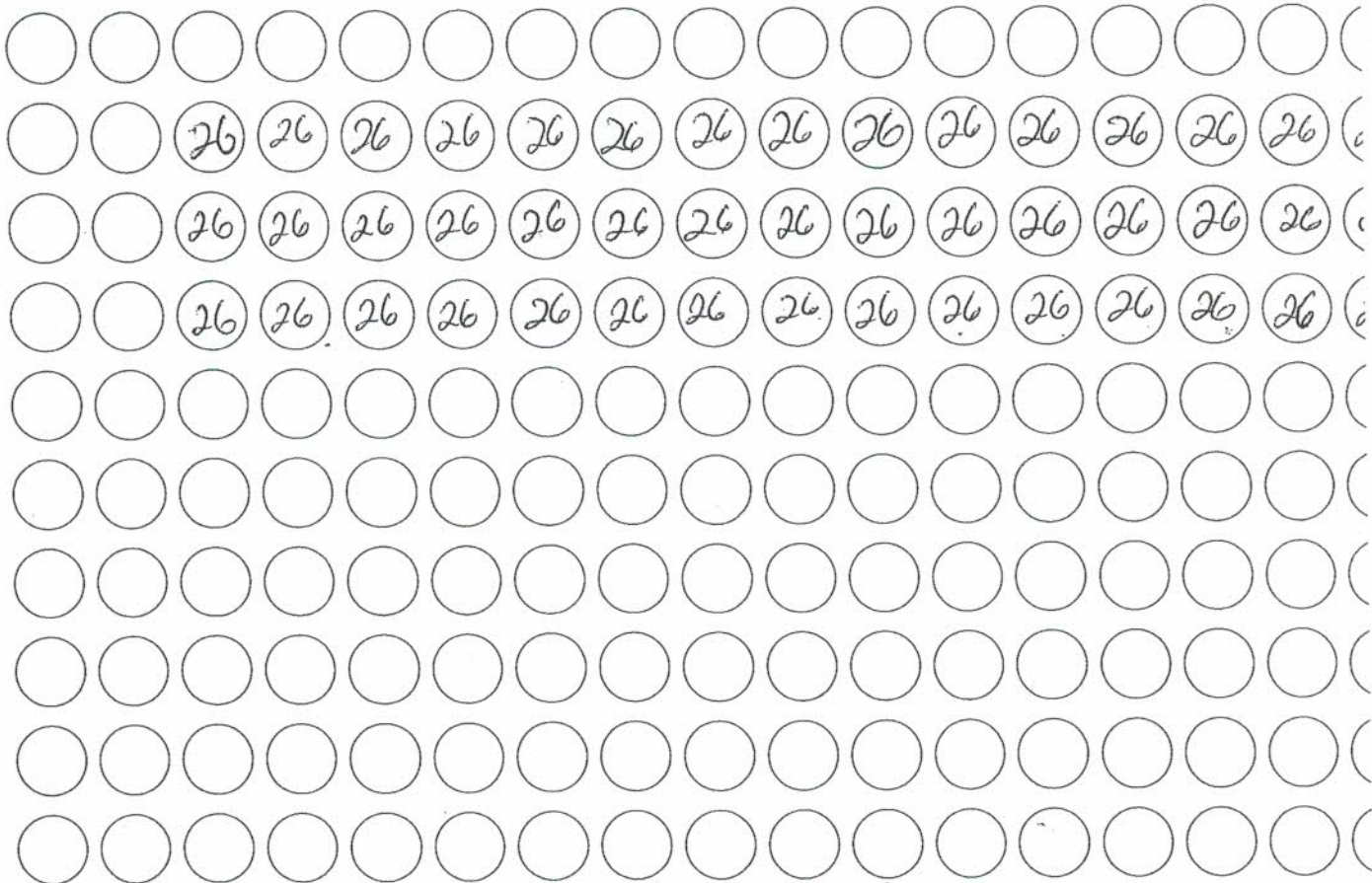
PATTERN: 13 x 13

SUB-DRILL (ft.): N/A

TOTAL FOOTAGE (ft.): 1326' (51 holes)

- INDIVIDUAL HOLE DEI
- INDICATE TOE AND HE
- SHOW BURDEN OF FAC
- SHOW NORTH ARC

CUT SHEET # _____



CUT SHEET # _____

Histogram Start Time 10:42:41 June 1, 2017
Histogram Finish Time 11:57:47 June 1, 2017
Number of Intervals 901 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps
Job Number: 1

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.2 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name ___TEMP.EVT

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

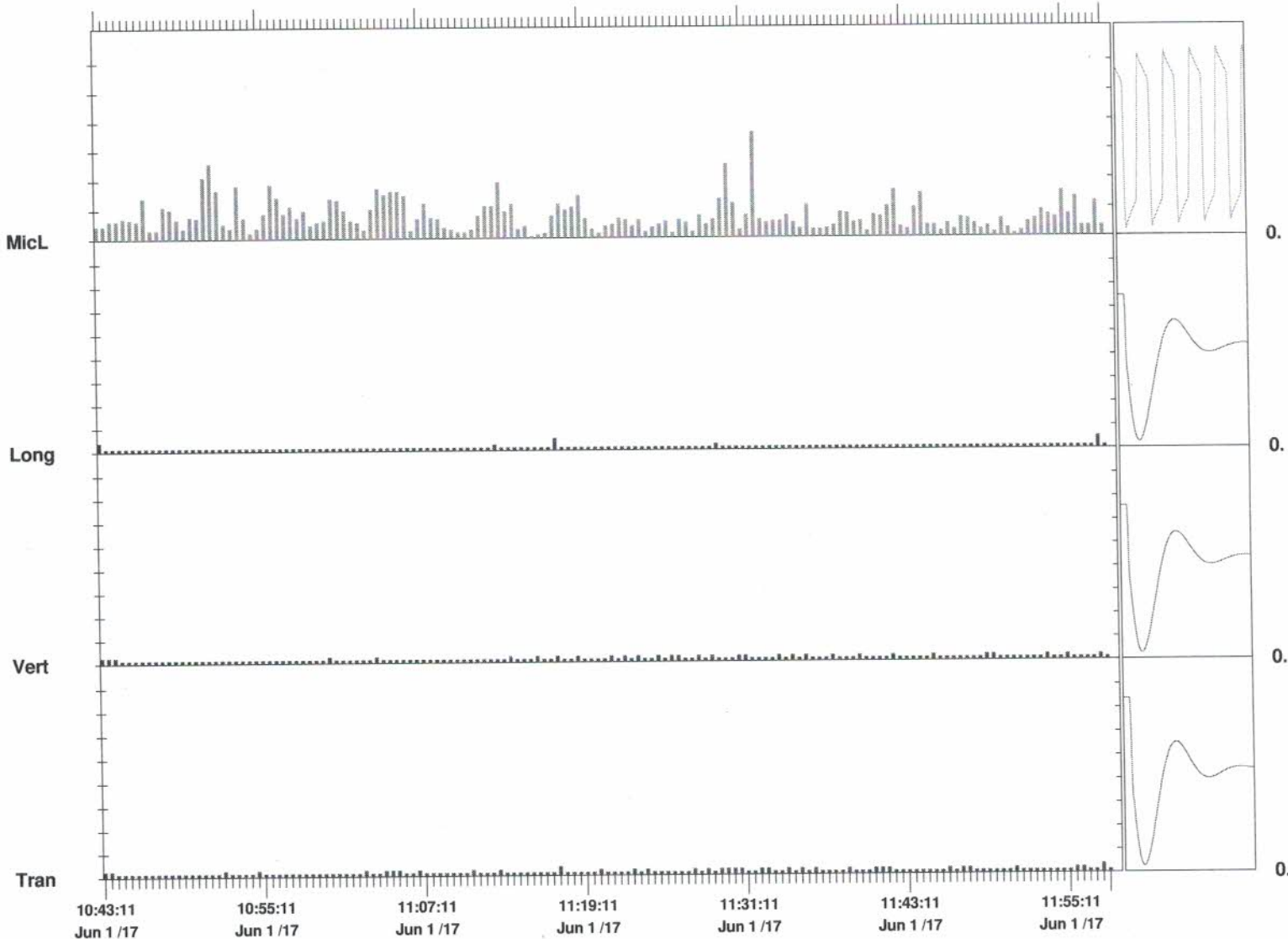
Extended Notes

678 Barrick Road

Microphone Linear Weighting
PSPL 119.1 dB(L) on June 1, 2017 at 11:32:01
ZC Freq 13 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 628 mv)

	Tran	Vert	Long	
PPV	0.381	0.254	0.508	mm/s
ZC Freq	57	>100	30	Hz
Date	Jun 1 /17	Jun 1 /17	Jun 1 /17	
Time	11:16:51	10:43:01	11:16:56	
Sensor Check	Passed	Passed	Passed	
Frequency	8.2	7.6	7.5	Hz
Overswing Ratio	3.5	3.8	3.8	

Peak Vector Sum 0.568 mm/s on June 1, 2017 at 11:57:36



Time Scale: 30 seconds /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 5.00 pa.(L)/div

Sensor Check

Date/Time Vert at 11:18:06 June 1, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number 0404 V 5.52 BlastMate II/477
Battery Level 6.5 Volts
Unit Calibration August 31, 2016 by InstanTel
File Name B404GX2S.Q60

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc.
 Converted: June 6, 2017 08:40:53 (V10.20)

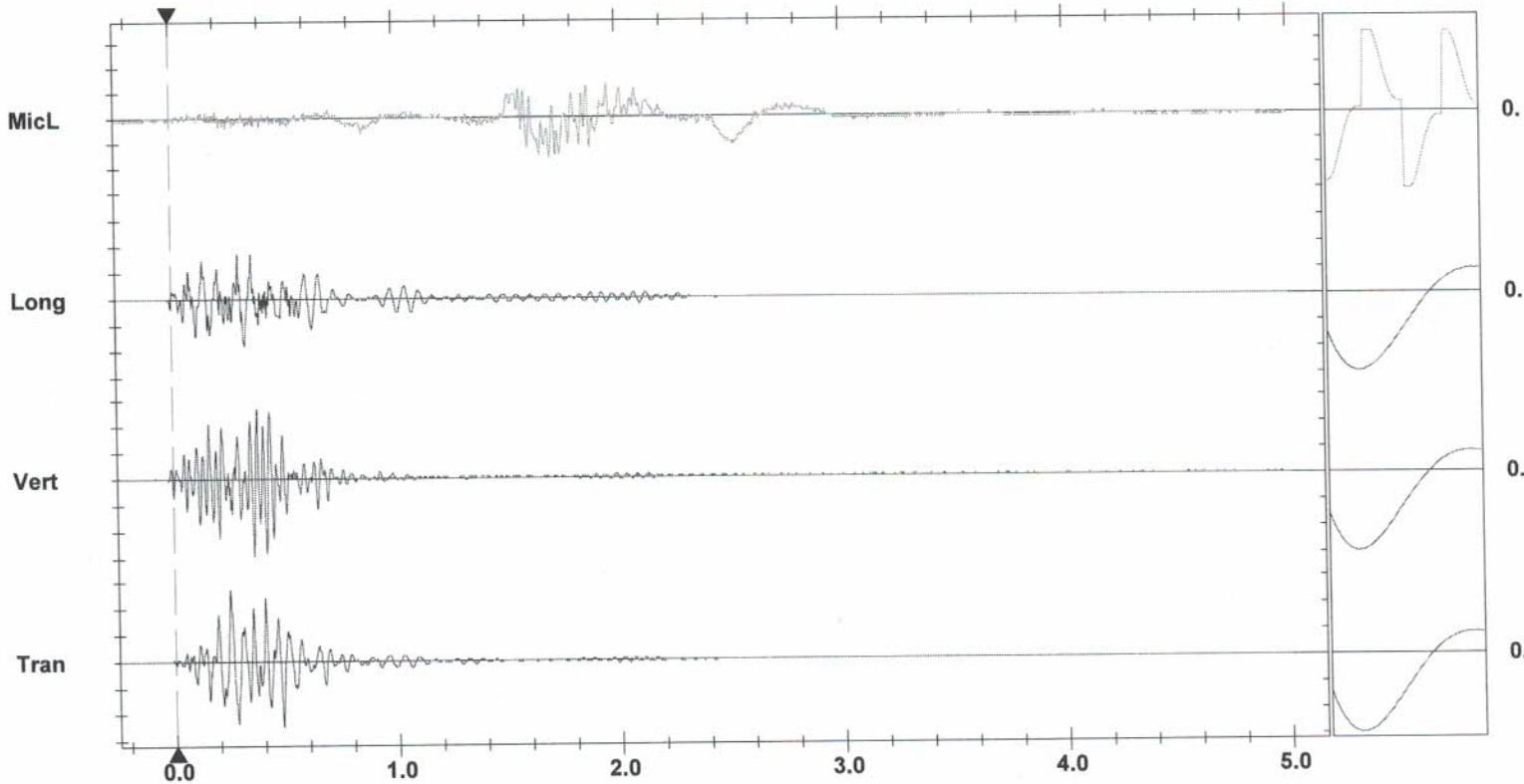
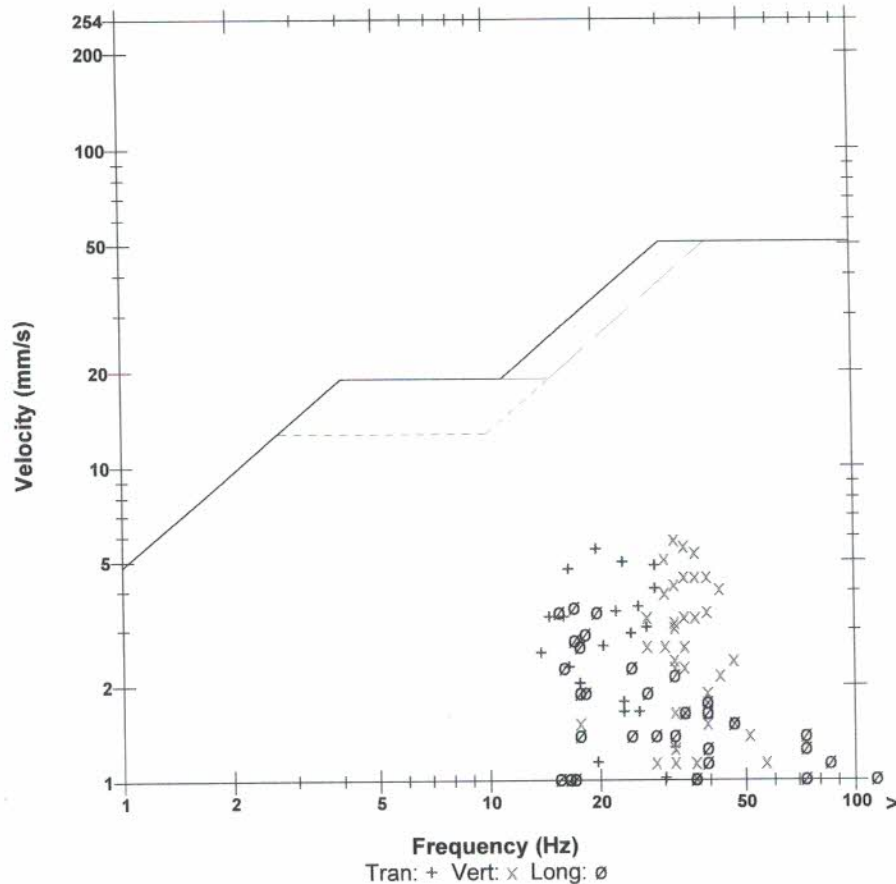
Extended Notes
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 112.0 dB(L) at 1.703 sec
ZC Freq 6.0 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 526 mv)

	Tran	Vert	Long	
PPV	5.46	5.84	3.56	mm/s
ZC Freq	19	34	17	Hz
Time (Rel. to Trig)	0.250	0.361	0.329	sec
Peak Acceleration	0.0928	0.159	0.0928	g
Peak Displacement	0.0404	0.0282	0.0308	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.7	7.6	Hz
Overswing Ratio	3.7	3.8	3.6	

Peak Vector Sum 6.78 mm/s at 0.361 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 5.00 pa.(L)/div
 Trigger =

Sensor Check



BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE June 8 2017 TIME TBD

BLASTER Kevin M. Phee
Please Print

CONTRACT / JOB # 519064C

SIGNATURE [Signature]

LOCATION Low Crushed Stone Port Colborne

EXPLOSIVES: **No 022335**

DESIGN:

BLAST TYPE Quality open
SIZE OF HOLES 4"
NO. OF HOLES 31
NO. OF DELAYS 31
MAX. LOAD PER DELAY 60.8 Kg
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>1991.8 Kgs</u>
2) <u>802 Booster</u>	<u>31</u>
3)	

DETONATORS / INITIATORS:

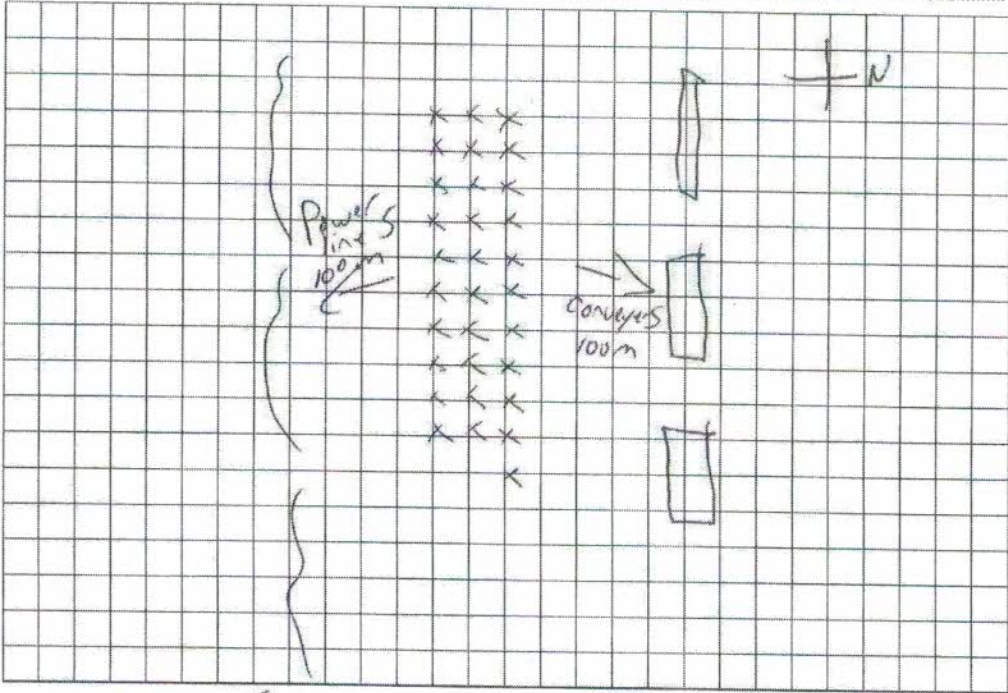
TYPE	LENGTH	# UNITS
1) <u>Nitro Emul</u>	<u>15m</u>	<u>31</u>
2) <u>Nitro Emul Jumper</u>	<u>6m</u>	<u>9</u>
3) <u>Jumper</u>	<u>6m</u>	<u>6</u>

LOADING:

COLLAR 7" and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD 802 Booster
SUBGRADE N/A

DIMENSIONS:

WIDTH 39'
LENGTH 143'
AVE CUT 26' AVE. DRILL DEPTH 26'
PATTERN : BURDEN 13' SPACING 13'



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Tonnage = 10014

FLYROCK DAMAGE:

CONSBEC INC.

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE Jan 8/17 TIME 10:20 am
CONTRACT / JOB # low waste stone
LOCATION Port Colborne

BLASTER J. G. G. G. G.
Please Print

SIGNATURE [Signature]

EXPLOSIVES: **№ 022746**

DESIGN:

BLAST TYPE P.O.
SIZE OF HOLES 4 inch
NO. OF HOLES 31
NO. OF DELAYS 31
MAX. LOAD PER DELAY 58.9 kg
HOLES PER SERIES single
POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>200 kg</u>
2) <u>Sensu booster</u>	<u>10 / 11 cases</u>
3)	

DETONATORS / INITIATORS:

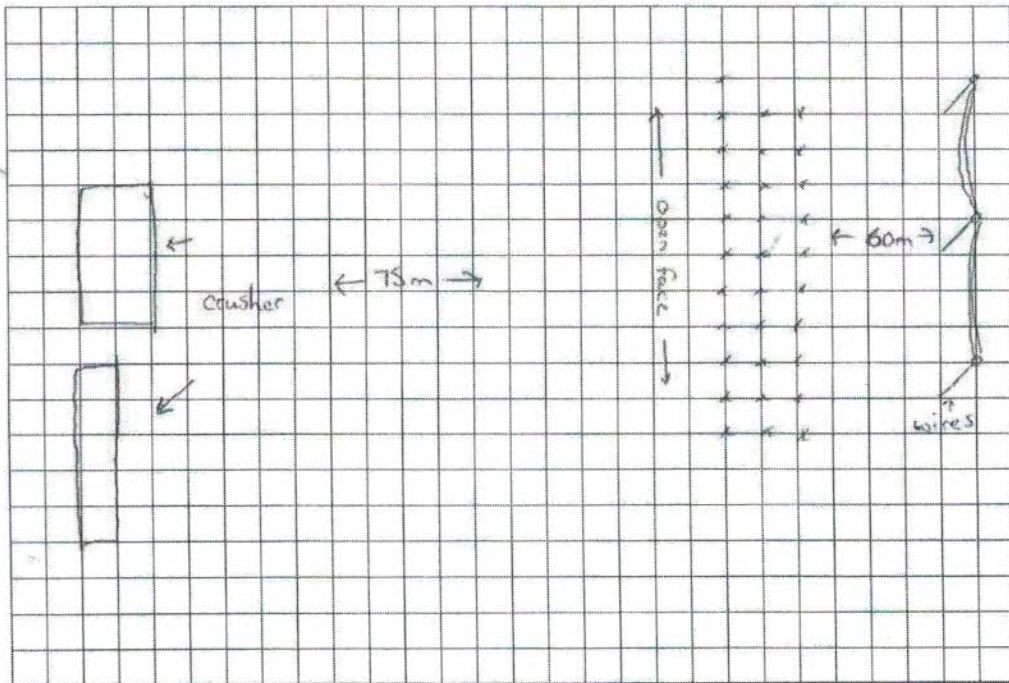
TYPE	LENGTH	# UNITS
1) <u>M.A.S.</u>	<u>15m</u>	<u>31</u>
2) <u>M.A.S. 109/34ms</u>	<u>6m</u>	<u>10</u>
3) <u>Gas</u>	<u>3.6m</u>	<u>1</u>

LOADING:

COLLAR 7.1 collar
COLUMN LOAD emulsion
TOE LOAD Sensu booster
SUBGRADE 0

DIMENSIONS:

WIDTH
LENGTH
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 13.61 SPACING 13.61



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: all good

FLYROCK DAMAGE: none

10:22:15

Date/Time Vert at 10:08:04 June 8, 2017
 Trigger Source Geo: 1.00 mm/s, Mic: 113 dB(L)
 Range Geo: 254 mm/s
 Record Time 5.0 sec at 1024 sps

Serial Number 0904 V 5.52 BlastMate II/477
 Battery Level 6.5 Volts
 Unit Calibration August 31, 2016 by InstanTel
 File Name B904GXFO.5D0

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc.
 Converted: June 9, 2017 12:04:52 (V10.20)

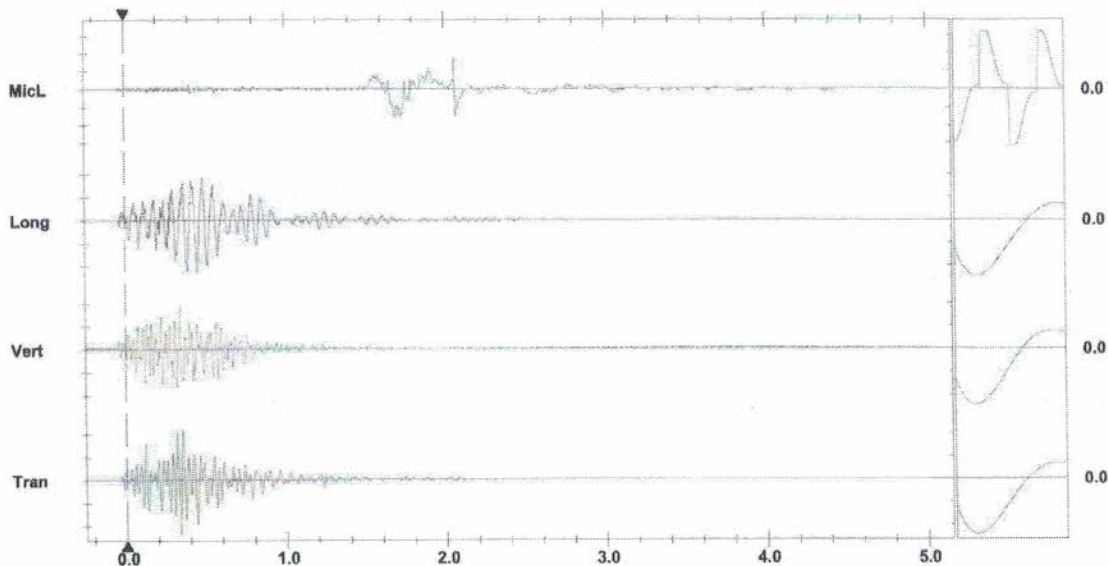
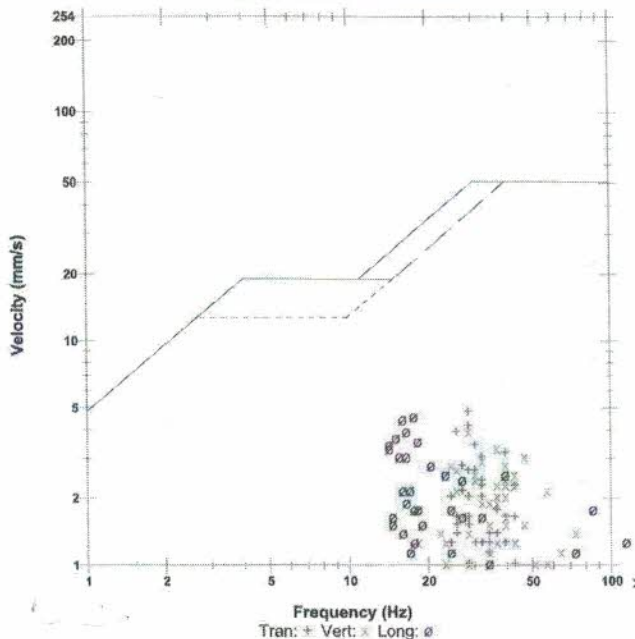
Extended Notes
 Hydro Pole Across from 2035 Youngs Road

Microphone Linear Weighting
 PSPL 112.6 dB(L) at 2.062 sec
 ZC Freq 20 Hz
 Channel Test Passed (Freq = 20.0 Hz Amp = 523 mv)

	Tran	Vert	Long	
PPV	4.83	3.94	4.57	mm/s
ZC Freq	30	27	18	Hz
Time (Rel. to Trig)	0.336	0.342	0.451	sec
Peak Acceleration	0.119	0.119	0.106	g
Peak Displacement	0.0277	0.0195	0.0414	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	8.2	7.7	Hz
Overswing Ratio	4.0	3.3	3.6	

Peak Vector Sum 5.84 mm/s at 0.319 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 5.00 pa.(L)/div
 Trigger = >

Sensor Check

CONSBEC INC.

MINING + CONSTRUCTION

Seismograph Report

Date	June 8, 2017	
Client	Waterford Sand & Gravel Limited	
Quarry Name	Law Crushed Stone Quarry	
Location	678 Barrick Road	
Company	Consbec Inc.	
Name of User	Kevin McPhee	
Seismograph Serial Number	BA 10985	
Blast Report Number		
Time of Blast	10:22	
Trigger Levels	Mic	113 dB(L)
	Geo	1.00 mm/s
Results	Mic	did not trigger
	Tran	did not trigger
	Vert	did not trigger
	Long	did not trigger

Comments:

Seismograph readings did not
exceed trigger levels during the time
of the blast.

Consbec Inc.

2736 Belisle Drive, Val Caron, ON Canada P3N 1B3 T. 750.897.4971 F. 705.897.4565

www.consbec.com



Event Report



Histogram Start Time 09:53:30 June 8, 2017
Histogram Finish Time 11:54:01 June 8, 2017
Number of Intervals 1446 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GXDS.T60

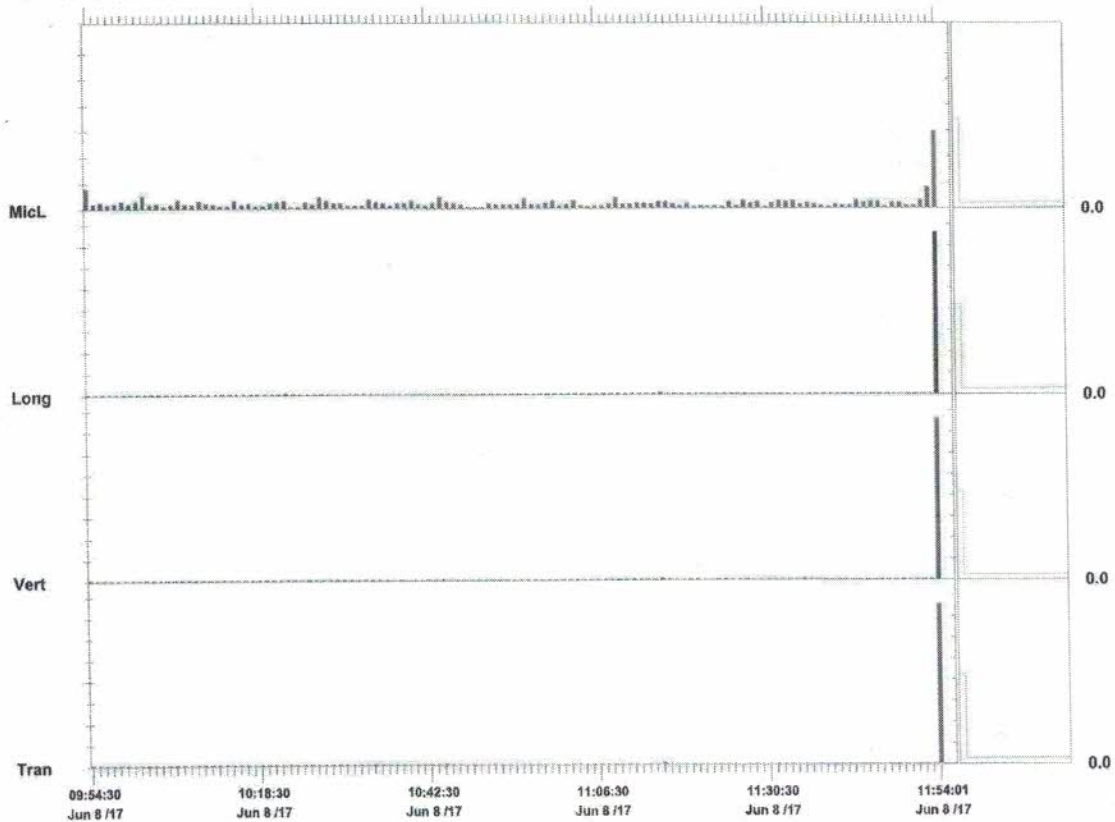
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes
 678 Barrick Road

Microphone Linear Weighting
PSPL 117.4 dB(L) on June 8, 2017 at 11:53:40
ZC Freq 12 Hz
Channel Test Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	r
PPV	75.7	75.7	75.9	mm/s
ZC Freq	85	85	85	Hz
Date	Jun 8 /17	Jun 8 /17	Jun 8 /17	
Time	11:53:40	11:53:40	11:53:40	
Sensor Check	Check	Check	Check	
Frequency	1024.0	1024.0	1024.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 131 mm/s on June 8, 2017 at 11:53:40



Time Scale: 1 minute /div Amplitude Scale:Geo: 10.00 mm/s/div Mic: 5.00 pa.(L)/div

Sensor Check

Event Type : Full Histogram
Serial Number : BA10985
Version : V 10.72-8.17 BlastMate III
File Name : __TEMP.EVT
Histogram Start Time : 09:53:30
Histogram Start Date : June 8, 2017
Histogram Stop Time : 11:54:01
Histogram Stop Date : June 8, 2017
Number of Intervals : 1446
Interval Size : 5 seconds
Sample Rate : 1024 sps
Battery Level : 6.1 Volts
Calibration : April 9, 2017 by Instantel
Units : mm/s and dB(L)
Location : : Law Crushed Stone Quarry
Client : : Waterford Sand & Gravel Limited
User Name : : Consbec Inc
General : : Blast Vibration Monitoring
Extended Notes
678 Barrick Road
Geo Range : 254 mm/s
Tran PPV : 75.7 mm/s
Vert PPV : 75.7 mm/s
Long PPV : 75.9 mm/s
Tran ZC Freq : 85 Hz
Vert ZC Freq : 85 Hz
Long ZC Freq : 85 Hz
Tran Peak Time : 11:53:40
Tran Peak Date : June 8, 2017
Vert Peak Time : 11:53:40
Vert Peak Date : June 8, 2017
Long Peak Time : 11:53:40
Long Peak Date : June 8, 2017
Peak Vector Sum : 131 mm/s
Peak Vector Sum Time : 11:53:40
Peak Vector Sum Date : June 8, 2017
Microphone : Linear Weighting
MicL PSPL : 117.4 dB(L)
MicL Time : 11:53:40
MicL Date : June 8, 2017
MicL ZC Freq : 12 Hz
Tran Test Freq : 1024.0 Hz
Tran Test Ratio : 0.0
Tran Test Results : Check
Vert Test Freq : 1024.0 Hz
Vert Test Ratio : 0.0
Vert Test Results : Check
Long Test Freq : 1024.0 Hz
Long Test Ratio : 0.0

Long Test Results : Check

MicL Test Freq : 0.0 Hz

MicL Test Amplitude : 0 mv

MicL Test Results : Check

Monitor Log(s)

Jun 8 /17 09:53:29 Jun 8 /17 11:54:01 Event recorded. (Keyboard Exit)

PC SW Version : V10.20 - 10.20

Time	Tran PPV mm/s	Tran Freq Hz	Vert PPV mm/s	Vert Freq Hz	Long PPV mm/s	Long Freq Hz	Geo PVS mm/s	MicL PSPL pa.(L)	MicL PSPL dB(L)	MicL Freq Hz
08-Jun-17										
9:53:35	0.127	>100	0.127	N/A	0.127	>100	0.22	3.25	104	4.6
9:53:40	0.127	>100	0.127	>100	0.127	>100	0.22	2.75	103	>100
9:53:45	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	>100
9:53:50	0.381		0.381		0.254	>100	0.475	1	94	4.2
9:53:55	0.127	>100	0.127	>100	0.127	>100	0.22	4	106	26
9:54:00	0.127	>100	0.127	>100	0.127	>100	0.22	1.25	95.9	4.4
9:54:05	0.127	>100	0.127	>100	0.127	>100	0.22	1	94	27
9:54:10	0.127	>100	0.127	>100	0.127	>100	0.22	1	94	3.4
9:54:15	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:20	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	85
9:54:25	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	13
9:54:30	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	32
9:54:35	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	39
9:54:40	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:45	0.127	>100	0.127	>100	0.127	>100	0.22	1	94	6.9
9:54:50	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:55	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	9.5
9:55:00	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	47
9:55:05	0.127	>100	0.127	>100	0.127	>100	0.22	1	94	7.6
9:55:10	0.127	>100	0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:55:15	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	9.5
9:55:20	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:25	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:30	0.127	>100	0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:55:35	0.127	>100	0.127	>100	0.127	>100	0.22	1.25	95.9	9.3
9:55:40	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:45	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:50	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	8.4
9:55:55	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:56:00	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	47
9:56:05	0.127	>100	0.127	>100	0.127	>100	0.22	1	94	43
9:56:10	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	19
9:56:15	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	37
9:56:20	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	22
9:56:25	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	28
9:56:30	0.127	>100	0.127	>100	0.127	>100	0.22	0.5	88	>100
9:56:35	0.127	>100	0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:56:40	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	34

<i>Time</i>	<i>Trans</i>	<i>Vert</i>	<i>Long</i>			
10:19:55	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
10:20:00	0.254 >100	0.127 >100	0.127 >100	0.254	0.75	91.5
10:20:05	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
10:20:10	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88
10:20:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:20:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:20:25	0.254 >100	0.254 >100	0.127 >100	0.311	0.25	81.9
10:20:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:20:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:20:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:20:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:20:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:20:55	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:21:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:05	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:21:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:15	0.254 >100	0.127 >100	0.127 >100	0.284	1.25	95.9
10:21:20	0.127 >100	0.254 >100	0.127 >100	0.284	0.5	88
10:21:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:21:30	0.254 >100	0.127 >100	0.127 >100	0.284	0.25	81.9
10:21:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:21:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:00	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:22:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:15	0.508	23 0.381	37 0.508	26 0.684	0.25	81.9
10:22:20	0.127 >100	0.127 >100	0.127 >100	0.22	1.5	97.5
10:22:25	0.254 >100	0.127 >100	0.127 >100	0.284	0.5	88
10:22:30	0.254 >100	0.127 >100	0.127 >100	0.284	0.25	81.9
10:22:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:40	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:22:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:22:55	0.254 >100	0.127 >100	0.127 >100	0.284	0.25	81.9
10:23:00	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:23:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:25	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:23:30	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:23:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9

10:23:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:23:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:00	0.254 >100	0.127 >100	0.127 >100	0.284	0.25	81.9
10:24:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:15	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:24:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:24:45	0.127 >100	0.254 >100	0.127 >100	0.284	0.5	88
10:24:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:24:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:25:00	0.254 >100	0.127 >100	0.127 >100	0.311	0.25	81.9
10:25:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:25:10	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:25:15	0.254 >100	0.381	64 0.127 >100	0.381	1.25	95.9
10:25:20	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88
10:25:25	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88
10:25:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:25:35	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:25:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:25:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:25:50	0.127 >100	0.254 >100	0.127 >100	0.284	0.25	81.9
10:25:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:26:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:26:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
10:26:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:26:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
10:26:45	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
10:26:50	0.254 >100	0.254 >100	0.127 >100	0.311	0.5	88
10:26:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
10:27:00	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88
10:27:05	0.127 >100	0.254 >100	0.127 >100	0.311	2.25	101
10:27:10	0.254 >100	0.127 >100	0.127 >100	0.254	0.75	91.5
10:27:15	0.254 >100	0.254 >100	0.127 >100	0.284	1.5	97.5
10:27:20	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
10:27:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
10:27:30	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
10:27:35	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING & CONSTRUCTION

General

Project Lean crash stone
 Location Port Colborne
 Blast Date June 17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) prod
 Name of Blaster James Graham
 Blast Report # 022746
 Previous Blast Report # Reviewed yes

Blast Area Considerations

Designated Blast Area meters
 Hydro/Bell Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Request permission to re-route/shut down attach correspondence
 Request utility representative to attend blast attach correspondence
 Gas/Water Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Roads/Highways Distance to blast meters
 Construction Workers Distance to blast meters
 Property Owners Distance to blast meters
 Notification of blasting required in writing attach correspondence
 Evacuation required in writing attach correspondence
 MTO evacuation approval received in writing attach correspondence

700	meters	
60m	meters	
Y	<input checked="" type="checkbox"/> N	attach correspondence
Y	<input checked="" type="checkbox"/> N	attach correspondence
Y	<input checked="" type="checkbox"/> N	attach correspondence
Ø	meters	
Y	<input checked="" type="checkbox"/> N	attach correspondence
300	meters	
400	meters	
Ø	meters	
Y	<input checked="" type="checkbox"/> N	attach correspondence
Y	<input checked="" type="checkbox"/> N	attach correspondence
Y	<input checked="" type="checkbox"/> N	attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

6:21	PM	time
4		ea
0		ea
<input checked="" type="checkbox"/>	N	
<input checked="" type="checkbox"/>	N	

Post Blast Considerations

Output Flock (If yes, give distance) meters
 Vibration (reading) mm/s
 Airblast (reading) dB
 Fragmentation
 Movement

Good	Bad
Y	N

	meters
	mm/s
	dB
Good	Bad
Y	N

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman

Y	N
---	---

 Notify Head Office to investigate inquiries

Y	N
---	---

Changes

What is required to reduce undesirables ? _____

CONSBEC INC.

MINING+CONSTRUCTION

BLAST LOG

DESIGN

REPORT

DATE June 9 2017 TIME TBD

BLASTER Kevin M. Hee
Please Print

CONTRACT / JOB # J180640

SIGNATURE [Signature]

LOCATION Low crushed stone Pat Calhoun

EXPLOSIVES: **No 022336**

DESIGN:

BLAST TYPE Primary open

TYPE/BLEND kgs/ # units
1) Emulsion 2736 Kgs

SIZE OF HOLES 4"

2) Boz Booster 45

NO. OF HOLES 45

3)

NO. OF DELAYS 45

DETONATORS / INITIATORS:

MAX. LOAD PER DELAY 60.9 Kgs

TYPE LENGTH # UNITS
1) Nitro Energy 15m 45

HOLES PER SERIES 1

2) Jumper 109ms 6m 7

POWDER FACTOR

3) Jumper 42ms 6m 7
Flaz Det 3m

LOADING:

DIMENSIONS:

COLLAR 7" and adjusted accordingly

WIDTH 39'

COLUMN LOAD Emulsion

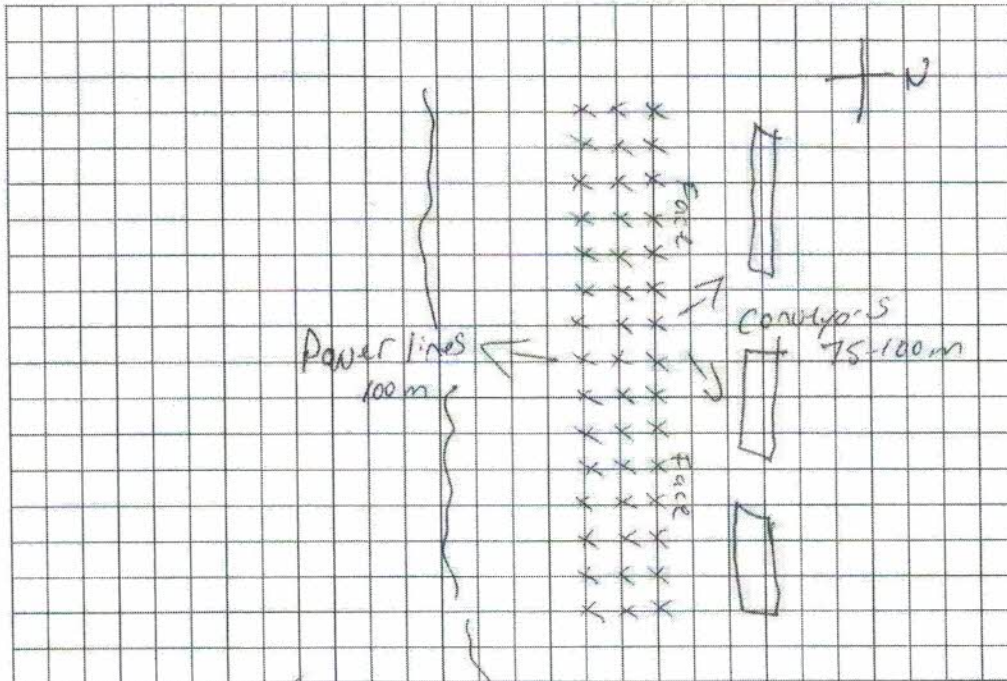
LENGTH 195'

TOE LOAD Boz booster

AVE CUT 26" AVE. DRILL DEPTH 26"

SUBGRADE N/A

PATTERN : BURDEN 13 SPACING 13



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est 7000LS

FLYROCK DAMAGE:

CUT SHEET #



CONSBEC INC.
MINING + CONSTRUCTION

CUT SHEET

DATE: _____

JOB # 318064C

No 005971

JOB LOCATION: Part Colbourne (Middle bench)

DRILLER: Kevin Mabel

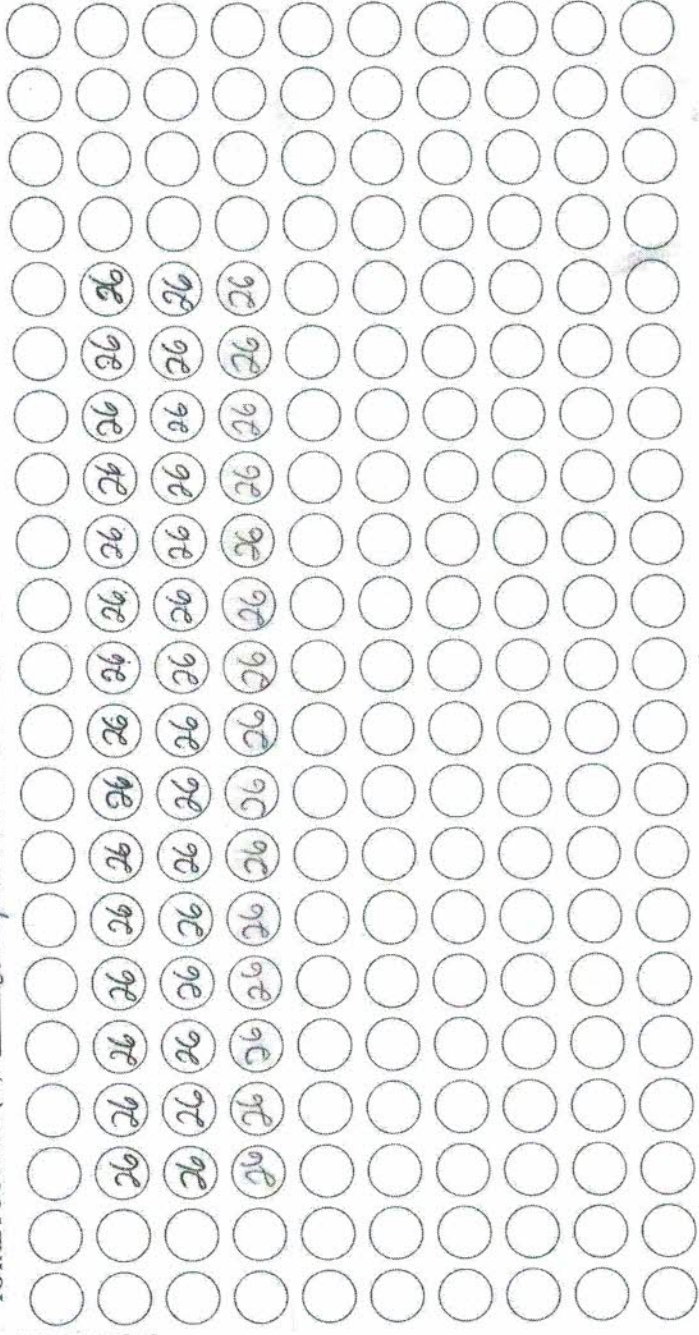
PATTERN: 13"x13"

SUB-DRILL (ft.): N/A

TOTAL FOOTAGE (ft.): 780' 1170' Holes 45

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____



CUT SHEET # _____

CUT SHEET # _____

CONSBEC INC.

BLAST LOG

DESIGN

REPORT

MINING + CONSTRUCTION

DATE Jun 3, 17 TIME 11:15 am
 CONTRACT / JOB # Low crush stone
 LOCATION Port Colborne

BLASTER James Cook

SIGNATURE 

No 022747

DESIGN:

BLAST TYPE Pen
 SIZE OF HOLES 4 inch
 NO. OF HOLES 45
 NO. OF DELAYS 45
 MAX. LOAD PER DELAY 58.9
 HOLES PER SERIES single
 POWDER FACTOR

EXPLOSIVES:

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2700 kg</u>
2) <u>Sensar booster</u>	<u>10mm / 1314 case</u>
3)	

DETONATORS / INITIATORS:

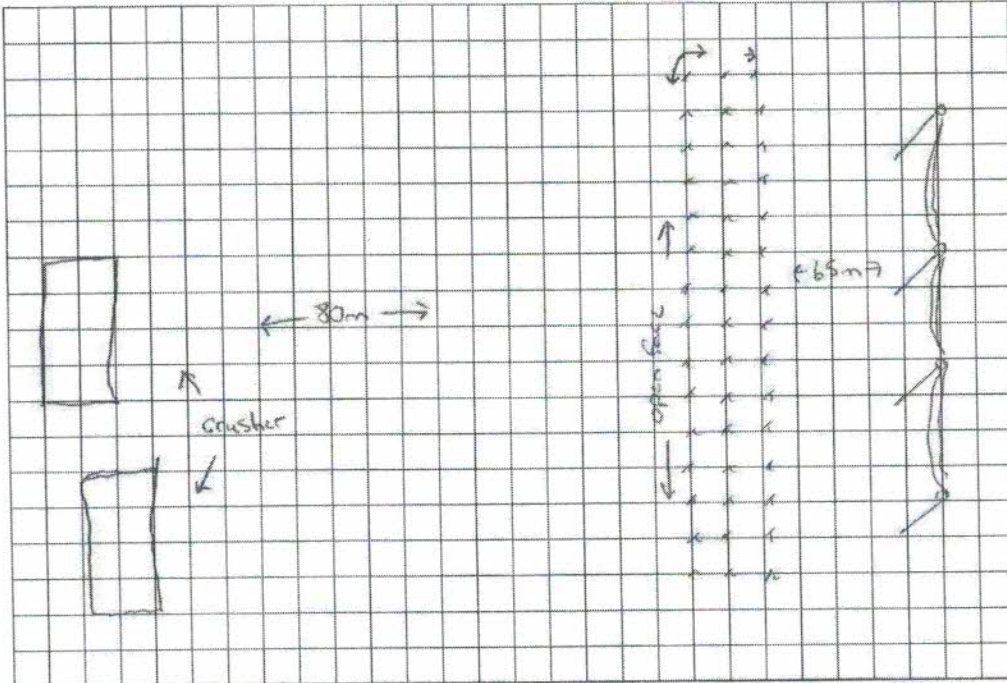
TYPE	LENGTH	# UNITS
1) <u>Dites 2500</u>	<u>15m</u>	<u>45</u>
2) <u>Dites 109/34</u>	<u>6m</u>	<u>12</u>
3) <u>Ele</u>	<u>366m</u>	<u>1</u>

LOADING:

COLLAR 7ft
 COLUMN LOAD emulsion
 TOE LOAD Sensar booster
 SUBGRADE off

DIMENSIONS:

WIDTH
 LENGTH
 AVE CUT 792 m AVE. DRILL DEPTH 792 m
 PATTERN : BURDEN 13.66 SPACING 13.11



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: cut good

FLYROCK DAMAGE: none



Event Report



11:15:00
Date/Time Tran at 11:00:42 June 8, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 113 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbac Inc.
 Converted: June 9, 2017 12:04:52 (V10.20)

Serial Number 0904 V 5.52 BlastMate II/477
Battery Level 6.5 Volts
Unit Calibration August 31, 2016 by InstanTel
File Name B904GXFQ.L60

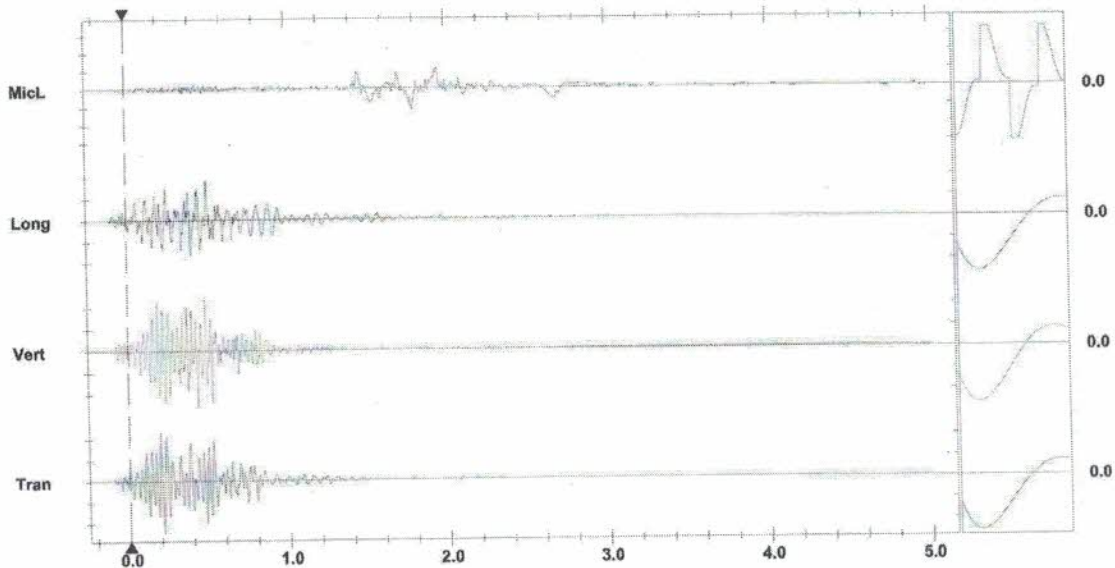
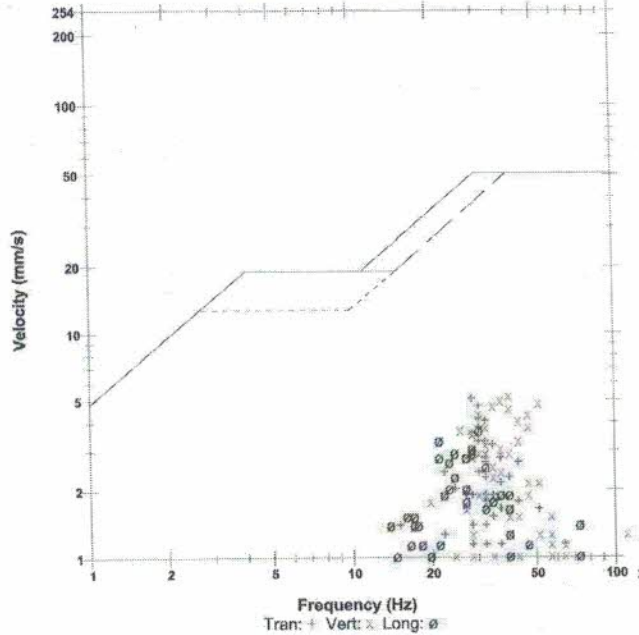
Extended Notes
 Hydro Pole Across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 109.5 dB(L) at 1.794 sec
ZC Freq 8.0 Hz
Channel Test Passed (Freq = 20.0 Hz Amp = 523 mv)

	Tran	Vert	Long	
PPV	5.08	5.21	3.68	mm/s
ZC Freq	28	43	30	Hz
Time (Rel. to Trig)	0.214	0.439	0.505	sec
Peak Acceleration	0.119	0.159	0.106	g
Peak Displacement	0.0272	0.0224	0.0209	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	8.2	7.7	Hz
Overswing Ratio	4.0	3.3	3.6	

Peak Vector Sum 6.62 mm/s at 0.233 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 5.00 pa.(L)/div
 Trigger = >

Sensor Check

CONSBEC INC.

MINING • CONSTRUCTION

Seismograph Report

Date	June 8, 2017	
Client	Waterford Sand & Gravel Limited	
Quarry Name	Law Crushed Stone Quarry	
Location	678 Barrick Road	
Company	Consbec Inc.	
Name of User	Kevin McPhee	
Seismograph Serial Number	BA10985	
Blast Report Number		
Time of Blast	11:15	
Trigger Levels	Mic	113 dB(L)
	Geo	1.00 mm/s
Results	Mic	did not trigger
	Tran	did not trigger
	Vert	did not trigger
	Long	did not trigger

Comments:

Seismograph readings did not
exceed trigger levels during the time
of the blast

Consbec Inc.

2736 Bellisle Drive, Val Caron, ON Canada P3N 1B3 T. 750.897.4971 F. 705.897.4565

www.consbec.com



Event Report



Histogram Start Time 09:53:30 June 8, 2017
Histogram Finish Time 11:54:01 June 8, 2017
Number of Intervals 1446 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.1 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L9B5GXDS.T60

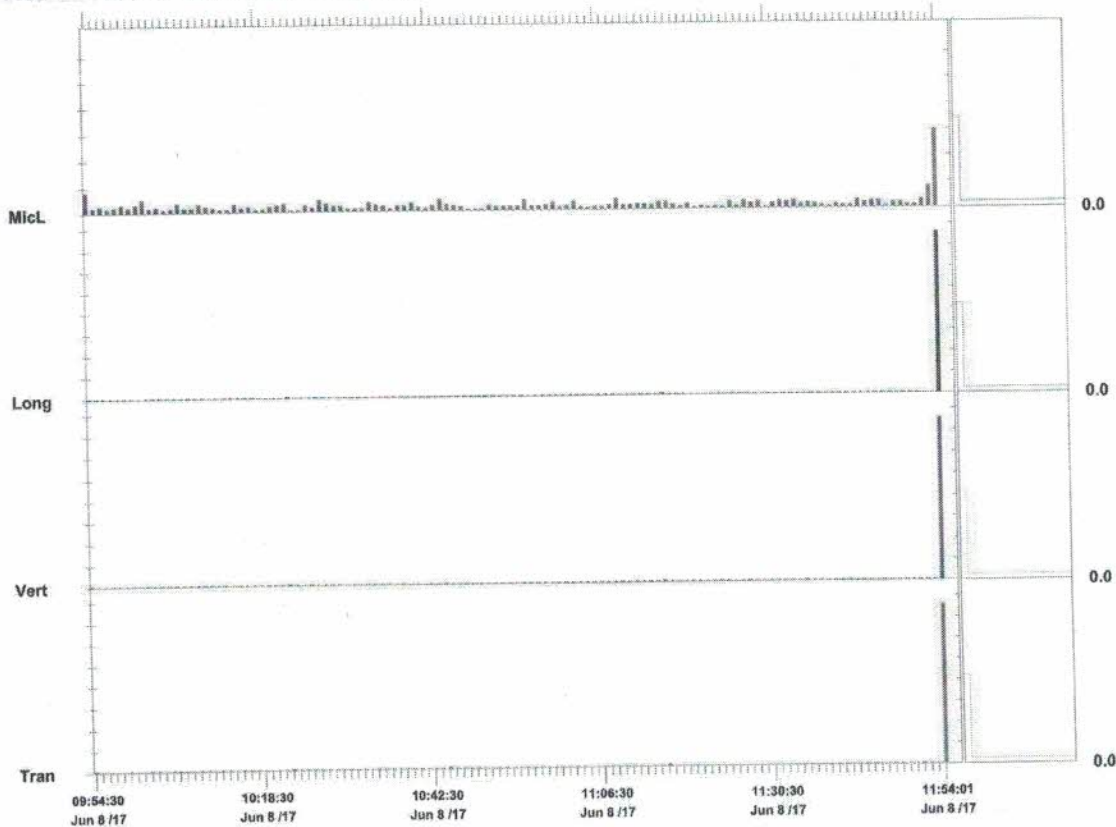
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes
 678 Barrick Road

Microphone Linear Weighting
PSPL 117.4 dB(L) on June 8, 2017 at 11:53:40
ZC Freq 12 Hz
Channel Test Check (Freq = 0.0 Hz Amp = 0 mv)

	Tran	Vert	Long	
PPV	75.7	75.7	75.9	mm/s
ZC Freq	85	85	85	Hz
Date	Jun 8 /17	Jun 8 /17	Jun 8 /17	
Time	11:53:40	11:53:40	11:53:40	
Sensor Check	Check	Check	Check	
Frequency	1024.0	1024.0	1024.0	Hz
Overswing Ratio	0.0	0.0	0.0	

Peak Vector Sum 131 mm/s on June 8, 2017 at 11:53:40



Time Scale: 1 minute /div Amplitude Scale:Geo: 10.00 mm/s/div Mic: 5.00 pa.(L)/div

Sensor Check

Event Type : Full Histogram
Serial Number : BA10985
Version : V 10.72-8.17 BlastMate III
File Name : __TEMP.EVT
Histogram Start Time : 09:53:30
Histogram Start Date : June 8, 2017
Histogram Stop Time : 11:54:01
Histogram Stop Date : June 8, 2017
Number of Intervals : 1446
Interval Size : 5 seconds
Sample Rate : 1024 sps
Battery Level : 6.1 Volts
Calibration : April 9, 2017 by InstanTel
Units : mm/s and dB(L)
Location : : Law Crushed Stone Quarry
Client : : Waterford Sand & Gravel Limited
User Name : : Consbec Inc
General : : Blast Vibration Monitoring
Extended Notes
678 Barrick Road
Geo Range : 254 mm/s
Tran PPV : 75.7 mm/s
Vert PPV : 75.7 mm/s
Long PPV : 75.9 mm/s
Tran ZC Freq : 85 Hz
Vert ZC Freq : 85 Hz
Long ZC Freq : 85 Hz
Tran Peak Time : 11:53:40
Tran Peak Date : June 8, 2017
Vert Peak Time : 11:53:40
Vert Peak Date : June 8, 2017
Long Peak Time : 11:53:40
Long Peak Date : June 8, 2017
Peak Vector Sum : 131 mm/s
Peak Vector Sum Time : 11:53:40
Peak Vector Sum Date : June 8, 2017
Microphone : Linear Weighting
MicL PSPL : 117.4 dB(L)
MicL Time : 11:53:40
MicL Date : June 8, 2017
MicL ZC Freq : 12 Hz
Tran Test Freq : 1024.0 Hz
Tran Test Ratio : 0.0
Tran Test Results : Check
Vert Test Freq : 1024.0 Hz
Vert Test Ratio : 0.0
Vert Test Results : Check
Long Test Freq : 1024.0 Hz
Long Test Ratio : 0.0

Long Test Results : Check

MicL Test Freq : 0.0 Hz

MicL Test Amplitude : 0 mv

MicL Test Results : Check

Monitor Log(s)

Jun 8 /17 09:53:29 Jun 8 /17 11:54:01 Event recorded. (Keyboard Exit)

PC SW Version : V10.20 - 10.20

Time	Tran PPV mm/s	Tran Freq Hz	Vert PPV mm/s	Vert Freq Hz	Long PPV mm/s	Long Freq Hz	Geo PVS mm/s	MicL PSPL pa.(L)	MicL PSPL dB(L)	MicL Freq Hz	
08-Jun-17											
9:53:35	0.127	>100	0.127	N/A	0.127	>100	0.22	3.25	104	4.6	
9:53:40	0.127	>100	0.127	>100	0.127	>100	0.22	2.75	103	>100	
9:53:45	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.5	>100	
9:53:50	0.381		73	0.381	64	0.254	>100	0.475	1	94	4.2
9:53:55	0.127	>100		0.127	>100	0.127	>100	0.22	4	106	26
9:54:00	0.127	>100		0.127	>100	0.127	>100	0.22	1.25	95.9	4.4
9:54:05	0.127	>100		0.127	>100	0.127	>100	0.22	1	94	27
9:54:10	0.127	>100		0.127	>100	0.127	>100	0.22	1	94	3.4
9:54:15	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:20	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	85
9:54:25	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	13
9:54:30	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	32
9:54:35	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	39
9:54:40	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:45	0.127	>100		0.127	>100	0.127	>100	0.22	1	94	6.9
9:54:50	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:54:55	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	9.5
9:55:00	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	47
9:55:05	0.127	>100		0.127	>100	0.127	>100	0.22	1	94	7.6
9:55:10	0.127	>100		0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:55:15	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	9.5
9:55:20	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:25	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:30	0.127	>100		0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:55:35	0.127	>100		0.127	>100	0.127	>100	0.22	1.25	95.9	9.3
9:55:40	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:45	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:55:50	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	8.4
9:55:55	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:56:00	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	47
9:56:05	0.127	>100		0.127	>100	0.127	>100	0.22	1	94	43
9:56:10	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	19
9:56:15	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	37
9:56:20	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	22
9:56:25	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	28
9:56:30	0.127	>100		0.127	>100	0.127	>100	0.22	0.5	88	>100
9:56:35	0.127	>100		0.127	>100	0.127	>100	0.22	0.25	81.9	>100
9:56:40	0.127	>100		0.127	>100	0.127	>100	0.22	0.75	91.5	34

11:10:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:10:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:10:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:10	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
11:11:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:25	0.254	0.381	0.127 >100	0.421	0.5	88
11:11:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:11:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:11:40	0.127 >100	0.254 >100	0.127 >100	0.254	1	94
11:11:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:11:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:11:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:00	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
11:12:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:15	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
11:12:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:12:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:12:45	0.127 >100	0.254 >100	0.127 >100	0.254	0.5	88
11:12:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:12:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:13:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:05	0.127 >100	0.127 >100	0.127 >100	0.22	1	94
11:13:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:13:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:25	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9
11:13:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5
11:13:45	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88
11:13:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:13:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88
11:14:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9
11:14:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9

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11:14:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:14:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:14:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:14:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:00	0.635	24	0.635	27	0.508	28	0.823	0.25	81.9
11:15:05	0.127 >100	0.127 >100	0.127 >100	0.22	1.25	95.9			
11:15:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:40	0.127 >100	0.254 >100	0.127 >100	0.284	0.5	88			
11:15:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:15:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:16:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:16:05	0.127 >100	0.127 >100	0.127 >100	0.22	1	94			
11:16:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:16:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:16:20	0.127 >100	0.127 >100	0.127 >100	0.22	1.25	95.9			
11:16:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:16:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5			
11:16:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:16:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:16:45	0.254 >100	0.127 >100	0.127 >100	0.254	0.5	88			
11:16:50	0.254 >100	0.127 >100	0.127 >100	0.254	0.25	81.9			
11:16:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:17:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.5			
11:17:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:17:30	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:17:35	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:40	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:45	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:17:50	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:17:55	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:18:00	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:18:05	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	88			
11:18:10	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:18:15	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:18:20	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			
11:18:25	0.127 >100	0.127 >100	0.127 >100	0.22	0.25	81.9			

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING + CONSTRUCTION

General

Project Low density

Location Port Colborne

Blast Date Jun 8/16

Context (urban/rural/quarry/road/ditch) quarry

Blast Type (test/production/clean-up/shear) prod

Name of Blaster James Graham

Blast Report # 022747

Previous Blast Report # Reviewed yes

Blast Area Designated Blast Area meters

Considerations Hydro/Bell Distance to blast meters

Notification of blasting required in writing attach correspondence

Request permission to re-route/shut down attach correspondence

Request utility representative to attend blast attach correspondence

Gas/Water Distance to blast meters

Notification of blasting required in writing attach correspondence

Roads/Highways Distance to blast meters

Construction Workers Distance to blast meters

Property Owners Distance to blast meters

Notification of blasting required in writing attach correspondence

Evacuation required in writing attach correspondence

MTO evacuation approval received in writing attach correspondence

200		meters
65		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
<input checked="" type="checkbox"/>		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
300		meters
400		meters
<input checked="" type="checkbox"/>		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence

Pre-Blast Designated Blast Area is cleared of workers and public prior to blast.....

Considerations Number of guards ea

Quantity (# of) blasting mats..... ea

Audible warning device used such as cannister or air horn N

Pre-blast survey complete N

	AM	time
4	PM	ea
0		ea
<input checked="" type="checkbox"/>	N	
<input checked="" type="checkbox"/>	N	

Post Blast Output Flyrock (If yes, give distance)..... meters

Considerations Vibration (reading)..... mm/s

Airblast (reading)..... dB

Fragmentation..... Good Bad

Movement..... Y N

		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries Person(s) Name _____

Time _____

Telephone # _____

Address _____

Reason for call _____

Action Notify Site Supervisor / Job Foreman N

Notify Head Office to investigate inquiries N

Changes What is required to reduce undesirables ? _____

BLAST LOG

DESIGN

MINING+CONSTRUCTION

REPORT

DATE June 20 2017 TIME 12:00

BLASTER Kevin M Phee
Please Print

CONTRACT / JOB # J18.064C

SIGNATURE [Signature]

LOCATION Port Colborne (middle end)

EXPLOSIVES: **No 022337**

DESIGN:

BLAST TYPE Quarry Open
 SIZE OF HOLES 4
 NO. OF HOLES 63
 NO. OF DELAYS 63
 MAX. LOAD PER DELAY 60.8 Kg
 HOLES PER SERIES 1
 POWDER FACTOR

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3.830 Kg</u>
2) <u>8oz Booster</u>	<u>63</u>
3)	

DETONATORS / INITIATORS:

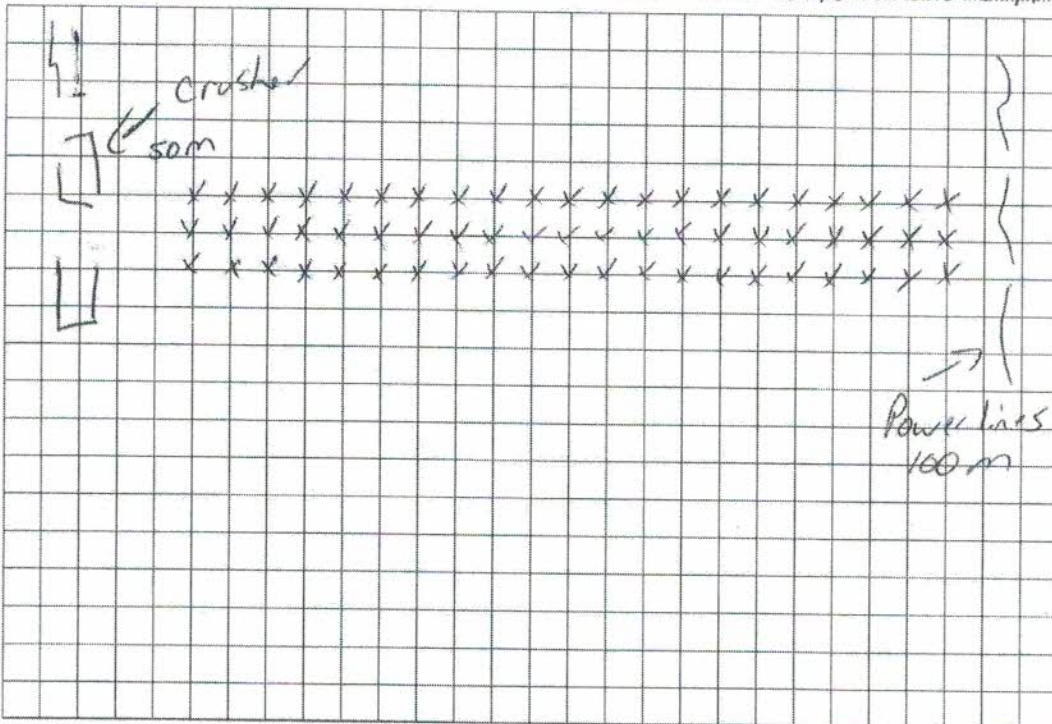
TYPE	LENGTH	# UNITS
1) <u>2.10 Emul. 25/400</u>	<u>15m</u>	<u>63</u>
2) <u>Jumper 5.10/10s</u>	<u>6m</u>	<u>9</u>
3) <u>Jumper 4.20/5</u>	<u>6m</u>	<u>6</u>

LOADING:

COLLAR 7 and adjusted accordingly
 COLUMN LOAD Emulsion
 TOE LOAD 8oz booster
 SUBGRADE

DIMENSIONS:

WIDTH 11.79 m
 LENGTH 83.16
 AVE CUT 7.922 AVE. DRILL DEPTH 7.922
 PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton = 20343.67 tons

FLYROCK DAMAGE:

HAZARDS & DISTANCE: see diagram

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #s: 00 8407

BULK USED? YES NO

BULK TRUCK NUMBER'S

BULK TRUCK DRIVER

MINING+CONSTRUCTION

DATE June 20/17 TIME 11:36am
 CONTRACT / JOB # Low crush Stone
 LOCATION Part 1 Collier

BLASTER James Graham
Please Print
 SIGNATURE [Signature]

23451

DESIGN:

BLAST TYPE Per
 SIZE OF HOLES 4
 NO. OF HOLES 63
 NO. OF DELAYS 63
 MAX. LOAD PER DELAY 60kg
 HOLES PER SERIES single
 POWDER FACTOR.....

EXPLOSIVES:

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>3814 kg</u>
2) <u>Banner booster</u>	<u>13.5 / 1 case</u>
3) .....	.....

DETONATORS / INITIATORS:

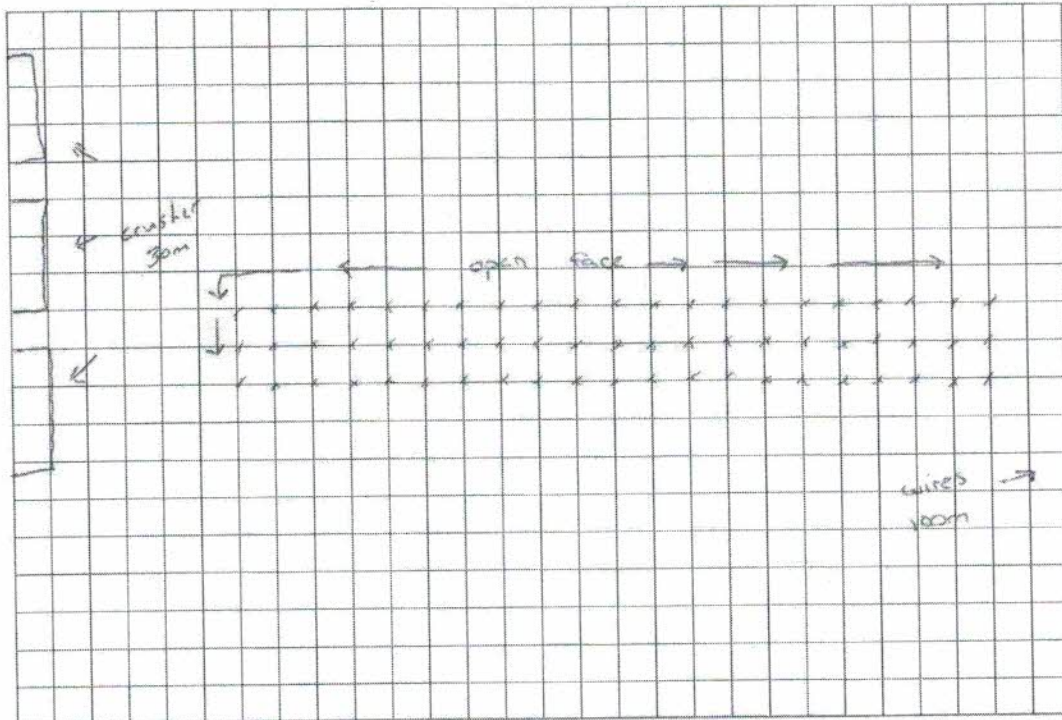
TYPE	LENGTH	# UNITS
1) <u>Nitro 25/500</u>	<u>1.5m</u>	<u>63</u>
2) <u>Nitro 109/17ms</u>	<u>6m</u>	<u>15</u>
3) <u>Electric</u>	<u>2.65m</u>	<u>1</u>

LOADING:

COLLAR 7ft 5 according
 COLUMN LOAD emulsion
 TOE LOAD Banner booster
 SUBGRADE off

DIMENSIONS:

WIDTH.....
 LENGTH.....
 AVE CUT 26ft AVE. DRILL DEPTH 26ft
 PATTERN : BURDEN 13 SPACING 13



PRE BLAST DESIGN

NOTES / REMARKS: all good
* front hole took a bit as rock was
undermined

HAZARDS & DISTANCE: 30m crusher / 100m wire

IS THERE A GUARDING PLAN & PROCEDURE? YES NO
 ARE GUARDS IN PLACE? YES NO
 WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO
 CUT SHEET #'s.....

POST BLAST REPORT

FLYROCK DAMAGE: none

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

SEISMIC DATA: UNIT #'s.....

WIND DIRECTION VELOCITY: S/W

ATMOSPHERIC CONDITIONS: sun / cloud

BULK USED? YES NO

BULK TRUCK NUMBER's 13/

BULK TRUCK DRIVER [Signature]

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project Miller
 Location Post carbon
 Blast Date May 19/17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) pro
 Name of Blaster James Graham
 Blast Report # 022738
 Previous Blast Report # Reviewed yes

Blast Area Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

200		meters
0		meters
Y	N	attach correspondence
Y	N	attach correspondence
Y	N	attach correspondence
0		meters
Y	N	attach correspondence
		meters
500		meters
0		meters
Y	N	attach correspondence
Y	N	attach correspondence
Y	N	attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

	AM	time
	PM	
4		ea
0		ea
Y	N	
Y	N	

Post Blast Considerations

Output Flyrock (if yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

100		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action Notify Site Supervisor / Job Foreman

Y	N
---	---

 Notify Head Office to investigate inquiries

Y	N
---	---

Changes What is required to reduce undesirables ? _____

Seismograph Report

Date	20-Jun-17	
Client	Waterford Sand & Gravel	
Quarry Name	Law Crushed Stone	
Location	Hydro Pole Across from 2035 Youngs Road	
Company	Consbec Inc.	
Name of User	Kevin Mcphee	
Seismograph Serial Number	904	
Blast Report Number	23451	
Time of Blast	11:32	
Trigger Levels	Mic	113.1 dB(L)
	Geo	1.00 mm/s
Results	Mic	Did not trigger due to insufficient memory
	Tran	Did not trigger due to insufficient memory
	Vert	Did not trigger due to insufficient memory
	Long	Did not trigger due to insufficient memory

Comments:

The strong winds exceeding the seismographs mic trigger level caused 23 false events between 10:40 to 11:03 therefore, the unit aborted recording due to lack of memory space . Corrective action will be taken to ensure a more updated and reliable unit is used in the future.

Seismograph Report

Date	20-Jun-17	
Client	Waterford Sand & Gravel	
Quarry Name	Law Crushed Stone	
Location	40 Townline Rd S	
Company	Consbec Inc.	
Name of User	Kevin Mcphee	
Seismograph Serial Number	BA10985	
Blast Report Number	23451	
Time of Blast	11:32	
Trigger Levels	Mic	113 dB(L)
	Geo	1.00 mm/s
Results	Mic	115.4 dB(L)
	Tran	4.953 mm/s
	Vert	2.53 mm/s
	Long	5.207 mm/s

Comments:

Please note that the seismograph location was changed from 678 Barrick Road to 40 Townline Road S.

Histogram Start Time 10:47:08 June 20, 2017
Histogram Finish Time 12:02:58 June 20, 2017
Number of Intervals 910.00 at 5 seconds
Range Geo:254.0 mm/s
Sample Rate 1024sps

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.2 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name L985GY03.AKO

Notes

Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

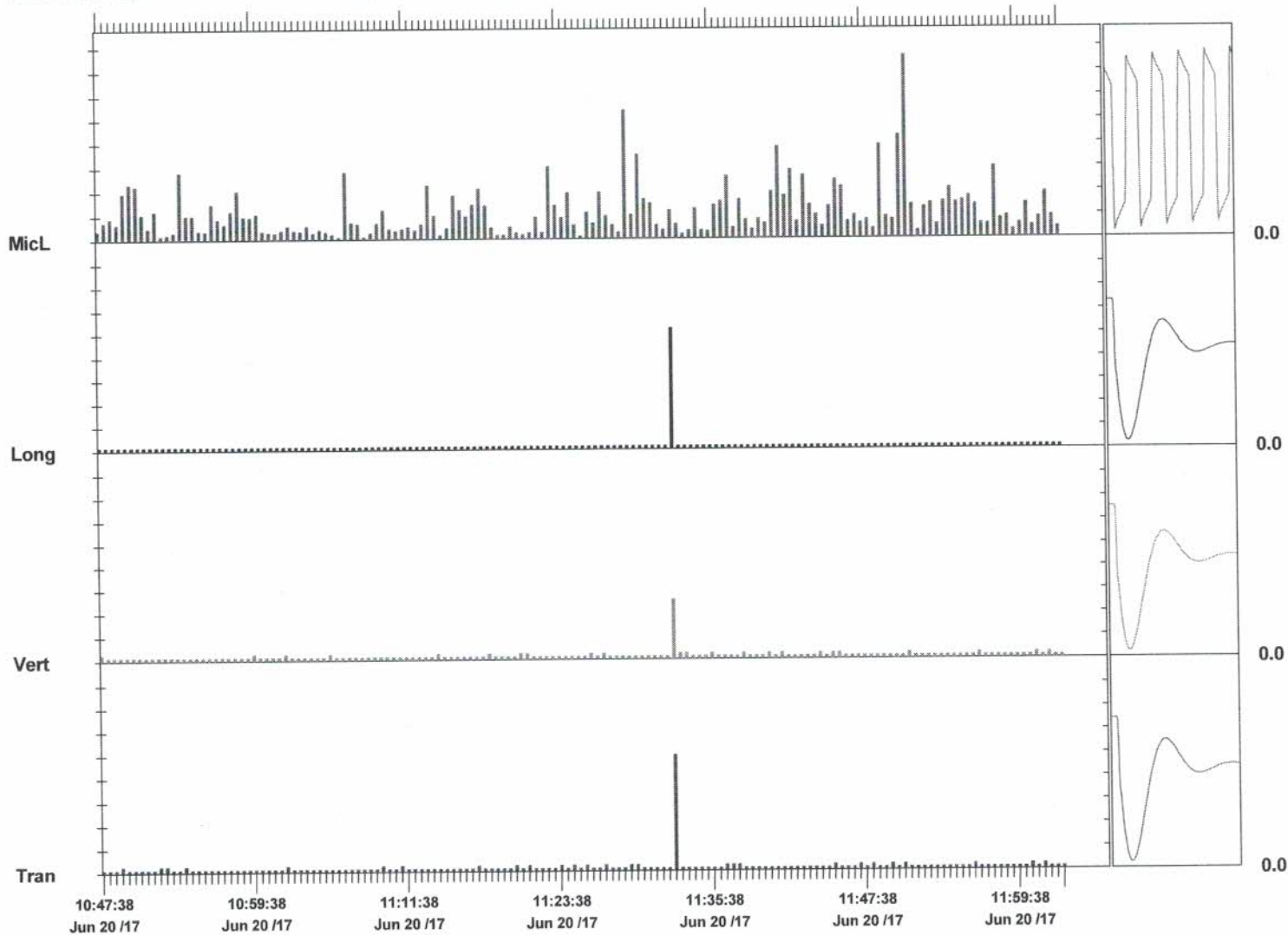
Extended Notes

678 Barrick Road

Microphone Linear Weighting
PSPL 131.6 dB(L) on June 20, 2017 at 11:51:03
ZC Freq 10 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 554 mv)

	Tran	Vert	Long	
PPV	4.953	2.540	5.207	mm/s
ZC Freq	32	43	28	Hz
Date	Jun 20 /17	Jun 20 /17	Jun 20 /17	
Time	11:32:23	11:32:23	11:32:23	
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.6	7.4	Hz
Overswing Ratio	3.6	3.8	3.8	

Peak Vector Sum 6.888 mm/s on June 20, 2017 at 11:32:23



Sensor Check

Event Type : Full Histogram
Serial Number : BA10985
Version : V 10.72-8.17 BlastMate III
File Name : L985GY03.AK0
Histogram Start Time : 10:47:08
Histogram Start Date : June 20, 2017
Histogram Stop Time : 12:02:58
Histogram Stop Date : June 20, 2017
Number of Intervals : 910.00
Interval Size : 5 seconds
Sample Rate : 1024 sps
Battery Level : 6.2 Volts
Calibration : April 9, 2017 by InstanTel
Units : mm/s and dB(L)
Location: : Law Crushed Stone Quarry
Client: : Waterford Sand & Gravel Limited
User Name: : Consbec Inc
General: : Blast Vibration Monitoring
Extended Notes
678 Barrick Road
Geo Range : 254.0 mm/s
Tran PPV : 4.953 mm/s
Vert PPV : 2.540 mm/s
Long PPV : 5.207 mm/s
Tran ZC Freq : 32 Hz
Vert ZC Freq : 43 Hz
Long ZC Freq : 28 Hz
Tran Peak Time : 11:32:23
Tran Peak Date : June 20, 2017
Vert Peak Time : 11:32:23
Vert Peak Date : June 20, 2017
Long Peak Time : 11:32:23
Long Peak Date : June 20, 2017
Peak Vector Sum : 6.888 mm/s
Peak Vector Sum Time : 11:32:23
Peak Vector Sum Date : June 20, 2017
Microphone : Linear Weighting
MicL PSPL : 131.6 dB(L)
MicL Time : 11:51:03
MicL Date : June 20, 2017
MicL ZC Freq : 10 Hz
Tran Test Freq : 7.7 Hz
Tran Test Ratio : 3.6
Tran Test Results : Passed
Vert Test Freq : 7.6 Hz
Vert Test Ratio : 3.8
Vert Test Results : Passed
Long Test Freq : 7.4 Hz

Long Test Ratio : 3.8

Long Test Results : Passed

MicL Test Freq : 20.1 Hz

MicL Test Amplitude : 554 mv

MicL Test Results : Passed

Monitor Log(s)

Jun 20 /17 10:47:07 Jun 20 /17 12:02:58 Event recorded. (Keyboard Exit)

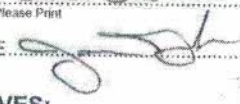
PC SW Version : V10.72 - 10.72.1

Time	Tran PPV mm/s	Tran Freq Hz	Vert PPV mm/s	Vert Freq Hz	Long PPV mm/s	Long Freq Hz	Geo PVS mm/s	MicL PSPL pa.(L)	MicL PSPL dB(L)	MicL Freq Hz
20-Jun-17										
10:47:13	0.127	N/A	0.254	>100	0.127	>100	0.284	2	100	12
10:47:18	0.127	>100	0.127	>100	0.127	>100	0.22	1.25	95.92	7.6
10:47:23	0.127	>100	0.127	>100	0.127	>100	0.22	2.5	101.9	12
10:47:28	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.48	43
10:47:33	0.127	>100	0.127	>100	0.127	>100	0.22	2	100	15
10:47:38	0.127	>100	0.254	>100	0.127	>100	0.311	3.75	105.5	7.3
10:47:43	0.127	>100	0.127	>100	0.127	>100	0.22	5.5	108.8	24
10:47:48	0.127	>100	0.127	>100	0.127	>100	0.22	1.5	97.5	13
10:47:53	0.127	>100	0.127	>100	0.127	>100	0.22	2.25	101	6
10:47:58	0.127	>100	0.127	>100	0.127	>100	0.22	7.25	111.2	3.3
10:48:03	0.127	>100	0.127	>100	0.127	>100	0.22	2	100	18
10:48:08	0.127	>100	0.127	>100	0.127	>100	0.22	1.25	95.92	5.3
10:48:13	0.127	>100	0.127	>100	0.127	>100	0.22	7	110.9	8.3
10:48:18	0.127	>100	0.127	>100	0.127	>100	0.22	4	106	5.3
10:48:23	0.127	>100	0.127	>100	0.127	>100	0.22	3.25	104.2	9
10:48:28	0.127	>100	0.127	>100	0.127	>100	0.22	8.75	112.8	9.8
10:48:33	0.127	>100	0.127	>100	0.127	>100	0.22	6	109.5	N/A
10:48:38	0.127	>100	0.127	>100	0.127	>100	0.22	4.25	106.5	3.1
10:48:43	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.48	19
10:48:48	0.127	>100	0.127	>100	0.127	>100	0.22	1	93.98	23
10:48:53	0.127	>100	0.127	>100	0.127	>100	0.22	6.5	110.2	7.3
10:48:58	0.127	>100	0.127	>100	0.127	>100	0.22	3.5	104.9	8.8
10:49:03	0.127	>100	0.127	>100	0.127	>100	0.22	2.5	101.9	9.8
10:49:08	0.254	>100	0.127	>100	0.127	>100	0.254	5	108	5.1
10:49:13	0.127	>100	0.127	>100	0.127	>100	0.22	19.5	119.8	12
10:49:18	0.127	>100	0.127	>100	0.127	>100	0.22	2.25	101	13
10:49:23	0.127	>100	0.127	>100	0.127	>100	0.22	0.75	91.48	6
10:49:28	0.127	>100	0.127	>100	0.127	>100	0.22	2.25	101	37
10:49:33	0.127	>100	0.127	>100	0.127	>100	0.22	2.5	101.9	13
10:49:38	0.127	>100	0.127	>100	0.127	>100	0.22	1	93.98	18
10:49:43	0.127	>100	0.127	>100	0.127	>100	0.22	1.75	98.84	4.3
10:49:48	0.127	>100	0.127	>100	0.127	>100	0.22	1	93.98	37
10:49:53	0.127	>100	0.127	>100	0.127	>100	0.22	2.25	101	8
10:49:58	0.127	>100	0.127	>100	0.127	>100	0.22	3.75	105.5	21
10:50:03	0.127	>100	0.127	>100	0.127	>100	0.22	5.75	109.2	4.2
10:50:08	0.127	>100	0.127	>100	0.127	>100	0.22	23.25	121.3	N/A

11:30:13	0.127 >100	0.127 >100	0.127 >100	0.22	10	114	3.3			
11:30:18	0.127 >100	0.127 >100	0.127 >100	0.22	6	109.5	3.4			
11:30:23	0.127 >100	0.127 >100	0.127 >100	0.22	2.25	101	4.5			
11:30:28	0.127 >100	0.127 >100	0.127 >100	0.22	4.25	106.5	3.3			
11:30:33	0.127 >100	0.127 >100	0.127 >100	0.22	16.5	118.3	10			
11:30:38	0.127 >100	0.127 >100	0.127 >100	0.22	6.25	109.9	14			
11:30:43	0.127 >100	0.127 >100	0.127 >100	0.22	14.75	117.4	8.4			
11:30:48	0.127 >100	0.127 >100	0.127 >100	0.22	7.75	111.8	6.5			
11:30:53	0.127 >100	0.127 >100	0.127 >100	0.22	8.25	112.3	5.6			
11:30:58	0.127 >100	0.127 >100	0.127 >100	0.22	6	109.5	7.6			
11:31:03	0.127 >100	0.127 >100	0.127 >100	0.22	6.25	109.9	10			
11:31:08	0.127 >100	0.127 >100	0.127 >100	0.22	7.5	111.5	5.3			
11:31:13	0.127 >100	0.127 >100	0.127 >100	0.22	3.5	104.9	3.4			
11:31:18	0.127 >100	0.127 >100	0.127 >100	0.22	3.5	104.9	9.7			
11:31:23	0.127 >100	0.127 >100	0.127 >100	0.22	1.75	98.84	13			
11:31:28	0.127 >100	0.127 >100	0.127 >100	0.22	4.25	106.5	4.2			
11:31:33	0.127 >100	0.127 >100	0.127 >100	0.22	2.5	101.9	11			
11:31:38	0.127 >100	0.127 >100	0.127 >100	0.22	5.75	109.2	5.3			
11:31:43	0.127 >100	0.127 >100	0.127 >100	0.22	2.5	101.9	13			
11:31:48	0.127 >100	0.127 >100	0.127 >100	0.22	3.5	104.9	19			
11:31:53	0.127 >100	0.127 >100	0.127 >100	0.22	3.5	104.9	23			
11:31:58	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	87.96 >100				
11:32:03	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	87.96 >100				
11:32:08	0.127 >100	0.127 >100	0.127 >100	0.22	2.25	101	11			
11:32:13	0.127 >100	0.127 >100	0.127 >100	0.22	2.75	102.8	4.2			
11:32:18	0.127 >100	0.127 >100	0.127 >100	0.22	3.5	104.9	9.5			
11:32:23	4.953	32	2.54	43	5.207	28	6.888	10.5	114.4	16
11:32:28	0.127 >100	0.127 >100	0.127 >100	0.127 >100	0.22	11.75	115.4	10		
11:32:33	0.127 >100	0.127 >100	0.127 >100	0.22	2.5	101.9	8.3			
11:32:38	0.254 >100	0.127 >100	0.127 >100	0.254	2.5	101.9	4.9			
11:32:43	0.127 >100	0.127 >100	0.127 >100	0.22	6	109.5	5.9			
11:32:48	0.127 >100	0.127 >100	0.127 >100	0.22	1.5	97.5	5.2			
11:32:53	0.127 >100	0.127 >100	0.127 >100	0.22	2.5	101.9	8.8			
11:32:58	0.127 >100	0.254 >100	0.127 >100	0.284	0.25	81.94 >100				
11:33:03	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	23			
11:33:08	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	16			
11:33:13	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	17			
11:33:18	0.127 >100	0.254 >100	0.127 >100	0.311	1.75	98.84	3.5			
11:33:23	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	43			
11:33:28	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	87.96 >100				
11:33:33	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	9.7			
11:33:38	0.127 >100	0.127 >100	0.127 >100	0.22	0.75	91.48	11			
11:33:43	0.127 >100	0.127 >100	0.127 >100	0.22	0.5	87.96 >100				
11:33:48	0.127 >100	0.127 >100	0.127 >100	0.22	3.25	104.2	4.7			
11:33:53	0.127 >100	0.127 >100	0.127 >100	0.22	3	103.5	3.7			
11:33:58	0.127 >100	0.127 >100	0.127 >100	0.22	1	93.98	5.9			
11:34:03	0.127 >100	0.127 >100	0.127 >100	0.22	2	100	4.2			
11:34:08	0.127 >100	0.127 >100	0.127 >100	0.22	1.5	97.5	9.3			

MINING + CONSTRUCTION

DATE Jun 28/17 TIME 10:12am
 CONTRACT / JOB # landfill site
 LOCATION Ed Colton

BLASTER James Graham
Please Print
 SIGNATURE 
 EXPLOSIVES: 23455

DESIGN:

BLAST TYPE Production
 SIZE OF HOLES 4 inch
 NO. OF HOLES 48
 NO. OF DELAYS 48
 MAX. LOAD PER DELAY 389 kg
 HOLES PER SERIES Single
 POWDER FACTOR

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>2827</u>
2) <u>Granular booster</u>	<u>10 / 34 case</u>
3)	

DETONATORS / INITIATORS:

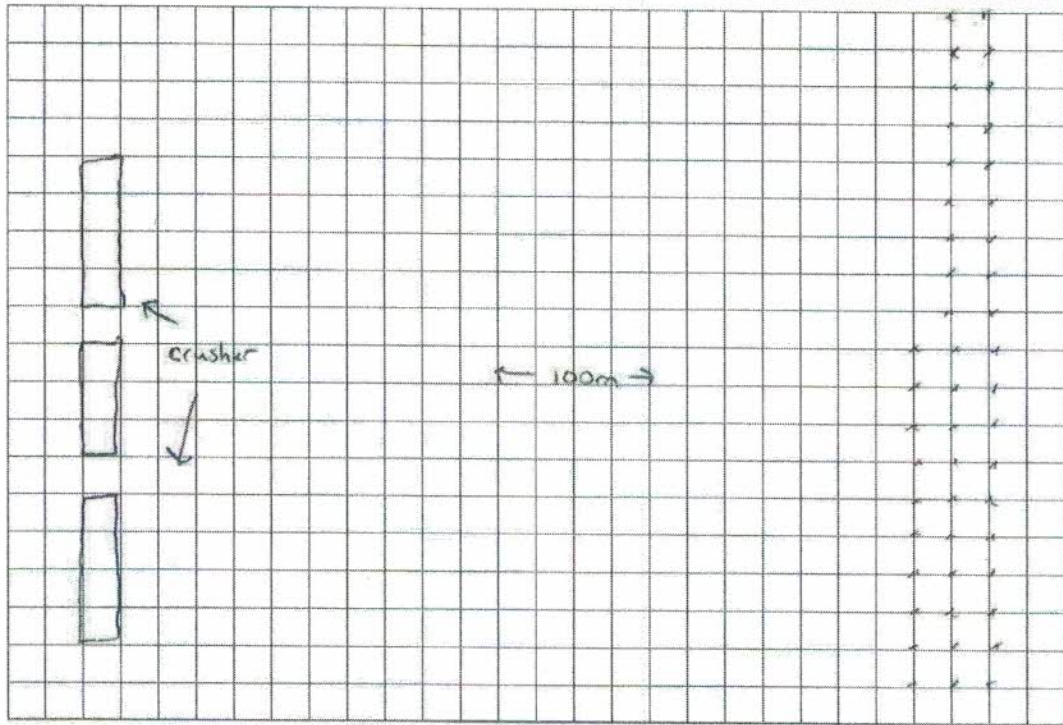
TYPE	LENGTH	# UNITS
1) <u>M.I.O. 25/500</u>	<u>15m</u>	
2) <u>M.I.O. 109/34ms</u>	<u>6m</u>	<u>10</u>
3) <u>Electric</u>	<u>3.66m</u>	<u>1</u>

LOADING:

COLLAR 7ft & according
 COLUMN LOAD emulsion
 TOE LOAD granular booster
 SUBGRADE

DIMENSIONS:

WIDTH
 LENGTH
 AVE CUT 3.65 AVE. DRILL DEPTH 16ft
 PATTERN: BURDEN 13 SPACING 13



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: aligned

FLYROCK DAMAGE: None

HAZARDS & DISTANCE: 100m crusher / 75m wires

MISFIRE: YES NO
 IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: gd UNIT #s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: S/W

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: sun

CUT SHEET #'s

BULK USED? YES NO

BULK TRUCK NUMBER's 131

BULK TRUCK DRIVER Dave

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING + CONSTRUCTION

General

Project Lamb crush stone
 Location Port Colborne
 Blast Date Jun 25/17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) po
 Name of Blaster James Graham
 Blast Report # 23455
 Previous Blast Report # Reviewed Yes

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

<u>200m</u>			meters
<u>75m</u>			meters
Y	<input checked="" type="checkbox"/>	N	attach correspondence
Y	<input checked="" type="checkbox"/>	N	attach correspondence
Y	<input checked="" type="checkbox"/>	N	attach correspondence
<u>0</u>			meters
Y	<input checked="" type="checkbox"/>	N	attach correspondence
<u>300</u>			meters
<u>300</u>			meters
<u>900</u>			meters
Y	<input checked="" type="checkbox"/>	N	attach correspondence
Y	<input checked="" type="checkbox"/>	N	attach correspondence
Y	<input checked="" type="checkbox"/>	N	attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

		AM	PM	time
<u>4</u>				ea
<u>0</u>				ea
<input checked="" type="checkbox"/>		N		
<input checked="" type="checkbox"/>		N		

Post Blast Considerations

Output Flyrock (if yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

<u>none</u>			meters
			mm/s
			dB
<input checked="" type="checkbox"/>		Bad	
<input checked="" type="checkbox"/>		N	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN

REPORT

DATE TIME

CONTRACT / JOB # J18.064C

LOCATION Port Colbourne Laminated Stone

DESIGN:

BLAST TYPE Quarry open

SIZE OF HOLES 44

NO. OF HOLES 44

NO. OF DELAYS 44

MAX. LOAD PER DELAY 60.8 Kgs

HOLES PER SERIES 1

POWDER FACTOR

LOADING:

COLLAR 2.13m and adjusted accordingly

COLUMN LOAD Emulsion

TOE LOAD 8oz Booster

SUBGRADE

BLASTER Kevin M Hop
Please Print

SIGNATURE [Signature]

EXPLOSIVES: **No 022338**

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2675 Kgs</u>
2) <u>8oz Booster</u>	<u>44</u>
3) .....	.....

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Ultra Energy 250</u>	<u>15</u>	<u>44</u>
2) <u>Juniper 3 100ms 6m</u>	<u>6m</u>	<u>8</u>
3) <u>Juniper 42ms 6m</u>	<u>6m</u>	<u>7</u>

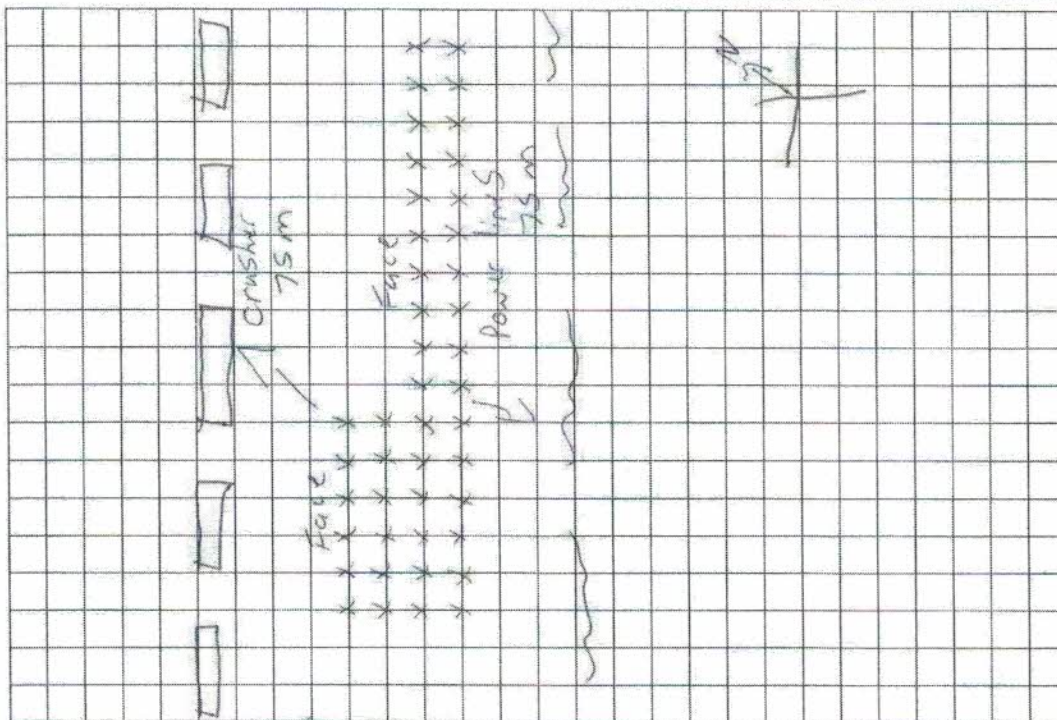
DIMENSIONS:

WIDTH 15.84m

LENGTH 63.36m

AVE CUT 7.92 AVE. DRILL DEPTH 7.92

PATTERN : BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est Ton = 14208

HAZARDS & DISTANCE: See diagram

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

ARE GUARDS IN PLACE? YES NO

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

CUT SHEET #'s (008408)

FLYROCK DAMAGE:

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

SEISMIC DATA: UNIT #'s

WIND DIRECTION VELOCITY:

ATMOSPHERIC CONDITIONS:

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER

Date/Time Long at 10:12:20 June 28, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 114 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GYEV.0K0

Notes
 location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

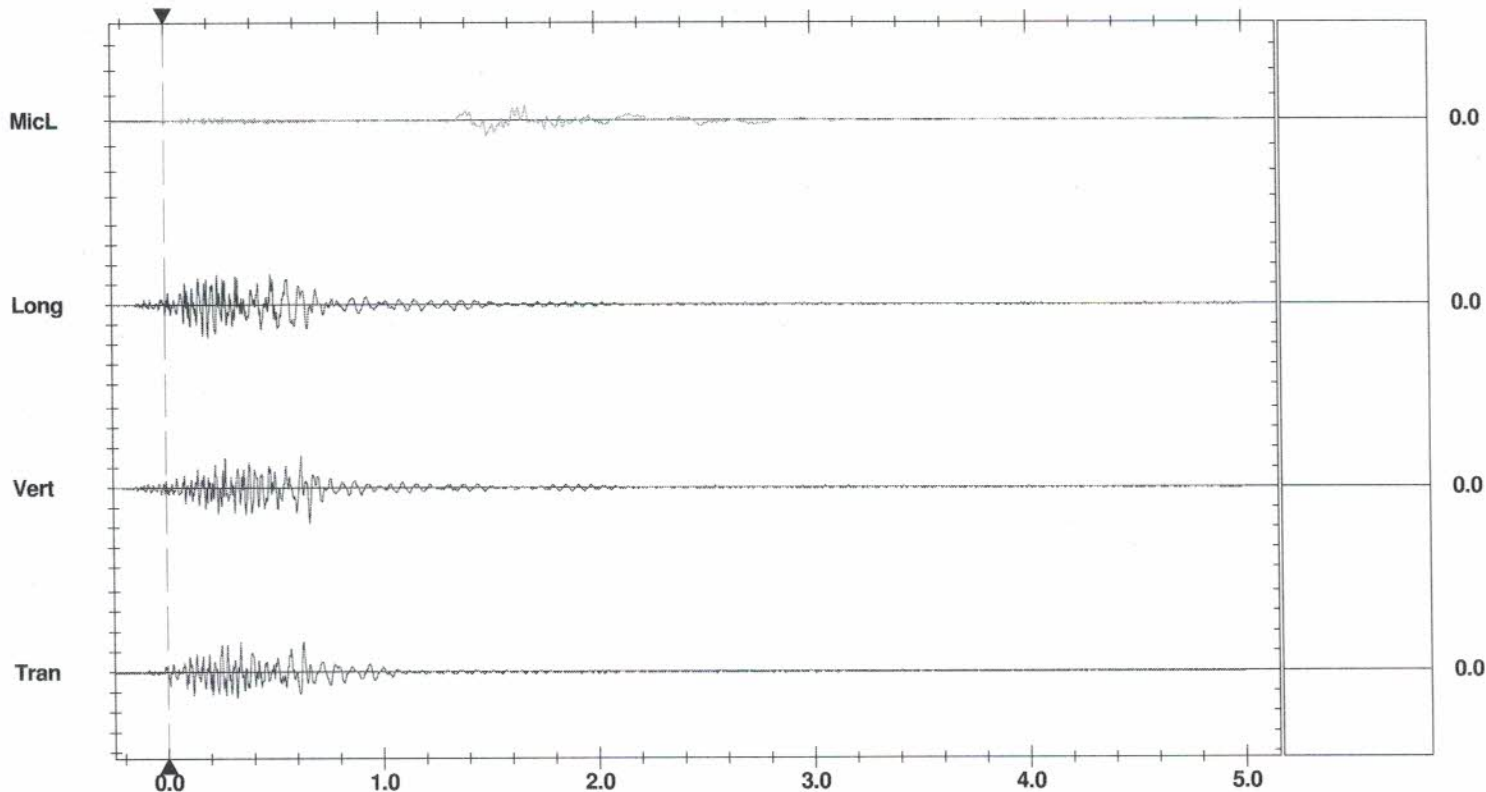
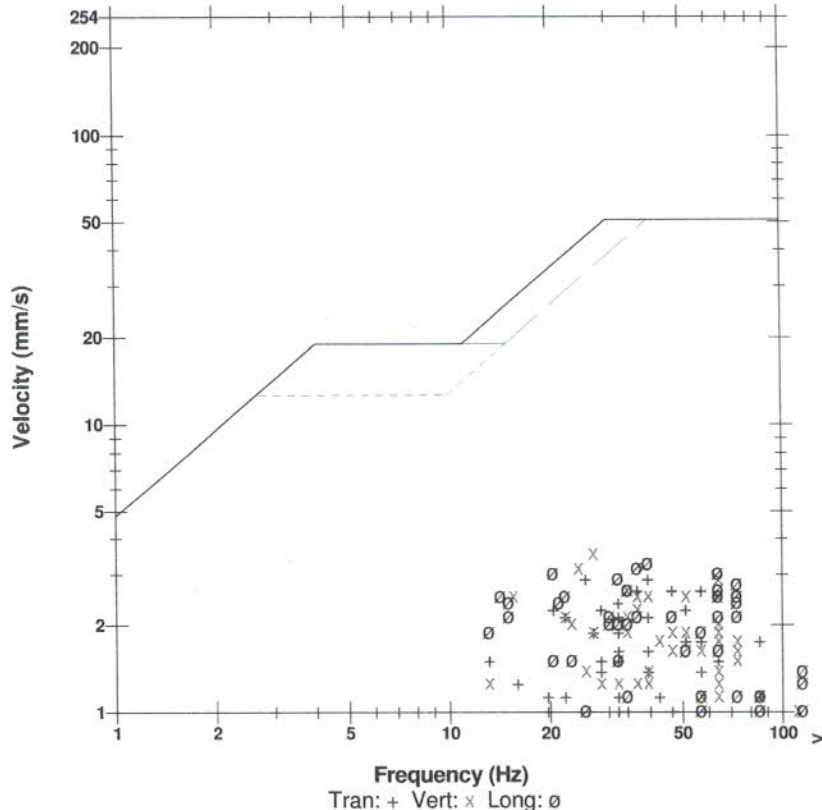
Extended Notes
 Combo Mode June 28, 2017 09:33:57
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 109.5 dB(L) at 1.678 sec
ZC Freq 17 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.92	3.56	3.30	mm/s
ZC Freq	39	27	39	Hz
Time (Rel. to Trig)	0.339	0.665	0.198	sec
Peak Acceleration	0.106	0.119	0.133	g
Peak Displacement	0.0172	0.0192	0.0262	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.00 mm/s at 0.242 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

Date/Time Vert at 10:12:20 June 28, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 2, 2016 by InstanTel.
File Name N758GYEV.0K0

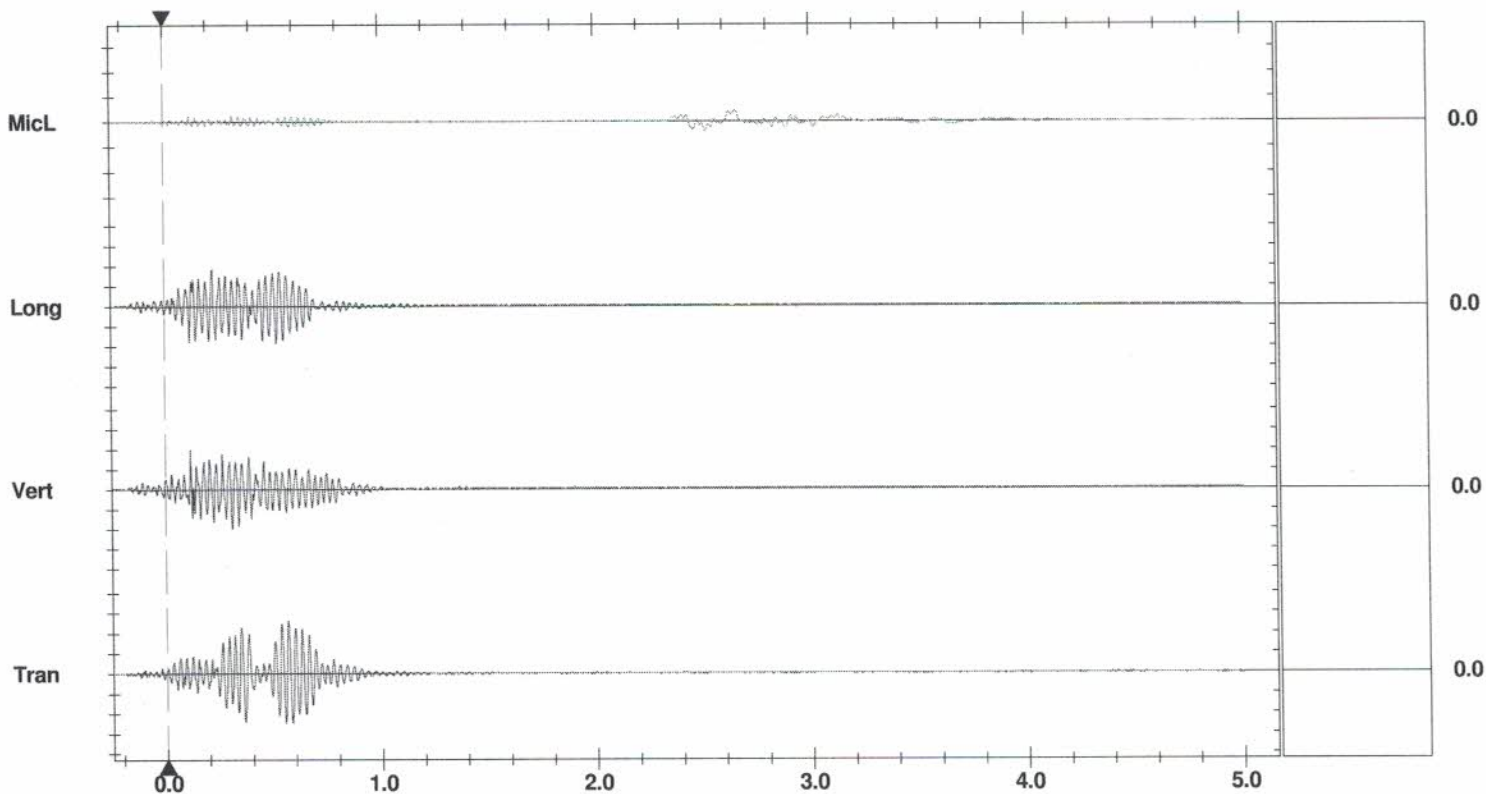
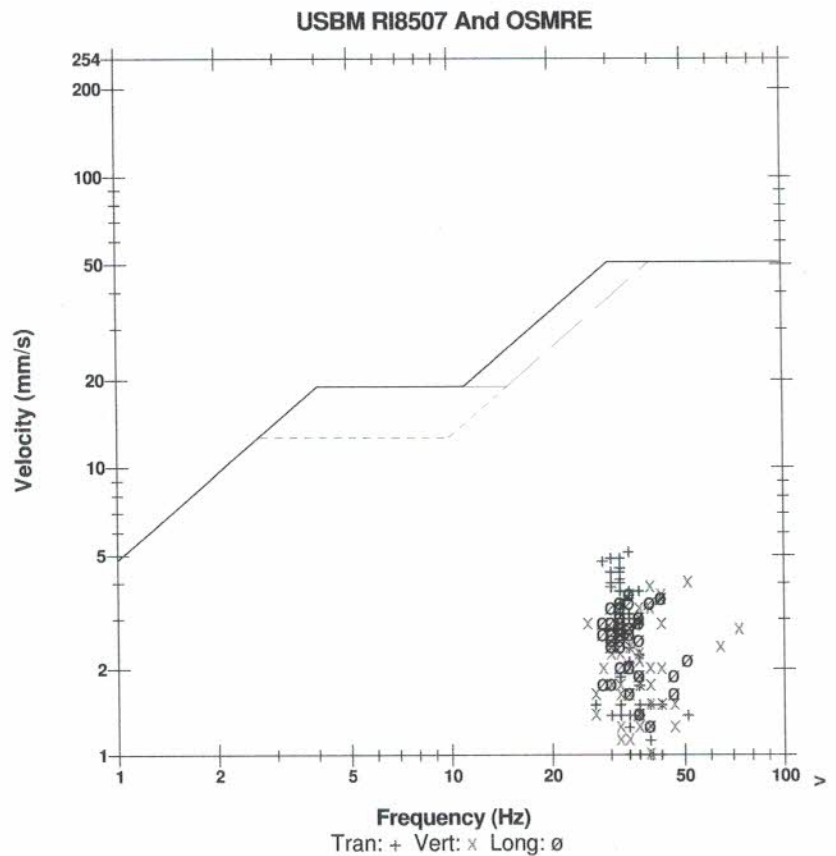
Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes
 Combo Mode June 28, 2017 09:40:24
 40 Townline Road S

Microphone Linear Weighting
PSPL 107.5 dB(L) at 2.655 sec
ZC Freq 7.3 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	5.21	4.06	3.68	mm/s
ZC Freq	34	51	34	Hz
Time (Rel. to Trig)	0.563	0.117	0.222	sec
Peak Acceleration	0.119	0.133	0.119	g
Peak Displacement	0.0274	0.0161	0.0180	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 6.10 mm/s at 0.564 sec



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger = $\blacktriangleleft \longrightarrow \blacktriangleright$

Sensor Check

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE Jun 28/17 TIME 11:35
CONTRACT / JOB # Low creek stn
LOCATION Pct Colman

BLASTER James Graham
Please Print
SIGNATURE [Signature]

23456

DESIGN:

BLAST TYPE Production
SIZE OF HOLES 4 inch
NO. OF HOLES 33
NO. OF DELAYS 33
MAX. LOAD PER DELAY 58.6
HOLES PER SERIES single
POWDER FACTOR

EXPLOSIVES:

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>1933 kg</u>
2) <u>Bounce booster</u>	<u>5kg / 1/2 cms</u>
3)	

LOADING:

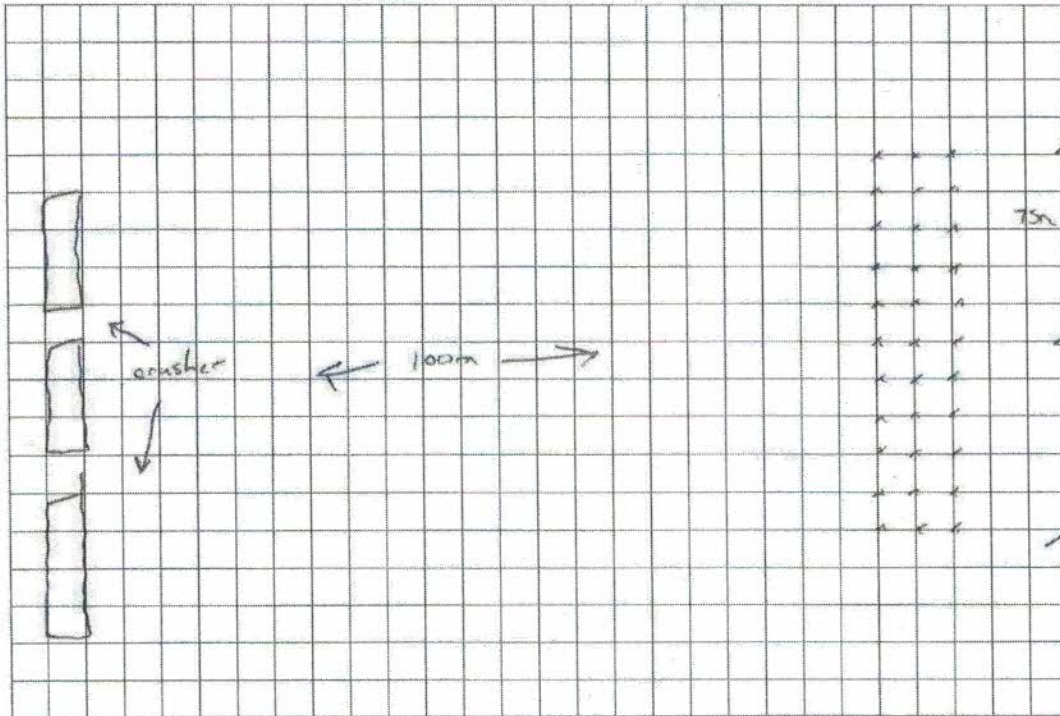
COLLAR 7ft & according
COLUMN LOAD emulsion
TOE LOAD Bounce booster
SUBGRADE soft

DETONATORS / INITIATORS:

TYPE	LENGTH	#UNITS
1) <u>Nitro 25ft</u>	<u>15m</u>	<u>33</u>
2) <u>Nitro 129ms</u>	<u>6m</u>	<u>10</u>
3) <u>etc</u>	<u>3.66m</u>	<u>1</u>

DIMENSIONS:

WIDTH
LENGTH
AVE CUT 24ft AVE. DRILL DEPTH 24ft
PATTERN : BURDEN 1.3 SPACING 1.3



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: all good

FLYROCK DAMAGE: None

HAZARDS & DISTANCE : 100m crusher

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: sd UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: slw

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: sun

CUT SHEET #'s

BULK USED? YES NO

BULK TRUCK NUMBER's B.1

BULK TRUCK DRIVER Davis

SAFE BLASTING & QUALITY CONTROL CHECKLIST

CONSBEC INC.

MINING+CONSTRUCTION

General

Project Lane Scansh stone
 Location Pct Colburn
 Blast Date Jun 28/17
 Context (urban/rural/quarry/road/ditch) quarry
 Blast Type (test/production/clean-up/shear) prod
 Name of Blaster James G. L.
 Blast Report # 23456
 Previous Blast Report # Reviewed 105

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

300		meters
75		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
/		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
300		meters
300		meters
300		meters
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence
Y	<input checked="" type="checkbox"/>	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

10:12	AM	PM	time
4			ea
0			ea
<input checked="" type="checkbox"/>	N		
<input checked="" type="checkbox"/>	N		

Post Blast

Considerations

Output Flyrock (if yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

2002		meters
		mm/s
		dB
Good	Bad	
Y	N	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes

What is required to reduce undesirables ? _____

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE TBD TIME TBD

BLASTER Kevin M. Phel
Please Print
SIGNATURE [Signature]

CONTRACT / JOB # 519 064C
LOCATION Part Colbourne Low Crushed Stone

EXPLOSIVES: **No 022339**

DESIGN:

BLAST TYPE Quarry OPEN
SIZE OF HOLES 1 1/2"
NO. OF HOLES 33
NO. OF DELAYS 33
MAX. LOAD PER DELAY 1000 Kgs
HOLES PER SERIES 1
POWDER FACTOR 1.0

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>2006.4 Kgs</u>
2) <u>Raz Booster</u>	<u>33 ea</u>
3) <u> </u>	<u> </u>

LOADING:

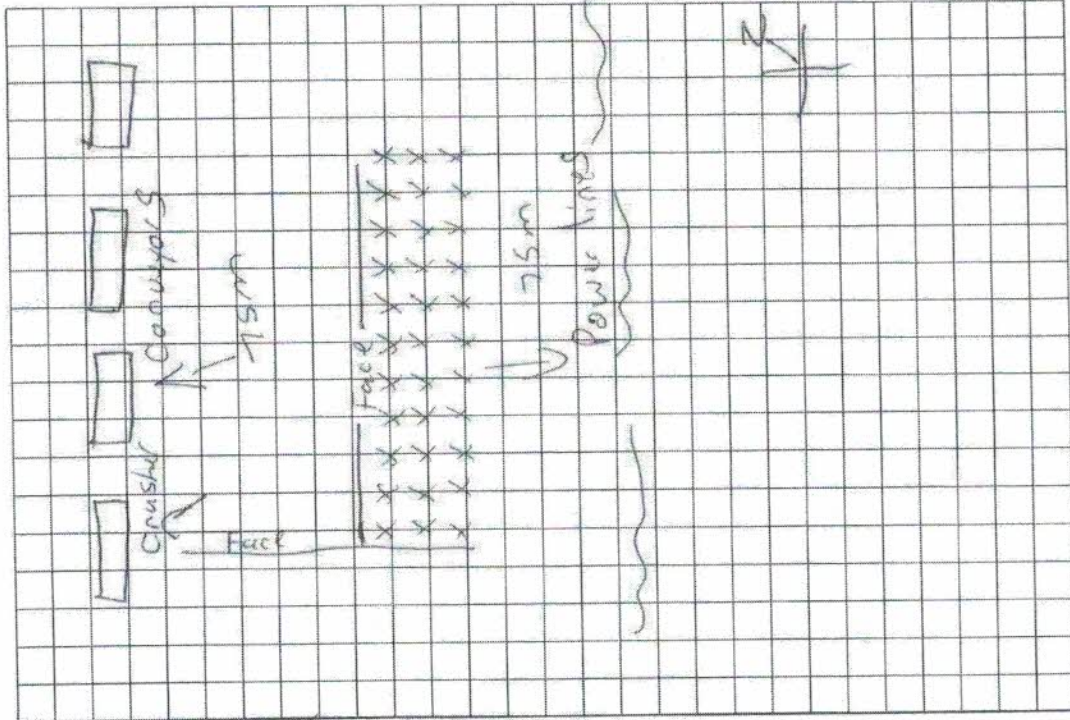
COLLAR 2.3m and adjusted accordingly
COLUMN LOAD Emulsion
TOE LOAD Raz Booster
SUBGRADE

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>M.I. Energy 2500</u>	<u>1.5m</u>	<u>33</u>
2) <u>Jumpet 109ms</u>	<u>6m</u>	<u>4</u>
3) <u>Jumpet 401ms</u>	<u>6m</u>	<u>9</u>

DIMENSIONS:

WIDTH 11.79
LENGTH 43.12 m
AVE CUT 7.92 AVE. DRILL DEPTH 7.92
PATTERN: BURDEN 3.96 SPACING 3.96



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Est for = 10656

FLYROCK DAMAGE:

HAZARDS & DISTANCE: See Diagram

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 008409

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



MINING + CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: June 28, 2017

JOB # J18064C

No 008409

JOB LOCATION: Port Colbourne Low Crushed Stone

DRILLER: Kevin M'Phie

PATTERN: 13x13

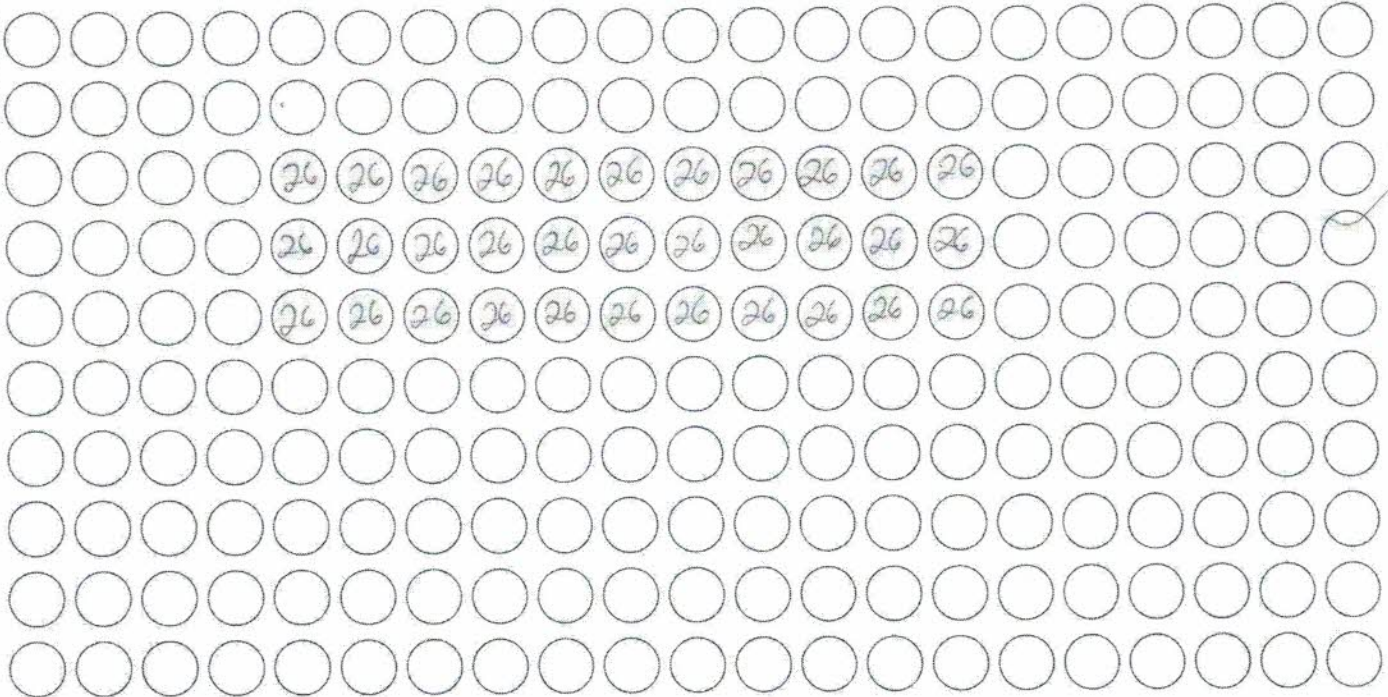
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 33holes 858'

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET #

CUT SHEET #



CUT SHEET # _____

Date/Time Tran at 11:37:03 June 28, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 114 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BA10984 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration August 9, 2016 by InstanTel.
File Name L984GYEY.XR0

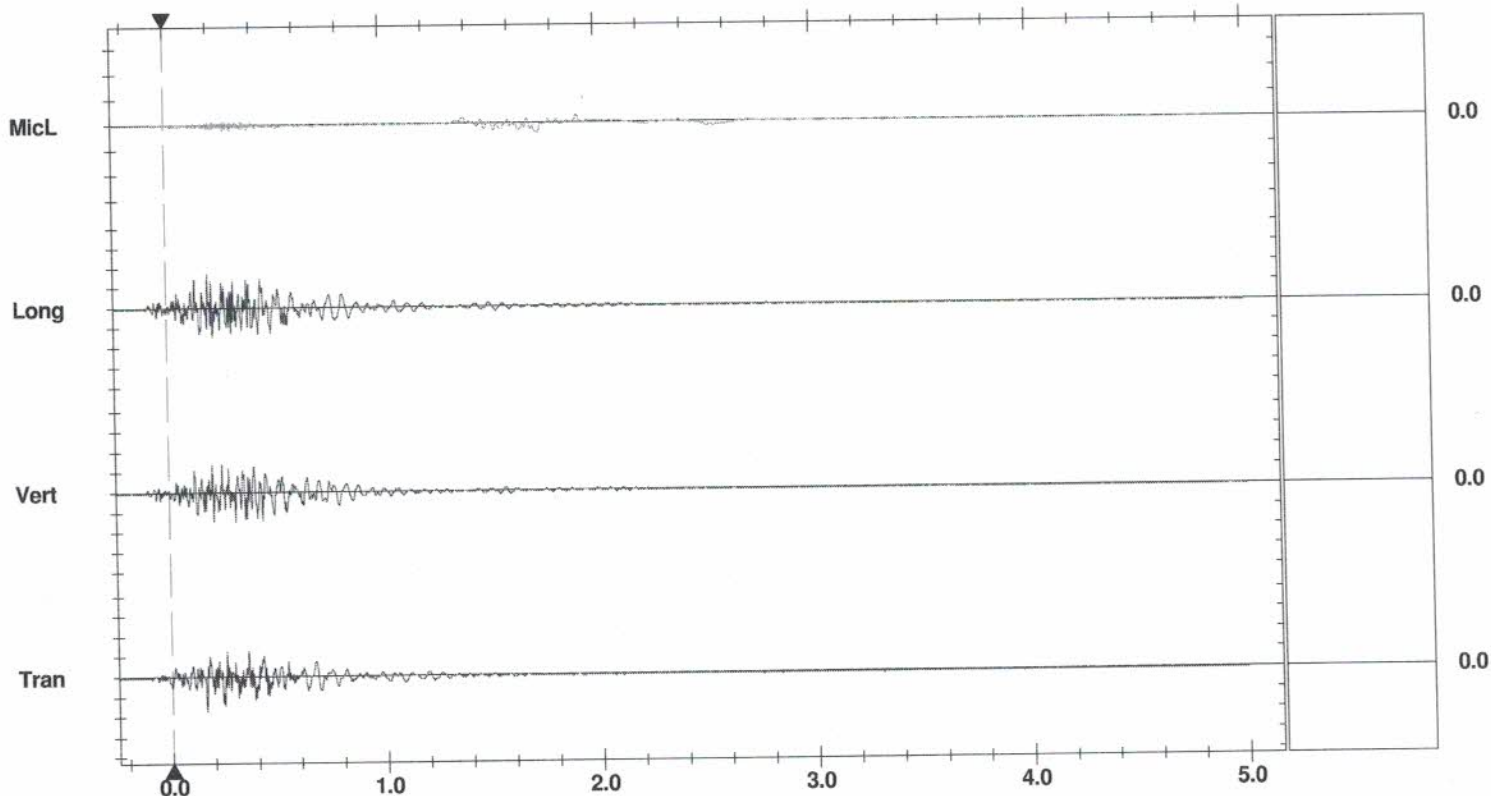
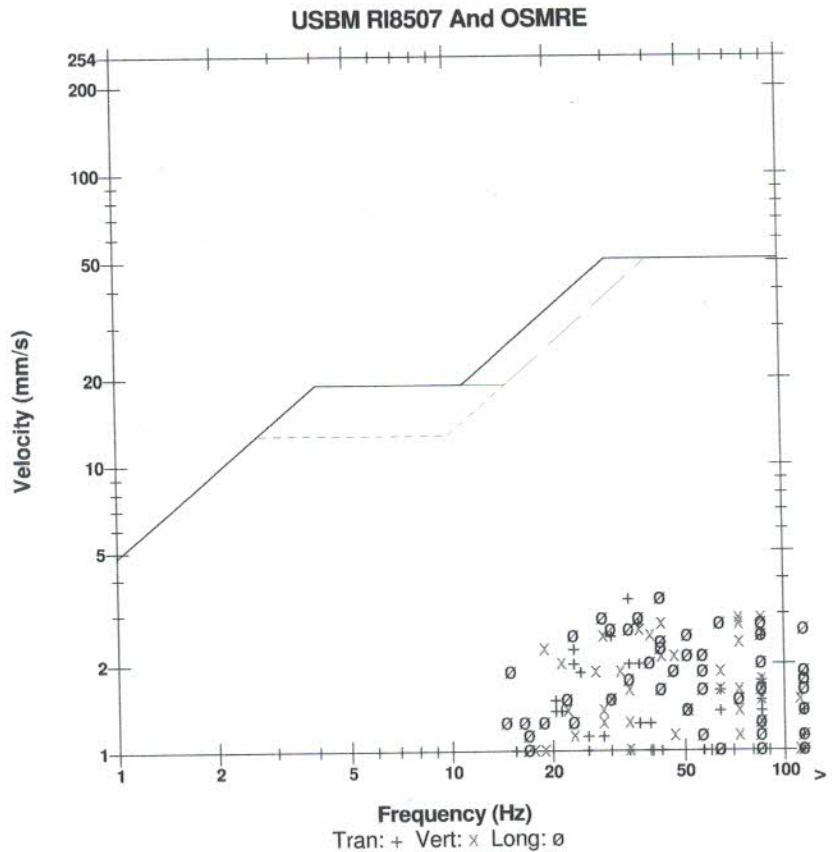
Notes
 location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc
 General: Blast Vibration Monitoring

Extended Notes
 Combo Mode June 28, 2017 10:17:46
 Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 106.0 dB(L) at 1.731 sec
ZC Freq 8.7 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.43	2.92	3.43	mm/s
ZC Freq	34	73	43	Hz
Time (Rel. to Trig)	0.161	0.208	0.192	sec
Peak Acceleration	0.133	0.172	0.172	g
Peak Displacement	0.0140	0.0147	0.0161	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 4.15 mm/s at 0.161 sec



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 11:37:03 June 28, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

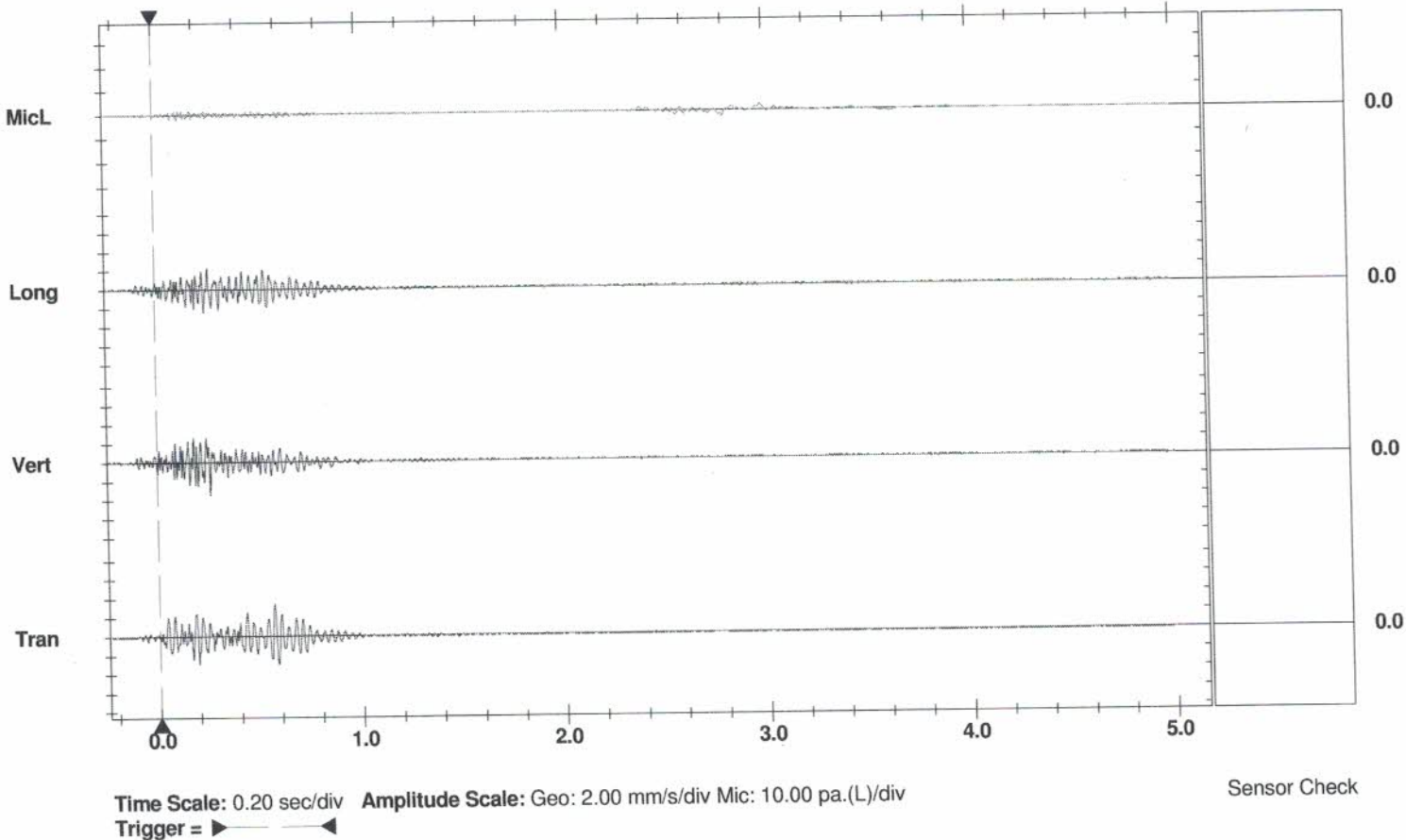
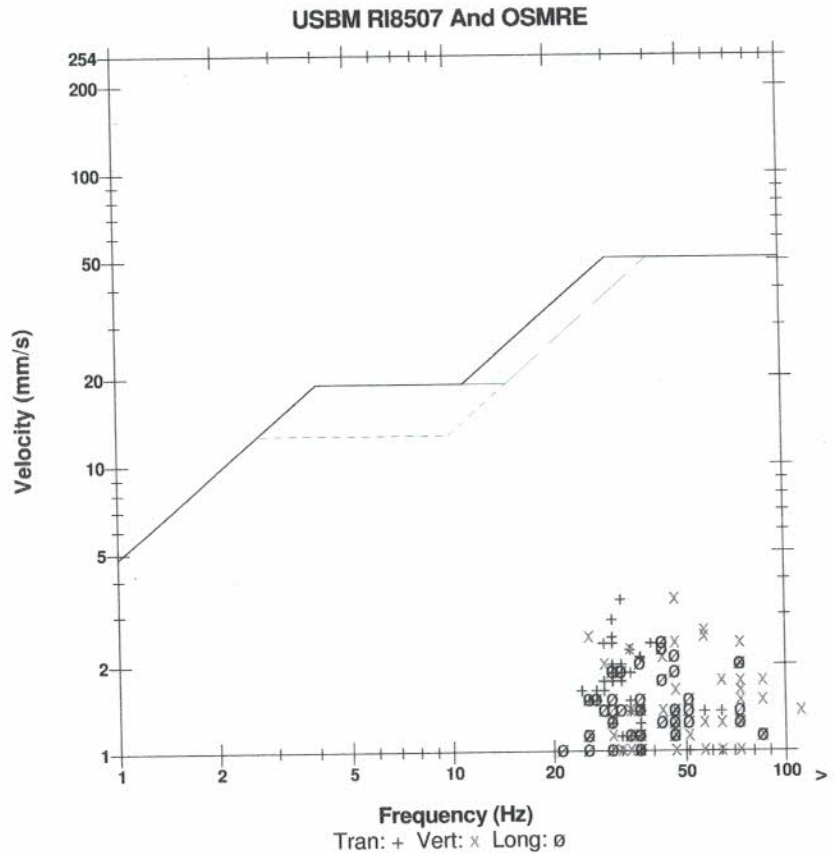
Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 2, 2016 by InstanTel.
File Name N758GYEY.XR0

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel Limited
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes
 Combo Mode June 28, 2017 09:40:24
 40 Townline Road S

Microphone Linear Weighting
PSPL 101.9 dB(L) at 2.805 sec
ZC Freq 12 Hz
Channel Test Disabled

	Tran	Vert	Long	
PPV	3.43	3.43	2.41	mm/s
ZC Freq	32	47	43	Hz
Time (Rel. to Trig)	0.565	0.261	0.242	sec
Peak Acceleration	0.106	0.119	0.0928	g
Peak Displacement	0.0172	0.0135	0.0106	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	
Peak Vector Sum	4.13 mm/s at 0.262 sec			





AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Crushed Stone

Date: March 8 2017

Location in Quarry: Top Bench (White)

Layout

		Feet	Metres	Feet	Metres				
# Holes:	156	Hole Depth:	9.5	2.90	Burden:	13.0	3.96	m ³ / Hole:	45.5
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	109.1
Diameter mm:		Face Height:	9.5	2.89	Collar:	5.5	1.68	Total Tonnes:	17021.2
Diameter in:	4								
Material Blasted:	Limestone	Explosive / Hole:	57.0	kg	125.0 lb				
Density:	2.4 t/m ³	Max. kg. / Delay:	12.7						
Max Holes / Delay:	1	Distance to Seis.:	800.0	m	2625.0 ft				

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20' 20'30'		Boosters		Electronic Det
12' -	50' -	9ms -	42ms -	Orange Cap (1 lb) -		24' E-star-
16' -	60' -	17ms -	67ms -	Black Cap (3/4 lb) -		40' E-Star-
24' -	80' -	25ms -	100ms -	Brown Cap (1/2 lb) -		60' E-star-
30' -	156 100' -	33ms -		E-Star Booster (1 lb) -		80' E-star-
40' -						100' E-star-

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Hyd 4100 NP			
Hyd 4600			
Hyd. 4400	4	28.0	12.7
Total product		4366.0	1981.2

Miscellaneous:

25ms between holes
92ms between rows

Approved: *B. Smith*
Gary deboer

Date: July 19 2011



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 03/06/17
MO DA YR

COMPANY (PERMITTEE) LAW LOCATION WHITE ROCK

TYPE OF MATERIAL BLASTED LIME STONE HOLE DIAMETER 4

NO. OF HOLES 165 NO. OF ROWS 8 BURDEN 13

SPACING 13 DEPTH 10 FACE HEIGHT 10 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES

TOTAL QUANTITY

CONVERSIONS

30' Dual Delay 165
67' Dual Delay

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

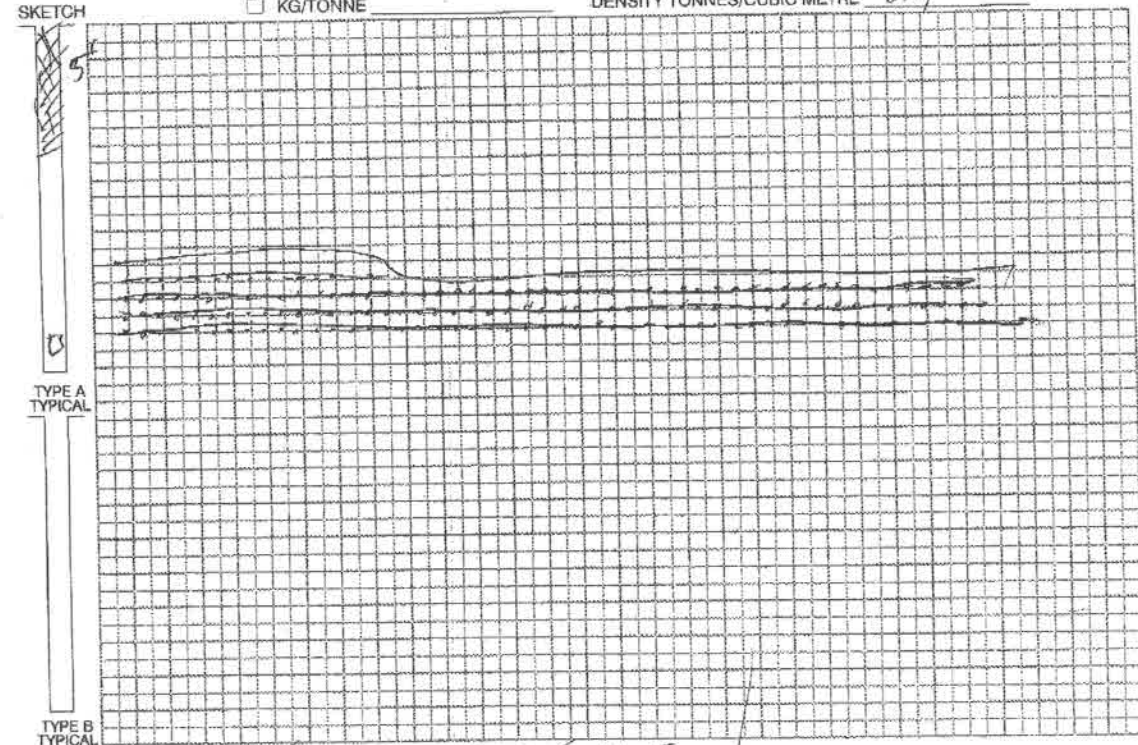
TYPE OF PRIMER PLACIC AP. 165

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2310 WEIGHT OF EXPLOSIVES PER HOLE 14

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC
DELAY DETONATORS USED (TYPE) DUAL DELAY DUAL RELAY
(SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

TOTAL NO. TONNES PRODUCED 18947 OR TOTAL CUBIC METRES PRODUCED 7594

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.2 KG/TONNE
DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 25 ms BETWEEN HOLES
92 ms BETWEEN ROWS.

POST-BLAST COMMENTS: PIT FORMER TO CLEAR PIT FOR
BLAST TIME.

BLASTER IN CHARGE: John Davis
PRINT _____
SIGNATURE _____

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 03/08/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/08/2017 11:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: SSW

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 30-50 km/h

Blast Lat./Long.: 42° 53' 41.200" N 79° 17' 43.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Direction/Bearing: 10 °

Structure Type: Dwelling

Distance: 910 m

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

LAYOUT

Hole Depth:	1.52-2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	442.6 m
No. of Holes:	160	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	160	Face Height:	1.52-2.90 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Water Depth:	0.00 m
				Stem Length:	min 1.22 m
				Area Type:	Conventional
				Method:	Weighted Average

(H = 2.77 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	30.1 kg	Volume Produced:	6,951.0 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	30.1 kg	Weight Produced:	16,685.2 t
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	15.994 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	15.0 kg	Powder Factor 2:	0.150 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	234.79	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	166.02		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: Yes Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
BELCOSKI	MICHAEL, S			No	Yes	Yes	No	No
LI	JACKSON, A			No	Yes	Yes	No	No
MERRITT	AARON, K			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	No	No	No	No
ROMPHF	ALAN, S			No	No	Yes	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway	Maple Leaf Drilling			No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 03/08/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/08/2017 11:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	160.00 ea	54.42
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	166.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
07696	Hydromite 4400 Bulk	2,180.00 kg	2,180.00
D0120	Other-Drilling Charges	1,452.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			2,234.42

COMMENTS / EXPLANATIONS

General Comments: The 15th hole in the third row failed to initiate the 16th due to a misconnection of the Duel Delay to the Shock tube in the next hole. We were able to re tie in the row using 21 new detonators acting as a safety to make sure the detonators fired.

Layout: There were holes in the front row that were not drilled due to poor burden. extra det was used for timing.

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 03/08/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/08/2017 11:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT & HWY#3

Data Type: Seismic Record Seismograph Type: Mini White Seis
Date: 03/08/17 Trigger Level: 1.01 mm/s --- dB Transverse: 0.63 mm/s 46.5 Hz
Time: 11:24 Calibration Date: 09/02/16 Vertical: 0.88 mm/s 39.3 Hz
Distance From Blast: 519.99 m Calibration Signal: Longitudinal: 1.27 mm/s 64.0 Hz
Direction From Blast: SE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 112 dB
Location: Vector Sum: 1.27 mm/s
Lat./Long.: 42° 53' 29.800" N 79° 17' 26.120" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:

SEISMOGRAPH 2 - YOUNG STREET TEST WELL

Data Type: Seismic Record Seismograph Type: White Mini Sies
Date: 03/08/17 Trigger Level: 1.01 mm/s 120.00 dB Transverse: 1.27 mm/s 25.6 Hz
Time: 11:24 Calibration Date: 11/18/16 Vertical: 0.38 mm/s 39.3 Hz
Distance From Blast: 803.76 m Calibration Signal: Longitudinal: 0.76 mm/s 24.3 Hz
Direction From Blast: ENE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz
Readout: Display Only Mic. Min. Freq.: --- Hz Acoustic: 124 dB
Location: Vector Sum: 1.27 mm/s
Lat./Long.: 42° 53' 49.260" N 79° 17' 9.310" W
Reader and Firm: Jordan Davis, AUSTIN POWDER
Analyst and Firm:
Installer and Firm:



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Mar,21,17

Location in Quarry: **Top Bench:**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	195	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4						
Material Blasted: Limestone		Explosive / Hole:		11.1	kg	24.5	
Density: 2.4 t/m ³		Max. kg. / Delay:		11.1	kg	24.5	
Max Holes / Delay: 1		Distance to Seis.:		**	m	**	
						ft	

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	195 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6142.0	2730.0

Miscellaneous:

Comments:

Approved: *B. Smith*

Date: *Mar 20-17*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____ DATE 1 / 1 / 81

COMPANY (PERMITTEE) LAW Quarry LOCATION WHITE ROCK

TYPE OF MATERIAL BLASTED LIMESTONE HOLE DIAMETER 4

NO. OF HOLES 202 NO. OF ROWS 5 BURDEN 13

SPACING 13 DEPTH 9.5 FACE HEIGHT 9.5 LENGTH OF STEMMING (COLLAR) 5

EXPLOSIVES TOTAL QUANTITY

30' Dual Densy 200

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ² = 1.308 yd ²	1 yd ² = 0.764555 m ²
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.942777 ton/yd ³	1 ton/yd ³ = 1.1866 tonne/m ³

TYPE OF PRIMER ORANGE 200

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 2400 WEIGHT OF EXPLOSIVES PER HOLE 12

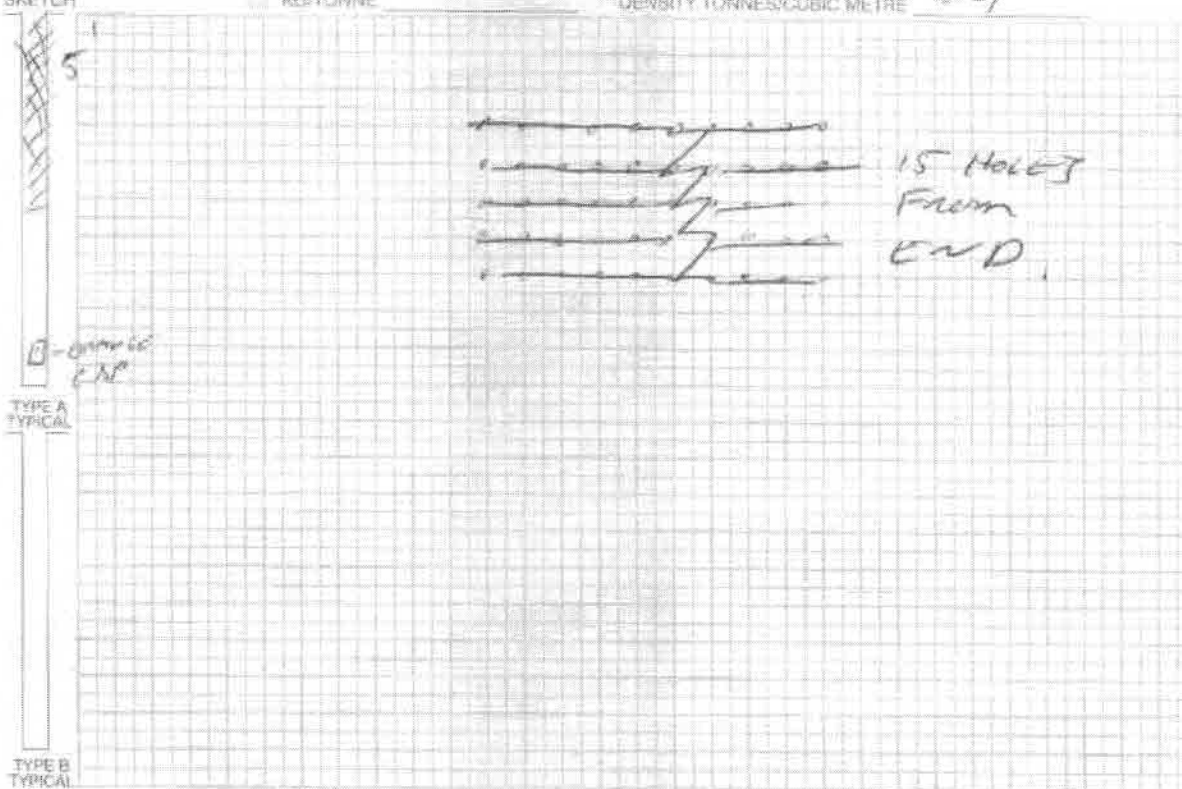
TYPE OF INITIATION SYSTEM: NON-ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

DELAY DETONATORS USED (TYPE) DUAL DENSY

TOTAL NO. TONNES PRODUCED 21516 OR TOTAL CUBIC METRES PRODUCED 9091

TOTAL POWDER FACTOR: KG/CUBIC METRE 0.2

SKETCH KG/TONNE DENSITY TONNES/CUBIC METRE 0.4



PRE-BLAST COMMENTS: 25ms BETWEEN ROWS
109ms BETWEEN ROWS

POST-BLAST COMMENTS:

BLASTER IN CHARGE [Signature] PRINT [Signature] SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF-HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 03/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 7 °C

Terrain: Flat

Wind Velocity: 1-6 km/h

Blast Lat./Long.: 42° 53' 41.600" N 79° 17' 36.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 0 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 884 m

LAYOUT

Hole Depth:	2.90 m	Material Blasted:	Limestone	Total Meters Drilled:	579.1 m
No. of Holes:	200	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	200	Face Height:	2.90 m	Spacing:	3.96 m
No. of Rows:	5	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation:	Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	50.9 kg	Volume Produced:	9,092.5 m ³
Firing Device:	Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	50.9 kg	Weight Produced:	21,825.7 t
Other Method:	Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	8.662 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	12.7 kg	Powder Factor 2:	0.277 kg/m ³
Initiation Settings:		Scaled Distance Factor (max charge):	247.78	Rock Density:	2.400 t/m ³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	123.89		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	No	Yes	No	No
DEBOER	GARY, B	* ON - 278B-454071 [12/31/2099]		No	Yes	Yes	No	No
LANE	LAVERN, G			No	Yes	Yes	No	No
LI	JACKSON, A			No	No	Yes	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway	Maple Leaf Drilling	No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada NOA 1- H0

Blast No.: 03/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
05192	Orange Cap Boosters	198.00 ea	89.79
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	198.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	9.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	10.00 ea	0.00
07696	Hydromite 4400 Bulk	2,430.00 kg	2,430.00
D0120	Other-Drilling Charges	1,900.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 2,519.79

COMMENTS / EXPLANATIONS

John Davis

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 03/21/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/21/2017 12:30

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - 678 BARRICK RD

Data Type:	No Trigger	Seismograph Type:	White Mini Seis							
Date:	03/21/17	Trigger Level:	1.01 mm/s	---	dB	Transverse:	---	mm/s	---	Hz
Time:	12:30	Calibration Date:	11/18/16			Vertical:	---	mm/s	---	Hz
Distance From Blast:	2,398.17 m	Calibration Signal:				Longitudinal:	---	mm/s	---	Hz
Direction From Blast:	NE	Geophone Min. Freq.:	---	Hz		PPV:	---	mm/s	---	Hz
Readout:		Mic. Min. Freq.:	---	Hz		Acoustic:	---	dB		
Location:						Vector Sum:	---	mm/s		
Lat./Long.:	42° 54' 36.000" N									
Reader and Firm:	Jordan Davis, AUSTIN POWDER									
Analyst and Firm:										
Installer and Firm:										

SEISMOGRAPH 2 - CORNER OF ERIE PEAT & HWY#3

Data Type:	Seismic Record	Seismograph Type:	Mini White Seis							
Date:	03/21/17	Trigger Level:	1.01 mm/s	---	dB	Transverse:	1.65	mm/s	73.1	Hz
Time:	12:30	Calibration Date:	09/02/16			Vertical:	1.52	mm/s	51.2	Hz
Distance From Blast:	427.63 m	Calibration Signal:				Longitudinal:	1.77	mm/s	46.5	Hz
Direction From Blast:	SE	Geophone Min. Freq.:	---	Hz		PPV:	---	mm/s	---	Hz
Readout:	Display Only	Mic. Min. Freq.:	---	Hz		Acoustic:	117	dB		
Location:						Vector Sum:	2.15	mm/s		
Lat./Long.:	42° 53' 29.800" N									
Reader and Firm:	Jordan Davis, AUSTIN POWDER									
Analyst and Firm:										
Installer and Firm:										



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: Mar,29,17

Location in Quarry: **Top Bench:**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	195	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	5	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4					m3/ Hole:	57.7
Material Blasted:		Limestone		Explosive / Hole:		11.1	kg
Density:		2.4 t/m3		Max. kg. / Delay:		11.1	kg
Max Holes / Delay:		1		Distance to Seis.:		**	m
						**	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	18	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	16	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	195 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		6142.0	2730.0

Miscellaneous:

Comments:

Approved: *[Signature]* Date: *Mar 29/17*



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO 03-29-2017

DATE 03/29/17

COMPANY (PERMITTEE) Law Crushed Stone LOCATION White Rock

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"

NO. OF HOLES 190 NO. OF ROWS 5 BURDEN 13'

SPACING 13' DEPTH 10' FACE HEIGHT 10' LENGTH OF STEMMING 6'
(COLLAR)

EXPLOSIVES 24' Dual Delay 25/500 TOTAL QUANTITY 190

20' Quick Relay 67ms 7
Hydramite 4400 1800

CONVERSIONS	
1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1886 tonne/m ³

TYPE OF PRIMER Black Cap Booster 190

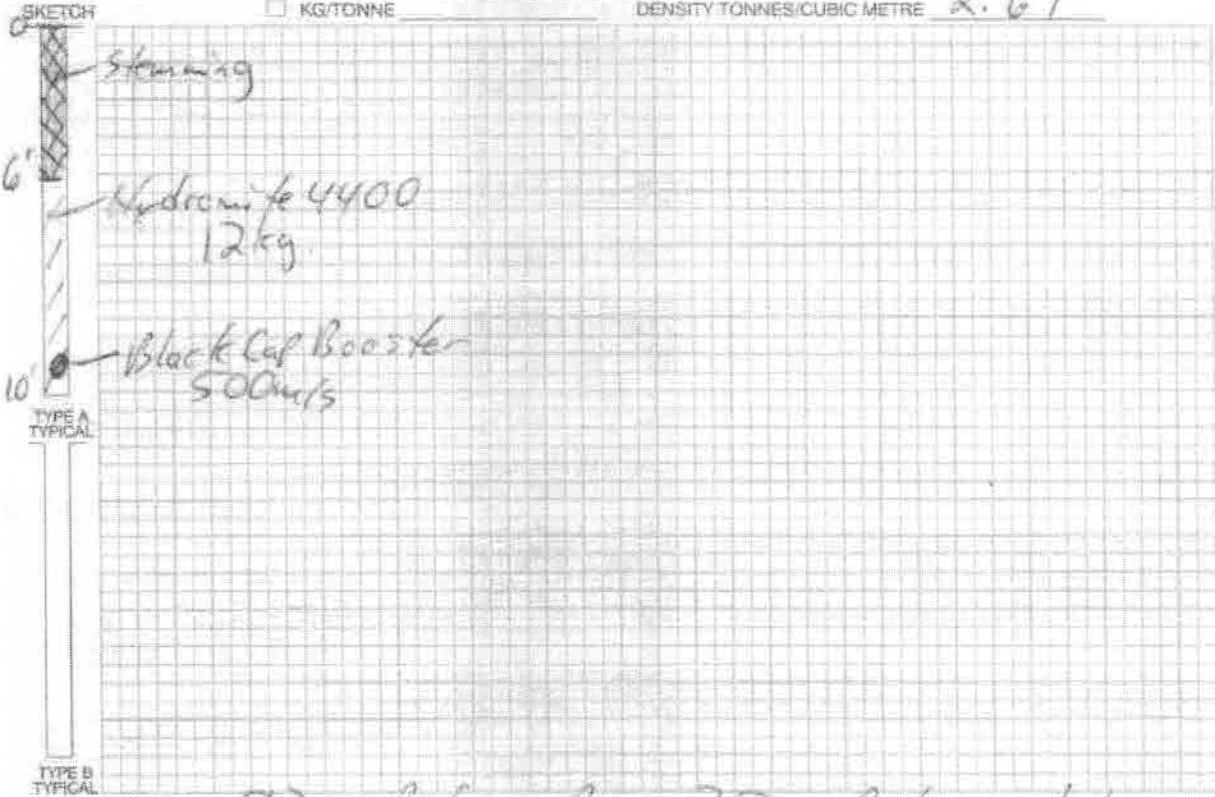
TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____ WEIGHT OF EXPLOSIVES PER HOLE 12kg

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)

DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 21826 OR TOTAL CUBIC METRES PRODUCED 9093m³

TOTAL POWDER FACTOR: KG/CUBIC METRE KG/TONNE _____ DENSITY TONNES/CUBIC METRE 2.61



PRE-BLAST COMMENTS: 9 days between rows, 25ms between holes
Quarry to be cleared by foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Aaron Merritt
SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 03-29-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/29/2017 13:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Partly Cloudy

Wind From: WSW

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast Lat./Long.: 42° 53' 41.399" N 79° 17' 44.599" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Structure Type: Dwelling

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Compass Point: N

Direction/Bearing: 0 °

Distance: 890 m

LAYOUT

Hole Depth:	3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	579.1 m
No. of Holes:	190	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	190	Face Height:	3.05 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Water Depth:	0.30 m
				Stem Length:	1.83 m
				Area Type:	Corner/Open End
				Method:	Specified

† V.P. = Volume Producing

(H = 3.05 m)

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	19.6 kg	Volume Produced:	9,092.5 m ³
Firing Device: Other	Max. Wt. of Expl. Per 8 ms Interval:	19.6 kg	Weight Produced:	21,825.7 t
Other Method: Remote Blasting Machine	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	11.706 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	9.8 kg	Powder Factor 2:	0.205 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	284.11	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	200.89		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No Misfire Occurred: No Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BELCOSKI	MICHAEL, S			No	Yes	Yes	No	No
PASSMORE	EDGAR, M			No	Yes	No	No	No
VAN RAVENSWAAY	JEREMY, P			No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 03-29-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/29/2017 13:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	190.00 ea	64.62
10750	SHOCK*STAR DualDelay 7.3m/24' 25/500	196.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
00788	SHOCK*STAR Lead-In-Line- 762m(2500')	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	7.00 ea	0.00
07696	Hydromite 4400 Bulk	1,800.00 kg	1,800.00
D0120	Other-Drilling Charges	1,900.00 ea	0.00

Total Weight of Explosives (Include Primers) (kg): 1,864.62

COMMENTS / EXPLANATIONS

General Comments: Used 6 extra dets for timing to make up for the holes that were dug out by the excavator

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 03-29-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 03/29/2017 13:05

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - CORNER OF ERIE PEAT RD & HWY#3

Data Type:	No Trigger	Seismograph Type:	White Mini-Seis	Transverse:	---	mm/s	---	Hz
Date:	03/29/17	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	---	mm/s	---	Hz
Time:	13:05	Calibration Date:	11/07/16	Longitudinal:	---	mm/s	---	Hz
Distance From Blast:	551.38 m	Calibration Signal:		PPV:	---	mm/s	---	Hz
Direction From Blast:	SE	Geophone Min. Freq.:	---	Acoustic:	---	dB		
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	---	mm/s	
Location:	Corner Of Erie Peat Rd & Hwy#3							
Lat./Long.:	42° 53' 29.800" N		79° 17' 26.120" W					
Reader and Firm:	Aaron Merritt, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Austin Powder							

SEISMOGRAPH 2 - 678 BARRICK RD

Data Type:	No Trigger	Seismograph Type:	White mini-Seis	Transverse:	---	mm/s	---	Hz
Date:	03/29/17	Trigger Level:	1.02 mm/s 120.00 dB	Vertical:	---	mm/s	---	Hz
Time:	13:05	Calibration Date:	05/02/16	Longitudinal:	---	mm/s	---	Hz
Distance From Blast:	2,542.03 m	Calibration Signal:		PPV:	---	mm/s	---	Hz
Direction From Blast:	NE	Geophone Min. Freq.:	---	Acoustic:	---	dB		
Readout:		Mic. Min. Freq.:	---	Hz	Vector Sum:	---	mm/s	
Location:	678 Barrick Rd spiked in front yard							
Lat./Long.:	42° 54' 36.000" N		79° 16' 20.700" W					
Reader and Firm:	Aaron Merritt, AUSTIN POWDER							
Analyst and Firm:								
Installer and Firm:	Austin Powder							



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May,05,17

Location in Quarry: **Top Bench:**

Layout

		Feet	Metres	Feet	Metres		
# Holes:	170	Hole Depth:	10.0	3.05	Burden:	13.0	3.96
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98
Diameter in:	4						
Material Blasted:		Limestone		Explosive / Hole:		11.1	kg
Density:		2.4 t/m3		Max. kg. / Delay:		11.1	kg
Max Holes / Delay:		1		Distance to Seis.:		**	m
						**	ft

Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	16	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	14	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	170 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		5355.0	2380.0

Miscellaneous:

Comments:

Approved:

Date:

May 5/17



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 05-05-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/05/2017 12:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Heavy Rain

Wind From: NE

Temperature: 10 °C

Terrain: Flat

Wind Velocity: 17-26 km/h

Blast Lat./Long.: 42° 53' 40.200" N 79° 17' 44.500" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 0 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 44.100" W

Distance: 927 m

LAYOUT

Hole Depth:	3.05 m	Material Blasted:	Limestone	Total Meters Drilled:	502.9 m
No. of Holes:	165	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P.† Holes:	165	Face Height:	3.05 m	Spacing:	3.96 m
No. of Rows:	6	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4 Clear Stone
				Area Type:	Corner/Open End
				Method:	Specified

(H = 3.05 m)

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	0.7 kg	Volume Produced:	7,896.2 m ³
Firing Device: Other	Max. Wt. of Expl. Per 8 ms Interval:	12.1 kg	Weight Produced:	18,953.9 t
Other Method: Remote Blasting Machine	Max. No. of Holes Per 8 ms Interval:	1	Powder Factor 1:	9.496 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	12.1 kg	Powder Factor 2:	0.253 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	266.49	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	266.49		

SEISMOGRAPHS

See seismographs on separate page

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
MERRITT	AARON, K	* ON - N/A	* ON - N/A	Yes	Yes	Yes	No	No
BELCOSKI	MICHAEL, S			No	Yes	Yes	No	No
MINOR	CARMEN, R			No	Yes	Yes	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jeremy	Maple Leaf Drilling			No	No	No	Yes	Yes

AUSTIN POWDER LTD.
BLAST REPORT



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 05-05-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/05/2017 12:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	165.00 ea	56.12
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	166.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	9.00 ea	0.00
07602	Hydromite 4100 Bulk	1,940.00 kg	1,940.00
D0120	Other-Drilling Charges	1,650.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			1,996.12

COMMENTS / EXPLANATIONS

General Comments: .

Signature of Blaster in Charge

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 05-05-2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/05/2017 12:01

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

SEISMOGRAPH 1 - 678 BARRICK RD

Data Type: No Trigger	Seismograph Type: White mini-Seis	Transverse: --- mm/s	--- Hz
Date: 05/05/17	Trigger Level: 1.02 mm/s 110.00 dB	Vertical: --- mm/s	--- Hz
Time: 12:01	Calibration Date: 11/07/16	Longitudinal: --- mm/s	--- Hz
Distance From Blast: 2,564.89 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: NE	Geophone Min. Freq.: --- Hz	Acoustic: --- dB	
Readout:	Mic. Min. Freq.: --- Hz	Vector Sum: --- mm/s	
Location: 678 Barrick Rd spiked in front yard			
Lat./Long.: 42° 54' 36.000" N	79° 16' 20.700" W		
Reader and Firm: Aaron Merritt, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm: Austin Powder			

SEISMOGRAPH 2 - CORNER OF ERIE PEAT RD & HWY#3

Data Type: Seismic Record	Seismograph Type: White Mini-Seis	Transverse: 0.63 mm/s	23.2 Hz
Date: 05/05/17	Trigger Level: 1.02 mm/s 110.00 dB	Vertical: 1.14 mm/s	46.5 Hz
Time: 12:01	Calibration Date: 05/02/16	Longitudinal: 1.01 mm/s	7.7 Hz
Distance From Blast: 526.08 m	Calibration Signal:	PPV: --- mm/s	--- Hz
Direction From Blast: ESE	Geophone Min. Freq.: --- Hz	Acoustic: 118 dB	
Readout:	Mic. Min. Freq.: --- Hz	Vector Sum: 1.27 mm/s	
Location: Corner Of Erie Peat Rd & Hwy#3			
Lat./Long.: 42° 53' 29.800" N	79° 17' 26.120" W		
Reader and Firm: Aaron Merritt, AUSTIN POWDER			
Analyst and Firm:			
Installer and Firm: Austin Powder			

Corner of erie peat rd and hwy#3

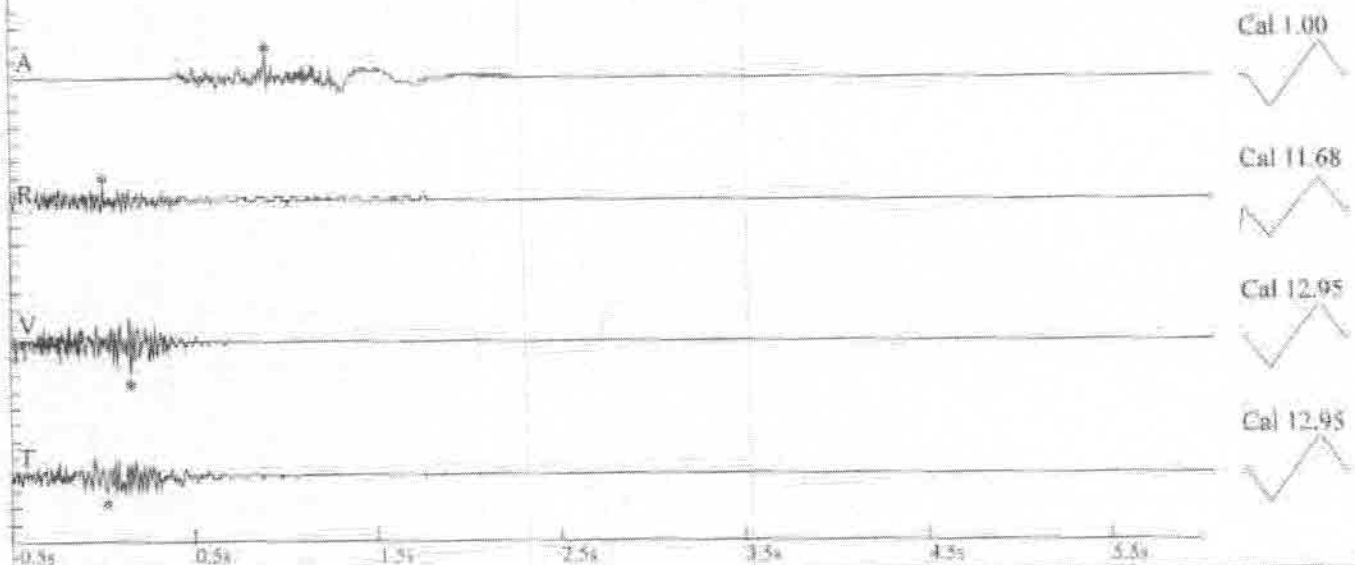
File Name: 59020170505205.dib
Number: 252
Date: 5/5/2017
Time: 17:01
Serial Number: 5900
Seismic Trigger: 1.016 mm/sec
Acoustic Trigger: 112 dB
Sample Rate: 1024
Duration: 6.0 Seconds
Pre-Trigger: 0.50 Seconds
Gain: 2x
Voltage: 6.0

Amplitudes and Frequencies

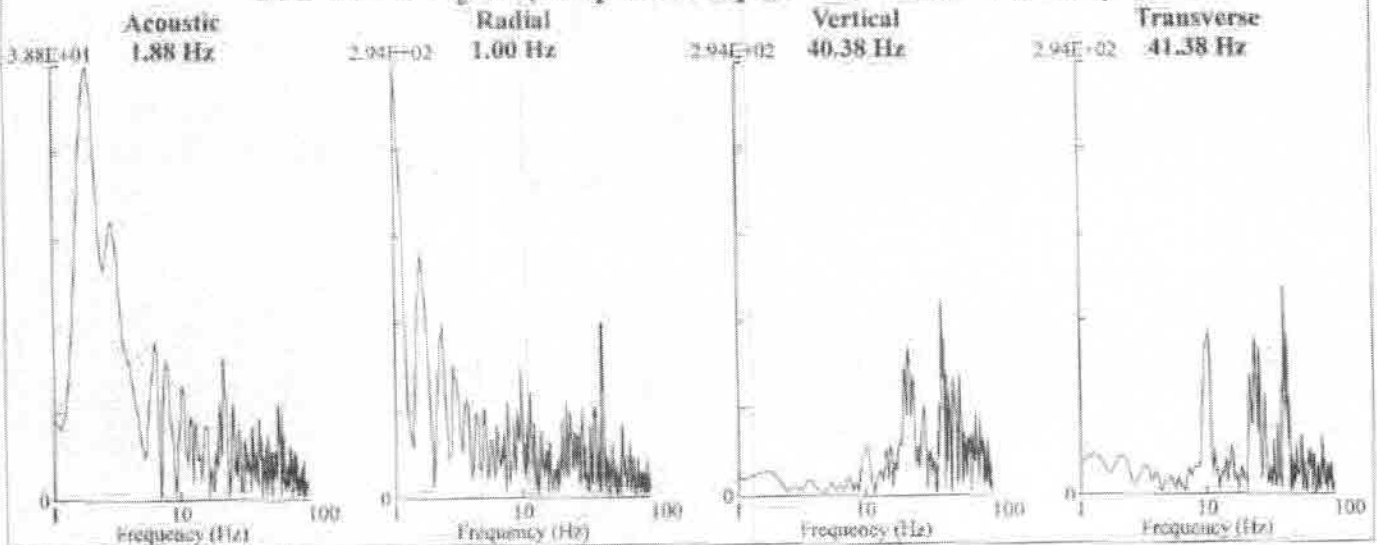
Acoustic: 118 dB, 0.16 Mb @ 21.3 Hz
Radial: 1.016 mm/sec @ 7.7 Hz
Vertical: 1.143 mm/sec @ 46.5 Hz
Transverse: 0.635 mm/sec @ 23.2 Hz

Graph Information

Duration: -0.500 s To: 6.000 s
Acoustic Scale: 126 dB
Seismic Scale: 2.40 mm/sec (0.600 mm/sec/div)
Time Intervals at: 1.00 s



Fourier Analysis (Amplitude Spectrum - Box Window)





AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. 0509-2017

DATE 5/5/17

COMPANY (PERMITTEE) Low Crushed Stone LOCATION White Rock

TYPE OF MATERIAL BLASTED Limestone HOLE DIAMETER 4"

NO. OF HOLES 165 NO. OF ROWS 4 BURDEN 13'

SPACING 13' DEPTH 10' FACE HEIGHT 10' LENGTH OF STEMMING (COLLAR) 5.5'

EXPLOSIVES	TOTAL QUANTITY
<u>30' Dual Delay 25/500</u>	<u>165</u>
<u>20' Quick Relay 6/45</u>	<u>7</u>
<u>Hydramite 4/100</u>	<u>2145</u>

CONVERSIONS

1 mm = 0.03937 in	1 in = 25.4 mm
1 m = 3.28 ft	1 ft = 0.3048 m
1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
1 kg = 2.2046 lb	1 lb = 0.454 kg
1 tonne = 1,1023 ton	1 ton = 0.907185 tonne
1 tonne/m ³ = 0.642777 ton/yd ³	1 ton/yd ³ = 1.568 tonne/m ³

TYPE OF PRIMER Black Cap Booster 165 WEIGHT OF EXPLOSIVES PER HOLE 13 kg

TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) _____

TYPE OF INITIATION SYSTEM: NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH)

DELAY DETONATORS USED (TYPE) Dual Delay + Quick Relay

TOTAL NO. TONNES PRODUCED 18,954 tonnes OR TOTAL CUBIC METRES PRODUCED 7,896 m³

TOTAL POWDER FACTOR: KG/CUBIC METRE KG/TONNE DENSITY TONNES/CUBIC METRE 2.4



PRE-BLAST COMMENTS: 92mfs Between Rows, 25mfs Between holes
Quarry to be cleared by Foreman prior to blast time

POST-BLAST COMMENTS: _____

BLASTER IN CHARGE Avon Merritt
PRINT Avon Merritt
SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE



AUSTIN POWDER PRE-BLAST DESIGN

Customer: Law Quarry

Date: May, 15, 17

Location in Quarry: **Top Bench:**

Layout

		Feet		Metres		Feet		Metres	
# Holes:	65	Hole Depth:	10.0	3.05	Burden:	13.0	3.96	m ³ / Hole:	57.7
# Rows:	4	Subdrilling:	0.0	0.00	Spacing:	13.0	3.96	Tonnes/Hole:	136.0
Diameter mm:		Face Height:	10.0	3.05	Collar:	6.5	1.98	Total Tonnes:	8840.0
Diameter in:	4								
Material Blasted:	Limestone		Explosive / Hole:		11.1 kg		24.5 lb		
Density:	2.4	t/m ³	Max. kg. / Delay:		11.1 kg		24.5 lb		
Max Holes / Delay:	1		Distance to Seis.:		** m		** ft		


Products

Shockstar Dual Delay 25/500		Shockstar Quick Relay 20'		Boosters	
12' -	50' -	9ms -	42ms -	8	Orange Cap (1 lb) -
16' -	60' -	17ms -	67ms -	6	Black Cap (3/4 lb) -
24' -	80' -	25ms -	100ms -		Brown Cap (1/2 lb) -
30' -	65 100' -	33ms -			Green Cap (1/4 lb) -
40' -					

	Ft / hole	Approx. lbs	Approx. Kg
Austinite 15			
Heet-30			
Heet-40			
Heet-50			
Hyd. 4400	3.5	31.5	14.0
Total product		2047.0	910.0

Miscellaneous:

Comments:

Approved:  Date: May 15/17



**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 05/15/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/15/2017 10:21

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 15 °C

Terrain: Flat

Wind Velocity: 1-5 km/h

Blast Lat./Long.: 42° 53' 43.900" N 79° 17' 29.000" W

NEAREST PROTECTED STRUCTURE

Structure Name: 20455 Erie Peat Rd

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 349 °

Structure Lat./Long.: 42° 54' 10.240" N 79° 17' 35.900" W

Distance: 828 m

LAYOUT

Hole Depth:	3.35 m	Material Blasted:	Limestone	Total Meters Drilled:	217.9 m
No. of Holes:	65	Subdrilling:	0.00 m	Burden:	3.96 m
No. of V.P. † Holes:	65	Face Height:	3.35 m	Spacing:	3.96 m
No. of Rows:	4	Drilling Angle:	0 °	Back Fill Depth:	0.00 m
Diameter:	101.6 mm	Mats Used:	No	Stem Type:	3/4" Clear Stone
				Area Type:	Conventional
				Method:	Weighted Average

† V.P. = Volume Producing

WEIGHTS

Initiation: Non-Electric	Max. Wt. of Expl. in Overlapped Decks:	20.4 kg	Volume Produced:	3,421.7 m ³
Firing Device: Electric Blasting Machine	Max. Wt. of Expl. Per 8 ms Interval:	20.4 kg	Weight Produced:	8,213.4 t ✓
Other Method: Remote Blasting Equipment	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	12.398 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	10.5 kg	Powder Factor 2:	0.193 kg/m ³
Initiation Settings:	Scaled Distance Factor (max charge):	255.16	Rock Density:	2.400 t/m ³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	183.41		

SEISMOGRAPH 1 - 678 BARRICK RD

Data Type: No Trigger	Seismograph Type: White Mini Sies			
Date: 05/15/17	Trigger Level: 1.02 mm/s 110.00 dB	Transverse:	--- mm/s	--- Hz
Time: 10:21	Calibration Date: 09/02/16	Vertical:	--- mm/s	--- Hz
Distance From Blast: 2,236.01 m	Calibration Signal:	Longitudinal:	--- mm/s	--- Hz
Direction From Blast: NE	Geophone Min. Freq.: --- Hz	PPV:	--- mm/s	--- Hz
Readout:	Mic. Min. Freq.: --- Hz	Acoustic:	--- dB	
Location:		Vector Sum:	--- mm/s	
Lat./Long.: 42° 54' 36.000" N	79° 16' 20.500" W			
Reader and Firm: Jordan Davis, AUSTIN POWDER				
Analyst and Firm:				
Installer and Firm:				

**AUSTIN POWDER LTD.
BLAST REPORT**



310-Oneida

ON, Hagersville, Canada N0A 1- H0

Blast No.: 05/15/2017

Blast Type: Stone Quarry/Stone Mine - Production

Customer: LAW CRUSHED STONE
(LAW1000-001)

Date/Time: 05/15/2017 10:21

Pit/Permit: LAW CRUSHED STONE / SHOT SERVICE

Location: White Rock

CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
DAVIS	JORDAN, T	* ON - N/A		Yes	Yes	Yes	No	No
LI	JACKSON, A			No	No	No	No	No
MINOR	CARMEN, R			No	No	No	No	No

Other Crew Members	Company	In Charge	Tied In	Chk. Tie-In	Driller	Layout
Jermery Vanravensway	Maple Leaf Drilling	No	No	No	Yes	Yes

PRODUCTS AND SERVICES

Number	Product Description	Quantity	Weight (kg)
11743	Black Cap DC Booster - 340g (.75 lb)	66.00 ea	22.45
10751	SHOCK*STAR DualDelay 9.2m/30' 25/500	65.00 ea	0.00
11240	500' SHOCK*STAR Lead-In-Line	1.00 ea	0.00
12376	E*Star Seismic Detonator 16m	1.00 ea	0.00
01751	SHOCK*STAR Quick Relay 67ms 6m/20'	8.00 ea	0.00
01490	SHOCK*STAR QuickRelay 42ms 6m/20'	9.00 ea	0.00
07602	Hydromite 4100 Bulk	640.00 kg	640.00
D0120	Other-Drilling Charges	715.00 ea	0.00
Total Weight of Explosives (Include Primers) (kg):			662.45

COMMENTS / EXPLANATIONS

General Comments: Extra Booster was lost Down a Hole . Only One Siesmograph was set up due to dead Battery

Jordan Davis

Signature of Blaster in Charge



AUSTIN POWDER LTD. BLAST DESIGN



SHOT NO. _____

DATE: 05/15/12

COMPANY (PERMITTEE) LAW CLUSTERS Stone LOCATION WHITE ROCK

TYPE OF MATERIAL BLASTED LIME Stone HOLE DIAMETER 4

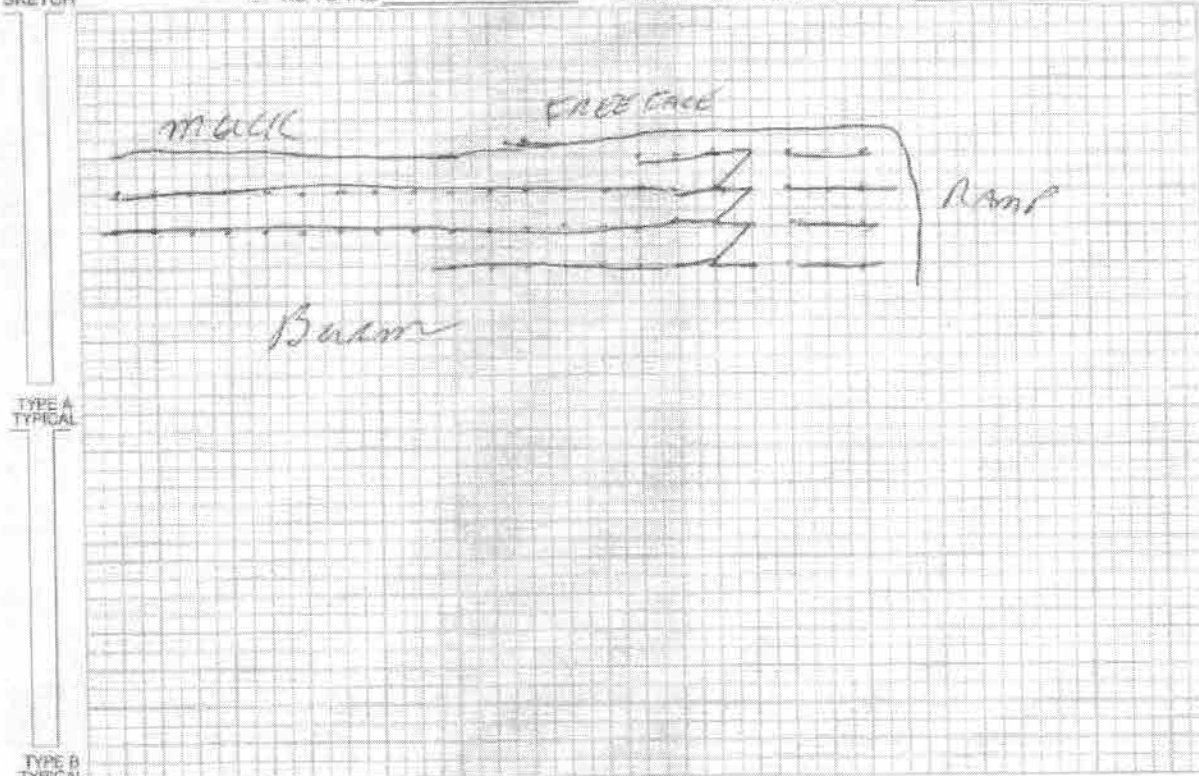
NO. OF HOLES 66 NO. OF ROWS 4 BURDEN 13

SPACING 13 DEPTH 11 FACE HEIGHT 11 LENGTH OF STEMMING 6
(COLLAR)

EXPLOSIVES	TOTAL QUANTITY	CONVERSIONS	
<u>30' Dual Delay 25/70</u>	<u>660</u>	1 mm = 0.03937 in	1 in = 25.4 mm
		1 m = 3.28 ft	1 ft = 0.3048 m
		1 m ³ = 35.32 ft ³	1 ft ³ = 0.0283168 m ³
		1 m ³ = 1.308 yd ³	1 yd ³ = 0.764555 m ³
		1 yd ³ = 27 ft ³	1 ft ³ = 0.37037 yd ³
		1 kg = 2.2046 lb	1 lb = 0.454 kg
		1 tonne = 1.1023 ton	1 ton = 0.907185 tonne
		1 tonne/m ³ = 0.842777 ton/yd ³	1 ton/yd ³ = 1.1986 tonne/m ³

TYPE OF PRIMER Basic CW 660
 TOTAL WEIGHT OF EXPLOSIVES (INCLUDE PRIMERS) 660 WEIGHT OF EXPLOSIVES PER HOLE 10
 TYPE OF INITIATION SYSTEM NON ELECTRIC ELECTRONIC (SIGNIFICANT VARIATIONS SHOULD BE EXPLAINED AND IDENTIFIED IN SKETCH.)
 DELAY DETONATORS USED (TYPE) Dual Delay Quanta

TOTAL NO. TONNES PRODUCED 337 OR TOTAL CUBIC METRES PRODUCED 3473
 TOTAL POWDER FACTOR: KG/CUBIC METRE 0.1
 SKETCH KG/TONNE _____ DENSITY TONNES/CUBIC METRE _____



PRE-BLAST COMMENTS: 25m's BETWEEN HOLES
169m's BETWEEN ROWS

POST-BLAST COMMENTS: PIT FORGOWN TO CLEAR
PIT FOR BLAST TIME

BLASTER IN CHARGE: SORAN PAUS PRINT
[Signature] SIGNATURE

TYPE OF PROTECTIVE COVER USED
 STEEL SHELTER OFF HIGHWAY TRUCK
 BUCKET OF LOADER / SHOVEL OTHER - PLEASE DESCRIBE

BLAST LOG

DESIGN REPORT

MINING + CONSTRUCTION

DATE May 18 2017 TIME 12:00pm
CONTRACT / JOB #
LOCATION Low Crushed stone

BLASTER James Graham
Please Print
SIGNATURE

EXPLOSIVES: **No 022329**

DESIGN:

BLAST TYPE Quarry Open
SIZE OF HOLES 4 1/2"
NO. OF HOLES 42
NO. OF DELAYS 42
MAX. LOAD PER DELAY 64 Kg.s
HOLES PER SERIES 1
POWDER FACTOR

TYPE/BLEND kgs/ # units
1) Emulsion 2638 Kg.s
2) Ready Booster 42
3)

LOADING:

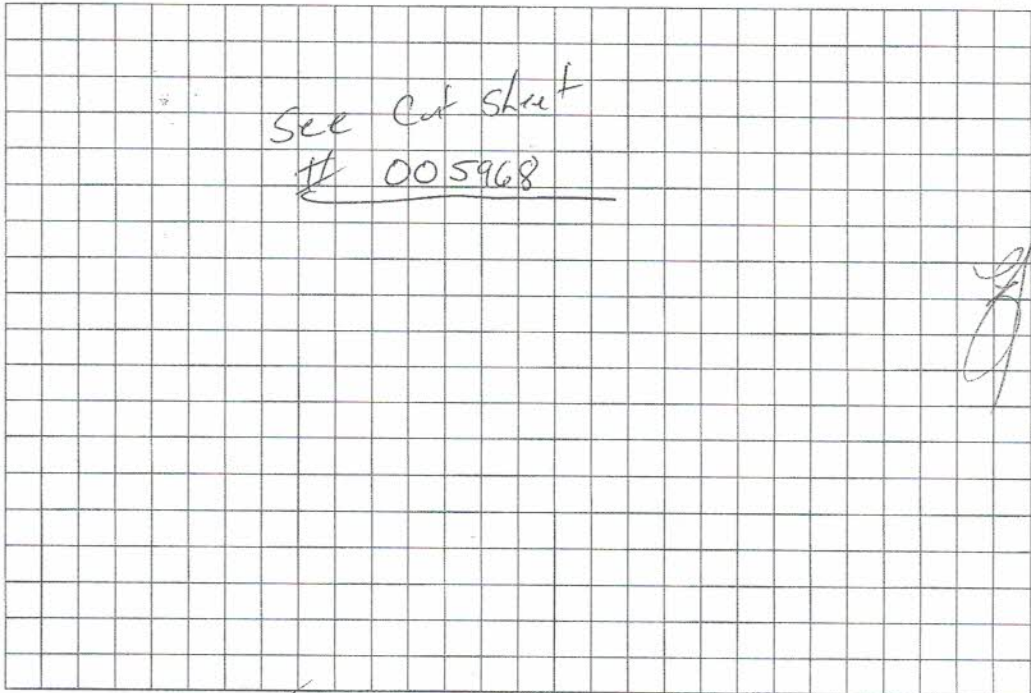
COLLAR 7"
COLUMN LOAD Emulsion
TOE LOAD 80% Ready Booster
SUBGRADE N/A

DETONATORS / INITIATORS:

TYPE LENGTH # UNITS
1) N. Ho Emul 12m 42
2) Jumper 67ms 6m 29
3) Jumper 109ms 5m 2
ELC Det 3m 1

DIMENSIONS:

WIDTH 39'
LENGTH 182'
AVE CUT 27' AVE. DRILL DEPTH 27'
PATTERN: BURDEN 13' SPACING 13'



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

FLYROCK DAMAGE:

HAZARDS & DISTANCE: Power Lines 100m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 005968

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER

EST 7



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: May 18 2017

JOB # 518 064 C

No 005968

JOB LOCATION: Low Cracked Stone middle Bench

DRILLER: Kevin M'Phie

PATTERN: 13 X 13

SUB-DRILL (ft.): N/A

TOTAL FOOTAGE (ft.): 1134 - (42 holes)

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____

		27	27	27	27	27	27	27	27	27	27	27	27	27						
		27	27	27	27	27	27	27	27	27	27	27	27	27						
		27	27	27	27	27	27	27	27	27	27	27	27	27						
											27	27	27							
											27									

CUT SHEET # _____

BLAST LOG

DESIGN

REPORT

MINING+CONSTRUCTION

DATE May 18 2017 TIME 11:48am
 CONTRACT / JOB # J18064C
 LOCATION Low Crashed stone
 DESIGN: wait for ont

BLASTER Kevin McPhee
Please Print
 SIGNATURE [Signature]

EXPLOSIVES: **No 022331**

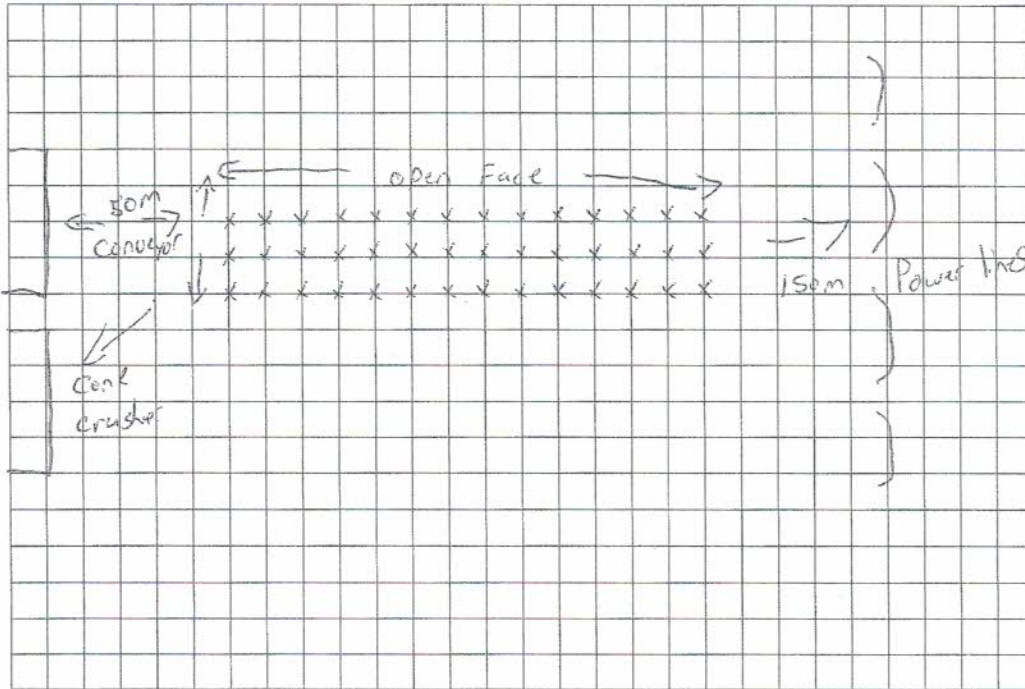
BLAST TYPE Quarry open
 SIZE OF HOLES 4"
 NO. OF HOLES 42
 NO. OF DELAYS 42
 MAX. LOAD PER DELAY 58.9kg
 HOLES PER SERIES Single
 POWDER FACTOR

TYPE/BLEND kgs/# units
 1) Emulsion 2875 Kg
 2) 8.02 Booster 42ea
 3)

LOADING:
 COLLAR 7" and adjusted accordingly
 COLUMN LOAD Emulsion
 TOE LOAD 8.02 booster
 SUBGRADE N/A

DETONATORS / INITIATORS:
 TYPE LENGTH # UNITS
 1) Nitro Energy 40ft 42
 2) Nitro Energy 20ft 14
 3) Elec Det 12ft 1

DIMENSIONS:
 WIDTH
 LENGTH
 AVE CUT 8.02m AVE. DRILL DEPTH 8.08m
 PATTERN: BURDEN 13" SPACING 13"



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

FLYROCK DAMAGE: none

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: See attach UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: 39 kph SW

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: clear

CUT SHEET #'s 00 5968

BULK USED? YES NO

BULK TRUCK NUMBER's 131

BULK TRUCK DRIVER Denis Laramel

$$EST\ ton = (11,910 \cdot 6143) = 14076.18$$

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project Low Crushed Stone
 Location Wainfleet ont
 Blast Date 18 May 2017
 Context (urban/rural/quarry/road/ditch) urban / quarry
 Blast Type (test/production/clean-up/shear) production
 Name of Blaster Kevin McPhee
 Blast Report # 022331
 Previous Blast Report # Reviewed _____

Blast Area Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

500		meters
150		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
N/A		meters
Y	(N)	attach correspondence
150		meters
500+		meters
		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

11:15	AM	PM	time
3			ea
0			ea
(Y)	(N)		
(Y)	(N)		

Post Blast Considerations

Output Flyrock (if yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

50		meters
		mm/s
		dB
(Good)	Bad	
(Y)	(N)	

Blast Inquiries Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action Notify Site Supervisor / Job Foreman

Y	(N)
---	-----

 Notify Head Office to investigate inquiries

Y	(N)
---	-----

Changes What is required to reduce undesirables ? _____

Histogram Start Time 09:43:54 May 18, 2017
Histogram Finish Time 12:41:07 May 18, 2017
Number of Intervals 2126 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps
Job Number: 1

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.3 Volts
Unit Calibration April 9, 2017 by InstanTel
File Name __TEMP.EVT

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

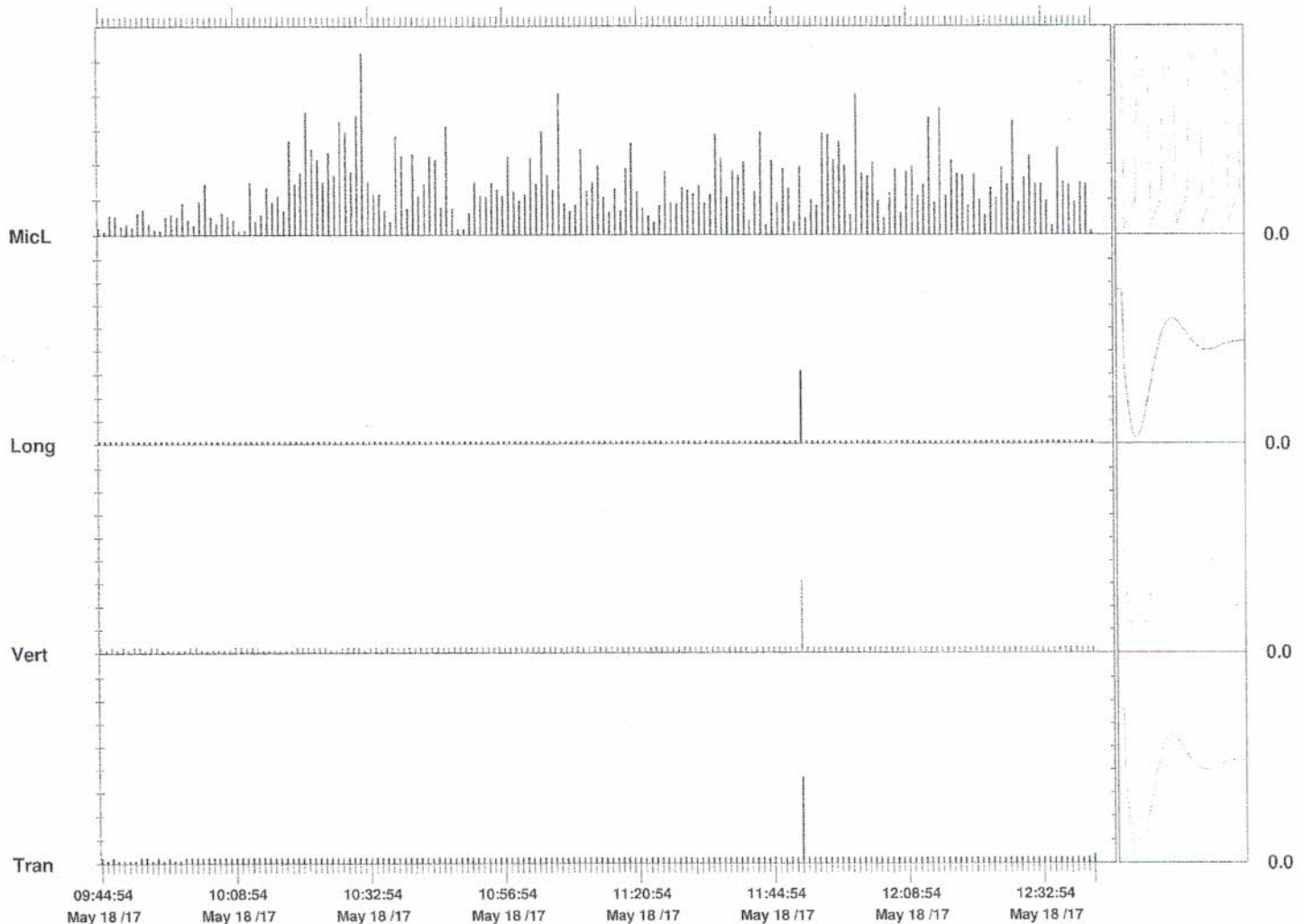
Extended Notes

Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 128.3 dB(L) on May 18, 2017 at 10:31:49
ZC Freq 9.5 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 497 mv)

	Tran	Vert	Long	
PPV	3.68	3.17	3.17	mm/s
ZC Freq	26	47	20	Hz
Date	May 18 /17	May 18 /17	May 18 /17	
Time	11:49:49	11:49:49	11:49:49	
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.6	7.4	Hz
Overswing Ratio	3.6	3.7	3.8	

Peak Vector Sum 3.98 mm/s on May 18, 2017 at 11:49:49



Time Scale: 1 minute /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 10.00 pa.(L)/div

Sensor Check



MINING + CONSTRUCTION

Seismograph Report

Date	May 18, 2017	
Client	Waterford Sand and Gravel Limited	
Quarry Name	Law Crushed Stone	
Location	678 Barrick Rd	
Company	Consbec Inc.	
Name of User	Mark Carpenter	
Seismograph Serial Number	0404	
Blast Report Number	022331	
Time of Blast	11:48am	
Trigger Levels	Mic	112 dB
	Geo	1.25 mm/s
Results	Mic	N/A
	Tran	N/A
	Vert	N/A
	Long	N/A

Comments:

Seismograph readings did not exceed trigger levels

BLAST LOG

DESIGN
REPORT

MINING-CONSTRUCTION

DATE May 18 2017 TIME 1 pm
CONTRACT / JOB # 518.064C
LOCATION Low Crashed Stone
wain fair ont

BLASTER James Graham
Please Print
SIGNATURE

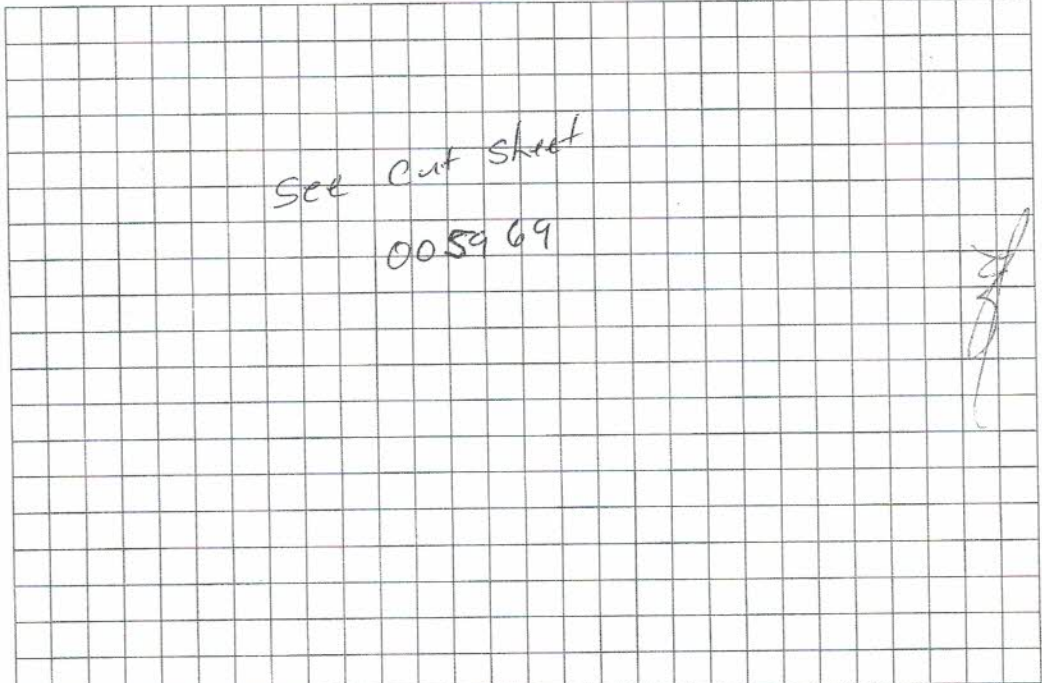
EXPLOSIVES: **No 022330**

DESIGN:
BLAST TYPE Quarry OPEN
SIZE OF HOLES 4"
NO. OF HOLES 33
NO. OF DELAYS 33
MAX. LOAD PER DELAY 60.8 Kgs
HOLES PER SERIES

TYPE/BLEND kgs/# units
1) Emulsion 2006 Kgs
2) Ready Booster 802 33
3)

LOADING:
COLLAR 7"
COLUMN LOAD Emulsion
TOE LOAD 802 Ready Booster
SUBGRADE N/A

DETONATORS / INITIATORS:
TYPE LENGTH # UNITS
1) Nitro Energ 12m 33
2) Sampler 67ms 6m 9
3) Jumper 109ms 6m 2
FHC Det 3m 1
DIMENSIONS:
WIDTH 39"
LENGTH 143"
AVE CUT 26" AVE. DRILL DEPTH 26"
PATTERN: BURDEN 1.3 SPACING 1.3



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

FLYROCK DAMAGE:

HAZARDS & DISTANCE: Power lines 100m

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s 005969

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER



MINING+CONSTRUCTION

CUT SHEET # _____

CUT SHEET



DATE: May 18 2017

No 005969

JOB # 518064C

JOB LOCATION: Low Crusted Stone Wainfair ont

DRILLER: Kevin Michael

PATTERN: 13 x 13 middle

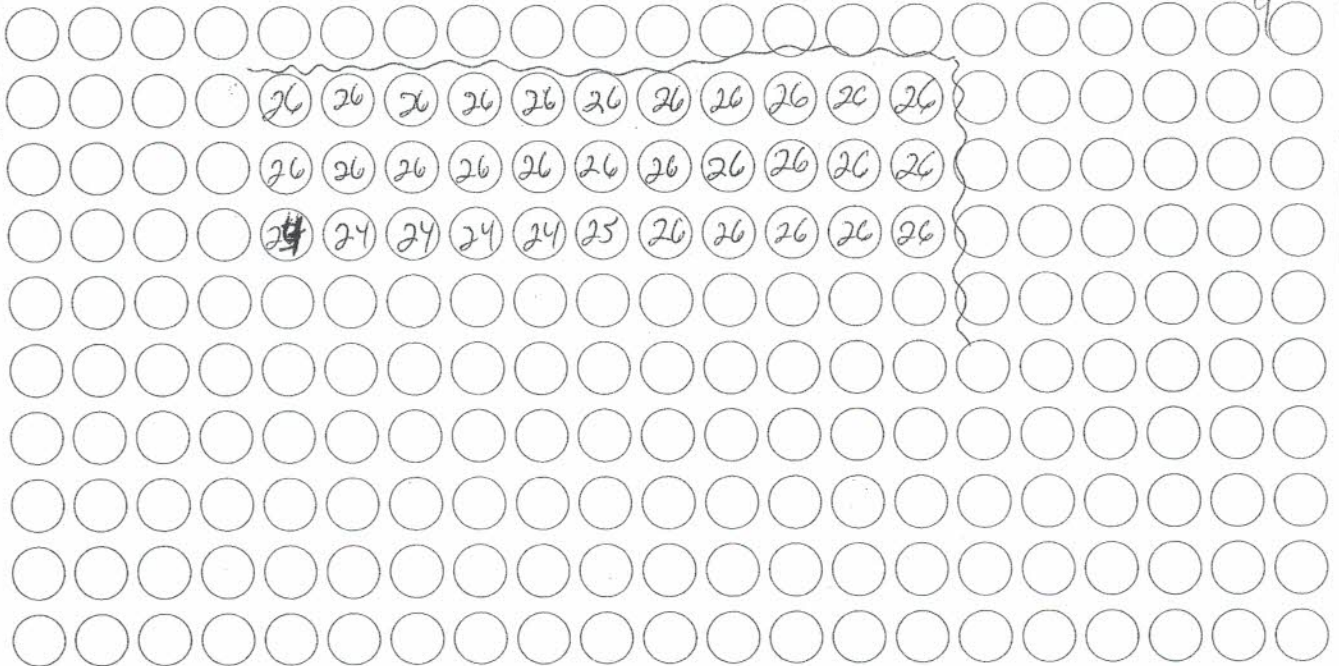
SUB-DRILL (ft.): _____

TOTAL FOOTAGE (ft.): 847 (33 holes)

- INDIVIDUAL HOLE DEPTHS (Include Sub)
- INDICATE TOE AND HELPER HOLES
- SHOW BURDEN OF FACE HOLES
- SHOW NORTH ARC

CUT SHEET # _____

CUT SHEET # _____



CUT SHEET # _____

MINING+CONSTRUCTION

DATE May 19, 2017 TIME 12:08 PM
 CONTRACT / JOB # J18 064C
 LOCATION Low Crashed Stone

BLASTER Kevin McKee
Please Print
 SIGNATURE [Signature]

EXPLOSIVES: **No 022332**

DESIGN:

BLAST TYPE Quarry Open
 SIZE OF HOLES 4"
 NO. OF HOLES 33
 NO. OF DELAYS 33
 MAX. LOAD PER DELAY 58.9 Kg
 HOLES PER SERIES Single
 POWDER FACTOR

TYPE/BLEND	kgs / # units
1) <u>Emulsion</u>	<u>2185 Kgs</u>
2) <u>8oz Booster</u>	<u>3.3 ea</u>
3)	

DETONATORS / INITIATORS:

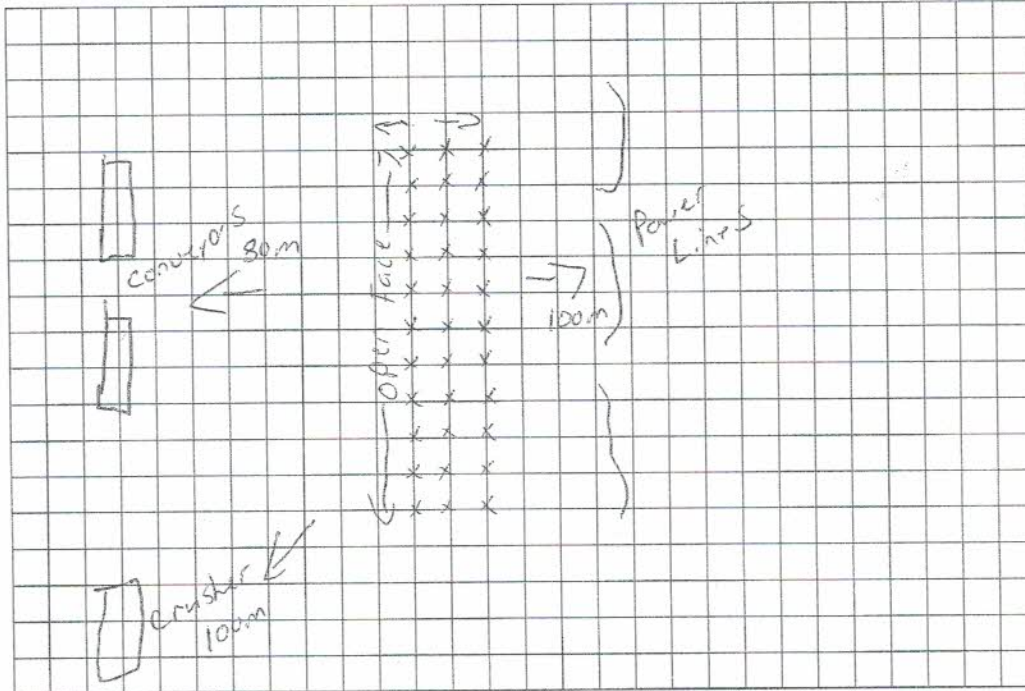
TYPE	LENGTH	# UNITS
1) <u>N. Ho Emul / 25/500</u>	<u>15m</u>	<u>33</u>
2) <u>N. Ho Emul / 42ms</u>	<u>6m</u>	<u>7</u>
3) <u>Elec Det</u>	<u>3.66m</u>	<u>1</u>

LOADING:

COLLAR 6-7 ft and adjusted accordingly
 COLUMN LOAD Emulsion
 TOE LOAD 8oz booster
 SUBGRADE N/A

DIMENSIONS:

WIDTH
 LENGTH
 AVE CUT 8.08m AVE. DRILL DEPTH 8.08m
 PATTERN: BURDEN 13 SPACING 13



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS:

FLYROCK DAMAGE: none

HAZARDS & DISTANCE: See diagram

MISFIRE: YES NO

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: See Atch. UNIT #s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: 39kph SW

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: clear

CUT SHEET #s: 005969

BULK USED? YES NO

BULK TRUCK NUMBER's: 131

BULK TRUCK DRIVER: Denis Laramee

Est ton = ~~9016.79~~
 = 10 656.21

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project Low Crushed stone
 Location Wainfleet ont
 Blast Date 18 May 2017
 Context (urban/rural/quarry/road/ditch) urban / Quarry
 Blast Type (test/production/clean-up/shear) Production
 Name of Blaster Kevin McPhee
 Blast Report # 022332
 Previous Blast Report # Reviewed _____

Blast Area Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

500		meters
100 m		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
N/A		meters
Y	(N)	attach correspondence
100		meters
500		meters
N/A		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

145	AM	time
3		ea
0		ea
(Y)	(N)	
(Y)	(N)	

Post Blast Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

50		meters
		mm/s
		dB
(Good)	(Bad)	
(Y)	(N)	

Blast Inquiries Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	N
Y	N

Changes What is required to reduce undesirables ? _____

Histogram Start Time 12:49:48 May 18, 2017
Histogram Finish Time 15:04:11 May 18, 2017
Number of Intervals 1612 at 5 seconds
Range Geo:254 mm/s
Sample Rate 1024sps
Job Number: 1

Serial Number BA10985 V 10.72-8.17 BlastMate III
Battery Level 6.2 Volts
Unit Calibration April 9, 2017 by Instantel
File Name __TEMP.EVT

Notes

Location: Law Crushed Stone Quarry
Client: Waterford Sand & Gravel Limited
User Name: Consbec Inc
General: Blast Vibration Monitoring

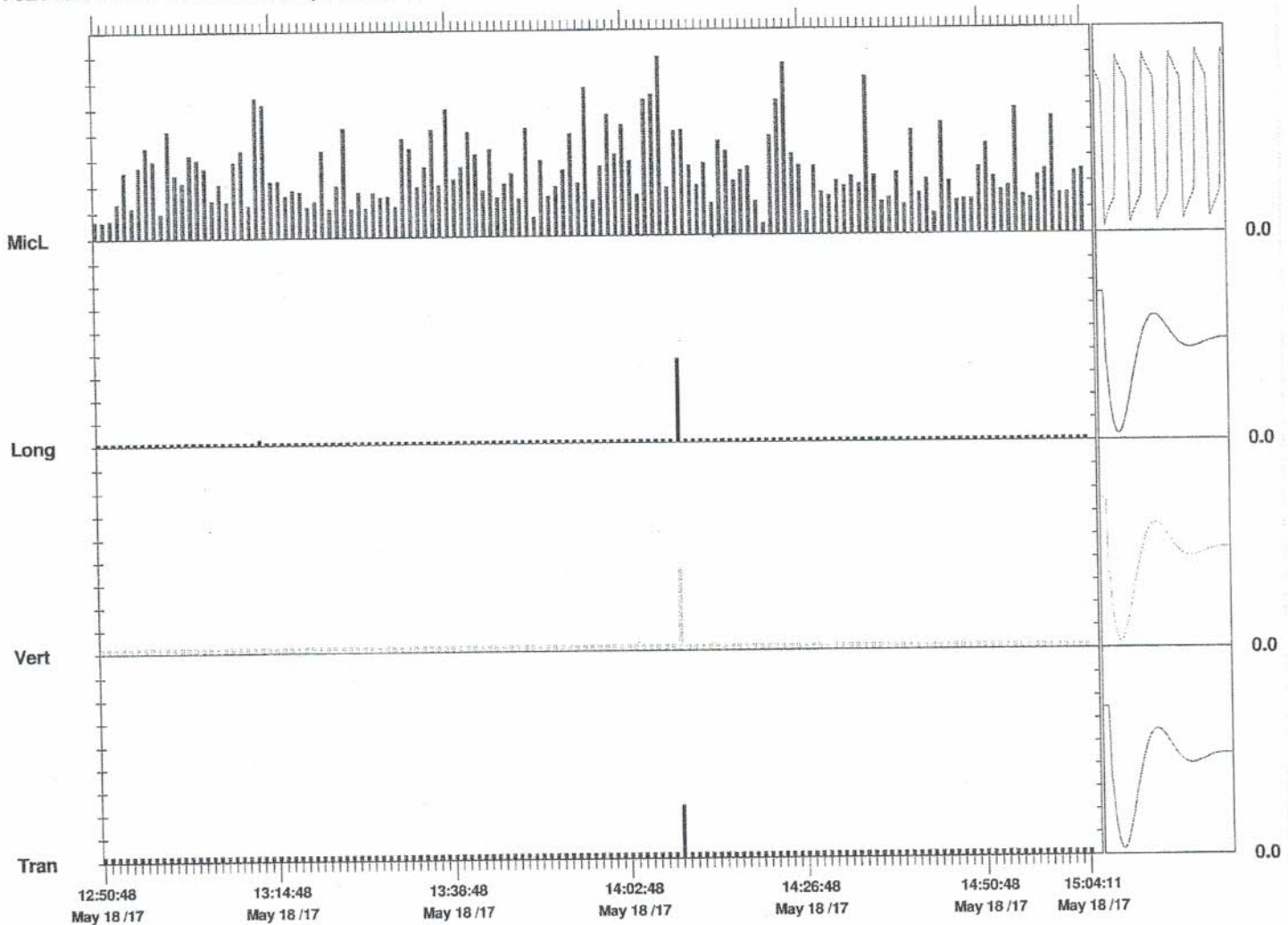
Extended Notes

Hydro pole across from 2035 Youngs Road

Microphone Linear Weighting
PSPL 130.8 dB(L) on May 18, 2017 at 14:06:53
ZC Freq 6.9 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 479 mv)

	Tran	Vert	Long	
PPV	2.29	3.56	3.68	mm/s
ZC Freq	37	64	30	Hz
Date	May 18 /17	May 18 /17	May 18 /17	
Time	14:09:23	14:09:23	14:09:23	
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.6	7.4	Hz
Overswing Ratio	3.5	3.7	3.8	

Peak Vector Sum 4.24 mm/s on May 18, 2017 at 14:09:23



Time Scale: 1 minute /div **Amplitude Scale:** Geo: 1.000 mm/s/div Mic: 10.00 pa.(L)/div

Sensor Check



MINING + CONSTRUCTION

Seismograph Report

Date	May 18, 2017	
Client	Waterford Sand & Gravel Limited	
Quarry Name	Law Crushed Stone	
Location	678 Barrick Rd	
Company	Consbec Inc	
Name of User	Mark Carpenter	
Seismograph Serial Number	0404	
Blast Report Number	022332	
Time of Blast	14:09	
Trigger Levels	Mic	112 dB
	Geo	1.25 mm/s
Results	Mic	N/A
	Tran	N/A
	Vert	N/A
	Long	N/A

Comments:

Seismograph readings did not exceed trigger levels.

Michelle Gallinger

From: Stuart Mitchell <stuartmitchell@consbec.com>
Sent: May-24-17 7:29 PM
To: Ed Lamb; Michelle Gallinger
Cc: kevin mcphoe
Subject: FW: Histogram Data

Please find attached below the computed noise levels for last Thursdays blast.

Anything further please advise.

Thanks



Stuart Mitchell
Manager, Central Division

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From: Mark Carpenter
Sent: May 24, 2017 3:57 PM
To: Stuart Mitchell
Subject: FW: Histogram Data

Good afternoon Stuart,

As requested here is the seismograph dB(L) readings for the May 18, 2017 blasts at the Law Crushed Stone quarry. Explotech has analyzed the seismograph histograms with a computer software to confirm the results.

Best Regards,
Mark Carpenter

From: Erik Hunnisett [<mailto:erik.hunnisett@explotech.com>]
Sent: May-24-17 3:36 PM
To: Mark Carpenter
Subject: Re: Histogram Data

Hi Mark,

The overpressure recorded during the blast time at 11:49 was **111.765 dB(L)** and during the blast at 14:09 was **113.06 dB(L)**. Both compliant with NPC 119 guidelines.

Thanks,

Erik Hunnisett

Explotech Engineering Ltd.

(705) 522-0585 Office

(705) 207-2506 Cell

www.explotech.com

www.blastvibrations.com

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On Wed, May 24, 2017 at 2:59 PM, Mark Carpenter <markcarpenter@consbec.com> wrote:

Hey Erik,

Enclosed is the raw data for the histograms we spoke about over the phone.

Best Regards,

Mark Carpenter

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE September 20 2017 TIME 10:20 am
 CONTRACT / JOB # 319064C
 LOCATION Part Colbourne (middle Bench)

BLASTER Zack Pollack
Please Print
 SIGNATURE [Signature]
 EXPLOSIVES: 23201

DESIGN:

BLAST TYPE Production Open
 SIZE OF HOLES 4 1/4"
 NO. OF HOLES 42
 NO. OF DELAYS
 MAX. LOAD PER DELAY 76kgs max
 HOLES PER SERIES
 POWDER FACTOR 0.45 kgs/m³

TYPE/BLEND kgs/ # units
 1) Emulsion 3195 kgs
 2) AES 200gr Boosters 42 units
 3)

LOADING:

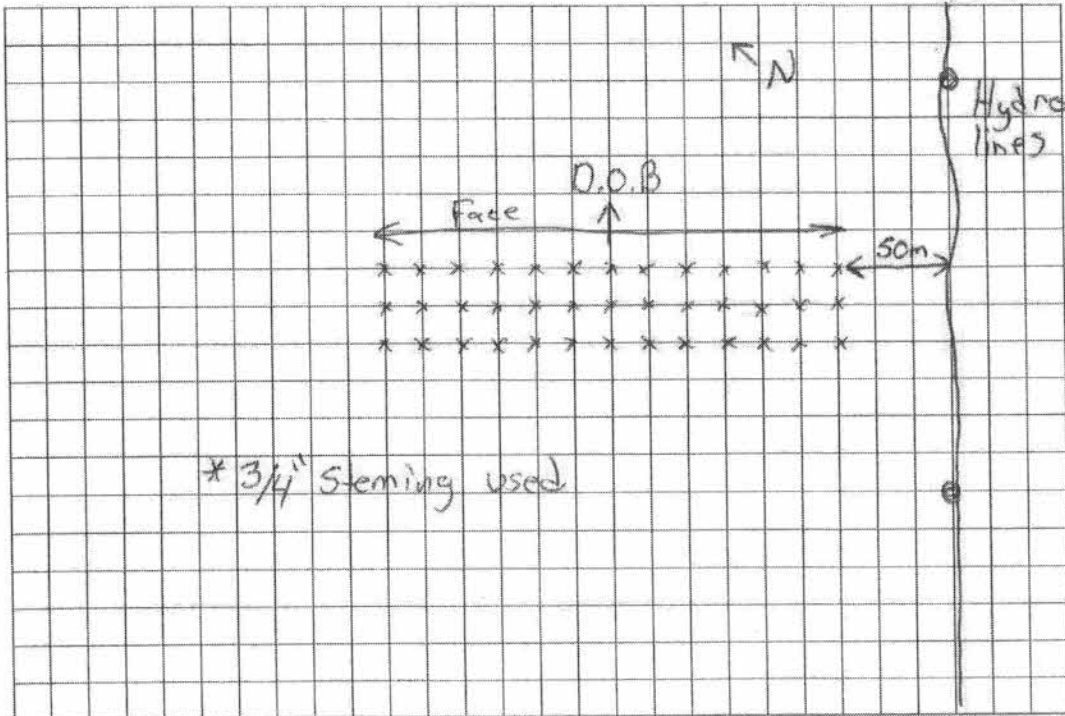
COLLAR 1.82m Accordingly
 COLUMN LOAD Emulsion
 TOE LOAD AES 200gr Boosters
 SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitroeng 250ms</u>	<u>15m</u>	<u>42</u>
2) <u>Nitroeng 109ms</u>	<u>9m</u>	<u>10</u>
3) <u>Nonel Estl 42ms</u>	<u>6m</u>	<u>6</u>

DIMENSIONS:

WIDTH 63.98m @ widest point
 LENGTH 13.71m @ longest point
 AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
 PATTERN: BURDEN 4.57m SPACING 4.57m



PRE BLAST DESIGN

NOTES / REMARKS: good
Approx 6947m³

HAZARDS & DISTANCE: Hydro lines @ 50m

IS THERE A GUARDING PLAN & PROCEDURE? YES NO
 ARE GUARDS IN PLACE? YES NO
 WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO
 CUT SHEET #'s 09810

POST BLAST REPORT

FLYROCK DAMAGE: no
 MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR
 SEISMIC DATA: UNIT #'s
 WIND DIRECTION VELOCITY: SW @ 5 km/h
 ATMOSPHERIC CONDITIONS: Sunny/clear
 BULK USED? YES NO
 BULK TRUCK NUMBER's 134
 BULK TRUCK DRIVER Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project J18064C
 Location Port Colbourne (middle Bench)
 Blast Date September 20th 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zack Pollock
 Blast Report # 23201
 Previous Blast Report # Reviewed 23200

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

50		meters
50		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence
N.A		meters
Y	(N)	attach correspondence
500		meters
500		meters
500 +		meters
Y	(N)	attach correspondence
Y	(N)	attach correspondence
Y	(N)	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

Yes	(AM/PM)	time <u>10:00 am</u>
3		ea
0		ea
(Y)	(N)	
(Y)	(N)	

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

10		meters
		mm/s
		dB
(Good)	(Bad)	
(Y)	(N)	

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

Y	(N)
Y	(N)

Changes

What is required to reduce undesirables ? _____

Date/Time Vert at 10:19:21 September 20, 2017
 Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
 Range Geo: 254 mm/s
 Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
 Battery Level 6.3 Volts
 Unit Calibration July 13, 2017 by Instantel
 File Name _TEMP.EVT

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

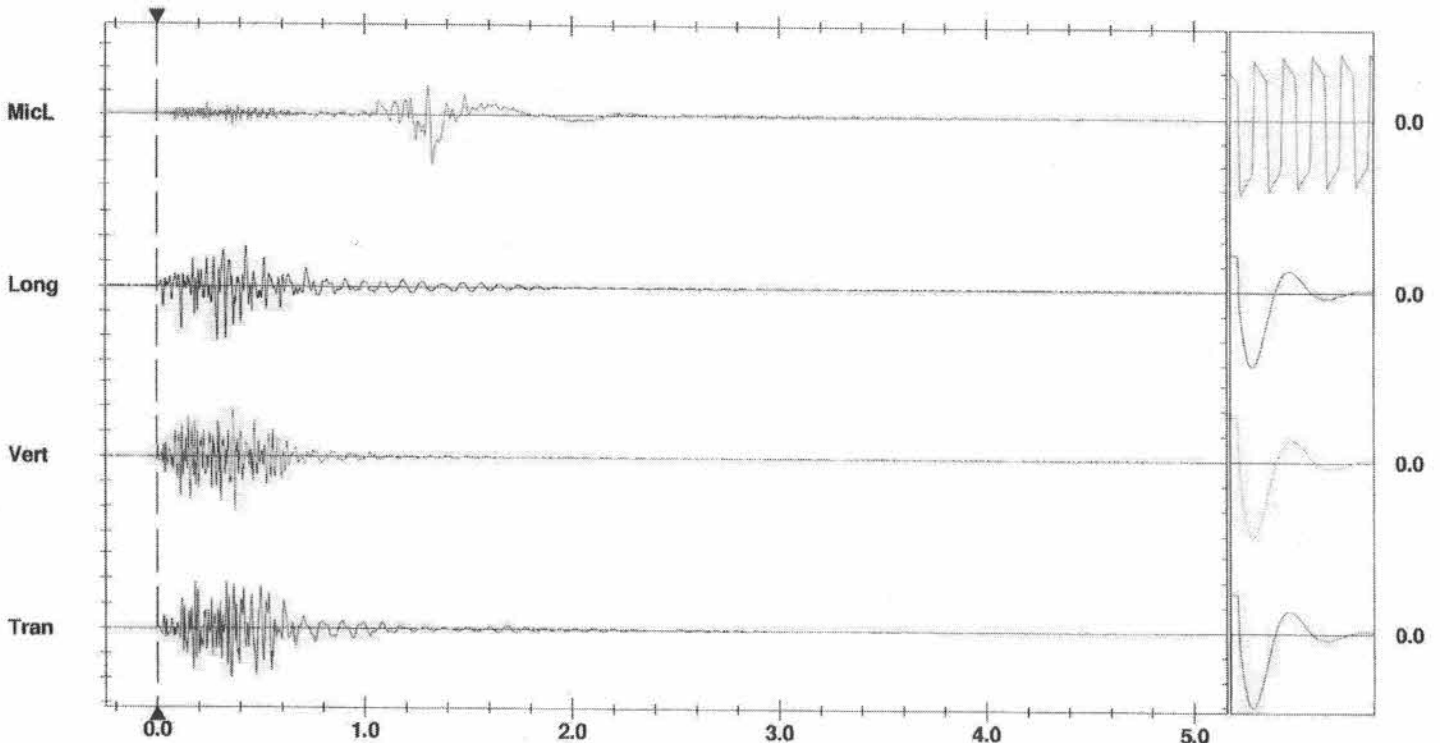
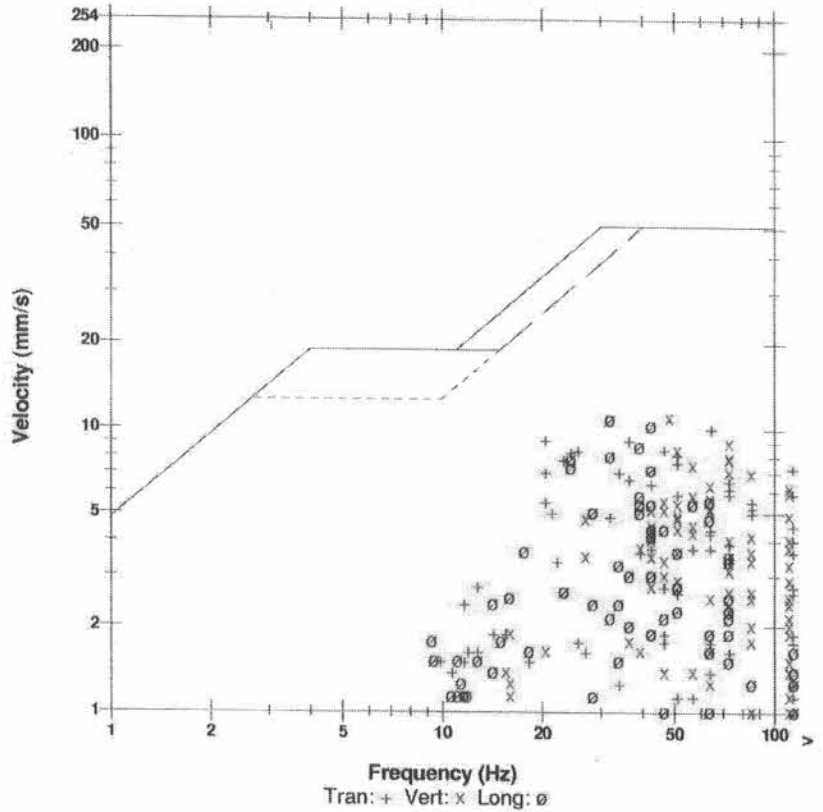
Extended Notes
 Combo Mode September 20, 2017 09:40:37
 South West Corner of Kwik Mix Building

Microphone Linear Weighting
PSPL 120.6 dB(L) at 1.332 sec
ZC Freq 7.0 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 534 mv)

	Tran	Vert	Long	
PPV	10.0	11.0	10.9	mm/s
ZC Freq	34	57	32	Hz
Time (Rel. to Trig)	0.356	0.375	0.291	sec
Peak Acceleration	0.424	0.583	0.318	g
Peak Displacement	0.0598	0.0451	0.0464	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.6	7.9	Hz
Overswing Ratio	3.3	3.4	3.5	

Peak Vector Sum 13.1 mm/s at 0.366 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 5.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check

Seismograph Report

Date	20-Sep-17	
Client	Waterford Sand & Gravel	
Quarry Name	Law Crushed Stone Quarry	
Location	Telephone pole on the corner of Erie Peat Road & Hwy 3	
Company	Consbec Inc	
Name of User	Kevin Mcphee	
Seismograph Serial Number	BA10985	
Blast Report Number	23201	
Time of Blast	10:19	
Trigger Levels	Mic	115 dB(L)
	Geo	1 mm/s
Results	Mic	Unknown
	Tran	Unknown
	Vert	Unknown
	Long	Unknown

Comments:

Seismograph did not take any readings for this blast due to a
 error with the units battery.

BLAST LOG

DESIGN
REPORT

MINING+CONSTRUCTION

DATE September 20th 2017 TIME 10:30 am
CONTRACT / JOB # J18064C (Low Crusher Stone)
LOCATION Port Colborne (middle bench)

BLASTER Zack Pollock
Please Print
SIGNATURE Zack Pollock

EXPLOSIVES: **No 022295**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4 1/4
NO. OF HOLES 42
NO. OF DELAYS
MAX. LOAD PER DELAY 82 kgs max
HOLES PER SERIES
POWDER FACTOR 0.49 Kgs/m³

TYPE/BLEND kgs / # units
1) Emulsion 3,444 Kgs
2) AES 200gr Boosters 42 units
3)

LOADING:

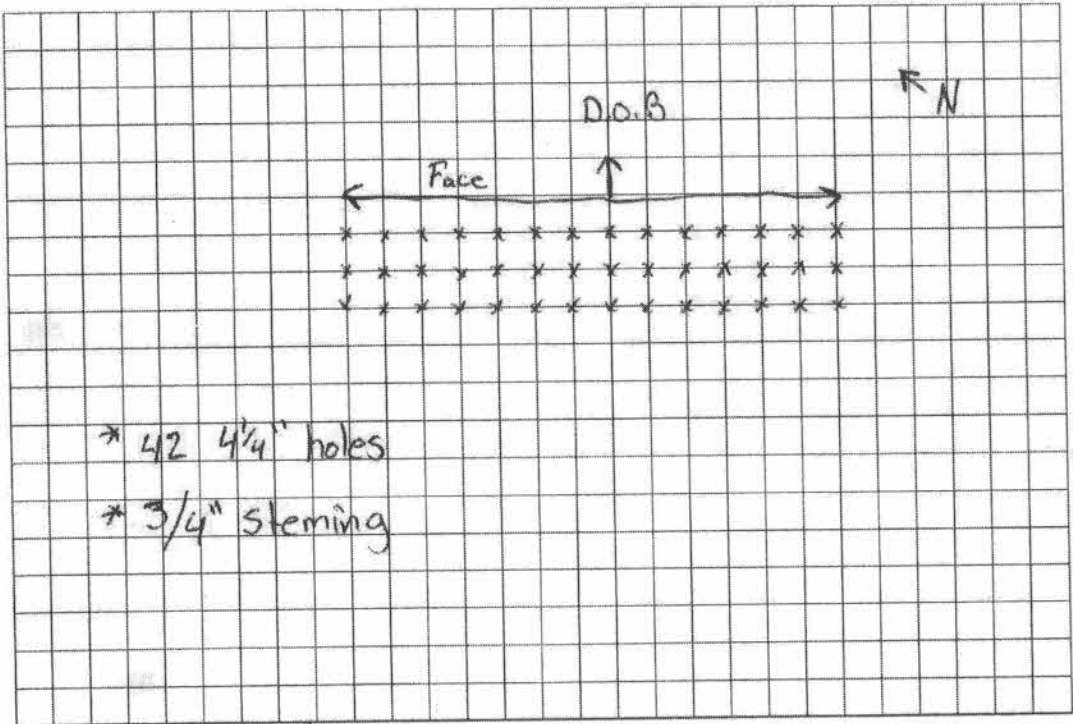
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD AES 200gr Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE LENGTH # UNITS
1) Nitroerg 250ms 15m 42
2) Nitroerg 100ms 6m 4
3) Nitroerg 42ms 6m 3

DIMENSIONS:

WIDTH 63.98m @ widest point
LENGTH 13.71m @ longest point
AVE CUT 7.92m AVE. DRILL DEPTH 7.92m
PATTERN : BURDEN 4.57m SPACING 4.57m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: * Approx 6947 m³

FLYROCK DAMAGE:

HAZARDS & DISTANCE :

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s.....

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s.....

BULK USED? YES NO

BULK TRUCK NUMBER's.....

BULK TRUCK DRIVER.....

BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE September 20 2017 TIME 12:26pm
CONTRACT / JOB # 518064C
LOCATION Part Calbousne (middle bench)

BLASTER Zack Pollock
Please Print
SIGNATURE [Signature]
EXPLOSIVES: 23202

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4 1/4
NO. OF HOLES 42
NO. OF DELAYS
MAX. LOAD PER DELAY 75.61 kgs max
HOLES PER SERIES
POWDER FACTOR 0.44 kgs/m³

TYPE/BLEND kgs/ # units
1) Emulsion 3175 kgs
2) AES 200g Basters 42 units
3)

LOADING:

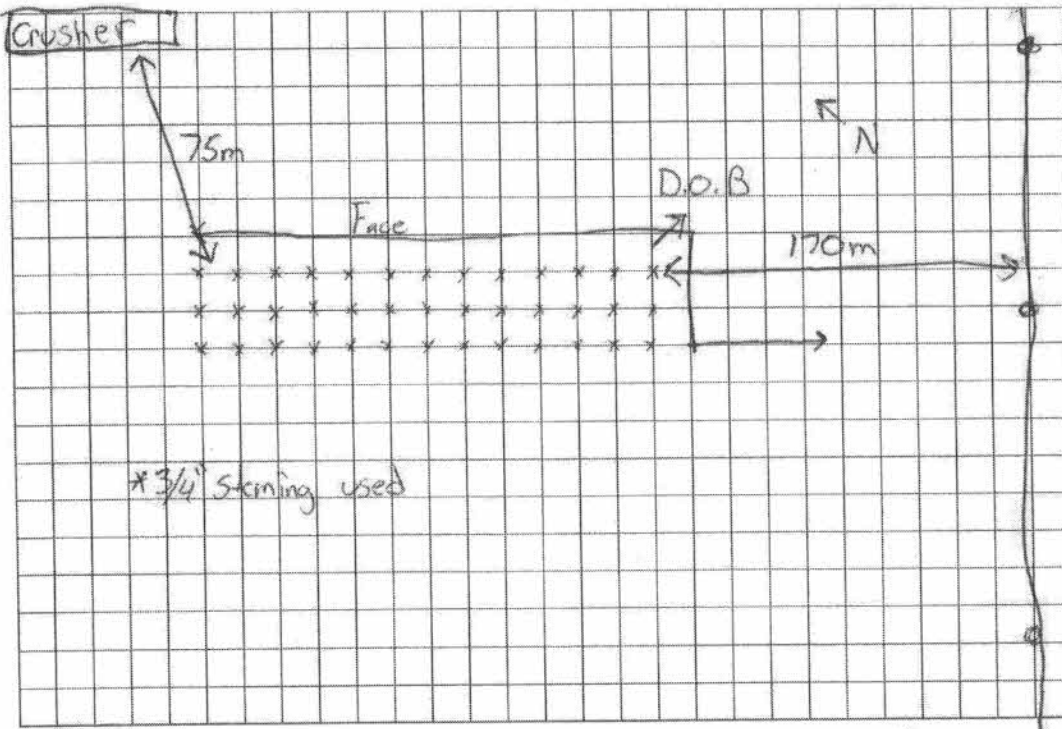
COLLAR 1.82m Accordingly
COLUMN LOAD Emulsion
TOE LOAD 200gr Basters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitroberg 500ms</u>	<u>15m</u>	<u>42</u>
2) <u>Nitroberg 89ms</u>	<u>9m</u>	<u>8</u>
3) <u>AKB 5 Electric Ons</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH 63.98m @ widest point
LENGTH 13.71m @ longest point
AVE CUT 8.22m AVE. DRILL DEPTH 8.22m
PATTERN : BURDEN 4.57m SPACING 4.57m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Approx 7210 m³
P.O# LC5398

FLYROCK DAMAGE: no

HAZARDS & DISTANCE :

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY: SW @ 5km/h

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS: Sunny/clear

CUT SHEET #'s 09811

BULK USED? YES NO

BULK TRUCK NUMBER's 134

BULK TRUCK DRIVER Marcel

SAFE BLASTING & QUALITY CONTROL CHECKLIST



MINING+CONSTRUCTION

General

Project J18064C
 Location Port Colbourne (middle bench)
 Blast Date September 20 2017
 Context (urban/rural/quarry/road/ditch) Quarry
 Blast Type (test/production/clean-up/shear) production (open)
 Name of Blaster Zeck Block
 Blast Report # 23202
 Previous Blast Report # Reviewed 23201

Blast Area

Considerations

Designated Blast Area
 Hydro/Bell Distance to blast
 Notification of blasting required in writing
 Request permission to re-route/shut down
 Request utility representative to attend blast
 Gas/Water Distance to blast
 Notification of blasting required in writing
 Roads/Highways Distance to blast
 Construction Workers Distance to blast
 Property Owners Distance to blast
 Notification of blasting required in writing
 Evacuation required in writing
 MTO evacuation approval received in writing

150	meters	
170	meters	
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
N.A.	meters	
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
500	meters	
500	meters	
500+	meters	
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	attach correspondence

Pre-Blast

Considerations

Designated Blast Area is cleared of workers and public prior to blast
 Number of guards
 Quantity (# of) blasting mats
 Audible warning device used such as cannister or air horn
 Pre-blast survey complete

4/5	AM	PM	time 12:00
5	ea		
5000	ea		
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		

Post Blast

Considerations

Output Flyrock (If yes, give distance)
 Vibration (reading)
 Airblast (reading)
 Fragmentation
 Movement

10	meters
	mm/s
	dB
<input checked="" type="checkbox"/> Good	<input checked="" type="checkbox"/> Bad
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N

Blast Inquiries

Person(s) Name _____
 Time _____
 Telephone # _____
 Address _____
 Reason for call _____

Action

Notify Site Supervisor / Job Foreman
 Notify Head Office to investigate inquiries

<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N
<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N

Changes

What is required to reduce undesirables ? _____

Date/Time Long at 12:24:15 September 20, 2017
Trigger Source Geo: 1.00 mm/s, Mic: 115 dB(L)
Range Geo: 254 mm/s
Record Time 5.0 sec at 1024 sps

Serial Number BE12758 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration July 13, 2017 by InstanTel
File Name _TEMP.EVT

Notes
 Location: Law Crushed Stone Quarry
 Client: Waterford Sand & Gravel
 User Name: Consbec Inc.
 General: Blast Vibration Monitoring

Extended Notes

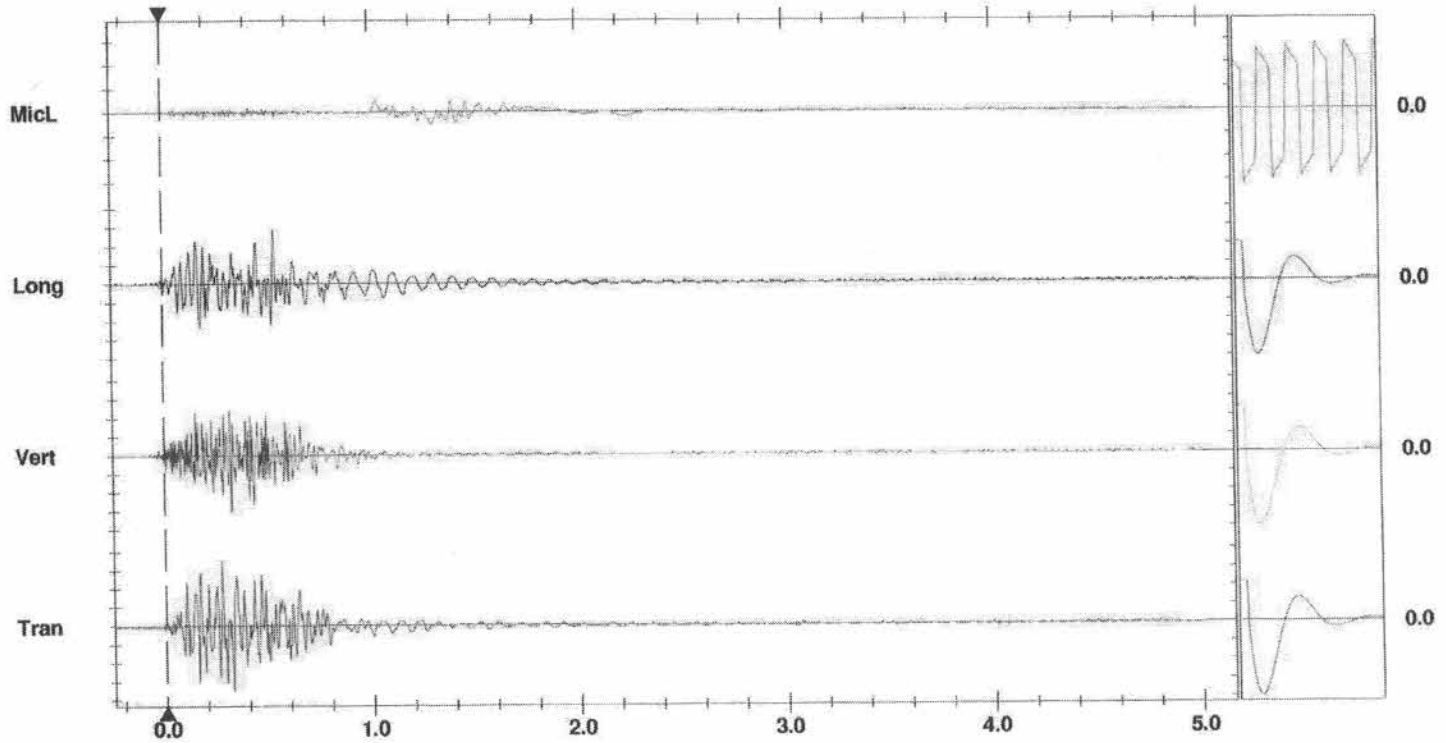
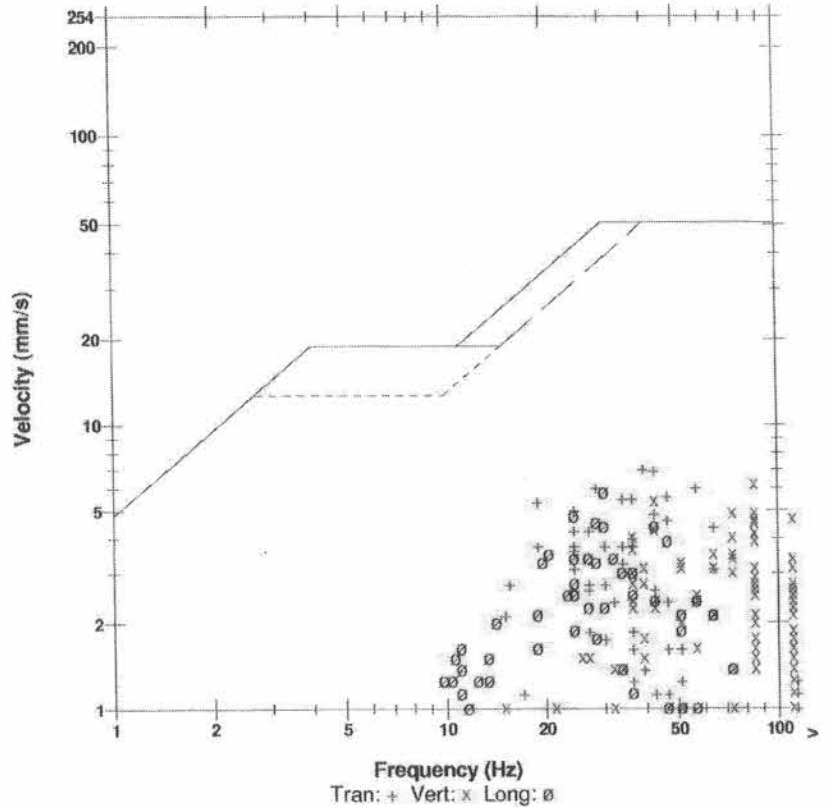
Combo Mode September 20, 2017 09:40:37
 South West Corner of Kwik Mix Building

Microphone Linear Weighting
PSPL 108.8 dB(L) at 1.313 sec
ZC Freq 9.1 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 534 mv)

	Tran	Vert	Long	
PPV	7.11	6.22	5.84	mm/s
ZC Freq	39	85	30	Hz
Time (Rel. to Trig)	0.271	0.322	0.534	sec
Peak Acceleration	0.252	0.331	0.133	g
Peak Displacement	0.0414	0.0186	0.0292	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.9	7.6	7.9	Hz
Overswing Ratio	3.3	3.4	3.5	

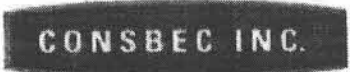
Peak Vector Sum 9.35 mm/s at 0.322 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
 Trigger =

Sensor Check



MINING + CONSTRUCTION

Seismograph Report

Date	20-Sep-17	
Client	Waterford Sand & Gravel	
Quarry Name	Law Crushed Stone Quarry	
Location	Telephone pole on the corner of Erie Peat Road & Hwy 3	
Company	Consbec Inc	
Name of User	Kevin Mcphee	
Seismograph Serial Number	BA10985	
Blast Report Number	23202	
Time of Blast	12:24	
Trigger Levels	Mic	115 dB(L)
	Geo	1 mm/s
Results	Mic	Unknown
	Tran	Unknown
	Vert	Unknown
	Long	Unknown

Comments: Seismograph did not take any readings for this blast due to a
 error with the units battery.

BLAST LOG

DESIGN
REPORT

MINING + CONSTRUCTION

DATE September 20th 2017 TIME 11:30am
CONTRACT / JOB # J18064C
LOCATION Port Colbourne (middle Bench)

BLASTER Zack Billock
Please Print
SIGNATURE [Signature]

EXPLOSIVES: **No 022300**

DESIGN:

BLAST TYPE Production (open)
SIZE OF HOLES 4 1/4"
NO. OF HOLES 42
NO. OF DELAYS
MAX. LOAD PER DELAY 82 kgs max
HOLES PER SERIES
POWDER FACTOR 0.49 kgs/m³

TYPE/BLEND	kgs/ # units
1) <u>Emulsion</u>	<u>3 444 kgs</u>
2) <u>200gr Boosters</u>	<u>42 units</u>
3) .....	.....

LOADING:

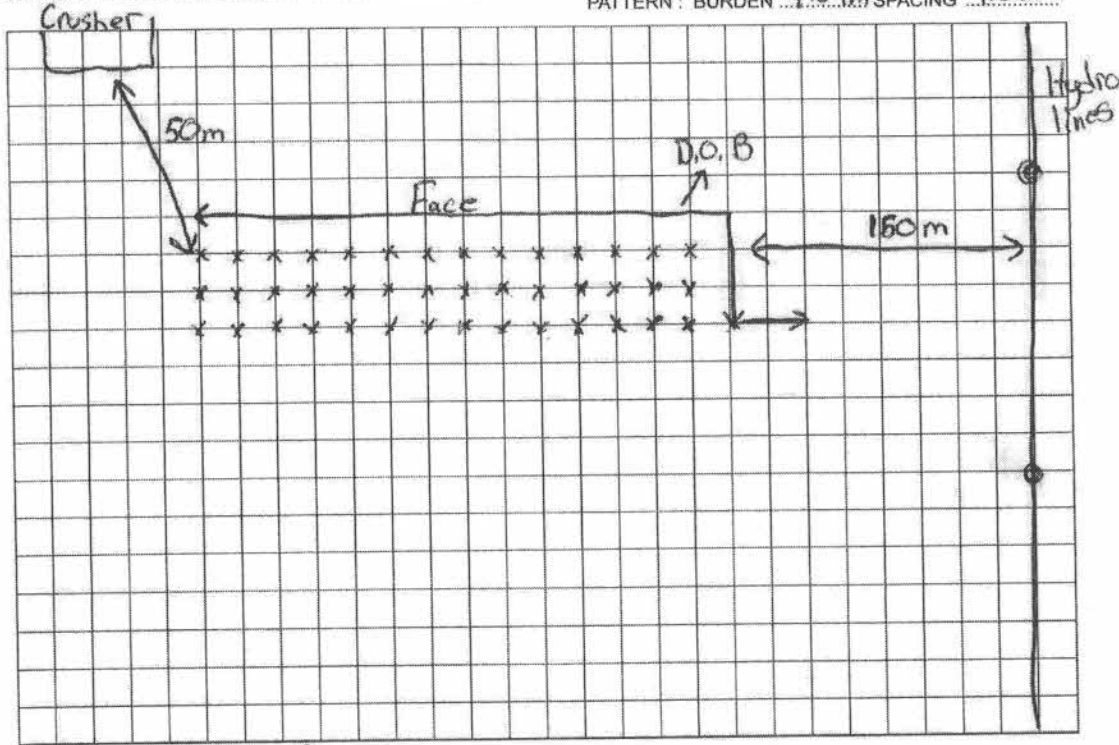
COLLAR 2m Accordingly
COLUMN LOAD Emulsion
TOE LOAD 200gr Boosters
SUBGRADE 0m

DETONATORS / INITIATORS:

TYPE	LENGTH	# UNITS
1) <u>Nitroeng 360ms</u>	<u>15m</u>	<u>42</u>
2) <u>Nitroeng 109ms</u>	<u>6m</u>	<u>4</u>
3) <u>Electric Cms</u>	<u>3m</u>	<u>1</u>

DIMENSIONS:

WIDTH 63.93m @ widest point
LENGTH 13.71m @ longest point
AVE CUT 8.22m AVE. DRILL DEPTH 8.22m
PATTERN : BURDEN 4.54m SPACING 4.57m



PRE BLAST DESIGN

POST BLAST REPORT

NOTES / REMARKS: Approx 7210 m³

FLYROCK DAMAGE:

HAZARDS & DISTANCE :

MISFIRE: YES NO
IF YES, REPORT TO DEPT. OF LABOUR

IS THERE A GUARDING PLAN & PROCEDURE? YES NO

SEISMIC DATA: UNIT #'s.....

ARE GUARDS IN PLACE? YES NO

WIND DIRECTION VELOCITY:

WAS THERE A CUT SHEET PROVIDED BY THE DRILLER? YES NO

ATMOSPHERIC CONDITIONS:

CUT SHEET #'s.....

BULK USED? YES NO

BULK TRUCK NUMBER's

BULK TRUCK DRIVER

Date dd/mm/yy	Blast #	# Holes	Depth (feet)	Tonnes	Seizmograph Locations	Trans.	Vert.	Long.	dB	Weather
22-Mar-18	18-001	121	15	7436.00	A	2.08	1.01	1.04	102.90	A
					B	2.24	1.11	0.85	106.00	A
22-Mar-18	18-003	124	15	7890.00	A	3.41	0.75	1.72	105.30	A
					B	2.73	1.63	1.39	105.10	A
4-Apr-18	18-002	118	14.5	7936.00	A	2.09	1.33	2.19	100.10	B
					B	2.78	1.40	2.86	99.30	B
4-Apr-18	18-004	126	14.6	8073.00	B	1.80	1.04	1.66	102.30	B
					A	3.098	1.49	3.53	108.00	B
					B	2.03	1.40	1.52	102.80	F
10-Apr-18	18-005	116	14	7652.00	B	4.98	2.59	2.97	103.70	F
					A	2.03	1.40	1.52	102.80	F
12-Apr-18	18-006	121	14	7982.00	A	2.14	0.98	1.25	100.30	B
					B	1.38	1.32	1.73	99.30	B
12-Apr-18	18-007	49	24.6	15230.00	B	3.14	1.17	1.58	106.40	H
					A	1.79	1.16	1.14	101.90	H
19-Apr-18	18-008	110	14	7256.00	A	2.35	1.67	1.52	106.20	B
					B	2.77	1.19	1.36	104.70	B
19-Apr-18	18-009	70	15	4806.00	B	2.12	1.12	1.48	107.70	B
					A	1.88	1.40	2.43	106.00	B
					B	2.12	1.12	1.48	107.70	B
23-Apr-18	18-010	82	15	5796.00	B	3.00	1.34	2.55	103.60	A
					A	2.15	1.41	1.95	99.10	A
23-Apr-18	18-011	60	26	19410.00	B	7.12	2.22	6.31	107.40	A
					A	3.82	3.78	2.11	99.70	A
					A	3.82	3.78	2.11	99.70	A
27-Apr-18	18-012	138	15	9754.00	B	3.87	1.70	1.90	107.00	F
					A	2.85	2.72	2.14	99.30	F
					B	2.89	1.17	2.47	107.50	F
27-Apr-18	18-013	108	15	7633.00	A	2.63	1.60	2.01	103.00	F
					B	2.92	3.68	3.18	119.70	K
					C	4.36	5.35	6.33	117.20	K
25-Jul-18	18-015	53	26	17146.00	C	2.74	2.82	3.83	117.30	B
					B	5.25	2.18	4.15	112.20	B
					No Triggers			B		
					C	2.12	3.93	4.32	118.80	B
25-Jul-18	18-016	56	26	17793.00	B	6.05	2.77	4.98	113.00	B
					D	1.65	0.89	0.64	91.50	B
					C	0.04	0.06	0.07	126.90	F
					E	4.72	3.44	6.63	111.60	F
1-Aug-18	18-017	66	24.2	19855.00	D	2.29	0.64	1.02	88.00	F
					C	2.46	2.29	2.96	116.70	B
					E	4.67	2.73	4.37	105.20	B
					No Triggers			B		
1-Aug-18	18-018	58	27.4	18089.00	E	4.71	1.78	4.54	108.00	F
					C	No Triggers			F	
					D	No Triggers			F	
					C	No Triggers			F	
10-Aug-18	18-019	60	26.5	19801.00	C	2.02	1.82	0.95	111.50	F
					E	4.08	2.56	4.25	110.30	F
					No Triggers			F		
					D	No Triggers			F	
10-Aug-18	18-020	62	24.7	19089.00	E	4.08	2.56	4.25	110.30	F
					No Triggers			F		
					E	4.08	2.56	4.25	110.30	F
					No Triggers			F		
10-Aug-18	18-021	61	26.7	19255.00	E	4.08	2.56	4.25	110.30	F
					C	2.02	1.82	0.95	111.50	F
					No Triggers			F		
					D	No Triggers			F	
13-Sep-18	18-022	60	27.9	20841.00	B	5.93	3.40	5.45	105.40	B
					C	1.91	2.41	1.78	118.60	B
					B	5.93	3.40	5.45	105.40	B
13-Sep-18	18-023	33	23.9	11336.00	C	1.91	2.41	1.78	118.60	B
					B	5.93	3.40	5.45	105.40	B
					C	1.91	2.41	1.78	118.60	B
4-Dec-18	18-025	118	15	8340.00	C	3.76	5.34	3.40	124.10	F
					B	1.65	1.47	1.27	103.60	F
4-Dec-18	18-026	136	15	9612.00	C	3.76	5.34	3.40	124.10	F
					B	1.65	1.47	1.27	103.60	F

Seizomograph Location

- A=2035 Youngs Rd.
- B=Cr. of Hwy 3 and Erie Peat Rd.
- C=Erie Peat Rd. North End
- D=10423 Lakeshore Rd. McCabe Residence
- E= Erie Peat Rd.

Weather

- A= Sunny and Clear
- B= Cloudy / Overcast
- C= Cloudy / Overcast and Showers
- D=Cloudy / Heavy Snow
- E-Cloudy/Light snow
- F=Partly Cloudy
- G=Cloudy/High Clouds
- H=Cloudy/Overcast/Light Rain
- I=Hazy Hot Humid
- J=Light Rain
- K=Overcast/Low Clouds
- L=Heavy rain

Customer: **Waterford**

Blast Report

Quarry: **Law Crushed Stone**P.O. #: **LCS3496**Blast Date: **2018-03-22**Blast Number: **18-001**Orica Order #: **2316001**Blast Time: **12:09 PM**

page 1

Blast-in-charge: **Mike derkinderen** (Print Name)Blast Location: **Bottom Bench** (Bench / Face)GPS Coordinates: **42.89767** °N Latitude **79.29322** °W Longitude
Centre of Blast Centre of BlastWind from the: **NW** at **20** kph Temperature: **0** °CClear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: **30000f****- Drilling Information -**

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0	# Holes: 121 = 1,815.0 ft (3 1/2 " diam)
Secondary Bit diam: <input type="text"/> mm	<input type="text"/>	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	<input type="text"/>	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	32,130	29,745	2,385

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	123	41.8

total explosives weight in Blast (kg): **2,427**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25 ms	123
CONNECTADET 9M		25 ms	3
CONNECTADET 9M		42 ms	12

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:	# req'd
# of Blasts today (this Quarry)	2
# of Blasters (this Blast)	1 5 hr
# of Helpers (this Blast)	2 8 hr
# of MMU's (this Blast)	1

Services:		
ADVANCED BLAST DESIGN	Enter "1" if Advance Blast Des	
BULK TRUCK CHARGE	As per agreement	1
SHOT SERVICE FEE *	As per agreement	1
BORETRACK	Enter "1" if Boretraked	0
SEISMOGRAPH RENTAL	Please Contact Account Mana	2

tonnes Blasted: **7,436** te **2,860** m³

Holes Loaded: **121** holes
... including: **5** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **5** rows

LLL15-39**- Pattern (Front Row)-**Burden: **8.0** ft avgSpacing: **8.0** ft avg# Holes: **31** front row**- Pattern (Main Body) -**Burden: **8.0** ft avgSpacing: **7.0** ft avg# Holes: **90** main bodyBench Height: **15.0** ft avgSub-drill: **0.0** ft avgHole Depth: **15.0** ft avg**- Stone Decking -**Front Row: ft avgMain Body: ft avg**# Stone Decks:** **0** per blast**- Collar Stemming -**Front Row: **6.5** ft avgMain Body: **6.5** ft avgMaterial used: **3/8's stone****- Charge Length -**Front Row: **8.5** ft avgMain Body: **8.5** ft avg**- Charge Weight -**Front Row: **19.0** kg/holeMain Body: **19.0** kg/holeMax. per delay: **20.0** kg/delaySD () Equation: **383.6** kg/delayTotal kg Loaded: **2,427** kgRock Density: **2.60** g/cc = te/m³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

- Powder Factor -Yield PF: **0.326** kg/te (actual)Front row: **0.268** kg/te (theoretical)Main Body: **0.307** kg/te (theoretical)"KPI" PF: **0.299** kg/te (theoretical)1.430 lb/yd³1.177 lb/yd³1.345 lb/yd³1.311 lb/yd³**NOTES:****2 Holes Received an additional primer due to the original primers not pulling into product.**

Customer: **Waterford****Blast Design**

Quarry: Law Crushed Stone

P.O. #: LCS3496

Blast Date: 2018-03-22

Blast Number: 18-001

Orica Order #: 2316001

Blast Time: 12:09 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89776	79.29332	0.748707	1.383929
Front Row Corner	42.89735	79.29335	0.748700	1.383930
Back Row Corner	42.89788	79.29300	0.748709	1.383924
Average (Centre of Blast)	42.89767	79.29322	0.748706	1.383928

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	587.6	m		
Post Blast Data:	ppV:	2.3 mm/s	Trigger set at:	2.0 mm/s
	frequency:	23.0 Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	106.0 dB	Trigger set at:	115 dB
Enter description of seismograph location				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28563	0.748629	1.383795
2nd Reading				
Average	42.89326	79.28563	0.748629	1.383795
Distance (2nd Seis. From Centre of Blast)	790.0	m		
Post Blast Data:	ppV:	2.1 mm/s	Trigger set at:	2.0 mm/s
	frequency:	4.0 Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	102.9 dB	Trigger set at:	115 dB
Enter description of seismograph location				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	mm/s	Trigger set at:	2.0 mm/s
	frequency:	Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	dB	Trigger set at:	115 dB
Enter description of seismograph location				

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: **30** Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(587.6)^2}{30^2} \text{ kg} \\
 &= \frac{345,274}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **384** kg

Orica

Blaster-in-charge:

*Mike Derkinderen*Signature required, indicating that
Blast Report is Complete & Accurate.



Customer: **Waterford**

Blast Design

Quarry: **Law crushed stone**

P.O. #:

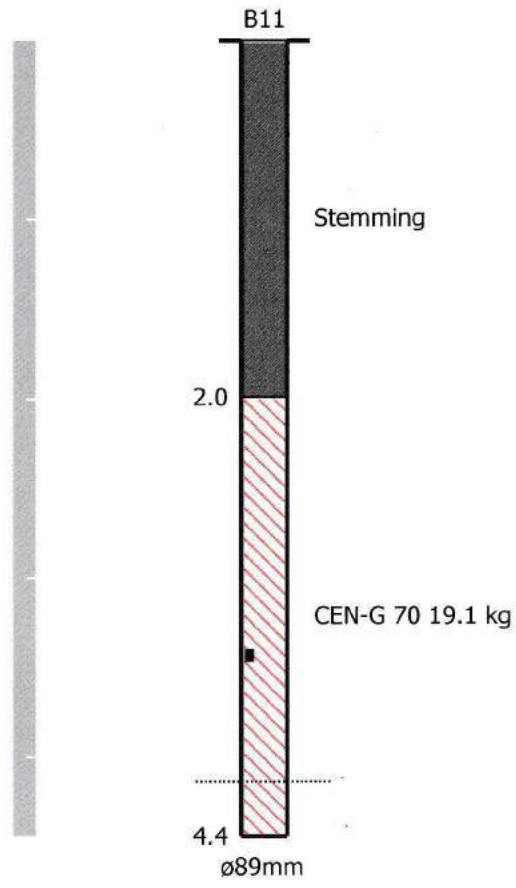
Blast Date: **March 22, 2018**

Blast Number: **18-001**

Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica
Blaster-in-charge:

Mike derkinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 12:09:15 March 22, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.127 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 22, 2017 by InstanTEL
File Name UM6859_20180322120915.IDFW

Notes

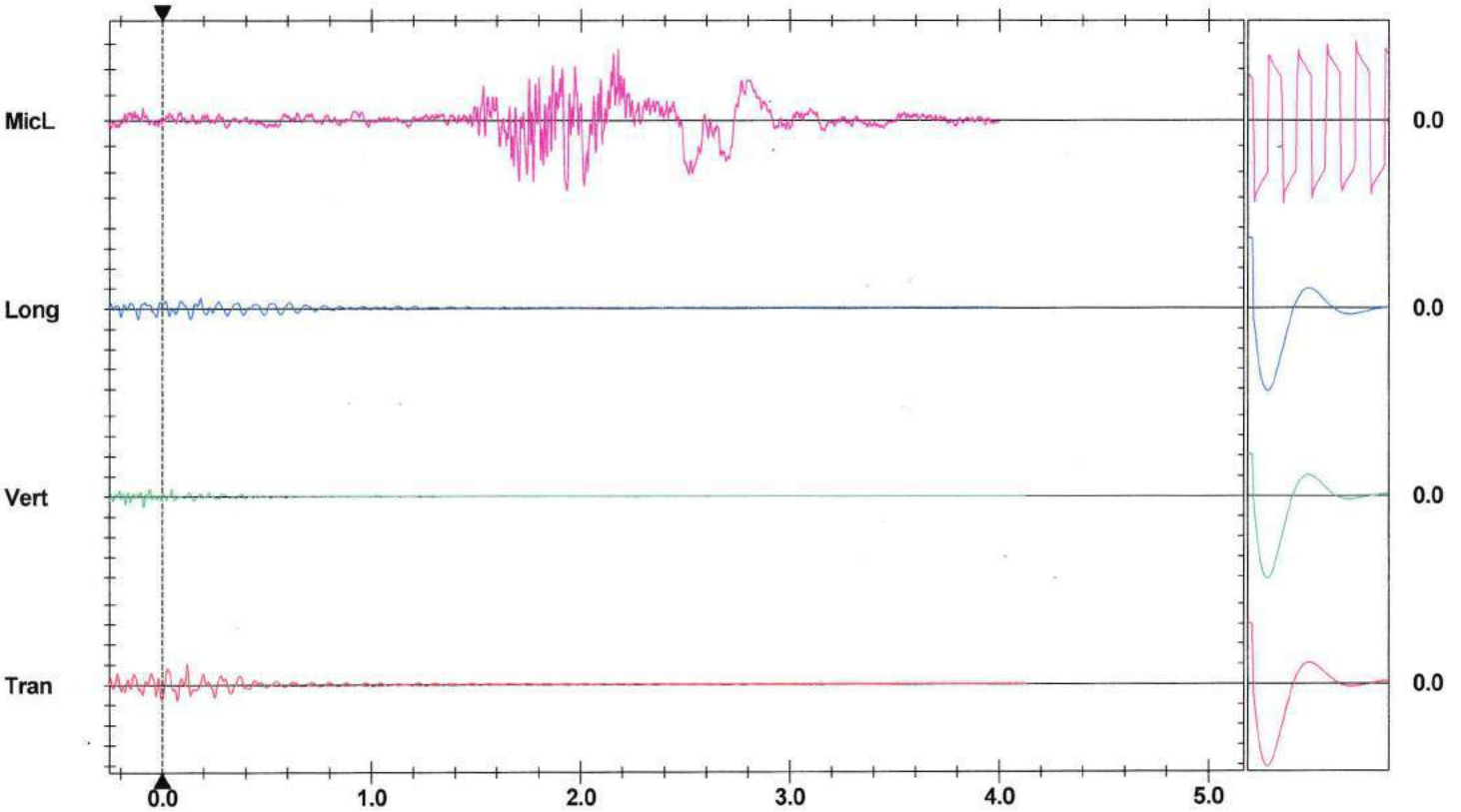
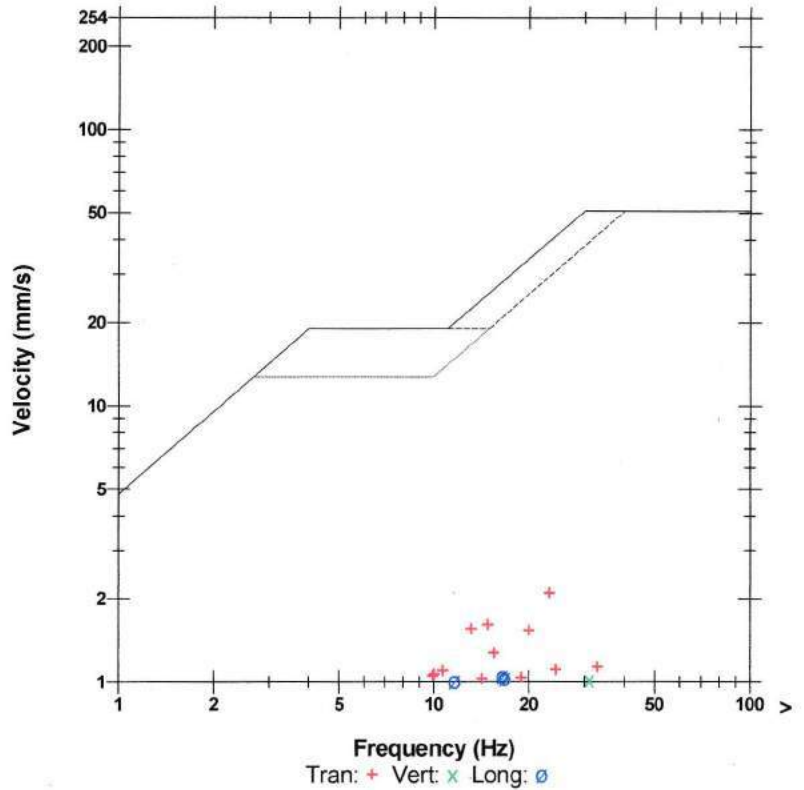
Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 102.9 dB(L) 2.777 pa. (L) at 2.181 sec
ZC Freq 4.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1560 mv)

	Tran	Vert	Long	
PPV	2.089	1.017	1.048	mm/s
ZC Freq	23	31	16.5	Hz
Time (Rel. to Trig)	0.124	-0.086	-0.113	sec
Peak Acceleration	0.038	0.028	0.020	g
Peak Displacement	0.017	0.005	0.011	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.0	4.0	4.3	

Peak Vector Sum 2.107 mm/s at 0.124 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 12:09:15 March 22, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.196 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180322110915.IDFW

Notes

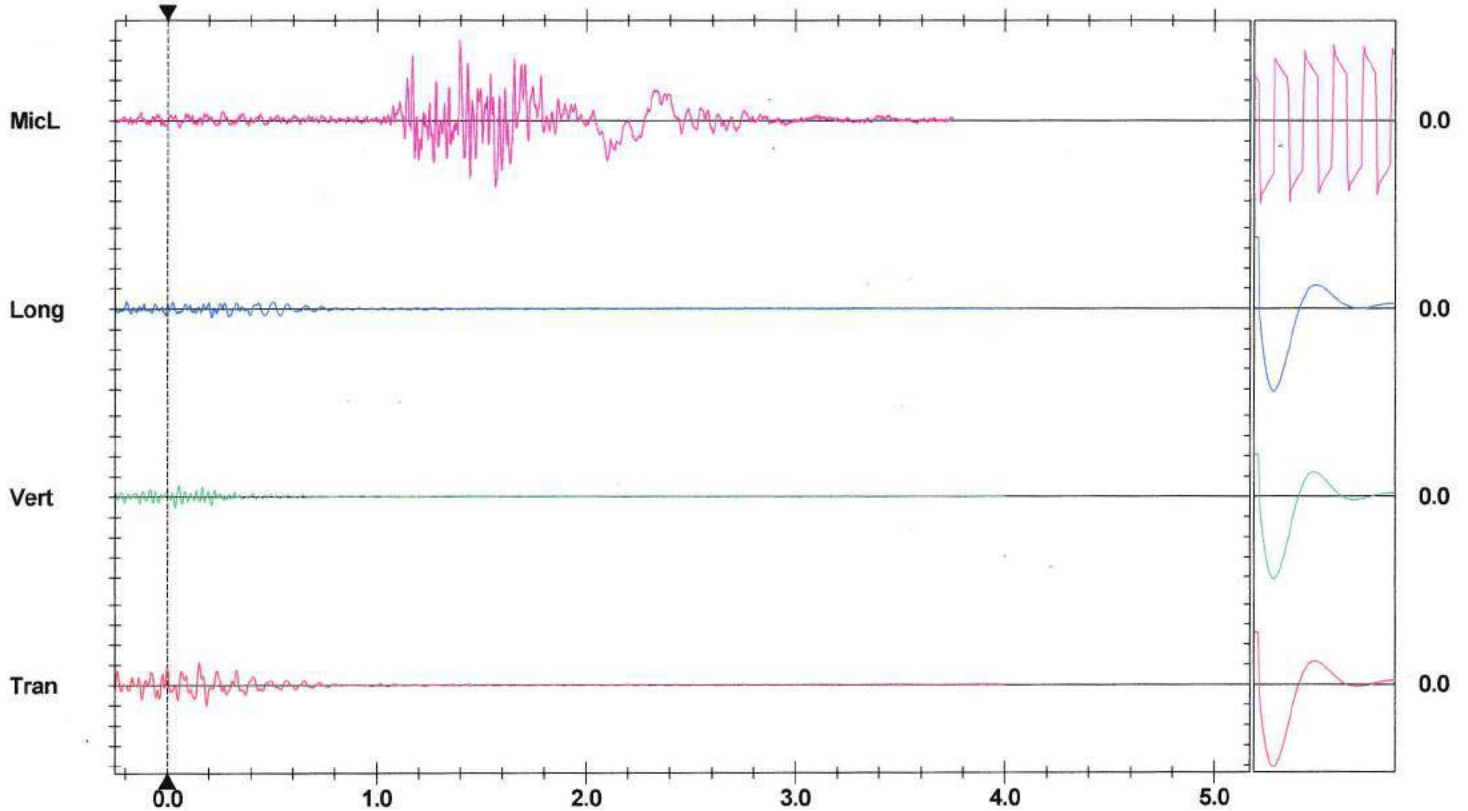
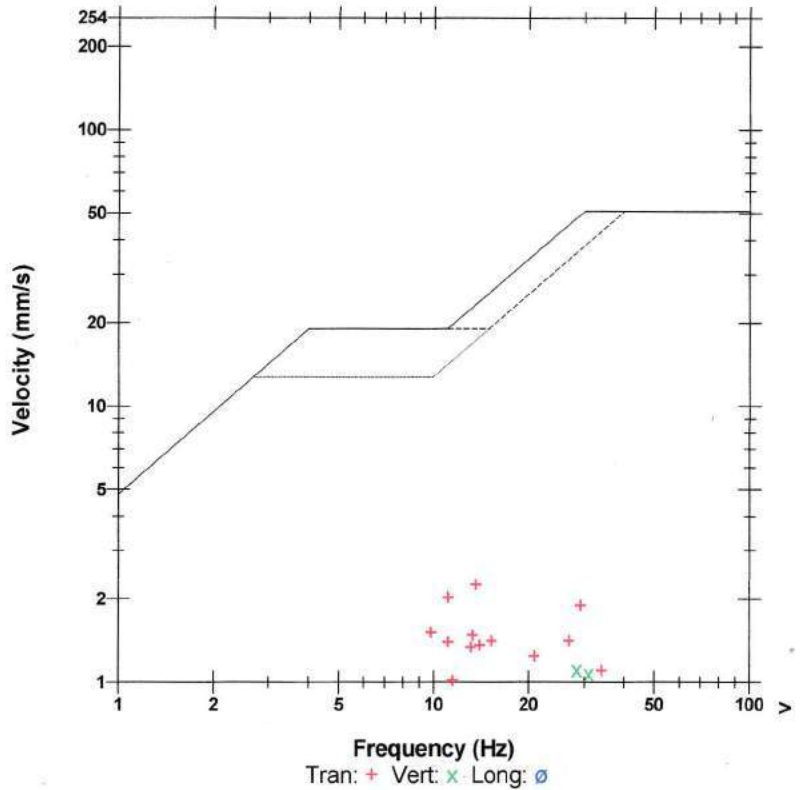
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 106.0 dB(L) 3.987 pa.(L) at 1.398 sec
ZC Freq 23 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1518 mv)

	Tran	Vert	Long	
PPV	2.246	1.111	0.851	mm/s
ZC Freq	13.7	28	26	Hz
Time (Rel. to Trig)	0.155	0.058	0.213	sec
Peak Acceleration	0.044	0.039	0.026	g
Peak Displacement	0.020	0.006	0.008	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.6	3.5	3.6	

Peak Vector Sum 2.285 mm/s at 0.155 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Customer: **Waterford**

Blast Report

Quarry: **Law Crushed Stone**P.O. #: **LCS3496**Blast Date: **2018-03-22**Blast Number: **18-003**Orica Order #: **2316001**Blast Time: **2:53 PM**

page 1

Blast-in-charge: **Mike Derkinderen** (Print Name)Blast Location: **Bottom Bench** (Bench / Face)GPS Coordinates: **42.89787** °N Latitude **79.29263** °W Longitude
Centre of Blast Centre of BlastWind from the: **NW** at **20** kph Temperature: **0** °CClear: Partly Cloudy: Rain: Overcast:
Snow: Inversion: **- Drilling Information -**

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam:	88.9 mm 0	# Holes: 124 = 1,860.0 ft (3 1/2 " diam)
Secondary Bit diam:	mm 0	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam:	mm 0	# Holes: = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,745	27,120	2,625

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	124	42.2

total explosives weight in Blast (kg): 2,667
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	124
CONNECTADET 9M		25 ms	10
UNITRONIC 600 9M		42 ms	6

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:	# req'd
# of Blasts today (this Quarry)	2
# of Blasters (this Blast)	1 5 hr
# of Helpers (this Blast)	2 8 hr
# of MMU's (this Blast)	1

Services:		
ADVANCED BLAST DESIGN	Enter "1" if Advance Blast Des	
BULK TRUCK CHARGE	As per agreement	1
SHOT SERVICE FEE *	As per agreement	1
BORETRACK	Enter "1" if Boretraked	0
SEISMOGRAPH RENTAL	Please Contact Account Mana	2

tonnes Blasted: **7,890** te **3,034** m³

Holes Loaded: **124** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **5** rows

LLL15-39**- Pattern (Front Row)-**Burden: **8.0** ft avgSpacing: **8.0** ft avg# Holes: **25** front row**- Pattern (Main Body) -**Burden: **8.0** ft avgSpacing: **7.0** ft avg# Holes: **99** main bodyBench Height: **15.0** ft avgSub-drill: **0.0** ft avgHole Depth: **15.0** ft avg**- Stone Decking -**Front Row: **0.0** ft avgMain Body: **0.0** ft avg**# Stone Decks:** **0** per blast**- Collar Stemming -**Front Row: **6.0** ft avgMain Body: **6.0** ft avgMaterial used: **3/8s Stone****- Charge Length -**Front Row: **9.0** ft avgMain Body: **9.0** ft avg**- Charge Weight -**Front Row: **20.1** kg/holeMain Body: **20.1** kg/holeMax. per delay: **21.0** kg/delaySD () Equation: **394.2** kg/delayTotal kg Loaded: **2,667** kgRock Density: **2.60** g/cc = te/m³**- Powder Factor -**Yield PF: **0.338** kg/te (actual)Front row: **0.284** kg/te (theoretical)Main Body: **0.325** kg/te (theoretical)"KPI" PF: **0.317** kg/te (theoretical)

NOTES:

Customer: **Waterford****Blast Design**

Quarry: Law Crushed Stone

P.O. #: LCS3496

Blast Date: 2018-03-22

Blast Number: 18-003

Orica Order #: 2316001

Blast Time: 2:53 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89788	79.29261
Front Row Corner	42.89789	79.29296
Back Row Corner	42.89785	79.29230
Average (Centre of Blast)	42.89787	79.29263

(N) Radians	(W) Radians
0.748709	1.383917
0.748709	1.383923
0.748709	1.383912
0.748709	1.383917

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

Distance (1st Seis. From Centre of Blast)	595.6	m
Post Blast Data:	ppV:	2.8 mm/s
	frequency:	16.0 Hz
	air overpressure:	dB

Trigger set at: 2.0 mm/s
 V / T / L : ? (Vertical, Transverse or Longitudinal)
 Trigger set at: 115 dB

Enter description of seismograph location **Erie Peat street**

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28563
2nd Reading		
Average	42.89326	79.28563

(N) Radians	(W) Radians
0.748629	1.383795
0.748629	1.383795

Distance (2nd Seis. From Centre of Blast)	767.7	m
Post Blast Data:	ppV:	3.7 mm/s
	frequency:	25.0 Hz
	air overpressure:	dB

Trigger set at: 2.0 mm/s
 V / T / L : ? (Vertical, Transverse or Longitudinal)
 Trigger set at: 115 dB

Enter description of seismograph location **Young Street**

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000

(N) Radians	(W) Radians
0.000000	0.000000

Distance (3rd Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV:	mm/s
	frequency:	Hz
	air overpressure:	dB

Trigger set at: 2.0 mm/s
 V / T / L : ? (Vertical, Transverse or Longitudinal)
 Trigger set at: 115 dB

Enter description of seismograph location

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: **30** Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(595.6)^2}{30^2} \text{ kg} \\
 &= \frac{354,739}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **394** kg

Orica

Blaster-in-charge:

Mike Derkinderen

jim bray

Signature required, indicating that
 Blast Report is Complete & Accurate.



Customer: **Waterford**

Blast Design

Quarry: **Law Crushed Stone**

P.O. #:

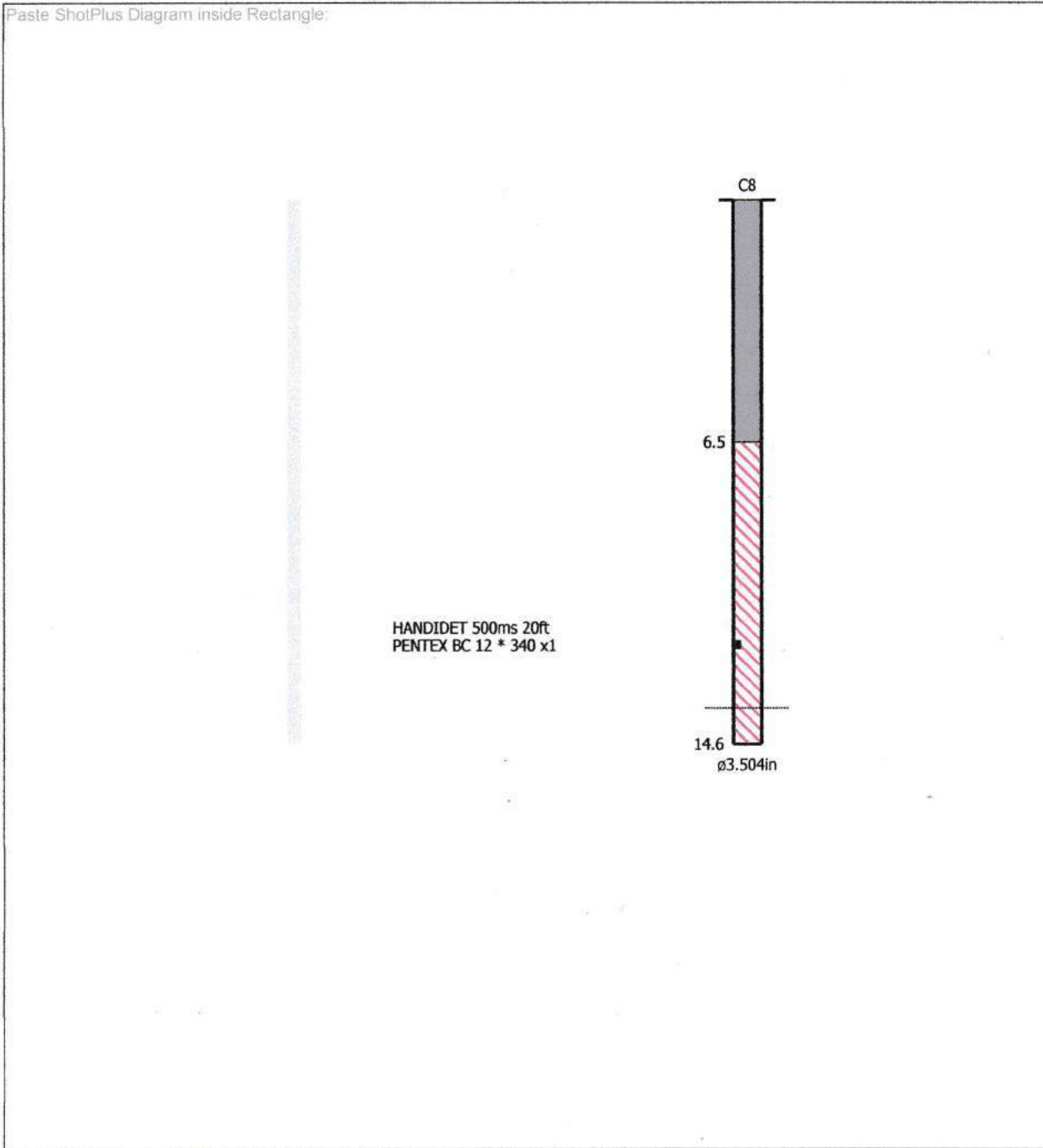
Blast Date: **March 22, 2018**

Blast Number: **18-003**

Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike derkinderen

#

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 13:53:03 March 22, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 31.70 pa.(L)
Range Geo: 254.0 mm/s
Record Time 4.625 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180322135303.IDFW

Notes

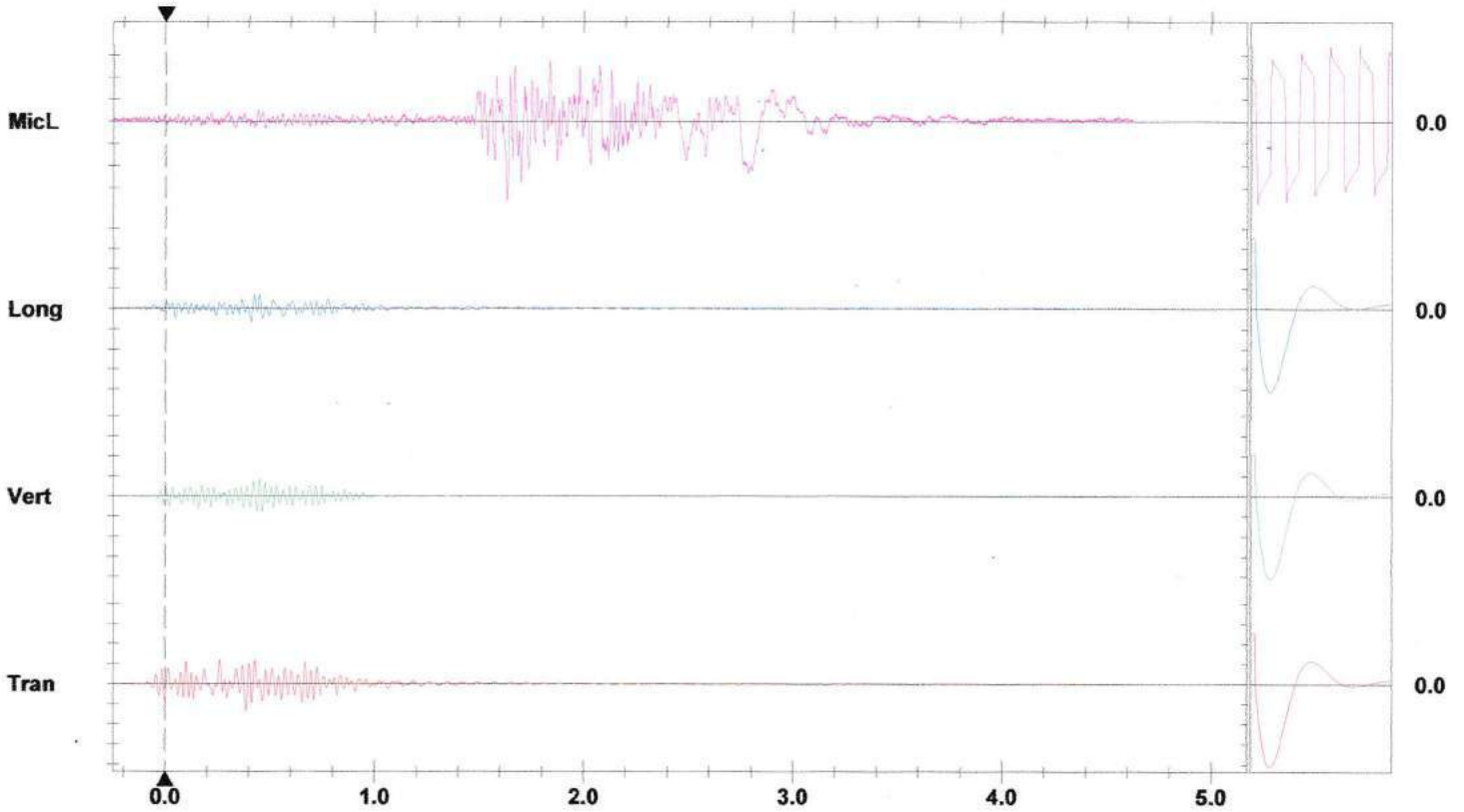
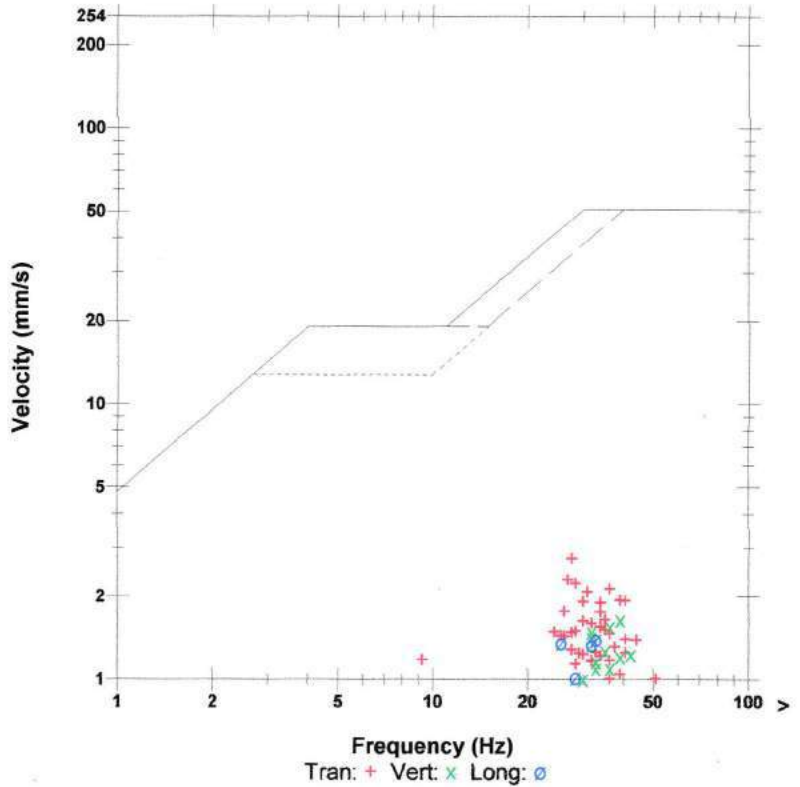
Location: Erie Peat Road
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Microphone Linear Weighting
PSPL 3.615 pa.(L) at 1.634 sec
ZC Freq 16.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1453 mv)

	Tran	Vert	Long	
PPV	2.735	1.639	1.395	mm/s
ZC Freq	28	39	33	Hz
Time (Rel. to Trig)	0.391	0.454	0.453	sec
Peak Acceleration	0.056	0.056	0.039	g
Peak Displacement	0.015	0.007	0.008	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.7	3.5	3.6	

Peak Vector Sum 2.835 mm/s at 0.391 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check

Date/Time Tran at 14:53:03 March 22, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 31.70 pa.(L)
Range Geo: 254.0 mm/s
Record Time 4.616 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 22, 2017 by InstanTel
File Name UM6859_20180322145303.IDFW

Notes

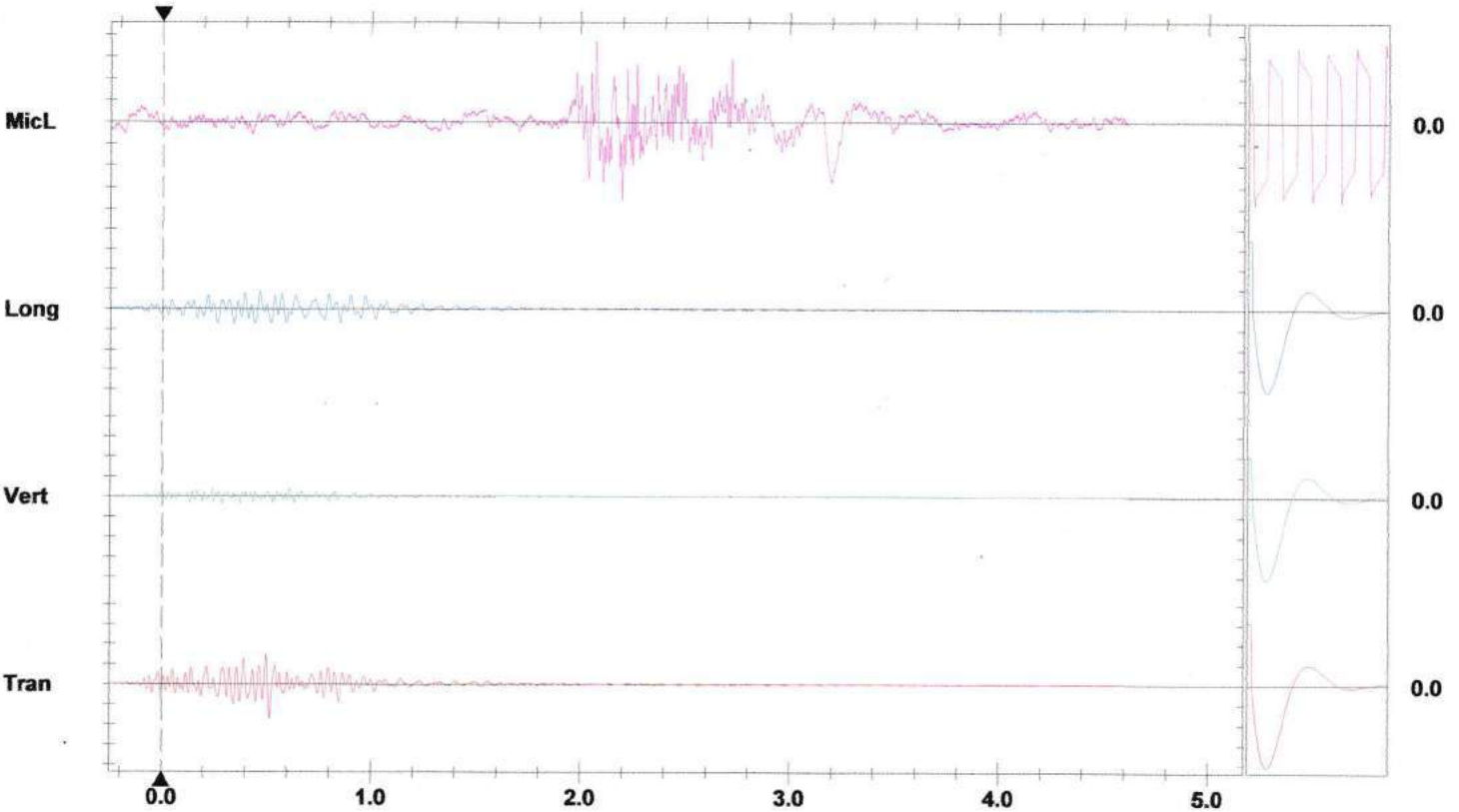
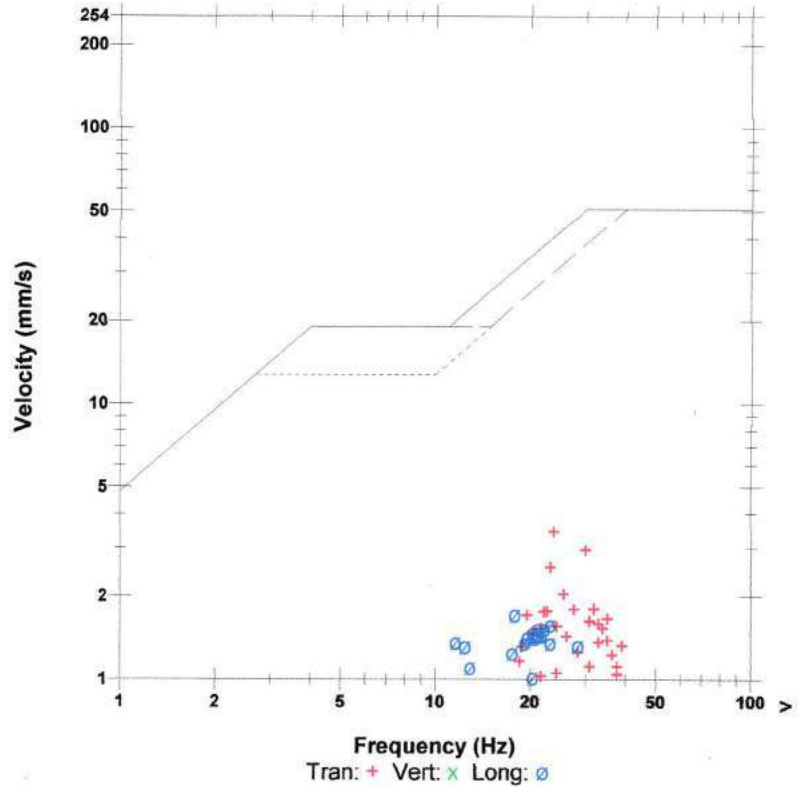
Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Microphone Linear Weighting
PSPL 3.677 pa.(L) at 2.073 sec
ZC Freq 25 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1487 mv)

	Tran	Vert	Long	
PPV	3.413	0.749	1.718	mm/s
ZC Freq	24	30	18.0	Hz
Time (Rel. to Trig)	0.521	0.292	0.469	sec
Peak Acceleration	0.061	0.031	0.049	g
Peak Displacement	0.020	0.004	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.1	4.1	4.4	

Peak Vector Sum 3.697 mm/s at 0.521 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3501**
 Blast Date: **2018-04-04**

Blast Number: **18-002**
 Orica Order #: **2320597**
 Blast Time: **11:08 AM**

page 1 Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89828** °N Latitude **79.29182** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **40** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: X
 Partly Cloudy: X Snow: Inversion: Ceiling: **3,120** ft

Tonnes Blasted: **7,936** te **3,052** m³
Rate LLL15-40 Code

Total tonnes per day: **7,936** te

Total Holes Loaded: **118** holes
 ... including: **0** Dead Holes
 ... and: **2** Helper Holes

Helper Hole Collar: **8.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -
 Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **29** front row

- Pattern (Main Body) -
 Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **89** main body

Bench Height: **14.5** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **15.5** ft avg

- Stone Decking -
 Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -
 Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg

Material used: **3/8 Stone**

- Charge Length -
 Front Row: **9.5** ft avg
 Main Body: **9.5** ft avg

- Charge Weight -
 Front Row: **21.3** kg/hole
 Main Body: **21.3** kg/hole
 Max. per delay: **23.0** kg/delay
 SD () Equation: **437.8** kg/delay
 Total kg Loaded: **2,996** kg
 Rock Density: **2.60** g/cc = te/m³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

- Powder Factor -
 1.654 lb/yd³ Yield PF: **0.378** kg/te (actual)
 1.361 lb/yd³ Front row: **0.311** kg/te (theoretical)
 1.361 lb/yd³ Main Body: **0.311** kg/te (theoretical)
 1.361 lb/yd³ "KPI" PF: **0.311** kg/te (theoretical)

- Drilling Information -

Primary Bit diam: **88.9** mm **0**° # Holes: **118** = **1,831.4** ft (**3 1/2** " diam)
Angle from Vertical

Secondary Bit diam: **0** mm **0**° # Holes: **0** = **0.0** ft (" diam)

Tertiary Bit diam: **0** mm **0**° # Holes: **0** = **0.0** ft (" diam)

Nominal Bit Diameter:

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,440	27,484	2,956

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	118	40.1

total explosives weight in Blast (kg): **2,996**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 6M			3
EXEL HANDIDET 9m		25/500	118
CONNECTADET 9M		25 ms	6
CONNECTADET 9M		42 ms	12

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	4.0
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

18-002 Was Designed as 97 holes, we added 21 holes to the design from the remainder of 18



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Bottom Lift
P.O. #: LCS3501
Blast Date: 2018-04-04

Blast Number: 18-002
Orica Order #: 2320597
Blast Time: 11:08 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89837	79.29178
Front Row Corner	42.89797	79.29189
Back Row Corner	42.89850	79.29178
Average (Centre of Blast)	42.89828	79.29182

(N) Radians	(W) Radians
0.748718	1.383903
0.748711	1.383905
0.748720	1.383903
0.748716	1.383903

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

Distance (1st Seis. From Centre of Blast) **627.7** m
Post Blast Data: ppV: **3.6** mm/s Trigger set at: **2.0** mm/s
frequency: **6.5** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **99.3** dB Trigger set at: **115** dB

Erie Peat Road

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28563
2nd Reading		
Average	42.89326	79.28563

(N) Radians	(W) Radians
0.748629	1.383795
0.748629	1.383795

Distance (2nd Seis. From Centre of Blast) **753.1** m
Post Blast Data: ppV: **2.3** mm/s Trigger set at: **2.0** mm/s
frequency: **19.3** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **100.1** dB Trigger set at: **115** dB

Youngs Road

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000

(N) Radians	(W) Radians
0.000000	0.000000

Distance (3rd Seis. From Centre of Blast) **0.0** m
Post Blast Data: ppV: **0.0** mm/s Trigger set at: **2.0** mm/s
frequency: **0.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **0.0** dB Trigger set at: **115** dB

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(627.7)^2}{30^2} \text{ kg}$$

$$= \frac{394,007}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.



Blast Design Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3496**
Design Date: **2018-04-04**

Blast Number: **18-002**
Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89828** °N Latitude **79.29182** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **7,936 te**
Total Holes Loaded: **116 holes**
... including: **0 Dead Holes**
... and: **0 Helper Holes**
Helper Hole Collar: **0.0 ft avg**
Rows Blasted: **4 rows**

- Drilling information -

Primary Bit diam: **88.9** mm **0°** # Holes: **116** = 1,800.3 ft (3 1/2 " diam)
Secondary Bit diam: mm **0°** # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm **0°** # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **8.0 ft avg**
Spacing: **8.0 ft avg**
Holes: **24** front row

- Design Pattern (Main Body) -

Burden: **8.0 ft avg**
Spacing: **8.0 ft avg**
Holes: 92 main body
Bench Height: **14.5 ft avg**
Sub-drill: **1.0 ft avg**
Hole Depth: **15.5 ft avg**

- Design Stone Decking -

Front Row: **0.0 ft avg**
Main Body: **0.0 ft avg**

- Design Collar Stemming -

Front Row: **6.0 ft avg**
Main Body: **6.0 ft avg**

Material used: **3/8 Stone**

- Design Charge Length -

Front Row: **9.5 ft avg**
Main Body: **9.5 ft avg**

- Design Charge Weight -

Front Row: **21.3 kg/hole**
Main Body: **21.3 kg/hole**
Max Chge Wt / delay: **24.0 kg/delay**

Required kg Loaded: **2,733 kg**
Rock Density: **2.60 g/cc = te/m³**

- Design Powder Factor -

Expected Yield PF: **0.344 kg/te (actual)**
Front row: **0.311 kg/te (theoretical)**
Main Body: **0.311 kg/te (theoretical)**
"KPI" PF: **0.311 kg/te (theoretical)**

1.361 lb/yd³
1.361 lb/yd³
1.361 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast

Bulk Expl. Required:	kg
	2,700

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	97	33.0

total explosives weight in Blast (kg): **2,733**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		5
EXEL HANDIDET 9m	25/500	116
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	42 ms	10

Cord & Access. Req'd:	U of M	# req'd
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Enter #	
# of Blasters (this Blast)	Enter #	
# of Helpers (this Blast)	Enter #	
# of MMU's (this Blast)	Enter #	

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Design
Waterford

Quarry: Laws - Bottom Lift
P.O. #: [REDACTED]
Blast Date: 4/4/2018

Blast Number: 18-002
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 11:08:00 April 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.MMB

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180404110800.IDF

Notes

Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Extended Notes

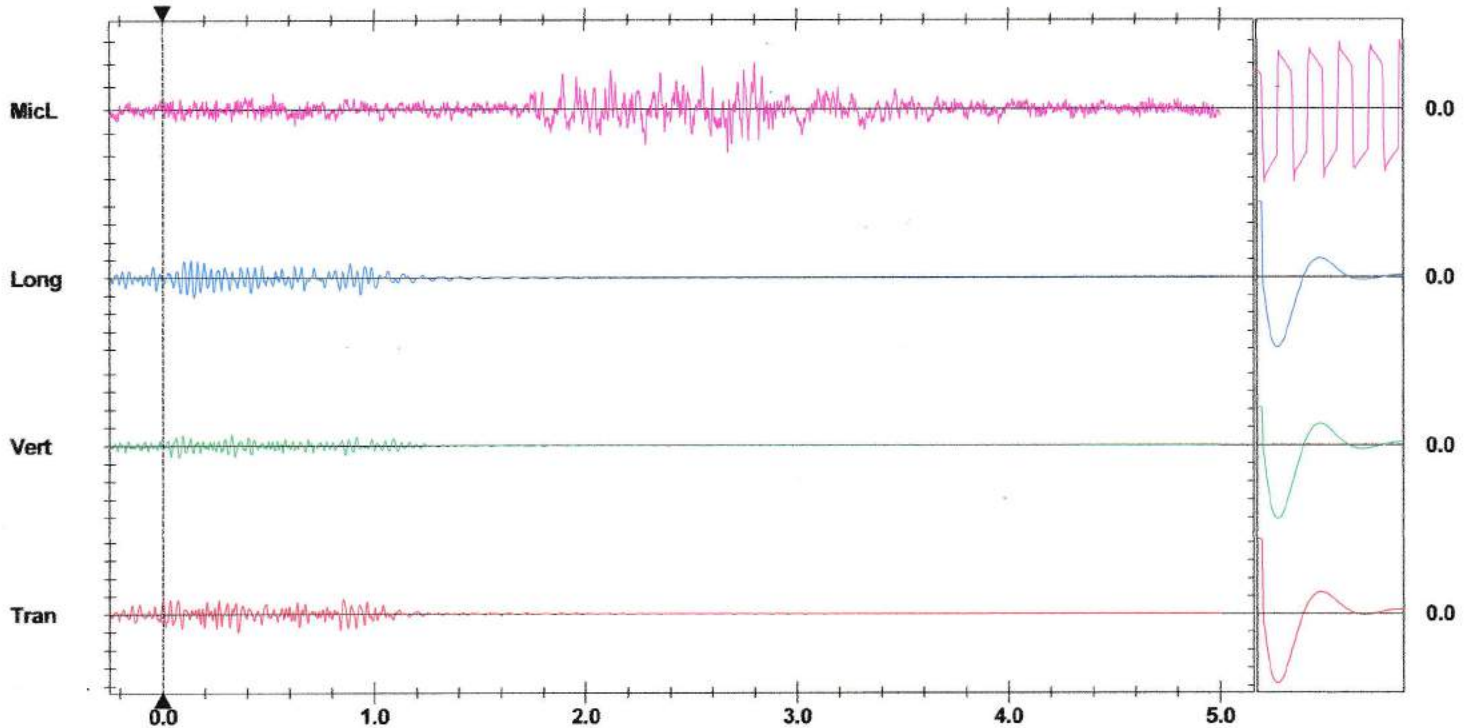
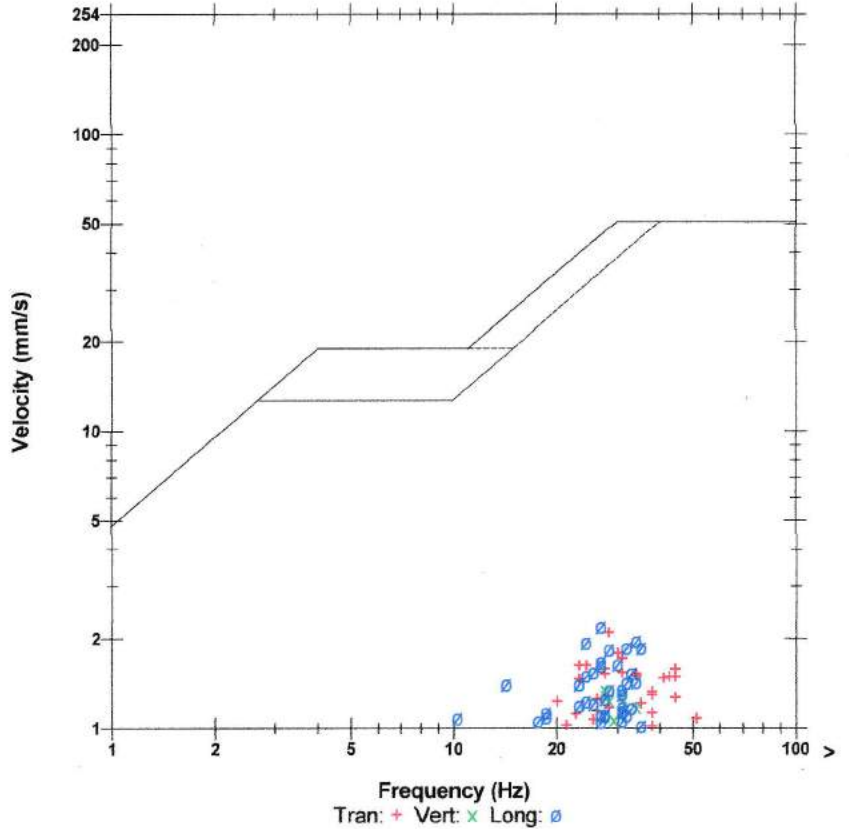
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 100.1 dB(L) 2.017 pa.(L) at 2.800 sec
ZC Freq 19.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1519 mv)

	Tran	Vert	Long	
PPV	2.089	1.332	2.191	mm/s
ZC Freq	28	28	27	Hz
Time (Rel. to Trig)	0.358	0.079	0.149	sec
Peak Acceleration	0.072	0.043	0.089	g
Peak Displacement	0.011	0.008	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.3	Hz
Overswing Ratio	3.3	3.6	3.8	

Peak Vector Sum 2.275 mm/s at 0.149 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger = \blacktriangleleft \blacktriangleright

Sensor Check

Date/Time Long at 11:07:39 April 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.759 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180404110739.IDFW

Notes

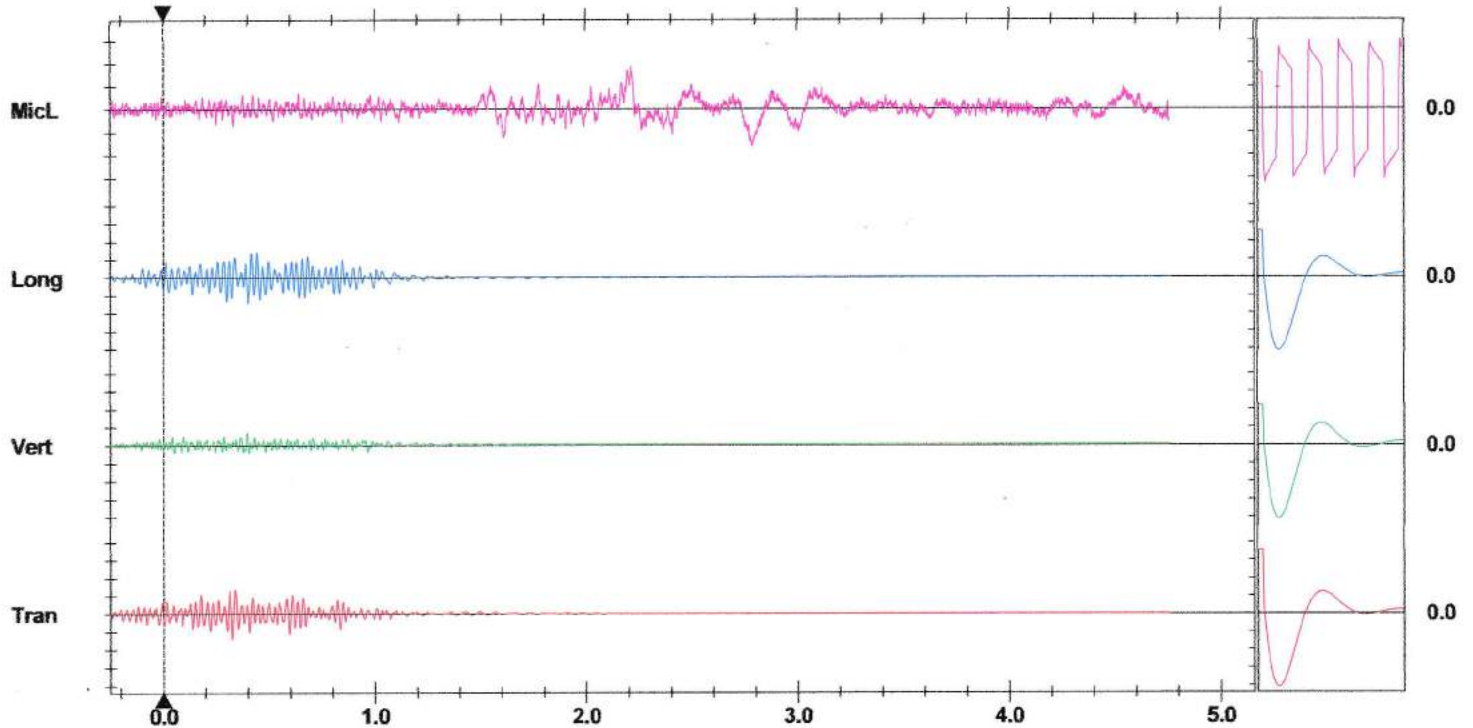
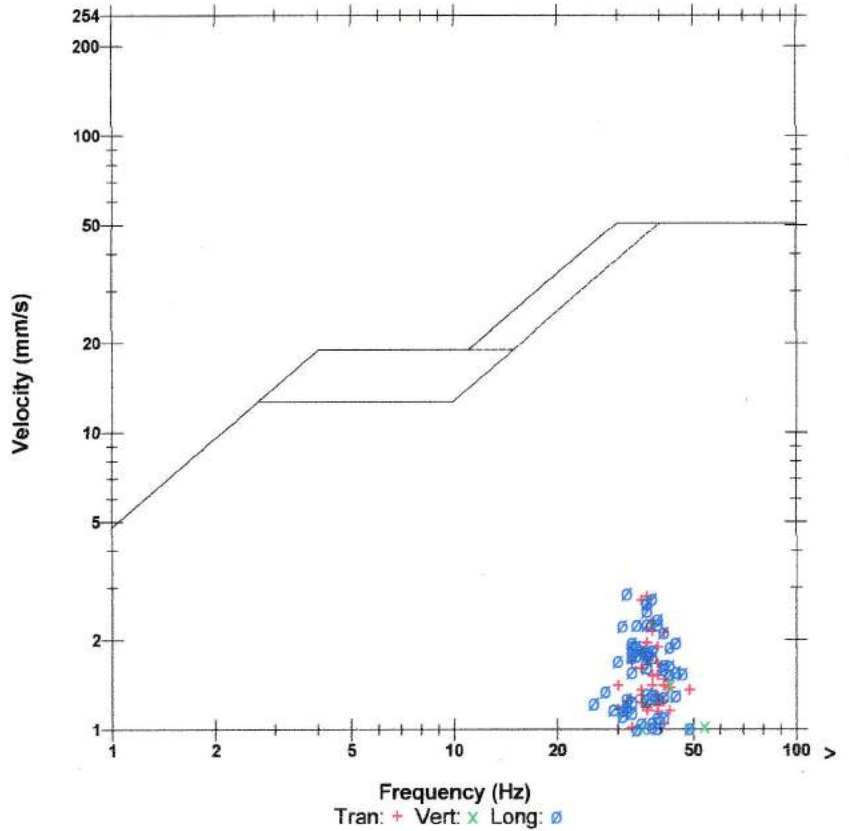
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 99.3 dB(L) 1.846 pa.(L) at 2.215 sec
ZC Freq 6.5 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1597 mv)

	Tran	Vert	Long	
PPV	2.782	1.403	2.861	mm/s
ZC Freq	37	43	32	Hz
Time (Rel. to Trig)	0.326	0.399	0.404	sec
Peak Acceleration	0.079	0.071	0.077	g
Peak Displacement	0.013	0.006	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.5	3.8	

Peak Vector Sum 3.587 mm/s at 0.327 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3501**
 Blast Date: **2018-04-04**

Blast Number: **18-004**
 Orica Order #: **2320597**
 Blast Time: **1:54 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89776** °N Latitude **79.29276** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **40** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: ft

Tonnes Blasted: **8,073** te **3,105** m³
Rate Code LLL15-40
 Total tonnes per day: te
 Total Holes Loaded: **126** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -
 Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **33** front row

- Pattern (Main Body) -
 Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **93** main body

Bench Height: **13.6** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **14.6** ft avg

- Stone Decking -
 Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -
 Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg
 Material used: **3/8 Stone**

- Charge Length -
 Front Row: **8.6** ft avg
 Main Body: **8.6** ft avg

- Charge Weight -
 Front Row: **19.2** kg/hole
 Main Body: **19.2** kg/hole
 Max. per delay: **23.0** kg/delay
 SD () Equation: **382.6** kg/delay
 Total kg Loaded: **3,087** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -
 Yield PF: **0.382** kg/te (actual)
 Front row: **0.300** kg/te (theoretical)
 Main Body: **0.300** kg/te (theoretical)
 "KPI" PF: **0.300** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blast)

- Drilling Information -

Primary Bit diam: **88.9** mm Angle from Vertical: **0**° # Holes: **126** = 1,839.3 ft (**3 1/2** " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,484	24,440	3,044

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	126	42.8

total explosives weight in Blast (kg): **3,087**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	126
CONNECTADET 9M		25 ms	4
CONNECTADET 9M		42 ms	6

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	1.5
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	4.0
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expi or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3501**
 Blast Date: **2018-04-04**

Blast Number: **18-004**
 Orica Order #: **2320597**
 Blast Time: **1:54 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89776	79.29268	0.748707	1.383918
Front Row Corner	42.89777	79.29323	0.748707	1.383928
Back Row Corner	42.89776	79.29238	0.748707	1.383913
Average (Centre of Blast)	42.89776	79.29276	0.748707	1.383920

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886

Distance (1st Seis. From Centre of Blast) **586.8** m
Post Blast Data: ppV: **1.9** mm/s Trigger set at: **2.0** mm/s
 frequency: **5.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: **102.3** dB Trigger set at: **115** dB

Erie Peat Road

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28563	0.748629	1.383795
2nd Reading				
Average	42.89326	79.28563	0.748629	1.383795

Distance (2nd Seis. From Centre of Blast) **768.2** m
Post Blast Data: ppV: **3.5** mm/s Trigger set at: **2.0** mm/s
 frequency: **28.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: **108.0** dB Trigger set at: **115** dB

Youngs Road

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000

Distance (3rd Seis. From Centre of Blast) **0.0** m
Post Blast Data: ppV: **0.0** mm/s Trigger set at: **2.0** mm/s
 frequency: **0.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: **0.0** dB Trigger set at: **115** dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(586.8)^2}{30^2} \text{ kg} \\
 &= \frac{344,334}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3496**
 Design Date: **2018-04-04**

Blast Number: **18-004**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89776** °N Latitude **79.29276** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **8,055** te
 Total Holes Loaded: **126** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Primary Bit diam: **88.9** mm **0**° Angle from Vertical # Holes: **126** = **1,835.6** ft (**3 1/2** " diam)
 Secondary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **33** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **93** main body
 Bench Height: **13.6** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **14.6** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg

Material used: **3/8 Stone**

- Design Charge Length -

Front Row: **8.6** ft avg
 Main Body: **8.6** ft avg

- Design Charge Weight -

Front Row: **19.1** kg/hole
 Main Body: **19.1** kg/hole
 Max Chge Wt / delay: **23.0** kg/delay

Required kg Loaded: **3,243** kg
 Rock Density: **2.60** g/cc = **te/m³**

- Design Powder Factor -

Expected Yield PF: **0.403** kg/te (actual)
 Front row: **0.299** kg/te (theoretical)
 Main Body: **0.299** kg/te (theoretical)
 "KPI" PF: **0.299** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required: kg

	3,200
--	--------------

Pkgd Expl. Required: kg

--	--

Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	126	42.8
----------------------------------	------	-----	------

total explosives weight in Blast (kg): **3,243**

Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required: ms # req'd

UNITRONIC 600 6M		5
EXEL HANDIDET 9m	25/500	126
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	42 ms	10

Cord & Access. Req'd: U of M # req'd

	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Enter #	
# of Blasters (this Blast)	Enter #	
# of Helpers (this Blast)	Enter #	
# of MMU's (this Blast)	Enter #	

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Design

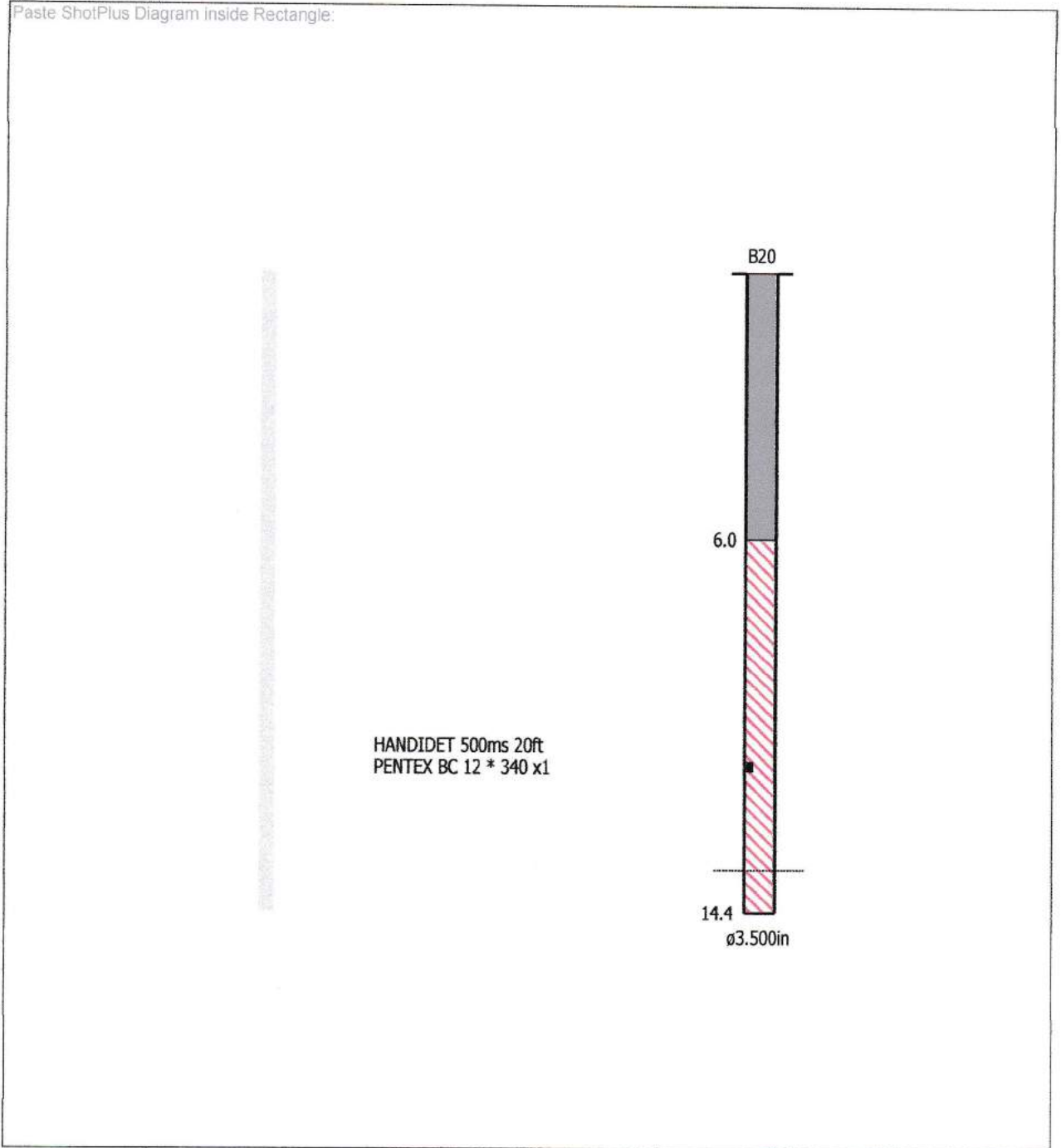
Waterford

Quarry: Laws - Bottom Lift
P.O. #: LCS3496
Blast Date: 4/4/2018

Blast Number: 18-004
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 13:54:29 April 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.067 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180404135429.IDFW

Notes

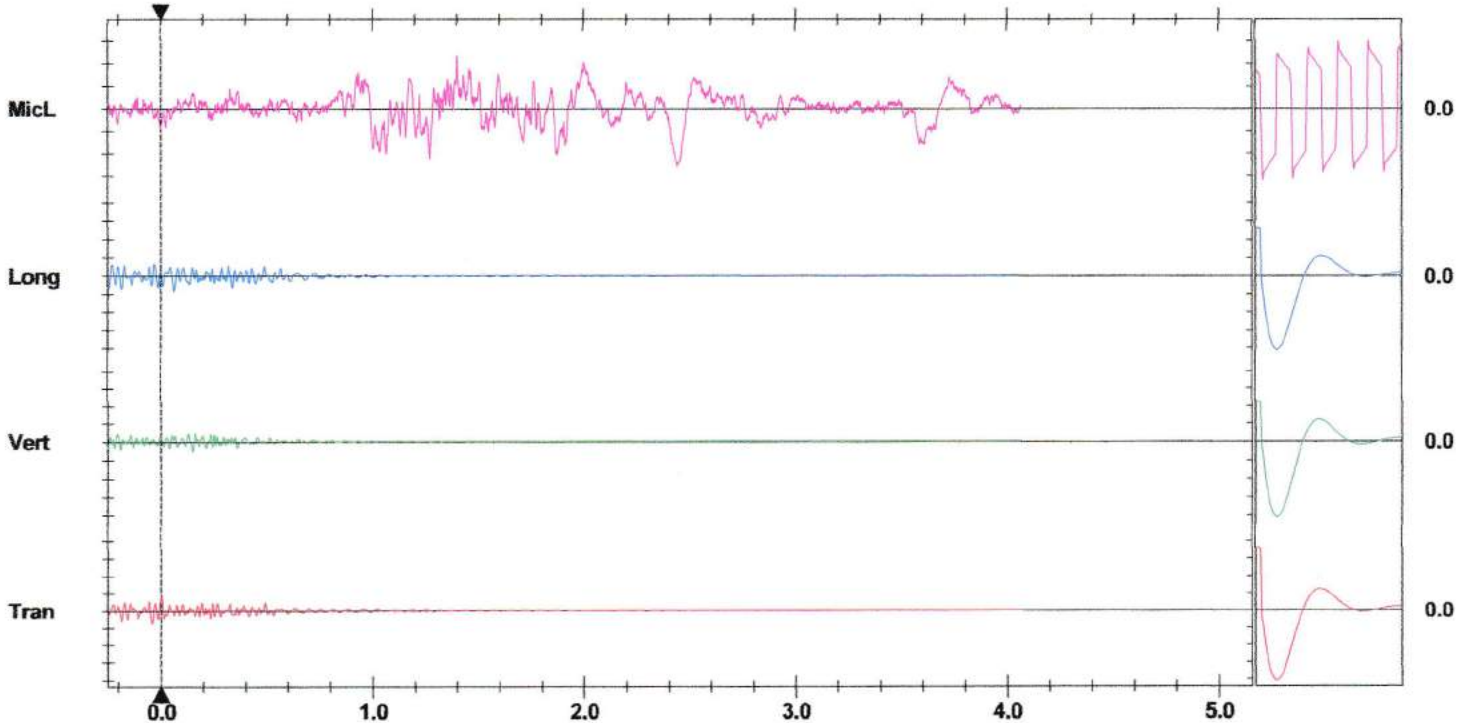
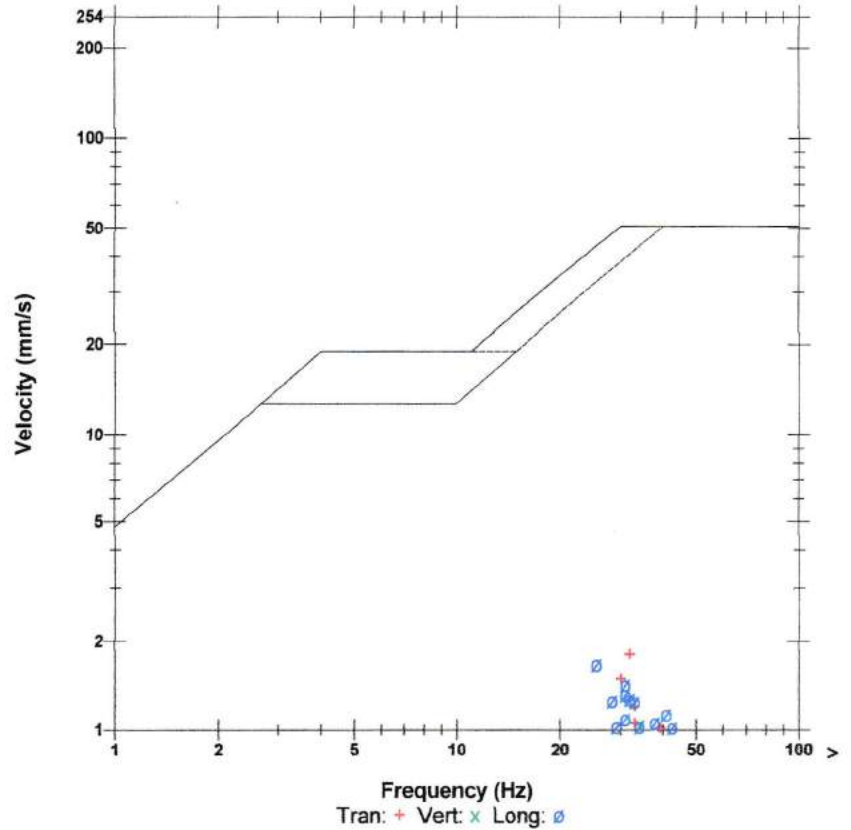
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 102.3 dB(L) 2.607 pa.(L) at 2.440 sec
ZC Freq 5.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1572 mv)

	Tran	Vert	Long	
PPV	1.797	1.040	1.663	mm/s
ZC Freq	32	34	26	Hz
Time (Rel. to Trig)	0.002	0.150	0.064	sec
Peak Acceleration	0.039	0.046	0.051	g
Peak Displacement	0.009	0.005	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.5	3.8	

Peak Vector Sum 1.938 mm/s at 0.002 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:54:49 April 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.MMB

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by Instantel
File Name UM9119_20180404135449.IDFW

Notes

Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Extended Notes

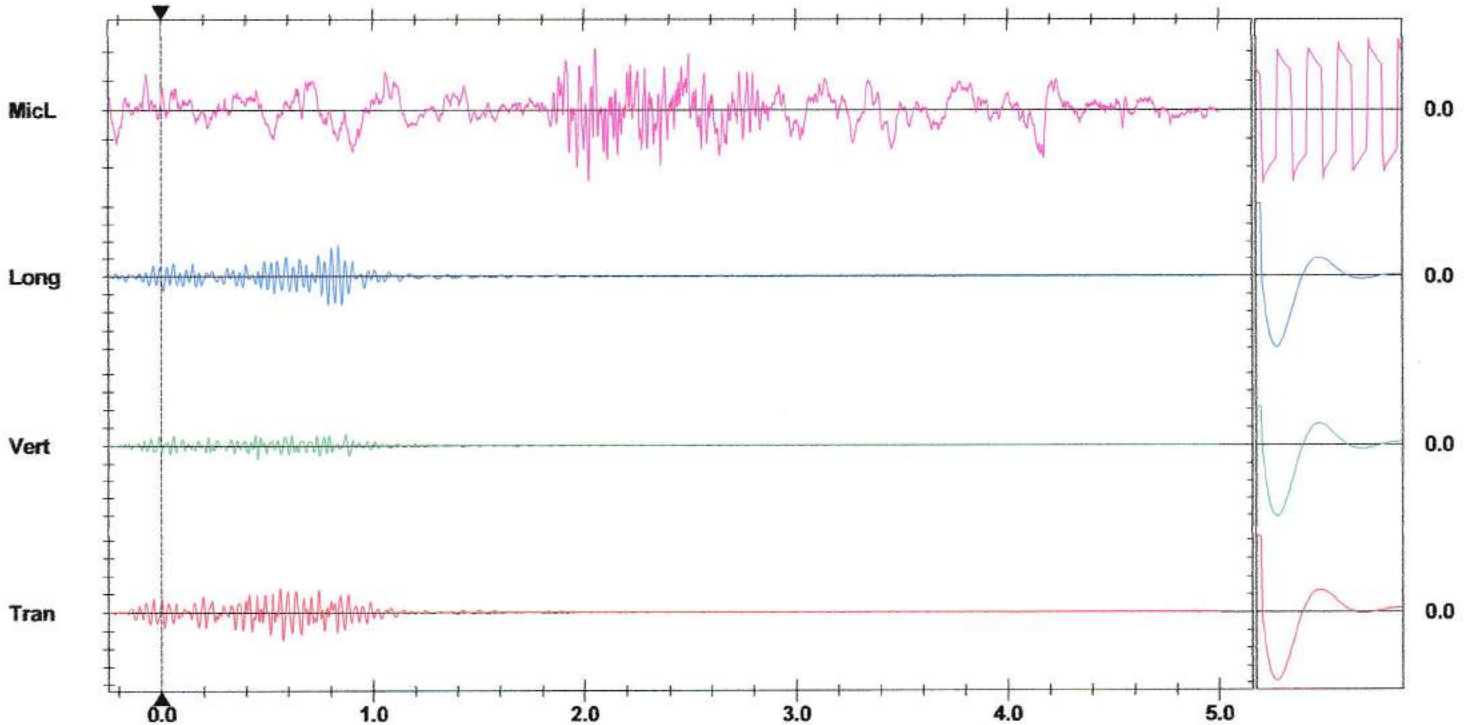
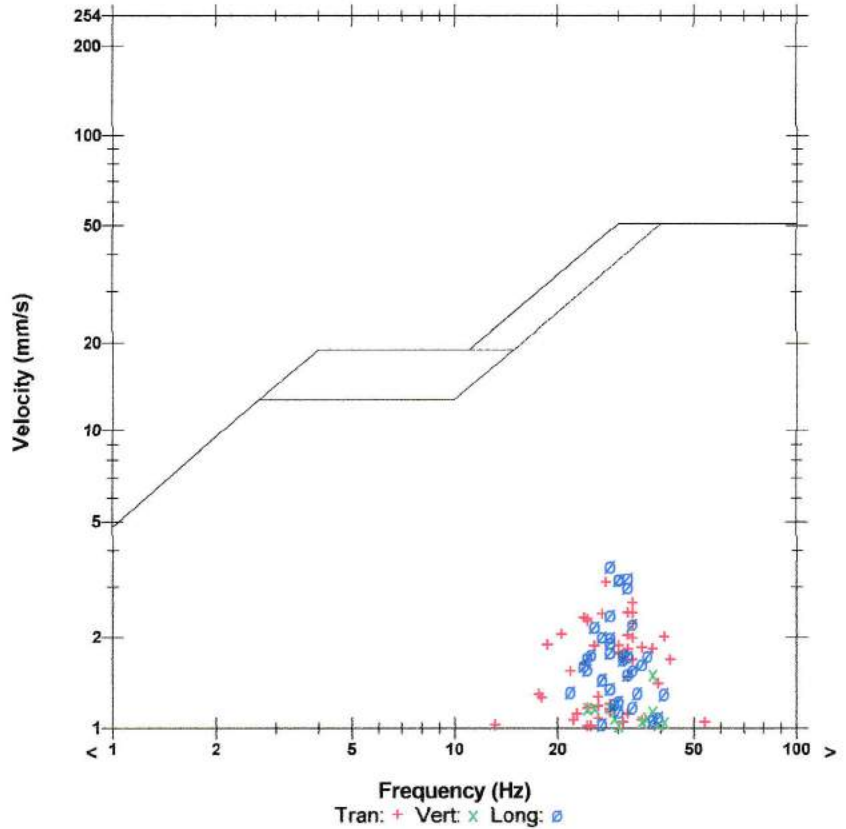
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 108.0 dB(L) 5.027 pa.(L) at 2.021 sec
ZC Freq 28 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1541 mv)

	Tran	Vert	Long	
PPV	3.098	1.498	3.531	mm/s
ZC Freq	28	38	28	Hz
Time (Rel. to Trig)	0.576	0.457	0.839	sec
Peak Acceleration	0.069	0.043	0.127	g
Peak Displacement	0.017	0.007	0.088	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.3	Hz
Overswing Ratio	3.3	3.5	3.8	

Peak Vector Sum 3.535 mm/s at 0.839 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3508**
Blast Date: **2018-04-10**

Blast Number: **18-005**
Orica Order #: **2322882**
Blast Time: **11:29 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89768** °N Latitude **79.29279** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **10** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

Tonnes Blasted: **7,652** te **2,943** m³
Total tonnes per day: **7,652** te **LLL15-39** Rate Code
Total Holes Loaded: **116** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **29** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **87** main body

Bench Height: **14.0** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg
Decks: **0** per blast

- Collar Stemming -

Front Row: **6.0** ft avg
Main Body: **6.0** ft avg

Material used: **3/8 Stone**

- Charge Length -

Front Row: **9.0** ft avg
Main Body: **9.0** ft avg

- Charge Weight -

Front Row: **20.1** kg/hole
Main Body: **20.1** kg/hole
Max. per delay: **23.0** kg/delay
SD () Equation: **371.3** kg/delay

Total kg Loaded: **2,820** kg

Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.615 lb/yd³ Yield PF: **0.368** kg/te (actual)
1.335 lb/yd³ Front row: **0.305** kg/te (theoretical)
1.335 lb/yd³ Main Body: **0.305** kg/te (theoretical)
1.335 lb/yd³ "KPI" PF: **0.305** kg/te (theoretical)

- Drilling Information -

Primary Bit diam: **88.9** mm **0**' # Holes: **116** = **1,740.0** ft (**3 1/2** " diam)
Secondary Bit diam: **mm** **0**' # Holes: = **0.0** ft (" diam)
Tertiary Bit diam: **mm** **0**' # Holes: = **0.0** ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,110	24,330	2,780

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	117	39.8

total explosives weight in Blast (kg): **2,820**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	117
CONNECTADET 9M		25 ms	4
CONNECTADET 9M		42 ms	4

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	5.0
HELPER HOURS	Enter total Helper man-hours	8.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Bottom Lift
P.O. #: LCS3508
Blast Date: 2018-04-10

Blast Number: 18-005
Orica Order #: 2322882
Blast Time: 11:29 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89769	79.29274	0.748706	1.383919
Front Row Corner	42.89768	79.29325	0.748706	1.383928
Back Row Corner	42.89767	79.29237	0.748706	1.383913
Average (Centre of Blast)	42.89768	79.29279	0.748706	1.383920

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886

Distance (1st Seis. From Centre of Blast) **578.1** m

Post Blast Data: ppV: **5.4** mm/s Trigger set at: **2.0** mm/s
frequency: **7.1** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **103.7** dB Trigger set at: **115** dB

Erie Peat Road

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28536	0.748629	1.383791
2nd Reading				
Average	42.89326	79.28536	0.748629	1.383791

Distance (2nd Seis. From Centre of Blast) **780.3** m

Post Blast Data: ppV: **2.2** mm/s Trigger set at: **2.0** mm/s
frequency: **2.9** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **102.8** dB Trigger set at: **115** dB

20235 Youngs Road

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000

Distance (3rd Seis. From Centre of Blast) **0.0** m

Post Blast Data: ppV: **0.0** mm/s Trigger set at: **2.0** mm/s
frequency: **0.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: **0.0** dB Trigger set at: **115** dB

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(578.1)^2}{30^2} \text{ kg}$$

$$= \frac{334,200}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

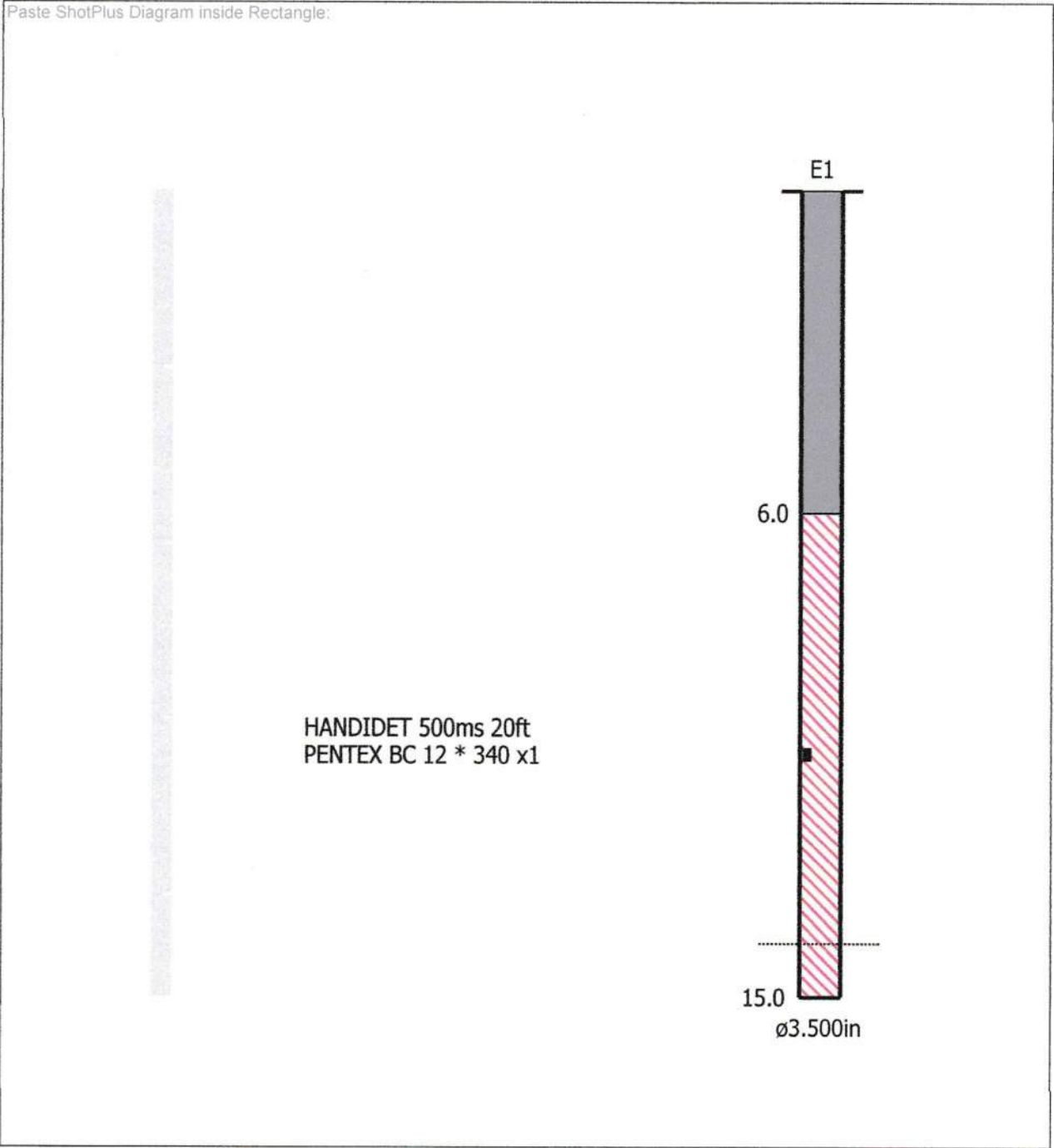


Blast Design
Waterford

Quarry: Laws - Bottom Lift
P.O. #:
Blast Date: 4/10/2018

Blast Number: 18-005
Orica Order #:

page 2



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 11:29:38 April 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.873 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTEL
File Name UM6857_20180410112938.IDFW

Notes

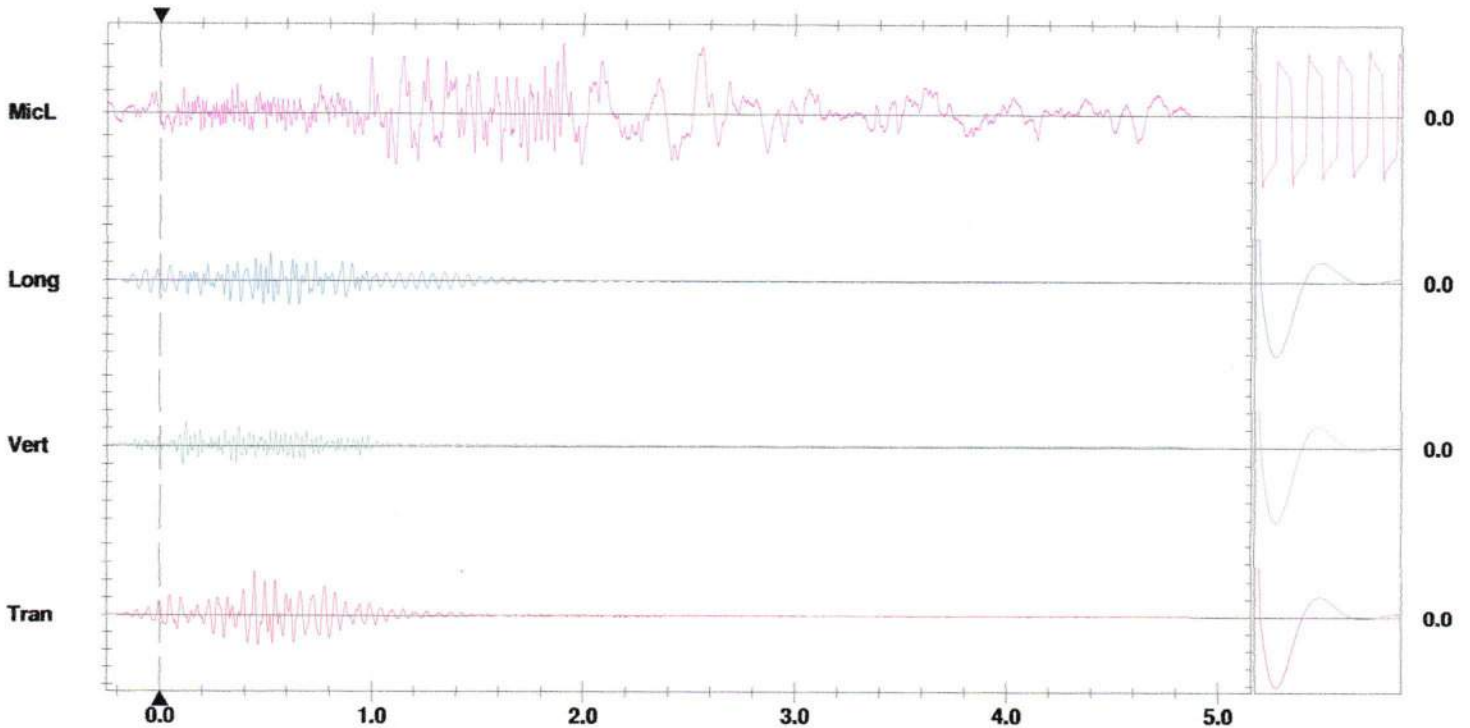
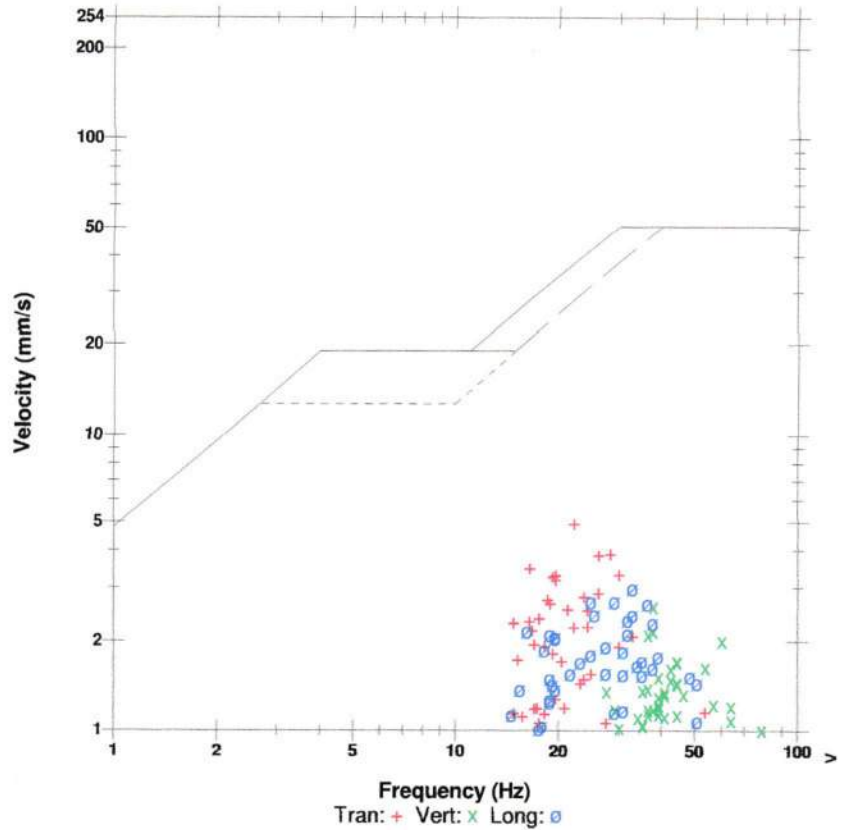
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 103.7 dB(L) 3.072 pa.(L) at 1.905 sec
ZC Freq 15.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1568 mv)

	Tran	Vert	Long	
PPV	4.981	2.593	2.971	mm/s
ZC Freq	22	38	33	Hz
Time (Rel. to Trig)	0.450	0.125	0.522	sec
Peak Acceleration	0.114	0.114	0.117	g
Peak Displacement	0.027	0.010	0.017	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.9	

Peak Vector Sum 5.440 mm/s at 0.450 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 11:29:39 April 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 110.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration November 3, 2017 by Instantel
File Name N877HD4L.9F0

Notes

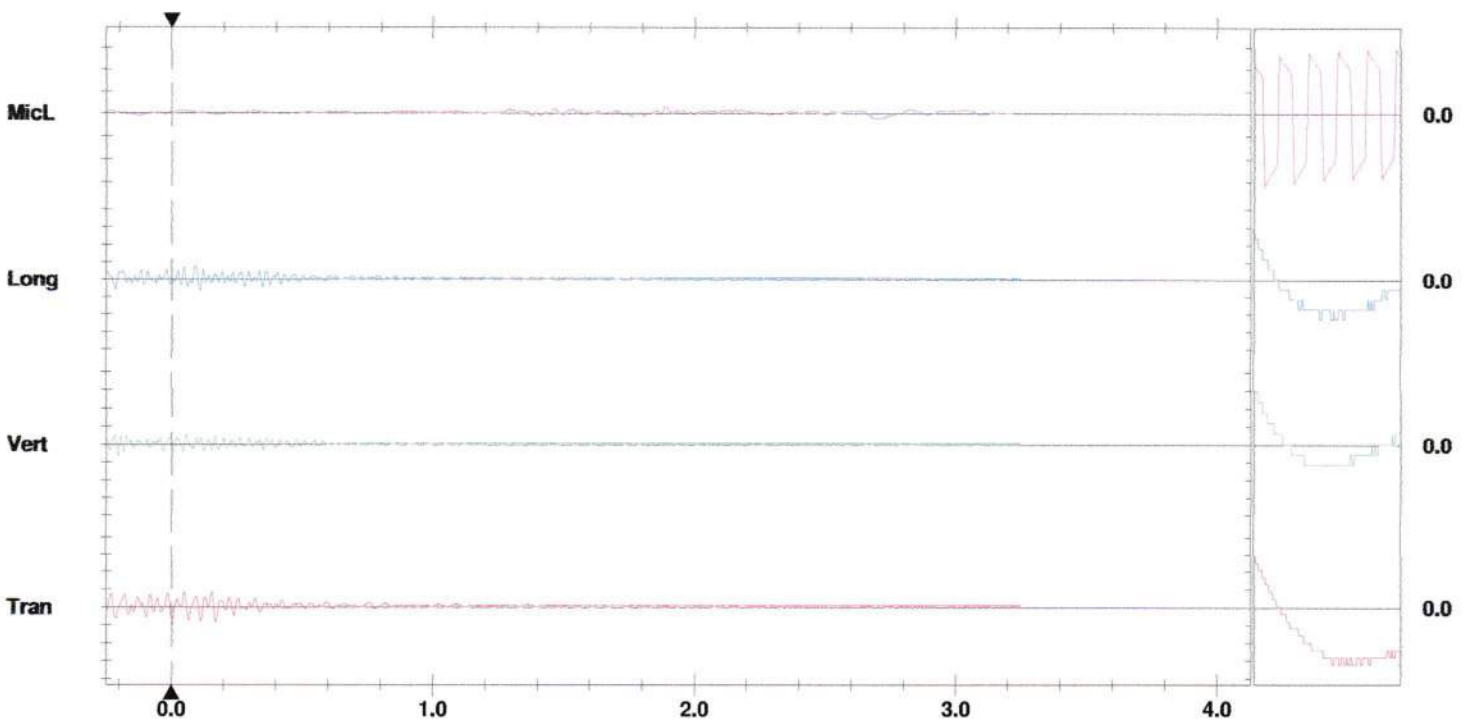
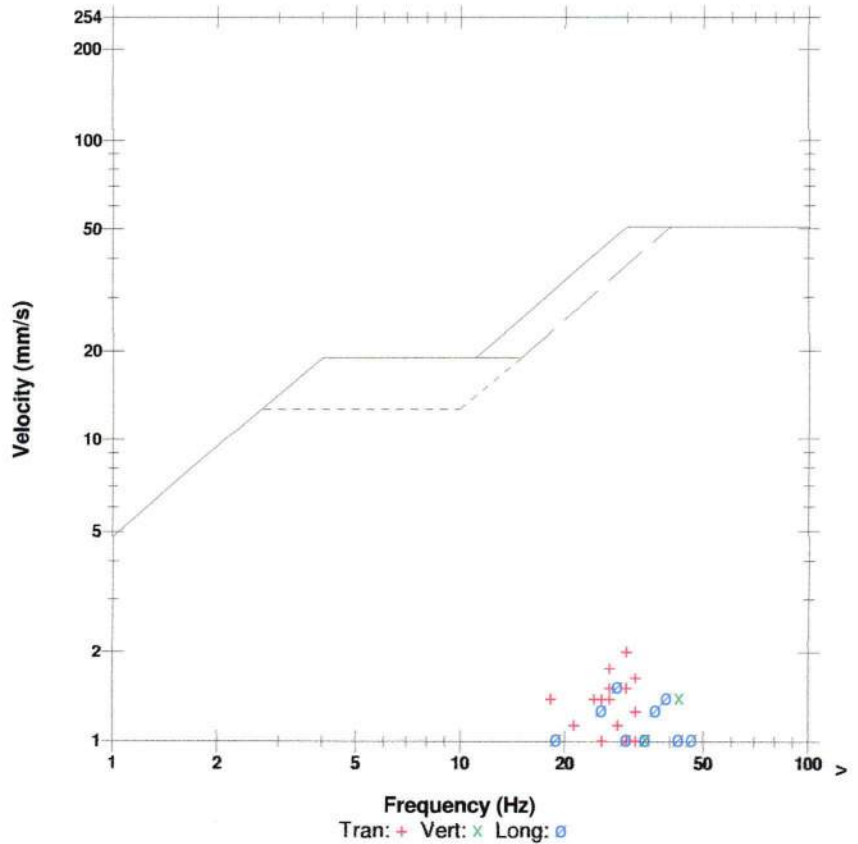
Location: 20235 Youngs Road
Client: Waterford Group Laws Quarry
User Name: ORICA CANADA INC.
General:

Microphone Linear Weighting
PSPL 102.8 dB(L) 2.750 pa.(L) at 2.695 sec
ZC Freq 4.5 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 604 mv)

	Tran	Vert	Long	
PPV	2.032	1.397	1.524	mm/s
ZC Freq	30	43	28	Hz
Time (Rel. to Trig)	0.003	-0.204	0.092	sec
Peak Acceleration	0.040	0.040	0.053	g
Peak Displacement	0.011	0.006	0.009	mm
Sensor Check	Check	Check	Check	
Frequency	2.5	3.7	2.5	Hz
Overswing Ratio	8.0	2.0	4.0	

Peak Vector Sum 2.178 mm/s at 0.112 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3496**
Blast Date: **2018-04-12**

Blast Number: **18-006**
Orica Order #: **2324166**
Blast Time: **12:49 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
GPS Coordinates: **42.89758** °N Latitude **79.29280** °W Longitude
Centre of Blast *Centre of Blast*

Wind from the: **S** at **20** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: Ceiling: **4,841** ft

Tonnes Blasted: **7,982** te **3,070** m³
Total tonnes per day: **23,212** te **LLL15-40** Rate Code
Total Holes Loaded: **121** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **29** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **92** main body

Bench Height: **14.0** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg
Decks: **0** per blast

- Collar Stemming -

Front Row: **6.0** ft avg
Main Body: **6.0** ft avg
Material used: **3/8 Stone**

- Charge Length -

Front Row: **9.0** ft avg
Main Body: **9.0** ft avg

- Charge Weight -

Front Row: **20.1** kg/hole
Main Body: **20.1** kg/hole
Max. per delay: **23.0** kg/delay
SD () Equation: **358.0** kg/delay

Total kg Loaded: **2,811** kg

Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.352** kg/te (actual)
Front row: **0.305** kg/te (theoretical)
Main Body: **0.305** kg/te (theoretical)
"KPI" PF: **0.305** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

- Drilling Information -

Primary Bit diam: **88.9** mm **0**° # Holes: **121** = **1,815.0** ft (**3 1/2** " diam)
Secondary Bit diam: **mm** **0**° # Holes: **=** **0.0** ft (" diam)
Tertiary Bit diam: **mm** **0**° # Holes: **=** **0.0** ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,520	27,750	2,770

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	121	41.1

total explosives weight in Blast (kg): **2,811**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	121
EXEL HANDIDET 9m		25 ms	0
CONNECTADET 9M		42 ms	14

Cord & Accessories:	U of M	# used
	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>/=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Bottom Lift
P.O. #: LCS3496
Blast Date: 2018-04-12

Blast Number: 18-006
Orica Order #: 2324166
Blast Time: 12:49 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89757	79.29281	0.748704	1.383921
Front Row Corner	42.89759	79.29318	0.748704	1.383927
Back Row Corner	42.89758	79.29239	0.748704	1.383913
Average (Centre of Blast)	42.89758	79.29280	0.748704	1.383920

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886

Distance (1st Seis. From Centre of Blast) **567.6** m

Post Blast Data: ppV: 1.7 mm/s Trigger set at: 2.0 mm/s
 frequency: 34.0 Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: 99.3 dB Trigger set at: 115 dB

Erie Peat Road

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28536	0.748629	1.383791
2nd Reading				
Average	42.89326	79.28536	0.748629	1.383791

Distance (2nd Seis. From Centre of Blast) **773.9** m

Post Blast Data: ppV: 2.1 mm/s Trigger set at: 2.0 mm/s
 frequency: 24.0 Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: 100.3 dB Trigger set at: 115 dB

Youngs Road

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000

Distance (3rd Seis. From Centre of Blast) **0.0** m

Post Blast Data: ppV: 0.0 mm/s Trigger set at: 2.0 mm/s
 frequency: 0.0 Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
 air overpressure: 0.0 dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(567.6)^2}{30^2} \text{ kg}$$

$$= \frac{322,170}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #:
Blast Date: 4/10/2018

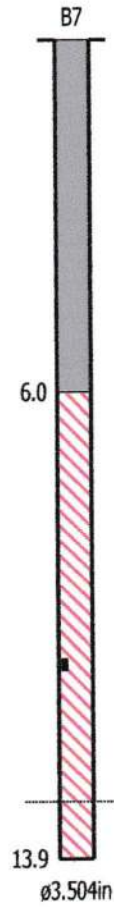
Blast Number: 18-006
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 12:49:16 April 12, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by Instantel
File Name UM9119_20180412124916.IDFW

Notes

Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Extended Notes

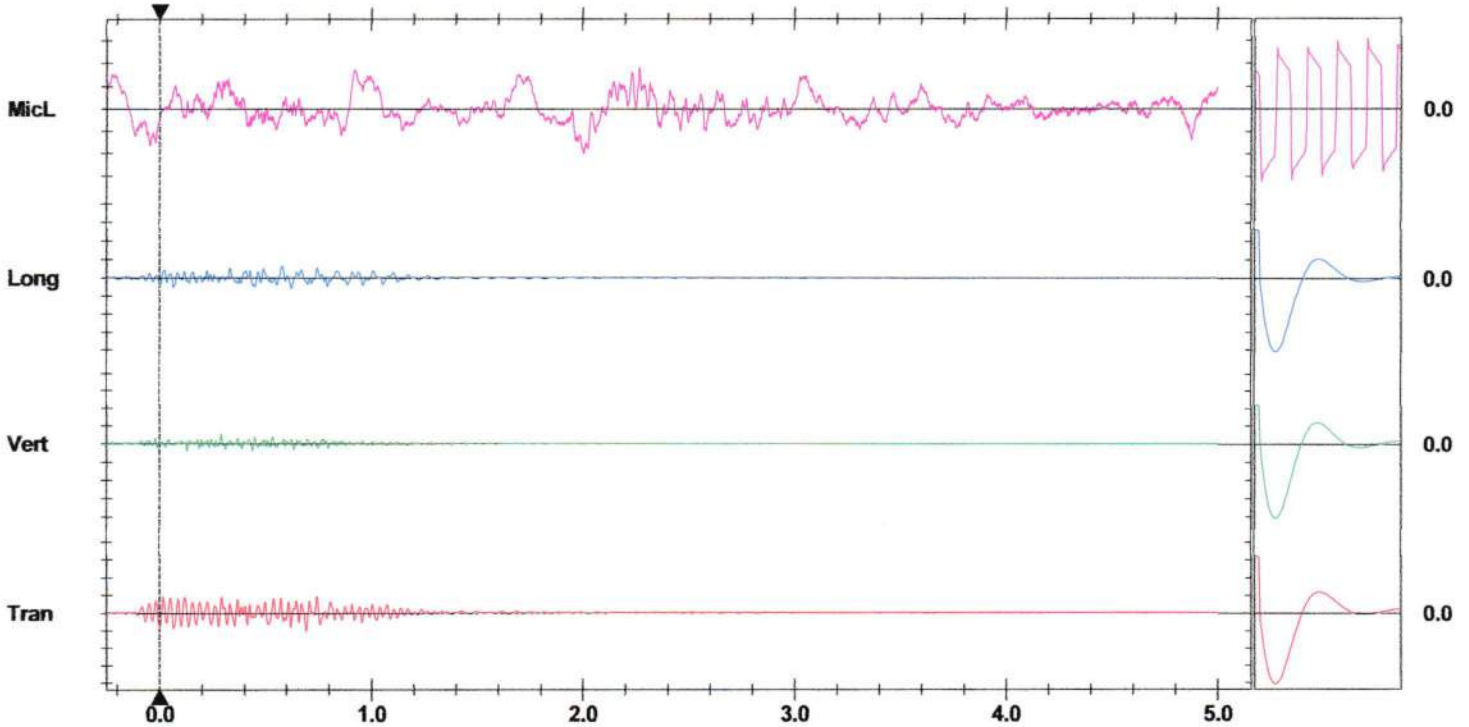
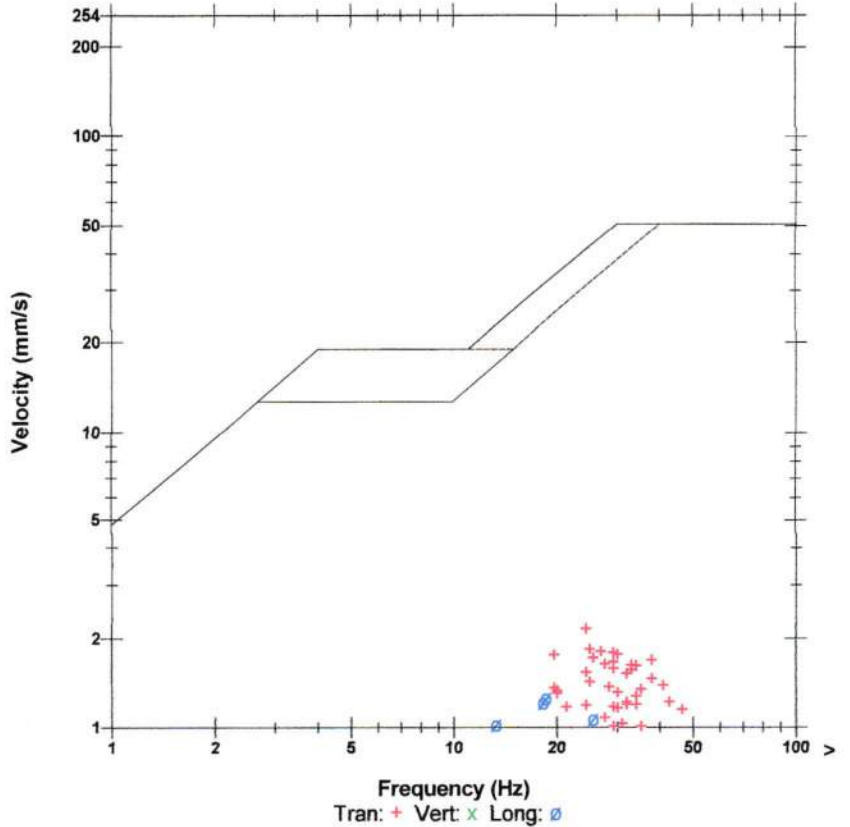
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 100.3 dB(L) 2.064 pa.(L) at 2.005 sec
ZC Freq 1.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1477 mv)

	Tran	Vert	Long	
PPV	2.136	0.977	1.253	mm/s
ZC Freq	24	34	18.6	Hz
Time (Rel. to Trig)	0.696	0.293	0.580	sec
Peak Acceleration	0.059	0.039	0.035	g
Peak Displacement	0.011	0.003	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.6	3.6	4.1	

Peak Vector Sum 2.197 mm/s at 0.696 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 12:49:16 April 12, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.361 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180412124916.IDFW

Notes

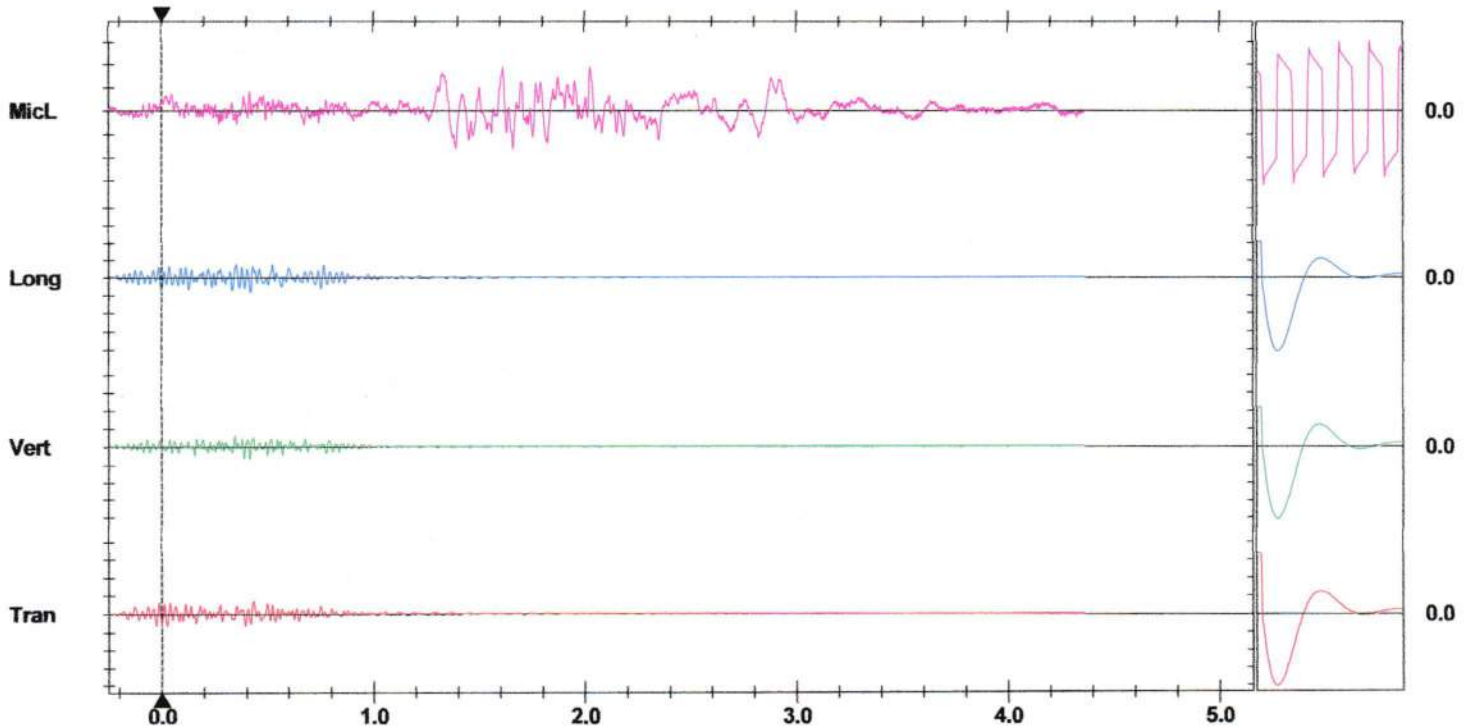
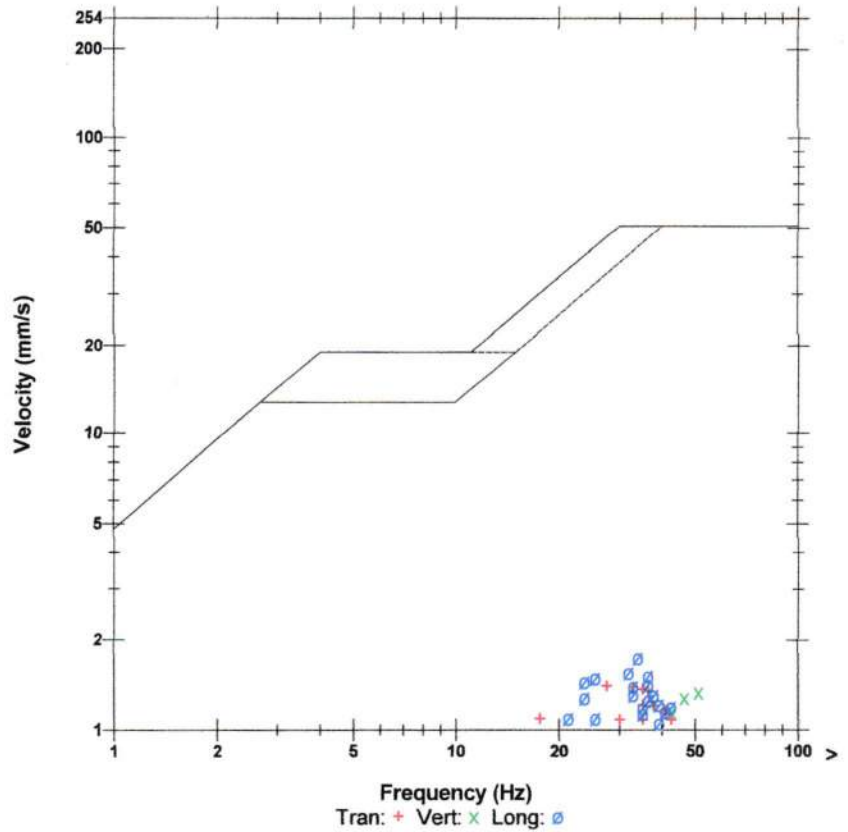
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 99.3 dB(L) 1.846 pa.(L) at 2.027 sec
ZC Freq 19.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1496 mv)

	Tran	Vert	Long	
PPV	1.379	1.324	1.726	mm/s
ZC Freq	28	51	34	Hz
Time (Rel. to Trig)	0.435	0.417	0.421	sec
Peak Acceleration	0.038	0.061	0.064	g
Peak Displacement	0.008	0.005	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.4	3.9	

Peak Vector Sum 2.283 mm/s at 0.419 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **LCS3496**
 Blast Date: **2018-04-12**

Blast Number: **18-007**
 Orica Order #: **2324166**
 Blast Time: **10:29 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89530** °N Latitude **79.29432** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **5** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling **12,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical **0**° # Holes: **49** = **1,254.4** ft (**4** " diam)
 Secondary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)
 Nominal Bit Diameter:

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,500	30,520	2,980

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	49	16.7

total explosives weight in Blast (kg): **2,997**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 15M			49

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>/-2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	3.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **15,230** te **5,858** m³
 Total tonnes per day: **23,212** te LML22-04 Rate Code
 Total Holes Loaded: **49** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **13.1** ft avg
 Spacing: **13.1** ft avg
 # Holes: **25** front row

- Pattern (Back Row) -

Burden: **13.1** ft avg
 Spacing: **13.1** ft avg
 # Holes: **24** back row

Bench Height: **24.6** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **25.6** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Back Row: **7.0** ft avg

Material used: **3/8 Stone**

- Charge Length -

Front Row: **18.6** ft avg
 Back Row: **18.6** ft avg

- Charge Weight -

Front Row: **54.2** kg/hole
 Back Row: **54.2** kg/hole
 Max. per delay: **64.0** kg/delay
 SD () Equation: **184.3** kg/delay

Total kg Loaded: **2,997** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.862 lb/yd³ Yield PF: **0.197** kg/te (actual)
 0.765 lb/yd³ Front row: **0.174** kg/te (theoretical)
 0.765 lb/yd³ Main Body: **0.174** kg/te (theoretical)
 0.765 lb/yd³ "KPI" PF: **0.174** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Middle Lift
P.O. #: LCS3496
Blast Date: 2018-04-12

Blast Number: 18-007
Orica Order #: 2324166
Blast Time: 10:29 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89529	79.29434	0.748664	1.383947
Front Row Corner	42.89530	79.29510	0.748664	1.383961
Back Row Corner	42.89530	79.29353	0.748664	1.383933
Average (Centre of Blast)	42.89530	79.29432	0.748664	1.383947

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	407.3	m		
Post Blast Data:	ppV:	3.1 mm/s	Trigger set at: 2.0 mm/s	
	frequency:	34.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)	
	air overpressure:	106.4 dB	Trigger set at: 115 dB	
Erie Peat Road				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28536	0.748629	1.383791
2nd Reading				
Average	42.89326	79.28536	0.748629	1.383791
Distance (2nd Seis. From Centre of Blast)	765.4	m		
Post Blast Data:	ppV:	1.8 mm/s	Trigger set at: 2.0 mm/s	
	frequency:	29.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)	
	air overpressure:	101.9 dB	Trigger set at: 115 dB	
Youngs Road S				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	0.0 mm/s	Trigger set at: 2.0 mm/s	
	frequency:	0.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)	
	air overpressure:	0.0 dB	Trigger set at: 115 dB	

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(407.3)^2}{30^2} \text{ kg} \\
 &= \frac{165,893}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



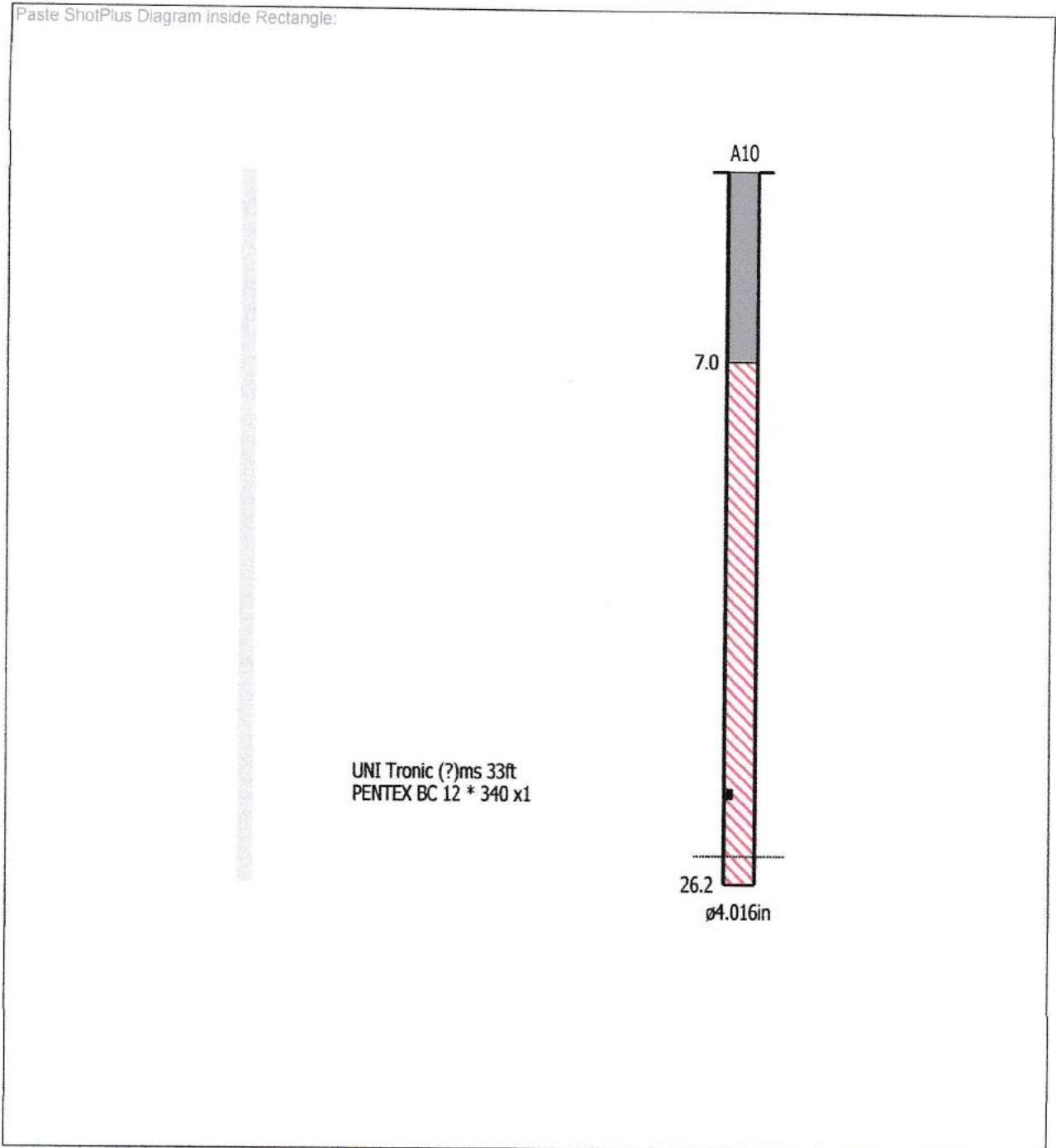
Customer: **Waterford**
Blast Design

Quarry: Law crushed stone
P.O. #:
Blast Date: 2018-04-12

Blast Number: 18-007
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike derkinderen

#

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 10:29:30 April 12, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 128.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.621 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180412102930.IDFW

Notes

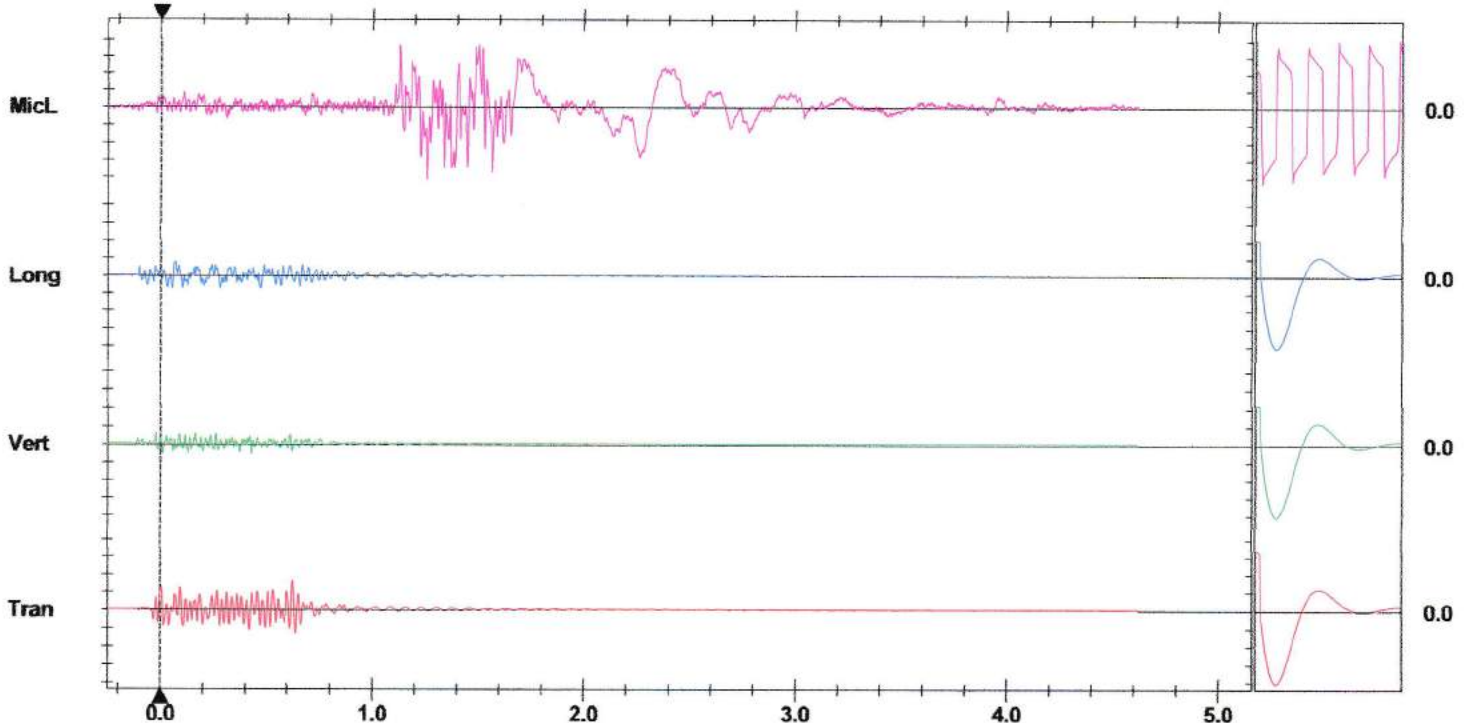
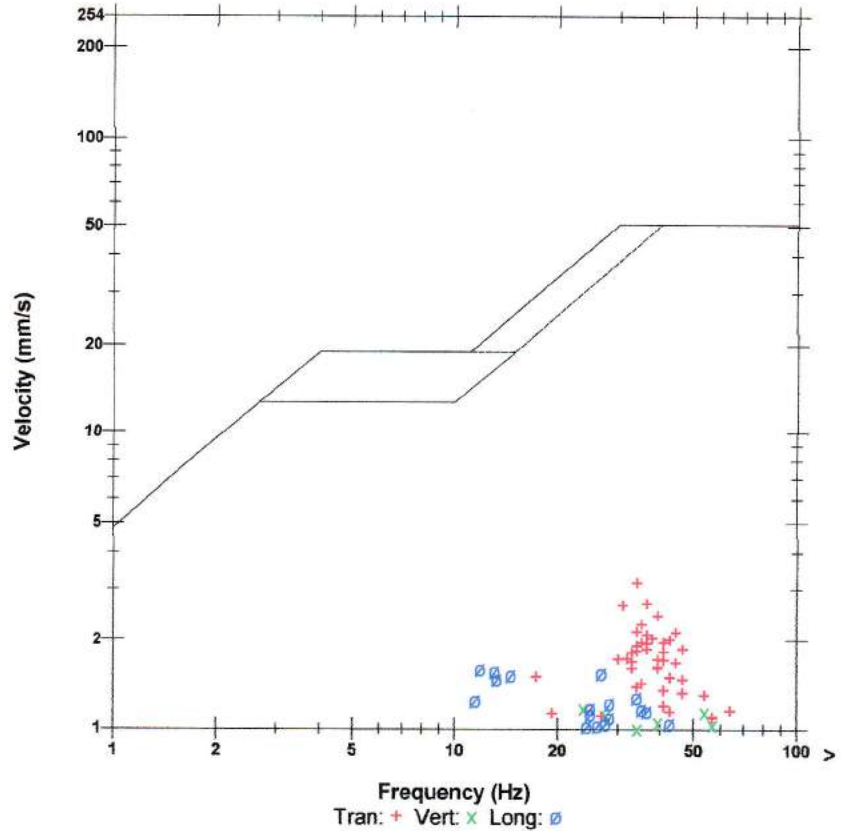
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Microphone Linear Weighting
PSPL 106.4 dB(L) 4.174 pa.(L) at 1.258 sec
ZC Freq 8.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1566 mv)

	Tran	Vert	Long	
PPV	3.137	1.167	1.576	mm/s
ZC Freq	34	24	11.9	Hz
Time (Rel. to Trig)	0.627	-0.020	0.280	sec
Peak Acceleration	0.095	0.063	0.099	g
Peak Displacement	0.015	0.005	0.015	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.4	3.9	

Peak Vector Sum 3.224 mm/s at 0.627 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check

Date/Time Tran at 10:29:31 April 12, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180412102931.IDFW

Notes
 Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Extended Notes

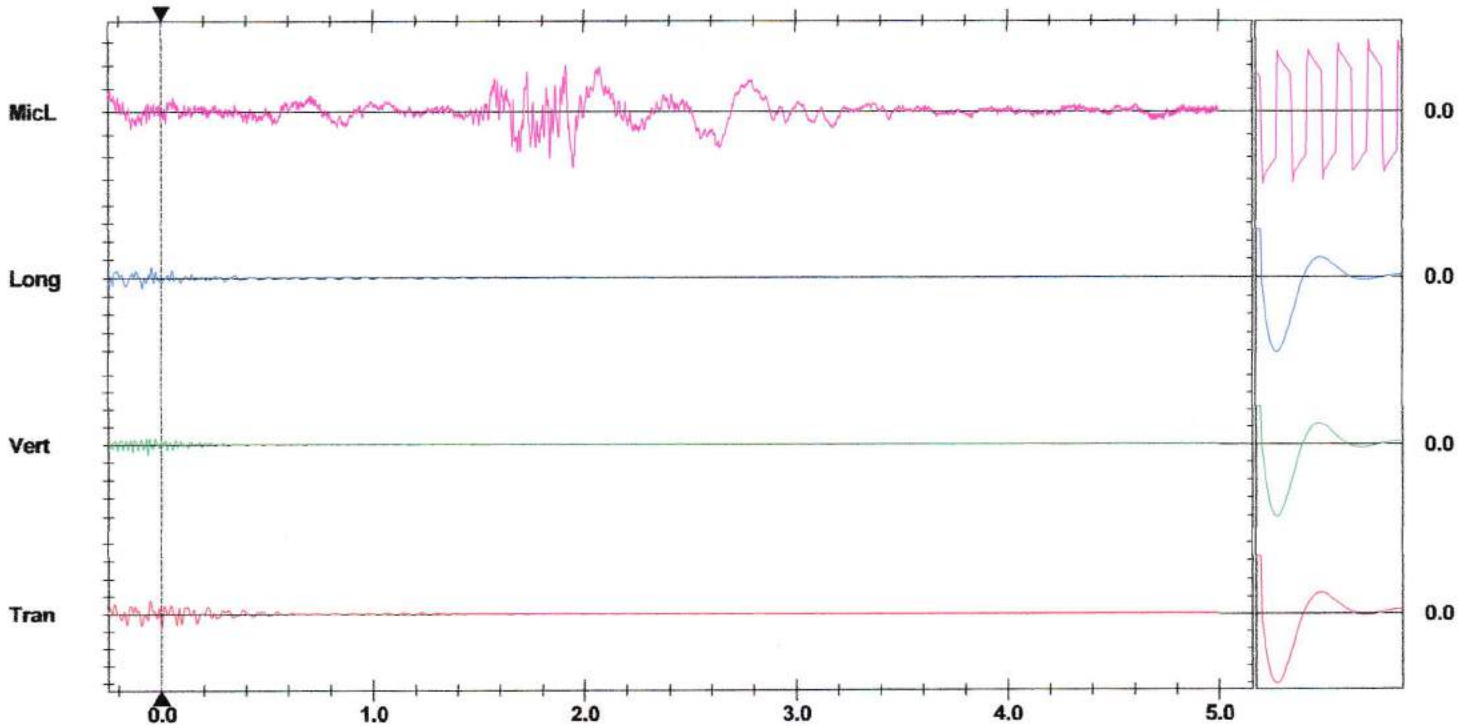
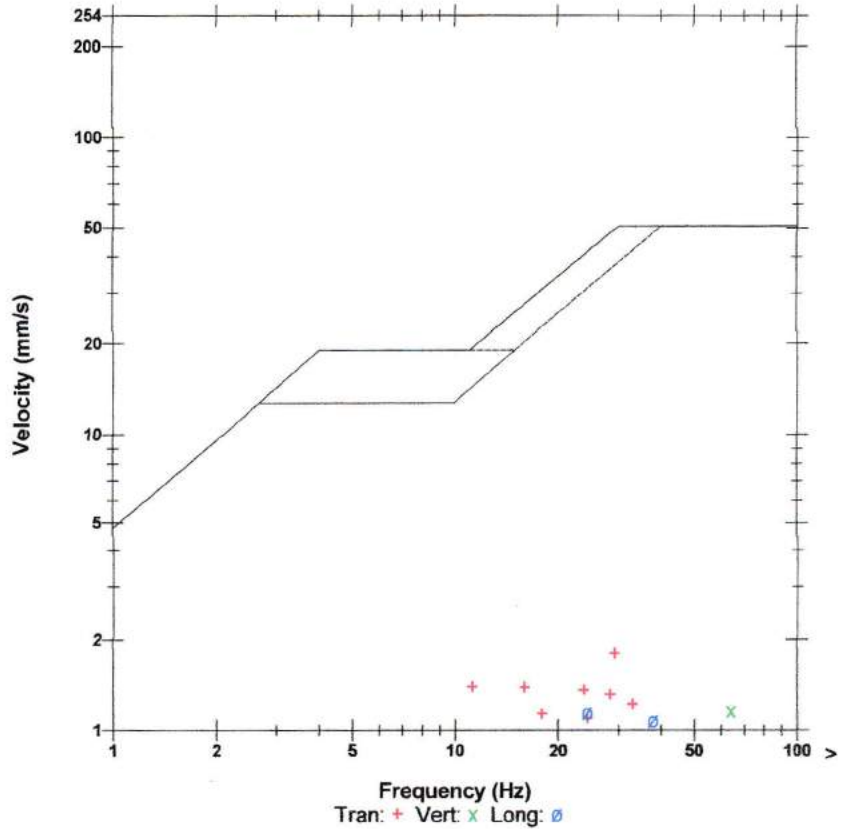
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 101.9 dB(L) 2.498 pa.(L) at 1.948 sec
ZC Freq 9.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1529 mv)

	Tran	Vert	Long	
PPV	1.789	1.159	1.143	mm/s
ZC Freq	29	64	24	Hz
Time (Rel. to Trig)	0.002	-0.061	-0.090	sec
Peak Acceleration	0.036	0.044	0.035	g
Peak Displacement	0.013	0.003	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.6	3.6	4.1	

Peak Vector Sum 1.919 mm/s at 0.002 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3511**
Blast Date: **2018-04-19**

Blast Number: **18-008**
Orica Order #: **2327134**
Blast Time: **11:12 AM**

page 1 Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
GPS Coordinates: **42.89749** °N Latitude **79.29216** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **15** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: X Ceiling: **3,132** ft

Tonnes Blasted: **7,256** te **2,791** m³
Total tonnes per day: **14,948** te **LLL15-39** Rate Code
Total Holes Loaded: **110** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **26** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **84** main body

Bench Height: **14.0** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **14.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg
Decks: **0** per blast

- Collar Stemming -

Front Row: **5.5** ft avg
Main Body: **5.5** ft avg
Material used: **1/2 Crushed**

- Charge Length -

Front Row: **8.5** ft avg
Main Body: **8.5** ft avg

- Charge Weight -

Front Row: **19.0** kg/hole
Main Body: **19.0** kg/hole
Max. per delay: **21.0** kg/delay
SD () Equation: **330.5** kg/delay
Total kg Loaded: **2,407** kg
Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.454 lb/yd³ Yield PF: **0.332** kg/te (actual)
1.261 lb/yd³ Front row: **0.288** kg/te (theoretical)
1.261 lb/yd³ Main Body: **0.288** kg/te (theoretical)
1.261 lb/yd³ "KPI" PF: **0.288** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
Primary Bit diam: **88.9** mm **0**° # Holes: **110** = **1,540.0** ft (**3 1/2** " diam)
Secondary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)
Tertiary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	31,050	28,680	2,370

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	110	37.4

total explosives weight in Blast (kg): **2,407**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	110
CONNECTADET 12M		42 ms	8

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3511**
 Blast Date: **2018-04-19**

Blast Number: **18-008**
 Orica Order #: **2327134**
 Blast Time: **11:12 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89748	79.29278	0.748702	1.383920
Front Row Corner	42.89750	79.29132	0.748703	1.383895
Back Row Corner	42.89748	79.29238	0.748702	1.383913
Average (Centre of Blast)	42.89749	79.29216	0.748702	1.383909

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	545.4 m			
Post Blast Data:	ppV:	2.8 mm/s	Trigger set at:	1.5 mm/s
	frequency:	28.0 Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	104.7 dB	Trigger set at:	115 dB
Erie Peat Road				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89326	79.28536	0.748629	1.383791
2nd Reading				
Average	42.89326	79.28536	0.748629	1.383791
Distance (2nd Seis. From Centre of Blast)	727.5 m			
Post Blast Data:	ppV:	2.3 mm/s	Trigger set at:	1.5 mm/s
	frequency:	31.0 Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	106.2 dB	Trigger set at:	115 dB
Youngs Road				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0 m			
Post Blast Data:	ppV:	0.0 mm/s	Trigger set at:	2.0 mm/s
	frequency:	0.0 Hz	V / T / L :	? (Vertical, Transverse or Longitudinal)
	air overpressure:	0.0 dB	Trigger set at:	115 dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(545.4)^2}{30^2} \text{ kg} \\
 &= \frac{297,461}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

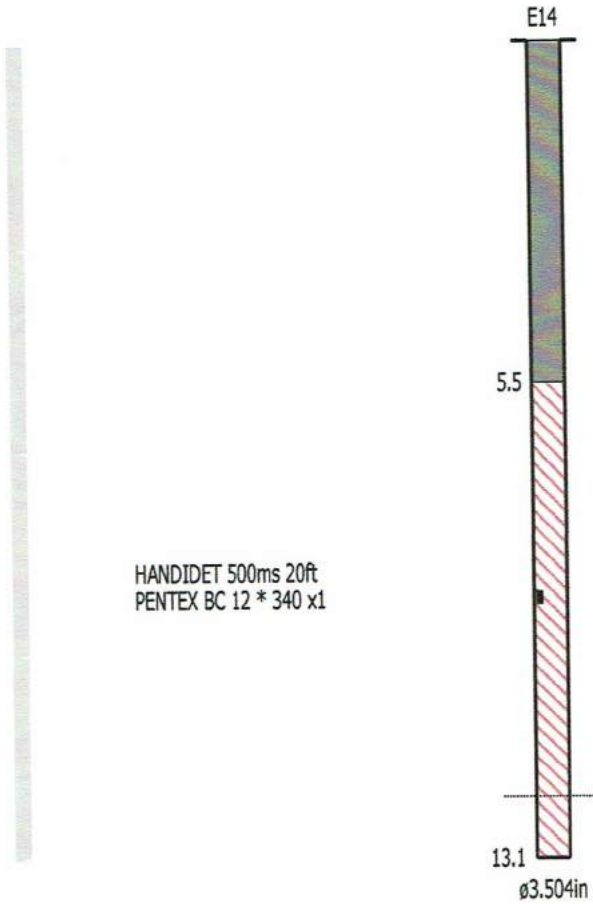
Waterford

Quarry: Laws - Bottom Lift
P.O. #: LCS3511
Blast Date: 4/13/2018

Blast Number: 18-008
Orica Order #: 2327134

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 11:12:30 April 19, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180419111230.IDFW

Notes

Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Extended Notes

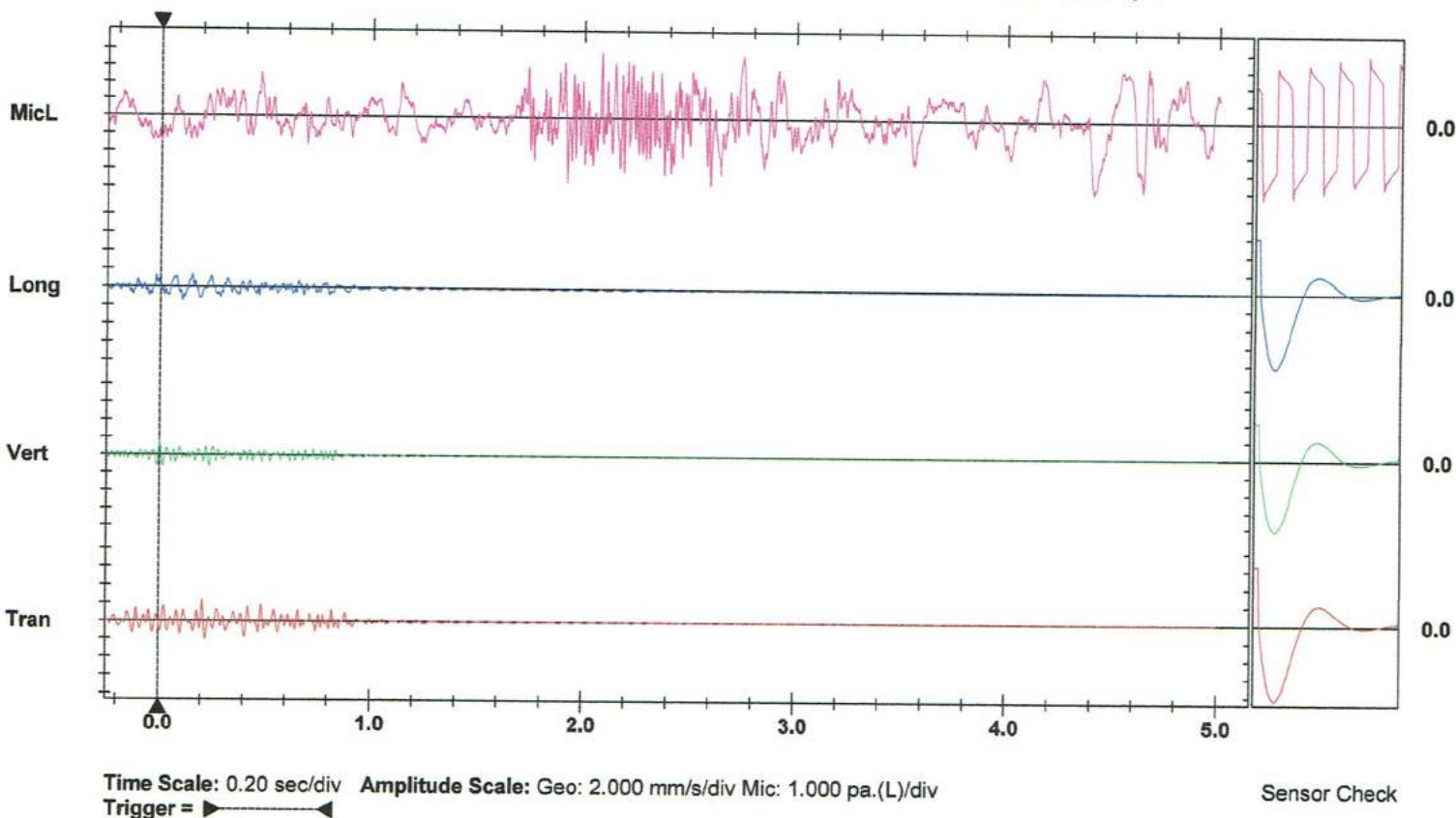
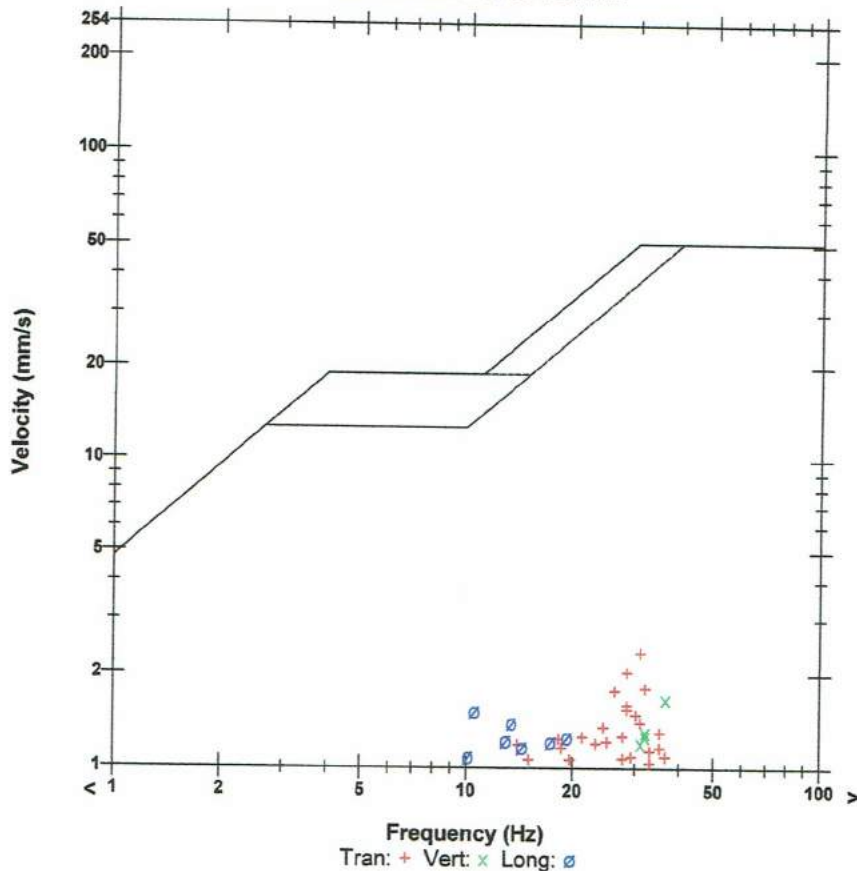
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 106.2 dB(L) at 4.410 sec
ZC Freq 4.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1592 mv)

	Tran	Vert	Long	
PPV	2.349	1.671	1.521	mm/s
ZC Freq	31	37	10.6	Hz
Time (Rel. to Trig)	0.209	0.001	0.105	sec
Peak Acceleration	0.063	0.061	0.044	g
Peak Displacement	0.012	0.015	0.025	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.3	Hz
Overswing Ratio	3.6	3.6	4.0	

Peak Vector Sum 2.468 mm/s at 0.209 sec

USBM RI8507 And OSMRE



Sensor Check

Date/Time Tran at 11:12:32 April 19, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.573 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180419111232.IDFW

Notes

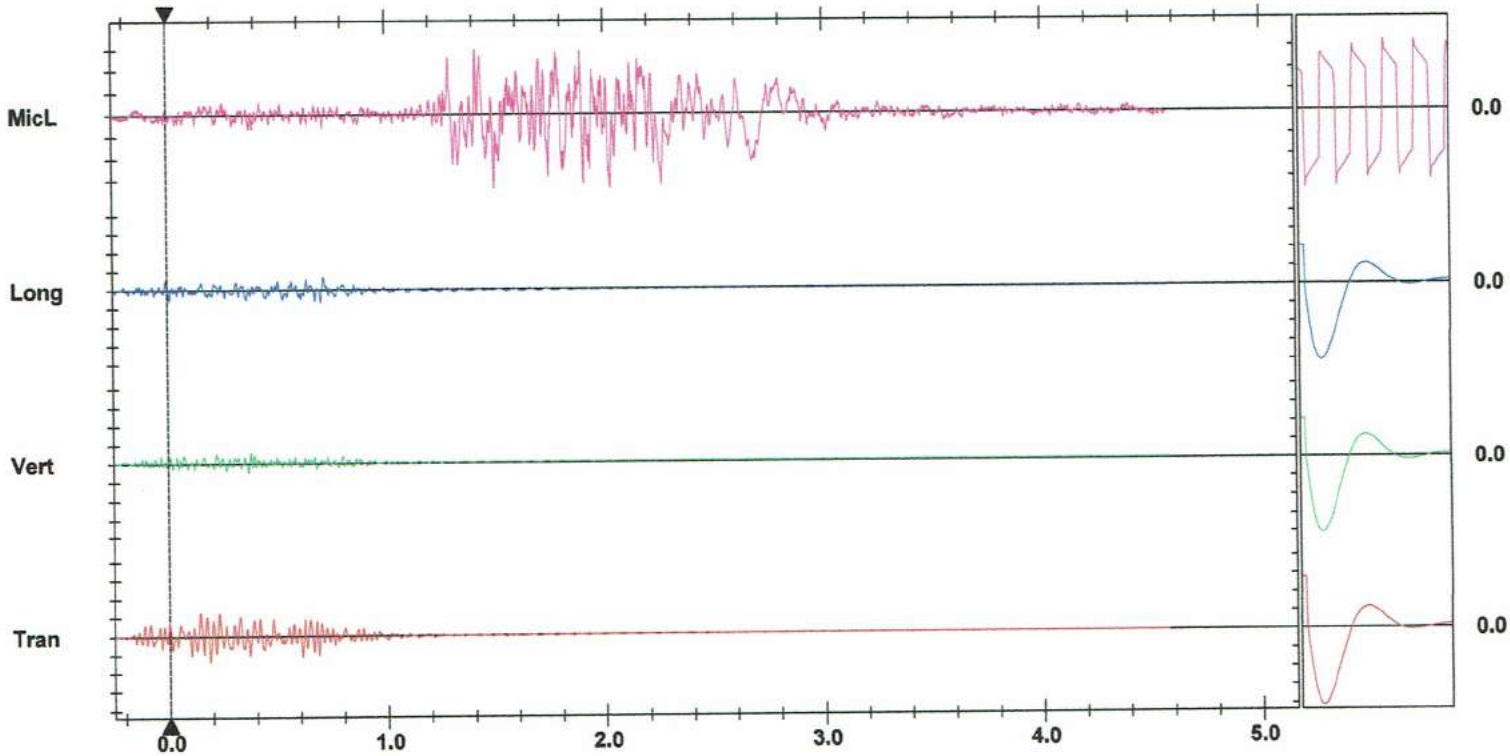
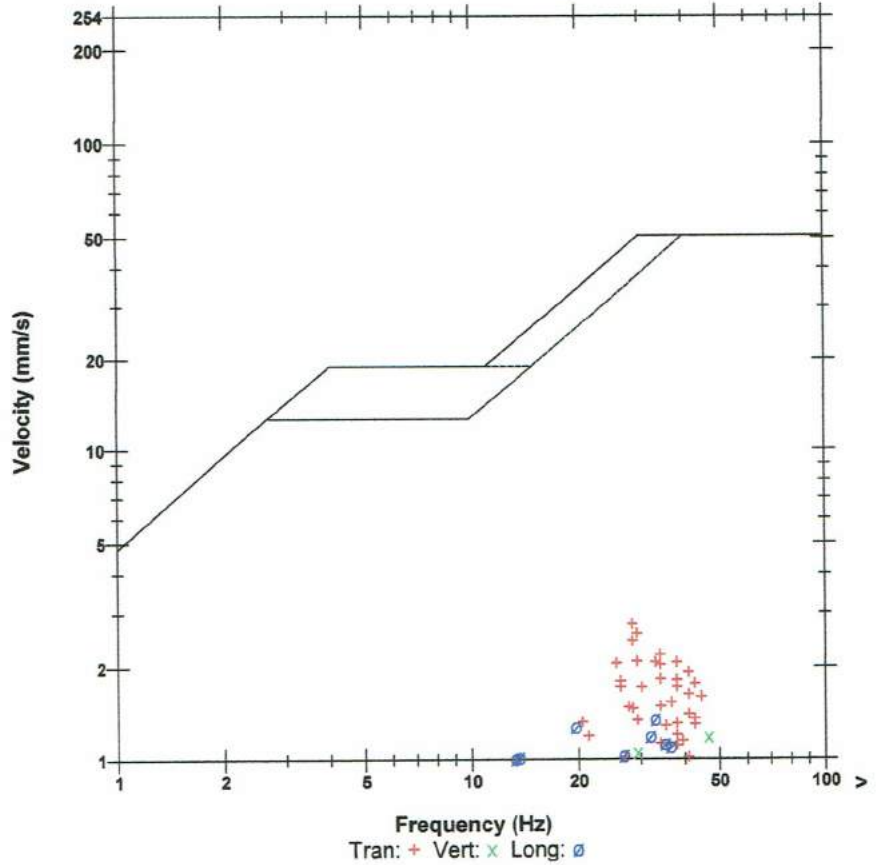
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 104.7 dB(L) at 2.034 sec
ZC Freq 20 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1609 mv)

	Tran	Vert	Long	
PPV	2.767	1.190	1.364	mm/s
ZC Freq	28	47	33	Hz
Time (Rel. to Trig)	0.186	0.378	0.703	sec
Peak Acceleration	0.074	0.056	0.048	g
Peak Displacement	0.014	0.007	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.9	

Peak Vector Sum 2.826 mm/s at 0.186 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3511**
 Blast Date: **2018-04-19**

Blast Number: **18-009**
 Orica Order #: **2327134**
 Blast Time: **1:12 PM**

page 1 Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89788** °N Latitude **79.29201** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **20** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling: **3,150** ft

- Drilling Information -

Nominal Bit Diameter:
 Primary Bit diam: **88.9** mm **0**° Angle from Vertical # Holes: **70** = 1,050.0 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	28,680	26,970	1,710

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	71	24.1

total explosives weight in Blast (kg): **1,734**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	20
EXEL HANDIDET 12m		25/500	51
CONNECTADET 12M		42 ms	8

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	3.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **4,806** te **1,849** m³
 Total tonnes per day: **12,062** te **LLL15-39** Rate Code
 Total Holes Loaded: **70** holes
 ... including: **2** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **16** front row

- Pattern (Back Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **54** back row

Bench Height: **15.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **5.5** ft avg
 Back Row: **5.5** ft avg
 Material used: **1/2" Stone**

- Charge Length -

Front Row: **9.5** ft avg
 Back Row: **9.5** ft avg

- Charge Weight -

Front Row: **21.2** kg/hole
 Back Row: **21.2** kg/hole
 Max. per delay: **23.0** kg/delay
 SD () Equation: **381.9** kg/delay
 Total kg Loaded: **1,734** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.581 lb/yd³ Yield PF: **0.361** kg/te (actual)
 1.315 lb/yd³ Front row: **0.300** kg/te (theoretical)
 1.315 lb/yd³ Main Body: **0.300** kg/te (theoretical)
 1.315 lb/yd³ "KPI" PF: **0.300** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

One hole received a secondary primer because the main primer was stuck



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3511**
Blast Date: **2018-04-19**

Blast Number: **18-009**
Orica Order #: **2327134**
Blast Time: **1:12 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89788	79.29202
Front Row Corner	42.89784	79.29225
Back Row Corner	42.89793	79.29176
Average (Centre of Blast)	42.89788	79.29201

(N) Radians	(W) Radians
0.748709	1.383907
0.748709	1.383911
0.748710	1.383902
0.748709	1.383907

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

Distance (1st Seis. From Centre of Blast)	586.3	m		
Post Blast Data:	ppV:	2.1	mm/s	Trigger set at: 1.5 mm/s
	frequency:	43.0	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:	107.7	dB	Trigger set at: 115 dB
Erie Peat Road				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28536
2nd Reading		
Average	42.89326	79.28536

(N) Radians	(W) Radians
0.748629	1.383791
0.748629	1.383791

Distance (2nd Seis. From Centre of Blast)	747.7	m		
Post Blast Data:	ppV:	2.4	mm/s	Trigger set at: 1.5 mm/s
	frequency:	57.0	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:	106.0	dB	Trigger set at: 115 dB
Youngs Road S				

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000

(N) Radians	(W) Radians
0.000000	0.000000

Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	0.0	mm/s	Trigger set at: 2.0 mm/s
	frequency:	0.0	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:	0.0	dB	Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(586.3)^2}{30^2} \text{ kg} \\
 &= \frac{343,748}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3511**
Blast Date: **4/19/2018**

Blast Number: **18-009**
Orica Order #: **2327134**

Page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 23ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike DerKinderin

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 13:12:47 April 19, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.177 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180419131247.IDFW

Notes

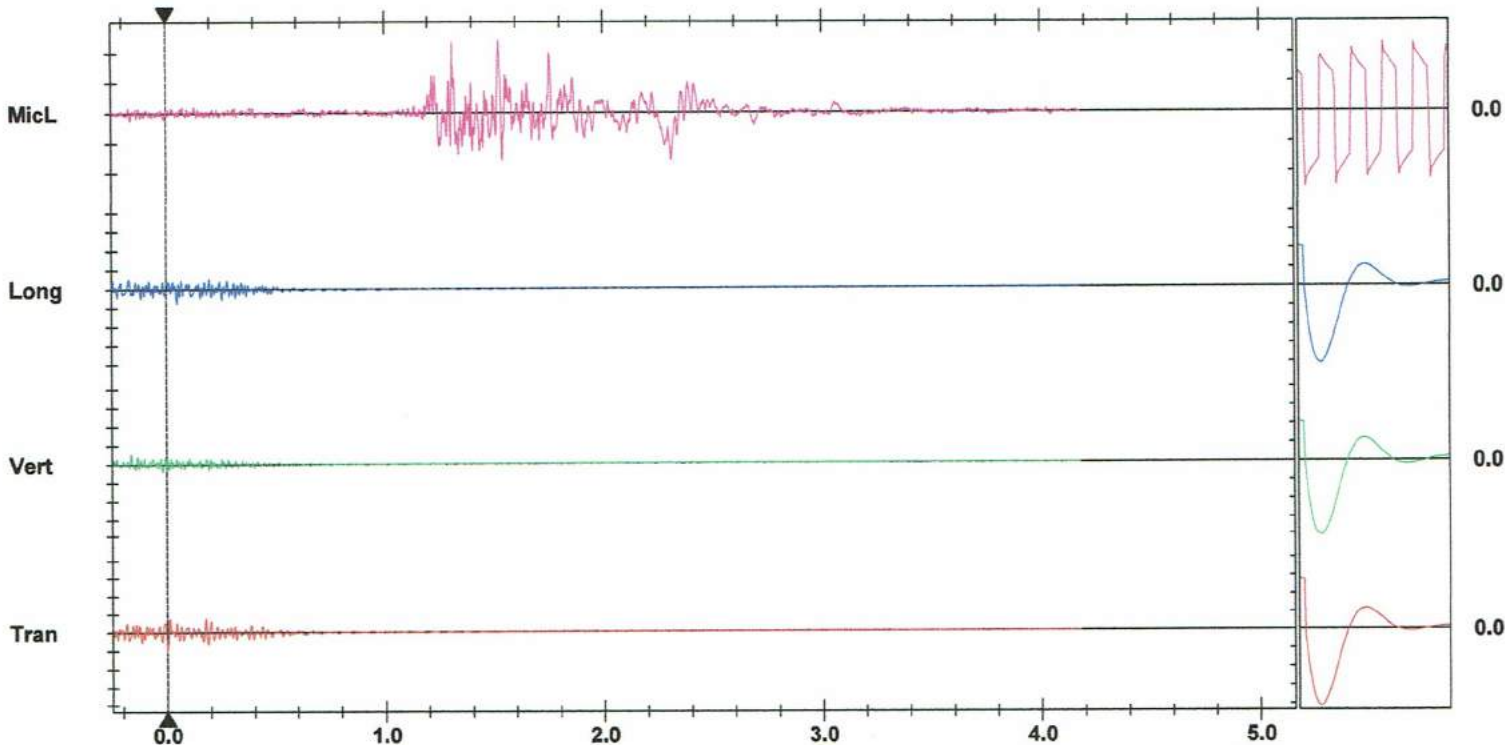
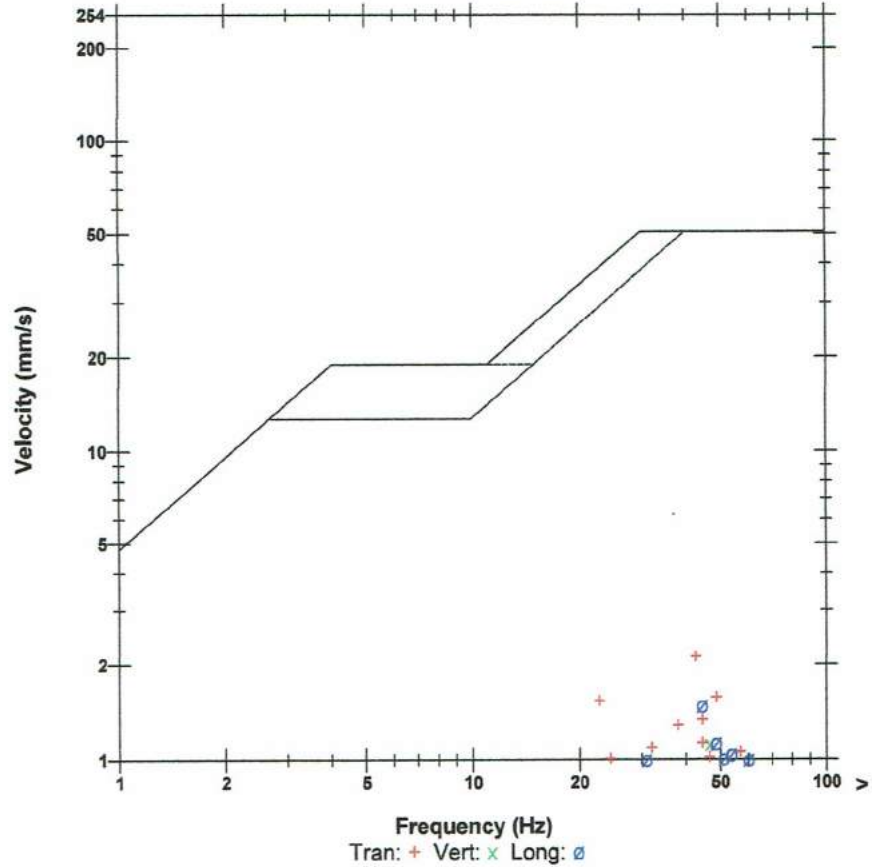
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 107.7 dB(L) at 1.523 sec
ZC Freq 23 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1546 mv)

	Tran	Vert	Long	
PPV	2.120	1.119	1.482	mm/s
ZC Freq	43	47	45	Hz
Time (Rel. to Trig)	0.002	-0.165	0.048	sec
Peak Acceleration	0.063	0.053	0.053	g
Peak Displacement	0.008	0.003	0.005	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.6	3.5	3.8	

Peak Vector Sum 2.243 mm/s at 0.003 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:12:45 April 19, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180419131245.IDFW

Notes

Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Extended Notes

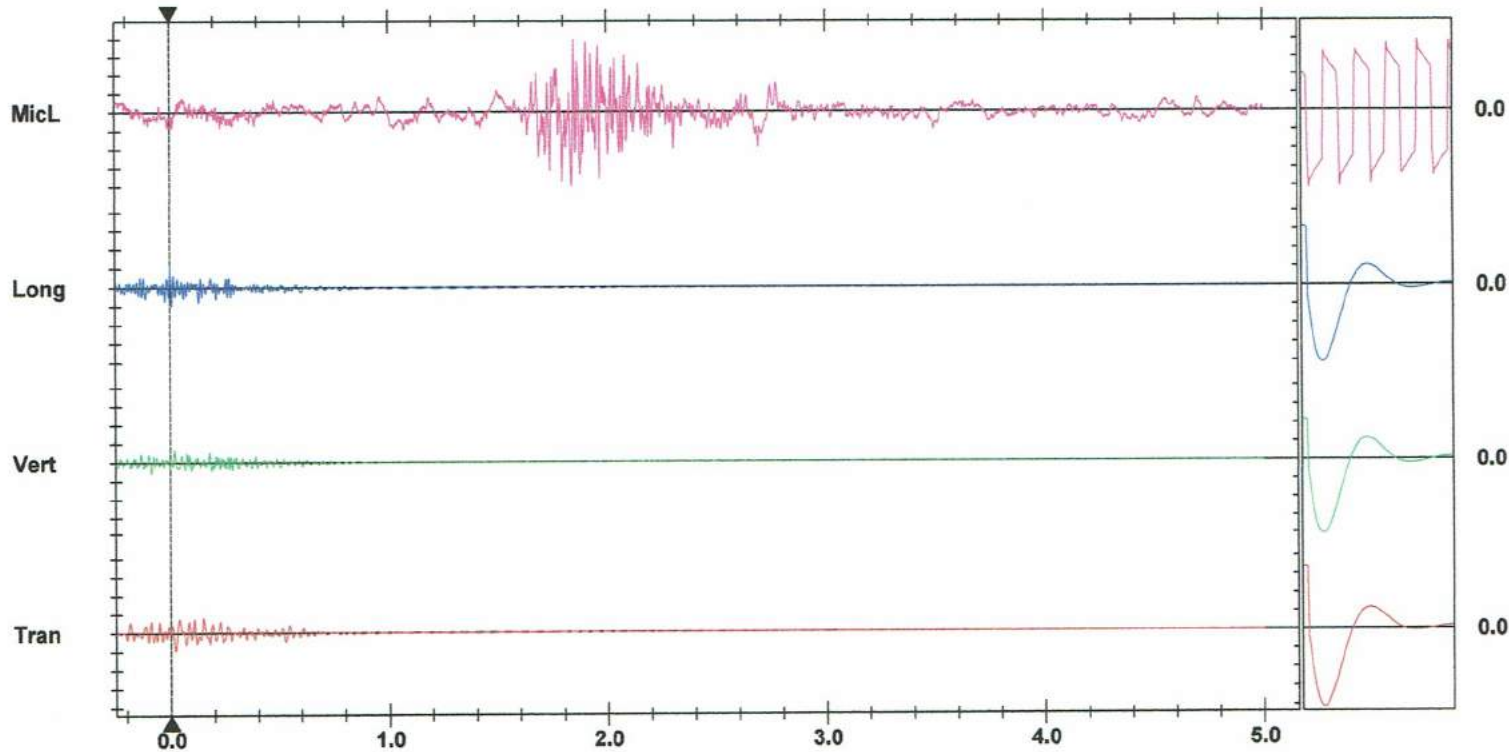
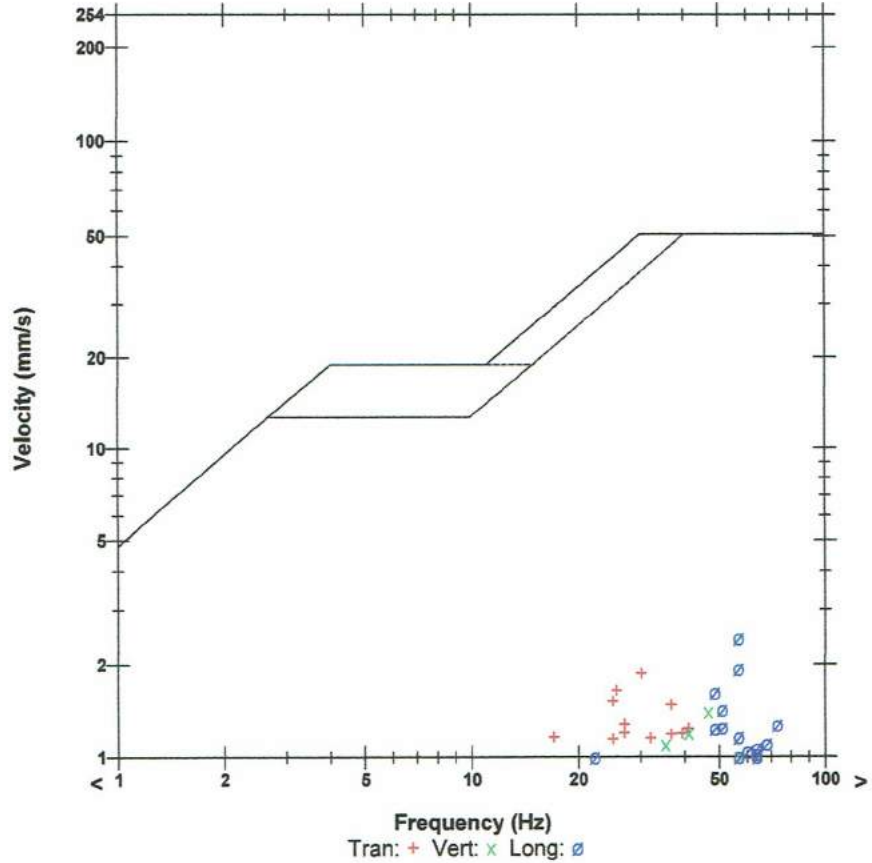
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 106.0 dB(L) at 1.841 sec
ZC Freq 35 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1539 mv)

	Tran	Vert	Long	
PPV	1.876	1.403	2.428	mm/s
ZC Freq	30	47	57	Hz
Time (Rel. to Trig)	0.022	0.020	0.002	sec
Peak Acceleration	0.059	0.086	0.095	g
Peak Displacement	0.010	0.004	0.052	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.3	Hz
Overswing Ratio	3.6	3.6	4.0	

Peak Vector Sum 2.479 mm/s at 0.020 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **LCS3513**
Blast Date: **2018-04-23**

Blast Number: **18-010**
Orica Order #: **23228112**
Blast Time: **11:13 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
GPS Coordinates: **42.89782** °N Latitude **79.29198** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **15** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Angle from Vertical
Primary Bit diam: **88.9** mm **0**° # Holes: **82** = 1,230.0 ft (3 1/2 " diam)
Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,080	27,120	1,960

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	83	28.2

total explosives weight in Blast (kg): **1,988**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	83
EXEL HANDIDET 9m		25 ms	0
CONNECTADET 9M		42 ms	6

Cord & Accessories:

	U of M	# used
	units	0
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	1
BLASTER HOURS	Enter Blaster hours	4.5
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **5,796** te **2,229** m³
Total tonnes per day: **25,206** te **LLL15-30** Rate Code
Total Holes Loaded: **82** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **18** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
Spacing: **8.0** ft avg
Holes: **64** main body

Bench Height: **15.0** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg
Decks: **0** per blast

- Collar Stemming -

Front Row: **5.5** ft avg
Main Body: **5.5** ft avg
Material used: **1/2 Stone**

- Charge Length -

Front Row: **9.5** ft avg
Main Body: **9.5** ft avg

- Charge Weight -

Front Row: **21.2** kg/hole
Main Body: **21.2** kg/hole
Max. per delay: **24.0** kg/delay
SD () Equation: **372.0** kg/delay
Total kg Loaded: **1,988** kg
Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.503 lb/yd³ Yield PF: **0.343** kg/te (actual)
1.315 lb/yd³ Front row: **0.300** kg/te (theoretical)
1.315 lb/yd³ Main Body: **0.300** kg/te (theoretical)
1.315 lb/yd³ "KPI" PF: **0.300** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

1 Hole received a safety primer because it was stuck in the bottom of the hole.



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3513**
 Blast Date: **2018-04-23**

Blast Number: **18-010**
 Orica Order #: **23228112**
 Blast Time: **11:13 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89783	79.29199
Front Row Corner	42.89783	79.29227
Back Row Corner	42.89780	79.29168
Average (Centre of Blast)	42.89782	79.29198

(N) Radians	(W) Radians
0.748708	1.383906
0.748708	1.383911
0.748708	1.383901
0.748708	1.383906

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082
Distance (1st Seis. From Centre of Blast)	578.6 m	
Post Blast Data:	ppV: 3.0 mm/s	Trigger set at: 2.0 mm/s
	frequency: 30.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: 103.6 dB	Trigger set at: 115 dB

Erie Peat Road

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28536
2nd Reading		
Average	42.89326	79.28536
Distance (2nd Seis. From Centre of Blast)	740.8 m	
Post Blast Data:	ppV: 2.2 mm/s	Trigger set at: 2.0 mm/s
	frequency: 25.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: 99.1 dB	Trigger set at: 115 dB

Youngs Road

(N) Radians	(W) Radians
0.748629	1.383791
0.748629	1.383791

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (3rd Seis. From Centre of Blast)	0.0 m	
Post Blast Data:	ppV: 0.0 mm/s	Trigger set at: 2.0 mm/s
	frequency: 0.0 Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: 0.0 dB	Trigger set at: 115 dB

(N) Radians	(W) Radians
0.000000	0.000000

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(578.6)^2}{30^2} \text{ kg} \\
 &= \frac{334,778}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: LCS3513
Blast Date: 4/20/2018

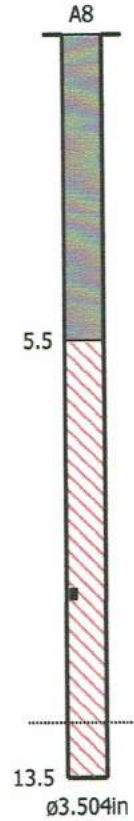
Blast Number: 18-010
Orica Order #: 23228112

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:13:28 April 23, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.366 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180423111328.IDFW

Notes

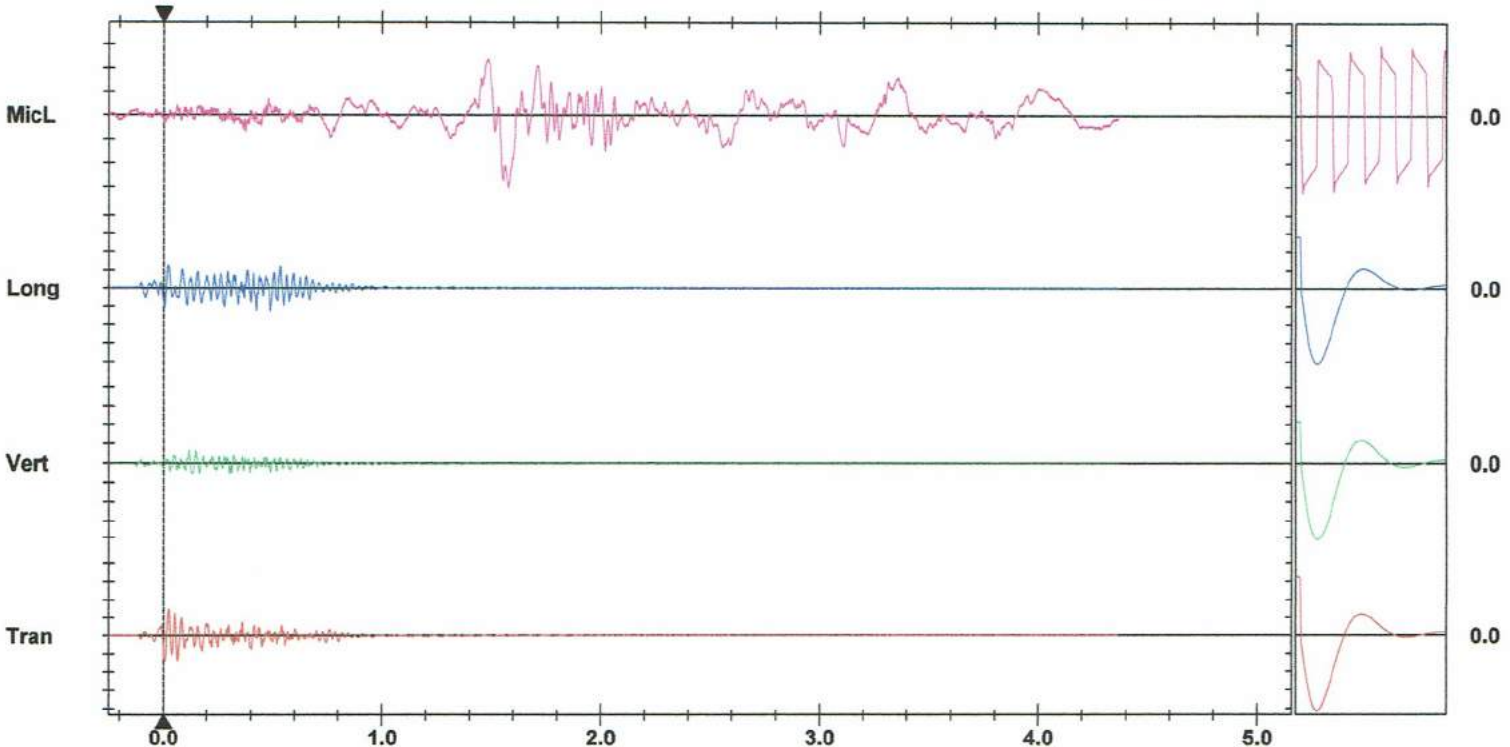
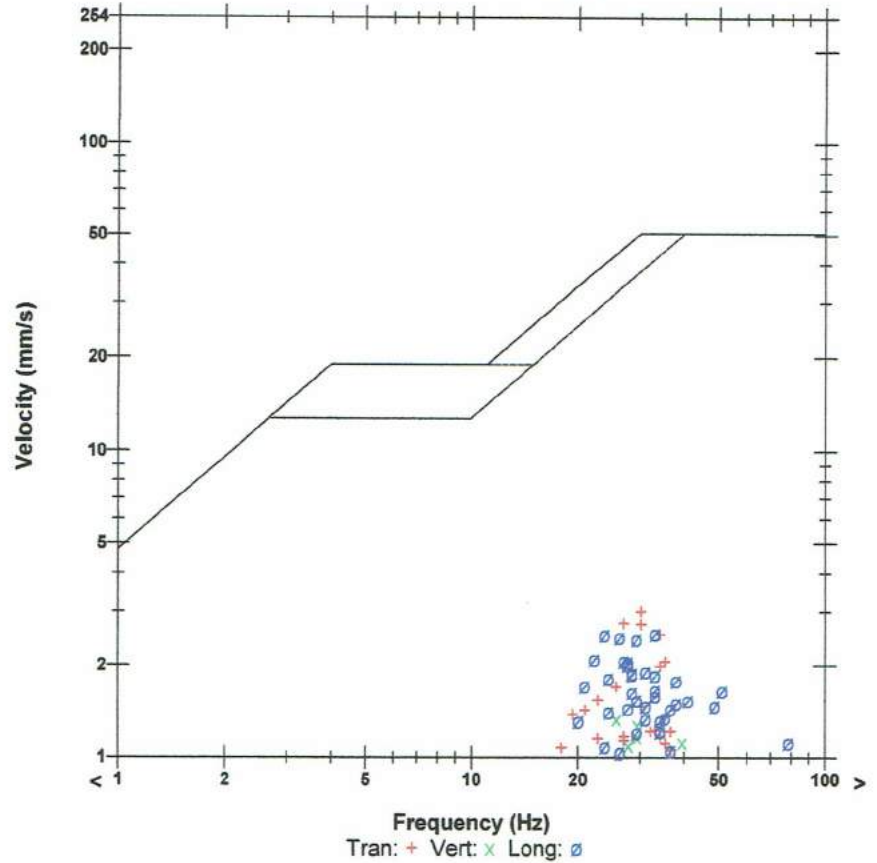
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 103.6 dB(L) at 1.579 sec
ZC Freq 6.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1318 mv)

	Tran	Vert	Long	
PPV	3.003	1.340	2.554	mm/s
ZC Freq	30	26	33	Hz
Time (Rel. to Trig)	0.024	0.119	0.488	sec
Peak Acceleration	0.071	0.058	0.107	g
Peak Displacement	0.017	0.007	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.4	3.7	

Peak Vector Sum 3.824 mm/s at 0.024 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check

Date/Time Tran at 11:13:27 April 23, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by Instantel
File Name UM9119_20180423111327.IDFW

Notes
 Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

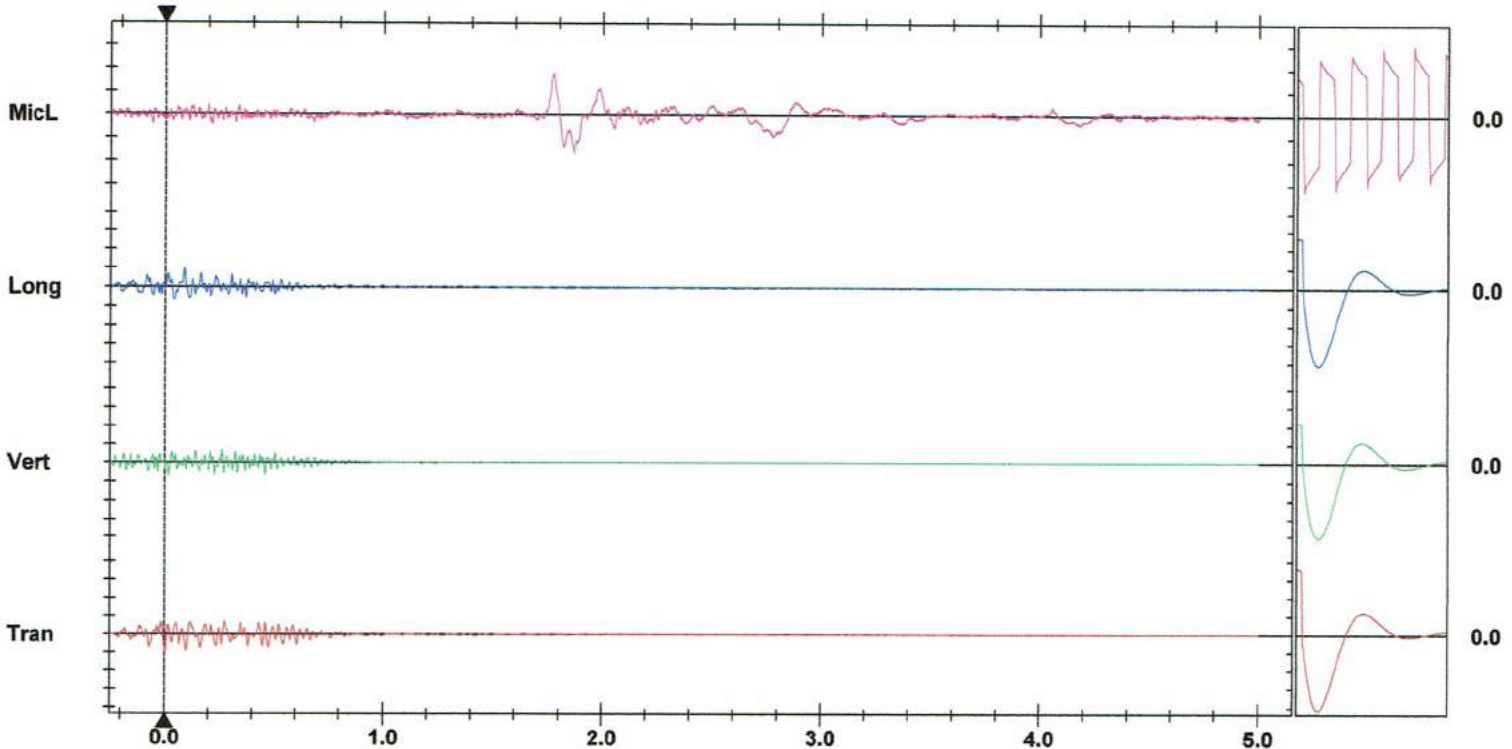
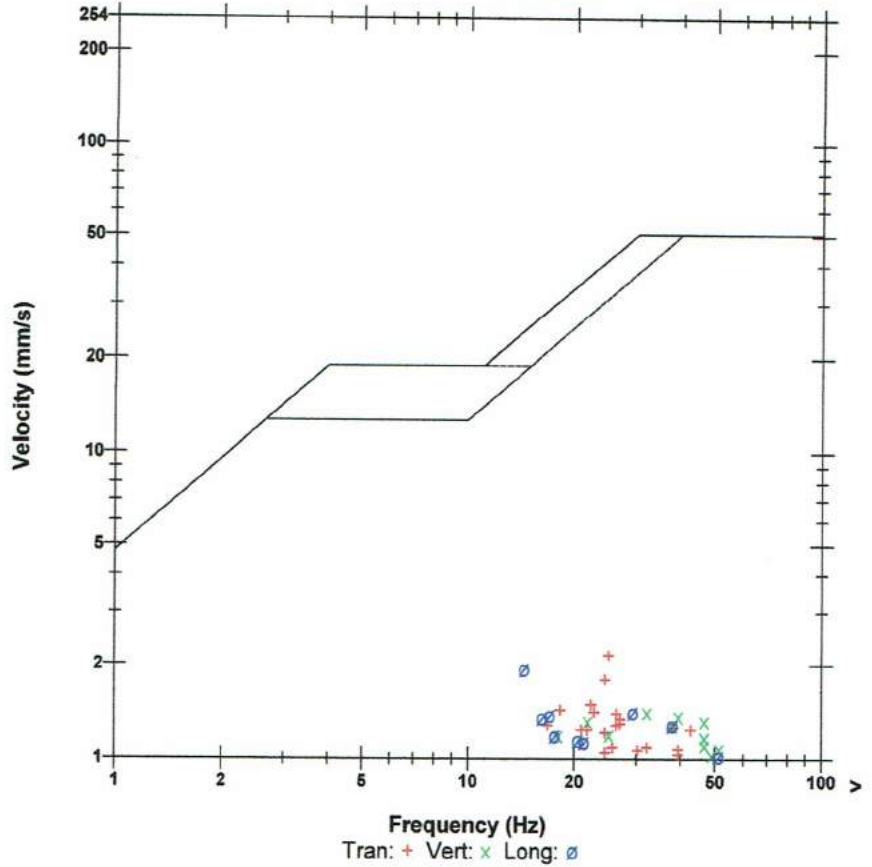
Extended Notes
 N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 99.1 dB(L) at 1.773 sec
ZC Freq 7.4 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1295 mv)

	Tran	Vert	Long	
PPV	2.152	1.411	1.947	mm/s
ZC Freq	25	32	14.4	Hz
Time (Rel. to Trig)	0.004	0.018	0.089	sec
Peak Acceleration	0.043	0.053	0.061	g
Peak Displacement	0.012	0.008	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.5	4.0	

Peak Vector Sum 2.161 mm/s at 0.004 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **LCS3513**
Blast Date: **2018-04-23**

Blast Number: **18-011**
Orica Order #: **2328112**
Blast Time: **2:04 PM**

page 1 Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
GPS Coordinates: **42.89532** °N Latitude **79.29502** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **15** kph Temperature: **16 to 20** °C

Clear: Partly Cloudy:
Rain: Snow:
Overcast: Inversion: Ceiling: **30,000** ft

Tonnes Blasted: **19,410** te **7,465** m³
Total tonnes per day: **25,206** te **LML22-14** Rate Code
Total Holes Loaded: **60** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
Spacing: **13.0** ft avg
Holes: **21** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
Spacing: **13.0** ft avg
Holes: **39** main body

Bench Height: **26.0** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **26.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg
Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
Main Body: **7.0** ft avg
Material used: **3/8 Stone**

- Charge Length -

Front Row: **19.0** ft avg
Main Body: **19.0** ft avg

- Charge Weight -

Front Row: **55.4** kg/hole
Main Body: **55.4** kg/hole
Max. per delay: **62.0** kg/delay
SD () Equation: **225.5** kg/delay
Total kg Loaded: **3,691** kg
Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.833 lb/yd³ Yield PF: **0.190** kg/te (actual)
0.751 lb/yd³ Front row: **0.171** kg/te (theoretical)
0.751 lb/yd³ Main Body: **0.171** kg/te (theoretical)
0.751 lb/yd³ "KPI" PF: **0.171** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
Primary Bit diam: **101.6** mm **0**° # Holes: **60** = **1,560.0** ft (**4** " diam)
Secondary Bit diam: **mm** **0**° # Holes: **mm** = **0.0** ft (" diam)
Tertiary Bit diam: **mm** **0**° # Holes: **mm** = **0.0** ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,120	23,470	3,650

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	120	40.8

total explosives weight in Blast (kg): **3,691**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 9m		25/500	60
EXEL HANDIDET 12m		25/500	60
CONNECTADET 12M		42 ms	5

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	4.5
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Middle Lift
P.O. #: LCS3513
Blast Date: 2018-04-23

Blast Number: 18-011
Orica Order #: 2328112
Blast Time: 2:04 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89521	79.29499
Front Row Corner	42.89523	79.29546
Back Row Corner	42.89552	79.29461
Average (Centre of Blast)	42.89532	79.29502

(N) Radians	(W) Radians
0.748663	1.383959
0.748663	1.383967
0.748668	1.383952
0.748665	1.383959

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082
Distance (1st Seis. From Centre of Blast)	450.5	m
Post Blast Data:	ppV: 7.1	mm/s
	frequency: 29.0	Hz
	air overpressure: 107.4	dB

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

Trigger set at: 2.0 mm/s
V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB
Erie Peat Road

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28536
2nd Reading		
Average	42.89326	79.28536
Distance (2nd Seis. From Centre of Blast)	820.4	m
Post Blast Data:	ppV: 3.8	mm/s
	frequency: 28.0	Hz
	air overpressure: 99.7	dB

(N) Radians	(W) Radians
0.748629	1.383791
0.748629	1.383791

Trigger set at: 2.0 mm/s
V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB
Youngs Road

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (3rd Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: 0.0	mm/s
	frequency: 0.0	Hz
	air overpressure: 0.0	dB

(N) Radians	(W) Radians
0.000000	0.000000

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(450.5)^2}{30^2} \text{ kg}$$

$$= \frac{202,950}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

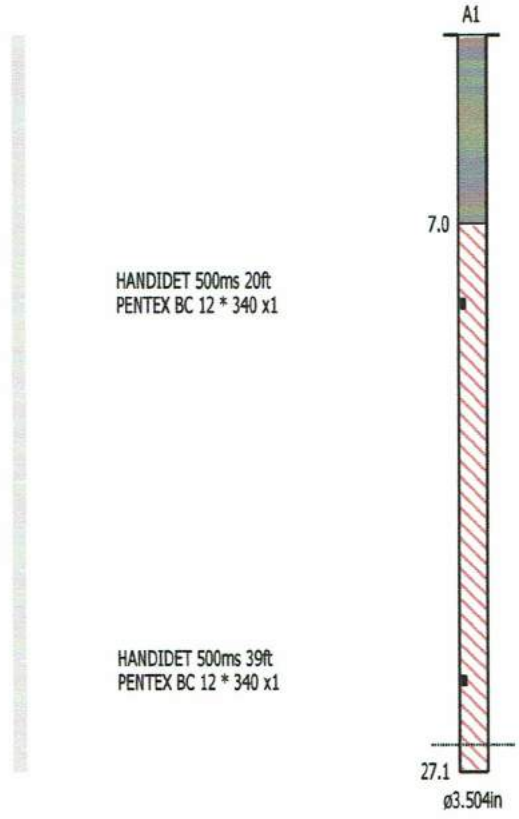
Waterford

Quarry: Laws - Middle Lift
P.O. #: LCS3513
Blast Date: 4/19/2018

Blast Number: 18-011
Orica Order #: 2328112

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Long at 14:04:58 April 23, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.779 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180423140458.IDFW

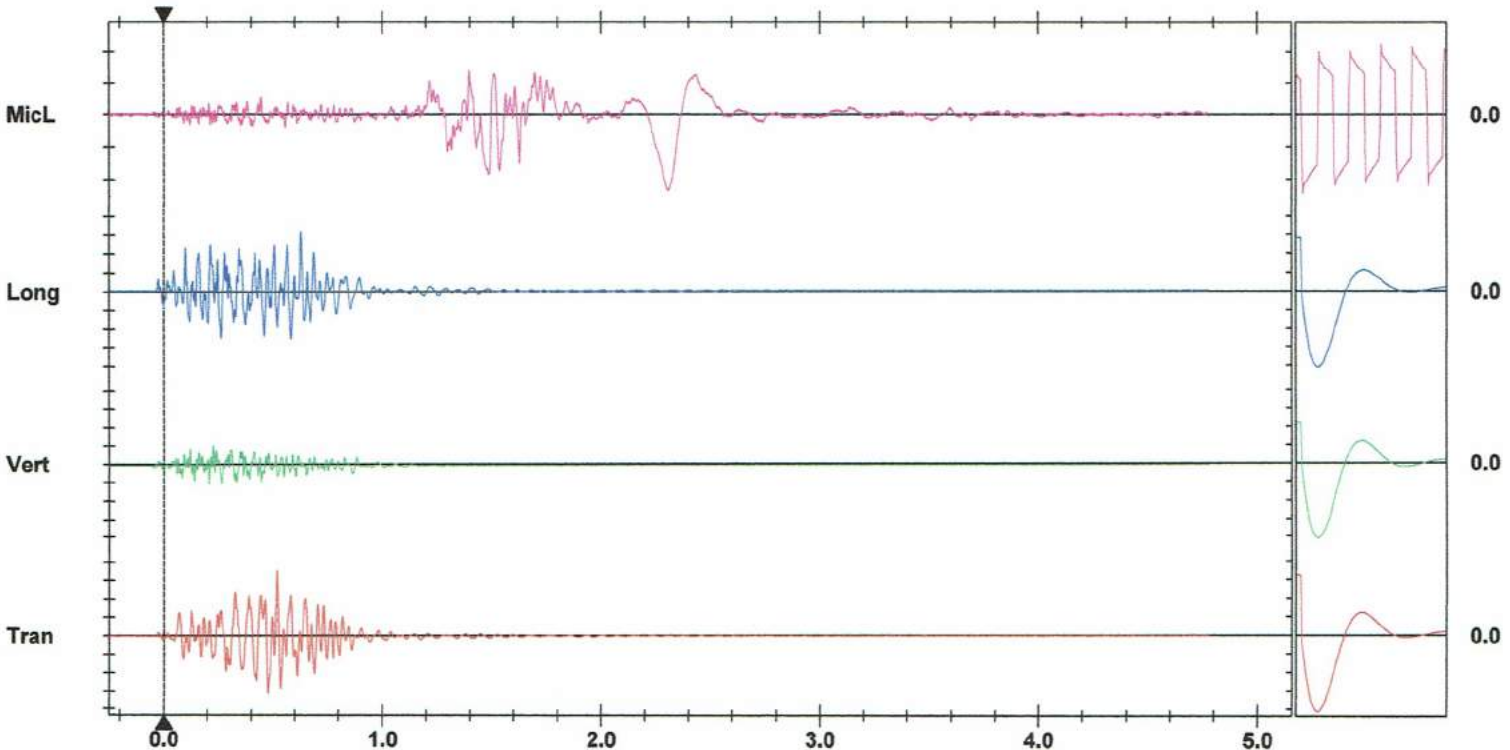
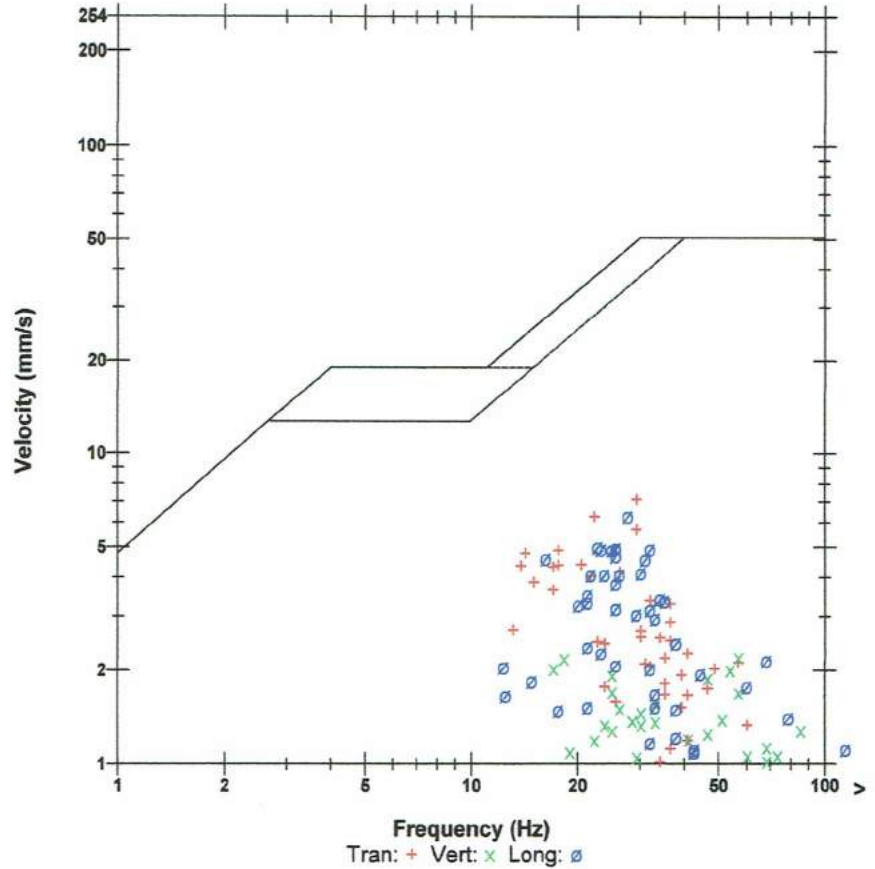
Notes
 Location: Erie Peat Road
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: SAND BAGGED

Microphone Linear Weighting
PSPL 107.4 dB(L) at 2.310 sec
ZC Freq 3.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1252 mv)

	Tran	Vert	Long	
PPV	7.117	2.215	6.313	mm/s
ZC Freq	29	57	28	Hz
Time (Rel. to Trig)	0.518	0.209	0.626	sec
Peak Acceleration	0.150	0.090	0.199	g
Peak Displacement	0.052	0.015	0.039	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.7	

Peak Vector Sum 8.024 mm/s at 0.519 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 14:04:57 April 23, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTEL
File Name UM9119_20180423140457.IDFW

Notes

Location: Youngs Road South
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General:

Extended Notes

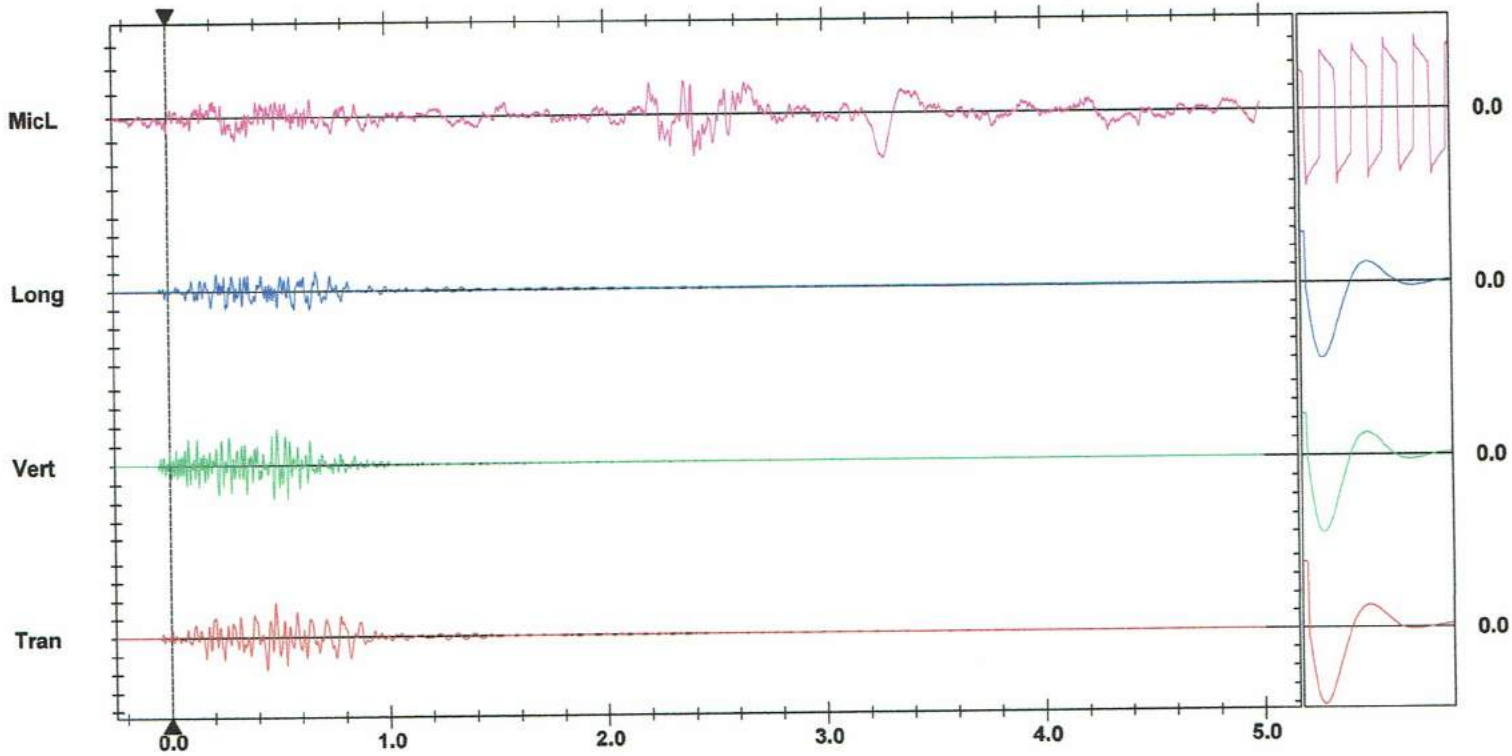
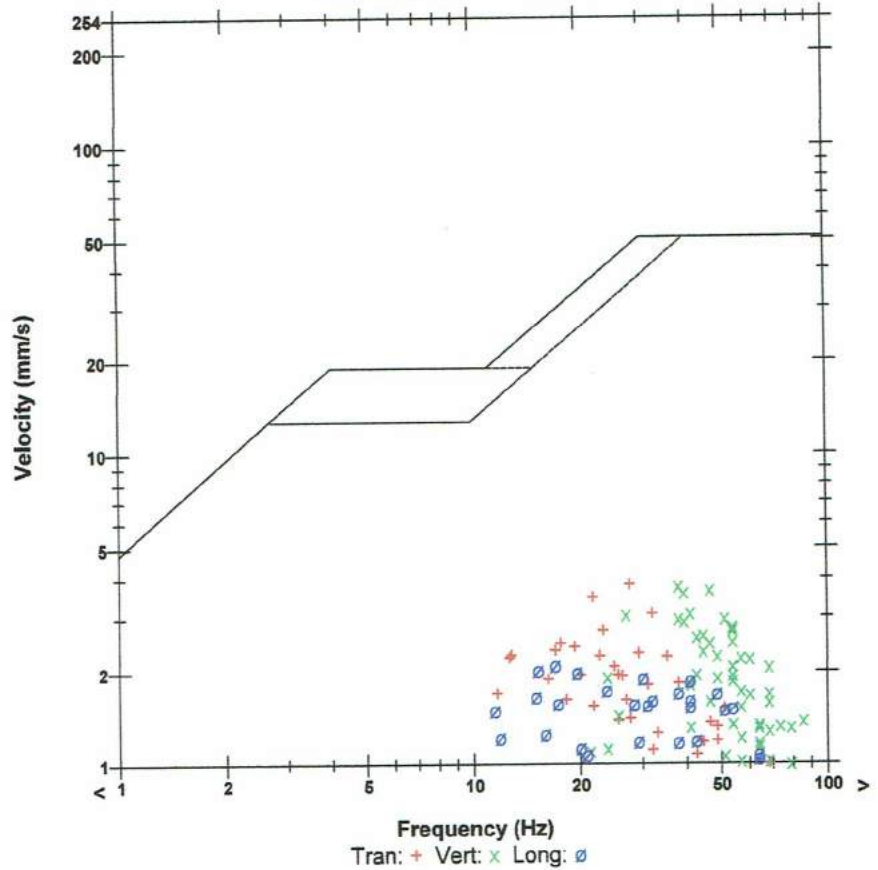
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 99.7 dB(L) at 3.274 sec
ZC Freq 3.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1240 mv)

	Tran	Vert	Long	
PPV	3.823	3.775	2.112	mm/s
ZC Freq	28	38	17.1	Hz
Time (Rel. to Trig)	0.479	0.492	0.674	sec
Peak Acceleration	0.081	0.143	0.081	g
Peak Displacement	0.026	0.016	0.023	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.9	

Peak Vector Sum 5.189 mm/s at 0.478 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
 Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3515**
 Blast Date: **2018-04-27**

Blast Number: **18-012**
 Orica Order #: **2330559**
 Blast Time: **10:37 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89816** °N Latitude **79.29186** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **5** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

Tonnes Blasted: **9,754** te **3,751** m³
 Total tonnes per day: **17,387** te **LLL15-39** Rate Code
 Total Holes Loaded: **138** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **34** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **104** main body
 Bench Height: **15.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **5.5** ft avg
 Main Body: **5.5** ft avg

Material used: **1/2" Stone**

- Charge Length -

Front Row: **9.5** ft avg
 Main Body: **9.5** ft avg

- Charge Weight -

Front Row: **21.2** kg/hole
 Main Body: **21.2** kg/hole
 Max. per delay: **26.0** kg/delay
 SD () Equation: **417.1** kg/delay
 Total kg Loaded: **3,442** kg

Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.547 lb/yd³ Yield PF: **0.353** kg/te (actual)
1.315 lb/yd³ Front row: **0.300** kg/te (theoretical)
1.315 lb/yd³ Main Body: **0.300** kg/te (theoretical)
1.315 lb/yd³ "KPI" PF: **0.300** kg/te (theoretical)

- Drilling Information -

Angle from Vertical: **0°** Nominal Bit Diameter: **2,070.0** ft (**3 1/2** " diam)
 Primary Bit diam: **88.9** mm **0°** # Holes: **138** = **0.0** ft (" diam)
 Secondary Bit diam: mm **0°** # Holes: = **0.0** ft (" diam)
 Tertiary Bit diam: mm **0°** # Holes: = **0.0** ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,440	27,045	3,395

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	139	47.3

total explosives weight in Blast (kg): **3,442**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 7m		25/500	139
CONNECTADET 12M		42 ms	4
CONNECTADET 9M		25 ms	2

Cord & Accessories:

	U of M	# used
	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

	Enter hours	
GPS LAYOUT		0.0
BULK TRUCK CHARGE	>/=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	5.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

one hole in the back row received a secondary primer because the main primer got stuck.



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3515**
 Blast Date: **2018-04-27**

Blast Number: **18-012**
 Orica Order #: **2330559**
 Blast Time: **10:37 AM**

page 2

Blast Co-ordinates		Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast		42.89816	79.29165	0.748714	1.383900
Front Row Corner		42.89852	79.29174	0.748720	1.383902
Back Row Corner		42.89780	79.29159	0.748708	1.383899
Average (Centre of Blast)		42.89816	79.29166	0.748714	1.383901

1st Seismograph Co-ordinates		Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading		42.89269	79.29082	0.748619	1.383886
2nd Reading					
Average		42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)		612.7 m			
Post Blast Data:	ppv:	3.9 mm/s	Trigger set at:	2.0 mm/s	
	frequency:	38.0 Hz	V / T / L:	? (Vertical, Transverse or Longitudinal)	
	air overpressure:	107.0 dB	Trigger set at:	115 dB	
Erie Peat Road					

2nd Seismograph Co-ordinates		Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading		42.89326	79.28536	0.748629	1.383791
2nd Reading					
Average		42.89326	79.28536	0.748629	1.383791
Distance (2nd Seis. From Centre of Blast)		749.4 m			
Post Blast Data:	ppv:	2.9 mm/s	Trigger set at:	2.0 mm/s	
	frequency:	41.0 Hz	V / T / L:	? (Vertical, Transverse or Longitudinal)	
	air overpressure:	99.3 dB	Trigger set at:	115 dB	
Youngs Road					

3rd Seismograph Co-ordinates		Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading					
2nd Reading					
Average		0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)		0.0 m			
Post Blast Data:	ppv:	0.0 mm/s	Trigger set at:	2.0 mm/s	
	frequency:	0.0 Hz	V / T / L:	? (Vertical, Transverse or Longitudinal)	
	air overpressure:	0.0 dB	Trigger set at:	115 dB	

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(612.7)^2}{30^2} \text{ kg} \\
 &= \frac{375,401}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

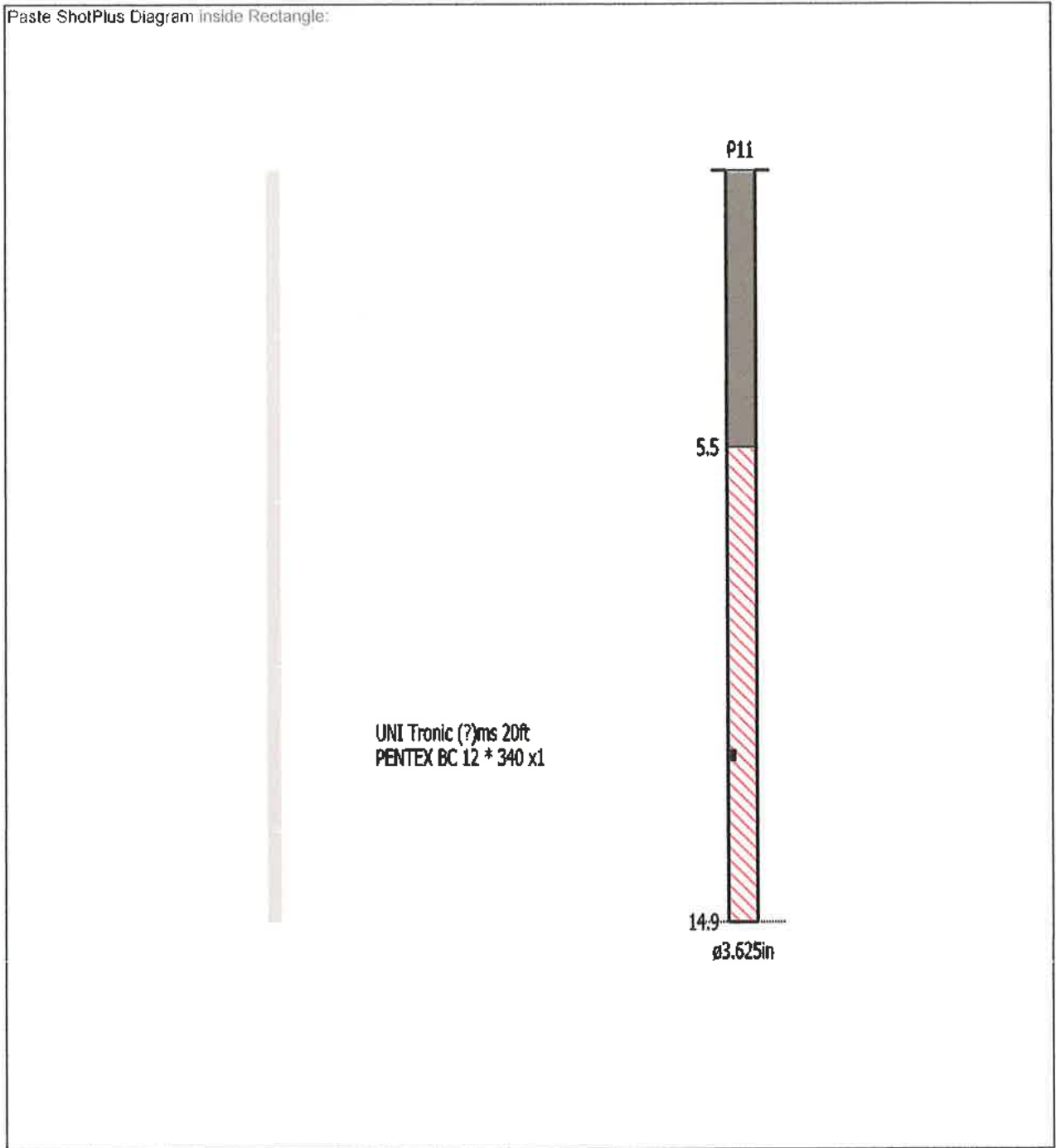
Waterford

Quarry: Laws - Bottom Lift
P.O. #: LCS3515
Blast Date: 4/27/2018

Blast Number: 18-012
Orica Order #: 2330559

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 10:37:17 April 27, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.875 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180427103717.IDFW

Notes

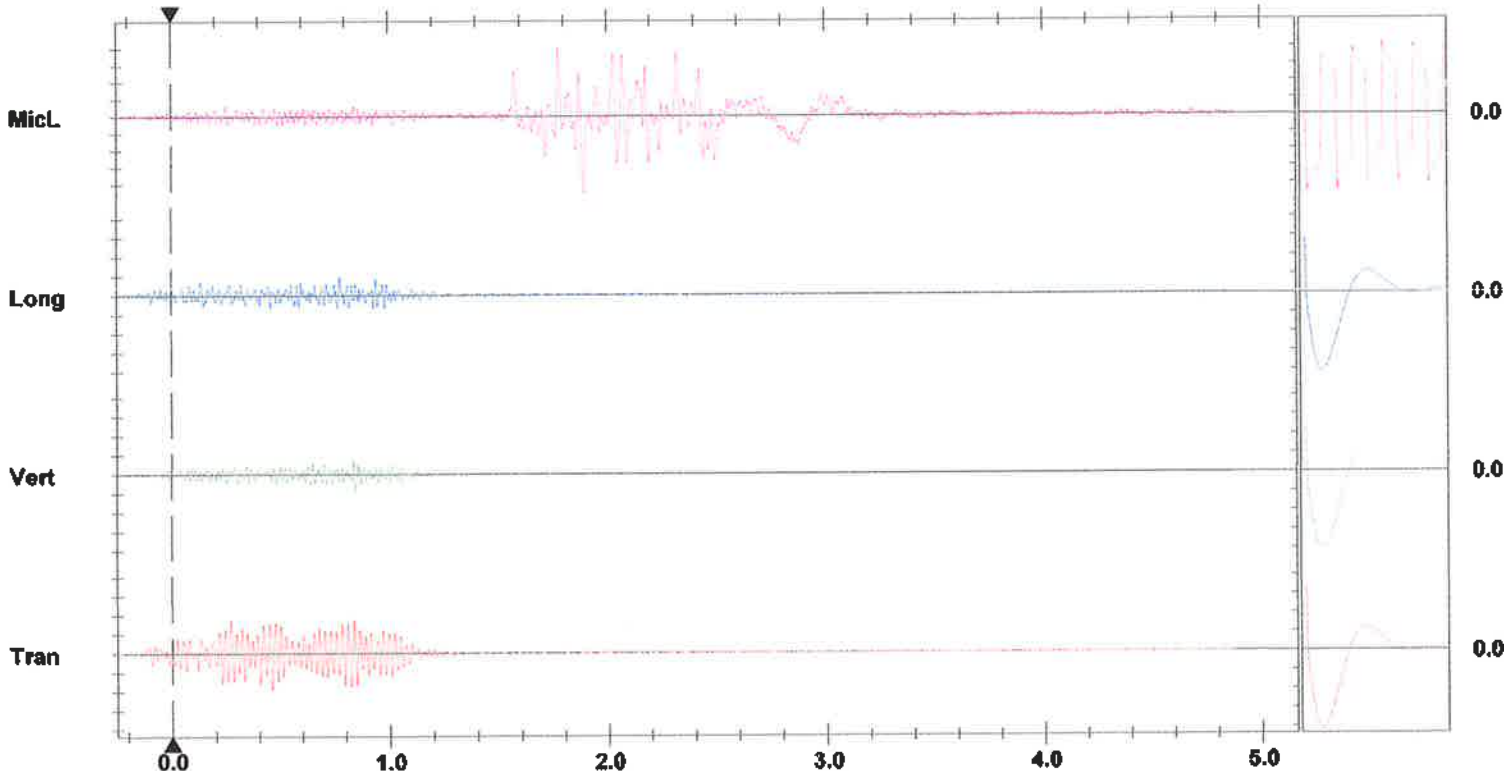
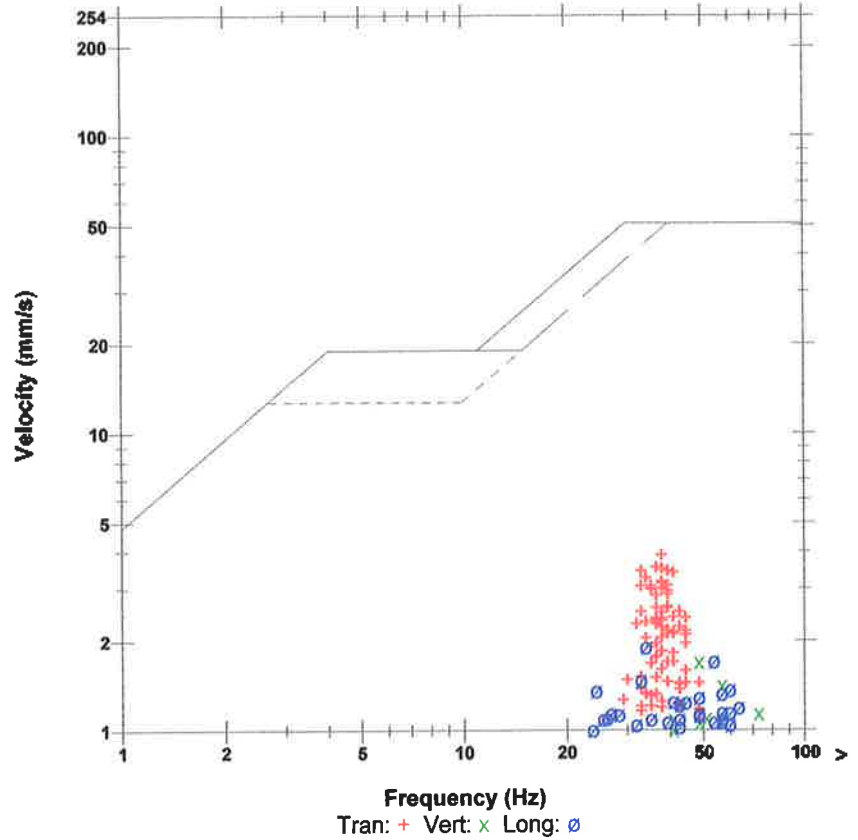
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 107.0 dB(L) at 1.892 sec
ZC Freq 18.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1371 mv)

	Tran	Vert	Long	
PPV	3.870	1.695	1.900	mm/s
ZC Freq	38	49	34	Hz
Time (Rel. to Trig)	0.460	0.845	0.777	sec
Peak Acceleration	0.109	0.090	0.072	g
Peak Displacement	0.016	0.007	0.007	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.7	

Peak Vector Sum 3.902 mm/s at 0.460 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 10:37:16 April 27, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180427103716.IDFW

Notes

Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

Extended Notes

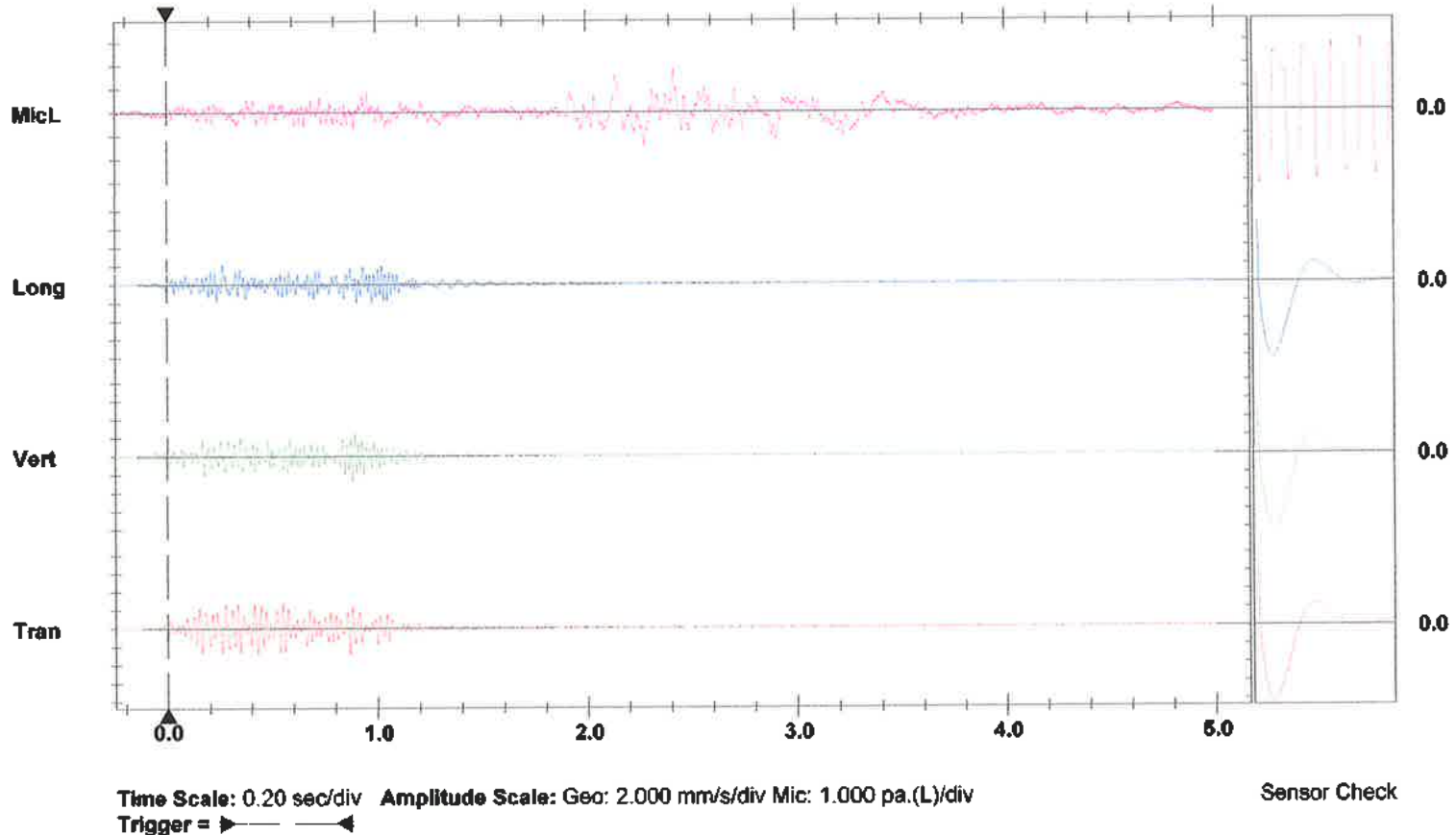
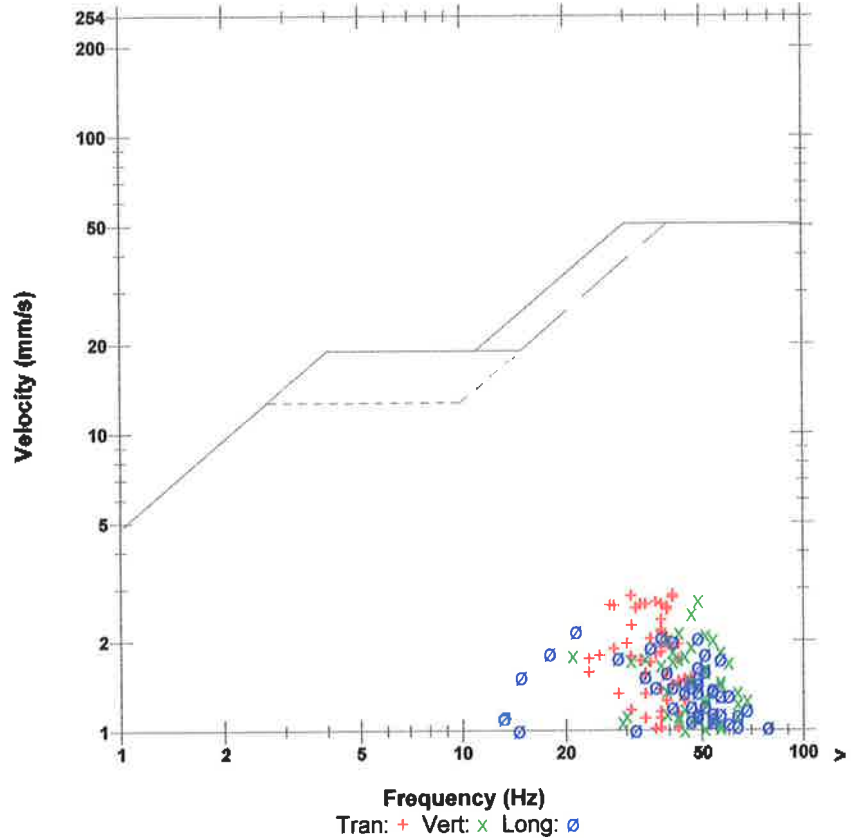
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 99.3 dB(L) at 2.423 sec
ZC Freq 12.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1357 mv)

	Tran	Vert	Long	
PPV	2.853	2.719	2.144	mm/s
ZC Freq	41	49	21	Hz
Time (Rel. to Trig)	0.869	0.884	0.265	sec
Peak Acceleration	0.087	0.114	0.077	g
Peak Displacement	0.015	0.009	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.5	3.5	4.0	

Peak Vector Sum 3.577 mm/s at 0.348 sec

USBM R18507 And OSMRE



Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **LCS3515**
 Blast Date: **2018-04-27**

Blast Number: **18-013**
 Orica Order #: **2330559**
 Blast Time: **12:36 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89772** °N Latitude **79.29197** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **5** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **19.110** ft

- Drilling Information -

Angle from Vertical: **0**° # Holes: **108** = 1,620.0 ft (3 1/2 " diam)
 Primary Bit diam: **88.9** mm
 Secondary Bit diam: **0** mm # Holes: **0** = 0.0 ft (" diam)
 Tertiary Bit diam: **0** mm # Holes: **0** = 0.0 ft (" diam)
 Nominal Bit Diameter:

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,045	24,530	2,515

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	110	37.4

total explosives weight in Blast (kg): **2,552**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 7m		25/500	11
CONNECTADET 9M		25/500	99
CONNECTADET 9M		25 ms	2
CONNECTADET 12M		42 ms	4

Cord & Accessories:	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>/=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	5.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **7,633** te **2,936** m³
 Total tonnes per day: **17,387** te **LLL15-39** Rate Code
 Total Holes Loaded: **108** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **26** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **82** main body

Bench Height: **15.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **5.5** ft avg
 Main Body: **5.5** ft avg

Material used: **1/2" Stone**

- Charge Length -

Front Row: **9.5** ft avg
 Main Body: **9.5** ft avg

- Charge Weight -

Front Row: **21.2** kg/hole
 Main Body: **21.2** kg/hole
 Max. per delay: **24.0** kg/delay
 SD () Equation: **358.0** kg/delay
 Total kg Loaded: **2,552** kg

Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.465 lb/yd³ Yield PF: **0.334** kg/te (actual)
 1.315 lb/yd³ Front row: **0.300** kg/te (theoretical)
 1.315 lb/yd³ Main Body: **0.300** kg/te (theoretical)
 1.315 lb/yd³ "KPI" PF: **0.300** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blasted)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

2 hole received a top safety primer



Blast Report

DFA / DIV of CRH (Ontario)

Quarry: Laws - Bottom Lift
P.O. #: LCS3515
Blast Date: 2018-04-27

Blast Number: 18-013
Orica Order #: 2330559
Blast Time: 12:36 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	42.89771	79.29195
Front Row Corner	42.89774	79.29237
Back Row Corner	42.89771	79.29158
Average (Centre of Blast)	42.89772	79.29197

(N) Radians	(W) Radians
0.748706	1.383906
0.748707	1.383913
0.748706	1.383899
0.748706	1.383906

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89269	79.29082
2nd Reading		
Average	42.89269	79.29082
Distance (1st Seis. From Centre of Blast)	567.6	m
Post Blast Data:	ppV: 2.9	mm/s
	frequency: 34.0	Hz
	air overpressure: 107.5	dB

(N) Radians	(W) Radians
0.748619	1.383886
0.748619	1.383886

Trigger set at: 2.0 mm/s
V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB
Erie Peat Road

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	42.89326	79.28536
2nd Reading		
Average	42.89326	79.28536
Distance (2nd Seis. From Centre of Blast)	732.6	m
Post Blast Data:	ppV: 2.6	mm/s
	frequency: 35.0	Hz
	air overpressure: 103.0	dB

(N) Radians	(W) Radians
0.748629	1.383791
0.748629	1.383791

Trigger set at: 2.0 mm/s
V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB
Youngs Road

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (3rd Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: 0.0	mm/s
	frequency: 0.0	Hz
	air overpressure: 0.0	dB

(N) Radians	(W) Radians
0.000000	0.000000

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(567.6)^2}{30^2} \text{ kg}$$

$$= \frac{322,170}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: LCS3515
Blast Date: 4/27/2018

Blast Number: 18-013
Orica Order #: 2330559

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
PENTEX BC 12 * 340 x1



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Tran at 12:36:17 April 27, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.837 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180427123617.IDFW

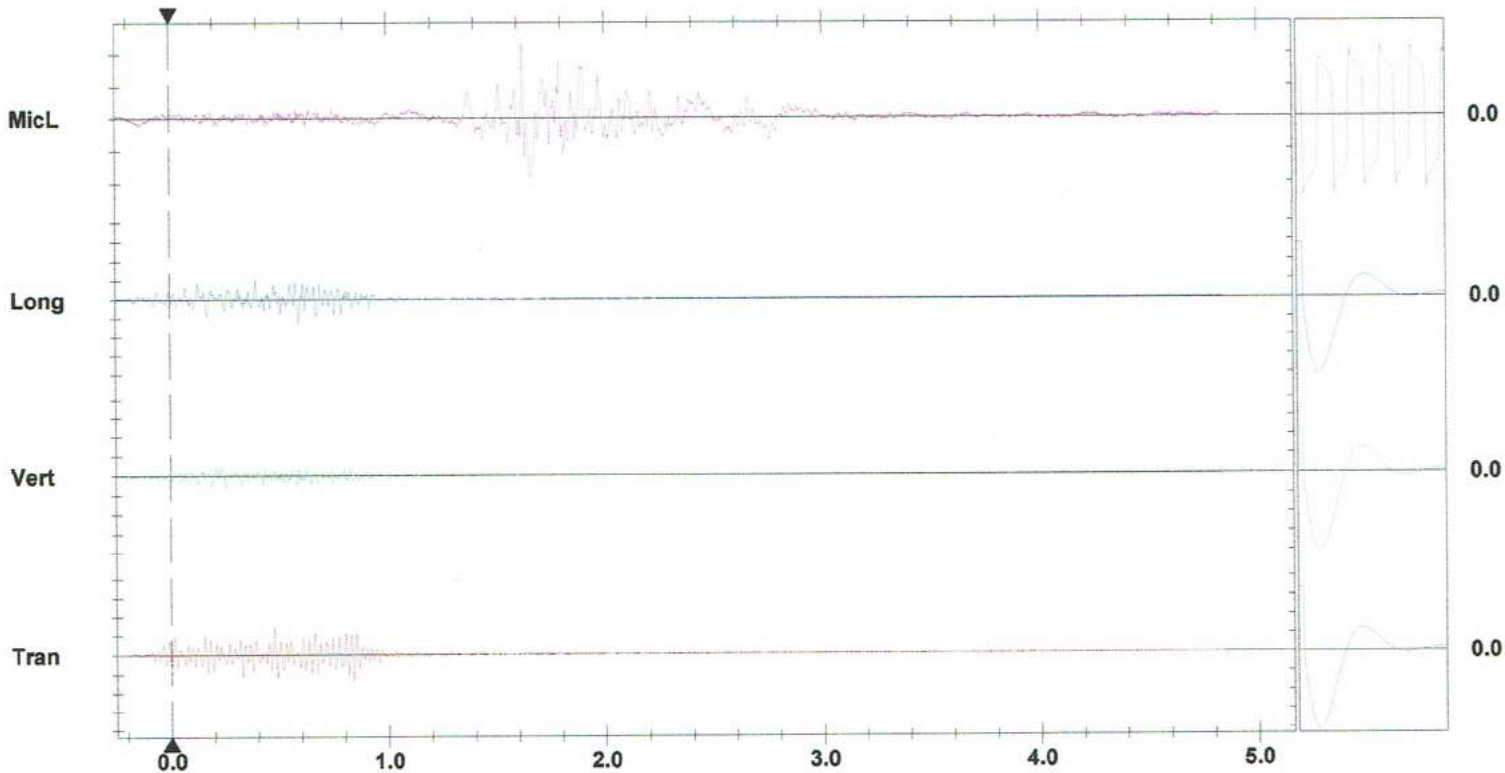
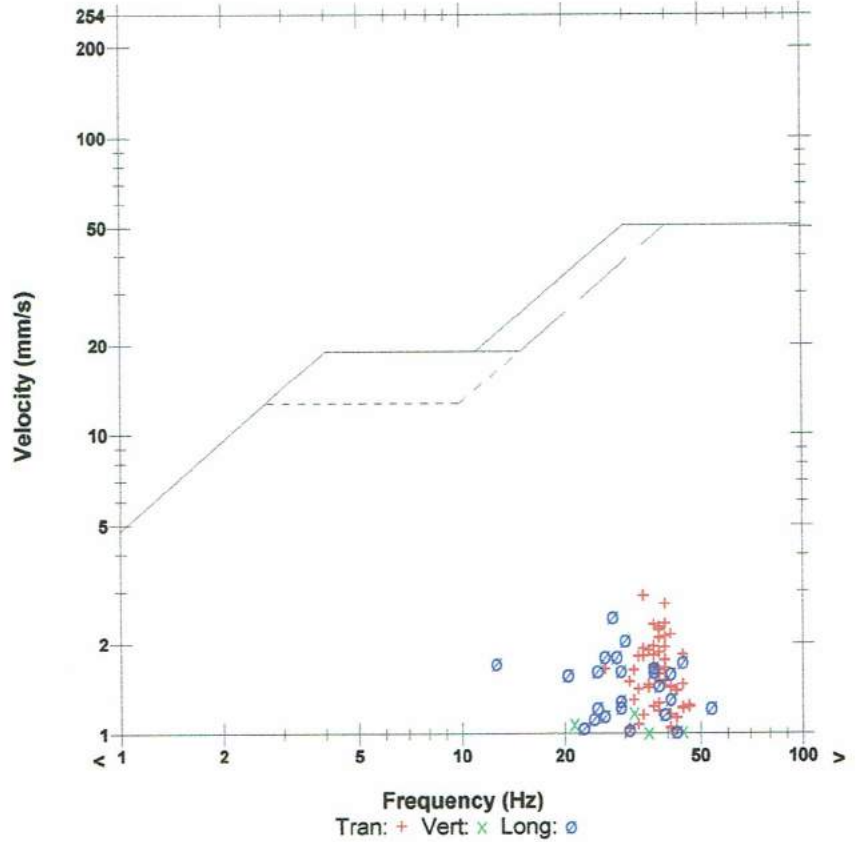
Notes
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 107.5 dB(L) at 1.625 sec
ZC Freq 35 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1346 mv)

	Tran	Vert	Long	
PPV	2.893	1.174	2.467	mm/s
ZC Freq	34	32	28	Hz
Time (Rel. to Trig)	0.475	0.256	0.591	sec
Peak Acceleration	0.082	0.053	0.089	g
Peak Displacement	0.013	0.006	0.015	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.7	

Peak Vector Sum 3.213 mm/s at 0.475 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 12:36:16 April 27, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/YOUNGS RD S.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by Instantel
File Name UM9119_20180427123616.IDFW

Notes
Location: Youngs Road South
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General:

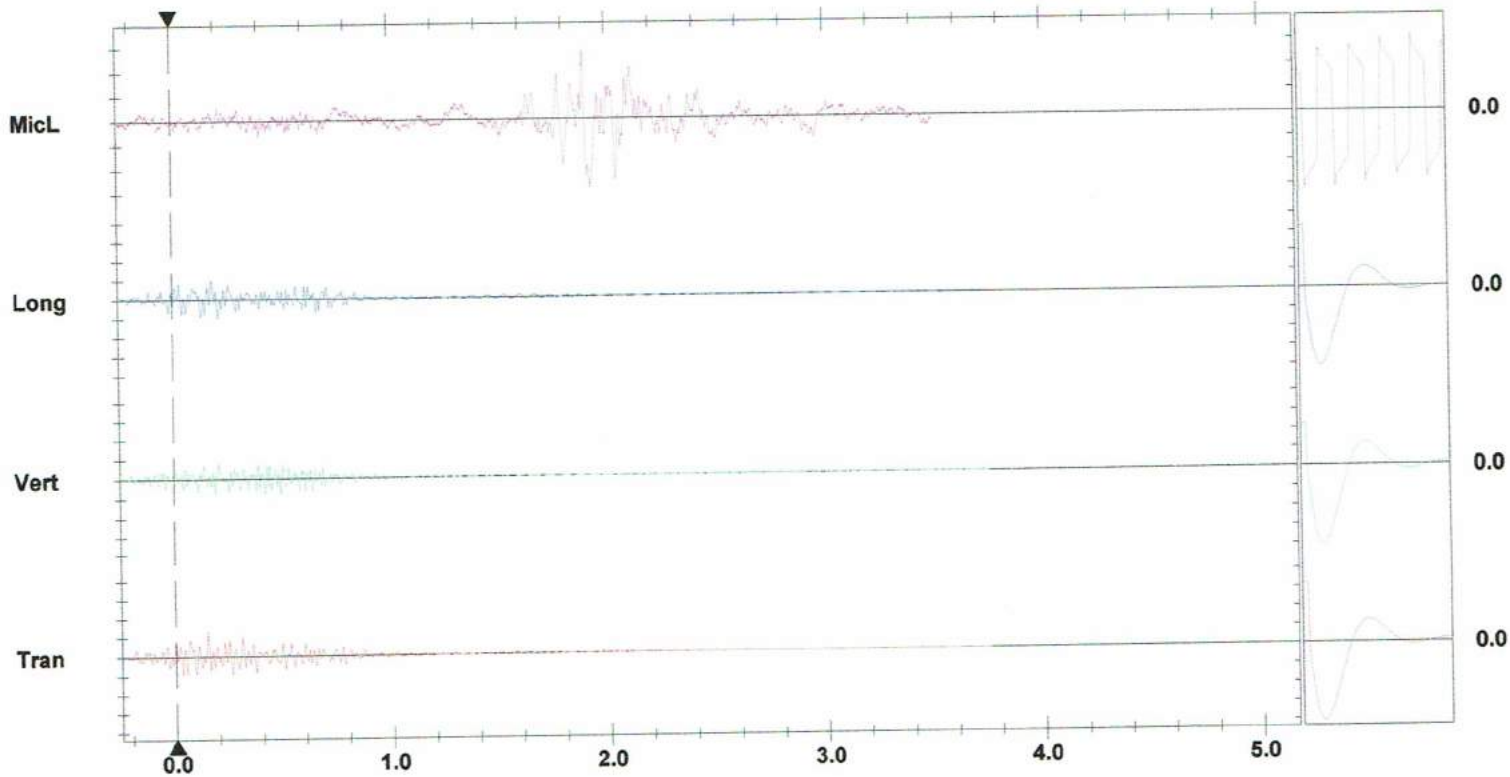
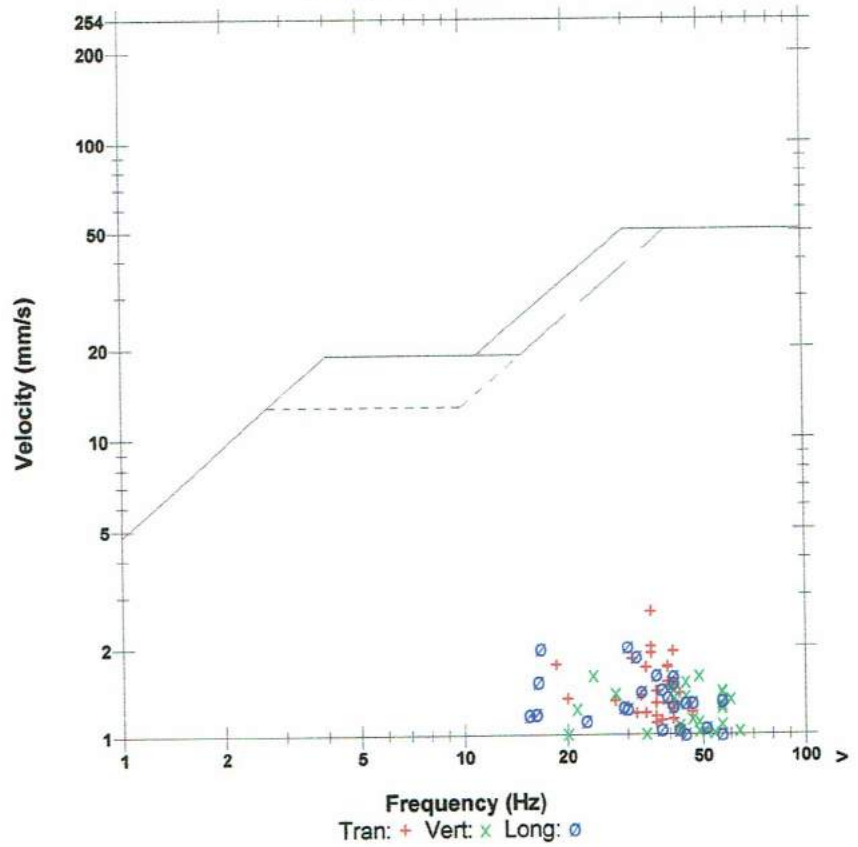
Extended Notes
 N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 103.0 dB(L) at 1.899 sec
ZC Freq 16.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1318 mv)

	Tran	Vert	Long	
PPV	2.633	1.600	2.010	mm/s
ZC Freq	35	24	30	Hz
Time (Rel. to Trig)	0.148	0.204	0.183	sec
Peak Acceleration	0.069	0.097	0.076	g
Peak Displacement	0.013	0.007	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.5	3.5	3.9	

Peak Vector Sum 2.962 mm/s at 0.148 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **181073S**
 Blast Date: **2018-06-28**

Blast Number: **18-014**
 Orica Order #: **2356095**
 Blast Time: **10:55 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89525** °N Latitude **79.29412** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **10** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: X
 Ceiling **2,318** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0** # Holes: **59** = 1,534.0 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	32,050	28,420	3,630

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	118	40.1

total explosives weight in Blast (kg): **3,670**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	59
EXEL HANDIDET 12m		25 ms	59
CONNECTADET 9M		42 ms	8

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	6.0
HELPER HOURS	Enter total Helper man-hours	10.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **19,087** te **7,341** m³
 Total tonnes per day: **19,087** te **LML22-14** Rate Code
 Total Holes Loaded: **59** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **17** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **42** main body

Bench Height: **26.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **1/2" Stone**

- Charge Length -

Front Row: **19.0** ft avg
 Main Body: **19.0** ft avg

- Charge Weight -

Front Row: **55.4** kg/hole
 Main Body: **55.4** kg/hole
 Max. per delay: **65.0** kg/delay
 SD () Equation: **170.2** kg/delay
 Total kg Loaded: **3,670** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.843 lb/yd³ Yield PF: **0.192** kg/te (actual)
 0.751 lb/yd³ Front row: **0.171** kg/te (theoretical)
 0.751 lb/yd³ Main Body: **0.171** kg/te (theoretical)
 0.751 lb/yd³ "KPI" PF: **0.171** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

A-26 was not loaded do to lean burden from previous blast infrom of it.



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89522"/>	<input type="text" value="79.29412"/>
Front Row Corner	<input type="text" value="42.89534"/>	<input type="text" value="79.29367"/>
Back Row Corner	<input type="text" value="42.89518"/>	<input type="text" value="79.29456"/>
Average (Centre of Blast)	<input type="text" value="42.89525"/>	<input type="text" value="79.29412"/>

(N) Radians	(W) Radians
<input type="text" value="0.748663"/>	<input type="text" value="1.383943"/>
<input type="text" value="0.748665"/>	<input type="text" value="1.383936"/>
<input type="text" value="0.748662"/>	<input type="text" value="1.383951"/>
<input type="text" value="0.748663"/>	<input type="text" value="1.383943"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

Distance (1st Seis. From Centre of Blast)	<input type="text" value="391.4"/>	m
Post Blast Data:		
ppV:	<input type="text" value="6.3"/>	mm/s Trigger set at: <input type="text" value="2.0"/> mm/s
frequency:	<input type="text" value="32.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="117.2"/>	dB Trigger set at: <input type="text" value="115"/> dB
<input type="text" value="Erie Peat Road"/>		

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89962"/>	<input type="text" value="79.29456"/>
2nd Reading		
Average	<input type="text" value="42.89962"/>	<input type="text" value="79.29456"/>

(N) Radians	(W) Radians
<input type="text" value="0.748740"/>	<input type="text" value="1.383951"/>
<input type="text" value="0.748740"/>	<input type="text" value="1.383951"/>

Distance (2nd Seis. From Centre of Blast)	<input type="text" value="488.4"/>	m
Post Blast Data:		
ppV:	<input type="text" value="3.7"/>	mm/s Trigger set at: <input type="text" value="2.0"/> mm/s
frequency:	<input type="text" value="28.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="119.7"/>	dB Trigger set at: <input type="text" value="115"/> dB
<input type="text" value="Erie Peat Road/Pipe Line"/>		

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>

(N) Radians	(W) Radians
<input type="text" value="0.000000"/>	<input type="text" value="0.000000"/>

Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m
Post Blast Data:		
ppV:	<input type="text" value="0.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/> mm/s
frequency:	<input type="text" value="0.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="0.0"/>	dB Trigger set at: <input type="text" value="115"/> dB
<input type="text"/>		

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(391.4)^2}{30^2} \text{ kg} \\
 &= \frac{153,194}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design
Waterford

Quarry: Laws - Middle Lift
P.O. #: 181073S
Blast Date: 6/28/2018

Blast Number: 18-014
Orica Order #: 2356095

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1

Date/Time Vert at 10:55:58 June 28, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.75 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration November 3, 2017 by InstanTEL
File Name __TEMP.EVT
Scaled Distance 3879.2 (1226.7 m, 0.1 kg)

Notes

Location: Erie Peat Road/Pipe Line
Client: WaterFord Group
User Name: ORICA CANADA INC.
General: Law Crushed Stone

Extended Notes

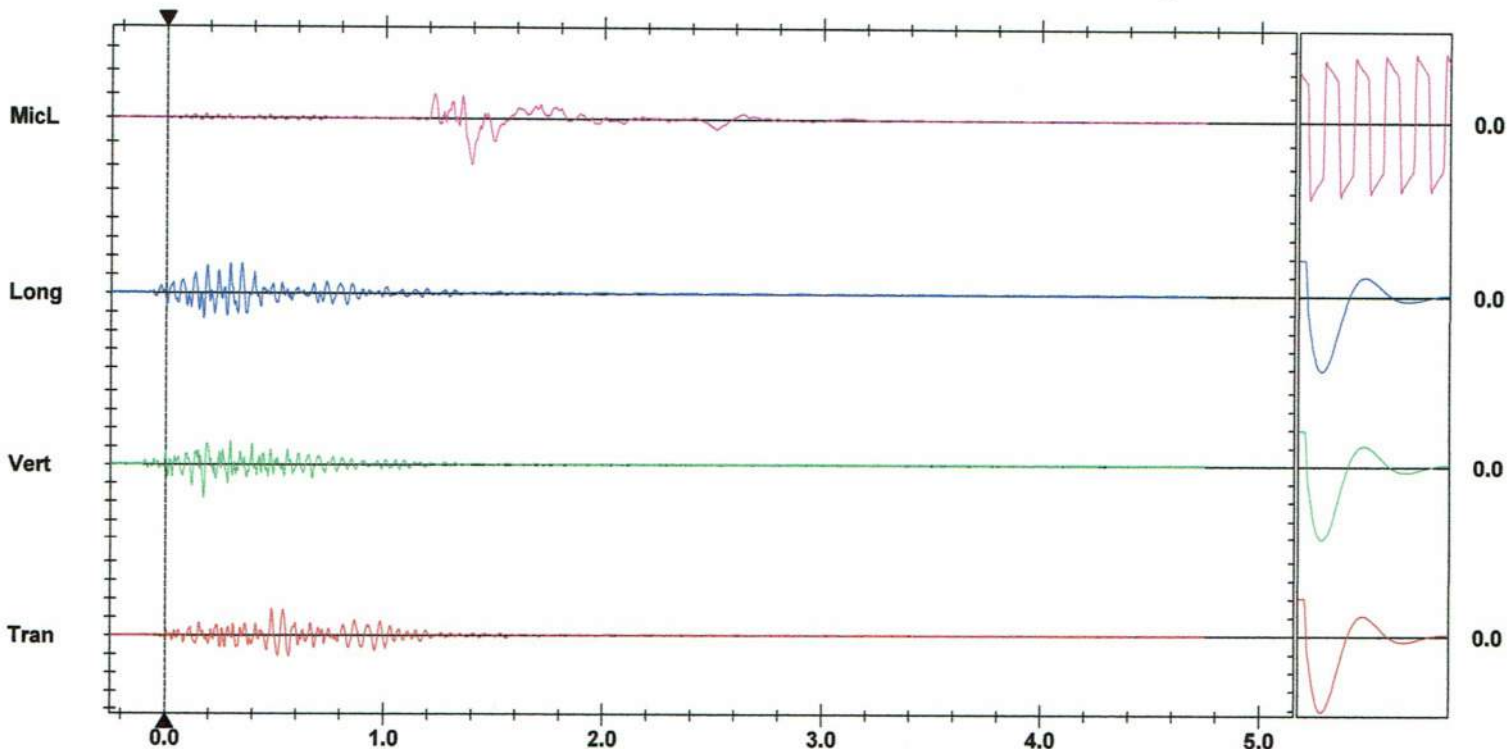
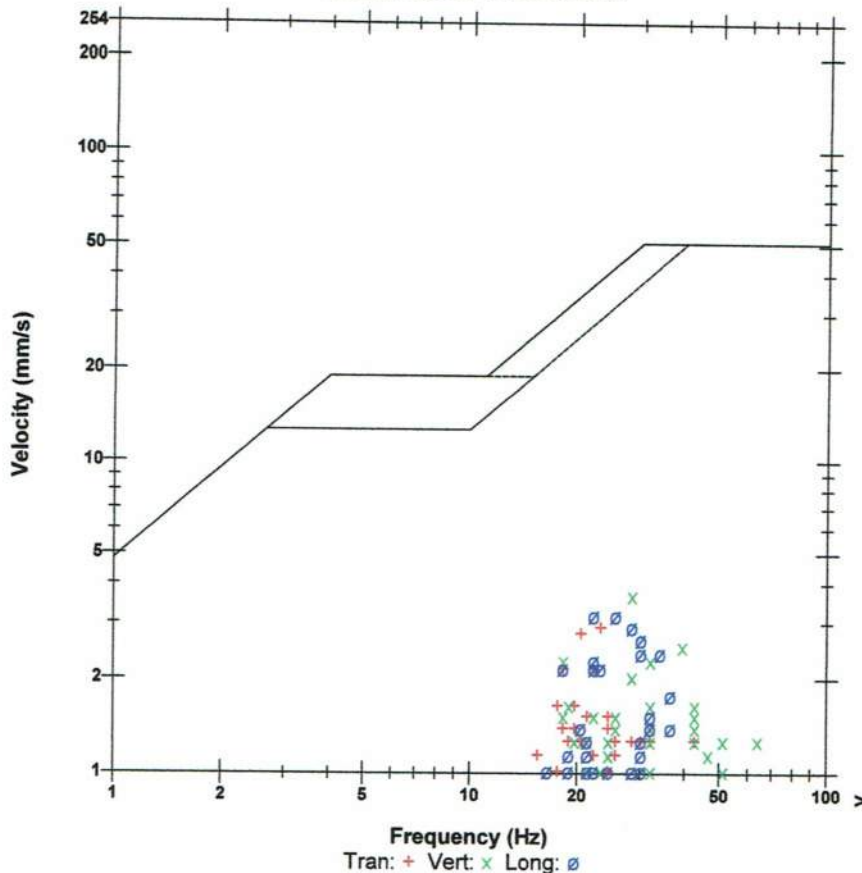
42.89962,-79.29456
 Sand Bagged
 North Of Quarry

Microphone Linear Weighting
PSPL 119.7 dB(L) at 1.395 sec
ZC Freq 6.1 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 576 mv)

	Tran	Vert	Long	
PPV	2.921	3.683	3.175	mm/s
ZC Freq	23	28	26	Hz
Time (Rel. to Trig)	0.488	0.175	0.293	sec
Peak Acceleration	0.040	0.080	0.066	g
Peak Displacement	0.022	0.018	0.022	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.7	3.5	4.0	

Peak Vector Sum 4.490 mm/s at 0.175 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:55:57 June 28, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.373 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by Instantel
File Name __TEMP.EVT

Notes

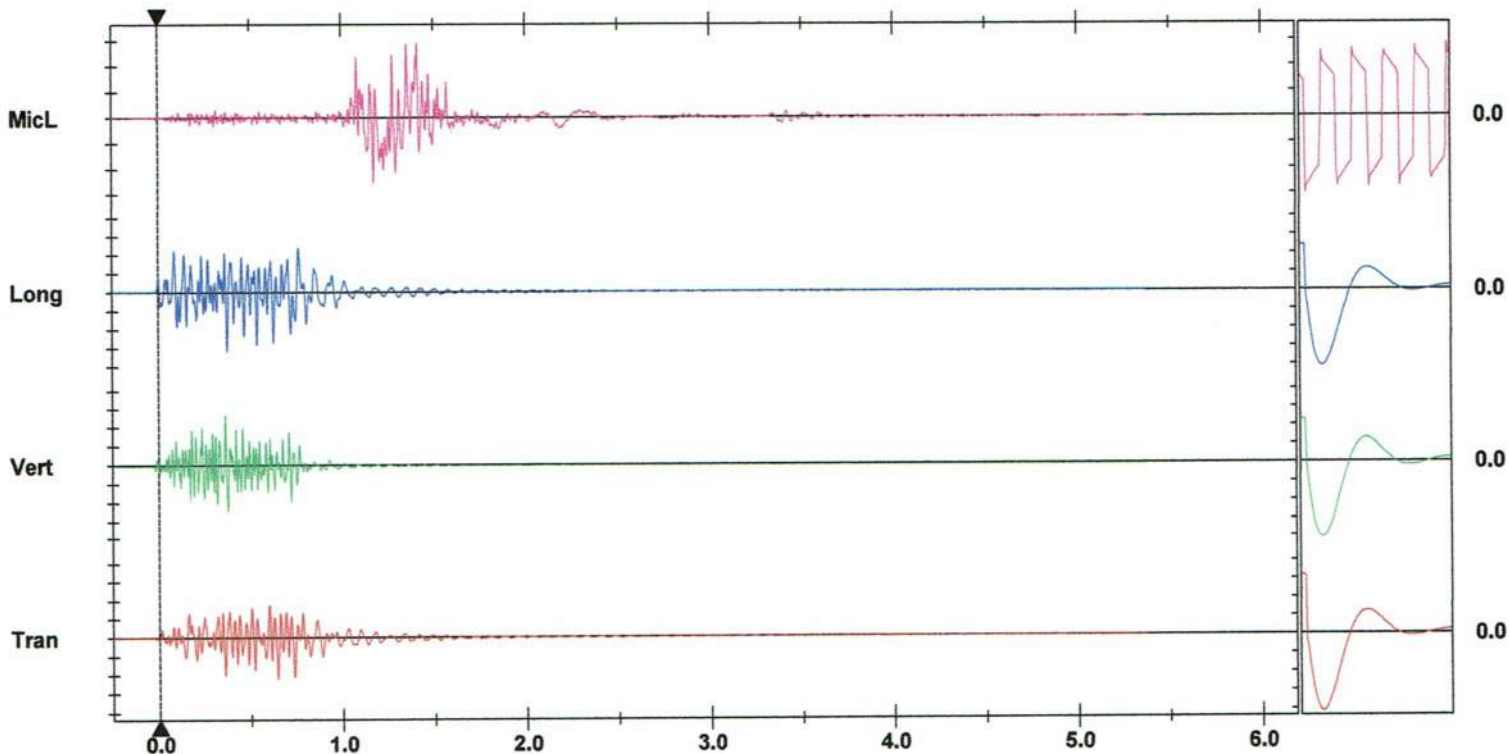
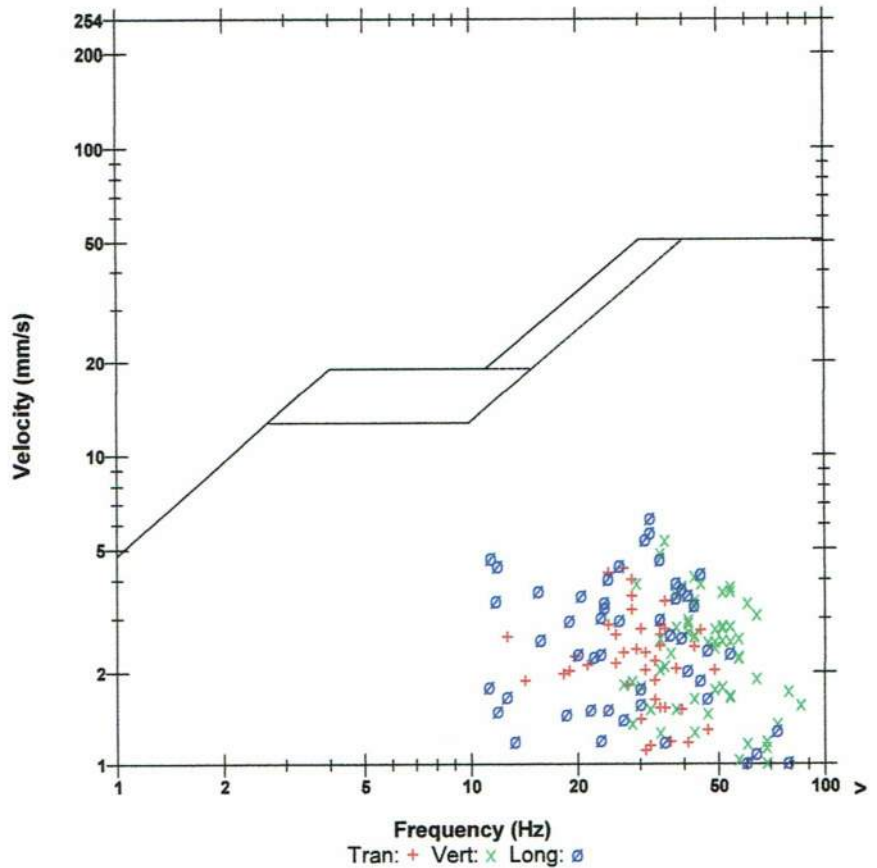
Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 117.2 dB(L) at 1.415 sec
ZC Freq 12.8 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1440 mv)

	Tran	Vert	Long	
PPV	4.359	5.352	6.329	mm/s
ZC Freq	27	35	32	Hz
Time (Rel. to Trig)	0.643	0.364	0.376	sec
Peak Acceleration	0.118	0.193	0.227	g
Peak Displacement	0.026	0.021	0.045	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.3	3.6	

Peak Vector Sum 8.151 mm/s at 0.376 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #:
 Design Date: **2018-06-28**

Blast Number: **18-014**
 Orica Order #:

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89525** °N Latitude **79.29412** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **18,664** te
 Total Holes Loaded: **60** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Primary Bit diam: **101.6** mm **0** # Holes: **60** = 1,500.0 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 42 main body
 Bench Height: **25.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: 25.0 ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **1/2" Stone**

- Design Charge Length -

Front Row: 18.0 ft avg
 Main Body: 18.0 ft avg

- Design Charge Weight -

Front Row: 52.5 kg/hole
 Main Body: 52.5 kg/hole
 Max Chge Wt / delay: **60.0** kg/delay

Required kg Loaded: **3,839** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.206** kg/te (actual)
 Front row: 0.169 kg/te (theoretical)
 Main Body: 0.169 kg/te (theoretical)
 "KPI" PF: **0.169** kg/te (theoretical)

0.739 lb/yd³
 0.739 lb/yd³
 0.739 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	3,800

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	114	38.8

total explosives weight in Blast (kg): **3,839**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		2
EXEL HANDIDET 9m	25/500	60
EXEL HANDIDET 12m	25/500	60
CONNECTADET 12M	42 ms	12

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181323**
 Blast Date: **2018-07-25**

Blast Number: **18-015**
 Orica Order #: **2366363**
 Blast Time: **10:53 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89509** °N Latitude **79.29555** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **10** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: X
 Ceiling **1,131** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical **0** # Holes: **53** = 1,378.0 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,330	30,230	3,100

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	106	36.0

total explosives weight in Blast (kg): **3,136**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 9m		25/500	51
EXEL HANDIDET 12m		25/500	55
CONNECTADET 12M		42 ms	10

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

	Enter hours	
GPS LAYOUT		0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	6.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **17,146** te **6,594** m³
 Total tonnes per day: **34,939** te **LML22-13** Rate Code
 Total Holes Loaded: **53** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **35** main body

Bench Height: **26.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" stone**

- Charge Length -

Front Row: **19.0** ft avg
 Main Body: **19.0** ft avg

- Charge Weight -

Front Row: **55.4** kg/hole
 Main Body: **55.4** kg/hole
 Max. per delay: **70.0** kg/delay
 SD () Equation: **244.7** kg/delay
 Total kg Loaded: **3,136** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.802 lb/yd³ Yield PF: **0.183** kg/te (actual)
 0.751 lb/yd³ Front row: **0.171** kg/te (theoretical)
 0.751 lb/yd³ Main Body: **0.171** kg/te (theoretical)
 0.751 lb/yd³ "KPI" PF: **0.171** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

3 Seismographs



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89509"/>	<input type="text" value="79.29554"/>
Front Row Corner	<input type="text" value="42.89512"/>	<input type="text" value="79.29592"/>
Back Row Corner	<input type="text" value="42.89506"/>	<input type="text" value="79.29519"/>
Average (Centre of Blast)	<input type="text" value="42.89509"/>	<input type="text" value="79.29555"/>

(N) Radians	(W) Radians
<input type="text" value="0.748661"/>	<input type="text" value="1.383968"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383975"/>
<input type="text" value="0.748660"/>	<input type="text" value="1.383962"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383968"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="469.3"/>	m
Post Blast Data:	ppV: <input type="text" value="5.2"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.5"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="112.2"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89962"/>	<input type="text" value="79.29456"/>
2nd Reading		
Average	<input type="text" value="42.89962"/>	<input type="text" value="79.29456"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="510.8"/>	m
Post Blast Data:	ppV: <input type="text" value="3.8"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.3"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="117.3"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748740"/>	<input type="text" value="1.383951"/>
<input type="text" value="0.748740"/>	<input type="text" value="1.383951"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="Not"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.000000"/>	<input type="text" value="0.000000"/>

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(469.3)^2}{30^2} \text{ kg} \\
 &= \frac{220,242}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

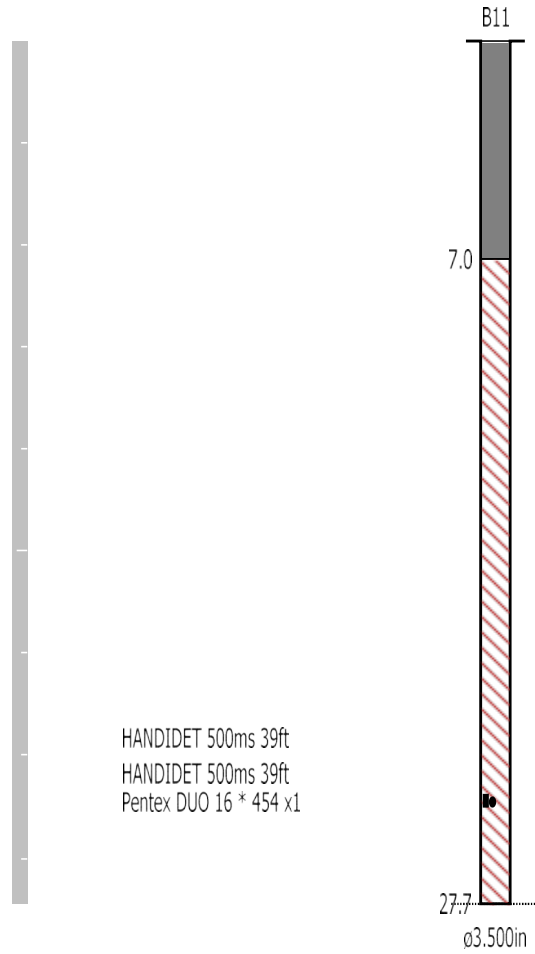
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181323**
Blast Date: **7/24/2018**

Blast Number: **18-015**
Orica Order #: **2366363**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 10:52:41 July 25, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/Erie Peat N.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180725105241.IDFW

Notes

Location: Erie Peat Rd North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

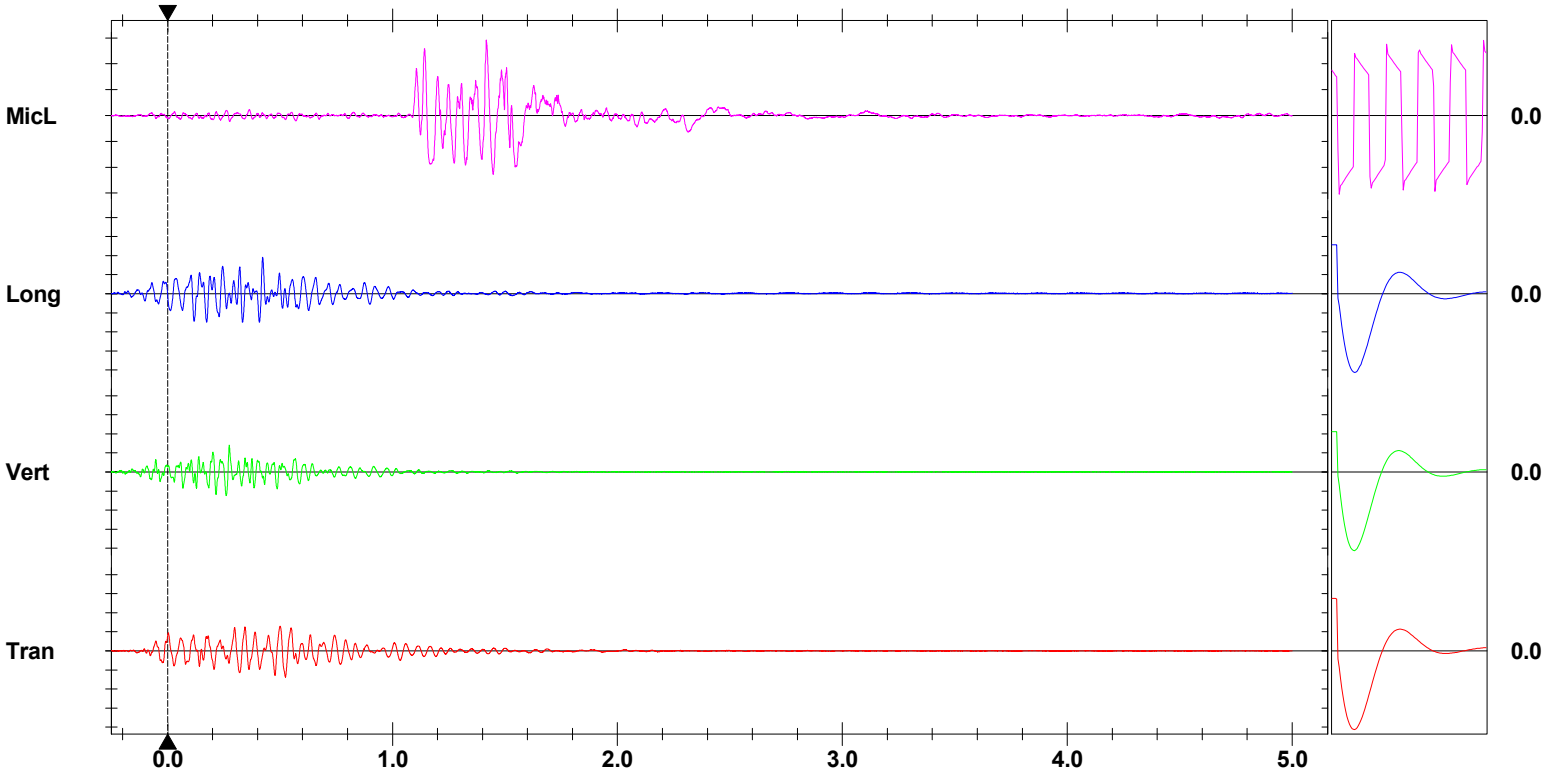
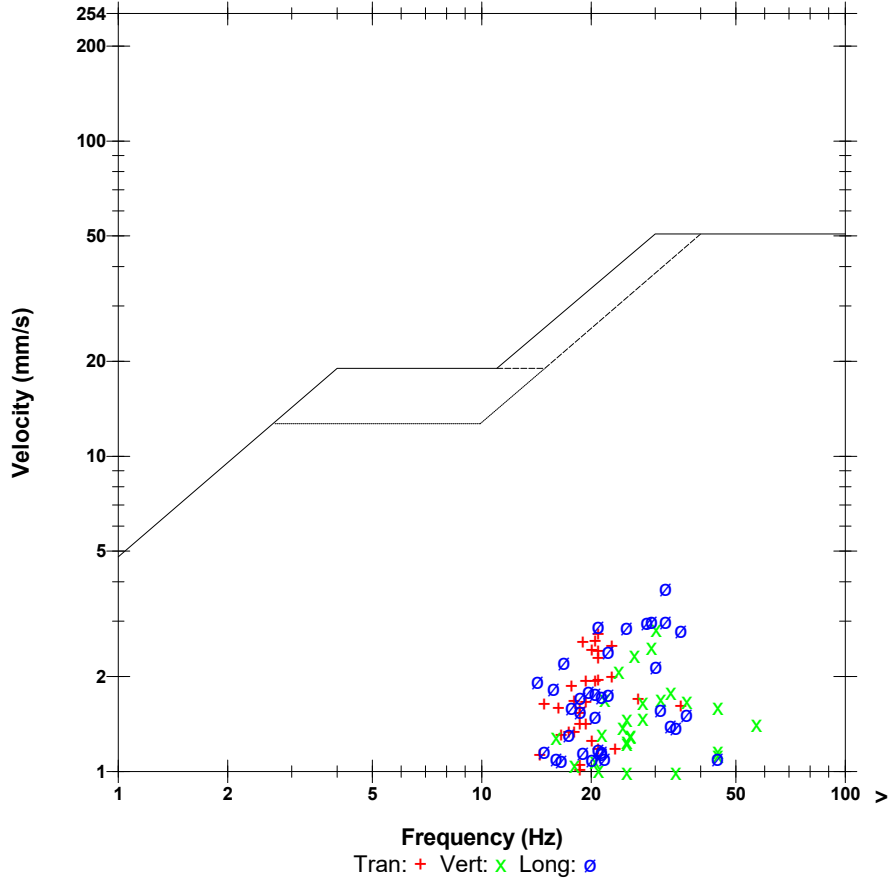
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 117.3 dB(L) at 1.417 sec
ZC Freq 21 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1228 mv)

	Tran	Vert	Long	
PPV	2.735	2.822	3.831	mm/s
ZC Freq	21	30	32	Hz
Time (Rel. to Trig)	0.524	0.274	0.422	sec
Peak Acceleration	0.061	0.079	0.158	g
Peak Displacement	0.021	0.014	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.6	3.7	3.6	

Peak Vector Sum 3.901 mm/s at 0.422 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 10:52:40 July 25, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.594 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180725105240.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

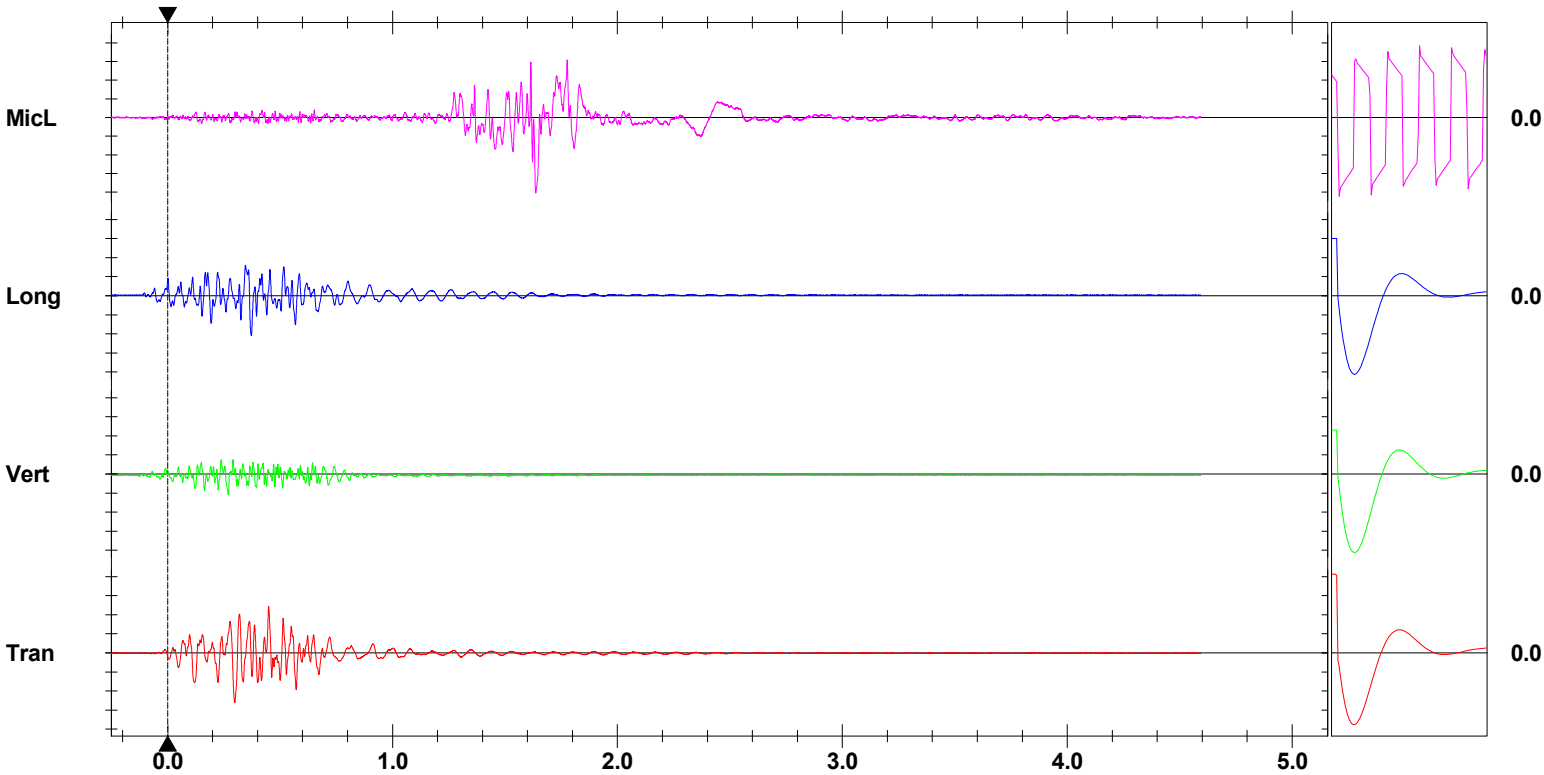
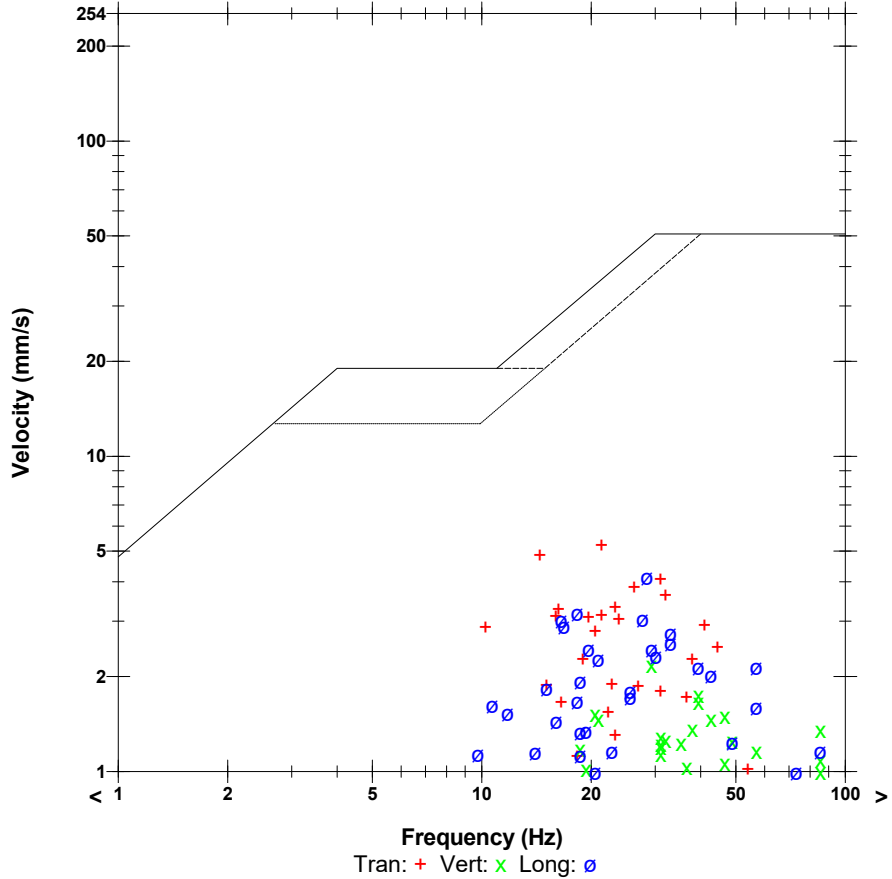
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 112.2 dB(L) at 1.637 sec
ZC Freq 14.6 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1212 mv)

	Tran	Vert	Long	
PPV	5.249	2.175	4.154	mm/s
ZC Freq	21	29	28	Hz
Time (Rel. to Trig)	0.298	0.270	0.372	sec
Peak Acceleration	0.145	0.090	0.209	g
Peak Displacement	0.039	0.011	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.1	Hz
Overswing Ratio	3.1	3.3	3.5	

Peak Vector Sum 5.273 mm/s at 0.298 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #:
 Design Date: **2018-07-24**

Blast Number: **18-015**
 Orica Order #:

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89509** °N Latitude **79.29555** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **17,294** te
 Total Holes Loaded: **53** holes
 ... including: **0** Dead Holes
 ... and: **2** Helper Holes
 Helper Hole Collar: **15.0** ft avg
 # Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical: °
 Nominal Bit Diameter: "
 Primary Bit diam: **101.6** mm ° # Holes: **53** = 1,444.5 ft (" diam)
 Secondary Bit diam: mm ° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm ° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **35** main body
 Bench Height: **27.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **3/8 Stone**

- Design Charge Length -

Front Row: **20.3** ft avg
 Main Body: **20.3** ft avg

- Design Charge Weight -

Front Row: **59.1** kg/hole
 Main Body: **59.1** kg/hole
 Max Chge Wt / delay: **65.0** kg/delay

Required kg Loaded: **4,018** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.232** kg/te (actual)
 Front row: **0.174** kg/te (theoretical)
 Main Body: **0.174** kg/te (theoretical)
 "KPI" PF: **0.174** kg/te (theoretical)

0.763 lb/yd³
 0.763 lb/yd³
 0.763 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast.

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,000

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	53	18.0

total explosives weight in Blast (kg): **4,018**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		2
EXEL HANDIDET 12m	25/500	53
EXEL HANDIDET 9m	25/500	53
CONNECTADET 9M	42 ms	4

Cord & Access. Req'd:	U of M	# req'd
	units	1
	units	
	units	

Resource Deployment:	
# of Blasts today (this Quarry)	Enter #
# of Blasters (this Blast)	Enter #
# of Helpers (this Blast)	Enter #
# of MMU's (this Blast)	Enter #

Services Req'd:	
GPS LAYOUT	Enter hours 0.0
BULK TRUCK CHARGE	<2,000kg
BLASTER HOURS	Enter Blaster hours 0.0
HELPER HOURS	Enter total Helper man-hours 0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs 0
3D LASER PROFILE	Enter hours 0
BORETRACK	Enter hours 0
TECHNICAL BLAST DESIGN	(per day) Enter # of days 0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181323**
 Blast Date: **2018-07-25**

Blast Number: **18-016**
 Orica Order #: **2366363**
 Blast Time: **1:00 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89510** °N Latitude **79.29470** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **10** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling **1,133** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0** # Holes: **56** = 1,456.0 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,230	27,210	3,020

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	112	38.1

total explosives weight in Blast (kg): **3,058**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			3
EXEL HANDIDET 9m		25/500	54
EXEL HANDIDET 12m		25 ms	58
CONNECTADET 12M		42 ms	8

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	5.0
HELPER HOURS	Enter total Helper man-hours	5.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **17,793** te **6,843** m³
 Total tonnes per day: **34,939** te **LML22-13** Rate Code
 Total Holes Loaded: **56** holes
 ... including: **1** Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **19** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **37** main body

Bench Height: **26.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Charge Length -

Front Row: **19.0** ft avg
 Main Body: **19.0** ft avg

- Charge Weight -

Front Row: **55.4** kg/hole
 Main Body: **55.4** kg/hole
 Max. per delay: **59.0** kg/delay
 SD () Equation: **191.3** kg/delay
 Total kg Loaded: **3,058** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.753 lb/yd³ Yield PF: **0.172** kg/te (actual)
 0.751 lb/yd³ Front row: **0.171** kg/te (theoretical)
 0.751 lb/yd³ Main Body: **0.171** kg/te (theoretical)
 0.751 lb/yd³ "KPI" PF: **0.171** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

3 Seismographs



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89510"/>	<input type="text" value="79.29465"/>
Front Row Corner	<input type="text" value="42.89513"/>	<input type="text" value="79.29504"/>
Back Row Corner	<input type="text" value="42.89507"/>	<input type="text" value="79.29440"/>
Average (Centre of Blast)	<input type="text" value="42.89510"/>	<input type="text" value="79.29470"/>

(N) Radians	(W) Radians
<input type="text" value="0.748661"/>	<input type="text" value="1.383953"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383960"/>
<input type="text" value="0.748660"/>	<input type="text" value="1.383948"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383954"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

Distance (1st Seis. From Centre of Blast)	<input type="text" value="414.9"/>	m
Post Blast Data:		
ppV:	<input type="text" value="6.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
frequency:	<input type="text" value="7.5"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="113.0"/>	dB Trigger set at: <input type="text" value="115"/>
<input type="text" value="Erie Peat Road"/>		

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
2nd Reading		
Average	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>

(N) Radians	(W) Radians
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>

Distance (2nd Seis. From Centre of Blast)	<input type="text" value="788.8"/>	m
Post Blast Data:		
ppV:	<input type="text" value="4.1"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
frequency:	<input type="text" value="7.3"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="118.8"/>	dB Trigger set at: <input type="text" value="115"/>
<input type="text" value="Erie Peat North/Pipe Line"/>		

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>

(N) Radians	(W) Radians
<input type="text" value="0.000000"/>	<input type="text" value="0.000000"/>

Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m
Post Blast Data:		
ppV:	<input type="text" value="1.7"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
frequency:	<input type="text" value="7.4"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
air overpressure:	<input type="text" value="91.5"/>	dB Trigger set at: <input type="text" value="115"/>
<input type="text" value="10423 Lakeshore Road W/McCabe"/>		

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(414.9)^2}{30^2} \text{ kg} \\
 &= \frac{172,142}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

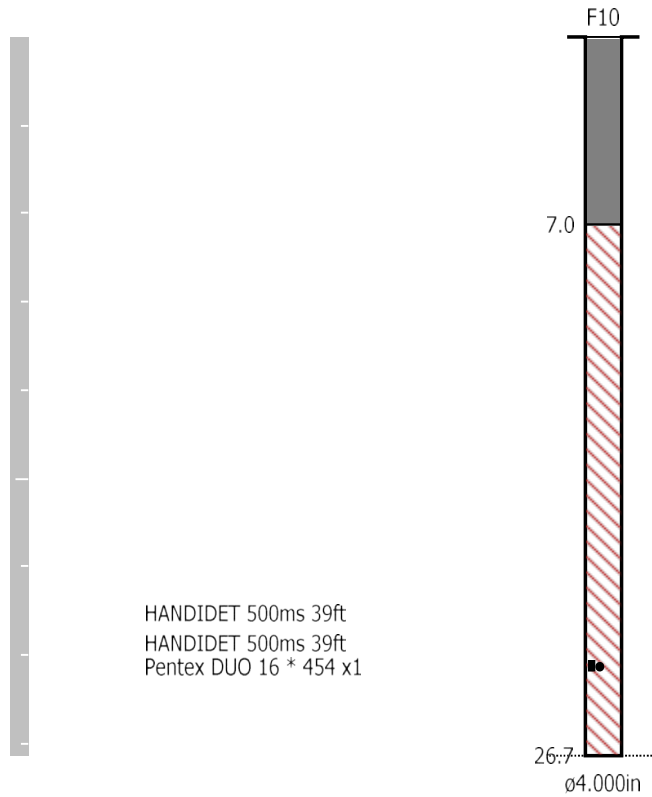
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181323**
Blast Date: **4/18/2018**

Blast Number: **18-016**
Orica Order #: **2366363**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 13:00:42 July 25, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/Erie Peat N.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20180725130042.IDFW

Notes

Location: Erie Peat Rd North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

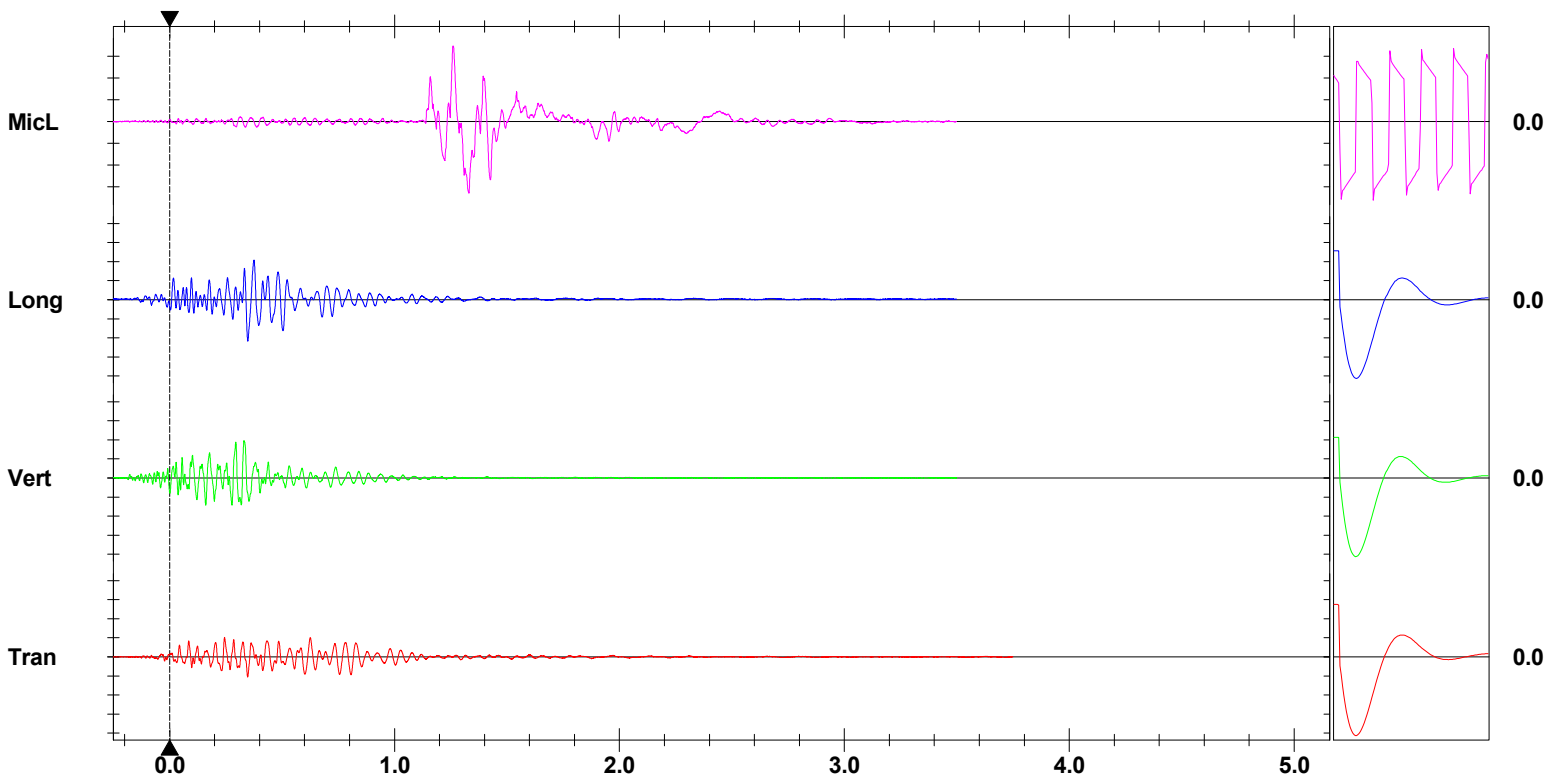
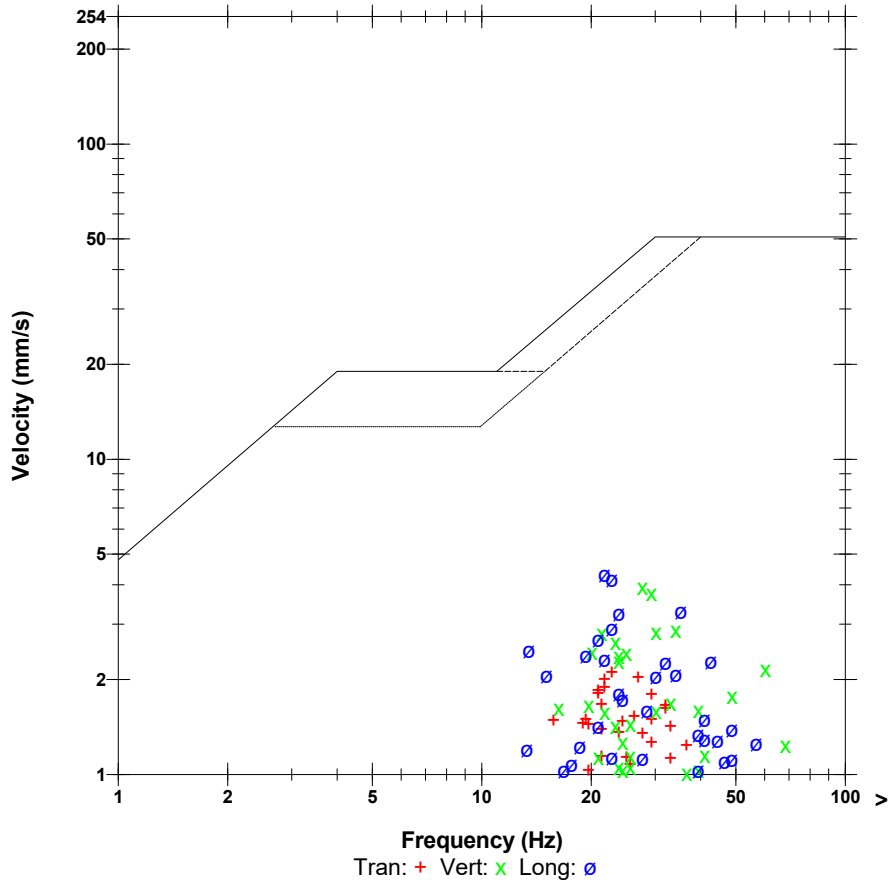
N 42.89326
 W 79.28563

Microphone Linear Weighting
PSPL 118.8 dB(L) at 1.260 sec
ZC Freq 10.4 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1229 mv)

	Tran	Vert	Long	
PPV	2.120	3.933	4.319	mm/s
ZC Freq	23	28	22	Hz
Time (Rel. to Trig)	0.347	0.331	0.348	sec
Peak Acceleration	0.054	0.171	0.146	g
Peak Displacement	0.014	0.024	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.6	3.6	3.6	

Peak Vector Sum 5.098 mm/s at 0.332 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:00:41 July 25, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.622 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180725130041.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

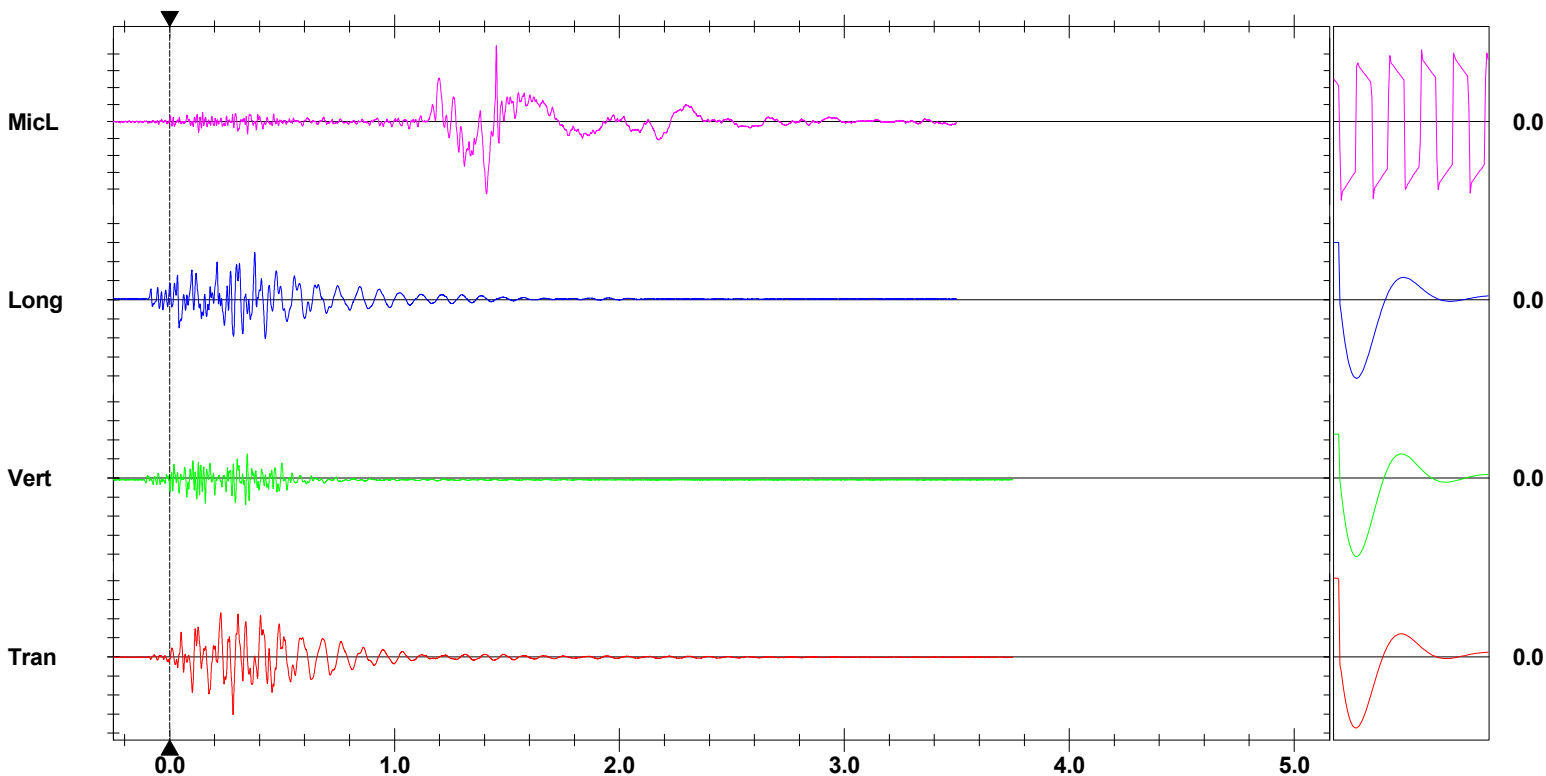
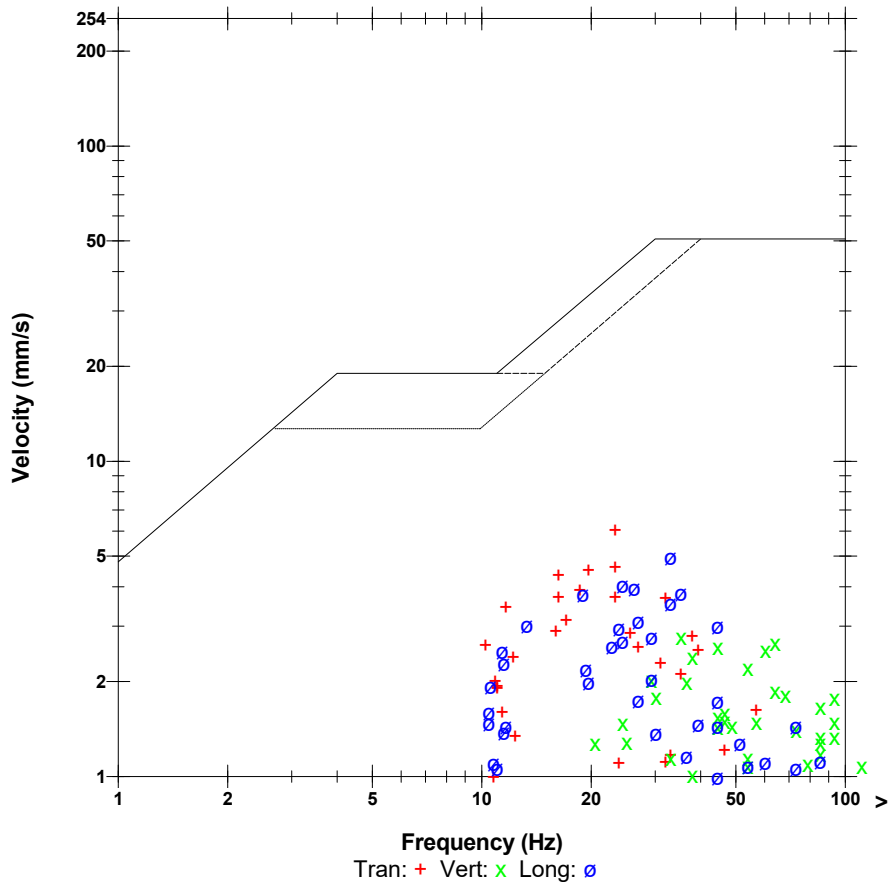
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 113.0 dB(L) at 1.453 sec
ZC Freq 30 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1164 mv)

	Tran	Vert	Long	
PPV	6.045	2.774	4.981	mm/s
ZC Freq	23	35	33	Hz
Time (Rel. to Trig)	0.282	0.338	0.379	sec
Peak Acceleration	0.132	0.179	0.158	g
Peak Displacement	0.038	0.015	0.035	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.1	Hz
Overswing Ratio	3.1	3.2	3.5	

Peak Vector Sum 7.181 mm/s at 0.283 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 13:00:42 July 25, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration November 3, 2017 by InstanTel
File Name __TEMP.EVT
Scaled Distance 5850.2 (1850.0 m, 0.1 kg)

Notes

Location: 10423 Lakeshore Road W/McCabe
 Client: WaterFord Group
 User Name: Mike der kinderen
 General: Law Crushed Stone

Extended Notes

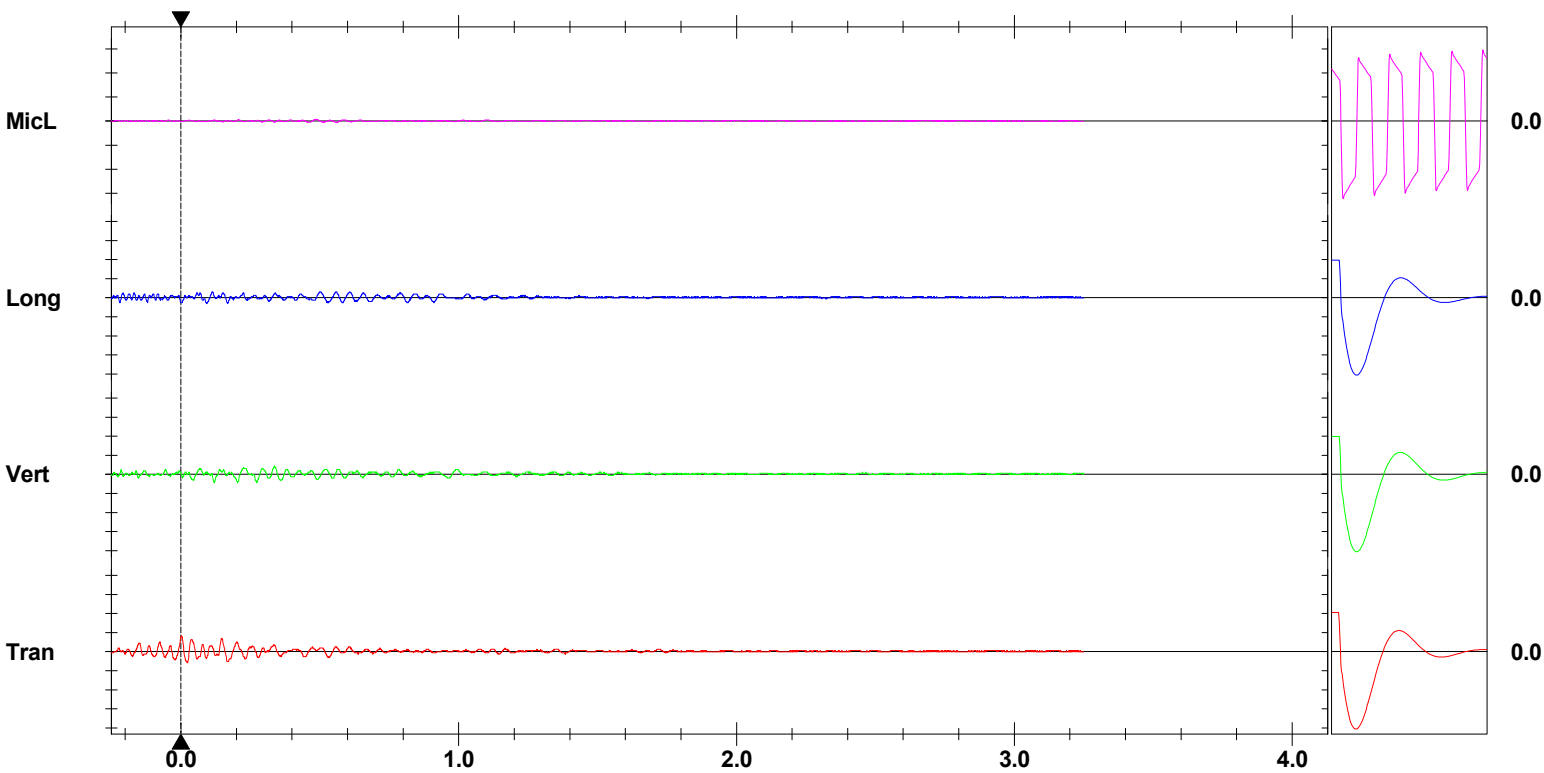
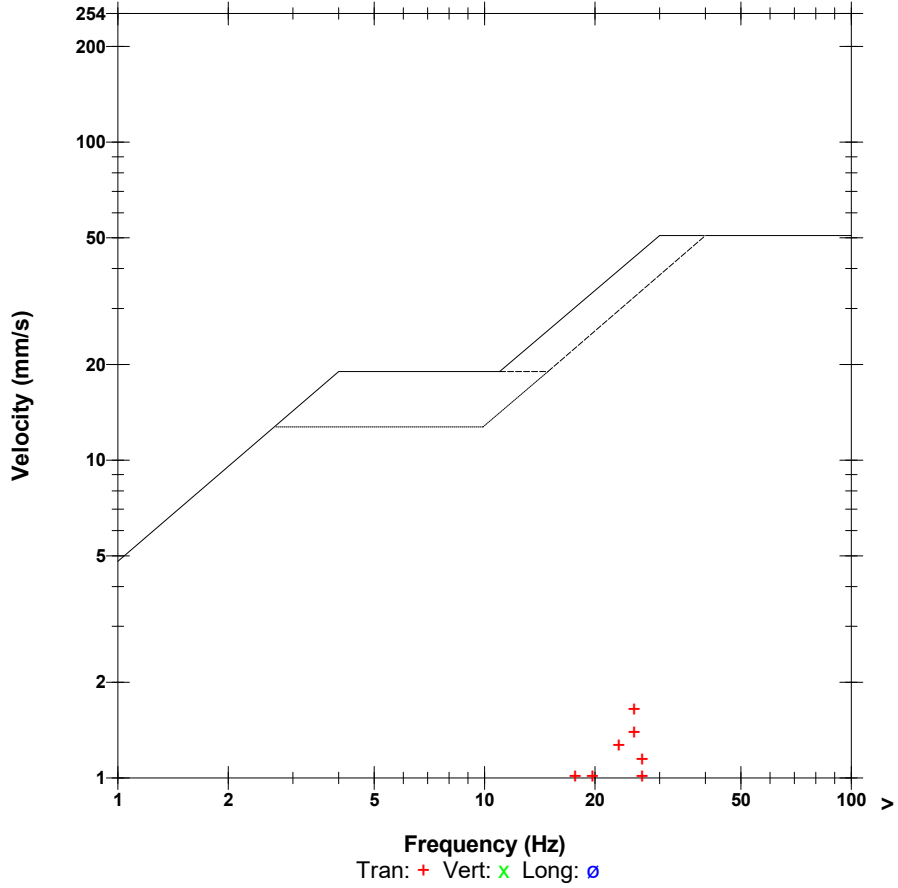
Sand bagged
 42°52'43.50"N
 79°17'50.78"W

Microphone Linear Weighting
PSPL 91.5 dB(L) at 0.207 sec
ZC Freq 47 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 494 mv)

	Tran	Vert	Long	
PPV	1.651	0.889	0.635	mm/s
ZC Freq	26	34	34	Hz
Time (Rel. to Trig)	0.001	0.120	0.093	sec
Peak Acceleration	0.040	0.027	0.027	g
Peak Displacement	0.010	0.007	0.005	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.2	Hz
Overswing Ratio	3.7	3.6	4.0	

Peak Vector Sum 1.732 mm/s at 0.003 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181342**
 Blast Date: **2018-08-01**

Blast Number: **18-017**
 Orica Order #: **2269298**
 Blast Time: **11:01 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89511** °N Latitude **79.29391** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **10** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **17,322** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical: **0** # Holes: **66** = 1,595.7 ft (**4** " diam)
 Secondary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,410	29,940	3,470

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	132	44.9

total explosives weight in Blast (kg): **3,515**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			2
EXEL HANDIDET 9m		25/500	62
EXEL HANDIDET 12m		25/500	70
CONNECTADET 12M		42 ms	8

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

	Enter hours	
GPS LAYOUT		0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **19,855** te **7,637** m³
 Total tonnes per day: **37,944** te **LML22-13** Rate Code
 Total Holes Loaded: **66** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **15** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **51** main body

Bench Height: **24.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **24.2** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Charge Length -

Front Row: **17.2** ft avg
 Main Body: **17.2** ft avg

- Charge Weight -

Front Row: **50.1** kg/hole
 Main Body: **50.1** kg/hole
 Max. per delay: **60.0** kg/delay
 SD () Equation: **151.2** kg/delay
 Total kg Loaded: **3,515** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.776 lb/yd³ Yield PF: **0.177** kg/te (actual)
 0.730 lb/yd³ Front row: **0.167** kg/te (theoretical)
 0.730 lb/yd³ Main Body: **0.167** kg/te (theoretical)
 0.730 lb/yd³ "KPI" PF: **0.167** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

3 Siesmographs set-up



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89511"/>	<input type="text" value="79.29391"/>
Front Row Corner	<input type="text" value="42.89514"/>	<input type="text" value="79.29426"/>
Back Row Corner	<input type="text" value="42.89508"/>	<input type="text" value="79.29355"/>
Average (Centre of Blast)	<input type="text" value="42.89511"/>	<input type="text" value="79.29391"/>

(N) Radians	(W) Radians
<input type="text" value="0.748661"/>	<input type="text" value="1.383940"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383946"/>
<input type="text" value="0.748660"/>	<input type="text" value="1.383933"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383940"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="368.9"/>	m
Post Blast Data:	ppV: <input type="text" value="6.6"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.3"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="111.6"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
2nd Reading		
Average	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="726.8"/>	m
Post Blast Data:	ppV: <input type="text" value="0.1"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.1"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="126.9"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1913.8"/>	m
Post Blast Data:	ppV: <input type="text" value="2.3"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.4"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Less Than 88"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(368.9)^2}{30^2} \text{ kg}$$

$$= \frac{136,087}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

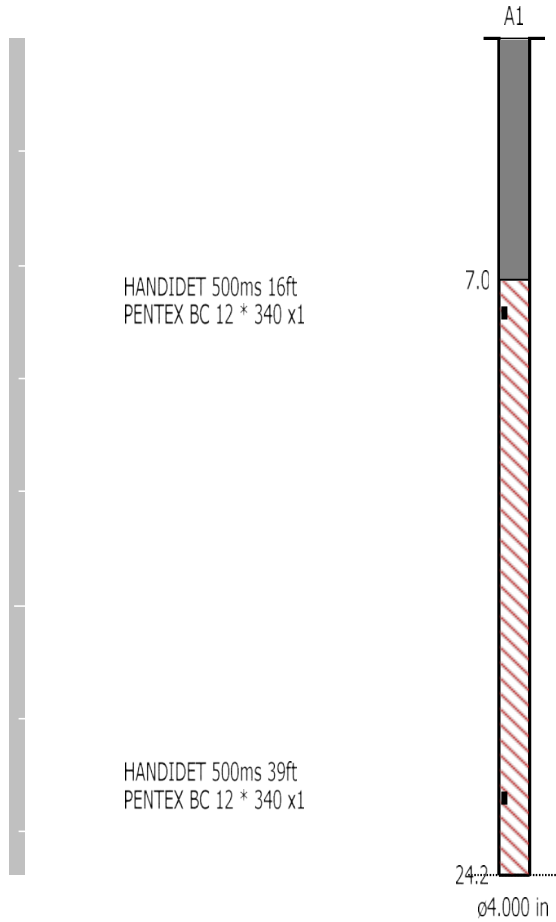
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181342**
Blast Date: **8/1/2018**

Blast Number: **18-017**
Orica Order #: **2269298**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time MicL at 11:07:56 August 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.58 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by InstanTel
File Name UM6859_20180801110756.IDFW

Notes

Location: Erie Peat Rd North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

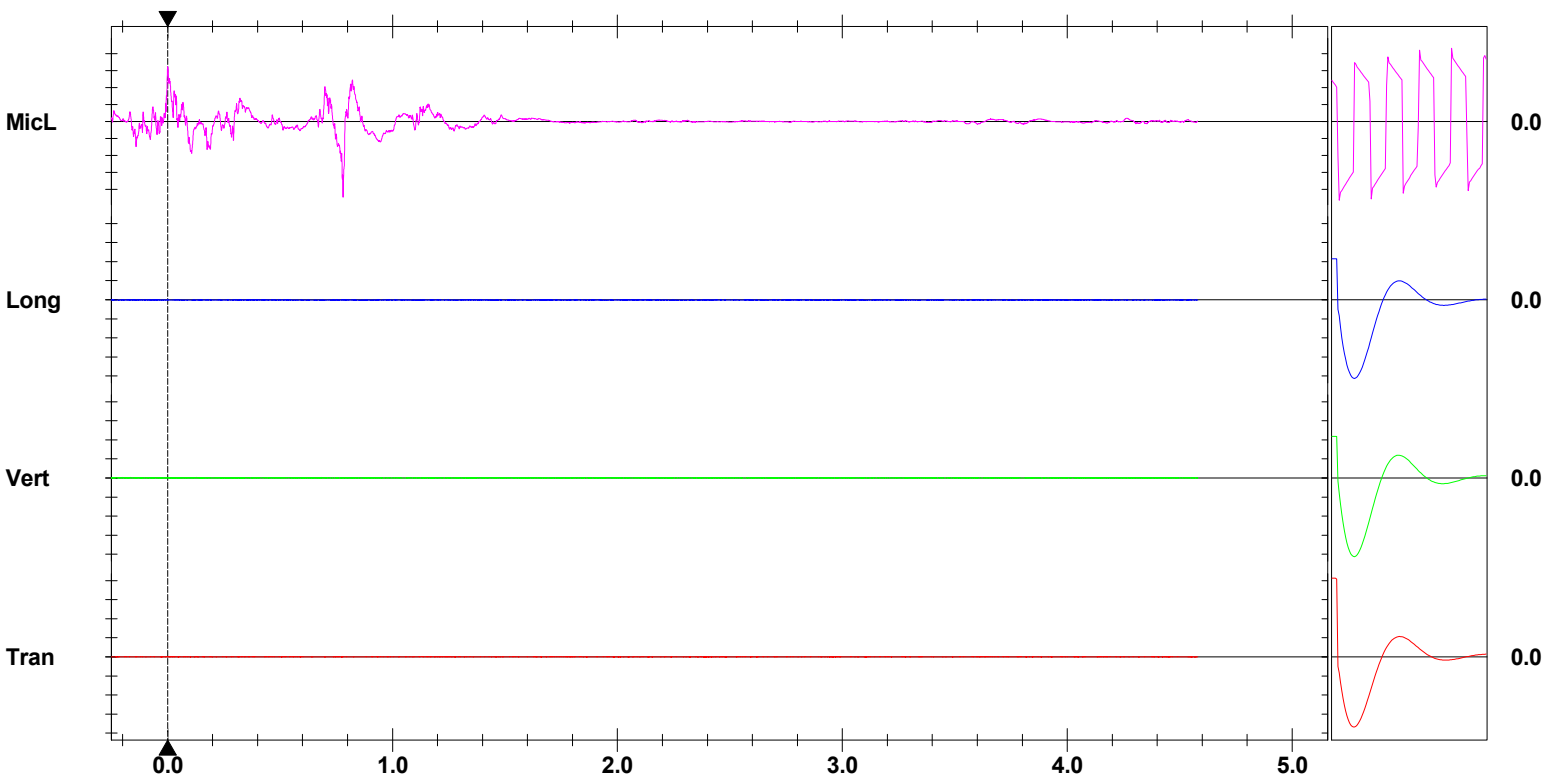
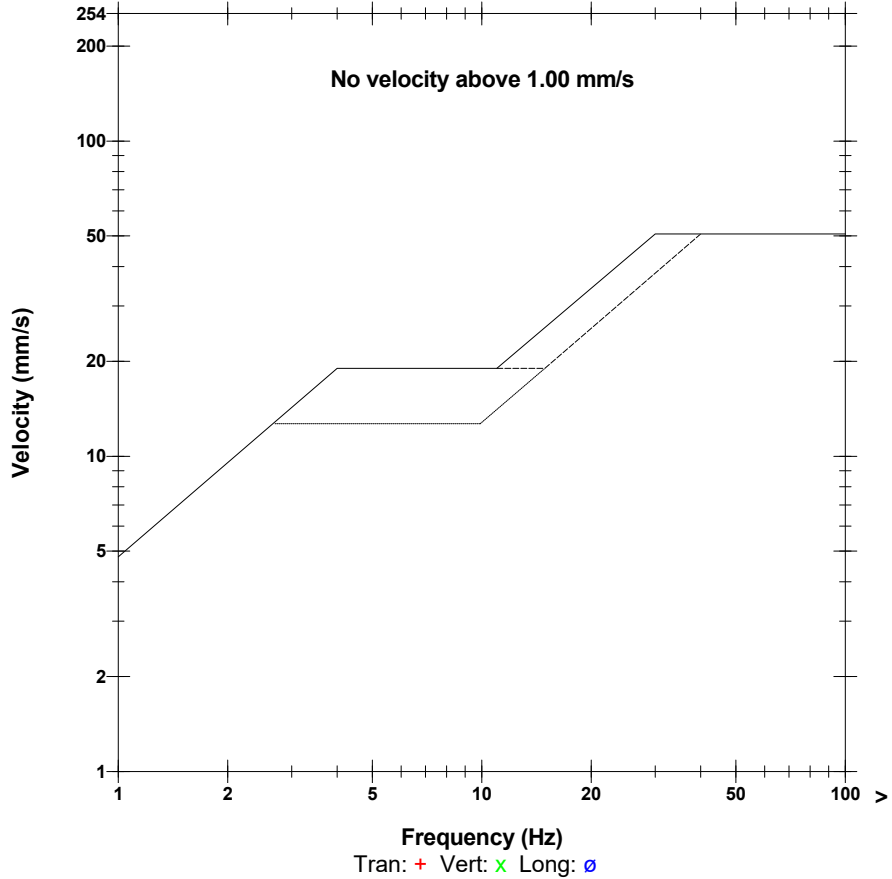
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 126.9 dB(L) at 0.780 sec
ZC Freq 9.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1261 mv)

	Tran	Vert	Long	
PPV	0.039	0.055	0.071	mm/s
ZC Freq	>200	60	2.9	Hz
Time (Rel. to Trig)	0.055	-0.200	0.120	sec
Peak Acceleration	0.008	0.008	0.010	g
Peak Displacement	0.000	0.000	0.005	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	4.2	

Peak Vector Sum 0.081 mm/s at 2.305 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 11:01:28 August 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.752 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180801110128.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

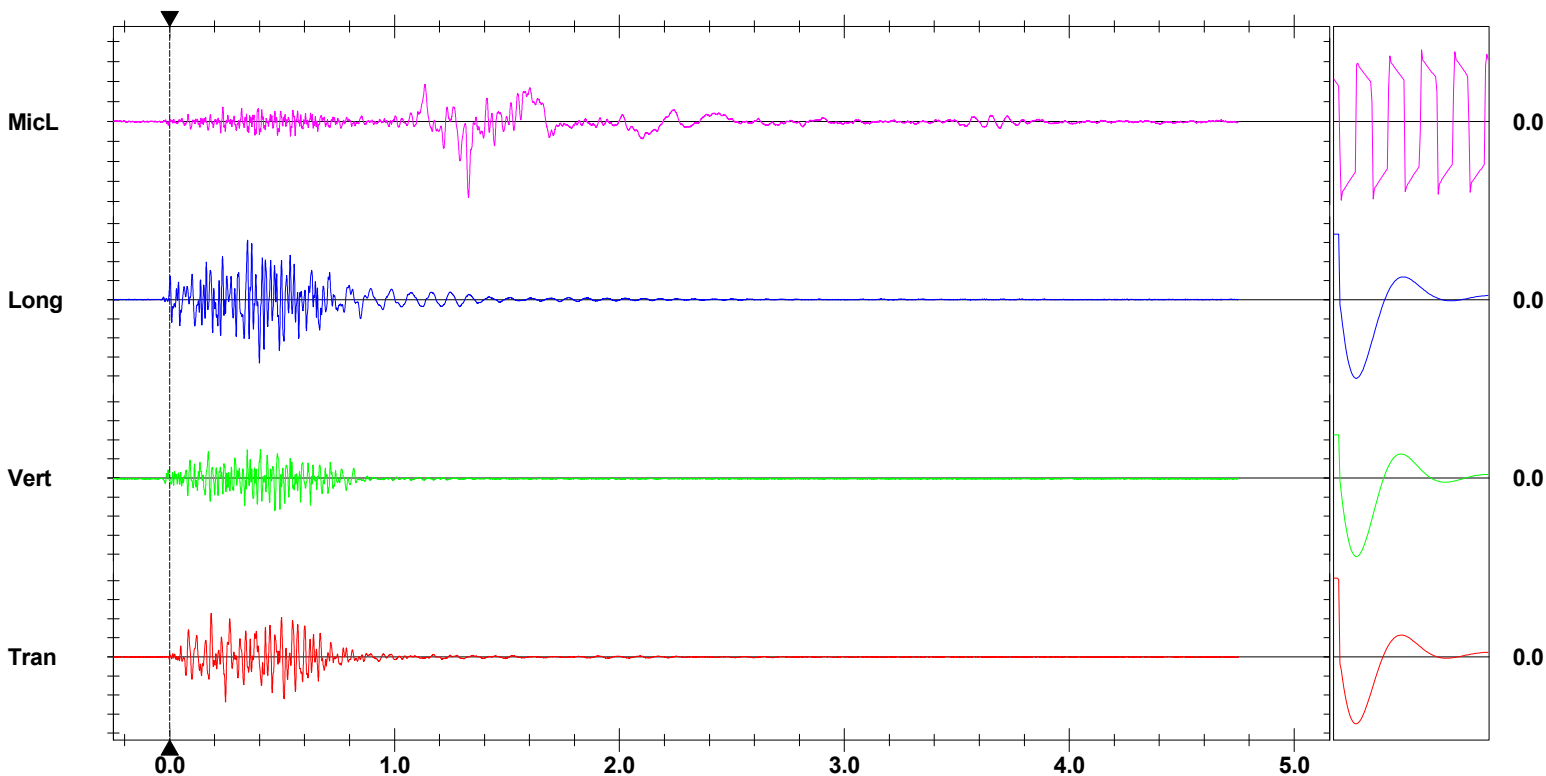
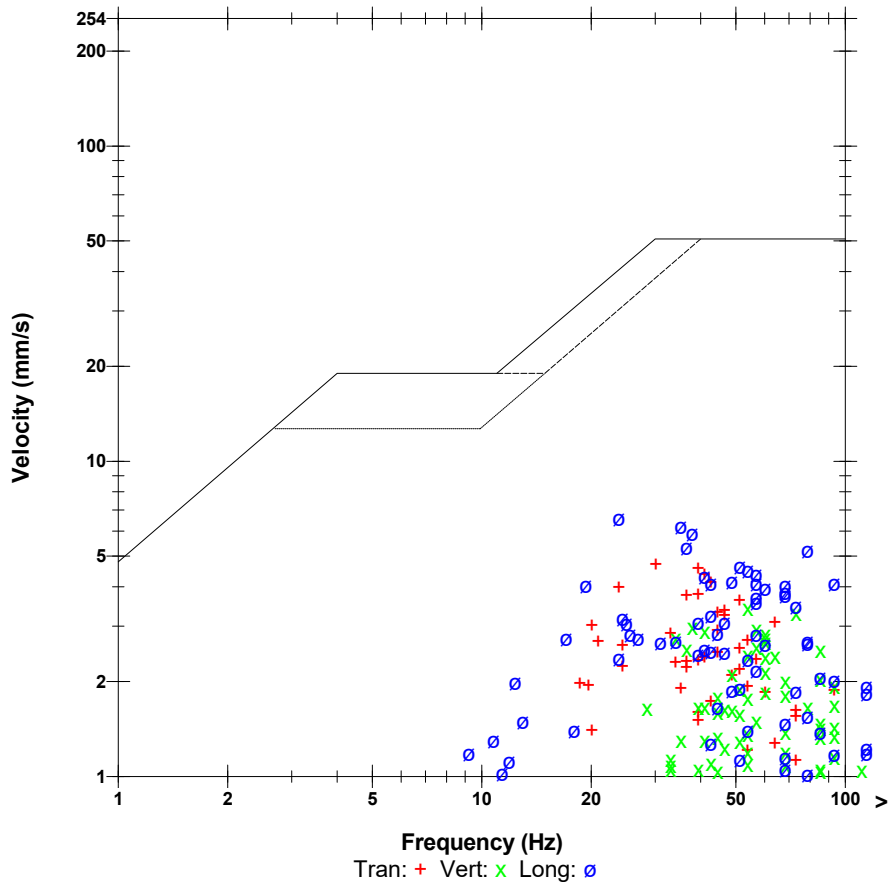
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 111.6 dB(L) at 1.329 sec
ZC Freq 5.9 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1277 mv)

	Tran	Vert	Long	
PPV	4.721	3.436	6.629	mm/s
ZC Freq	30	54	24	Hz
Time (Rel. to Trig)	0.249	0.468	0.399	sec
Peak Acceleration	0.148	0.222	0.352	g
Peak Displacement	0.021	0.012	0.026	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.3	Hz
Overswing Ratio	3.1	3.3	3.4	

Peak Vector Sum 6.877 mm/s at 0.399 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 11:01:30 August 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration November 3, 2017 by InstanTEL
File Name __TEMP.EVT
Scaled Distance 5850.2 (1850.0 m, 0.1 kg)

Notes

Location: 10423 Lakeshore Rd
 Client: WaterFord Group
 User Name: Mike der kinderen
 General: Law Crushed Stone

Extended Notes

Mc Cabe Residence
 42.87808, -79.29711

Microphone Linear Weighting

PSPL <88 dB(L)

ZC Freq >100 Hz

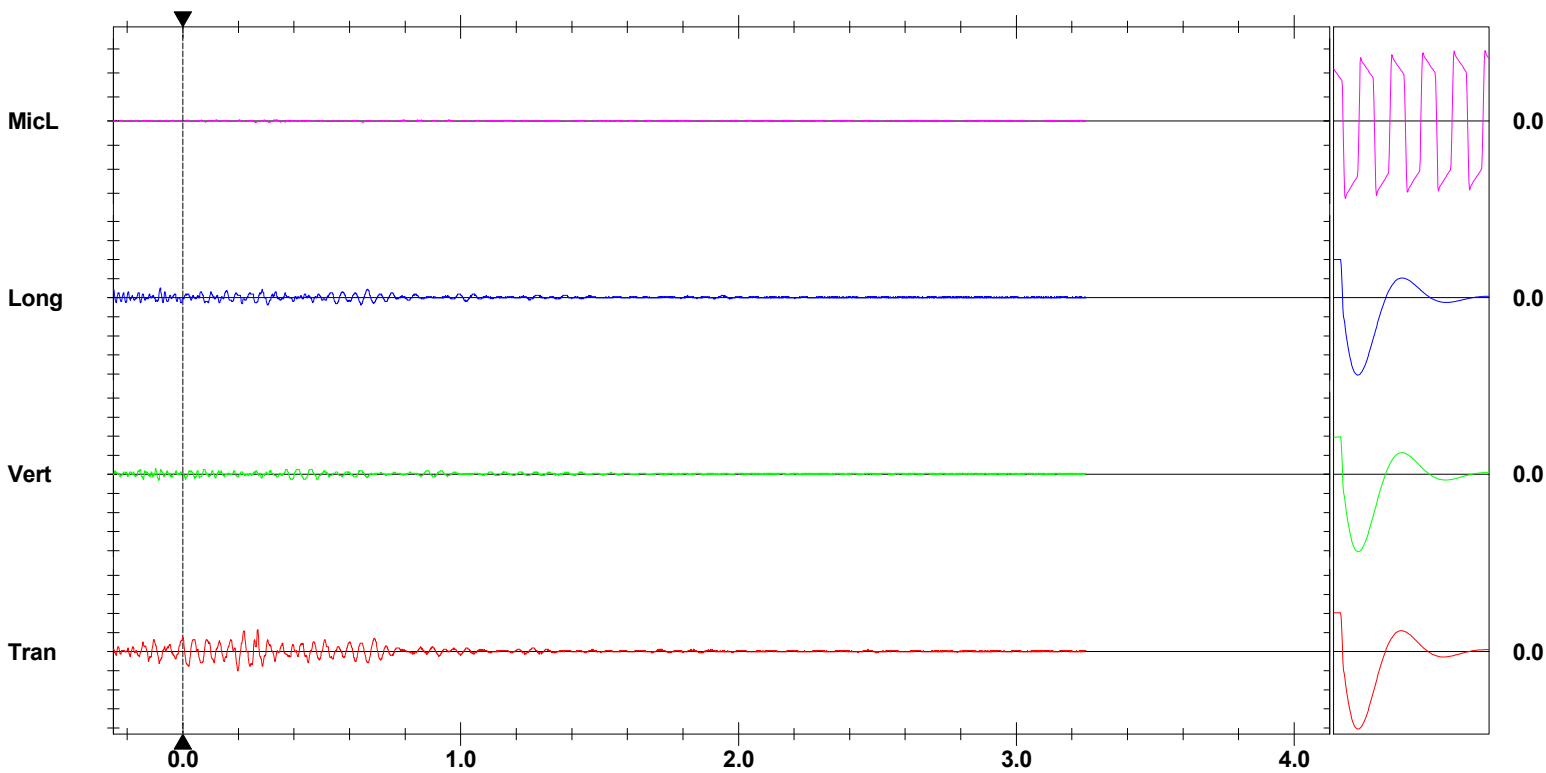
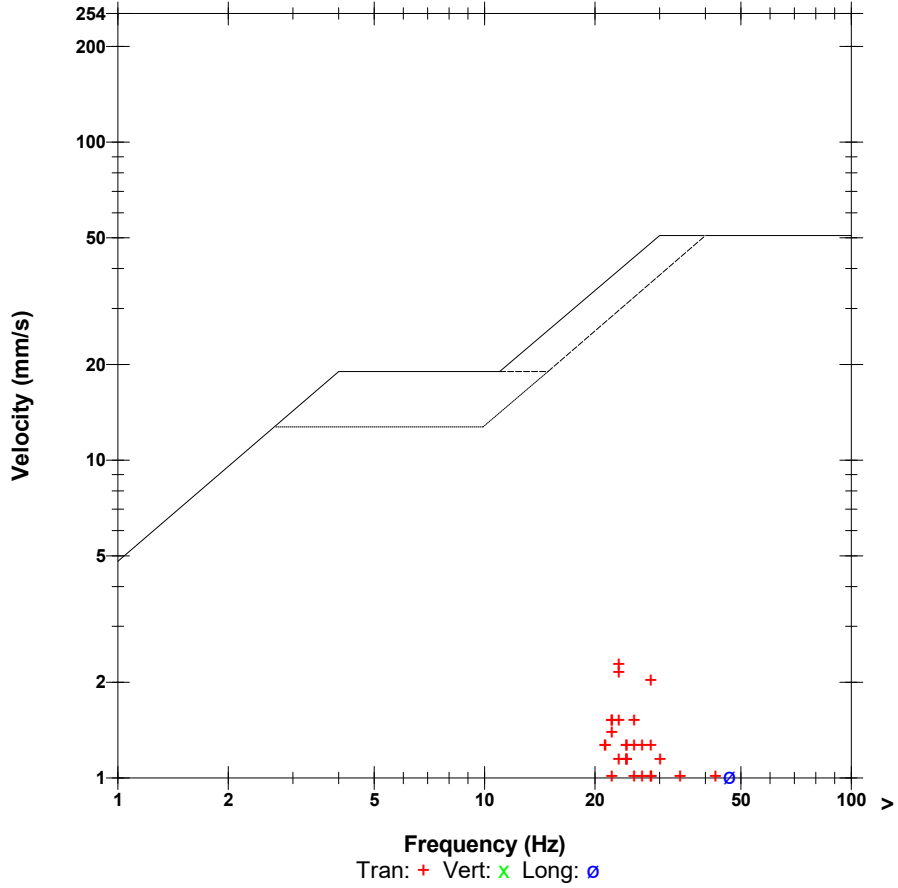
Channel Test Passed (Freq = 20.1 Hz Amp = 552 mv)

	Tran	Vert	Long	
PPV	2.286	0.635	1.016	mm/s
ZC Freq	23	64	47	Hz
Time (Rel. to Trig)	0.269	-0.099	-0.082	sec
Peak Acceleration	0.053	0.027	0.040	g
Peak Displacement	0.013	0.004	0.006	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

Peak Vector Sum 2.321 mm/s at 0.269 sec

N/A: Not Applicable

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181342**
 Blast Date: **2018-08-01**

Blast Number: **18-018**
 Orica Order #: **2369298**
 Blast Time: **1:27 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89476** °N Latitude **79.29484** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **15** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: X
 Ceiling: **12,018** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0** # Holes: **58** = 1,590.9 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,940	26,720	3,220

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	116	39.4

total explosives weight in Blast (kg): **3,259**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			1
EXEL HANDIDET 9m		25/500	53
EXEL HANDIDET 12m		25/500	63
CONNECTADET 9M		25 ms	4
CONNECTADET 12M		42 ms	12

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

	Enter hours	
GPS LAYOUT		0.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **18,089** te **6,957** m³
 Total tonnes per day: **37,944** te **LML22-13** Rate Code
 Total Holes Loaded: **58** holes
 ... including: Dead Holes
 ... and: **5** Helper Holes
 Helper Hole Collar: **26.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **14** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **44** main body

Bench Height: **27.4** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.4** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Charge Length -

Front Row: **20.4** ft avg
 Main Body: **20.4** ft avg

- Charge Weight -

Front Row: **59.6** kg/hole
 Main Body: **59.6** kg/hole
 Max. per delay: **65.0** kg/delay
 SD () Equation: **178.6** kg/delay
 Total kg Loaded: **3,259** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.790 lb/yd³ Yield PF: **0.180** kg/te (actual)
 0.765 lb/yd³ Front row: **0.175** kg/te (theoretical)
 0.765 lb/yd³ Main Body: **0.175** kg/te (theoretical)
 0.765 lb/yd³ "KPI" PF: **0.175** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

3 Siesmograph set-ups



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89492"/>	<input type="text" value="79.29479"/>
Front Row Corner	<input type="text" value="42.89448"/>	<input type="text" value="79.29514"/>
Back Row Corner	<input type="text" value="42.89488"/>	<input type="text" value="79.29460"/>
Average (Centre of Blast)	<input type="text" value="42.89476"/>	<input type="text" value="79.29484"/>

(N) Radians	(W) Radians
<input type="text" value="0.748658"/>	<input type="text" value="1.383955"/>
<input type="text" value="0.748650"/>	<input type="text" value="1.383961"/>
<input type="text" value="0.748657"/>	<input type="text" value="1.383952"/>
<input type="text" value="0.748655"/>	<input type="text" value="1.383956"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="400.9"/>	m
Post Blast Data:	ppV: <input type="text" value="4.7"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.5"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="105.2"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
2nd Reading		
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="539.2"/>	m
Post Blast Data:	ppV: <input type="text" value="3.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.1"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="116.7"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1866.3"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="Not"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(400.9)^2}{30^2} \text{ kg}$$

$$= \frac{160,721}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

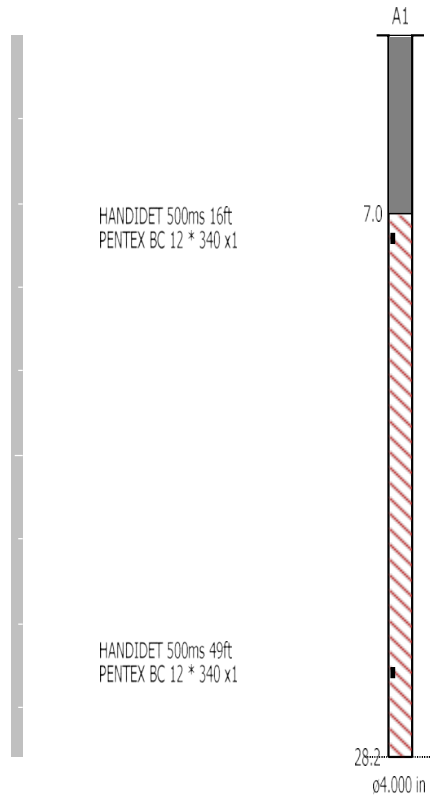
Waterford

Quarry: Laws - Middle Lift
P.O. #: S181342
Blast Date: 8/1/2018

Blast Number: 18-018
Orica Order #: 2369298

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #:
 Design Date: **2018-08-01**

Blast Number: **18-018**
 Orica Order #:

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89476** °N Latitude **79.29484** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **18,430** te
 Total Holes Loaded: **56** holes
 ... including: **0** Dead Holes
 ... and: **2** Helper Holes
 Helper Hole Collar: **12.0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **56** = 1,536.1 ft (**4** " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **56** main body
 Bench Height: **27.4** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.4** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.4** ft avg
 Main Body: **20.4** ft avg

- Design Charge Weight -

Front Row: **59.6** kg/hole
 Main Body: **59.6** kg/hole
 Max Chge Wt / delay: **72.0** kg/delay

Required kg Loaded: **4,088** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.222** kg/te (actual)
 Front row: **0.175** kg/te (theoretical)
 Main Body: **0.175** kg/te (theoretical)
 "KPI" PF: **0.175** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,050

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	112	38.1

total explosives weight in Blast (kg): **4,088**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		1
EXEL HANDIDET 9m	25/500	56
EXEL HANDIDET 12m	25/500	56
CONNECTADET 12M	42 ms	16

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:		
# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:		
GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Date/Time Tran at 13:27:14 August 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.577 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by InstanTEL
File Name UM6859_20180801132714.IDFW

Notes

Location: Erie Peat Rd North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

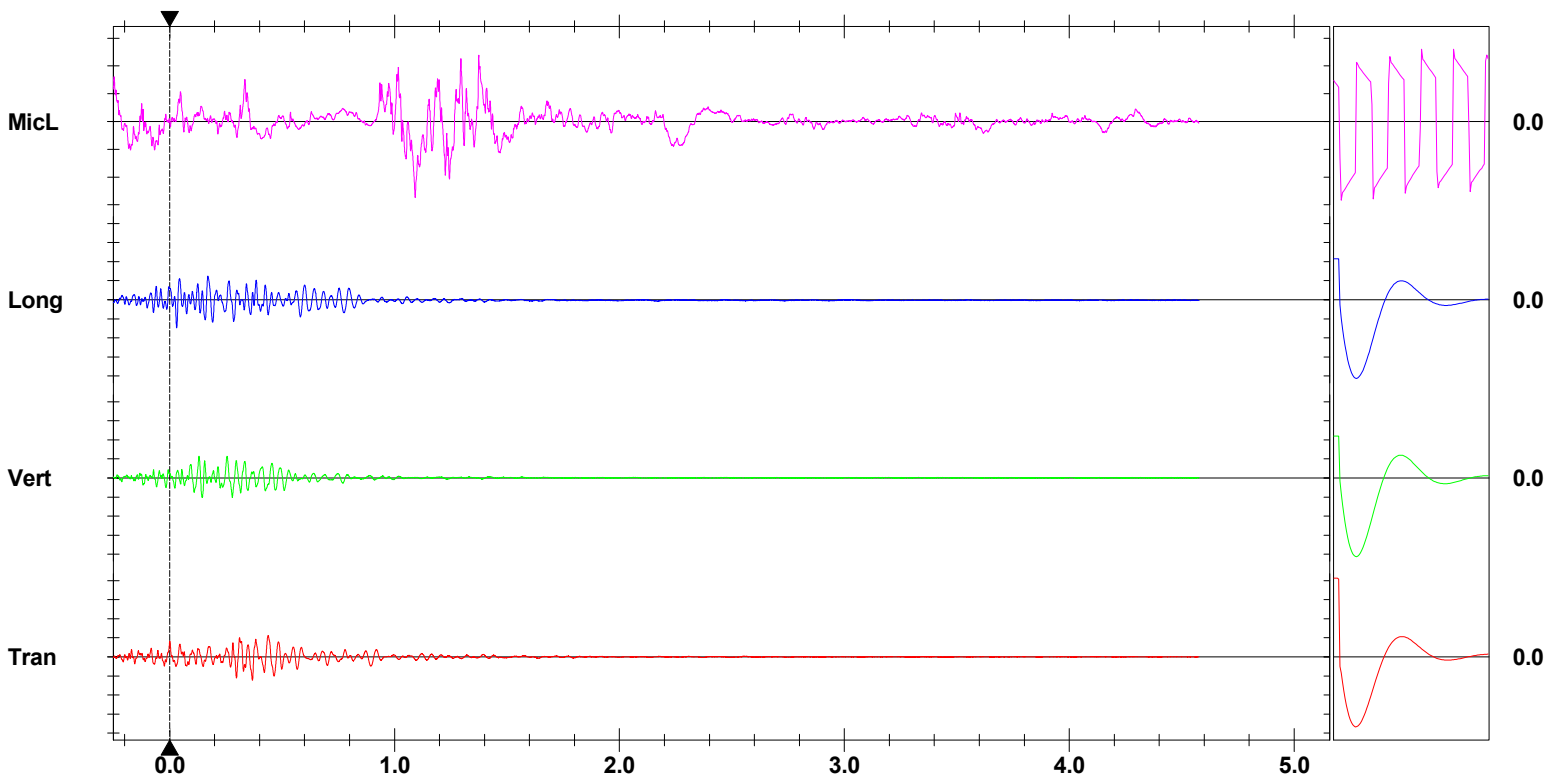
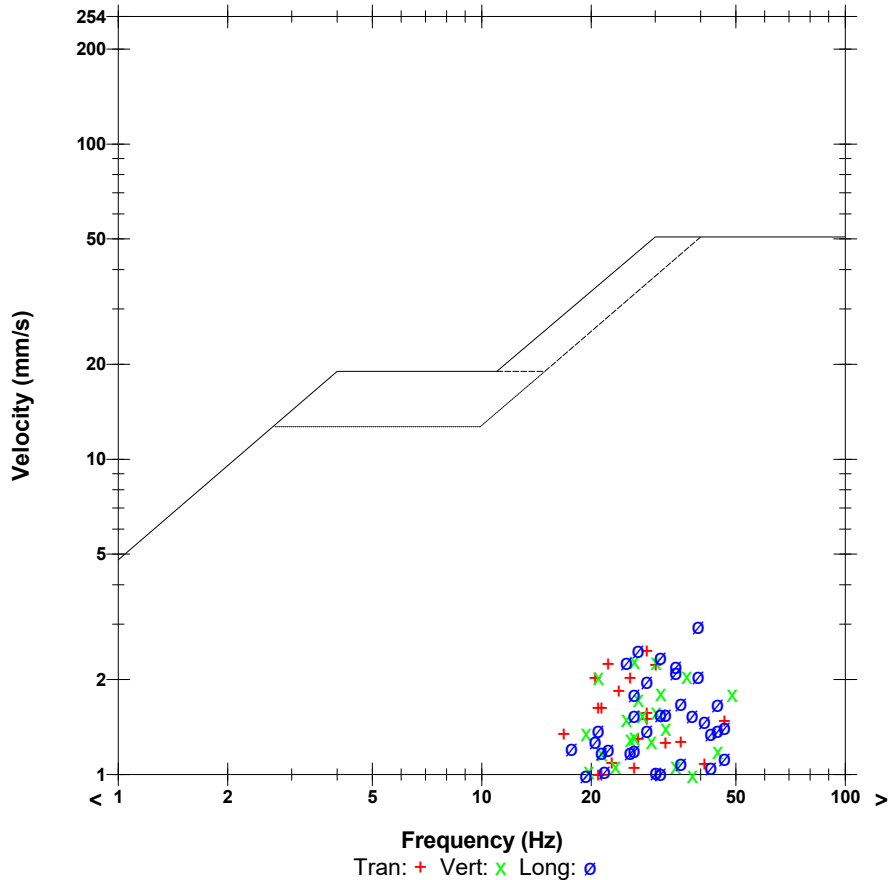
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 116.7 dB(L) at 1.092 sec
ZC Freq 4.6 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1226 mv)

	Tran	Vert	Long	
PPV	2.459	2.294	2.956	mm/s
ZC Freq	28	26	39	Hz
Time (Rel. to Trig)	0.368	0.255	0.031	sec
Peak Acceleration	0.072	0.092	0.102	g
Peak Displacement	0.016	0.012	0.032	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	4.1	

Peak Vector Sum 3.128 mm/s at 0.031 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:27:12 August 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.799 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180801132712.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

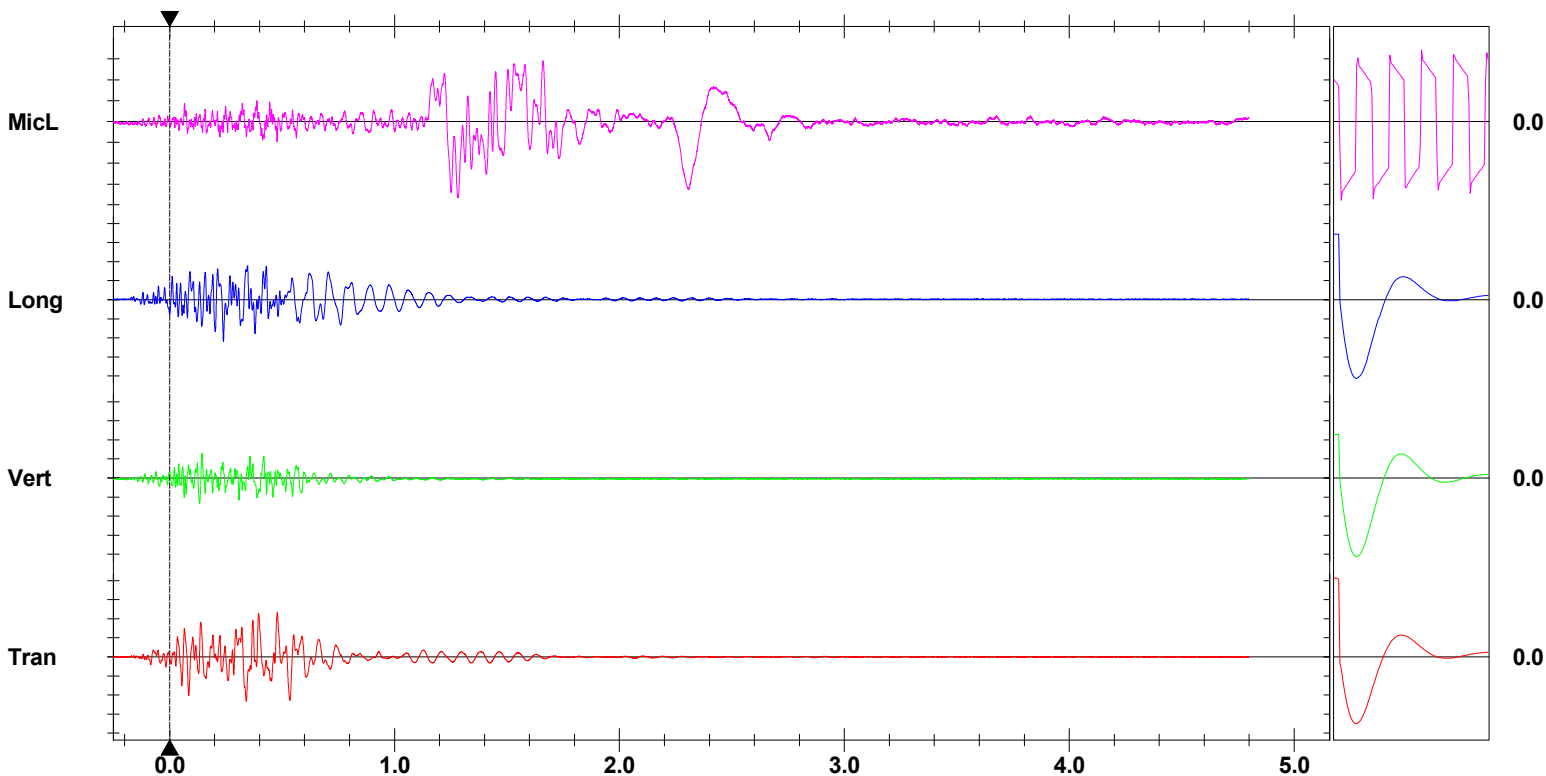
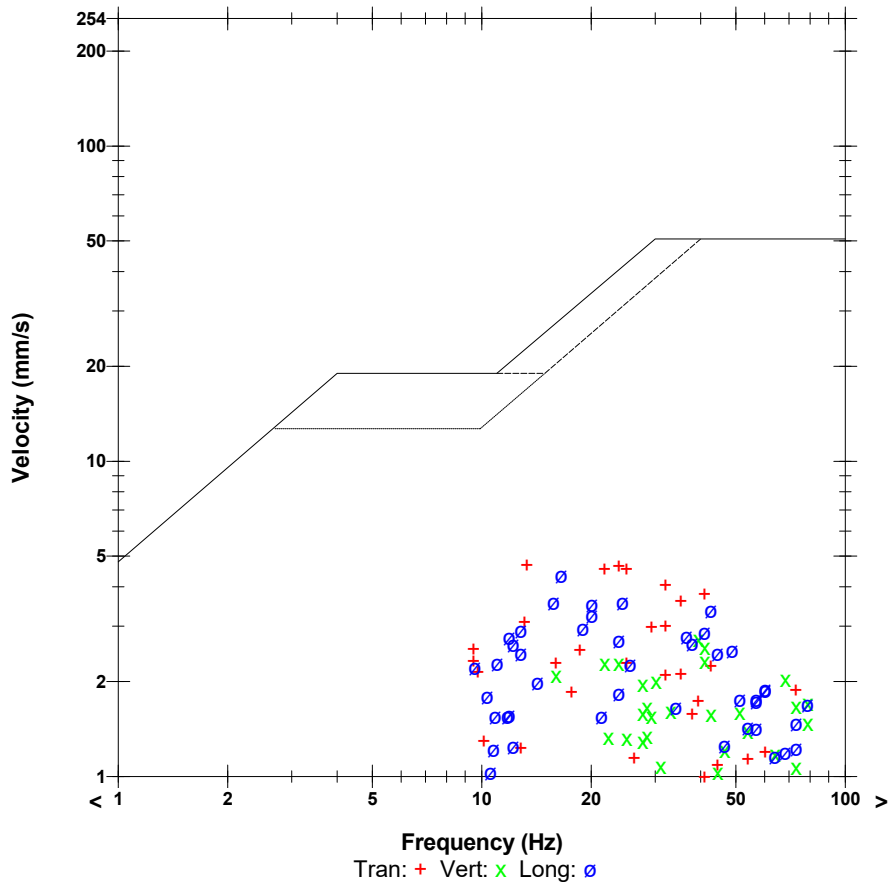
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 105.2 dB(L) at 1.281 sec
ZC Freq 5.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1242 mv)

	Tran	Vert	Long	
PPV	4.674	2.727	4.367	mm/s
ZC Freq	13.3	39	16.5	Hz
Time (Rel. to Trig)	0.341	0.133	0.239	sec
Peak Acceleration	0.137	0.128	0.169	g
Peak Displacement	0.043	0.018	0.035	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.1	Hz
Overswing Ratio	3.0	3.2	3.4	

Peak Vector Sum 5.596 mm/s at 0.340 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181343**
 Blast Date: **2018-08-10**

Blast Number: **18-019**
 Orica Order #: **2372561**
 Blast Time: **10:31 AM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89497** °N Latitude **79.29486** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **15** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical: **0** # Holes: **60** = 1,591.4 ft (**4** " diam)
 Secondary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,810	30,200	3,610

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	64	21.8

total explosives weight in Blast (kg): **3,632**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			64

Cord & Accessories:

	U of M	# used
HARNESS WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

	Enter hours	
GPS LAYOUT		1.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	2.3
HELPER HOURS	Enter total Helper man-hours	7.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **19,801** te **7,616** m³
 Total tonnes per day: **58,145** te **LML22-01** Rate Code
 Total Holes Loaded: **60** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **15** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **45** main body

Bench Height: **26.5** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.5** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" stone**

- Charge Length -

Front Row: **19.5** ft avg
 Main Body: **19.5** ft avg

- Charge Weight -

Front Row: **56.9** kg/hole
 Main Body: **56.9** kg/hole
 Max. per delay: **72.0** kg/delay
 SD () Equation: **192.3** kg/delay
 Total kg Loaded: **3,632** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.804 lb/yd³ Yield PF: **0.183** kg/te (actual)
 0.756 lb/yd³ Front row: **0.173** kg/te (theoretical)
 0.756 lb/yd³ Main Body: **0.173** kg/te (theoretical)
 0.756 lb/yd³ "KPI" PF: **0.173** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

B-1,C-1,D-1 All received a secondary Primer because we plugged and air decked these holes
 C-13 Received a secondary primer due to primary not pulling into product



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89496"/>	<input type="text" value="79.29484"/>
Front Row Corner	<input type="text" value="42.89503"/>	<input type="text" value="79.29514"/>
Back Row Corner	<input type="text" value="42.89493"/>	<input type="text" value="79.29460"/>
Average (Centre of Blast)	<input type="text" value="42.89497"/>	<input type="text" value="79.29486"/>

(N) Radians	(W) Radians
<input type="text" value="0.748658"/>	<input type="text" value="1.383956"/>
<input type="text" value="0.748659"/>	<input type="text" value="1.383961"/>
<input type="text" value="0.748658"/>	<input type="text" value="1.383952"/>
<input type="text" value="0.748658"/>	<input type="text" value="1.383956"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="416.0"/>	m
Post Blast Data:	ppV: <input type="text" value="4.7"/>	mm/s
	frequency: <input type="text" value="34.0"/>	Hz
	air overpressure: <input type="text" value="108.0"/>	dB

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

Trigger set at: mm/s
V / T / L : (Vertical, Transverse or Longitudinal)
Trigger set at: dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
2nd Reading		
Average	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="797.9"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz
	air overpressure: <input type="text" value="Trigger"/>	dB

(N) Radians	(W) Radians
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>

Trigger set at: mm/s
V / T / L : (Vertical, Transverse or Longitudinal)
Trigger set at: dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1889.2"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz
	air overpressure: <input type="text" value="Set Up"/>	dB

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Trigger set at: mm/s
V / T / L : (Vertical, Transverse or Longitudinal)
Trigger set at: dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(416)^2}{30^2} \text{ kg}$$

$$= \frac{173,056}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



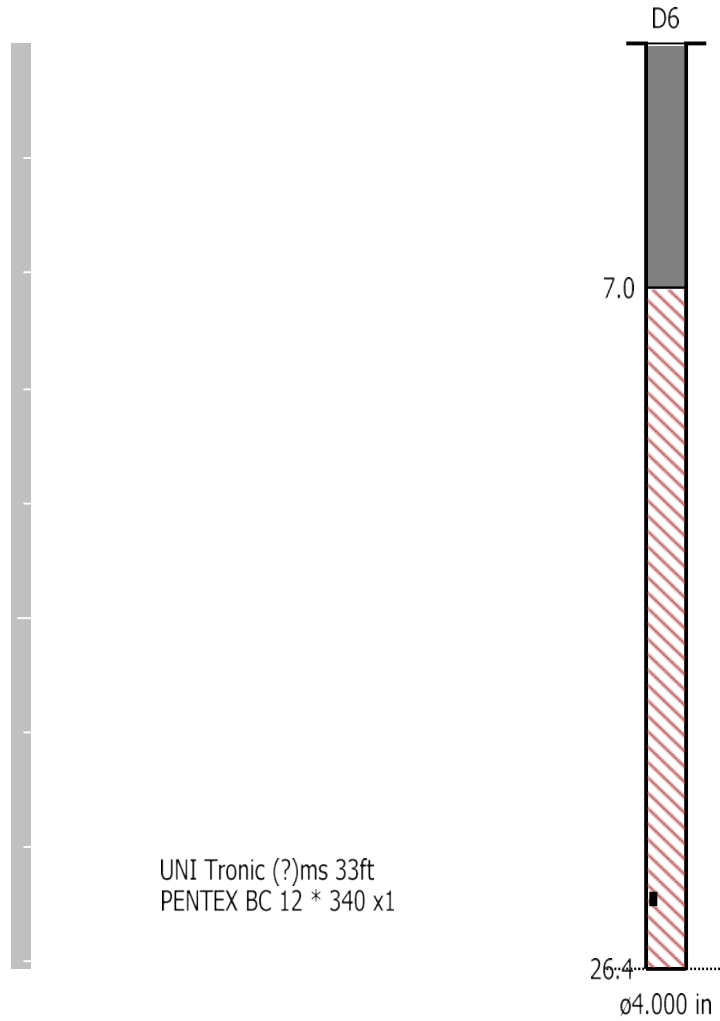
Blast Design
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181343**
Blast Date: **8/10/2018**

Blast Number: **18-019**
Orica Order #: **2372561**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 10:31:00 August 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.836 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 22, 2017 by Instantel
File Name UM6859_20180810103100.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

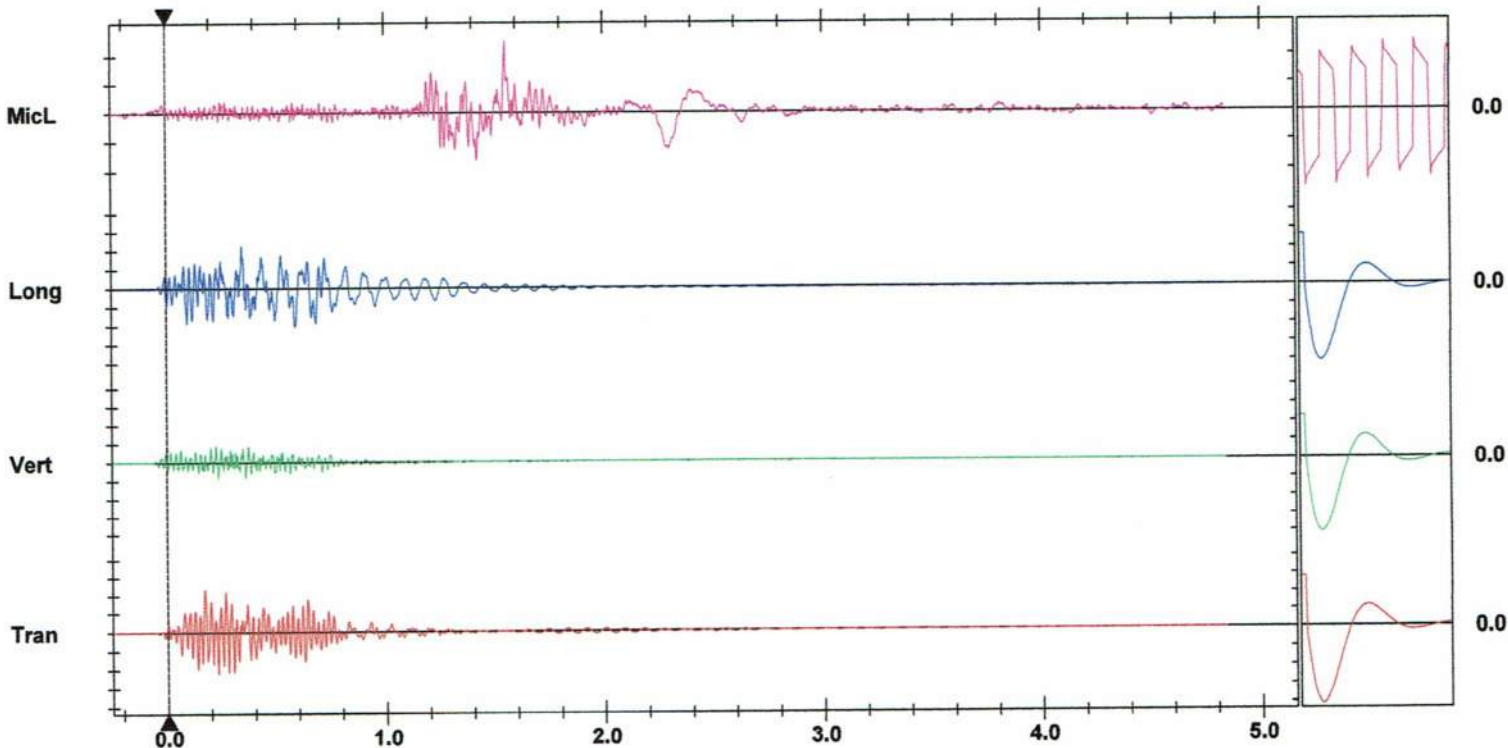
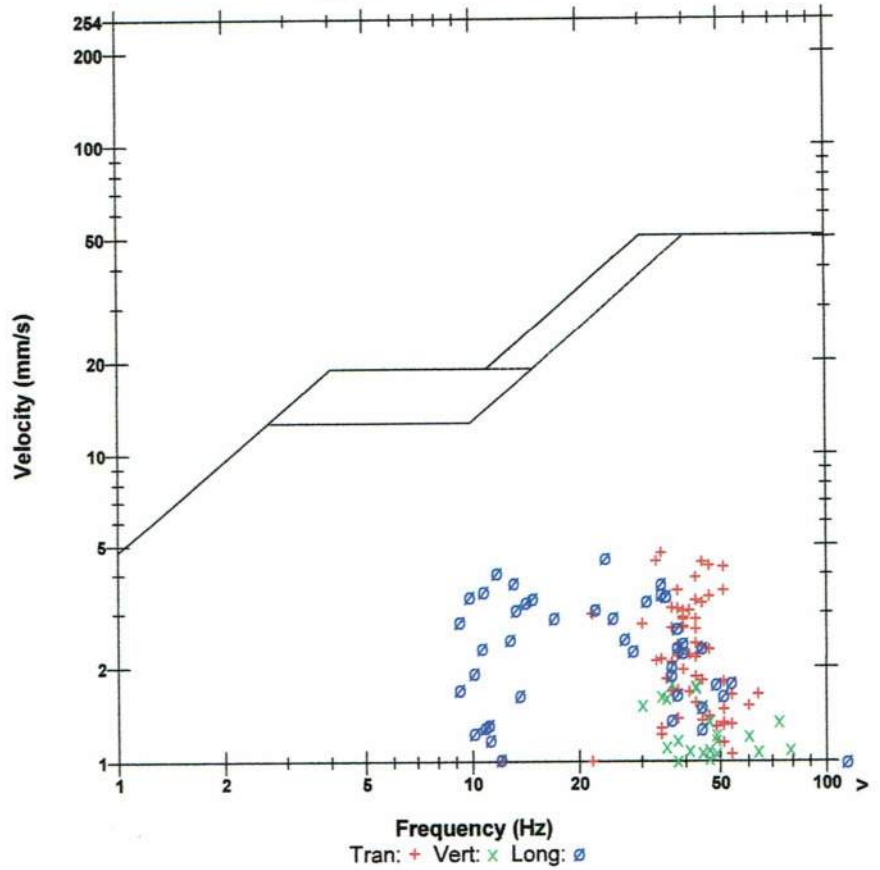
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 108.0 dB(L) at 1.553 sec
ZC Freq 14.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1188 mv)

	Tran	Vert	Long	
PPV	4.705	1.781	4.540	mm/s
ZC Freq	34	37	24	Hz
Time (Rel. to Trig)	0.171	0.225	0.346	sec
Peak Acceleration	0.188	0.099	0.212	g
Peak Displacement	0.022	0.006	0.042	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.6	3.5	4.2	

Peak Vector Sum 5.110 mm/s at 0.278 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger = [arrow pointing left]

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181343**
 Blast Date: **2018-08-10**

Blast Number: **18-020**
 Orica Order #: **2372561**
 Blast Time: **1:21 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89506** °N Latitude **79.29482** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **15** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 62 = 1,534.2 ft (4 " diam)
Secondary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,200	27,061	3,139

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	68	23.1

total explosives weight in Blast (kg): **3,162**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			68

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	1.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	3
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **19,089** te **7,342** m³
 Total tonnes per day: **58,145** te **LML22-01** Rate Code
 Total Holes Loaded: **62** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **17** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **45** main body

Bench Height: **24.7** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **24.7** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Charge Length -

Front Row: **17.7** ft avg
 Main Body: **17.7** ft avg

- Charge Weight -

Front Row: **51.7** kg/hole
 Main Body: **51.7** kg/hole
 Max. per delay: **61.0** kg/delay
 SD () Equation: **196.1** kg/delay
 Total kg Loaded: **3,162** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.726 lb/yd³ Yield PF: **0.166** kg/te (actual)
 0.737 lb/yd³ Front row: **0.168** kg/te (theoretical)
 0.737 lb/yd³ Main Body: **0.168** kg/te (theoretical)
 0.737 lb/yd³ "KPI" PF: **0.168** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

A-1,B1,C-1,D-1 All received a secondary primer because we plugged and air decked them.
C-4,C11 Also received a secondary primer because they did not pull into product



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89503"/>	<input type="text" value="79.29468"/>
Front Row Corner	<input type="text" value="42.89510"/>	<input type="text" value="79.29497"/>
Back Row Corner		
Average (Centre of Blast)	<input type="text" value="42.89506"/>	<input type="text" value="79.29482"/>

(N) Radians	(W) Radians
<input type="text" value="0.748660"/>	<input type="text" value="1.383953"/>
<input type="text" value="0.748661"/>	<input type="text" value="1.383958"/>
<input type="text" value="0.748660"/>	<input type="text" value="1.383956"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

Distance (1st Seis. From Centre of Blast)	<input type="text" value="420.1"/>	m
Post Blast Data:	ppV: <input type="text" value="4.3"/>	mm/s Trigger set at: <input type="text" value="1.5"/>
	frequency: <input type="text" value="29.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="110.3"/>	dB Trigger set at: <input type="text" value="124"/>
<input type="text" value="Erie Peat Road"/>		

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>
2nd Reading		
Average	<input type="text" value="42.89326"/>	<input type="text" value="79.28536"/>

(N) Radians	(W) Radians
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>
<input type="text" value="0.748629"/>	<input type="text" value="1.383791"/>

Distance (2nd Seis. From Centre of Blast)	<input type="text" value="797.5"/>	m
Post Blast Data:	ppV: <input type="text" value="2.0"/>	mm/s Trigger set at: <input type="text" value="1.5"/>
	frequency: <input type="text" value="33.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="111.5"/>	dB Trigger set at: <input type="text" value="115"/>
<input type="text" value="Erie Peat Road (North of Quarry)"/>		

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1899.9"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="Not"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB Trigger set at: <input type="text" value="115"/>
<input type="text" value="10423 Lakeshore Road W/McCabe"/>		

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(420.1)^2}{30^2} \text{ kg}$$

$$= \frac{176,484}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica

Blaster-in-charge:

Mike der Kinderen

jim bray

Signature required, indicating that Blast Report is Complete & Accurate.



Blast Design

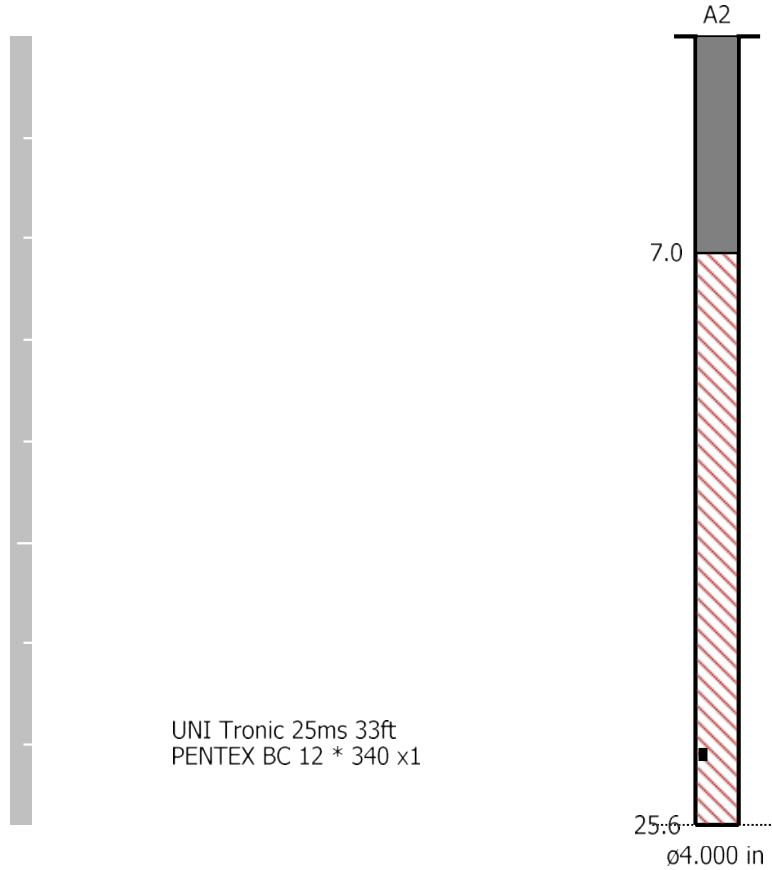
Waterford

Quarry: Laws - Middle Lift
P.O. #: S181343
Blast Date: 8/10/2018

Blast Number: 18-020
Orica Order #: 2372561

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Vert at 13:20:46 August 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.313 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20180810132046.IDFW

Notes

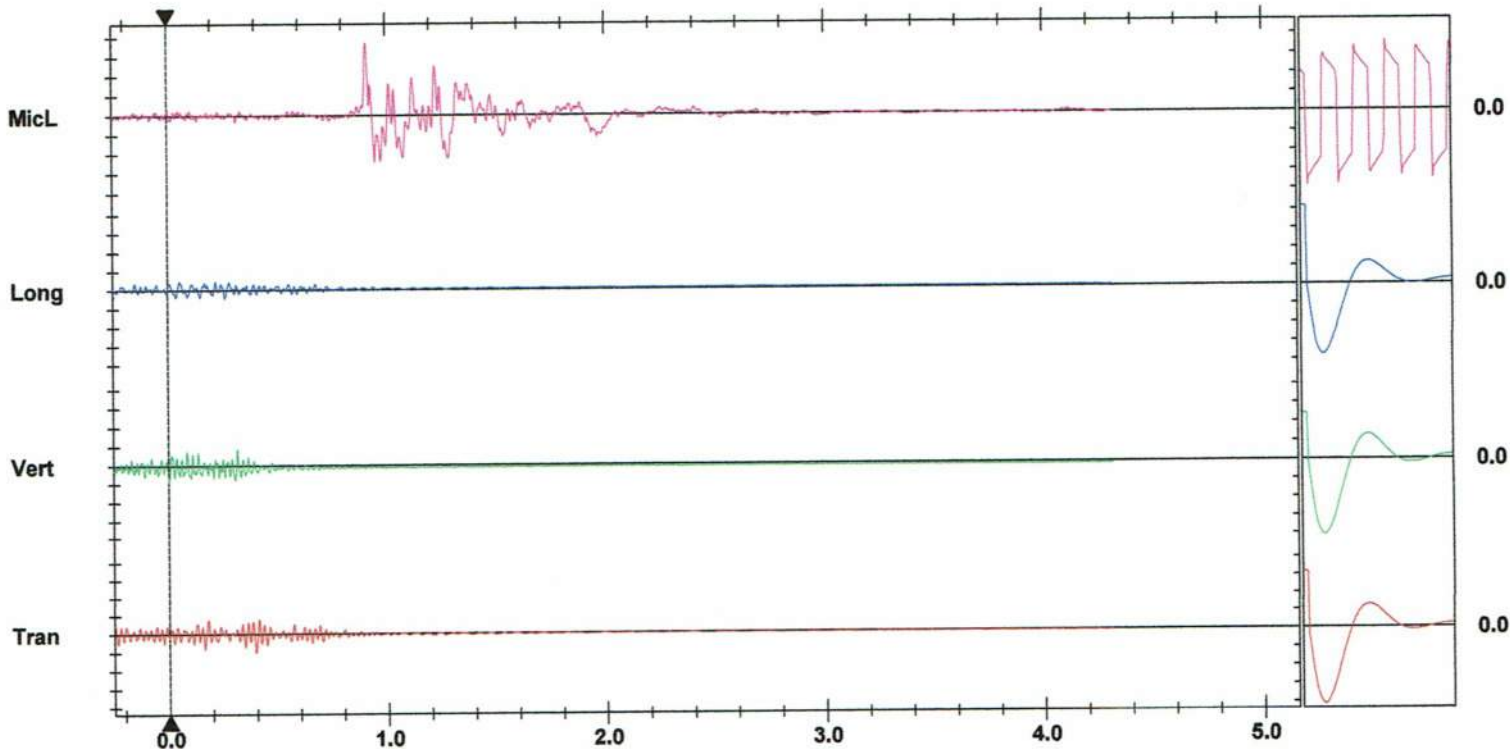
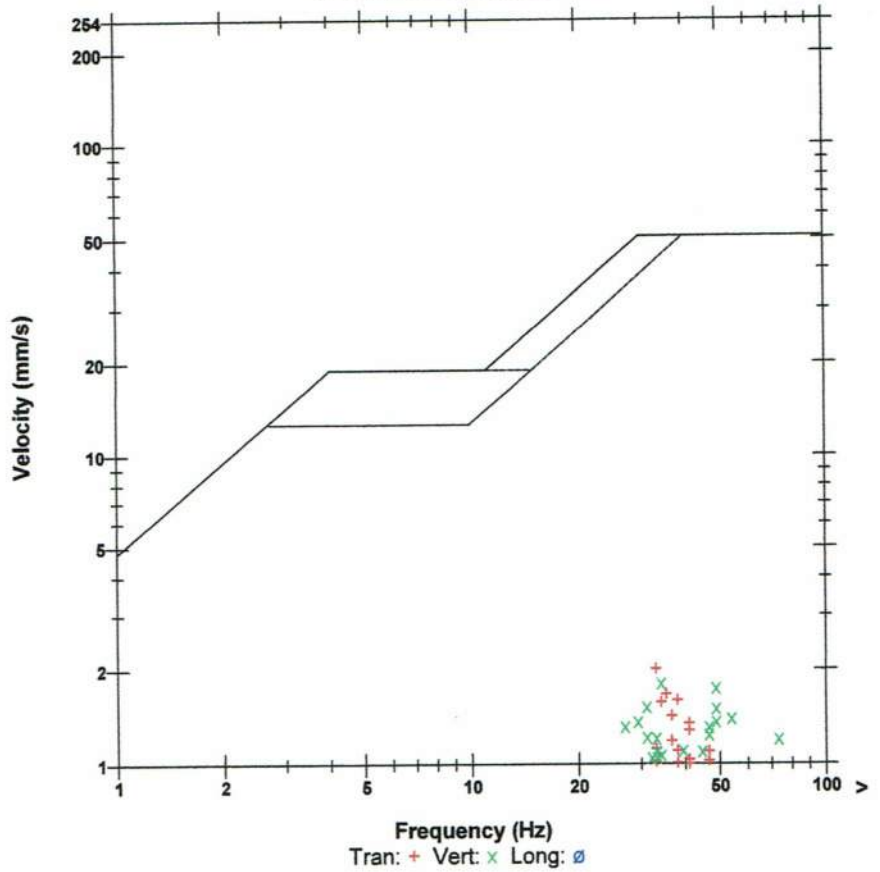
Location: Erie Peat Road North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 111.5 dB(L) at 0.912 sec
ZC Freq 6.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1216 mv)

	Tran	Vert	Long	
PPV	2.018	1.821	0.946	mm/s
ZC Freq	33	34	20	Hz
Time (Rel. to Trig)	0.395	0.002	0.055	sec
Peak Acceleration	0.054	0.089	0.031	g
Peak Displacement	0.010	0.013	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.3	3.2	3.2	

Peak Vector Sum 2.116 mm/s at 0.395 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 13:20:45 August 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.611 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 22, 2017 by InstanTEL
File Name UM6859_20180810132045.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

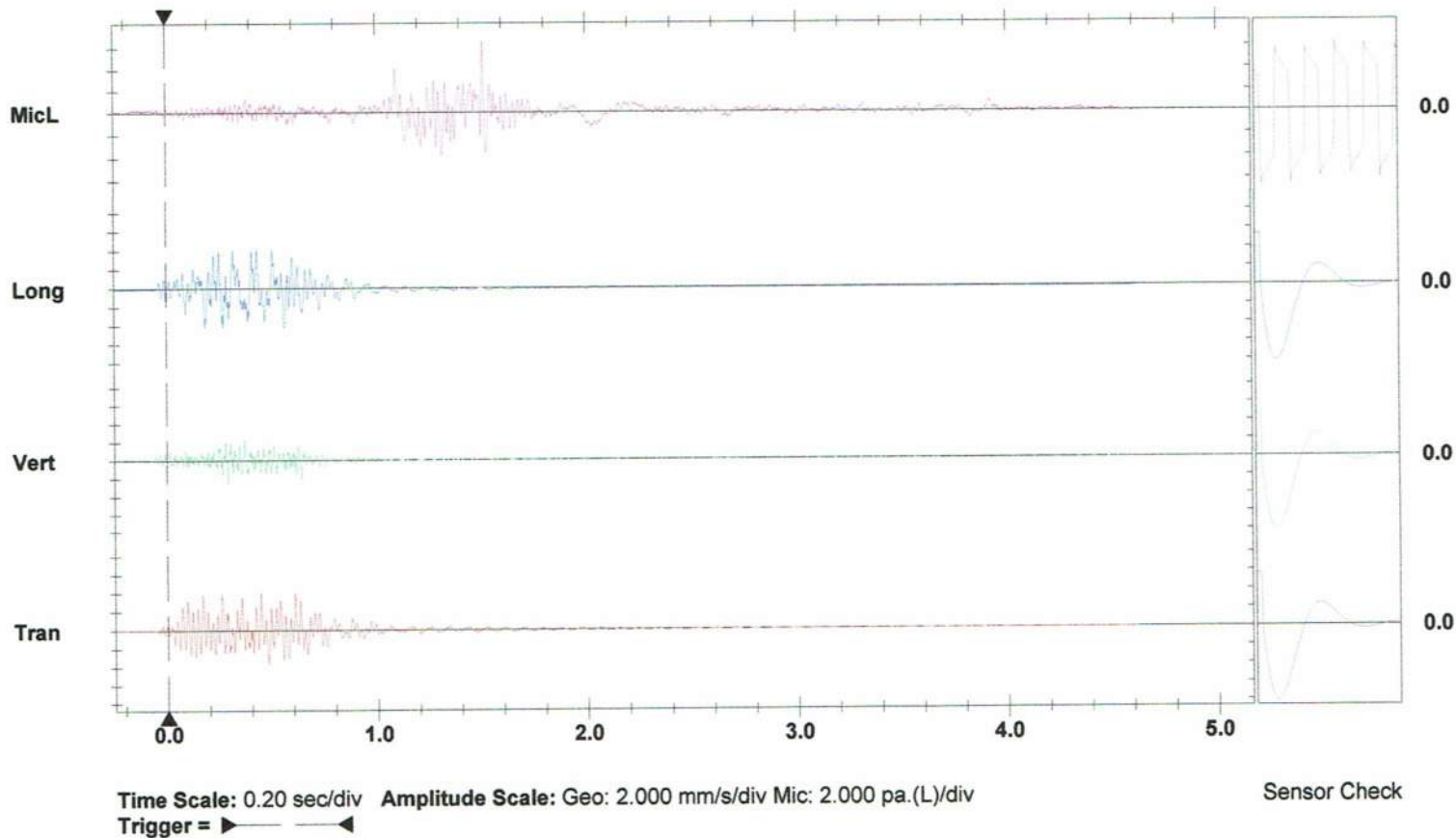
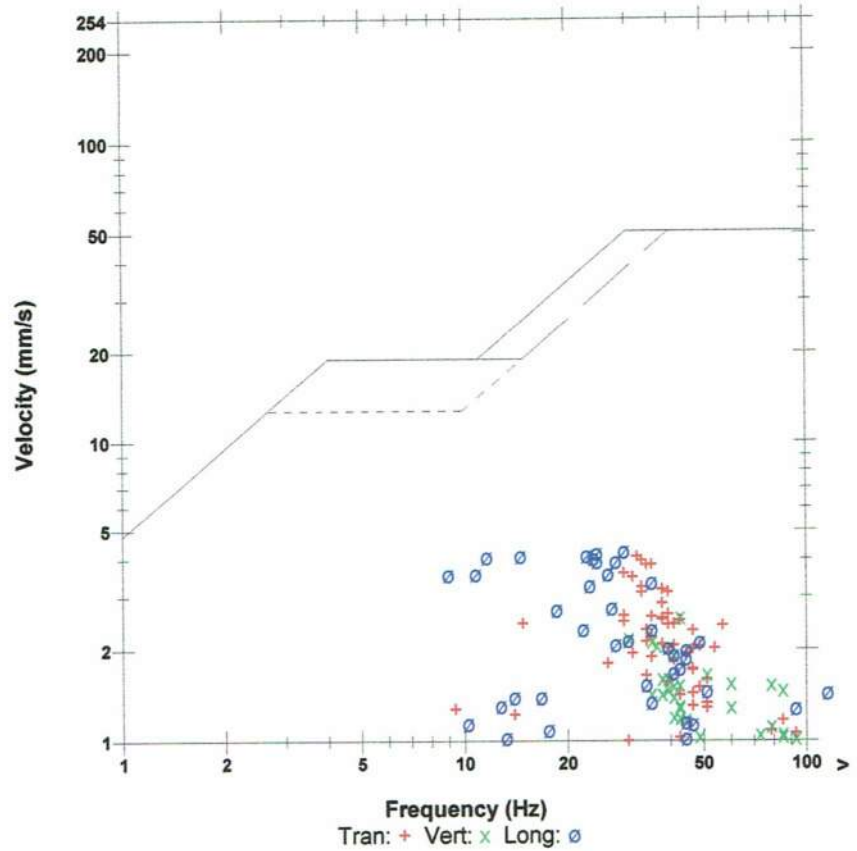
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 110.3 dB(L) at 1.512 sec
ZC Freq 37 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1081 mv)

	Tran	Vert	Long	
PPV	4.075	2.562	4.248	mm/s
ZC Freq	32	43	29	Hz
Time (Rel. to Trig)	0.442	0.291	0.559	sec
Peak Acceleration	0.138	0.169	0.127	g
Peak Displacement	0.019	0.008	0.045	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	6.9	Hz
Overswing Ratio	3.6	3.4	4.2	

Peak Vector Sum 4.760 mm/s at 0.317 sec

USBM R18507 And OSMRE





Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S181343**
 Blast Date: **2018-08-10**

Blast Number: **18-021**
 Orica Order #: **2372561**
 Blast Time: **1:21 PM**

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89479** °N Latitude **79.29545** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **15** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0** # Holes: **61** = 1,627.5 ft (4 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,061	23,640	3,421

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	67	22.8

total explosives weight in Blast (kg): **3,444**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			67

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	1.0
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted: **19,255** te **7,406** m³
 Total tonnes per day: **58,145** te **LML22-01** Rate Code
 Total Holes Loaded: **61** holes
 ... including: Dead Holes
 ... and: **3** Helper Holes
 Helper Hole Collar: **16.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **19** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **42** main body

Bench Height: **26.7** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.7** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Charge Length -

Front Row: **19.7** ft avg
 Main Body: **19.7** ft avg

- Charge Weight -

Front Row: **57.4** kg/hole
 Main Body: **57.4** kg/hole
 Max. per delay: **67.0** kg/delay
 SD () Equation: **219.3** kg/delay
 Total kg Loaded: **3,444** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.784 lb/yd³ Yield PF: **0.179** kg/te (actual)
 0.758 lb/yd³ Front row: **0.173** kg/te (theoretical)
 0.758 lb/yd³ Main Body: **0.173** kg/te (theoretical)
 0.758 lb/yd³ "KPI" PF: **0.173** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

X-1,X-2,X-3 All received 30 kgs and were air deck therefore they received a secondary primer
 C-6,C-7,D5 also received a secondary primer because the did not pull into product.

Blast 18-020MB & 18-021MB Were shot with 9 seconds in between them causing less down
 time to the customer.

1 Advanced Blast Design



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89488"/>	<input type="text" value="79.29547"/>
Front Row Corner	<input type="text" value="42.89488"/>	<input type="text" value="79.29508"/>
Back Row Corner	<input type="text" value="42.89469"/>	<input type="text" value="79.29580"/>
Average (Centre of Blast)	<input type="text" value="42.89479"/>	<input type="text" value="79.29545"/>

(N) Radians	(W) Radians
<input type="text" value="0.748656"/>	<input type="text" value="1.383967"/>
<input type="text" value="0.748657"/>	<input type="text" value="1.383960"/>
<input type="text" value="0.748654"/>	<input type="text" value="1.383973"/>
<input type="text" value="0.748655"/>	<input type="text" value="1.383967"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="444.3"/>	m
Post Blast Data:	ppV: <input type="text" value="4.2"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="29.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="110.3"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
2nd Reading		
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="542.3"/>	m
Post Blast Data:	ppV: <input type="text" value="2.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="33.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="111.5"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1865.5"/>	m
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="Not"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(444.3)^2}{30^2} \text{ kg} \\
 &= \frac{197,402}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

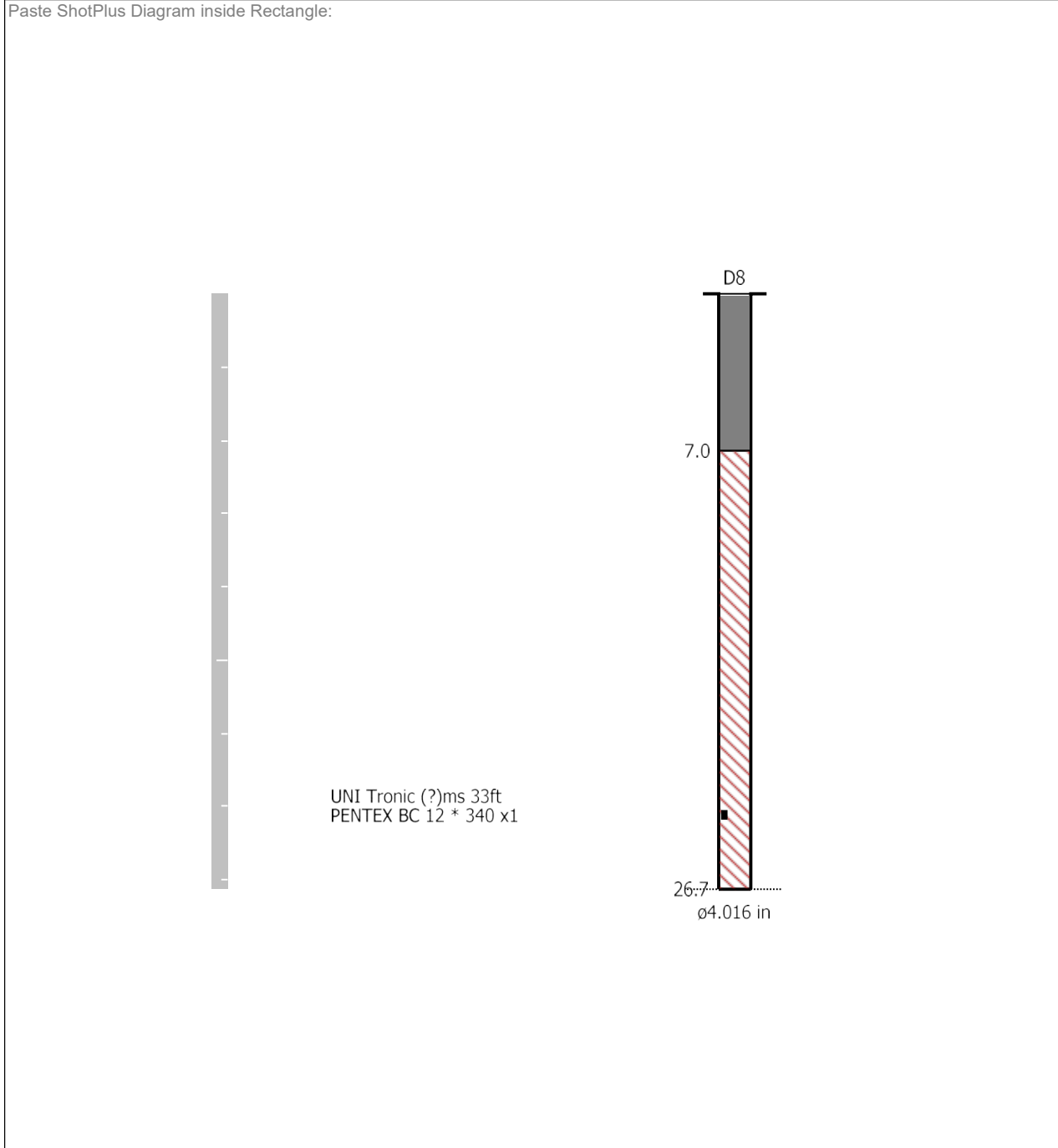
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181343**
Blast Date: **8/10/2018**

Blast Number: **18-021**
Orica Order #: **2372561**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 13:20:45 August 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.611 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 22, 2017 by Instantel
File Name UM6859_20180810132045.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

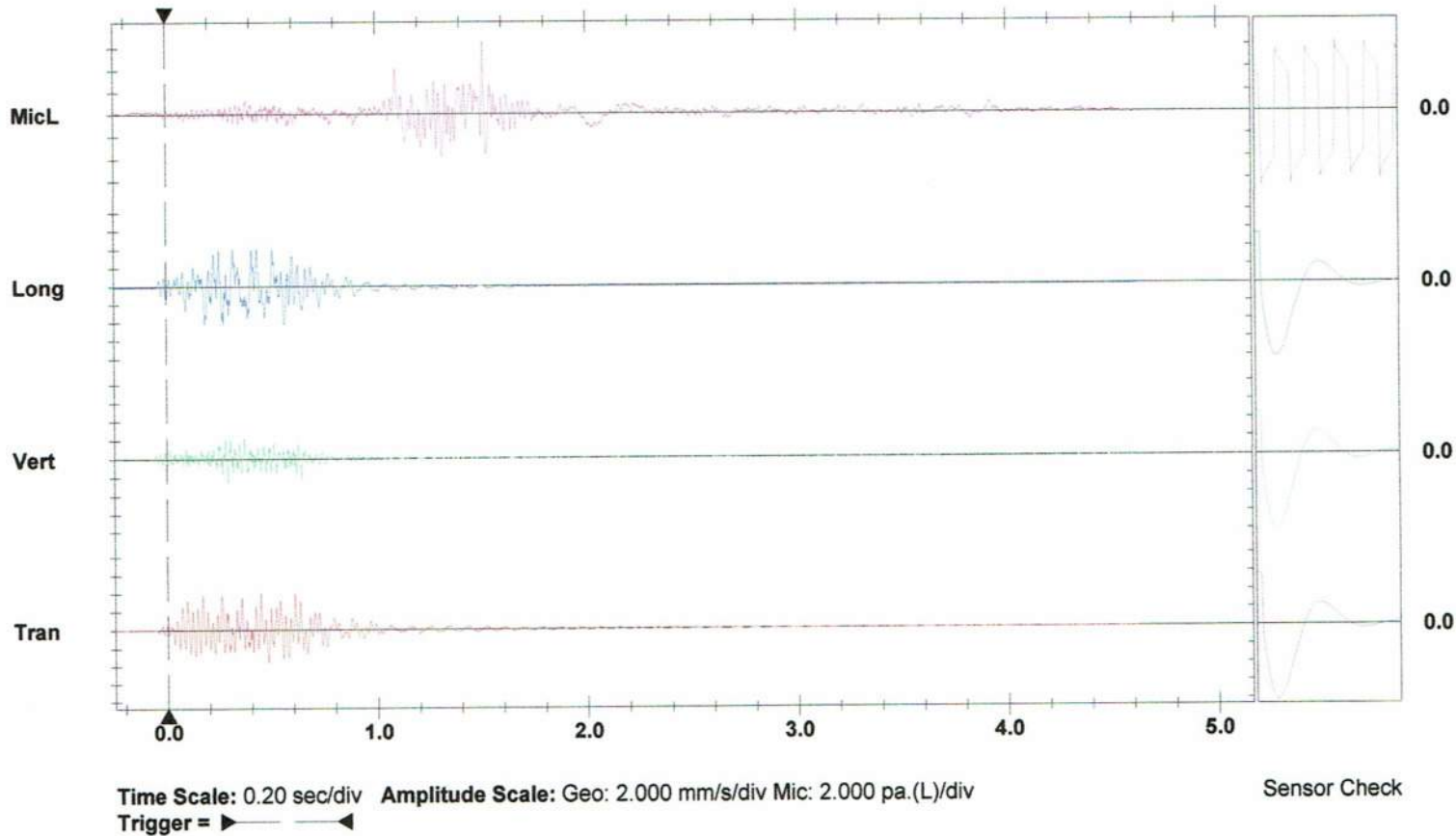
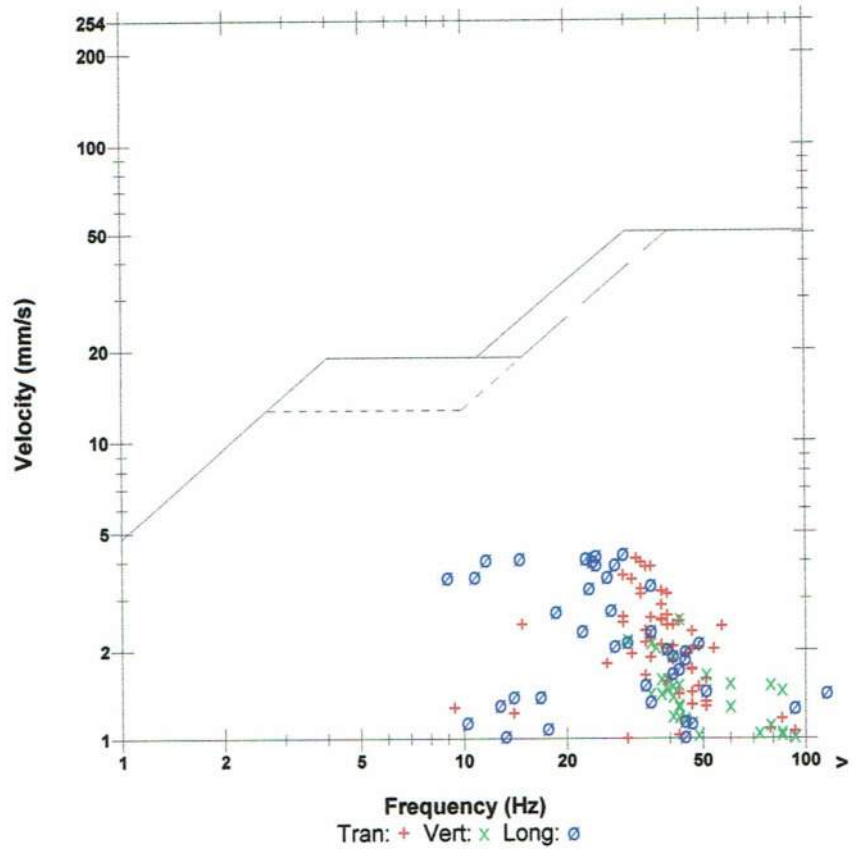
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 110.3 dB(L) at 1.512 sec
ZC Freq 37 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1081 mv)

	Tran	Vert	Long	
PPV	4.075	2.562	4.248	mm/s
ZC Freq	32	43	29	Hz
Time (Rel. to Trig)	0.442	0.291	0.559	sec
Peak Acceleration	0.138	0.169	0.127	g
Peak Displacement	0.019	0.008	0.045	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	6.9	Hz
Overswing Ratio	3.6	3.4	4.2	

Peak Vector Sum 4.760 mm/s at 0.317 sec

USBM R18507 And OSMRE



Date/Time Vert at 13:20:46 August 10, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.313 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180810132046.IDFW

Notes

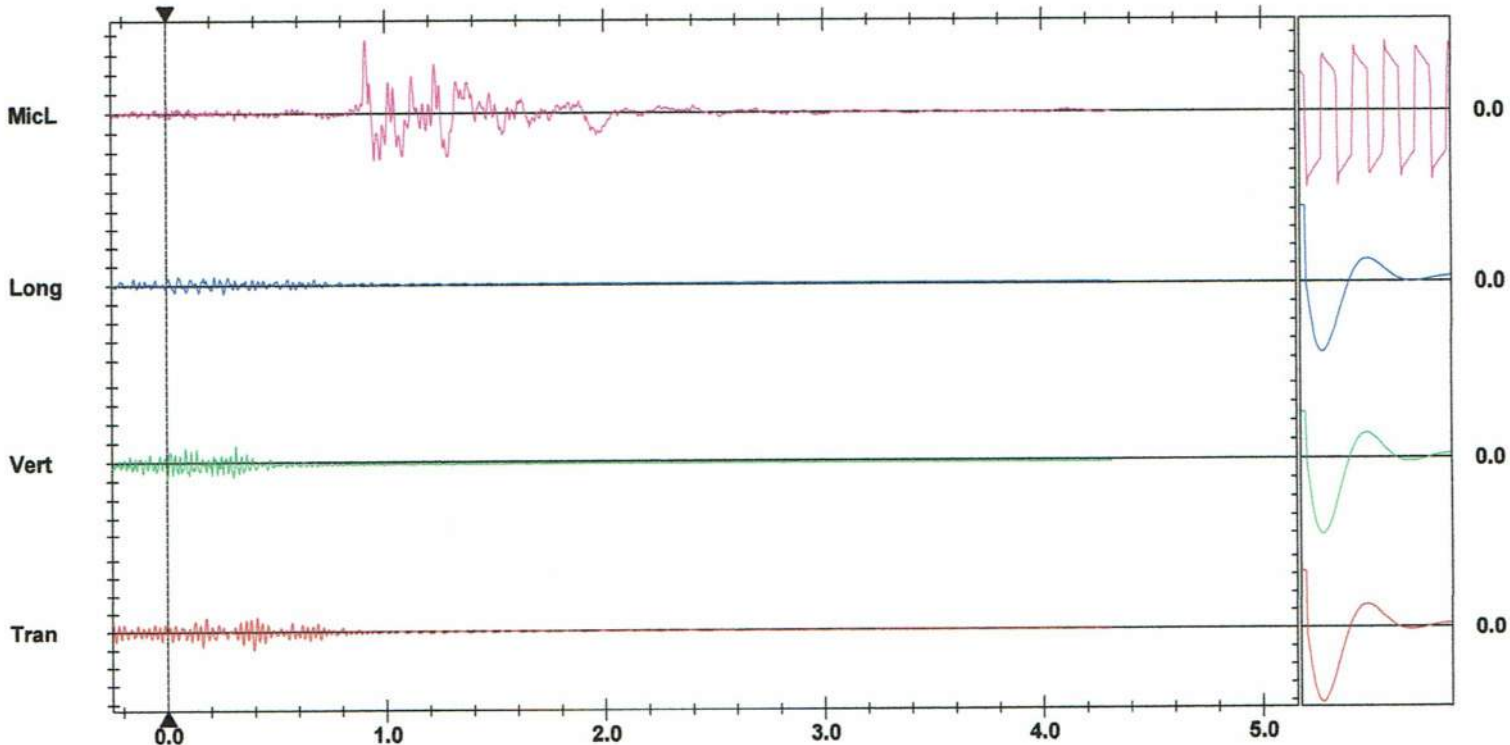
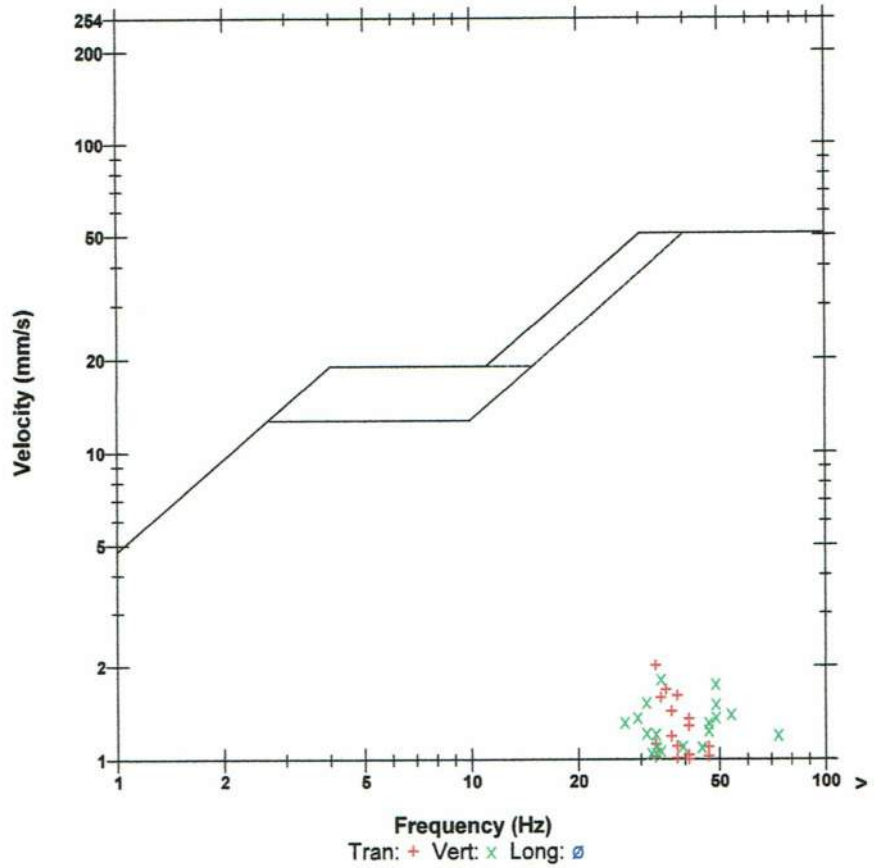
Location: Erie Peat Road North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 111.5 dB(L) at 0.912 sec
ZC Freq 6.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1216 mv)

	Tran	Vert	Long	
PPV	2.018	1.821	0.946	mm/s
ZC Freq	33	34	20	Hz
Time (Rel. to Trig)	0.395	0.002	0.055	sec
Peak Acceleration	0.054	0.089	0.031	g
Peak Displacement	0.010	0.013	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.3	3.2	3.2	

Peak Vector Sum 2.116 mm/s at 0.395 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger = [Trigger Symbol]

Sensor Check



Blast Design

Waterford

Quarry: Laws - Middle Lift
 P.O. #:
 Design Date: 2018-08-10

Blast Number: 18-021
 Orica Order #:

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Middle Bench (Bench / Face)

GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: 19,255 te
 Total Holes Loaded: 61 holes
 ... including: Dead Holes
 ... and: 3 Helper Holes
 Helper Hole Collar: 20.0 ft avg
 # Rows Blasted: 4 rows

- Drilling Information -

Primary Bit diam: 101.6 mm 0° # Holes: 61 = 1,627.5 ft (4 " diam)
 Secondary Bit diam: mm 0° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm 0° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: 13.0 ft avg
 Spacing: 13.0 ft avg
 # Holes: 22 front row

- Design Pattern (Main Body) -

Burden: 13.0 ft avg
 Spacing: 13.0 ft avg
 # Holes: 39 main body

Bench Height: 26.7 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 26.7 ft avg

- Design Stone Decking -

Front Row: 0.0 ft avg

Main Body: 0.0 ft avg

- Design Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: .75" Stone

- Design Charge Length -

Front Row: 19.7 ft avg

Main Body: 19.7 ft avg

- Design Charge Weight -

Front Row: 57.4 kg/hole

Main Body: 57.4 kg/hole

Max Chge Wt / delay: 70.0 kg/delay

Required kg Loaded: 4,421 kg

Rock Density: 2.60 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.230 kg/te (actual)

Front row: 0.173 kg/te (theoretical)

Main Body: 0.173 kg/te (theoretical)

"KPI" PF: 0.173 kg/te (theoretical)

0.758 lb/yd³

0.758 lb/yd³

0.758 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast.

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,400

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	61	20.7

total explosives weight in Blast (kg): 4,421
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 9M		61

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89482"/>	<input type="text" value="79.29473"/>
Front Row Corner	<input type="text" value="42.89488"/>	<input type="text" value="79.29502"/>
Back Row Corner	<input type="text" value="42.89478"/>	<input type="text" value="79.29449"/>
Average (Centre of Blast)	<input type="text" value="42.89483"/>	<input type="text" value="79.29475"/>

(N) Radians	(W) Radians
<input type="text" value="0.748656"/>	<input type="text" value="1.383954"/>
<input type="text" value="0.748657"/>	<input type="text" value="1.383959"/>
<input type="text" value="0.748655"/>	<input type="text" value="1.383950"/>
<input type="text" value="0.748656"/>	<input type="text" value="1.383954"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="399.0"/>	m
Post Blast Data:	ppV: <input type="text" value="5.9"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.3"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="105.3"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
2nd Reading		
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="531.2"/>	m
Post Blast Data:	ppV: <input type="text" value="2.4"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.4"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="118.6"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1874.4"/>	m
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="0.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(399)^2}{30^2} \text{ kg}$$

$$= \frac{159,201}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

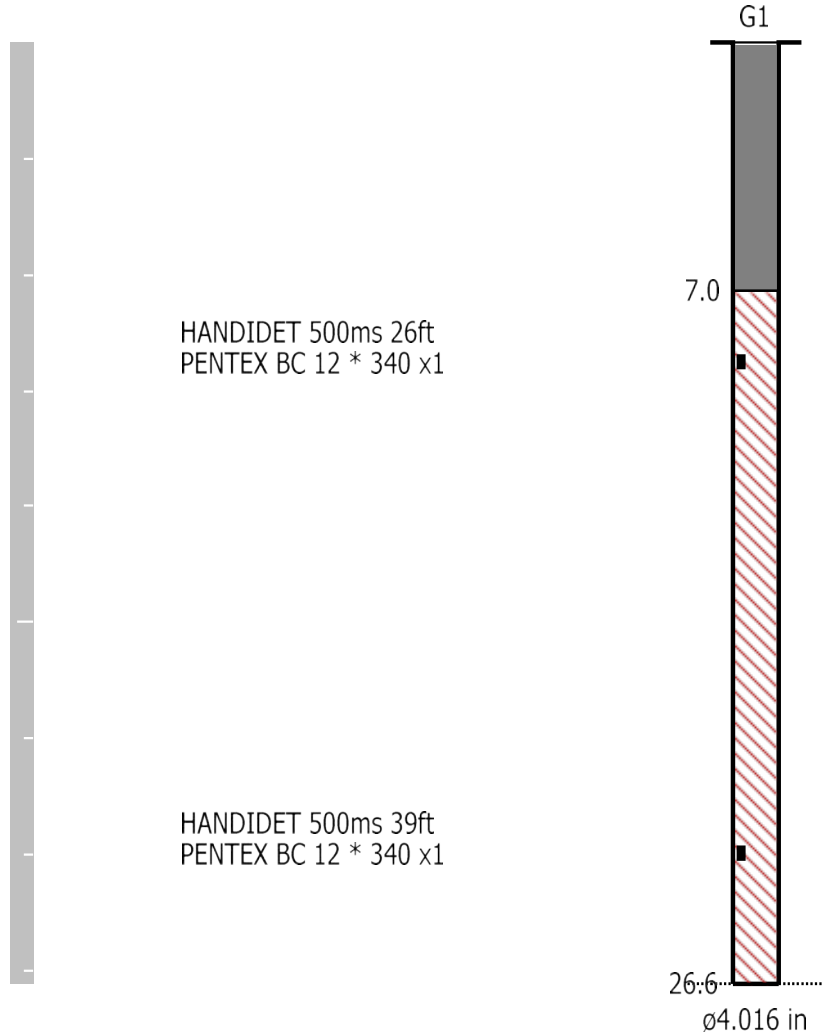
Waterford

Quarry: Laws - Middle Lift
P.O. #: S181496
Blast Date: 9/13/2018

Blast Number: 18-022
Orica Order #: 2386636

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 12:08:12 September 13, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.762 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180913120812.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

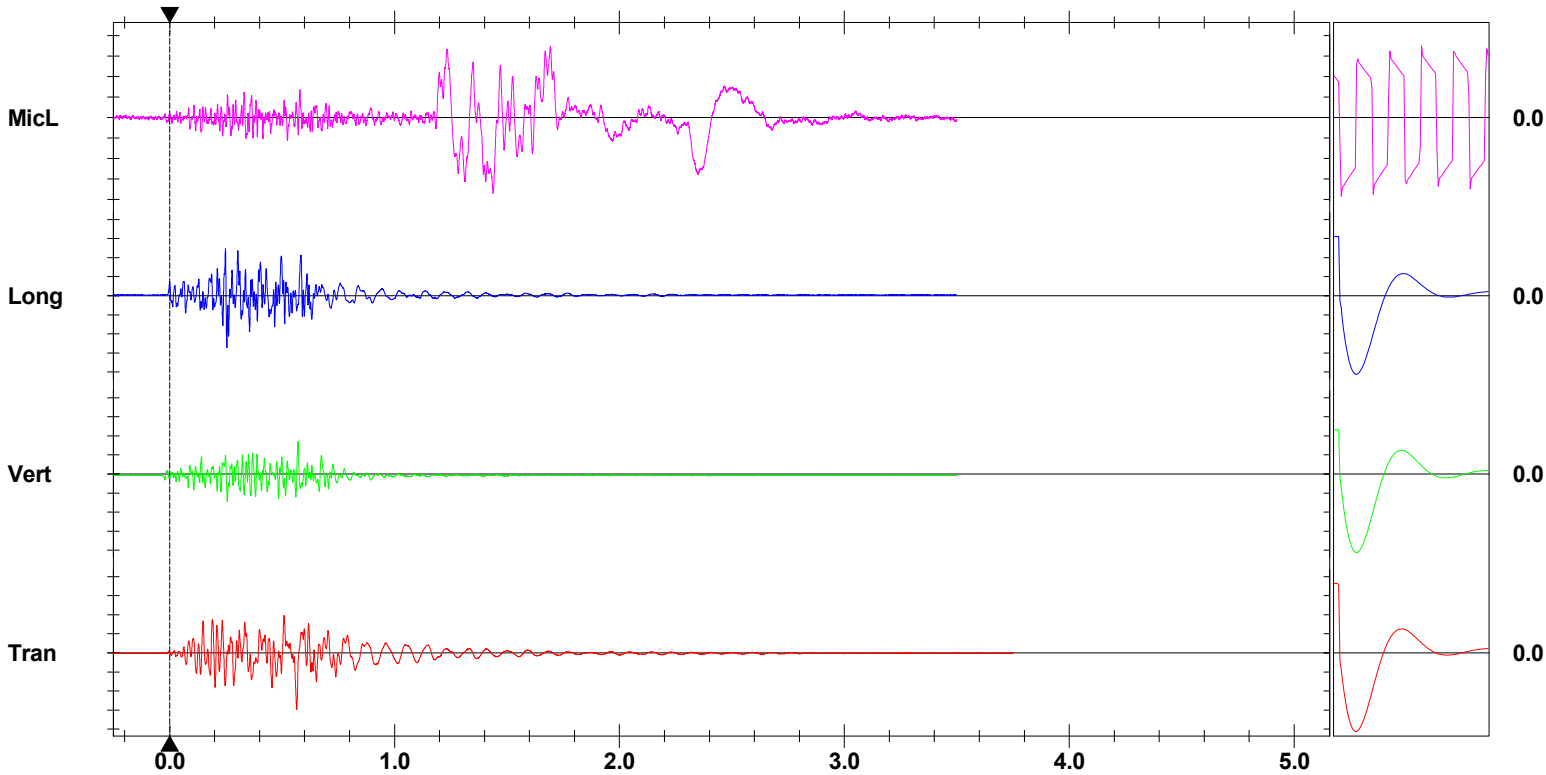
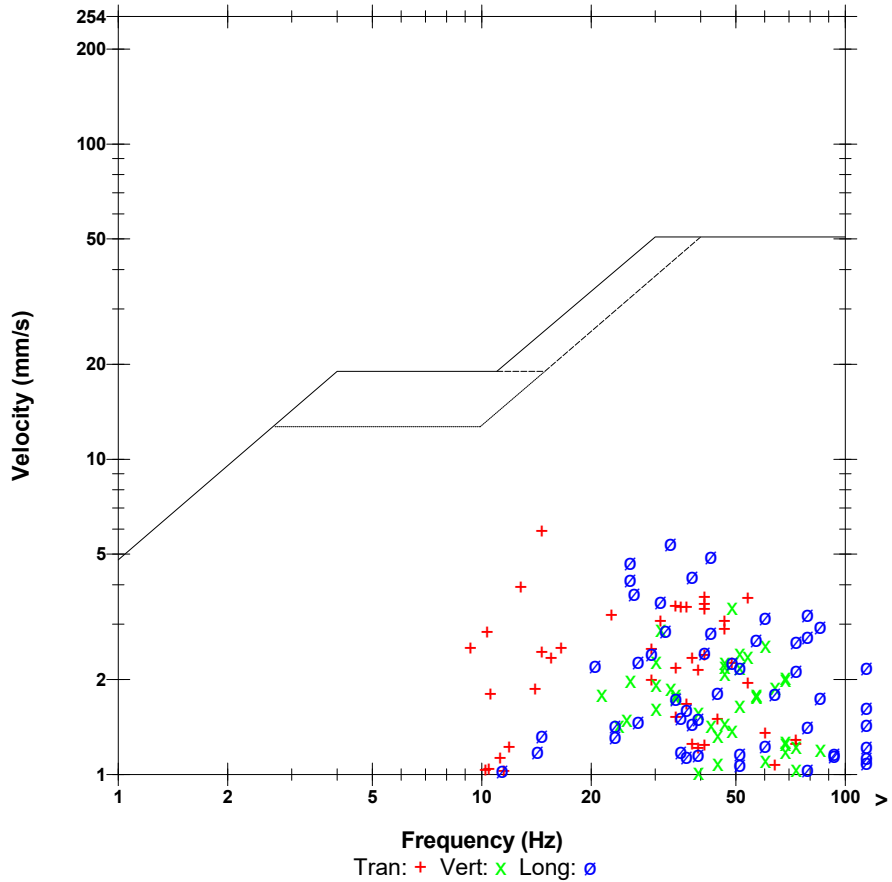
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 105.4 dB(L) at 1.438 sec
ZC Freq 6.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1195 mv)

	Tran	Vert	Long	
PPV	5.927	3.397	5.446	mm/s
ZC Freq	14.6	49	33	Hz
Time (Rel. to Trig)	0.565	0.571	0.254	sec
Peak Acceleration	0.151	0.146	0.265	g
Peak Displacement	0.033	0.019	0.021	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.3	3.5	

Peak Vector Sum 6.226 mm/s at 0.248 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 12:08:13 September 13, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration November 3, 2017 by InstanTel
File Name __TEMP.EVT
Scaled Distance 5850.2 (1850.0 m, 0.1 kg)

Notes

Location: Erie Peat Road-North of Quarry
Client: Waterford Group
User Name: Orica Canada
General: Law Crushed Stone

Extended Notes

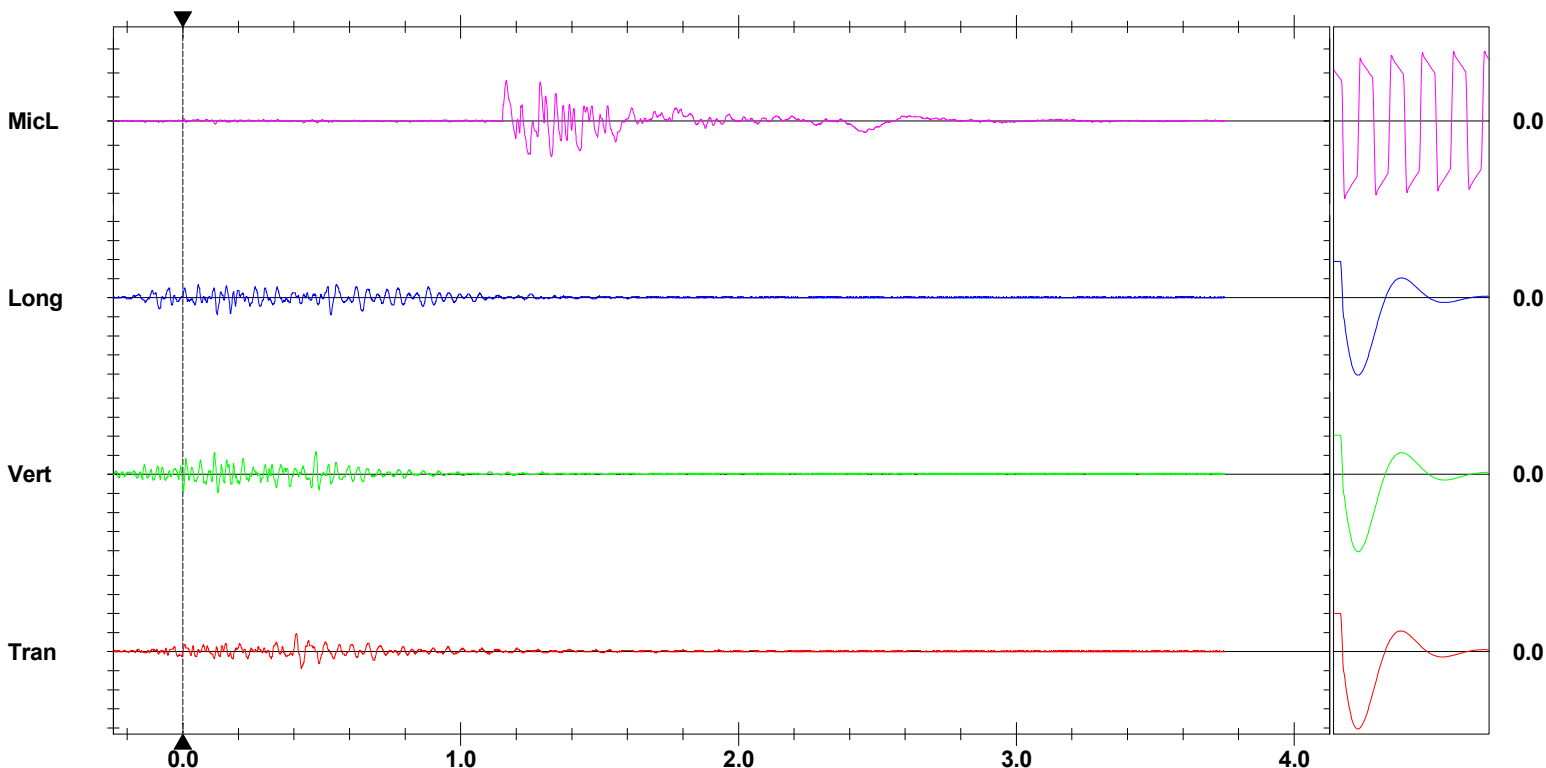
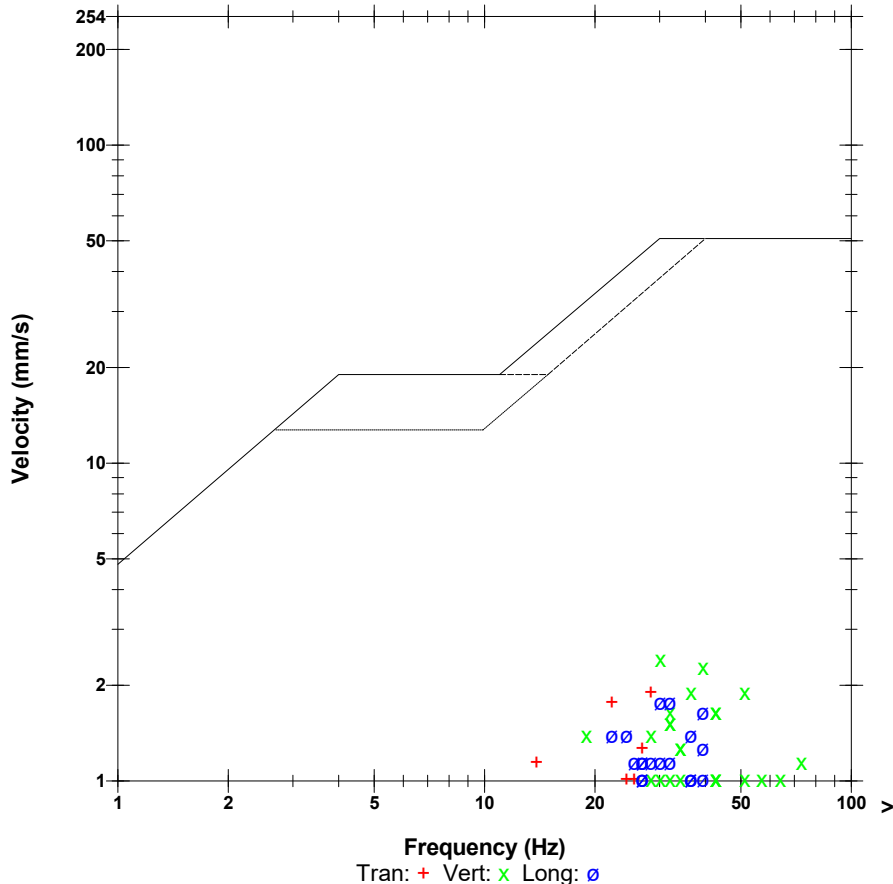
Sand Bagged

Microphone Linear Weighting
PSPL 118.6 dB(L) at 1.164 sec
ZC Freq 14 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 532 mv)

	Tran	Vert	Long	
PPV	1.905	2.413	1.778	mm/s
ZC Freq	28	30	32	Hz
Time (Rel. to Trig)	0.407	0.479	0.124	sec
Peak Acceleration	0.040	0.080	0.053	g
Peak Displacement	0.011	0.012	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

Peak Vector Sum 2.615 mm/s at 0.113 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: Laws - Middle Lift
 P.O. #:
 Design Date: 2018-09-13

Blast Number: 18-022
 Orica Order #:

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Middle Bench (Bench / Face)
 GPS Coordinates: 42.89483 °N Latitude 79.29475 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 19,553 te
 Total Holes Loaded: 60 holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 4 rows

- Drilling Information -

Angle from Vertical: 0°
 Nominal Bit Diameter: 1,571.5 ft (4 " diam)
 Primary Bit diam: 101.6 mm # Holes: 60 =
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: 13.0 ft avg
 Spacing: 13.0 ft avg
 # Holes: 18 front row

- Design Pattern (Main Body) -

Burden: 13.0 ft avg
 Spacing: 13.0 ft avg
 # Holes: 42 main body
 Bench Height: 26.2 ft avg
 Sub-drill: 0.0 ft avg
 Hole Depth: 26.2 ft avg

- Design Stone Decking -

Front Row: 0.0 ft avg
 Main Body: 0.0 ft avg

- Design Collar Stemming -

Front Row: 7.0 ft avg
 Main Body: 7.0 ft avg
 Material used: .75" Stone

- Design Charge Length -

Front Row: 19.2 ft avg
 Main Body: 19.2 ft avg

- Design Charge Weight -

Front Row: 56.0 kg/hole
 Main Body: 56.0 kg/hole
 Max Chge Wt / delay: kg/delay

Required kg Loaded: 4,041 kg
 Rock Density: 2.60 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.207 kg/te (actual)
 Front row: 0.172 kg/te (theoretical)
 Main Body: 0.172 kg/te (theoretical)
 "KPI" PF: 0.172 kg/te (theoretical)

0.753 lb/yd³
 0.753 lb/yd³
 0.753 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,000

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	120	40.8

total explosives weight in Blast (kg): 4,041
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		2
EXEL HANDIDET 9m	25/500	60
EXEL HANDIDET 12m	25 ms	60
CONNECTADET 9M	42 ms	8

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

GPS LAYOUT	Enter hours	
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	



Blast Report

DFA / DIV of CRH (Ontario)

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	<input type="text" value="42.89553"/>	<input type="text" value="79.29329"/>
Front Row Corner	<input type="text" value="42.89558"/>	<input type="text" value="79.29348"/>
Back Row Corner	<input type="text" value="42.89550"/>	<input type="text" value="79.29312"/>
Average (Centre of Blast)	<input type="text" value="42.89553"/>	<input type="text" value="79.29330"/>

(N) Radians	(W) Radians
<input type="text" value="0.748668"/>	<input type="text" value="1.383929"/>
<input type="text" value="0.748669"/>	<input type="text" value="1.383932"/>
<input type="text" value="0.748668"/>	<input type="text" value="1.383926"/>
<input type="text" value="0.748668"/>	<input type="text" value="1.383929"/>

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
2nd Reading		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="375.7"/>	m
Post Blast Data:	ppV: <input type="text" value="5.9"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.3"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="105.4"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
2nd Reading		
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="458.0"/>	m
Post Blast Data:	ppV: <input type="text" value="2.4"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="7.4"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="118.6"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>
<input type="text" value="0.748739"/>	<input type="text" value="1.383946"/>

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
2nd Reading		
Average	<input type="text" value="42.87808"/>	<input type="text" value="79.29711"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="1967.9"/>	m
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s Trigger set at: <input type="text" value="2.0"/>
	frequency: <input type="text" value="0.0"/>	Hz V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB Trigger set at: <input type="text" value="115"/>

(N) Radians	(W) Radians
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>
<input type="text" value="0.748364"/>	<input type="text" value="1.383996"/>

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(375.7)^2}{30^2} \text{ kg}$$

$$= \frac{141,150}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

jim bray

Signature required, indicating that Blast Report is Complete & Accurate.



Blast Design

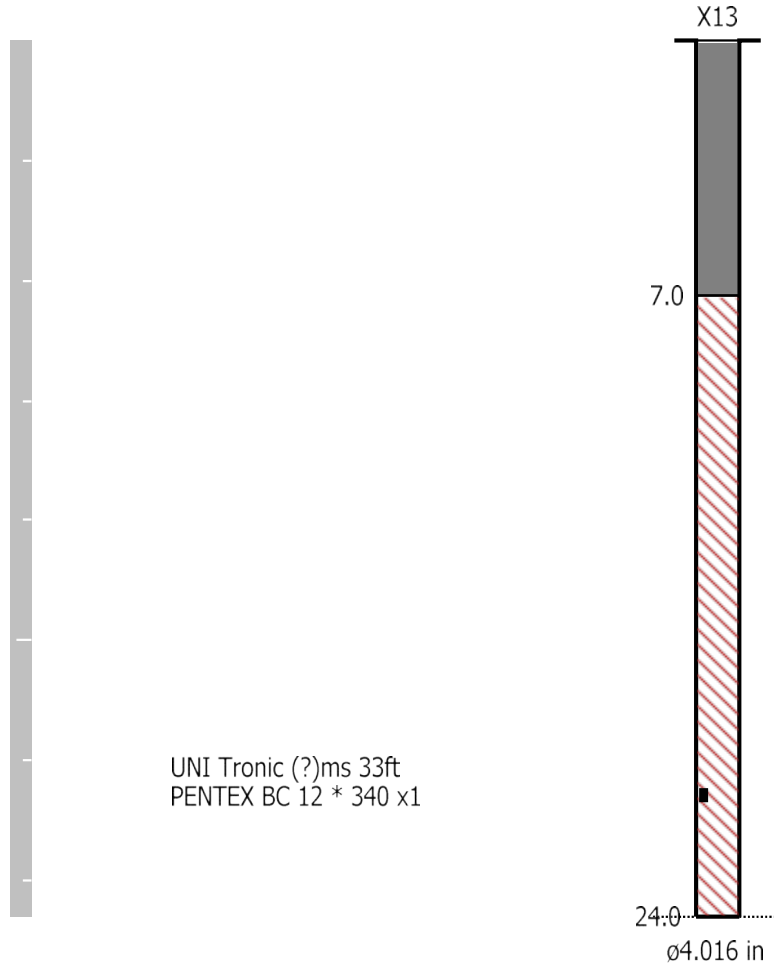
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S181496**
Blast Date: **9/13/2018**

Blast Number: **18-023**
Orica Order #: **2386636**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:08:12 September 13, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.762 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20180913120812.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

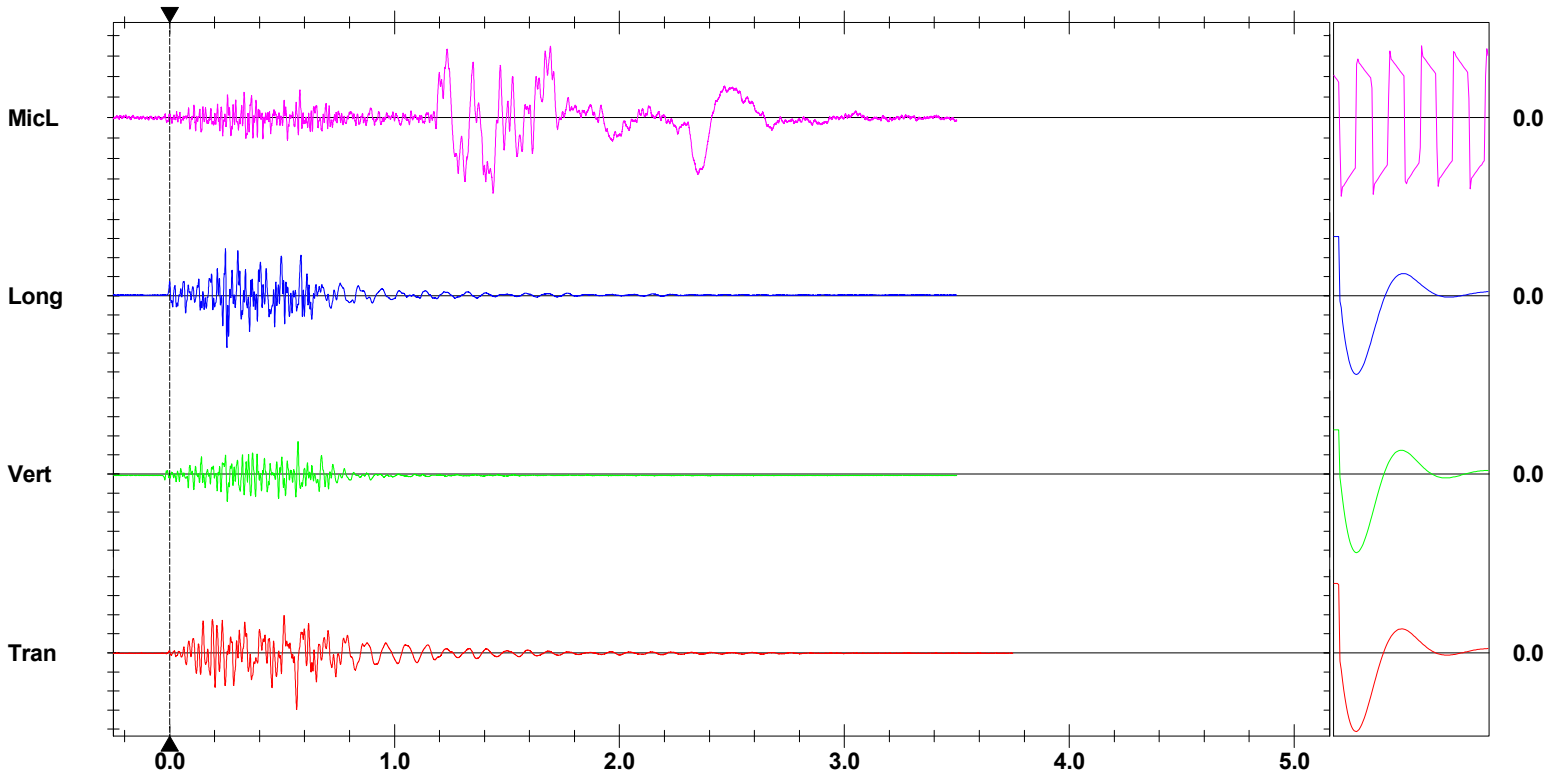
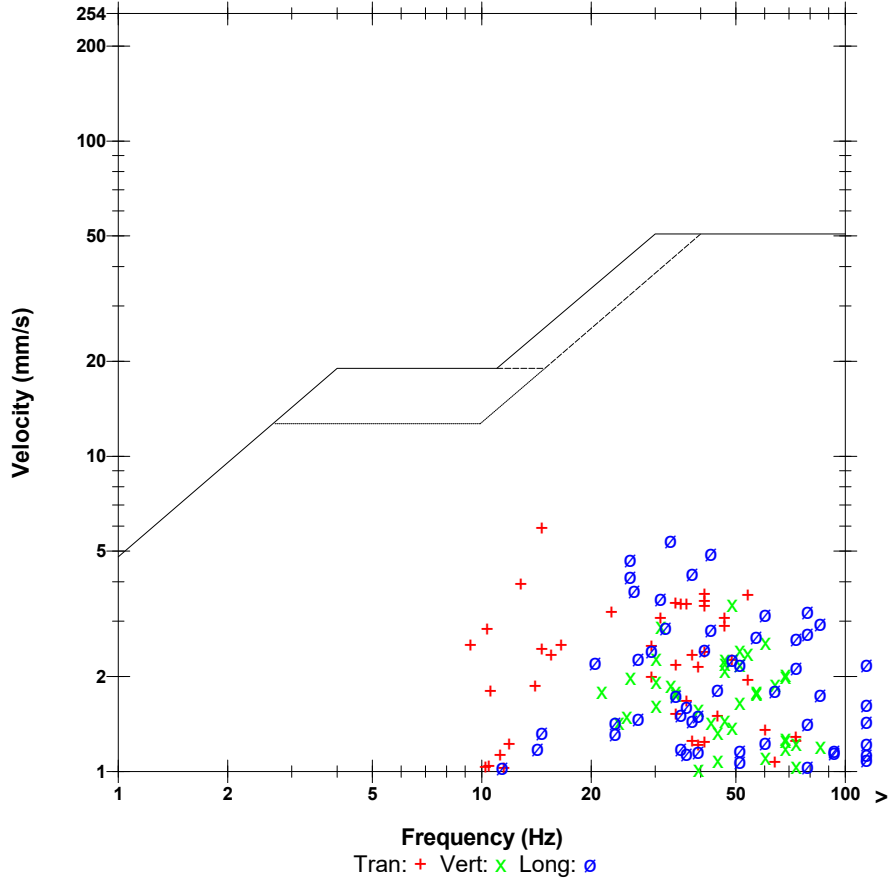
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 105.4 dB(L) at 1.438 sec
ZC Freq 6.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1195 mv)

	Tran	Vert	Long	
PPV	5.927	3.397	5.446	mm/s
ZC Freq	14.6	49	33	Hz
Time (Rel. to Trig)	0.565	0.571	0.254	sec
Peak Acceleration	0.151	0.146	0.265	g
Peak Displacement	0.033	0.019	0.021	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.3	3.5	

Peak Vector Sum 6.226 mm/s at 0.248 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Date/Time Vert at 12:08:13 September 13, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration November 3, 2017 by InstanTel
File Name __TEMP.EVT
Scaled Distance 5850.2 (1850.0 m, 0.1 kg)

Notes

Location: Erie Peat Road-North of Quarry
Client: Waterford Group
User Name: Orica Canada
General: Law Crushed Stone

Extended Notes

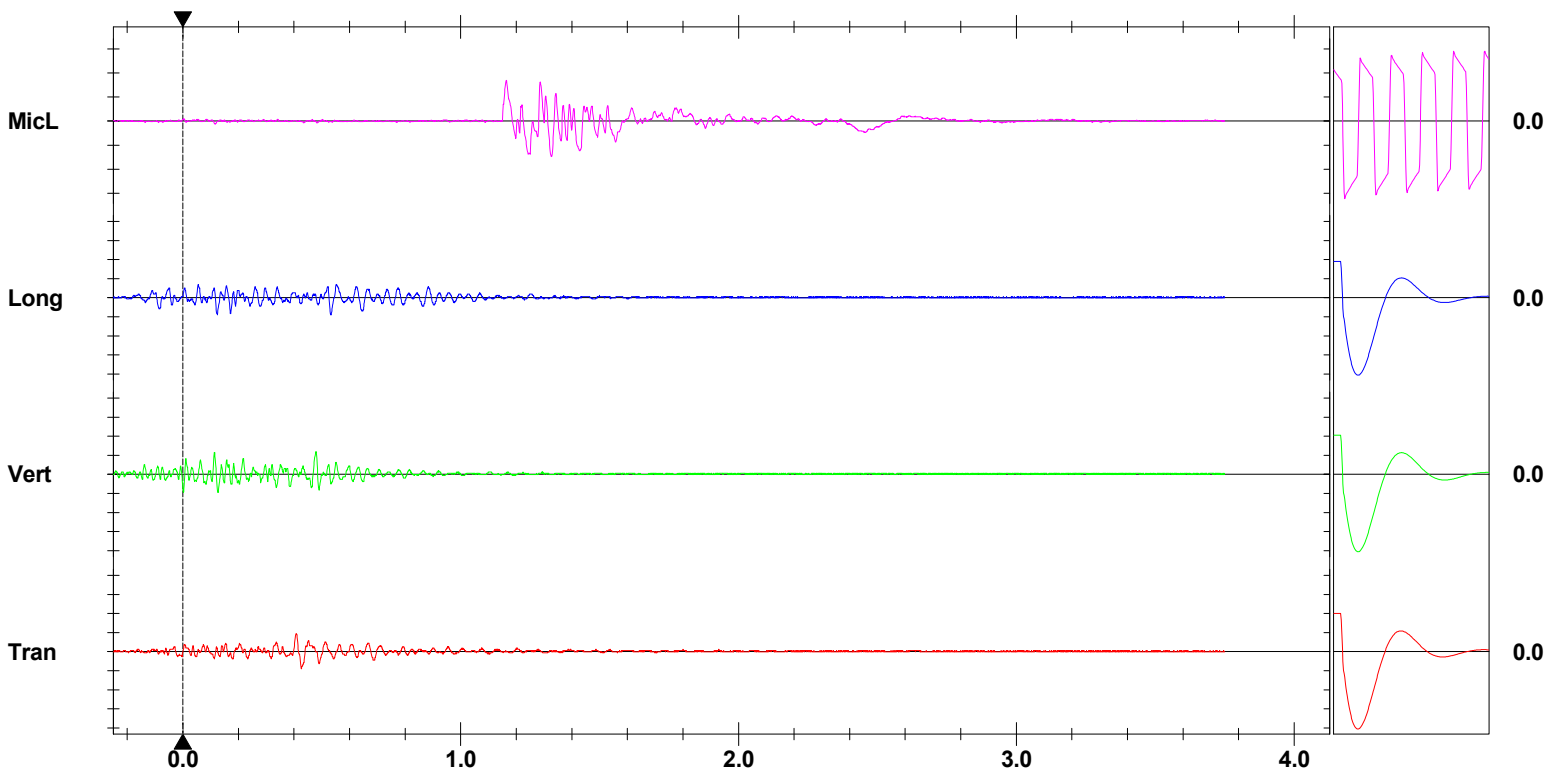
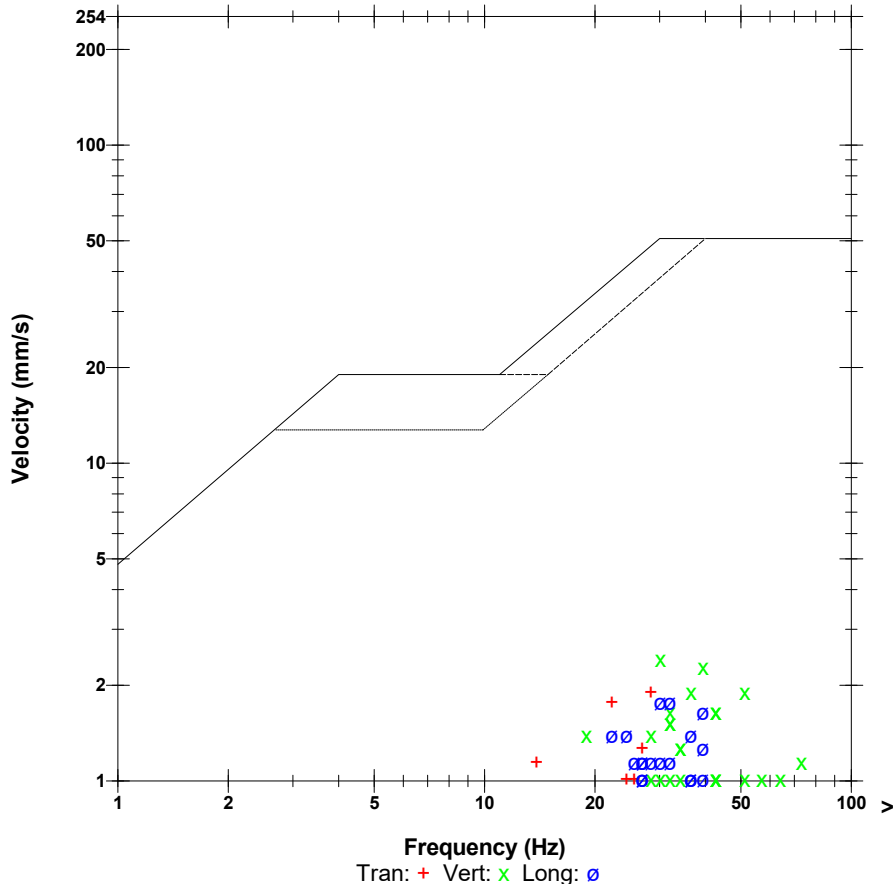
Sand Bagged

Microphone Linear Weighting
PSPL 118.6 dB(L) at 1.164 sec
ZC Freq 14 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 532 mv)

	Tran	Vert	Long	
PPV	1.905	2.413	1.778	mm/s
ZC Freq	28	30	32	Hz
Time (Rel. to Trig)	0.407	0.479	0.124	sec
Peak Acceleration	0.040	0.080	0.053	g
Peak Displacement	0.011	0.012	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

Peak Vector Sum 2.615 mm/s at 0.113 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design Waterford

Quarry: **Laws - Middle Lift**
 P.O. #:
 Design Date: **2018-09-13**

Blast Number: **18-023**
 Orica Order #:

page 1

Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89553** °N Latitude **79.29330** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **11,886** te
 Total Holes Loaded: **33** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **7.0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

		Angle from Vertical			Nominal Bit Diameter:
Primary Bit diam:	92.1 mm	0 °	# Holes:	12 =	286.9 ft (3 5/8 " diam)
Secondary Bit diam:	114.3 mm	0 °	# Holes:	21 =	502.0 ft (4 1/2 " diam)
Tertiary Bit diam:	mm	0 °	# Holes:	=	0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **12** front row

- Design Pattern (Main Body) -

Burden: **15.0** ft avg
 Spacing: **15.0** ft avg
 # Holes: **21** main body
 Bench Height: **23.9** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **23.9** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **.75** stone

- Design Charge Length -

Front Row: **16.9** ft avg
 Main Body: **15.9** ft avg

- Design Charge Weight -

Front Row: **40.5** kg/hole
 Main Body: **38.1** kg/hole
 Max Chge Wt / delay: **65.0** kg/delay

Required kg Loaded: **2,911** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.245** kg/te (actual)
 Front row: **0.136** kg/te (theoretical)
 Main Body: **0.096** kg/te (theoretical)
 "KPI" PF: **0.106** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,900

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	33	11.2

total explosives weight in Blast (kg): **2,911**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 9M		30

Cord & Access. Req'd:	U of M	# req'd
KON HARNESS WIRE (6-PACK)	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

	Enter hours	
GPS LAYOUT		0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	2
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89762"/>	<input type="text" value="79.29194"/>	0.748705	1.383905
Front Row Corner	<input type="text" value="42.89764"/>	<input type="text" value="79.26237"/>	0.748705	1.383389
Back Row Corner	<input type="text" value="42.89762"/>	<input type="text" value="79.29157"/>	0.748705	1.383899
Average (Centre of Blast)	<input type="text" value="42.89763"/>	<input type="text" value="79.28196"/>	0.748705	1.383731

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="908.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.6"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="28.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="103.6"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>	0.748739	1.383946
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>	0.748739	1.383946
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="1027.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="5.3"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="28.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="124.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd (Pipe Line)"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(908)^2}{30^2} \text{ kg} \\
 &= \frac{824,464}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design
Waterford

Quarry: Laws - Bottom Lift
P.O. #:
Blast Date: 11/28/2018

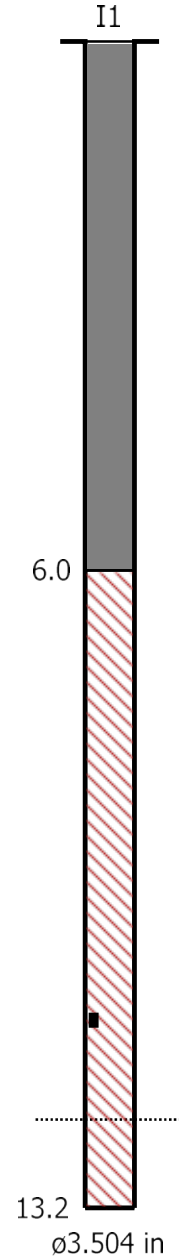
Blast Number: 18-025
Orica Order #: 2419036

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 23ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike derkinderen

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Vert at 15:06:34 December 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 10.77 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20181204150634.IDFW

Notes

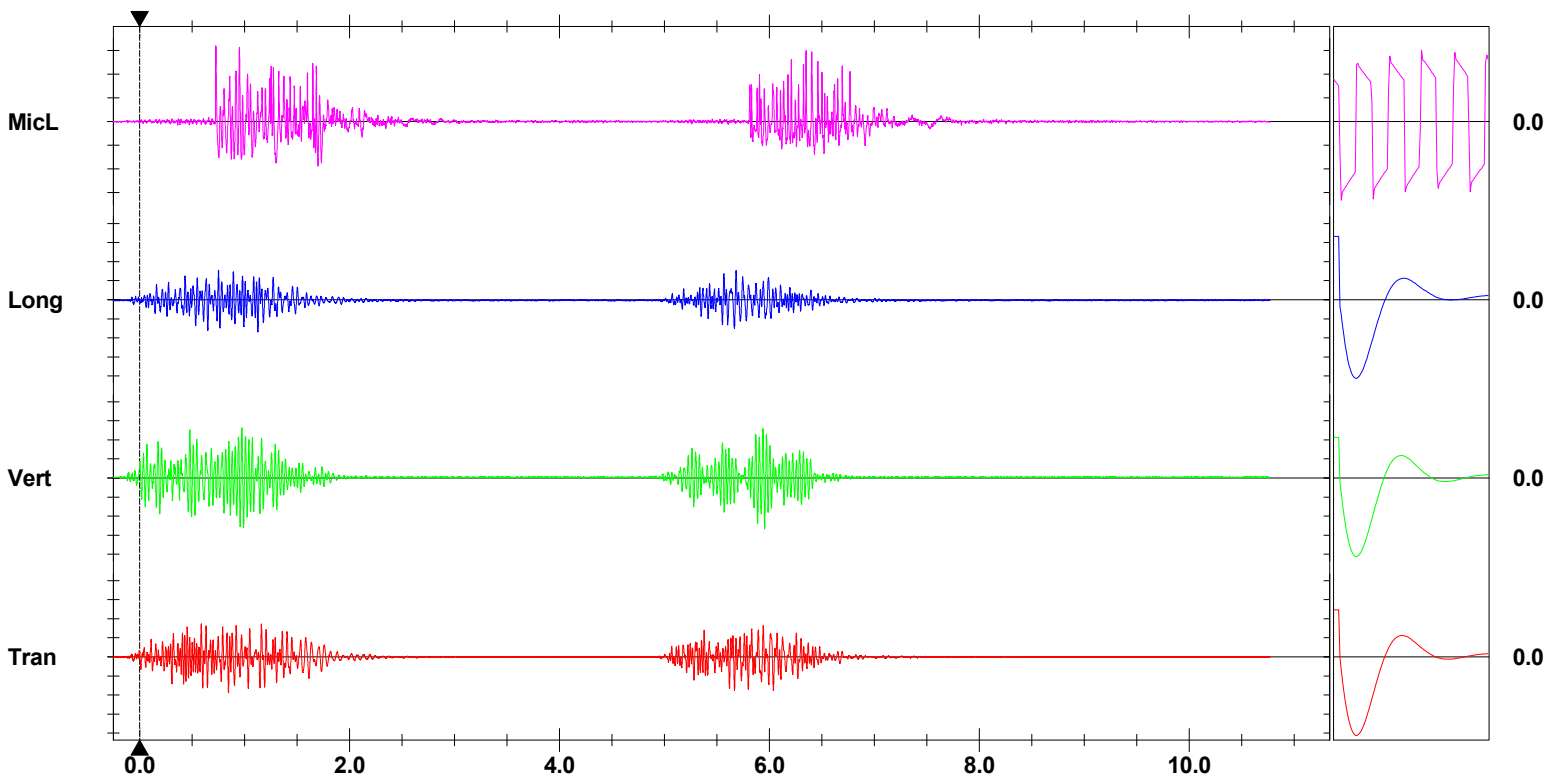
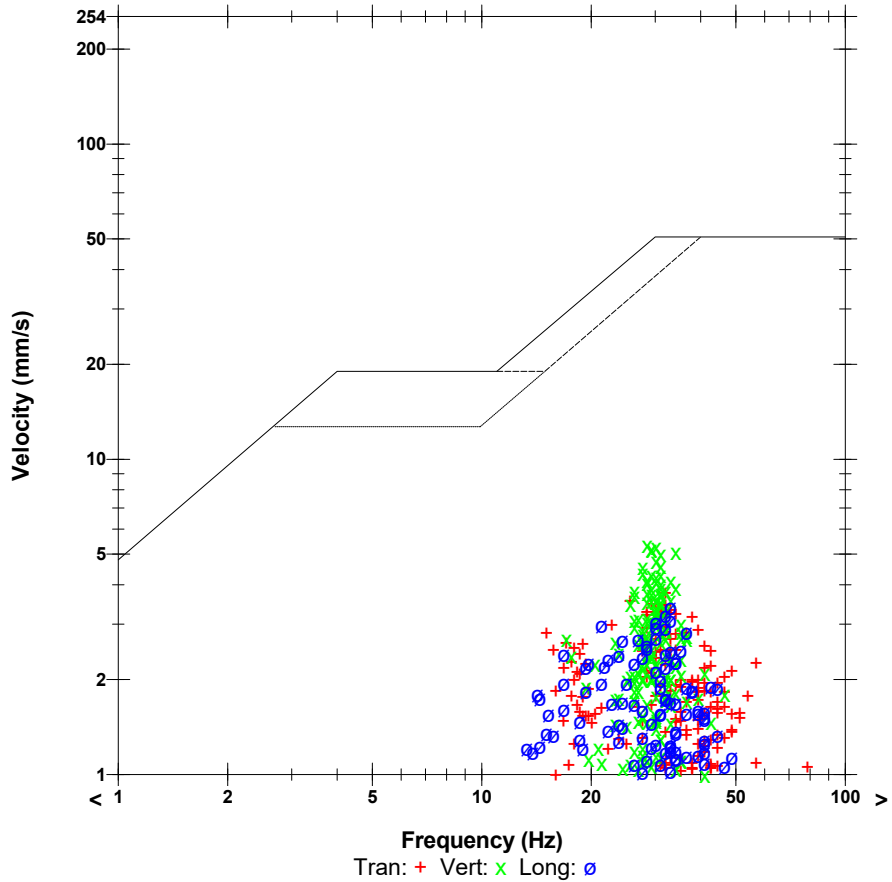
Location: Erie Peat Road North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 124.1 dB(L) at 0.727 sec
ZC Freq 32 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1670 mv)

	Tran	Vert	Long	
PPV	3.760	5.344	3.397	mm/s
ZC Freq	32	28	33	Hz
Time (Rel. to Trig)	0.847	5.955	1.127	sec
Peak Acceleration	0.123	0.156	0.122	g
Peak Displacement	0.024	0.087	0.083	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.6	

Peak Vector Sum 6.109 mm/s at 5.940 sec

USBM R18507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 15:06:39 December 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.003 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by InstanTEL
File Name UM6859_20181204150639.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

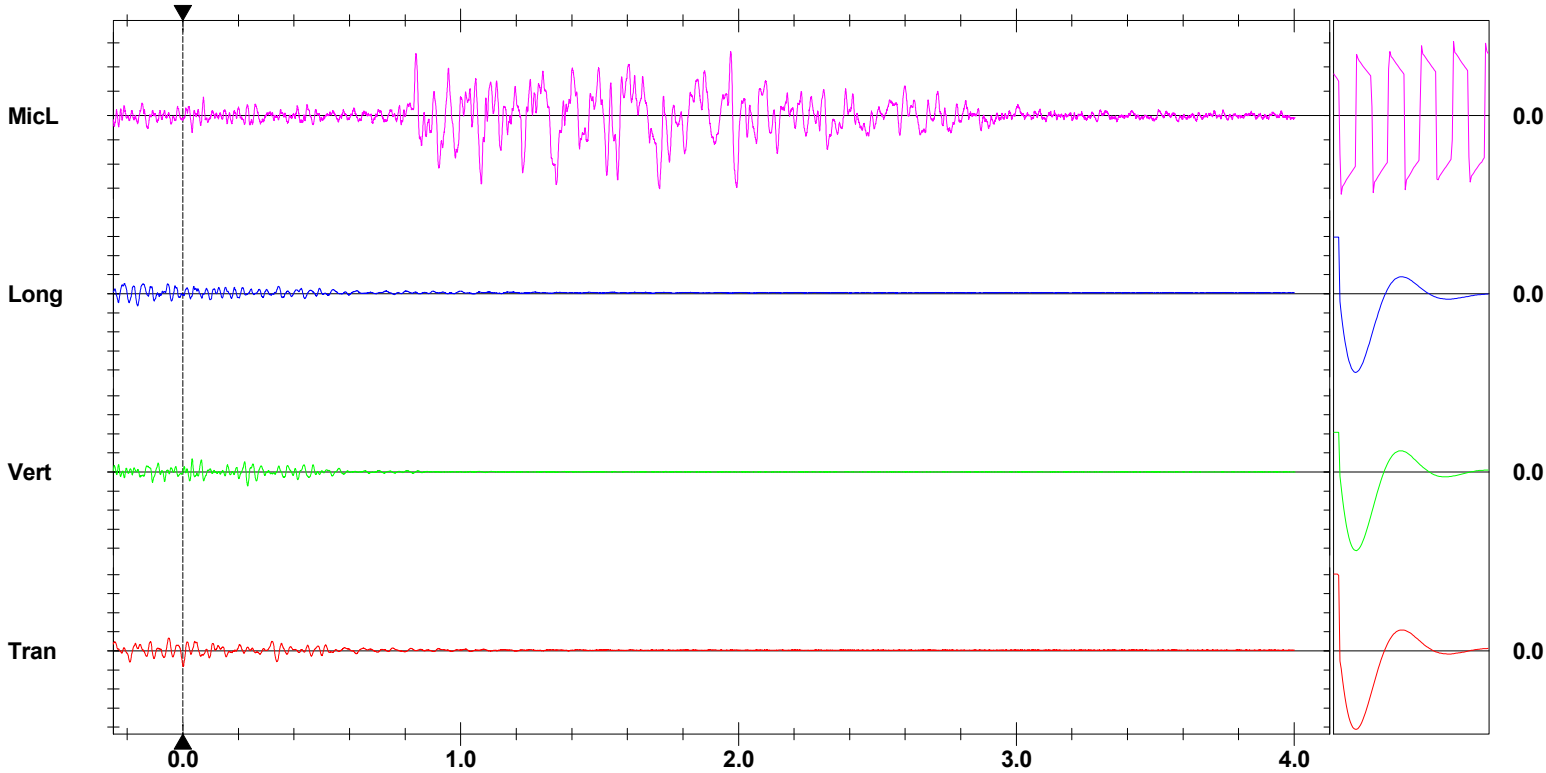
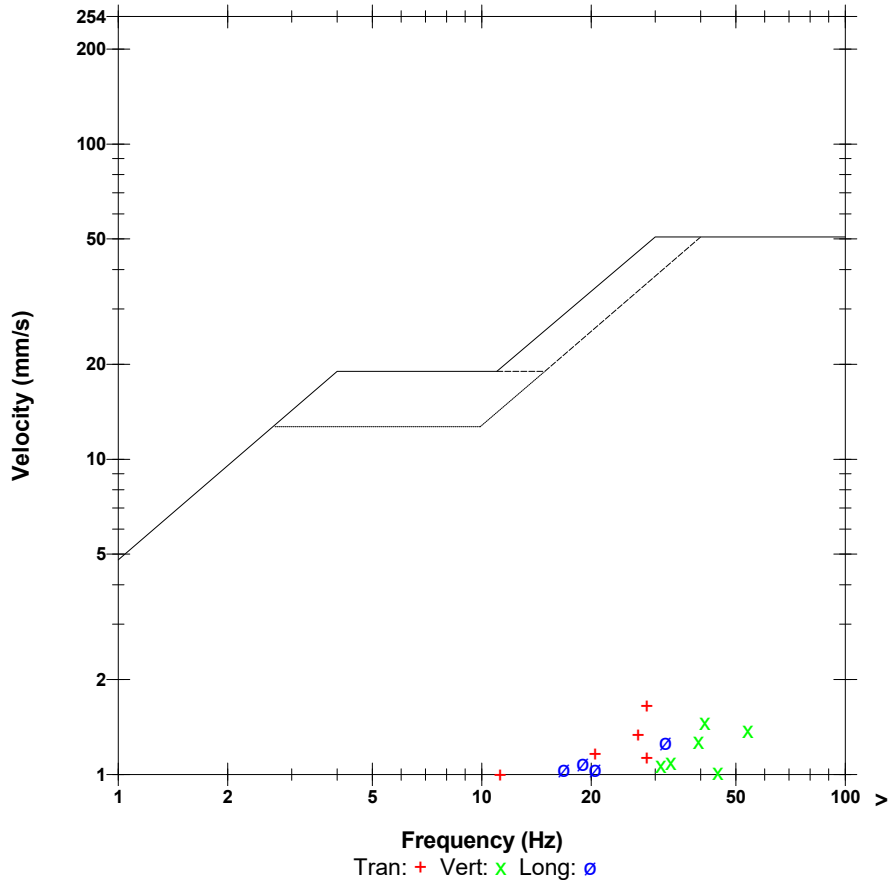
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 103.6 dB(L) at 1.716 sec
ZC Freq 9.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1654 mv)

	Tran	Vert	Long	
PPV	1.647	1.466	1.269	mm/s
ZC Freq	28	41	32	Hz
Time (Rel. to Trig)	0.001	0.233	-0.163	sec
Peak Acceleration	0.036	0.061	0.046	g
Peak Displacement	0.009	0.006	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.7	3.7	4.6	

Peak Vector Sum 1.662 mm/s at 0.001 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #:
 Design Date: **2018-11-28**

Blast Number: **18-025**
 Orica Order #:

page 1

Blaster-in-charge: **Mike derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89763** °N Latitude **79.28196** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **7,115** te
 Total Holes Loaded: **118** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **88.9** mm **0**° # Holes: **118** = 1,510.0 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **27** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **91** main body
 Bench Height: **12.8** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **12.8** ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **6.8** ft avg
 Main Body: **6.8** ft avg

- Design Charge Weight -

Front Row: **15.2** kg/hole
 Main Body: **15.2** kg/hole
 Max Chge Wt / delay: **23.0** kg/delay

Required kg Loaded: **2,969** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.417** kg/te (actual)
 1.103 lb/yd³ Front row: **0.252** kg/te (theoretical)
 1.103 lb/yd³ Main Body: **0.252** kg/te (theoretical)
 1.103 lb/yd³ "KPI" PF: **0.252** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

533 CLARENSE ST

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,929

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	118	40.1

total explosives weight in Blast (kg): **2,969**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m		118
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	42 ms	16

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	1
# of Blasters (this Blast)	Enter #
# of Helpers (this Blast)	Enter #
# of MMU's (this Blast)	Enter #

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89739"/>	<input type="text" value="79.29283"/>	0.748701	1.383921
Front Row Corner	<input type="text" value="42.89746"/>	<input type="text" value="79.29238"/>	0.748702	1.383913
Back Row Corner	<input type="text" value="42.89725"/>	<input type="text" value="79.29335"/>	0.748698	1.383930
Average (Centre of Blast)	<input type="text" value="42.89737"/>	<input type="text" value="79.29285"/>	0.748700	1.383921

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>		
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="546.4"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.6"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="28.0"/>	Hz	V / T / L : <input type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="103.6"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>	0.748739	1.383946
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>		
Average	<input type="text" value="42.89959"/>	<input type="text" value="79.29427"/>	0.748739	1.383946
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="272.8"/>	m		
Post Blast Data:	ppV: <input type="text" value="5.3"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="28.0"/>	Hz	V / T / L : <input type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="124.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd (Pipe Line)"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value=""/>	<input type="text" value=""/>		
2nd Reading	<input type="text" value=""/>	<input type="text" value=""/>		
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(272.8)^2}{30^2} \text{ kg} \\
 &= \frac{74,420}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

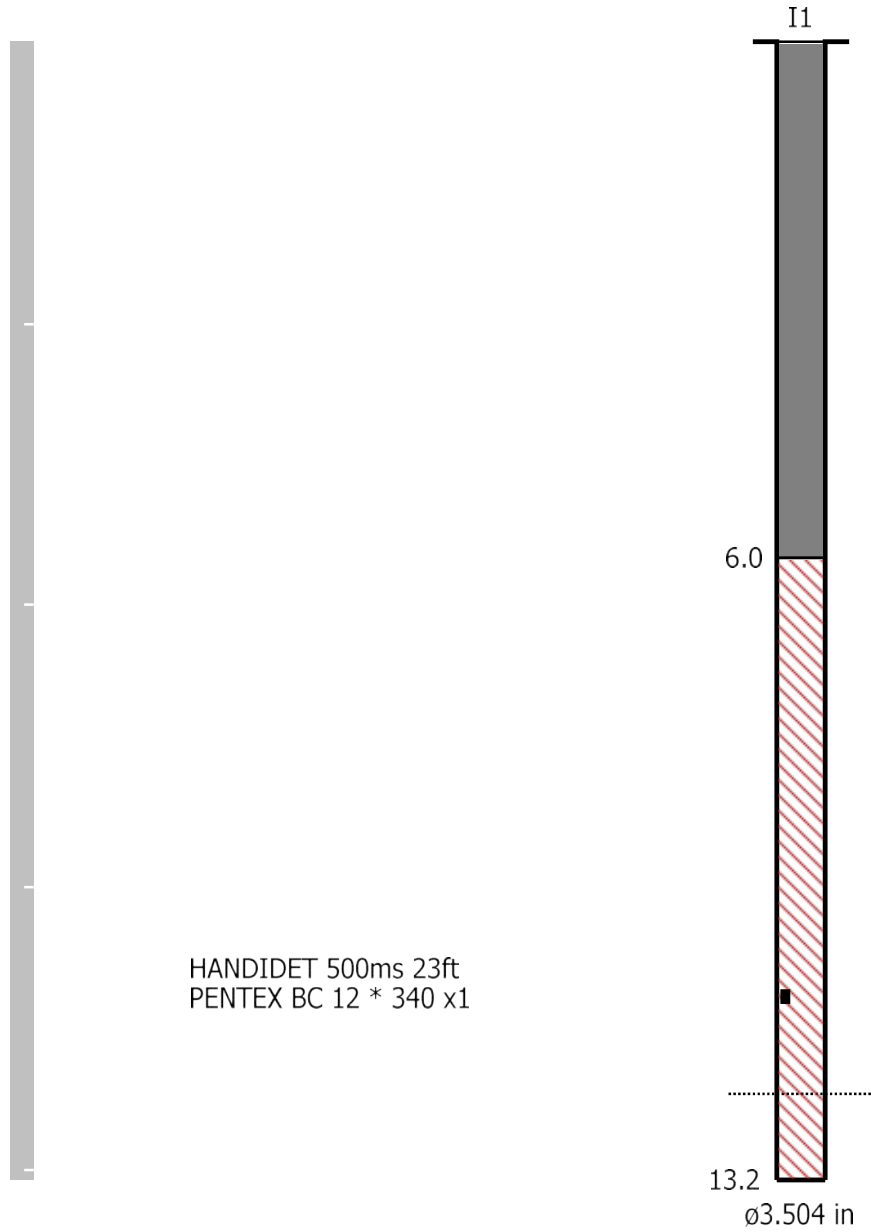
Waterford

Quarry: Laws - Bottom Lift
P.O. #:
Blast Date: 11/28/2018

Blast Number: 18-026
Orica Order #: 2419036

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike derkinderen

Quarry Manager:

Signature required, indicating
sign off on Blast Design.

Date/Time Vert at 15:06:34 December 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 10.77 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name UM6857_20181204150634.IDFW

Notes

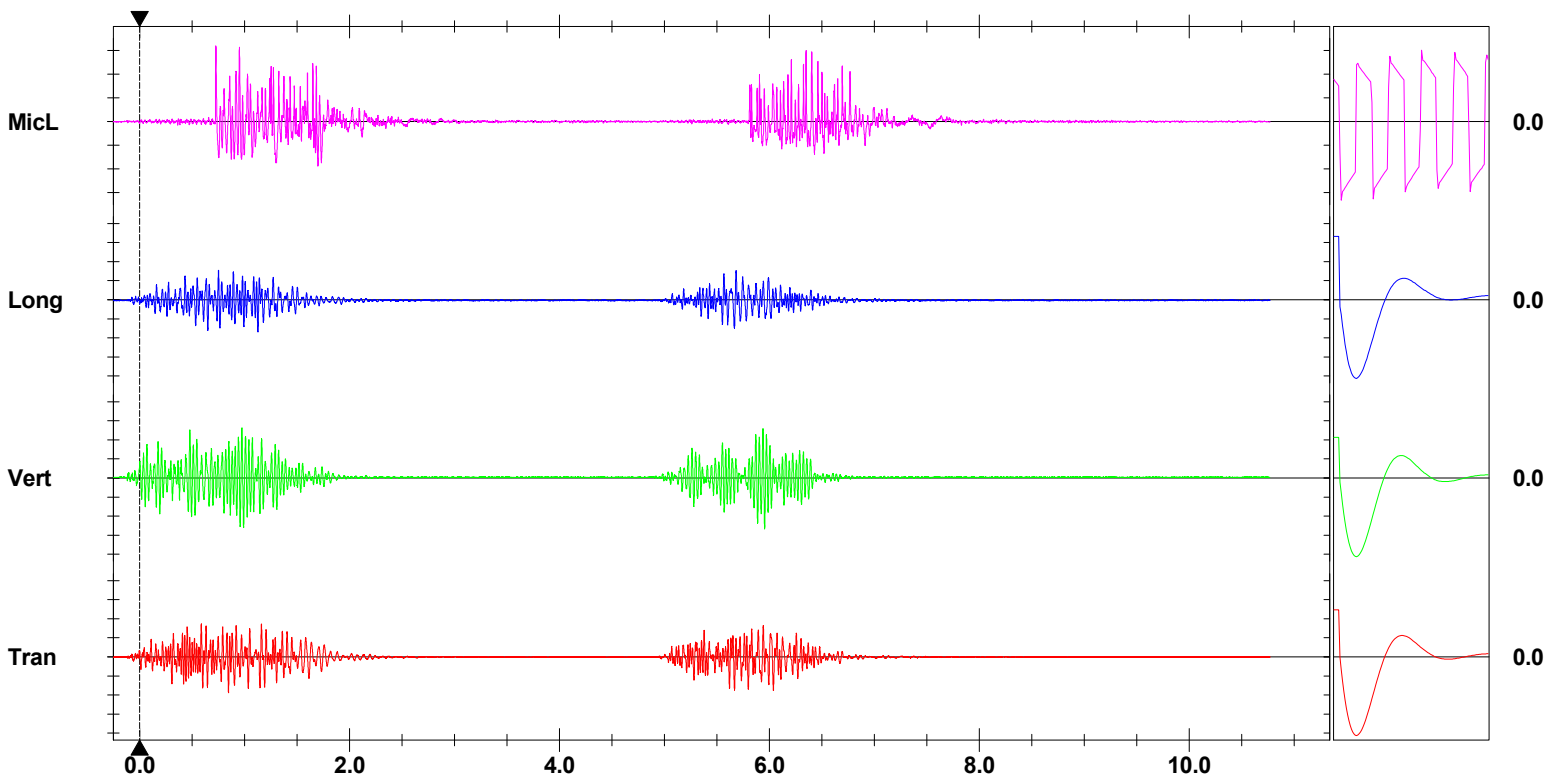
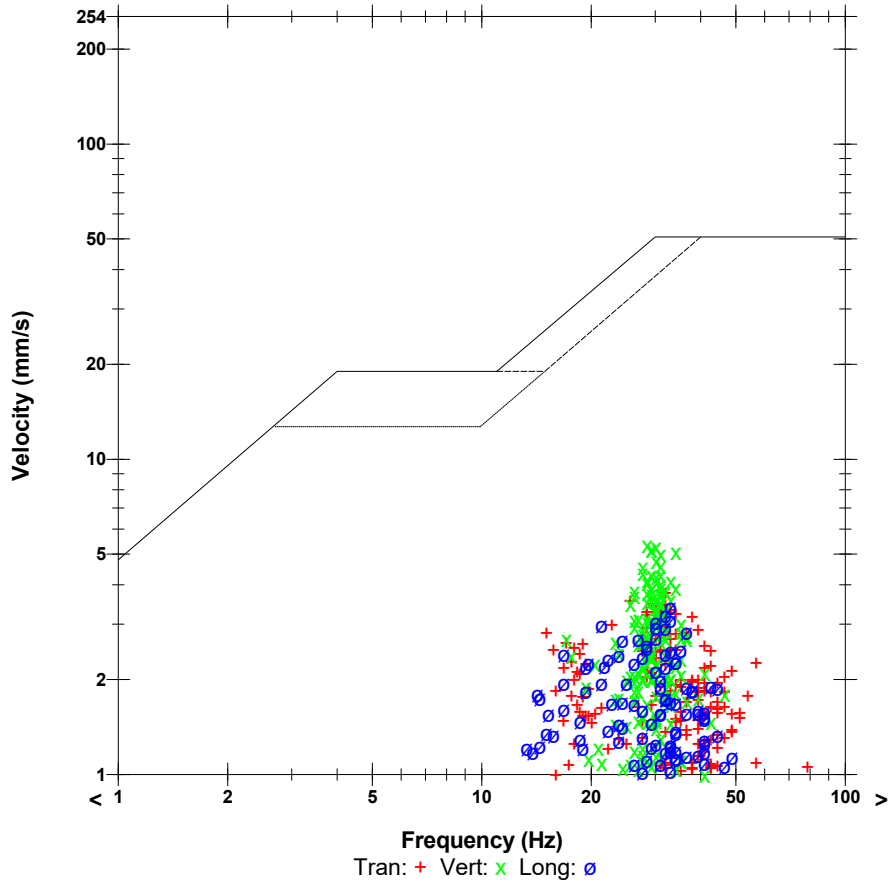
Location: Erie Peat Road North
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Microphone Linear Weighting
PSPL 124.1 dB(L) at 0.727 sec
ZC Freq 32 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1670 mv)

	Tran	Vert	Long	
PPV	3.760	5.344	3.397	mm/s
ZC Freq	32	28	33	Hz
Time (Rel. to Trig)	0.847	5.955	1.127	sec
Peak Acceleration	0.123	0.156	0.122	g
Peak Displacement	0.024	0.087	0.083	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.6	

Peak Vector Sum 6.109 mm/s at 5.940 sec

USBM R18507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 15:06:39 December 4, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.003 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Laws.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by InstanTel
File Name UM6859_20181204150639.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

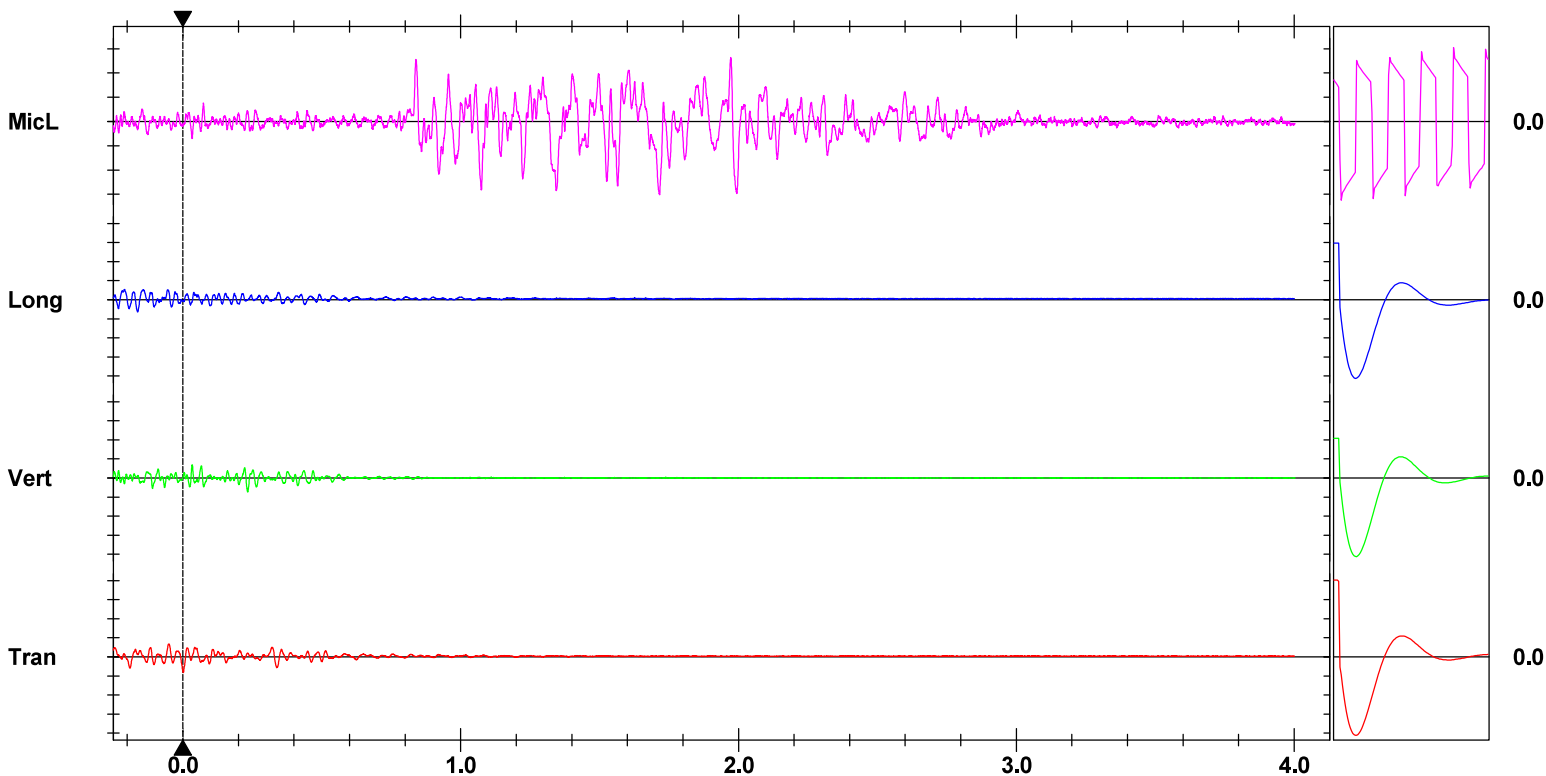
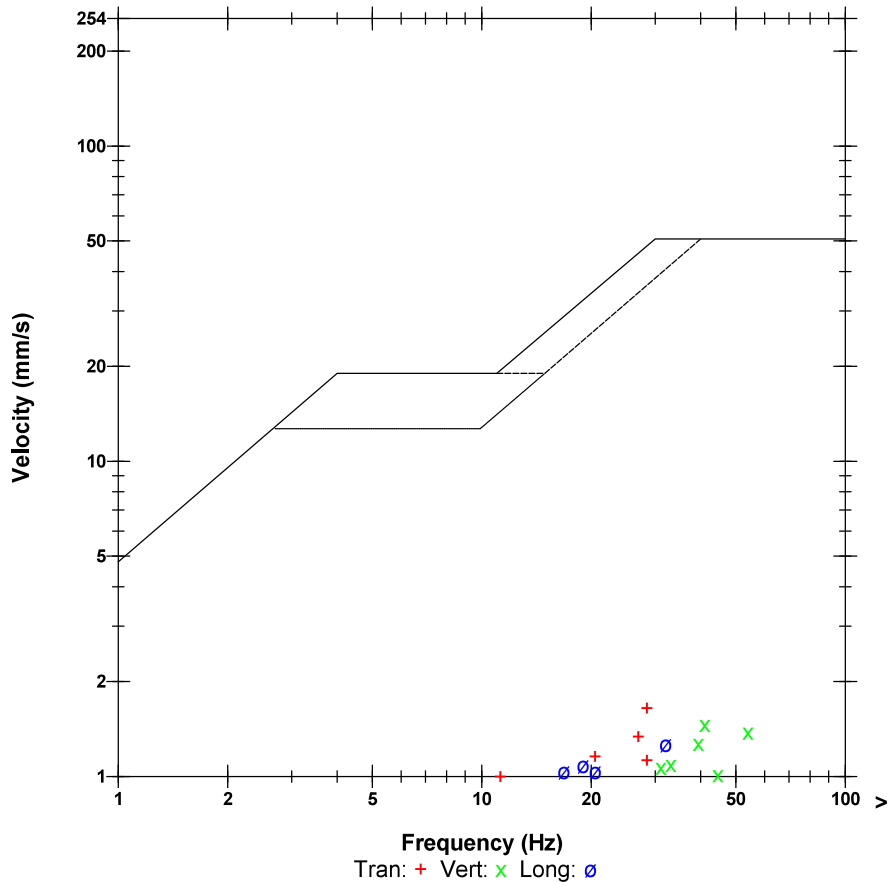
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 103.6 dB(L) at 1.716 sec
ZC Freq 9.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1654 mv)

	Tran	Vert	Long	
PPV	1.647	1.466	1.269	mm/s
ZC Freq	28	41	32	Hz
Time (Rel. to Trig)	0.001	0.233	-0.163	sec
Peak Acceleration	0.036	0.061	0.046	g
Peak Displacement	0.009	0.006	0.009	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.7	3.7	4.6	

Peak Vector Sum 1.662 mm/s at 0.001 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #:
 Design Date: **2018-11-28**

Blast Number: **18-026**
 Orica Order #:

page 1 Blaster-in-charge: **Mike derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89737** °N Latitude **79.29285** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **9,460** te
 Total Holes Loaded: **136** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **88.9** mm **0**° # Holes: **136** = 2,007.8 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **30** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: 106 main body
 Bench Height: **14.8** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **14.8** ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **8.8** ft avg
 Main Body: **8.8** ft avg

- Design Charge Weight -

Front Row: **19.6** kg/hole
 Main Body: **19.6** kg/hole
 Max Chge Wt / delay: **23.0** kg/delay

Required kg Loaded: **3,412** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.361** kg/te (actual)
 Front row: **0.281** kg/te (theoretical)
 Main Body: **0.281** kg/te (theoretical)
 "KPI" PF: **0.281** kg/te (theoretical)

1.232 lb/yd³
 1.232 lb/yd³
 1.232 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	3,366

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	136	46.2

total explosives weight in Blast (kg): **3,412**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m		136
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	42 ms	16

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Date dd/mm/yy	Blast #	# Holes	Depth (feet)	Tonnes	Seizmograph Locations	Trans.	Vert.	Long.	dB	Weather
9-Jan-19	19-001	54	23.4	16309.00	E	4.54	6.50	7.28	119.90	B
					F			No Triggers		B
10-Jan-19	19-002	126	15.5	10319.00	E	2.29	1.32	2.25	108.20	B
					C	3.21	3.82	3.38	111.90	B
25-Jan-19	19-003	52	24.3	14497.00	E	2.66	1.49	2.63	112.10	F
					F			No Triggers		F
25-Jan-19	19-004	98	15	6927.00	E	1.80	0.96	0.91	101.30	F
					F			No Triggers		F
14-Feb-19	19-005	99	15.1	7682.00	E	2.14	1.28	1.81	98.10	F
					G			No Triggers		F
14-Feb-19	19-006	40	24.2	11910.00	E	3.27	2.25	2.96	110.50	F
					G			No Triggers		F
26-Feb-19	19-007	40	25	11485.00	E	3.78	3.89	5.46	113.10	F
					G			No Triggers		F
26-Feb-19	19-008	81	14.3	5449.00	E	1.87	1.19	1.11	109.40	F
					G			No Triggers		F
1-Mar-19	19-009	98	15	6976.00	E	1.86	1.47	1.69	104.60	F
					G			No Triggers		F
6-Mar-19	19-010	125	15	8835.00	E	2.27	1.35	1.02	104.50	F
					G			No Triggers		F
6-Mar-19	19-011	48	25	13782.00	E	5.85	2.44	4.15	114.90	F
					G			No Triggers		F
6-Mar-19	19-012	25	26.2	6910.00	E	5.85	2.44	4.15	114.90	F
					G			No Triggers		F
15-Mar-19	19-013	113	15.1	10165.00	E	3.78	1.77	2.22	102.80	B
					G			No Triggers		B
15-Mar-19	19-014	98	15.1	8820.00	E	3.41	1.71	2.40	101.80	B
					G			No Triggers		B
20-Mar-19	19-015	59	25.6	17320.00	E	6.11	4.73	7.84	108.80	A
20-Mar-19	19-016	12	22	3032.00	H	3.56	1.78	1.40	108.00	A
					I			No Triggers		A
25-Mar-19	19-017	12	22	3032.00	H	1.65	1.91	3.18	117.40	A
					I			No Triggers		A
25-Mar-19	19-018	77	15.1	5482.00	E	1.58	1.24	1.55	103.20	A
					G			No Triggers		A
2-Apr-19	19-019	35	28	11256.00	E	6.86	5.64	9.06	114.90	F
					G			No Triggers		F
2-Apr-19	19-020	60	26	17900.00	E	6.86	5.64	9.06	114.90	F
					G			No Triggers		F
2-Apr-19	19-021	12	21.4	2948.00	H	1.52	1.27	2.16	113.50	F
					I			No Triggers		F
15-Apr-19	19-022	207	10.4	24528.00	E	0.09	0.10	0.07	116.60	B
					G			No Triggers		B
15-Apr-19	19-023	10	21.1	2307.00	H	1.58	1.33	1.72	110.60	J
					I			No Triggers		J
8-May-19	19-024	56	8	1126.00	E			No Triggers		F
					G			No Triggers		F
15-May-19	19-025	10	20	2297.00	H	1.52	1.52	2.41	111.20	F
					I			No Triggers		F
15-May-19	19-026	408	9.7	45272.00	E	2.41	2.41	2.03	115.70	F
					G			No Triggers		F
11-Jun-19	19-027	23	20.9	2741.00	H	2.40	1.53	2.44	109.50	A
					I	1.51	0.32	0.56	93.10	A
25-Jun-19	19-028	59	27	18296.00	E	7.84	2.70	5.19	107.50	F
					G			No Triggers		F
5-Jul-19	19-029	56	27	17676.00	E	6.01	3.47	5.75	108.00	F
					G	1.52	0.28	0.84	88.00	F
9-Aug-19	19-030	70	27	21741.00	E	7.97	3.45	5.88	113.00	F
					G			No Triggers		F
9-Aug-19	19-031	60	27	18560.00	E	7.54	3.88	8.42	112.10	F
					G			No Triggers		F
18-Sep-19	19-032	75	27	23545.00	E	6.23	3.44	6.77	108.70	F
					G			No Triggers		F
18-Sep-19	19-033	60	27	18686.00	E	6.06	4.87	9.31	106.40	F
					G			No Triggers		F
2-Oct-19	19-034	212	15.1	19063.00	E	4.03	1.91	2.90	107.80	F
					G	1.32	0.36	0.77	88.00	F
17-Oct-19	19-035	439	10	49387.00	E	1.88	1.76	2.77	126.60	K
					G	0.24	0.14	0.19	104.40	K
2-Dec-19	19-036	394	10	44104.00	C	2.83	3.19	3.97	120.10	E
					G	0.36	0.27	0.27	103.10	E
11-Dec-19	19-037	209	15	18696.00	E	2.91	1.74	2.12	106.20	E
					G			No Triggers		E

Seizomograph Location

- A=2035 Youngs Rd.
- B=Cr. of Hwy 3 and Erie Peat Rd.
- C=Erie Peat Rd. North End
- D=10423 Lakeshore Rd. McCabe Residence
- E= Erie Peat Rd.
- F=533 Clarence St. Port Colborne
- G=B/W 201 & 207 West Side Rd. Port Colborne
- H=10611 Hwy #3 on Road
- I=20804 Graybiel Rd. Wainfleet

Weather

- A= Sunny and Clear
- B= Cloudy / Overcast
- C= Cloudy / Overcast and Showers
- D=Cloudy / Heavy Snow
- E=Cloudy/Light snow
- F=Partly Cloudy
- G=Cloudy/High Clouds
- H=Cloudy/Overcast/Light Rain
- I=Hazy Hot Humid
- J=Light Rain
- K=Overcast/Low Clouds
- L=Heavy rain



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-01-09**

Blast Number: **19-001**
 Orica Order #: **2432124**
 Blast Time: **11:20 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89484** °N Latitude **79.29403** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **30** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 54 = 1,310.8 ft (4 " diam)
Secondary Bit diam: mm	0 °	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm	0 °	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,070	29,650	3,420

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	54	12.3
PENTEX 12 (OR EQUIVALENT)	0.34	54	18.4

total explosives weight in Blast (kg): **3,451**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m			54
EXEL HANDIDET 9m			54
UNITRONIC 600 6M			1
CONNECTADET 9M		25 ms	3
CONNECTADET 9M		65 ms	6

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	5.0
HELPER HOURS	Enter total Helper man-hours	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **16,309** te **6,273** m³
 Total tonnes per day: **16,309** te **LML22-14** Rate Code
 Total Holes Loaded: **54** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **13** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **41** main body

Bench Height: **24.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **24.3** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **17.3** ft avg
 Main Body: **17.3** ft avg

- Charge Weight -

Front Row: **50.4** kg/hole
 Main Body: **50.4** kg/hole
 Max. per delay: **65.0** kg/delay
 SD () Equation: **139.5** kg/delay
 Total kg Loaded: **3,451** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.212** kg/te (actual)
 Front row: **0.167** kg/te (theoretical)
 Main Body: **0.167** kg/te (theoretical)
 "KPI" PF: **0.167** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Rate code for larger tonnage due to cancelation

1 Hr Gps



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-01-09**

Blast Number: **19-001**
 Orica Order #: **2432124**
 Blast Time: **11:20 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89483	79.29401	0.748656	1.383942
Front Row Corner	42.89489	79.29429	0.748657	1.383946
Back Row Corner	42.89479	79.29377	0.748655	1.383937
Average (Centre of Blast)	42.89484	79.29403	0.748656	1.383942

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	354.3	m		
Post Blast Data:	ppV: 7.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 39.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.9	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 1.5	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.88657	79.27032	0.748512	1.383528
2nd Reading				
Average	42.88657	79.27032	0.748512	1.383528
Distance (3rd Seis. From Centre of Blast)	2141.5	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 1.5	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
533 Clarence Street, Port Colbourne				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: **30** Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(354.3)^2}{30^2} \text{ kg} \\
 &= \frac{125,528}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **139** kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

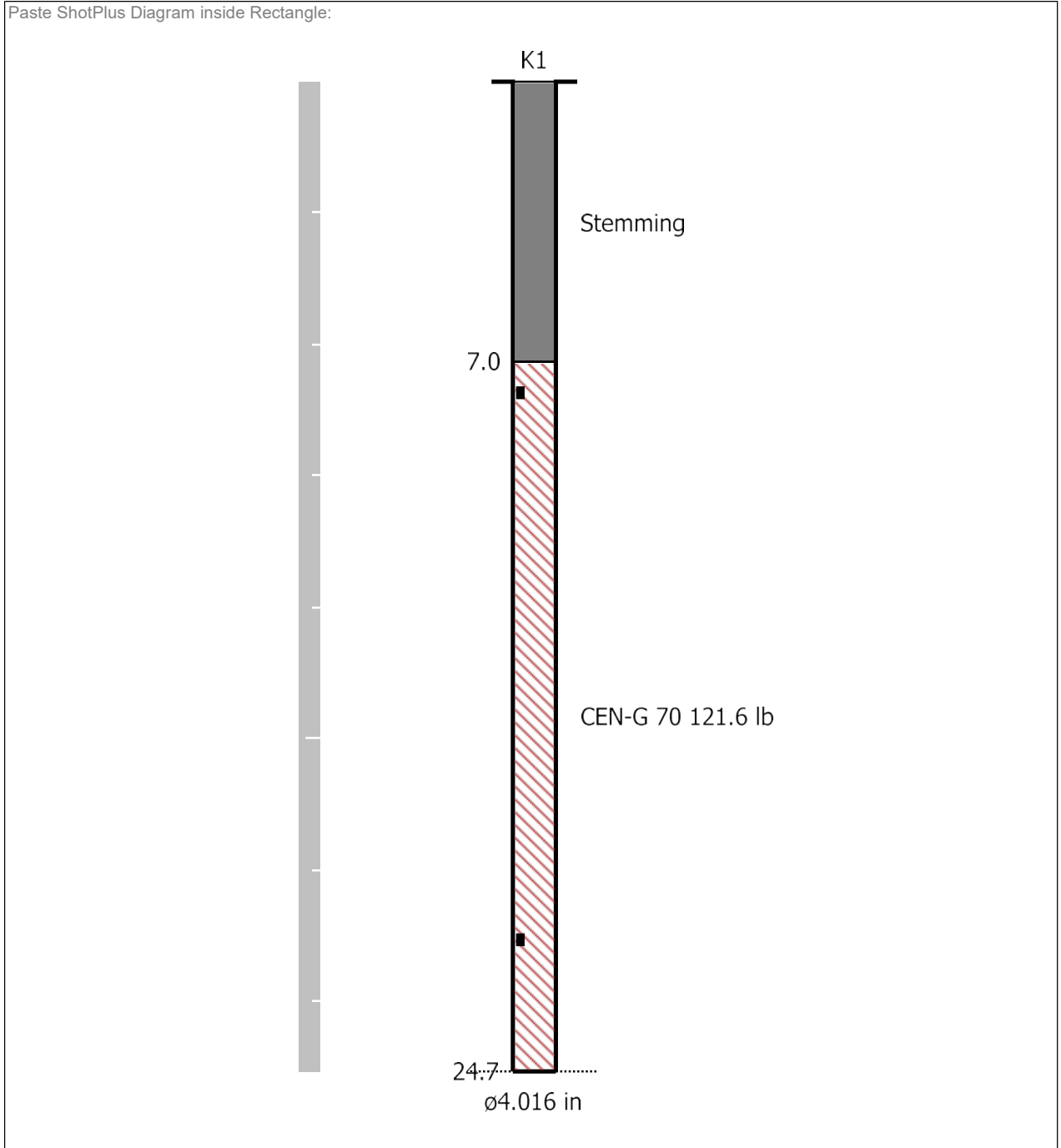
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 1/9/2019

Blast Number: 19-001
Orica Order #: 2432124

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 11:20:40 January 9, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM9119_20190109112040.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

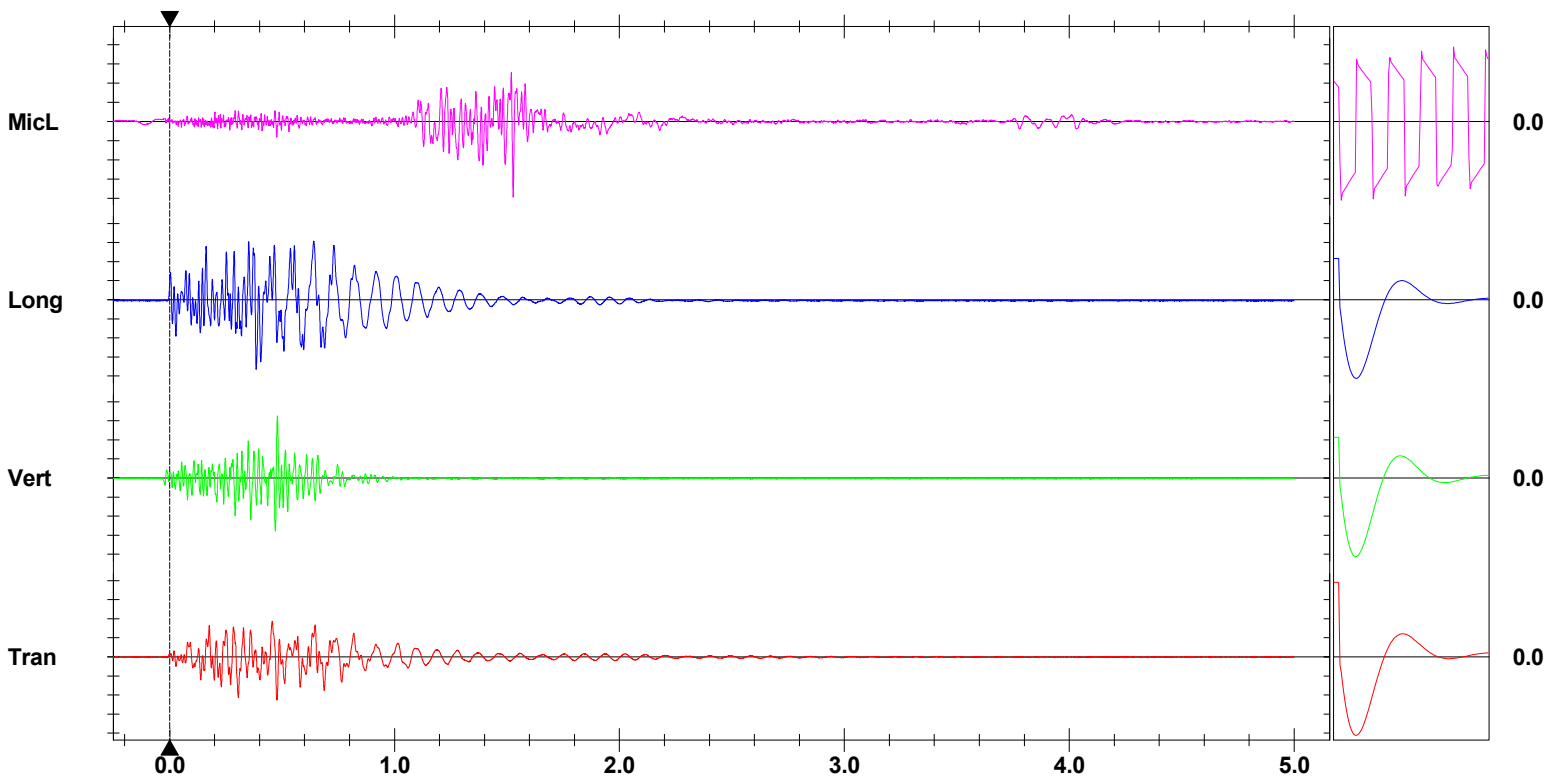
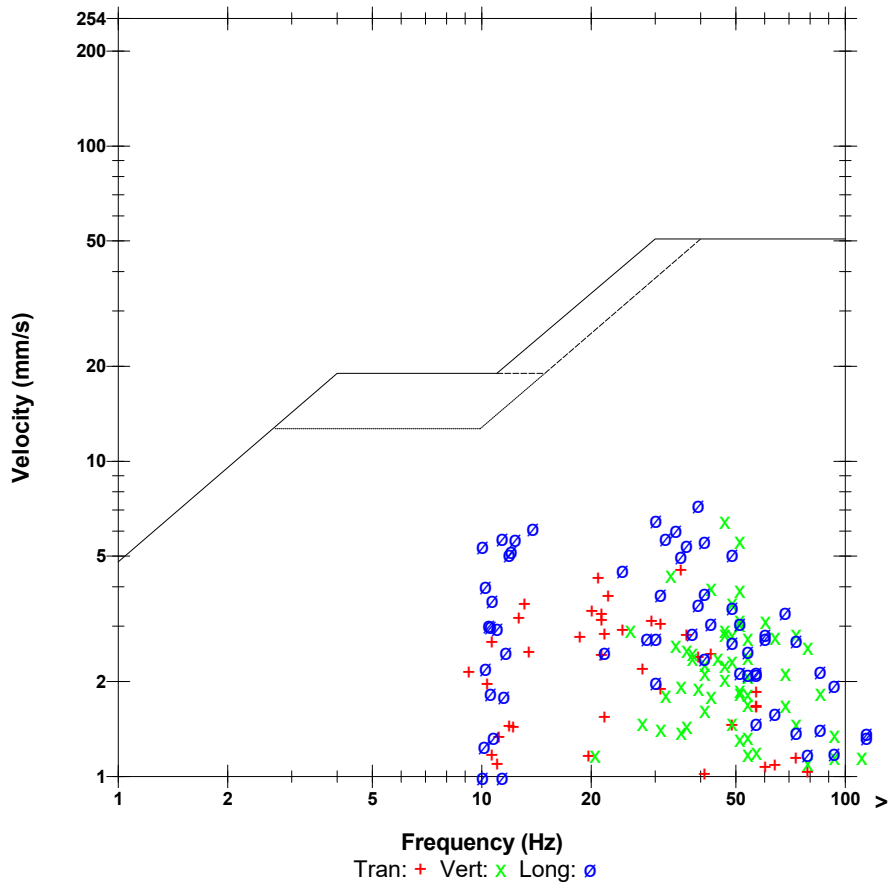
42.89269, -79.29082

Microphone Linear Weighting
PSPL 119.9 dB(L) at 1.527 sec
ZC Freq 49 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1462 mv)

	Tran	Vert	Long	
PPV	4.540	6.495	7.275	mm/s
ZC Freq	35	47	39	Hz
Time (Rel. to Trig)	0.477	0.479	0.385	sec
Peak Acceleration	0.123	0.260	0.267	g
Peak Displacement	0.031	0.023	0.065	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.1	Hz
Overswing Ratio	3.4	3.5	4.1	

Peak Vector Sum 8.777 mm/s at 0.479 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #:
Design Date: **2019-01-09**

Blast Number: **19-001**
Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89484** °N Latitude **79.29403** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **16,309** te
Total Holes Loaded: **54** holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
Primary Bit diam: **101.6** mm **0**° # Holes: **54** = 1,310.8 ft (**4** " diam)
Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
Spacing: **13.0** ft avg
Holes: **12** front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
Spacing: **13.0** ft avg
Holes: **42** main body
Bench Height: **24.3** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **24.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **17.3** ft avg
Main Body: **17.3** ft avg

- Design Charge Weight -

Front Row: **50.4** kg/hole
Main Body: **50.4** kg/hole

Max Chge Wt / delay: **58.0** kg/delay

Required kg Loaded: **3,131** kg

Rock Density: **2.60** g/cc = **te/m³**

- Design Powder Factor -

Expected Yield PF: **0.192** kg/te (actual)
Front row: **0.167** kg/te (theoretical)
Main Body: **0.167** kg/te (theoretical)
"KPI" PF: **0.167** kg/te (theoretical)

0.731 lb/yd³

0.731 lb/yd³

0.731 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

8 ounce booster as secondary primer

Bulk Expl. Required:

	kg
CENTRA GOLD 70	3,100

Pkgd Expl. Required:

	kg

Boosters Required:

	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	54	12.3
PENTEX 12 (OR EQUIVALENT)	0.34	54	18.4

total explosives weight in Blast (kg): **3,131**

Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:

	ms	# req'd
EXEL HANDIDET 7m	25/500	54
EXEL HANDIDET 9m	25/500	54
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	65 ms	10
UNITRONIC 600 6M		10

Cord & Access. Req'd:

	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-01-15**

Blast Number: **19-002**
 Orica Order #: **243574**
 Blast Time: **3:24 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89692** °N Latitude **79.29332** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **30** kph Temperature: **-1 to -5** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling **2,456** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **88.9** mm **0** # Holes: **126** = 1,946.7 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	22,100	19,410	2,690

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	126	42.8

total explosives weight in Blast (kg): **2,733**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 7m		25/500	126
EXEL HANDIDET 9m		25 ms	4
CONNECTADET 9M		33 ms	6
CONNECTADET 9M		65 ms	20

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	11.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **10,319** te **3,969** m³
 Total tonnes per day: **10,319** te **TBD** Rate Code
 Total Holes Loaded: **126** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **5** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **26** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **100** main body

Bench Height: **15.5** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.5** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **8.5** ft avg
 Main Body: **8.5** ft avg

- Charge Weight -

Front Row: **18.9** kg/hole
 Main Body: **18.9** kg/hole
 Max. per delay: **23.0** kg/delay
 SD () Equation: **104.8** kg/delay
 Total kg Loaded: **2,733** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.161 lb/yd³ Yield PF: **0.265** kg/te (actual)
 1.009 lb/yd³ Front row: **0.230** kg/te (theoretical)
 1.009 lb/yd³ Main Body: **0.230** kg/te (theoretical)
 1.009 lb/yd³ "KPI" PF: **0.230** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Rate Code to be announced by sales rep.

2hrs GPS



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89656	79.29336	0.748686	1.383930
Front Row Corner	42.89692	79.29333	0.748692	1.383930
Back Row Corner	42.89727	79.29329	0.748699	1.383929
Average (Centre of Blast)	42.89692	79.29332	0.748692	1.383930

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	512.9	m		
Post Blast Data:	ppV: 2.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.2	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 108.2	dB	Trigger set at: 115	dB
<u>Erie Peat Rd</u>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89959	79.29427	0.748739	1.383946
2nd Reading				
Average	42.89959	79.29427	0.748739	1.383946
Distance (2nd Seis. From Centre of Blast)	307.1	m		
Post Blast Data:	ppV: 3.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 54.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 111.9	dB	Trigger set at: 115	dB
<u>Erie Peat Rd/ Pipe Line</u>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(307.1)^2}{30^2} \text{ kg} \\
 &= \frac{94,310}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica

Blaster-in-charge:

jim bray

Signature required, indicating that
 Blast Report is Complete & Accurate.



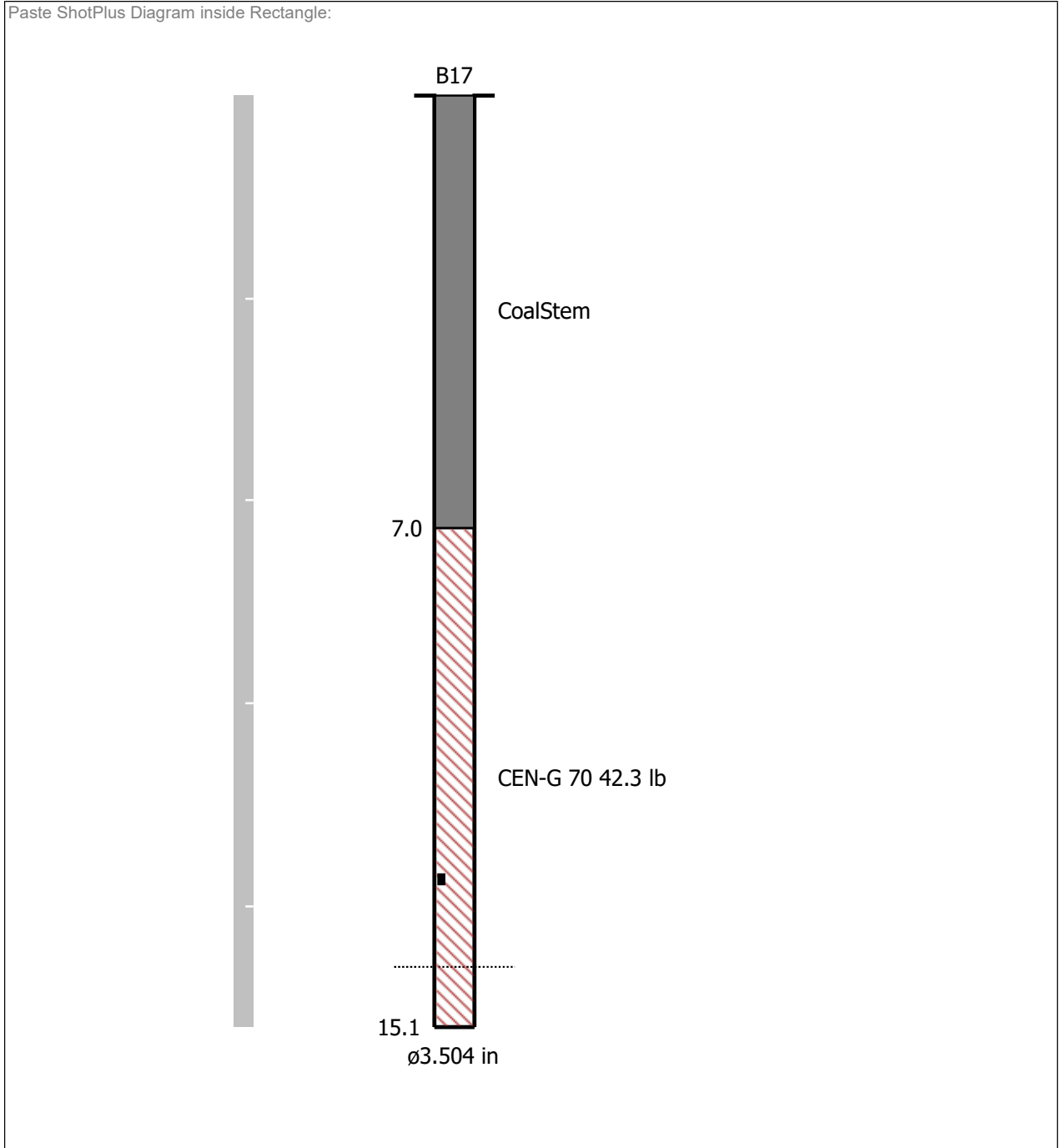
Blast Design
Waterford

Quarry: Laws - Middle Lift
P.O. #:
Blast Date: 1/9/2019

Blast Number: 19-002
Orica Order #: 243574

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 15:23:50 January 10, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM9119_20190110152350.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

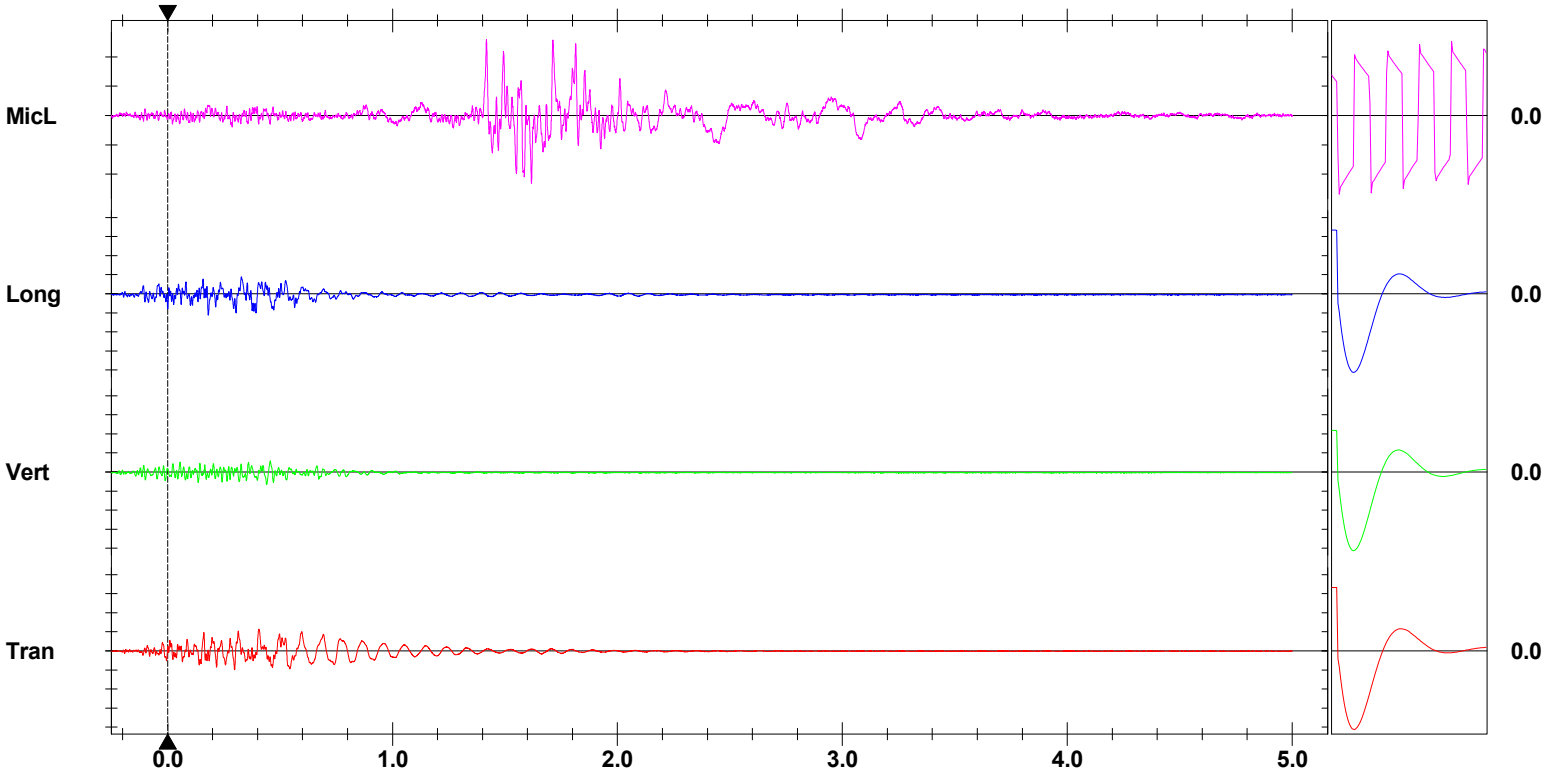
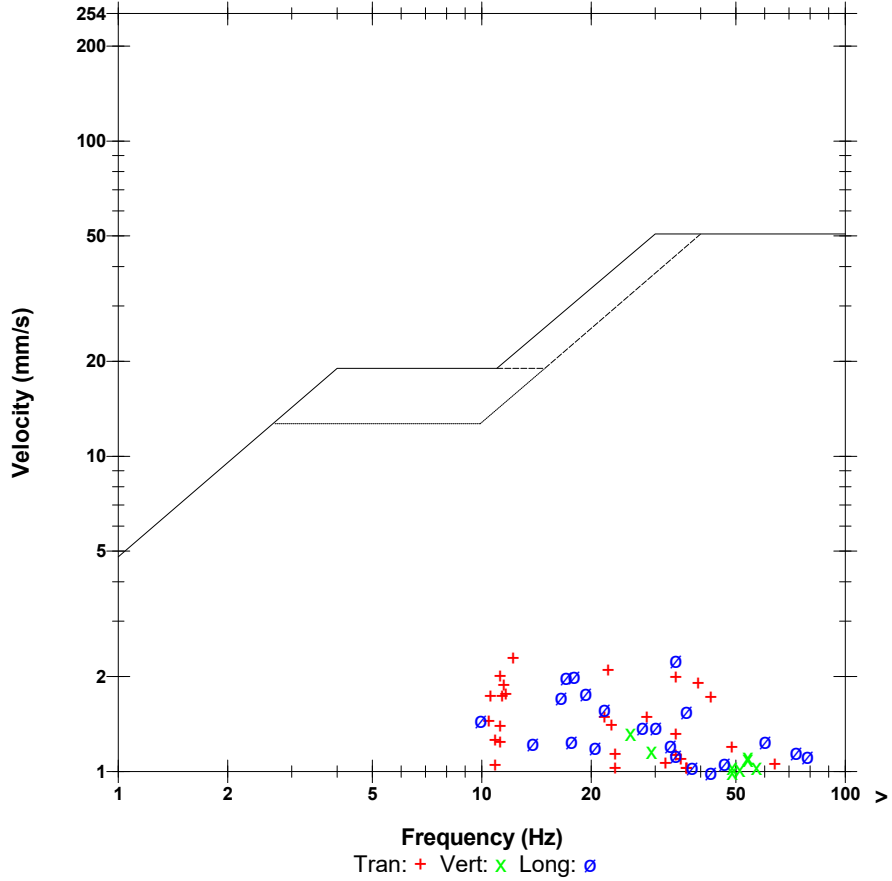
42.89269, -79.29082

Microphone Linear Weighting
PSPL 108.2 dB(L) at 1.417 sec
ZC Freq 22 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1508 mv)

	Tran	Vert	Long	
PPV	2.294	1.324	2.254	mm/s
ZC Freq	12.2	26	34	Hz
Time (Rel. to Trig)	0.406	0.440	0.181	sec
Peak Acceleration	0.072	0.072	0.156	g
Peak Displacement	0.023	0.007	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.3	Hz
Overswing Ratio	3.5	3.6	4.0	

Peak Vector Sum 2.561 mm/s at 0.405 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 15:24:07 January 10, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat N.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190110152407.IDFW

Notes

Location: Erie Peat Rd N
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

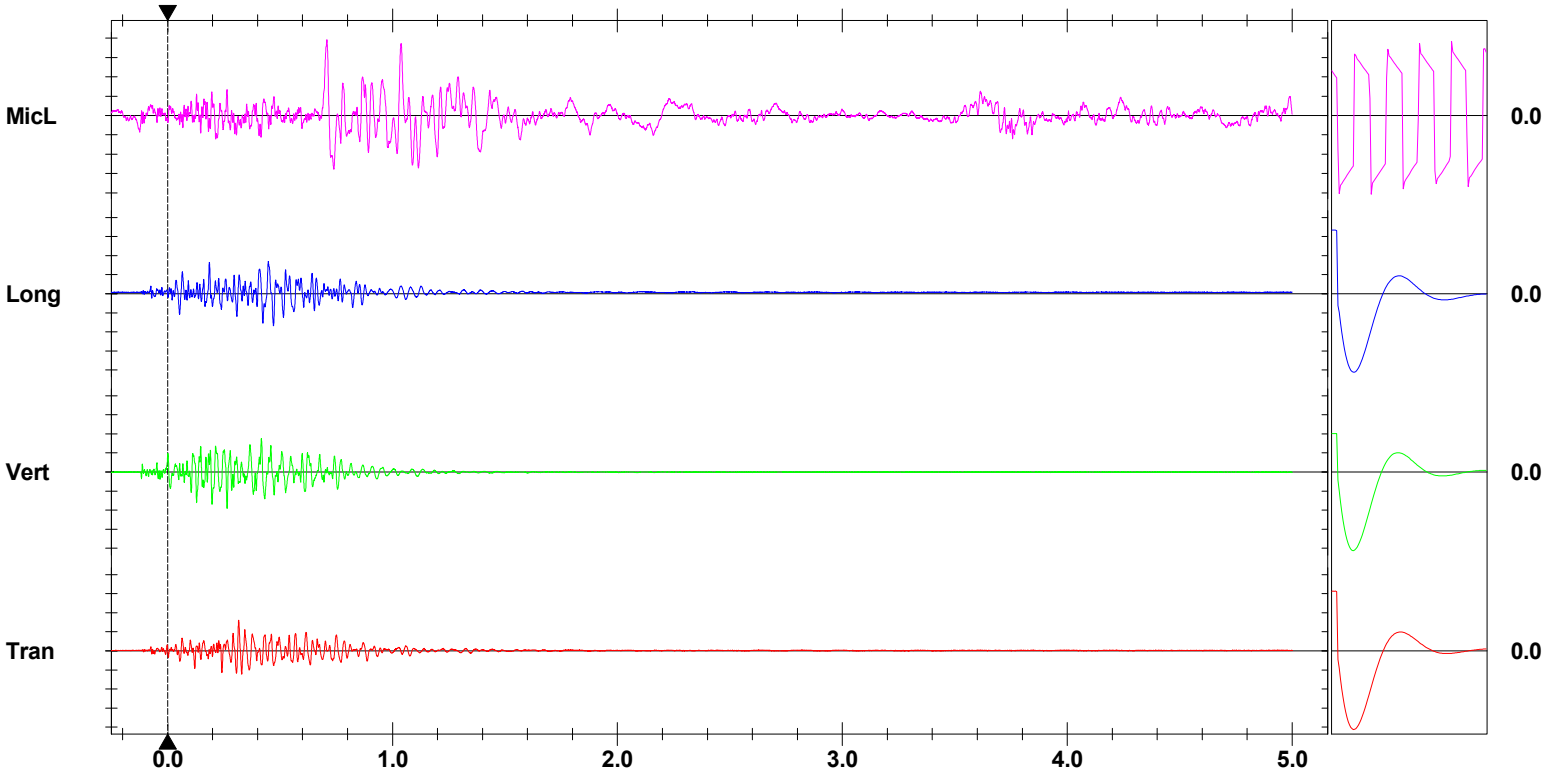
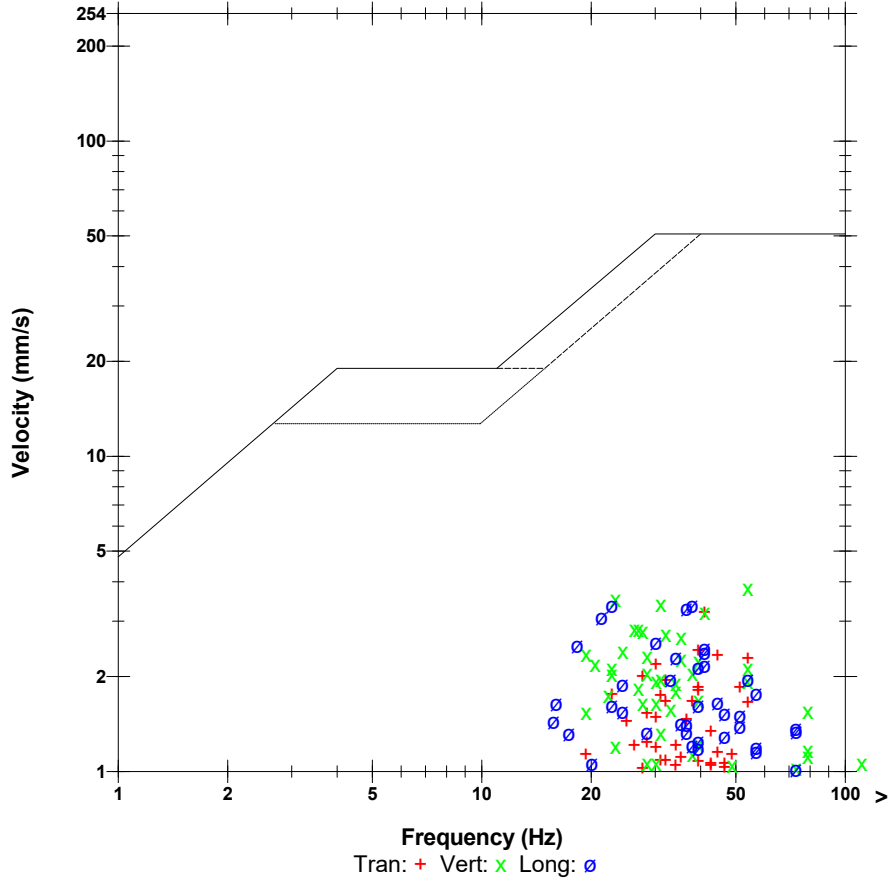
42.89959, -79.29427

Microphone Linear Weighting
PSPL 111.9 dB(L) at 0.708 sec
ZC Freq 15.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1643 mv)

	Tran	Vert	Long	
PPV	3.208	3.815	3.381	mm/s
ZC Freq	41	54	23	Hz
Time (Rel. to Trig)	0.316	0.265	0.448	sec
Peak Acceleration	0.105	0.171	0.125	g
Peak Displacement	0.012	0.016	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.1	4.1	4.4	

Peak Vector Sum 4.112 mm/s at 0.472 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #:
Design Date: **2019-01-09**

Blast Number: **19-002**
Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)
Blast Location: **Bottom Bench** (Bench / Face)
GPS Coordinates: **42.89692** °N Latitude **79.29332** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **16,599** te
Total Holes Loaded: **129** holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
Primary Bit diam: **88.9** mm **0**° # Holes: **129** = 3,131.3 ft (3 1/2 " diam)
Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **8.0** ft avg
Spacing: **9.0** ft avg
Holes: **28** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
Spacing: **9.0** ft avg
Holes: 101 main body
Bench Height: **24.3** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **24.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
Main Body: **6.0** ft avg
Material used: .75" Stone

- Design Charge Length -

Front Row: **18.3** ft avg
Main Body: **18.3** ft avg

- Design Charge Weight -

Front Row: **40.8** kg/hole
Main Body: **40.8** kg/hole
Max Chge Wt / delay: **23.0** kg/delay

Required kg Loaded: **3,344** kg
Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.201** kg/te (actual)
1.389 lb/yd³ Front row: **0.317** kg/te (theoretical)
1.389 lb/yd³ Main Body: **0.317** kg/te (theoretical)
1.389 lb/yd³ "KPI" PF: **0.317** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD)

8 ounce booster as secondary primer

Bulk Expl. Required: kg
CENTRA GOLD 70 **3,300**

Pkgd Expl. Required: kg

Boosters Required: kg/u # used kg
PENTEX 12 (OR EQUIVALENT) **0.34** **129** **43.9**

total explosives weight in Blast (kg): **3,344**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required: ms # req'd
EXEL HANDIDET 7m **25/500** **129**

Cord & Access. Req'd: U of M # req'd
WIRE DUPLEX (6 PACK) 400M units **1**

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-01-25**

Blast Number: **19-003**
 Orica Order #: **2438549**
 Blast Time: **1:32 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89537** °N Latitude **79.29331** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **30** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 92.1 mm	0	# Holes: 24 = 582.6 ft (3 5/8 " diam)
Secondary Bit diam: 114.3 mm	0	# Holes: 28 = 679.7 ft (4 1/2 " diam)
Tertiary Bit diam: 0 mm	0	# Holes: 0 = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	32,100	29,676	2,424

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	55	18.7

total explosives weight in Blast (kg): **2,443**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			55

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	4.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	14,497 te	5,576 m ³
Total tonnes per day:	21,424 te	SP19-023 Rate Code
Total Holes Loaded:	52 holes	
... including:	Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	8 rows	

- Pattern (Front Row) -

Burden:	15.0 ft avg
Spacing:	17.6 ft avg
# Holes:	13 front row

- Pattern (Main Body) -

Burden:	8.0 ft avg
Spacing:	15.0 ft avg
# Holes:	39 main body

Bench Height:	24.3 ft avg
Sub-drill:	0.0 ft avg
Hole Depth:	24.3 ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4" stone

- Charge Length -

Front Row:	17.3 ft avg
Main Body:	17.3 ft avg

- Charge Weight -

Front Row:	41.4 kg/hole
Main Body:	41.4 kg/hole
Max. per delay:	65.0 kg/delay
SD () Equation:	144.8 kg/delay
Total kg Loaded:	2,443 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.168 kg/te (actual)
Front row:	0.088 kg/te (theoretical)
Main Body:	0.193 kg/te (theoretical)
"KPI" PF:	0.180 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

NOTES (ANY VARIATION FROM STANDARD):

3 Hole required secondary primers due to primary not pulling into product



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89537"/>	<input type="text" value="79.29330"/>	0.748665	1.383929
Front Row Corner	<input type="text" value="42.89545"/>	<input type="text" value="79.29346"/>	0.748667	1.383932
Back Row Corner	<input type="text" value="42.89531"/>	<input type="text" value="79.29316"/>	0.748664	1.383927
Average (Centre of Blast)	<input type="text" value="42.89537"/>	<input type="text" value="79.29331"/>	0.748665	1.383929

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="361.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="112.1"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="12.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="2.7"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.88657"/>	<input type="text" value="79.27032"/>	0.748512	1.383528
2nd Reading				
Average	<input type="text" value="42.88657"/>	<input type="text" value="79.27032"/>	0.748512	1.383528
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2115.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="533 Clarence Street, Port Colbourne"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(361)^2}{30^2} \text{ kg} \\
 &= \frac{130,321}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



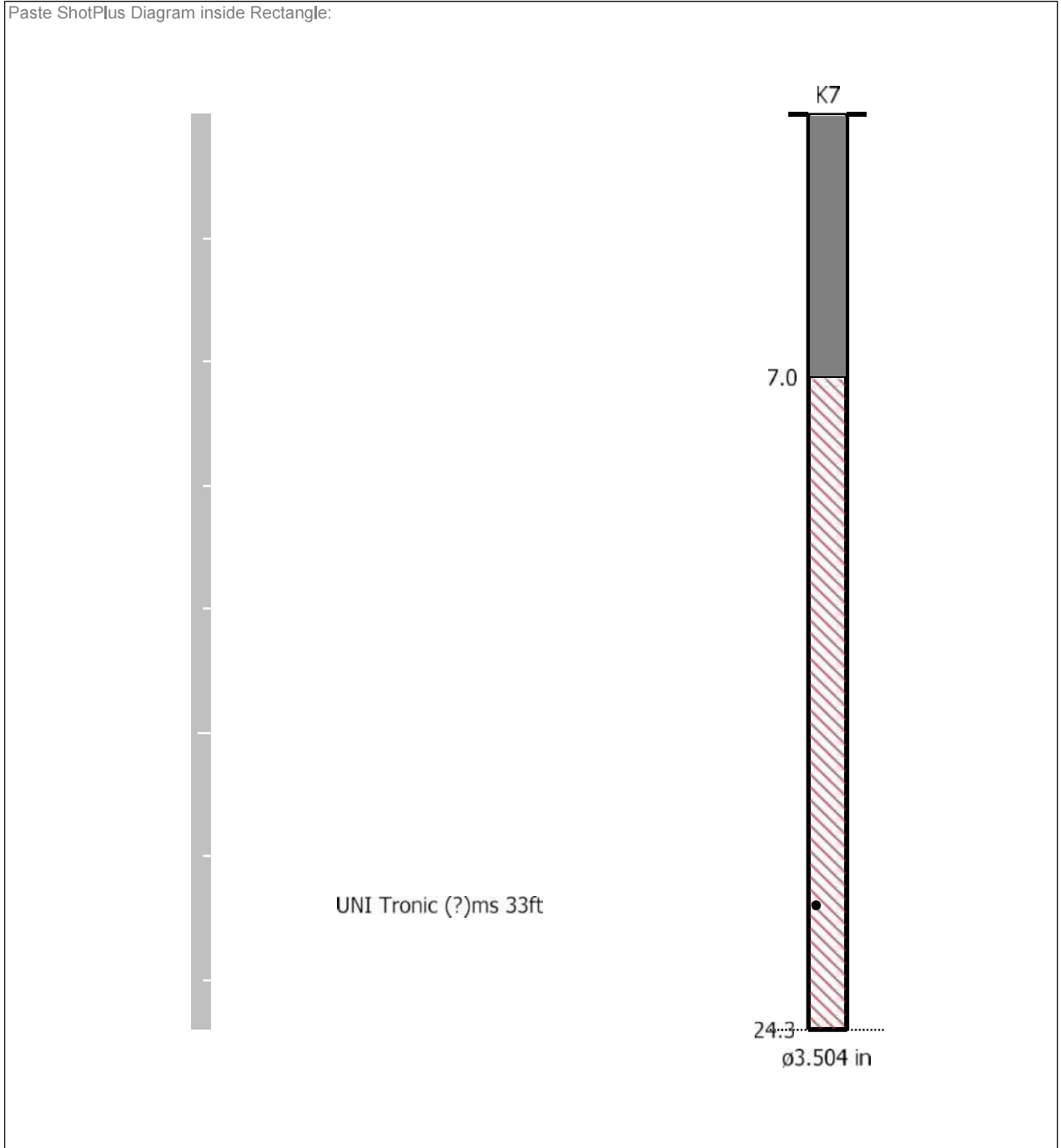
Blast Design
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 1/23/2019

Blast Number: 19-003
Orica Order #: 2438549

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 13:31:26 January 25, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM9119_20190125133126.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

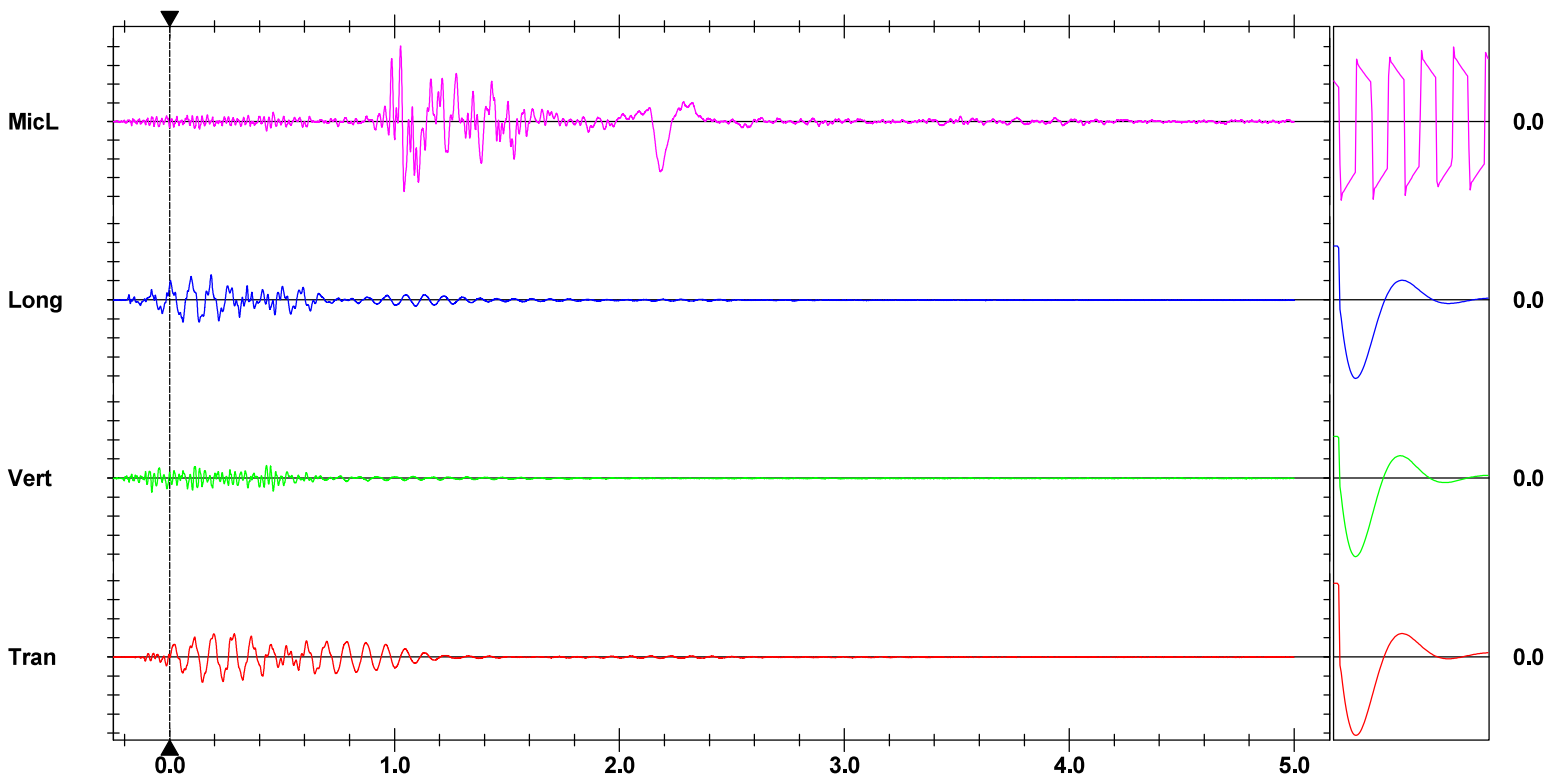
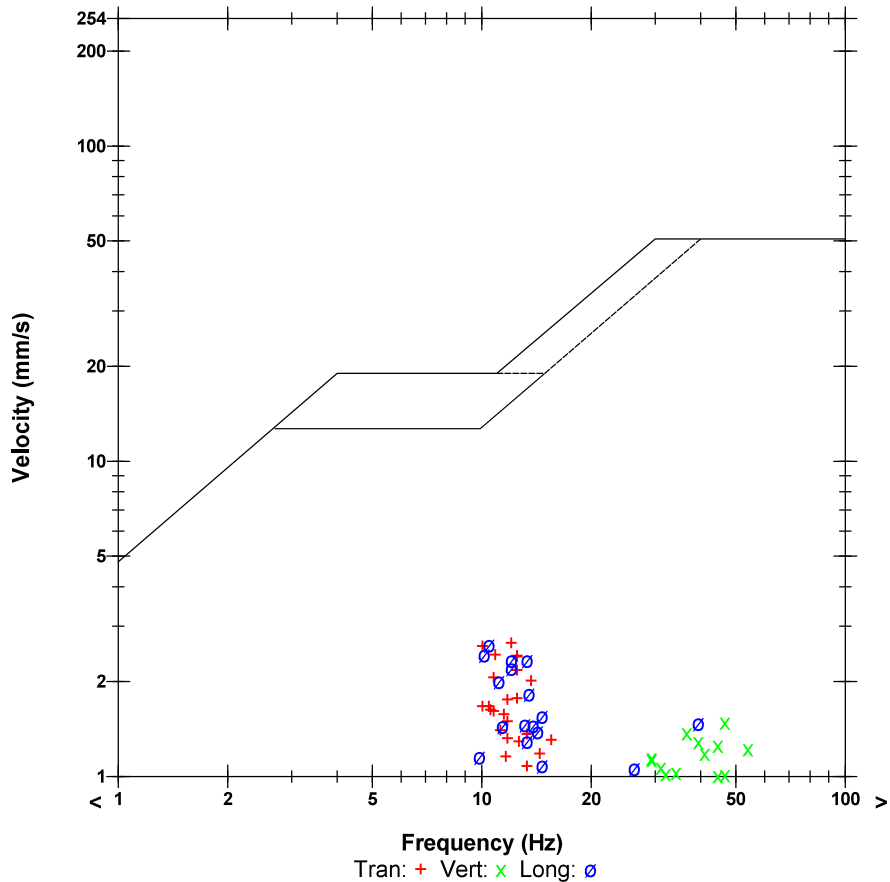
42.89269, -79.29082

Microphone Linear Weighting
PSPL 112.1 dB(L) at 1.027 sec
ZC Freq 26 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1497 mv)

	Tran	Vert	Long	
PPV	2.656	1.490	2.625	mm/s
ZC Freq	12.0	47	10.4	Hz
Time (Rel. to Trig)	0.145	-0.079	0.185	sec
Peak Acceleration	0.039	0.079	0.063	g
Peak Displacement	0.035	0.011	0.030	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.1	Hz
Overswing Ratio	3.4	3.5	4.0	

Peak Vector Sum 3.322 mm/s at 0.185 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #:
 Design Date: **2019-01-23**

Blast Number: **19-003**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89537** °N Latitude **79.29331** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **20,898** te
 Total Holes Loaded: **52** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **8** rows

- Drilling Information -

		Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam:	92.1 mm	0 °	# Holes: 24 =	582.3 ft (3 5/8 " diam)
Secondary Bit diam:	114.3 mm	0 °	# Holes: 28 =	679.3 ft (4 1/2 " diam)
Tertiary Bit diam:	 mm	0 °	# Holes: =	0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **15.0** ft avg
 Spacing: **15.0** ft avg
 # Holes: **7** front row

- Design Pattern (Main Body) -

Burden: **15.0** ft avg
 Spacing: **15.0** ft avg
 # Holes: **45** main body
 Bench Height: **24.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **24.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Design Charge Length -

Front Row: **17.3** ft avg
 Main Body: **17.3** ft avg

- Design Charge Weight -

Front Row: **41.3** kg/hole
 Main Body: **41.3** kg/hole
 Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **3,518** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.168** kg/te (actual)
 Front row: **0.103** kg/te (theoretical)
 Main Body: **0.103** kg/te (theoretical)
 "KPI" PF: **0.103** kg/te (theoretical)

0.451 lb/yd³

0.451 lb/yd³

0.451 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	3,500

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	52	17.7

total explosives weight in Blast (kg): **3,518**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 9M		52

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
# of Blasts (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-01-25**

Blast Number: **19-004**
 Orica Order #: **2438549**
 Blast Time: **1:20 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89537** °N Latitude **79.29331** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **30** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0	# Holes: 98 = 1,470.0 ft (3 1/2 " diam)
Secondary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	32,100	29,524	2,576

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	99	33.7

total explosives weight in Blast (kg): **2,610**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	99
CONNECTADET 9M		65 ms	8
UNITRONIC 600 9M			1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	4.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	6,927 te	2,664 m ³
Total tonnes per day:	21,424 te	LLL15-38 Rate Code
Total Holes Loaded:	98 holes	
... including:	Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	4 rows	

- Pattern (Front Row) -

Burden:	8.0 ft avg
Spacing:	8.0 ft avg
# Holes:	23 front row

- Pattern (Main Body) -

Burden:	8.0 ft avg
Spacing:	8.0 ft avg
# Holes:	75 main body

Bench Height:	15.0 ft avg
Sub-drill:	0.0 ft avg
Hole Depth:	15.0 ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	8.0 ft avg
Main Body:	8.0 ft avg
Material used:	3/4" stone

- Charge Length -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg

- Charge Weight -

Front Row:	15.6 kg/hole
Main Body:	15.6 kg/hole
Max. per delay:	18.0 kg/delay
SD () Equation:	144.8 kg/delay
Total kg Loaded:	2,610 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.377 kg/te (actual)
Front row:	0.221 kg/te (theoretical)
Main Body:	0.221 kg/te (theoretical)
"KPI" PF:	0.221 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

1 Hole required secondary primer



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89537"/>	<input type="text" value="79.29330"/>	0.748665	1.383929
Front Row Corner	<input type="text" value="42.89545"/>	<input type="text" value="79.29346"/>	0.748667	1.383932
Back Row Corner	<input type="text" value="42.89531"/>	<input type="text" value="79.29316"/>	0.748664	1.383927
Average (Centre of Blast)	<input type="text" value="42.89537"/>	<input type="text" value="79.29331"/>	0.748665	1.383929

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="361.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.8"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="41.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="101.3"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.88657"/>	<input type="text" value="79.27032"/>	0.748512	1.383528
2nd Reading				
Average	<input type="text" value="42.88657"/>	<input type="text" value="79.27032"/>	0.748512	1.383528
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2115.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="533 Clarence Street, Port Colbourne"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(361)^2}{30^2} \text{ kg} \\
 &= \frac{130,321}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 1/25/2019

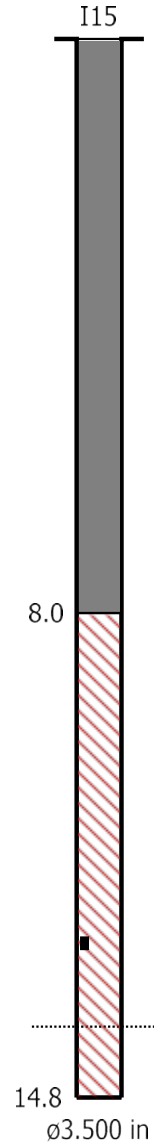
Blast Number: 19-004
Orica Order #: 2438549

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 23ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 13:20:29 January 25, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM9119_20190125132029.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

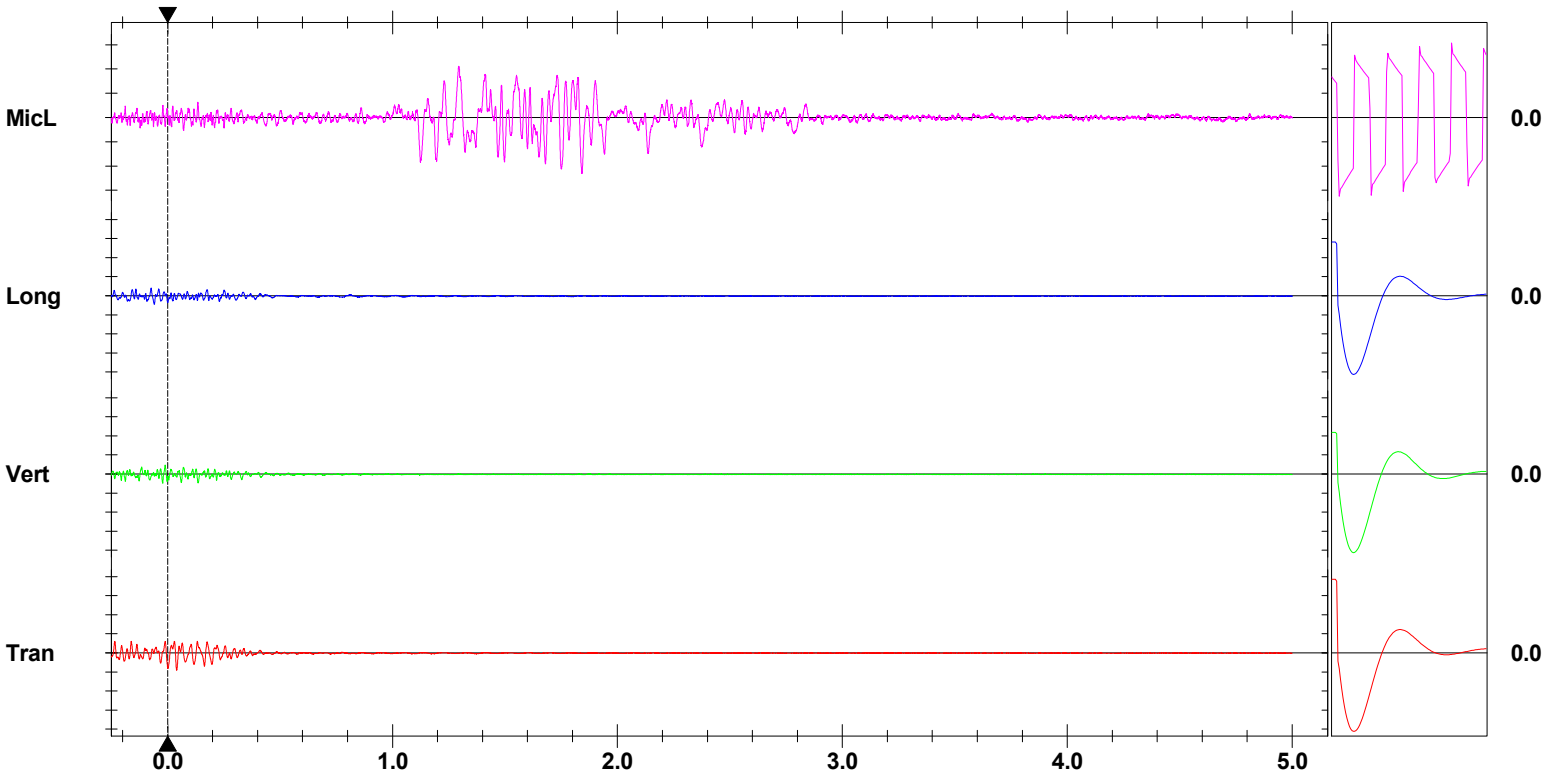
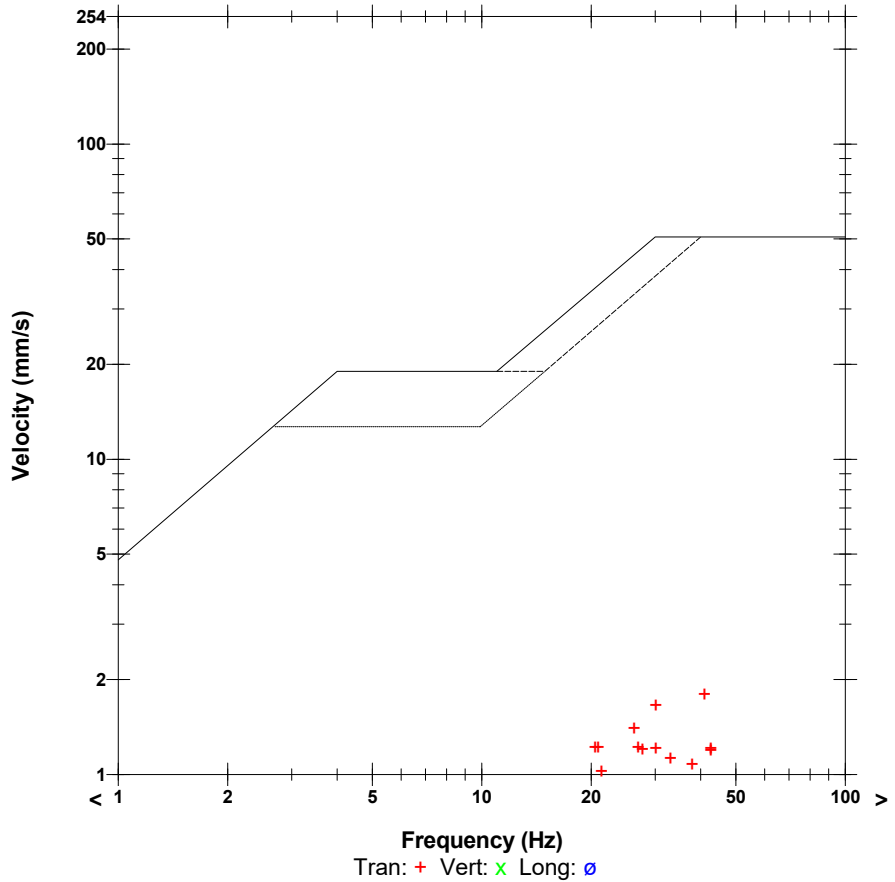
42.89269, -79.29082

Microphone Linear Weighting
PSPL 101.3 dB(L) at 1.841 sec
ZC Freq 20 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1497 mv)

	Tran	Vert	Long	
PPV	1.797	0.962	0.914	mm/s
ZC Freq	41	54	37	Hz
Time (Rel. to Trig)	0.040	-0.022	-0.060	sec
Peak Acceleration	0.054	0.036	0.044	g
Peak Displacement	0.008	0.020	0.043	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.1	Hz
Overswing Ratio	3.4	3.5	4.0	

Peak Vector Sum 1.854 mm/s at 0.040 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #:
 Design Date: **2019-01-25**

Blast Number: **19-004**
 Orica Order #:

page 1

Blaster-in-charge: **Mike derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89754** °N Latitude **79.29188** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **5,909** te
 Total Holes Loaded: **98** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Primary Bit diam: **88.9** mm **0**° Angle from Vertical # Holes: **98** = 1,254.1 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **23** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **75** main body
 Bench Height: **12.8** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **12.8** ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg
 Material used: **.75" Stone**

- Design Charge Length -

Front Row: **6.8** ft avg
 Main Body: **6.8** ft avg

- Design Charge Weight -

Front Row: **15.2** kg/hole
 Main Body: **15.2** kg/hole
 Max Chge Wt / delay: kg/delay

Required kg Loaded: **2,333** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.395** kg/te (actual)
 Front row: **0.252** kg/te (theoretical)
 Main Body: **0.252** kg/te (theoretical)
 "KPI" PF: **0.252** kg/te (theoretical)
 1.103 lb/yd³
 1.103 lb/yd³
 1.103 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,300

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	98	33.3

total explosives weight in Blast (kg): **2,333**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m		98
CONNECTADET 9M	25 ms	10
CONNECTADET 9M	65 ms	6
UNITRONIC 600 6M		5

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0



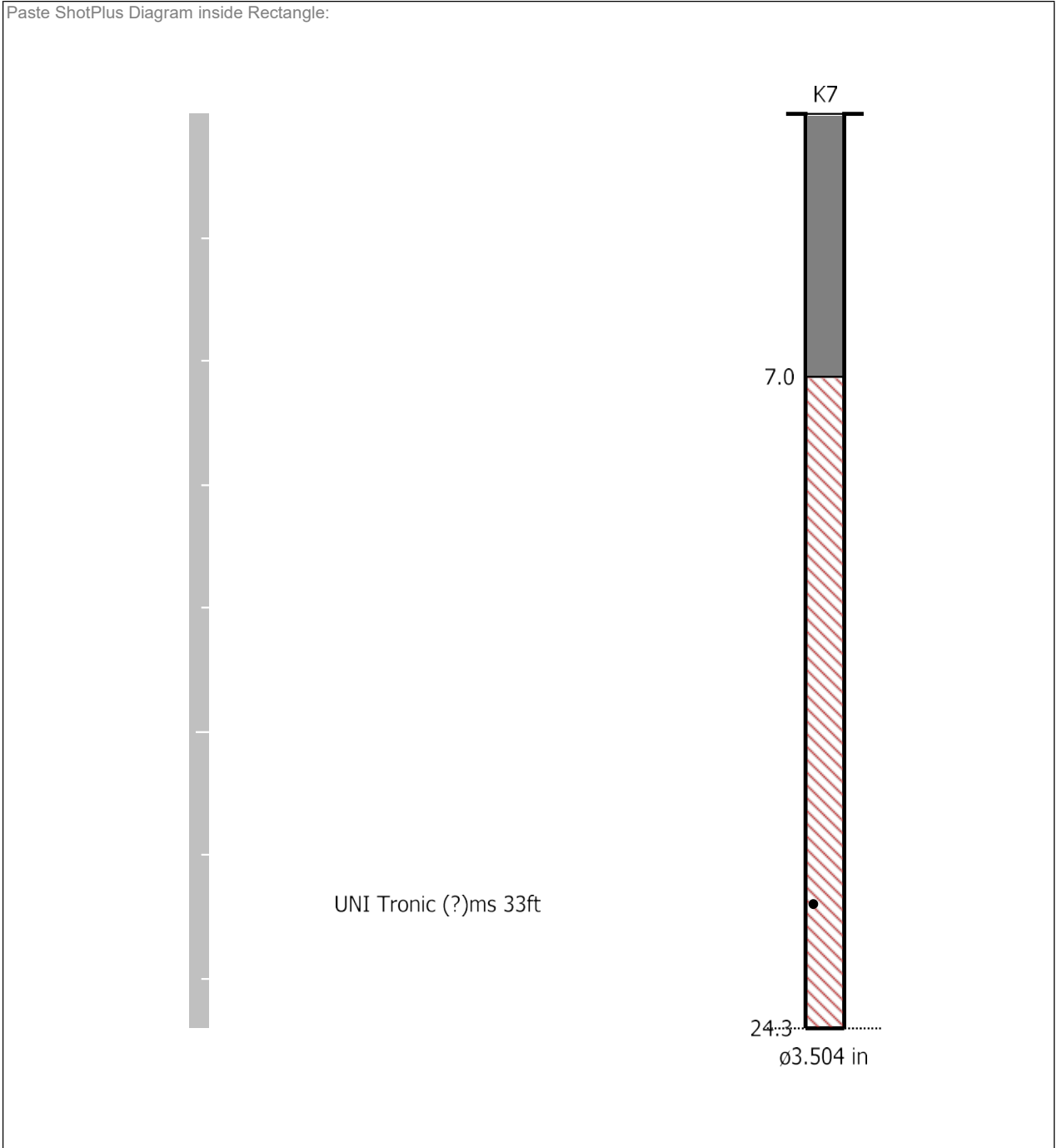
Blast Design
Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 2/14/2019

Blast Number: 19-005
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.



Blast Design

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2/14/2019

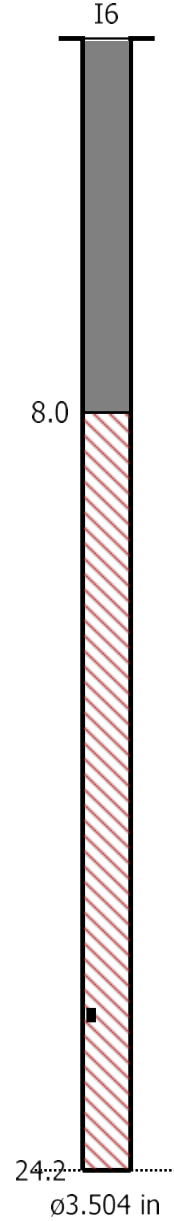
Blast Number: 19-006
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-02-26**

Blast Number: **19-007**
 Orica Order #: **2450728**
 Blast Time: **2:13 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89491** °N Latitude **79.29363** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **20** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 36 = 900.0 ft (4 " diam)
Secondary Bit diam: 88.9 mm	0	# Holes: 4 = 100.0 ft (3 1/2 " diam)
Tertiary Bit diam: 0 mm	0	# Holes: 0 = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	25,630	23,537	2,093

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	41	9.3
PENTEX 12 (OR EQUIVALENT)	0.34	39	13.3

total explosives weight in Blast (kg): **2,116**

Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	35
EXEL HANDIDET 12m		25/500	45
CONNECTADET 12M		65 ms	10
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **11,485** te **4,417** m³
 Total tonnes per day: **16,934** te **LML22-44** Rate Code
 Total Holes Loaded: **40** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **5** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **12** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **28** main body

Bench Height: **25.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **25.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **18.0** ft avg
 Main Body: **18.0** ft avg

- Charge Weight -

Front Row: **52.5** kg/hole
 Main Body: **52.5** kg/hole
 Max. per delay: **59.0** kg/delay
 SD () Equation: **126.5** kg/delay
 Total kg Loaded: **2,116** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.807 lb/yd³ Yield PF: **0.184** kg/te (actual)
 0.801 lb/yd³ Front row: **0.183** kg/te (theoretical)
 0.801 lb/yd³ Main Body: **0.183** kg/te (theoretical)
 0.801 lb/yd³ "KPI" PF: **0.183** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

- 1 GPS
- L-1 to L-5 Received Only 10 Kg Due to lean burden
- Rate Code LML22-44
- Extra Helper used for spotter while loading against highwall



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89490"/>	<input type="text" value="79.29364"/>	0.748657	1.383935
Front Row Corner	<input type="text" value="42.89504"/>	<input type="text" value="79.29372"/>	0.748660	1.383936
Back Row Corner	<input type="text" value="42.89480"/>	<input type="text" value="79.29354"/>	0.748655	1.383933
Average (Centre of Blast)	<input type="text" value="42.89491"/>	<input type="text" value="79.29363"/>	0.748657	1.383935

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="337.4"/>	m		
Post Blast Data:	ppV: <input type="text" value="5.5"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="7.3"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="113.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2368.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(337.4)^2}{30^2} \text{ kg} \\
 &= \frac{113,839}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

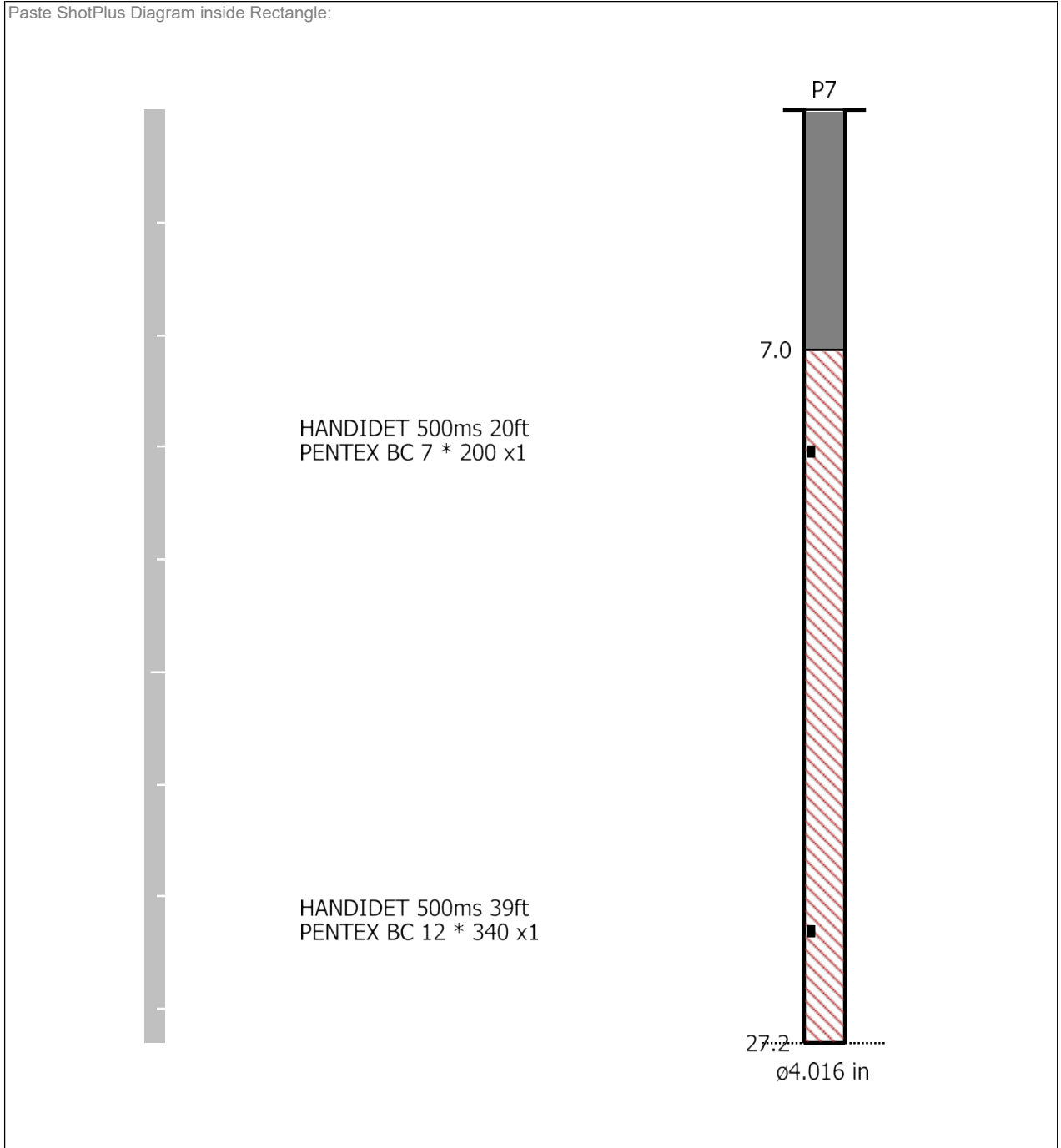
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2/26/2019

Blast Number: 19-007
Orica Order #: 2450728

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Vert at 14:13:35 February 26, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM9119_20190226141335.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

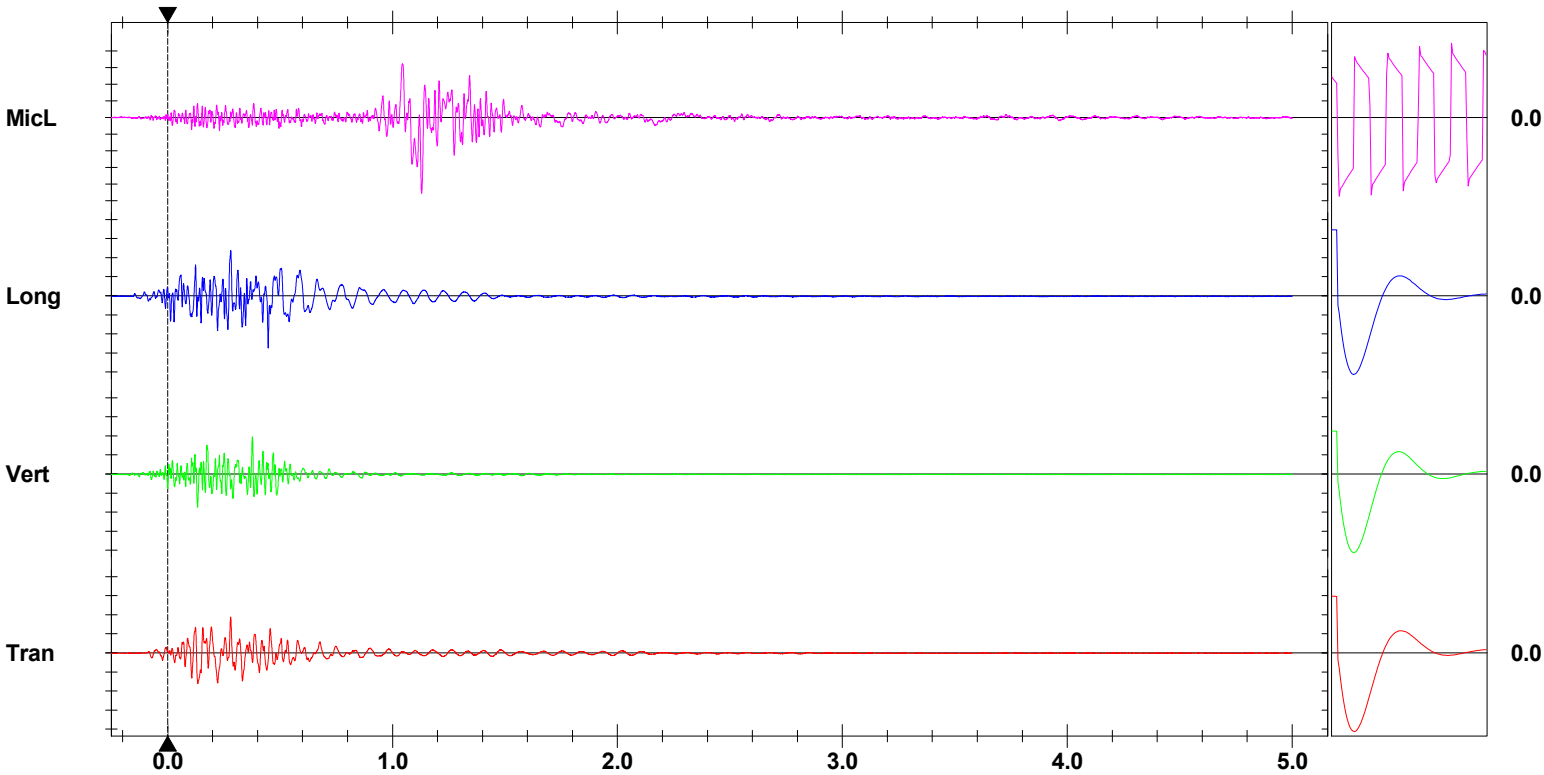
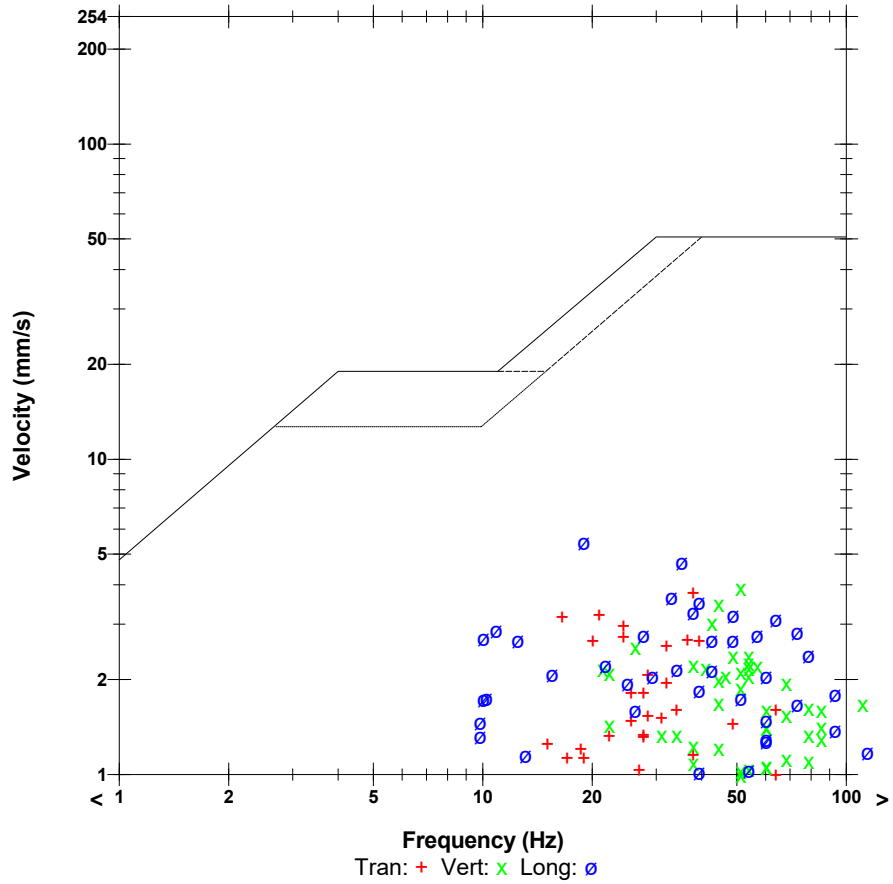
42.89269, -79.29082

Microphone Linear Weighting
PSPL 113.1 dB(L) at 1.129 sec
ZC Freq 28 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1470 mv)

	Tran	Vert	Long	
PPV	3.775	3.894	5.462	mm/s
ZC Freq	38	51	19.0	Hz
Time (Rel. to Trig)	0.280	0.377	0.447	sec
Peak Acceleration	0.118	0.265	0.183	g
Peak Displacement	0.026	0.013	0.038	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.3	Hz
Overswing Ratio	3.5	3.5	3.9	

Peak Vector Sum 6.226 mm/s at 0.281 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-02-25**

Blast Number: **19-007**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89491** °N Latitude **79.29363** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **12,510** te
 Total Holes Loaded: **40** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **36** = 980.3 ft (4 " diam)
 Secondary Bit diam: **88.9** mm **0**° # Holes: **4** = 108.9 ft (3 1/2 " diam)
 Tertiary Bit diam: **0** mm **0**° # Holes: **0** = 0.0 ft (" diam)

Nominal Bit Diameter:

Bulk Expl. Required:	kg
CENTRA GOLD 70	3,400

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	40	9.1
PENTEX 12 (OR EQUIVALENT)	0.34	40	13.6

total explosives weight in Blast (kg): **3,423**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 7m		40
EXEL HANDIDET 12m		40

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

- Design Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **22** main body

Bench Height: **27.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.2** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.2** ft avg
 Main Body: **20.2** ft avg

- Design Charge Weight -

Front Row: **59.0** kg/hole
 Main Body: **59.0** kg/hole

Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **3,423** kg

Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.274** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

0.827 lb/yd³

0.827 lb/yd³

0.827 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

1 GPS



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-02-26**

Blast Number: **19-008**
 Orica Order #: **2450728**
 Blast Time: **2:09 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89827** °N Latitude **79.29158** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **20** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0	# Holes: 84 = 1,199.2 ft (3 1/2 " diam)
Secondary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	23,537	22,160	1,377

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	81	27.5

total explosives weight in Blast (kg): **1,405**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			81

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.5
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **5,449** te **2,096** m³
 Total tonnes per day: **16,934** te **LLL15-39** Rate Code
 Total Holes Loaded: **81** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **29** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **52** main body

Bench Height: **14.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **14.3** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **6.3** ft avg
 Main Body: **6.3** ft avg

- Charge Weight -

Front Row: **14.0** kg/hole
 Main Body: **14.0** kg/hole
 Max. per delay: **17.0** kg/delay
 SD () Equation: **433.3** kg/delay
 Total kg Loaded: **1,405** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.258** kg/te (actual)
 Front row: **0.208** kg/te (theoretical)
 Main Body: **0.208** kg/te (theoretical)
 "KPI" PF: **0.208** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Unitronics are being used due to following conditions. Working against a highwall and maneuvering a rock fall shelter while loading blast.

N-2,N12,N-14 were not loaded because the holes were only 2-3' deep or the burden was too high. 3 Helper needed for working against the highwall



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89827"/>	<input type="text" value="79.29157"/>	0.748716	1.383899
Front Row Corner	<input type="text" value="42.89855"/>	<input type="text" value="79.29166"/>	0.748721	1.383901
Back Row Corner	<input type="text" value="42.89799"/>	<input type="text" value="79.29151"/>	0.748711	1.383898
Average (Centre of Blast)	<input type="text" value="42.89827"/>	<input type="text" value="79.29158"/>	0.748716	1.383899

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="624.5"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.9"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="7.1"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="109.4"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="2127.2"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(624.5)^2}{30^2} \text{ kg} \\
 &= \frac{390,000}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

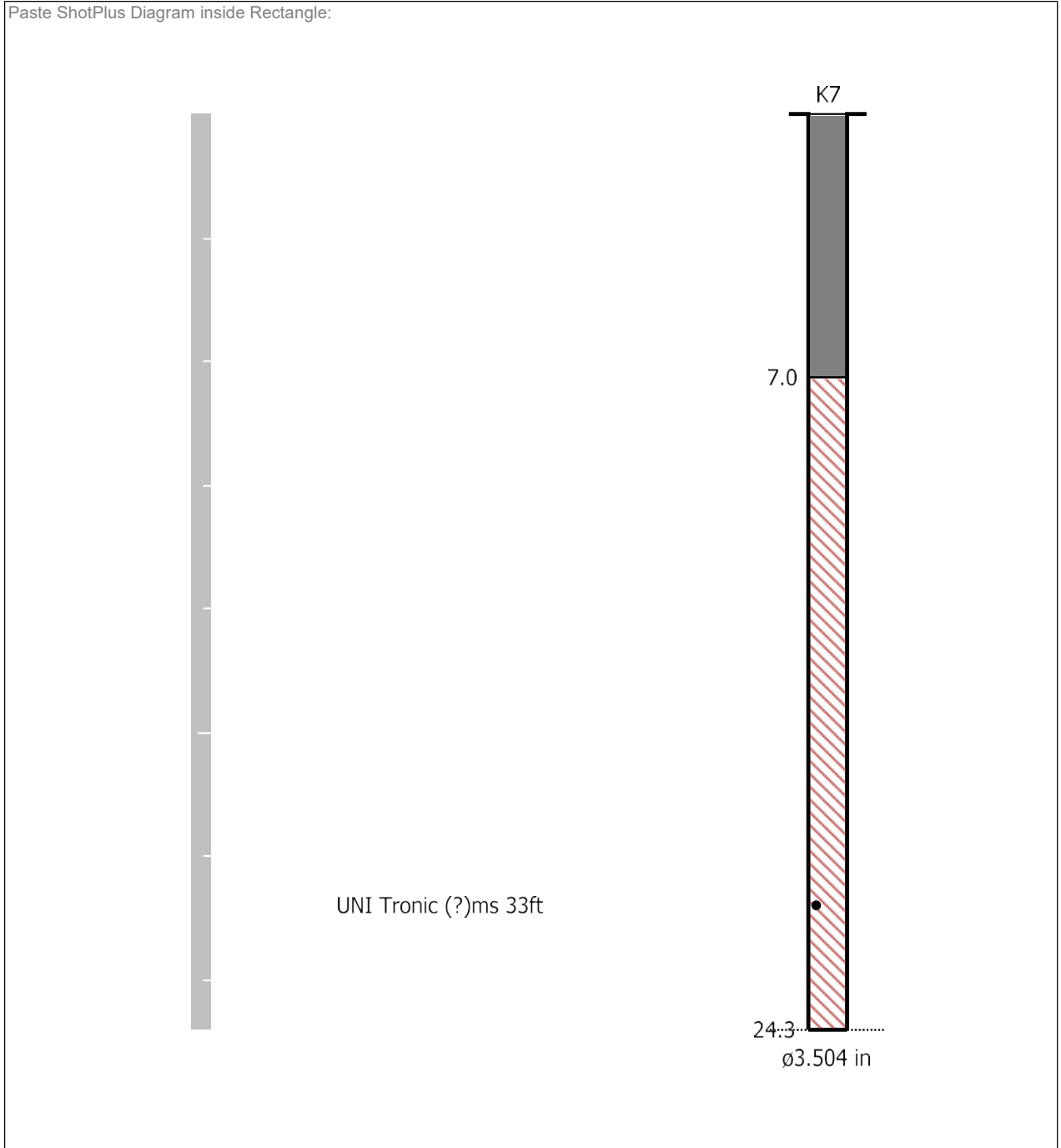
Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **S191856**
Blast Date: **2/26/2019**

Blast Number: **19-008**
Orica Order #: **2450728**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 14:09:15 February 26, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM9119_20190226140915.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

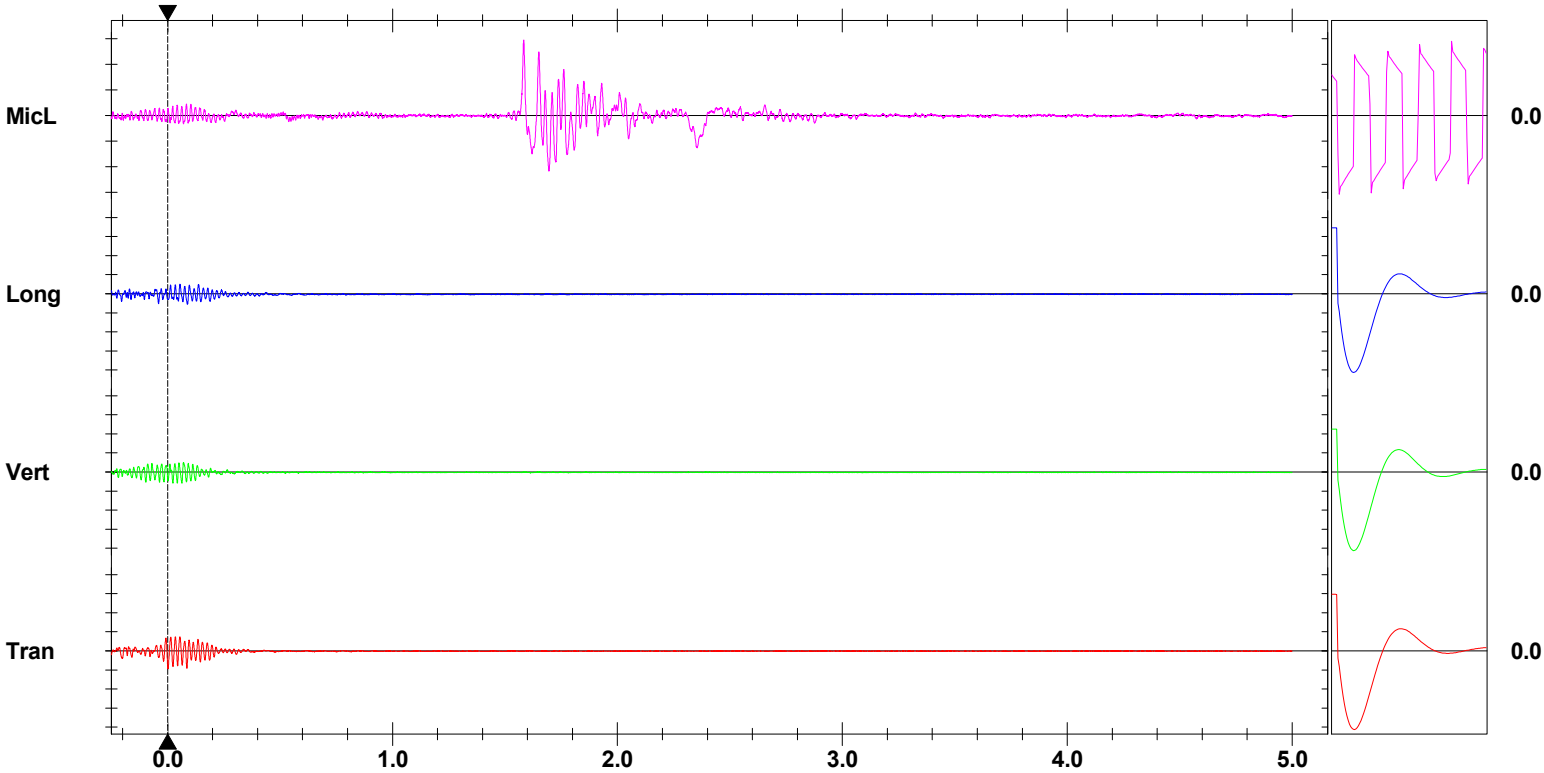
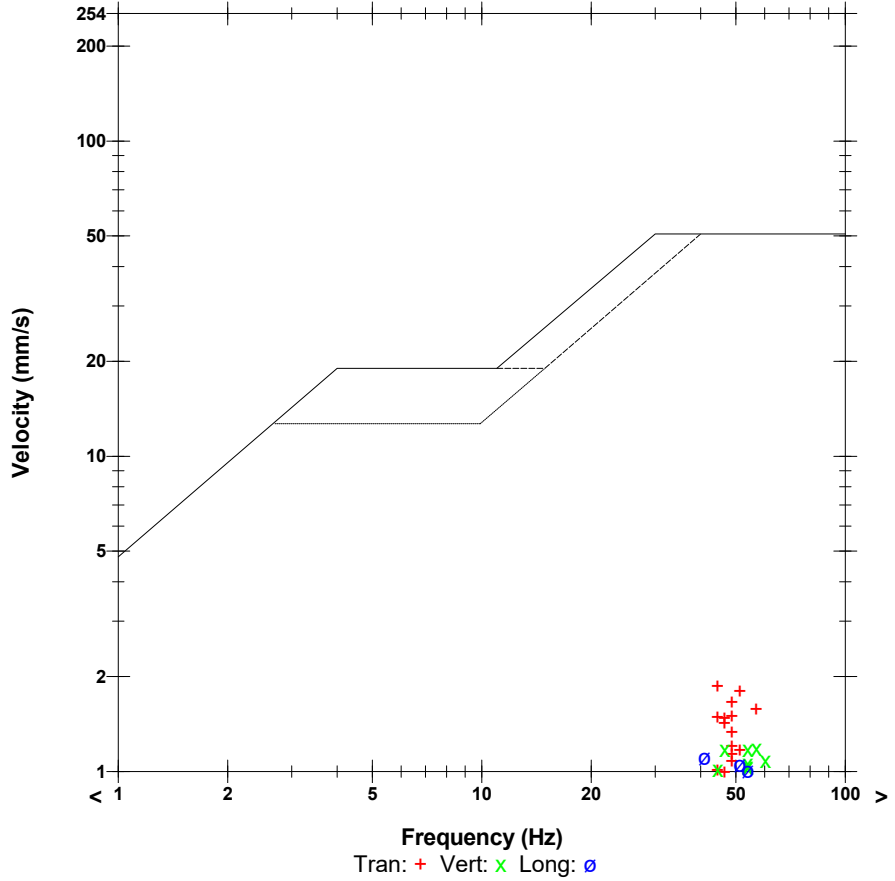
42.89269, -79.29082

Microphone Linear Weighting
PSPL 109.4 dB(L) at 1.583 sec
ZC Freq 12.6 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1470 mv)

	Tran	Vert	Long	
PPV	1.868	1.190	1.111	mm/s
ZC Freq	45	57	41	Hz
Time (Rel. to Trig)	0.002	0.023	0.088	sec
Peak Acceleration	0.059	0.064	0.044	g
Peak Displacement	0.006	0.034	0.004	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.3	Hz
Overswing Ratio	3.5	3.5	3.9	

Peak Vector Sum 2.178 mm/s at 0.002 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Design Date: **2019-02-26**

Blast Number: **19-008**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89827** °N Latitude **79.29158** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **5,247** te
 Total Holes Loaded: **81** holes
 ... including: **3** Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **88.9** mm **0**° # Holes: **81** = 1,156.4 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **27** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **54** main body
 Bench Height: **14.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **14.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **7.3** ft avg
 Main Body: **7.3** ft avg

- Design Charge Weight -

Front Row: **16.2** kg/hole
 Main Body: **16.2** kg/hole

Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **1,828** kg

Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.348** kg/te (actual)

Front row: **0.241** kg/te (theoretical)

Main Body: **0.241** kg/te (theoretical)

"KPI" PF: **0.241** kg/te (theoretical)

1.058 lb/yd³

1.058 lb/yd³

1.058 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Unitronics are being used due to following conditions. Working against a highwall and near a rock fall shelter while loading blast.

FACE
22 HOLE LEFT AGAINST HIGHWALL

Bulk Expl. Required:

	kg
CENTRA GOLD 70	1,800

Pkgd Expl. Required:

	kg

Boosters Required:

	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	81	27.5

total explosives weight in Blast (kg): **1,828**

Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:

	ms	# req'd
UNITRONIC 600 6M		81

Cord & Access. Req'd:

	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-01**

Blast Number: **19-009**
 Orica Order #: **2452877**
 Blast Time: **12:53 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89735** °N Latitude **79.29191** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **E** at **5** kph Temperature: **-1 to -5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0	# Holes: 98 = 1,470.0 ft (3 1/2 " diam)
Secondary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	28,910	26,960	1,950

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	1	0.2
PENTEX 12 (OR EQUIVALENT)	0.34	98	33.3

total explosives weight in Blast (kg): **1,984**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25 ms	99
CONNECTADET 9M		65 ms	16
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	0
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	5.0
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	6,976 te	2,683 m ³
Total tonnes per day:	6,976 te	LLL15-36 Rate Code
Total Holes Loaded:	98 holes	
... including:	4 Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	4 rows	

- Pattern (Front Row) -

Burden:	8.0 ft avg
Spacing:	8.4 ft avg
# Holes:	32 front row

- Pattern (Main Body) -

Burden:	8.0 ft avg
Spacing:	8.4 ft avg
# Holes:	66 main body

Bench Height:	15.0 ft avg
Sub-drill:	0.0 ft avg
Hole Depth:	15.0 ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	8.0 ft avg
Main Body:	8.0 ft avg
Material used:	3/4" stone

- Charge Length -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg

- Charge Weight -

Front Row:	15.6 kg/hole
Main Body:	15.6 kg/hole
Max. per delay:	23.0 kg/delay
SD () Equation:	308.4 kg/delay
Total kg Loaded:	1,984 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.284 kg/te (actual)
Front row:	0.211 kg/te (theoretical)
Main Body:	0.211 kg/te (theoretical)
"KPI" PF:	0.211 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Blank area for notes.



Blast Report

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 2019-03-01

Blast Number: 19-009
Orica Order #: 2452877
Blast Time: 12:53 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89735	79.29194	0.748700	1.383905
Front Row Corner	42.89741	79.29155	0.748701	1.383899
Back Row Corner	42.89731	79.29224	0.748699	1.383911
Average (Centre of Blast)	42.89735	79.29191	0.748700	1.383905

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	526.8	m		
Post Blast Data:	ppV: 1.9	mm/s	Trigger set at: 1.5	mm/s
	frequency: 7.1	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 104.6	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	mm/s	Trigger set at: 1.5	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure:	dB	Trigger set at: 115	dB

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (3rd Seis. From Centre of Blast)	2169.3	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 1.5	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
Between 201 & 207 West Side Road, Port Colborne, ON				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(526.8)^2}{30^2} \text{ kg} \\
 &= \frac{277,518}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



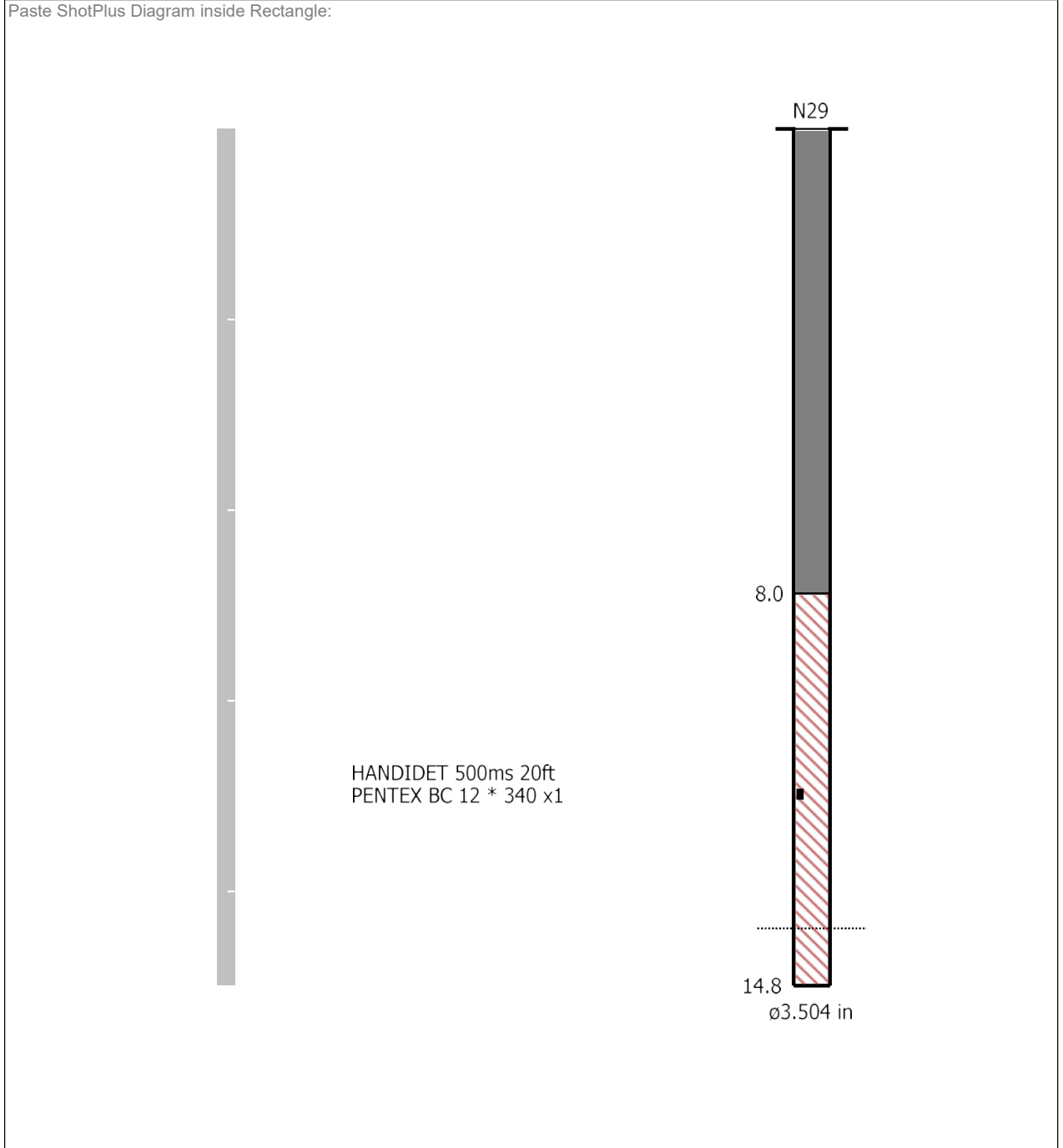
Blast Design
Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **S191856**
Blast Date: **3/1/2019**

Blast Number: **19-009**
Orica Order #: **2452877**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 12:53:26 March 1, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Operator/Erie Peat.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM9119_20190301125326.IDFW

Notes

Location: Erie Peat Rd
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

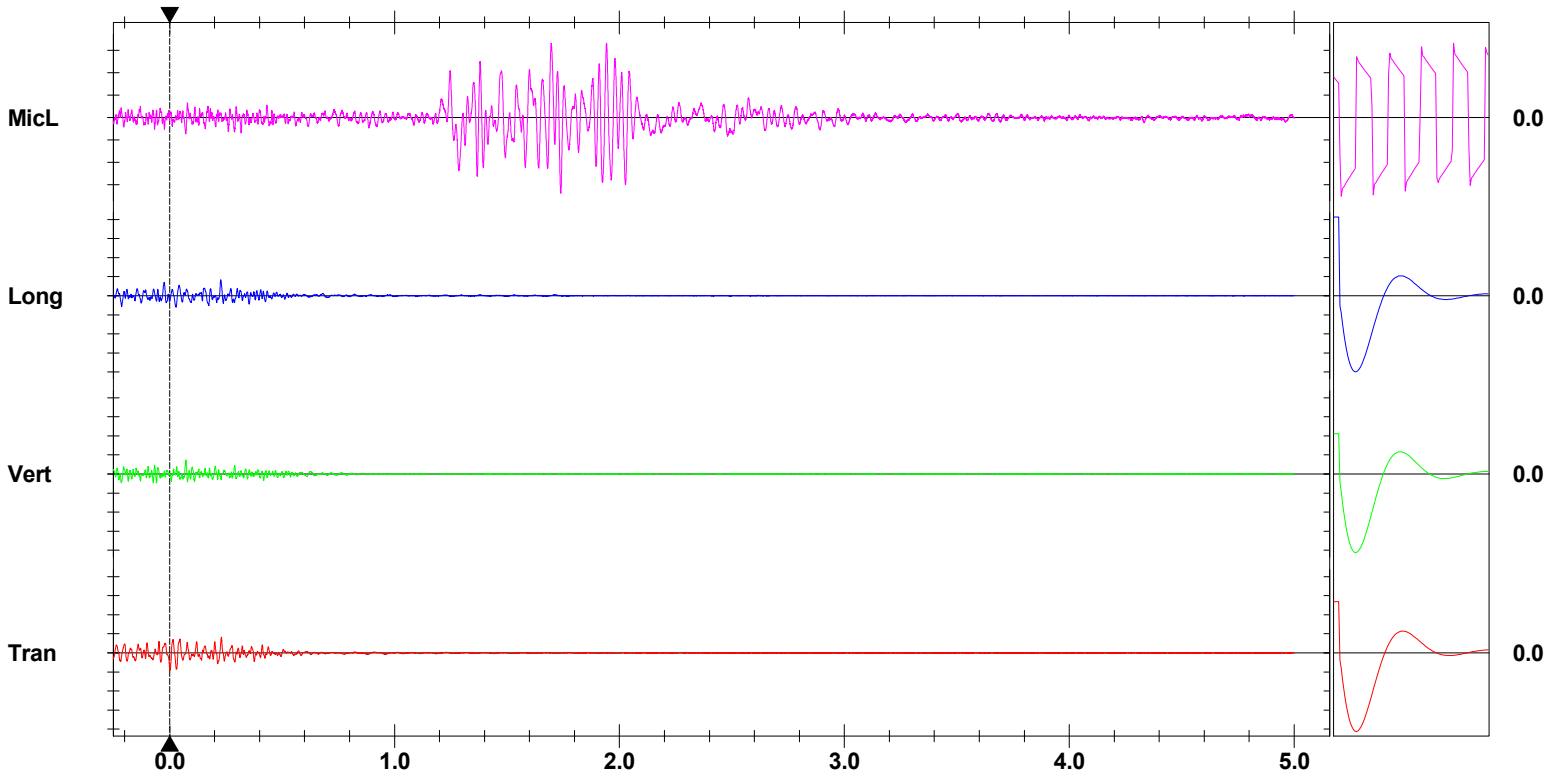
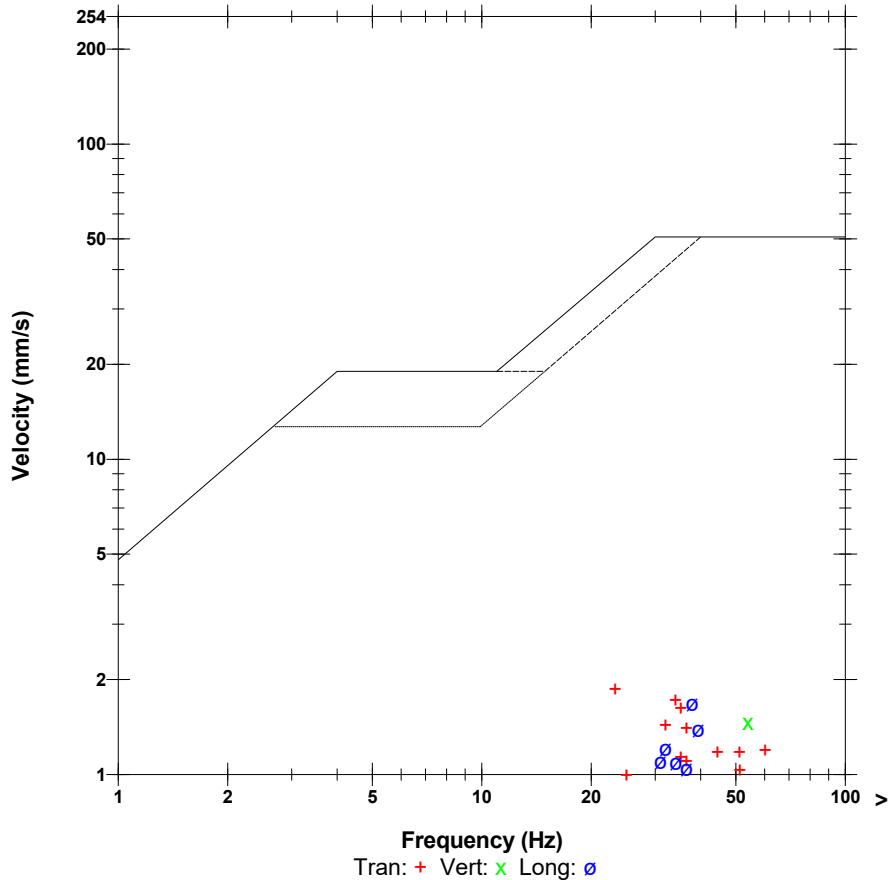
42.89269, -79.29082

Microphone Linear Weighting
PSPL 104.6 dB(L) at 1.739 sec
ZC Freq 31 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1395 mv)

	Tran	Vert	Long	
PPV	1.860	1.466	1.687	mm/s
ZC Freq	23	54	38	Hz
Time (Rel. to Trig)	0.002	0.072	0.228	sec
Peak Acceleration	0.056	0.079	0.054	g
Peak Displacement	0.009	0.004	0.006	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.5	7.3	Hz
Overswing Ratio	3.6	3.5	3.8	

Peak Vector Sum 2.206 mm/s at 0.229 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-06**

Blast Number: **19-010**
 Orica Order #: **245562**
 Blast Time: **3:09 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89731** °N Latitude **79.29278** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **-11 to -15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0	# Holes: 125 = 1,875.0 ft (3 1/2 " diam)
Secondary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	26,590	24,177	2,413

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	4	3	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	125	42.5

total explosives weight in Blast (kg): **2,481**
 Pkgd Prod (25 kg) % of Total kg: **1.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	125
CONNECTADET 9M		65 ms	8
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	0

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	8,835 te	3,398 m ³
Total tonnes per day:	29,527 te	LLL15-37 Rate Code
Total Holes Loaded:	125 holes	
... including:	0 Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	4 rows	

- Pattern (Front Row) -

Burden:	8.0 ft avg
Spacing:	8.0 ft avg
# Holes:	34 front row

- Pattern (Main Body) -

Burden:	8.0 ft avg
Spacing:	8.0 ft avg
# Holes:	91 main body

Bench Height:	15.0 ft avg
Sub-drill:	0.0 ft avg
Hole Depth:	15.0 ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	8.0 ft avg
Main Body:	8.0 ft avg
Material used:	3/4" stone

- Charge Length -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg

- Charge Weight -

Front Row:	15.6 kg/hole
Main Body:	15.6 kg/hole
Max. per delay:	20.0 kg/delay
SD () Equation:	322.1 kg/delay
Total kg Loaded:	2,481 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.281 kg/te (actual)
Front row:	0.221 kg/te (theoretical)
Main Body:	0.221 kg/te (theoretical)
"KPI" PF:	0.221 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Some holes were not loaded as per the original design due to lean burden



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89730"/>	<input type="text" value="79.29276"/>	0.748699	1.383920
Front Row Corner	<input type="text" value="42.89732"/>	<input type="text" value="79.29323"/>	0.748699	1.383928
Back Row Corner	<input type="text" value="42.89730"/>	<input type="text" value="79.29237"/>	0.748699	1.383913
Average (Centre of Blast)	<input type="text" value="42.89731"/>	<input type="text" value="79.29278"/>	0.748699	1.383920

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="538.4"/>	m		
Post Blast Data:	ppV: <input type="text" value="2.3"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="7.3"/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value="104.5"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="2240.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(538.4)^2}{30^2} \text{ kg} \\
 &= \frac{289,875}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

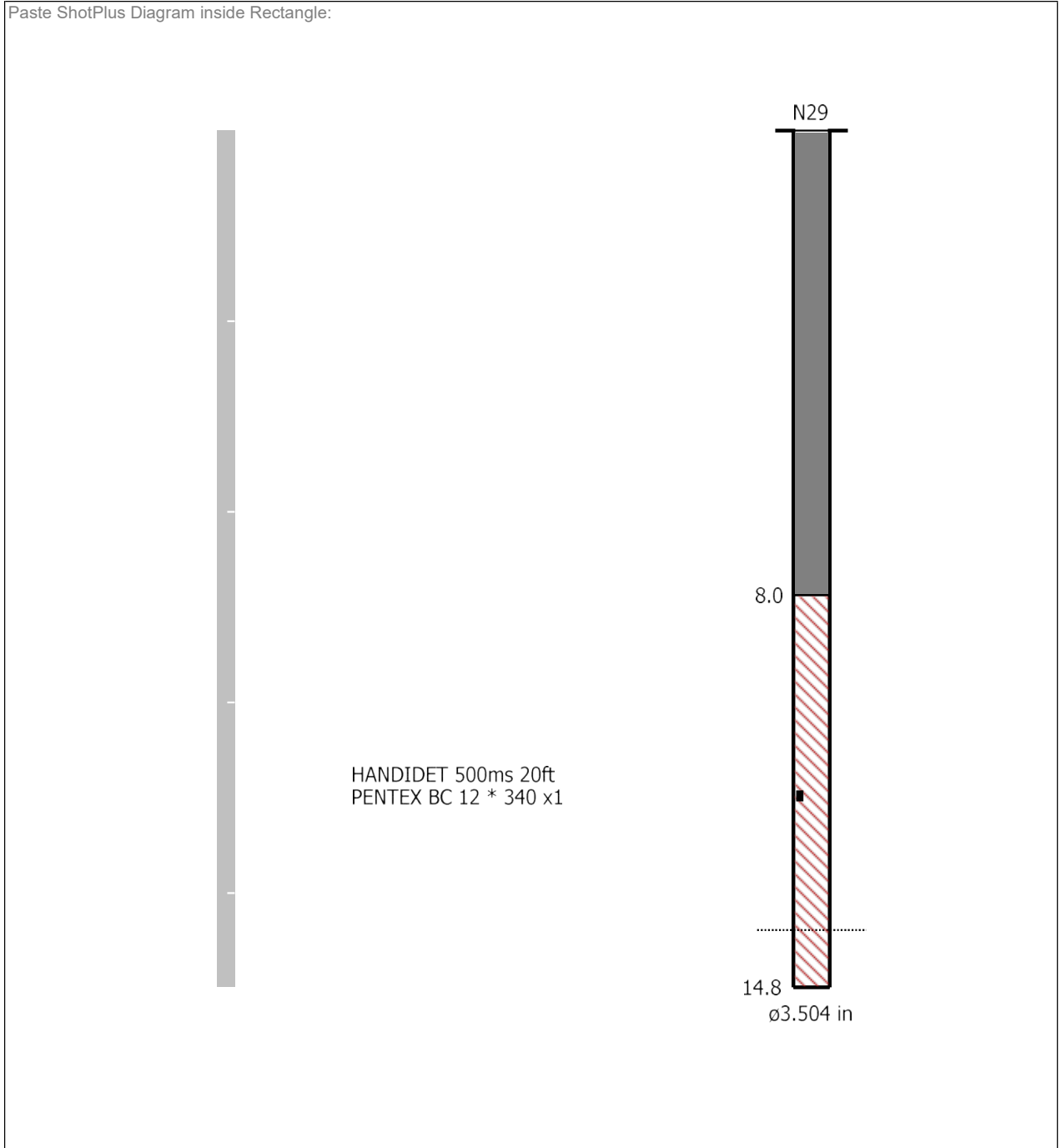
Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 3/6/2019

Blast Number: 19-010
Orica Order #: 245562

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

**Law Crushed Stone
Waterford Group
207 & 201 Westside Drive**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Mar 6 /19 07:02:42		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Mar 6 /19 07:02:42	Mar 6 /19 15:50:58	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12

Date/Time Tran at 15:09:42 March 6, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.365 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190306150942.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

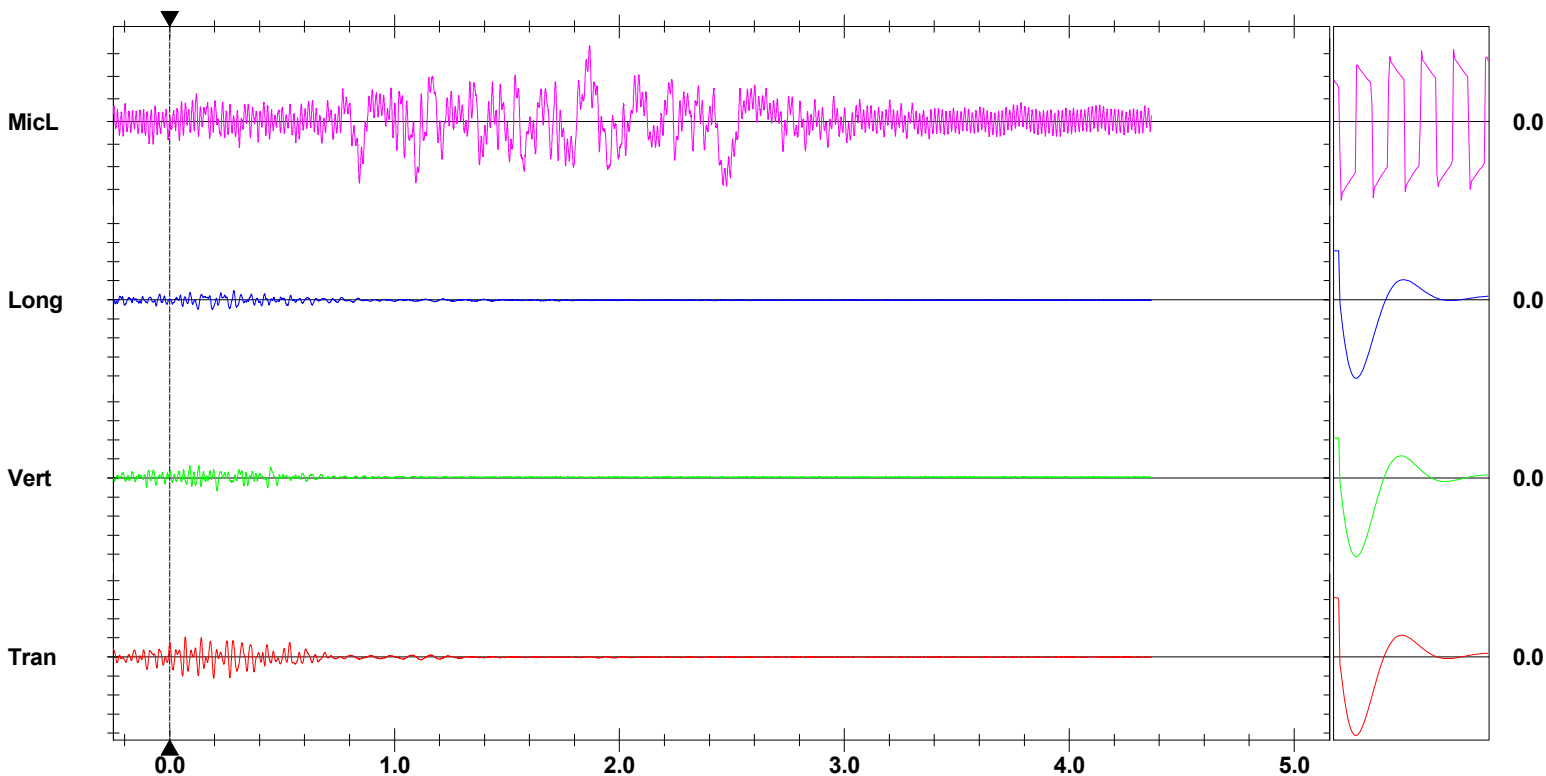
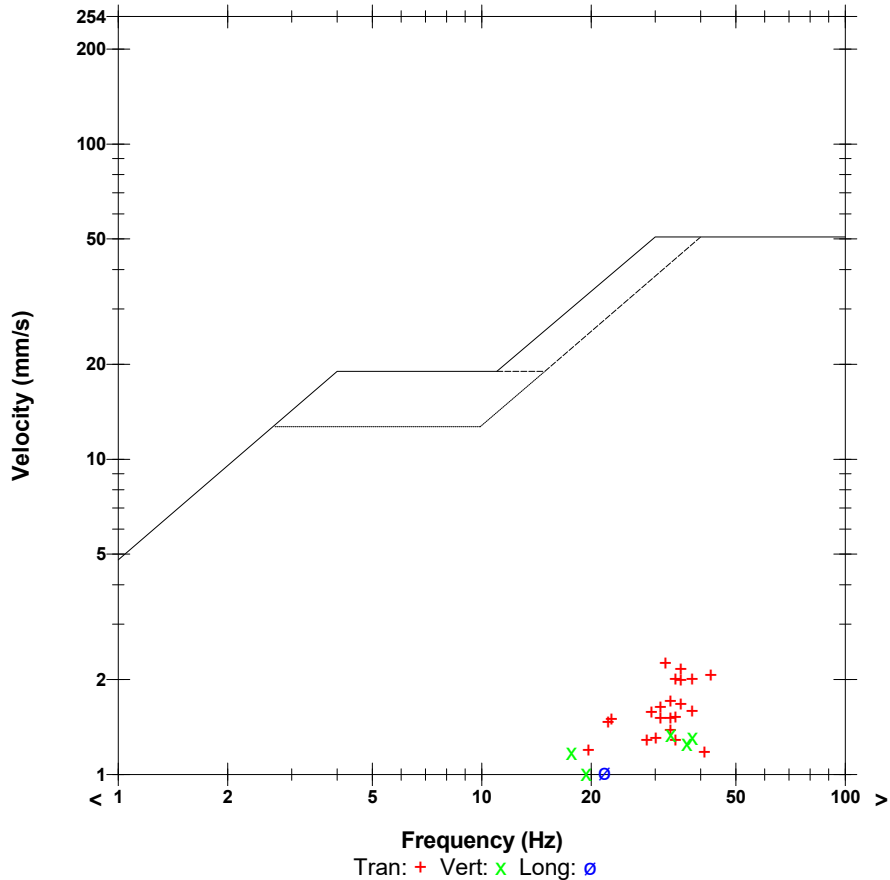
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 104.5 dB(L) at 1.868 sec
ZC Freq 5.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1648 mv)

	Tran	Vert	Long	
PPV	2.262	1.348	1.017	mm/s
ZC Freq	32	33	22	Hz
Time (Rel. to Trig)	0.196	0.211	0.189	sec
Peak Acceleration	0.067	0.079	0.036	g
Peak Displacement	0.011	0.008	0.052	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.6	3.5	3.9	

Peak Vector Sum 2.554 mm/s at 0.196 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-06**

Blast Number: **19-010**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89731** °N Latitude **79.29278** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **9,182** te
 Total Holes Loaded: **132** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **ft avg**
 # Rows Blasted: **4** rows

- Drilling Information -

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam: 88.9 mm	0 °	# Holes: 132	= 1,948.7 ft (3 1/2 " diam)
Secondary Bit diam: mm	0 °	# Holes: 	= 0.0 ft (" diam)
Tertiary Bit diam: mm	0 °	# Holes: 	= 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **27** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **105** main body
 Bench Height: **14.8** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **14.8** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **7.8** ft avg
 Main Body: **7.8** ft avg

- Design Charge Weight -

Front Row: **17.3** kg/hole
 Main Body: **17.3** kg/hole
 Max Chge Wt / delay: **22.0** kg/delay

Required kg Loaded: **3,045** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.332** kg/te (actual)
 Front row: **0.249** kg/te (theoretical)
 Main Body: **0.249** kg/te (theoretical)
 "KPI" PF: **0.249** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg
CENTRA GOLD 70 **3,000**

Pkgd Expl. Required: kg

Boosters Required: kg/u # used kg
PENTEX 12 (OR EQUIVALENT) **0.34** **132** **44.9**

total explosives weight in Blast (kg): **3,045**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required: ms # req'd
EXEL HANDIDET 7m **132**

Cord & Access. Req'd: U of M # req'd

WIRE DUPLEX (6 PACK) 400M units **1**

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-06**

Blast Number: **19-011**
 Orica Order #: **2454562**
 Blast Time: **3:26 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89508** °N Latitude **79.29320** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **-11 to -15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm **0**° Angle from Vertical # Holes: **48** = 1,200.0 ft (4 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	26,590	23,561	3,029

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	48	10.9
PENTEX 12 (OR EQUIVALENT)	0.34	48	16.3

total explosives weight in Blast (kg): **3,056**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 9m		25/500	48
EXEL HANDIDET 12m		25/500	48
CONNECTADET 9M		65 ms	8
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **13,782** te **5,301** m³
 Total tonnes per day: **29,527** te **LML22-43** Rate Code
 Total Holes Loaded: **48** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **30** main body

Bench Height: **25.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **25.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **18.0** ft avg
 Main Body: **18.0** ft avg

- Charge Weight -

Front Row: **52.5** kg/hole
 Main Body: **52.5** kg/hole
 Max. per delay: **79.0** kg/delay
 SD () Equation: **120.2** kg/delay
 Total kg Loaded: **3,056** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.222** kg/te (actual)
 Front row: **0.183** kg/te (theoretical)
 Main Body: **0.183** kg/te (theoretical)
 "KPI" PF: **0.183** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

1 GPS



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2019-03-06

Blast Number: 19-011
Orica Order #: 2454562
Blast Time: 3:26 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89506	79.29321	0.748660	1.383928
Front Row Corner	42.89513	79.29343	0.748661	1.383931
Back Row Corner	42.89504	79.29296	0.748660	1.383923
Average (Centre of Blast)	42.89508	79.29320	0.748660	1.383927

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	328.9	m		
Post Blast Data:	ppV: 5.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 19.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 114.9	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2329.6	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 1.5	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
Between 201 & 207 West Side Road, Port Colborne, ON				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	mm/s	Trigger set at: 1.5	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure:	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(328.9)^2}{30^2} \text{ kg}$$

$$= \frac{108,175}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

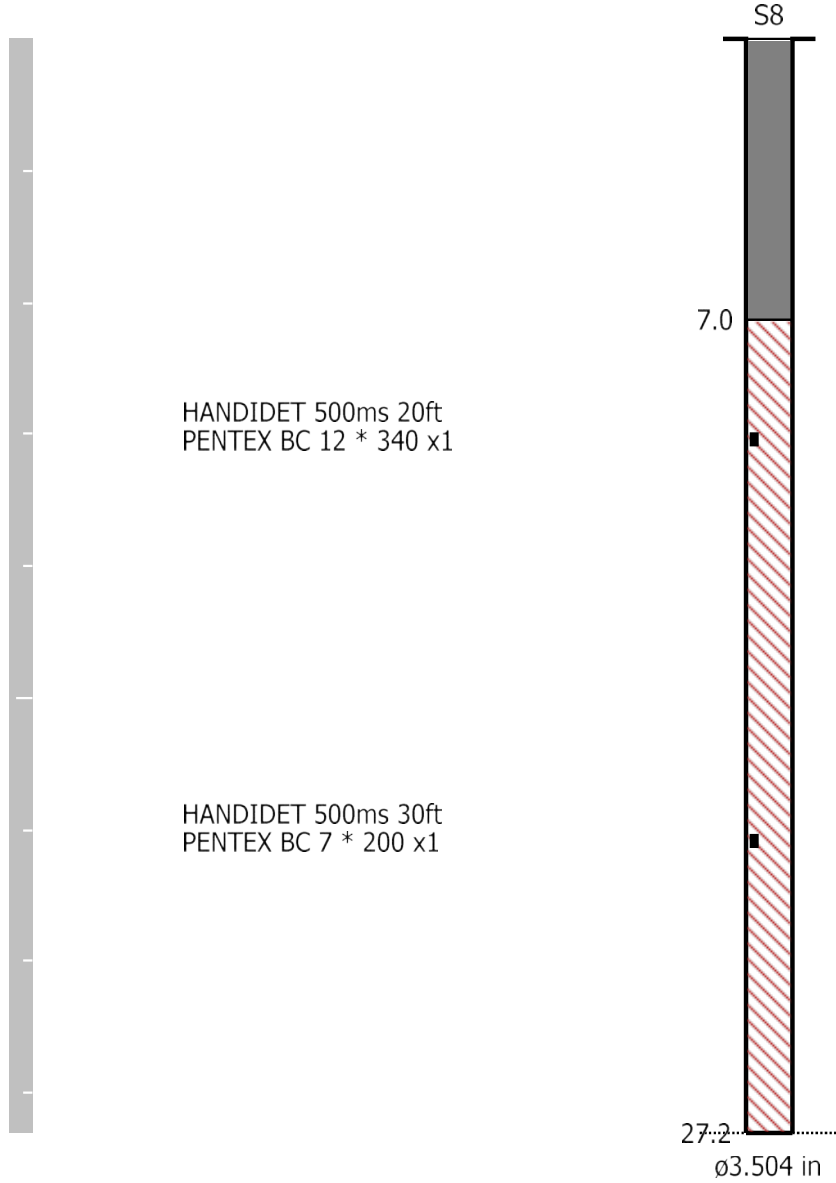
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 3/6/2019

Blast Number: 19-011
Orica Order #: 2454562

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

**Law Crushed Stone
Waterford Group
207 & 201 Westside Drive**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Mar 6 /19 07:02:42		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Mar 6 /19 07:02:42	Mar 6 /19 15:50:58	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12

Date/Time Vert at 15:26:46 March 6, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.625 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190306152646.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

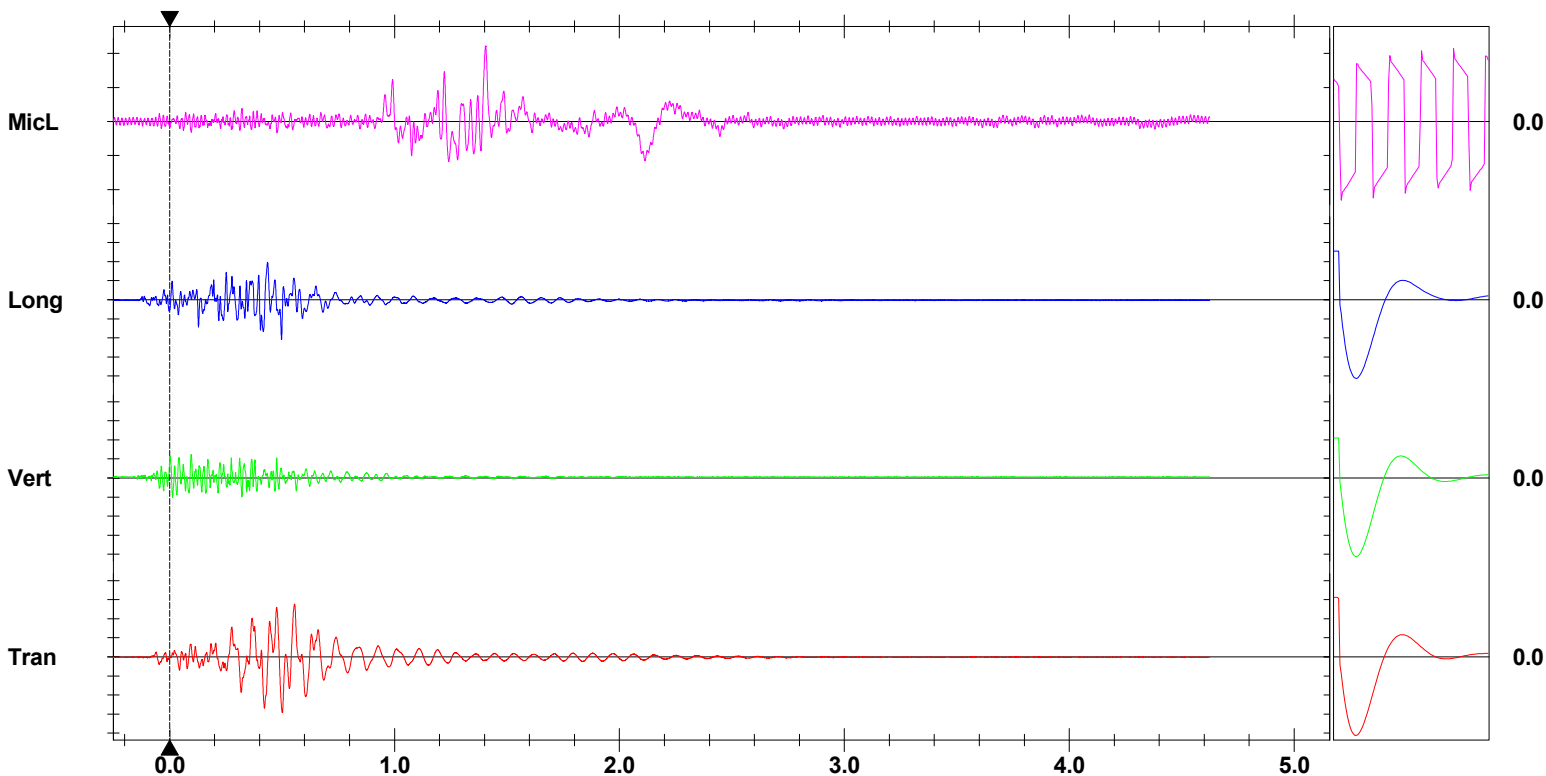
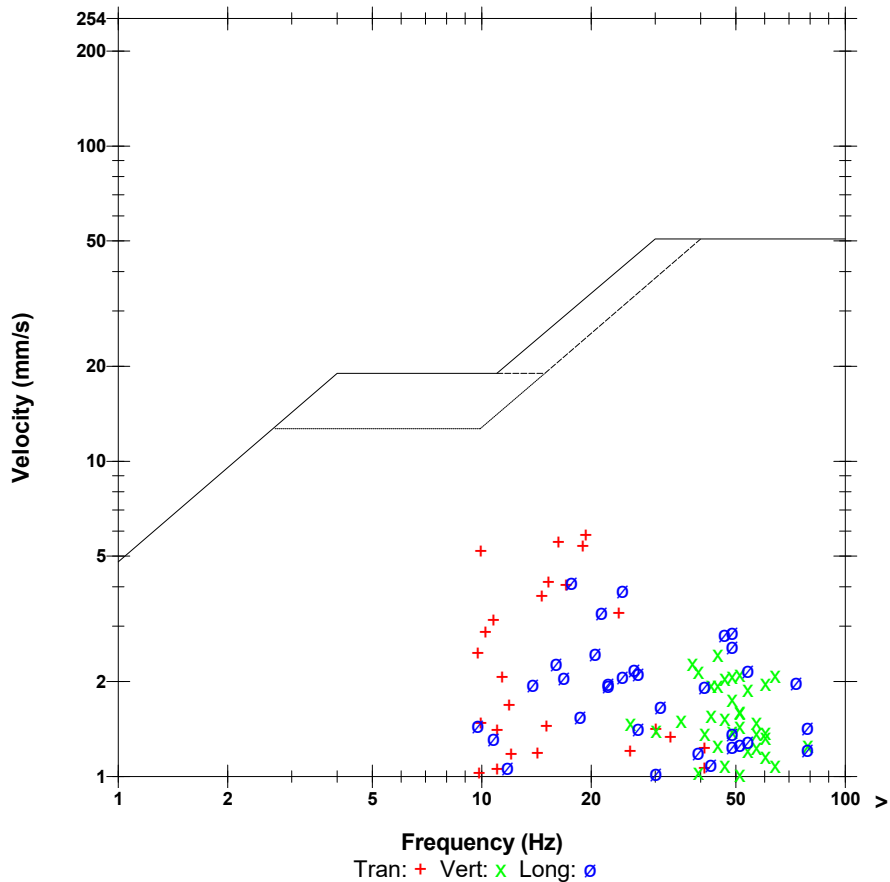
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 114.9 dB(L) at 1.405 sec
ZC Freq 15.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1661 mv)

	Tran	Vert	Long	
PPV	5.848	2.443	4.154	mm/s
ZC Freq	19.3	45	17.7	Hz
Time (Rel. to Trig)	0.500	0.096	0.498	sec
Peak Acceleration	0.084	0.132	0.245	g
Peak Displacement	0.063	0.009	0.028	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.5	4.0	

Peak Vector Sum 6.900 mm/s at 0.499 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-06**

Blast Number: **19-011**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)
 Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89508** °N Latitude **79.29320** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **15,012** te
 Total Holes Loaded: **48** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **ft avg**
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0°** # Holes: **48** = 1,307.1 ft (**4** " diam)
 Secondary Bit diam: mm **0°** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0°** # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **30** main body
 Bench Height: **27.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.2** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.2** ft avg
 Main Body: **20.2** ft avg

- Design Charge Weight -

Front Row: **59.0** kg/hole
 Main Body: **59.0** kg/hole
 Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **3,427** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.228** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

1 GPS

Bulk Expl. Required:	kg
CENTRA GOLD 70	3,400

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	48	10.9
PENTEX 12 (OR EQUIVALENT)	0.34	48	16.3

total explosives weight in Blast (kg): **3,427**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m	25/500	48
EXEL HANDIDET 12m	25/500	48
CONNECTADET 9M	65 ms	10

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasts (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-06**

Blast Number: **19-012**
 Orica Order #: **245562**
 Blast Time: **3:26 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89508** °N Latitude **79.29320** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **-11 to -15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 23 = 601.7 ft (4 " diam)
Secondary Bit diam: 92.1 mm	0	# Holes: 2 = 52.3 ft (3 5/8 " diam)
Tertiary Bit diam: 0 mm	0	# Holes: 0 = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	26,590	25,062	1,528

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	25	5.7
PENTEX 12 (OR EQUIVALENT)	0.34	25	8.5

total explosives weight in Blast (kg): **1,542**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 9m		25/500	24
EXEL HANDIDET 12m		25/500	26
CONNECTADET 9M		65 ms	8
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	9.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	6,910 te	2,658 m ³
Total tonnes per day:	29,527 te	LML22-43 Rate Code
Total Holes Loaded:	25 holes	
... including:	0 Dead Holes	
... and:	2 Helper Holes	
Helper Hole Collar:	13.0 ft avg	
# Rows Blasted:	4 rows	

- Pattern (Front Row) -

Burden:	12.0 ft avg
Spacing:	13.0 ft avg
# Holes:	10 front row

- Pattern (Main Body) -

Burden:	12.0 ft avg
Spacing:	13.0 ft avg
# Holes:	15 main body

Bench Height: **26.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.2** ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4" stone

- Charge Length -

Front Row:	19.2 ft avg
Main Body:	19.2 ft avg

- Charge Weight -

Front Row:	55.9 kg/hole
Main Body:	55.9 kg/hole
Max. per delay:	61.0 kg/delay
SD () Equation:	120.2 kg/delay
Total kg Loaded:	1,542 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.223 kg/te (actual)
Front row:	0.186 kg/te (theoretical)
Main Body:	0.186 kg/te (theoretical)
"KPI" PF:	0.186 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

1 GPS



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89506"/>	<input type="text" value="79.29321"/>	0.748660	1.383928
Front Row Corner	<input type="text" value="42.89513"/>	<input type="text" value="79.29343"/>	0.748661	1.383931
Back Row Corner	<input type="text" value="42.89504"/>	<input type="text" value="79.29296"/>	0.748660	1.383923
Average (Centre of Blast)	<input type="text" value="42.89508"/>	<input type="text" value="79.29320"/>	0.748660	1.383927

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="328.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="5.8"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="19.3"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="114.9"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2329.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(328.9)^2}{30^2} \text{ kg}$$

$$= \frac{108,175}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

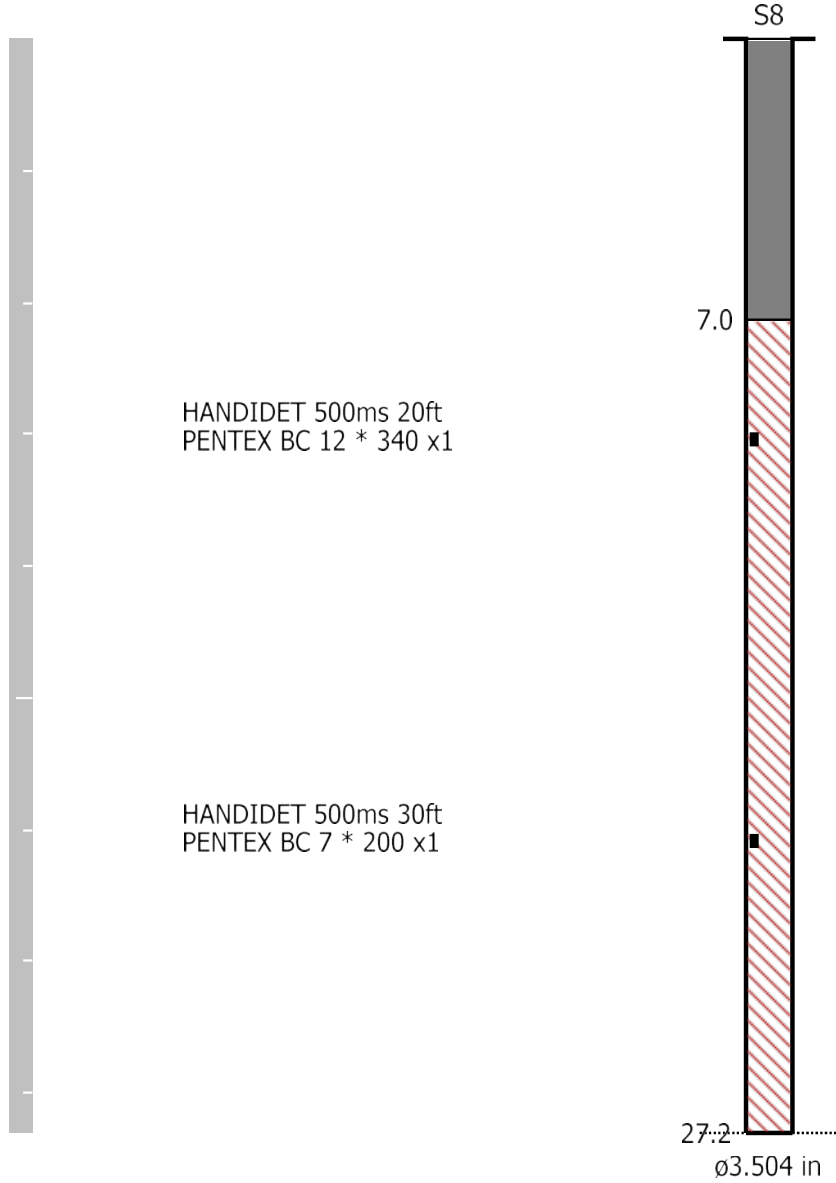
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 3/6/2019

Blast Number: 19-012
Orica Order #: 245562

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

**Law Crushed Stone
Waterford Group
207 & 201 Westside Drive**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Mar 6 /19 07:02:42		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Mar 6 /19 07:02:42	Mar 6 /19 15:50:58	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12

Date/Time Vert at 15:26:46 March 6, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.625 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Erie Peat Laws.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190306152646.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

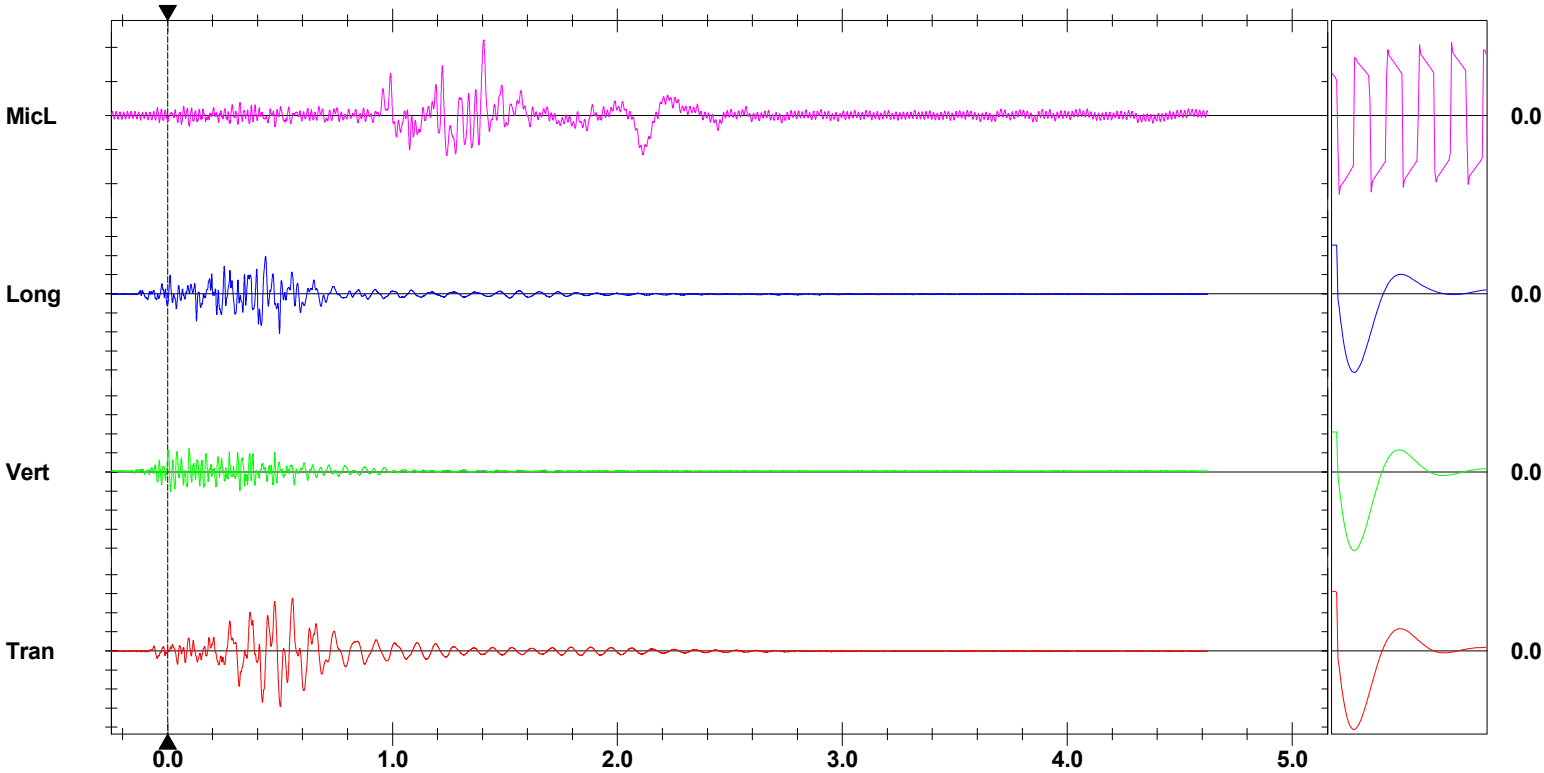
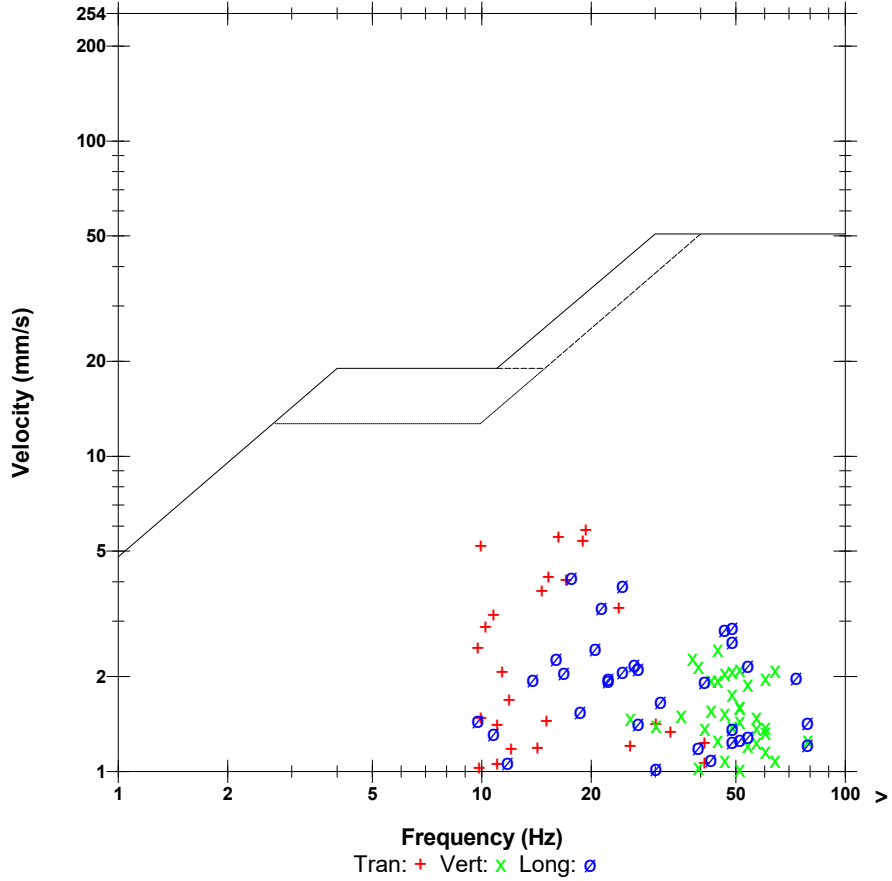
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 114.9 dB(L) at 1.405 sec
ZC Freq 15.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1661 mv)

	Tran	Vert	Long	
PPV	5.848	2.443	4.154	mm/s
ZC Freq	19.3	45	17.7	Hz
Time (Rel. to Trig)	0.500	0.096	0.498	sec
Peak Acceleration	0.084	0.132	0.245	g
Peak Displacement	0.063	0.009	0.028	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.5	4.0	

Peak Vector Sum 6.900 mm/s at 0.499 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-15**

Blast Number: **19-013**
 Orica Order #: **2458373**
 Blast Time: **10:39 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89726** °N Latitude **79.29185** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: X
 Ceiling: **3,154** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **88.9** mm **0** # Holes: **113** = 1,704.5 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,170	27,093	2,077

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	113	38.4

total explosives weight in Blast (kg): **2,115**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 7m		25/500	113
CONNECTADET 9M		65 ms	12

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **10,165** te **3,910** m³
 Total tonnes per day: **18,985** te **LLL15-49** Rate Code
 Total Holes Loaded: **113** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **34** front row

- Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **79** main body

Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.1** ft avg

- Stone Decking -

Front Row: ft avg
 Main Body: ft avg
 # Decks: per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **3/4" Clear**

- Charge Length -

Front Row: **7.1** ft avg
 Main Body: **7.1** ft avg

- Charge Weight -

Front Row: **15.8** kg/hole
 Main Body: **15.8** kg/hole
 Max. per delay: kg/delay
 SD () Equation: **295.4** kg/delay
 Total kg Loaded: **2,115** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.208** kg/te (actual)
 Front row: **0.176** kg/te (theoretical)
 Main Body: **0.176** kg/te (theoretical)
 "KPI" PF: **0.176** kg/te (theoretical)

0.912 lb/yd³
 0.770 lb/yd³
 0.770 lb/yd³
 0.770 lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 2019-03-15

Blast Number: 19-013
Orica Order #: 2458373
Blast Time: 10:39 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89725	79.29180	0.748698	1.383903
Front Row Corner	42.89728	79.29229	0.748699	1.383911
Back Row Corner	42.89725	79.29146	0.748698	1.383897
Average (Centre of Blast)	42.89726	79.29185	0.748698	1.383904

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	515.6	m		
Post Blast Data:	ppV: 3.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 29.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 102.8	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2166.6	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
Between 201 & 207 West Side Road, Port Colborne, ON				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(515.6)^2}{30^2} \text{ kg}$$

$$= \frac{265,843}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 3/15/2019

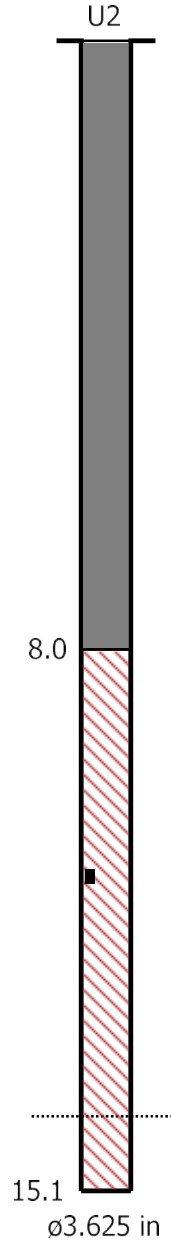
Blast Number: 19-013
Orica Order #: 2458373

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 10:39:38 March 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.616 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name __TEMP.EVT

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

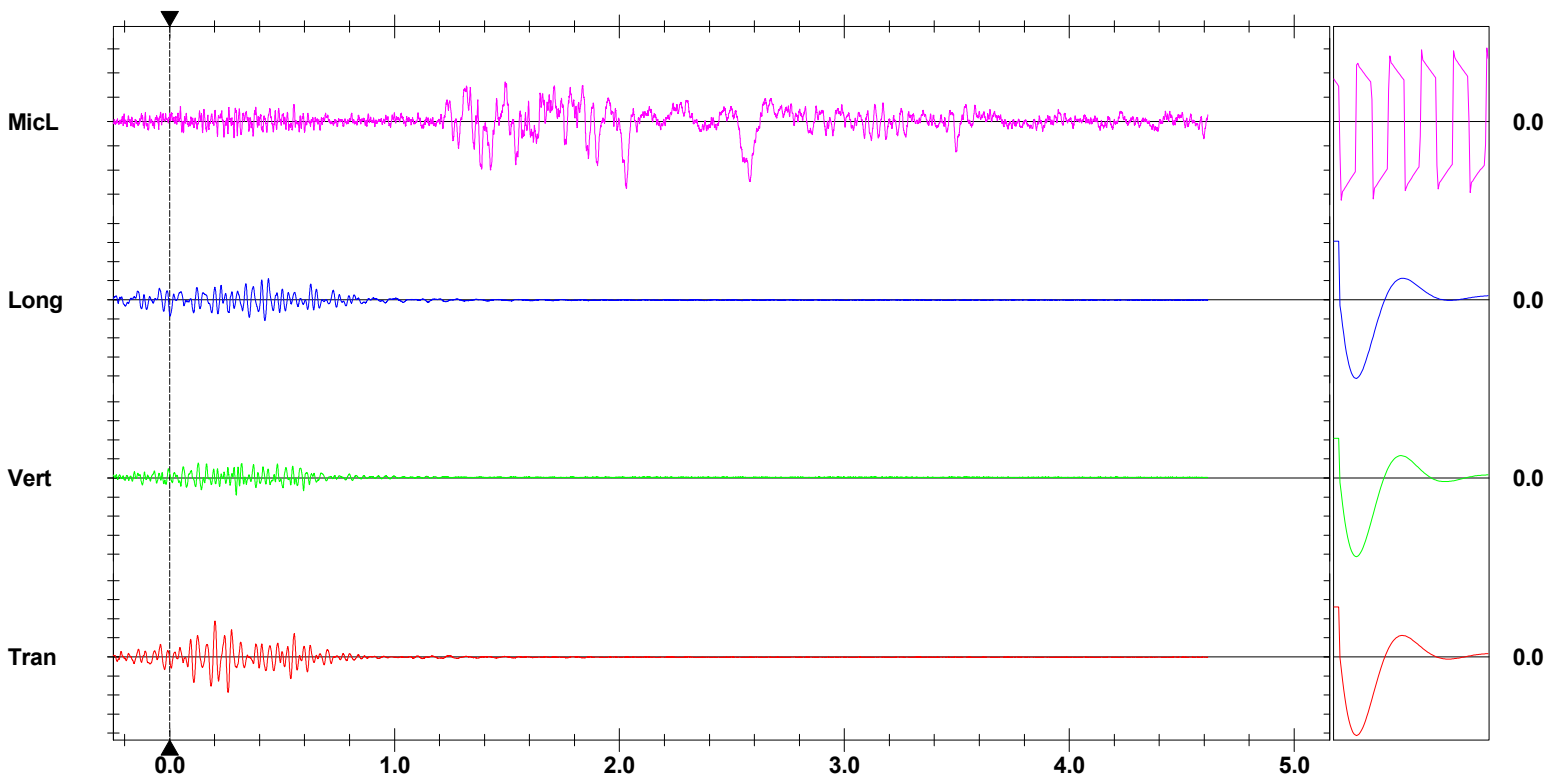
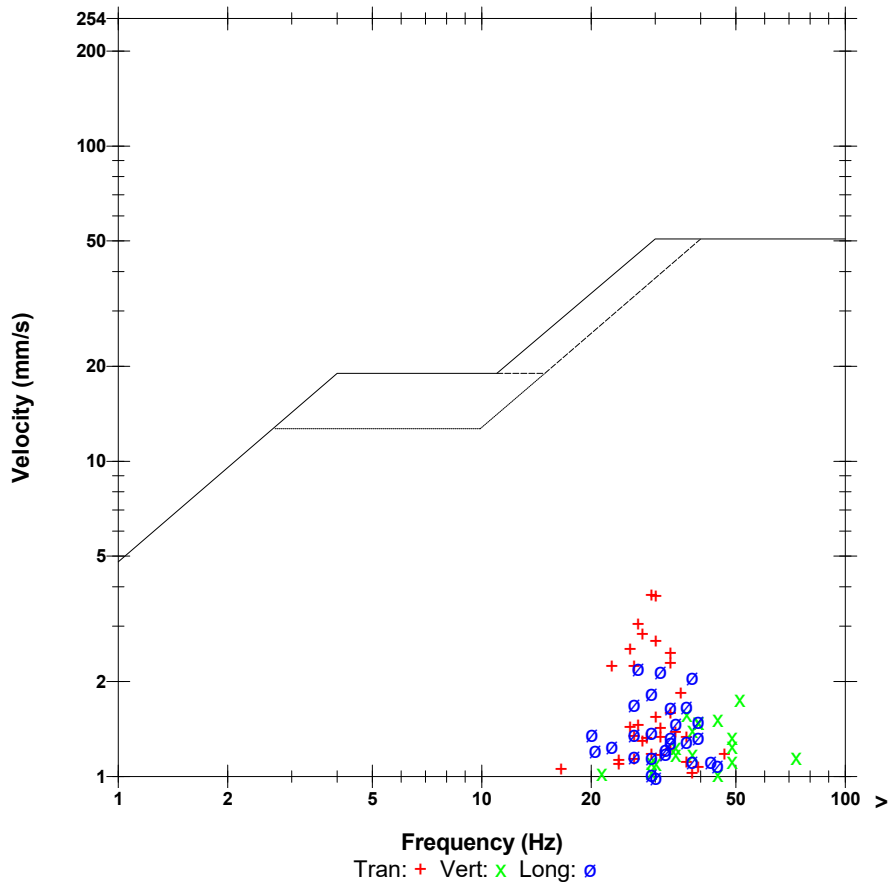
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 102.8 dB(L) at 2.031 sec
ZC Freq 10.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1557 mv)

	Tran	Vert	Long	
PPV	3.775	1.766	2.215	mm/s
ZC Freq	29	51	27	Hz
Time (Rel. to Trig)	0.202	0.296	0.439	sec
Peak Acceleration	0.084	0.102	0.067	g
Peak Displacement	0.020	0.007	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.7	

Peak Vector Sum 4.097 mm/s at 0.259 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-15**

Blast Number: **19-013**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)
 Blast Location: **Bottom Bench** (Bench / Face)
 GPS Coordinates: **42.89726** °N Latitude **79.29185** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **9,540** te
 Total Holes Loaded: **106** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **88.9** mm **0**° # Holes: **106** = 1,599.6 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **34** front row

- Design Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: 72 main body
 Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: 15.1 ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: 8.1 ft avg
 Main Body: 8.1 ft avg

- Design Charge Weight -

Front Row: 18.1 kg/hole
 Main Body: 18.1 kg/hole
 Max Chge Wt / delay: **17.0** kg/delay

Required kg Loaded: 2,136 kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.224** kg/te (actual)
 Front row: 0.201 kg/te (theoretical)
 Main Body: 0.201 kg/te (theoretical)
 "KPI" PF: 0.201 kg/te (theoretical)

0.880 lb/yd³
 0.880 lb/yd³
 0.880 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,100

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	106	36.0

total explosives weight in Blast (kg): **2,136**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 7m	25/500	106
CONNECTADET 9M	65 ms	8
UNITRONIC 600 6M		1

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-15**

Blast Number: **19-014**
 Orica Order #: **2458373**
 Blast Time: **12:50 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89726** °N Latitude **79.29185** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: X
 Ceiling: **3,150** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **88.9** mm **0** # Holes: **98** = 1,478.9 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,170	27,327	1,843

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	98	33.3

total explosives weight in Blast (kg): **1,876**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 7m		25/500	98
CONNECTADET 9M		42 ms	8

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **8,820** te **3,392** m³
 Total tonnes per day: **18,985** te **LLL15-49** Rate Code
 Total Holes Loaded: **98** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **26** front row

- Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **72** main body

Bench Height: **15.1** ft avg
 Sub-drill: ft avg
 Hole Depth: **15.1** ft avg

- Stone Decking -

Front Row: ft avg
 Main Body: ft avg
 # Decks: per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **1/2" Clear**

- Charge Length -

Front Row: **7.1** ft avg
 Main Body: **7.1** ft avg

- Charge Weight -

Front Row: **15.8** kg/hole
 Main Body: **15.8** kg/hole
 Max. per delay: **20.0** kg/delay
 SD () Equation: **295.4** kg/delay
 Total kg Loaded: **1,876** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.213** kg/te (actual)
 Front row: **0.176** kg/te (theoretical)
 Main Body: **0.176** kg/te (theoretical)
 "KPI" PF: **0.176** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89725"/>	<input type="text" value="79.29180"/>	0.748698	1.383903
Front Row Corner	<input type="text" value="42.89728"/>	<input type="text" value="79.29229"/>	0.748699	1.383911
Back Row Corner	<input type="text" value="42.89725"/>	<input type="text" value="79.29146"/>	0.748698	1.383897
Average (Centre of Blast)	<input type="text" value="42.89726"/>	<input type="text" value="79.29185"/>	0.748698	1.383904

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="515.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="3.4"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="7.1"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="101.8"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2166.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(515.6)^2}{30^2} \text{ kg} \\
 &= \frac{265,843}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 3/15/2019

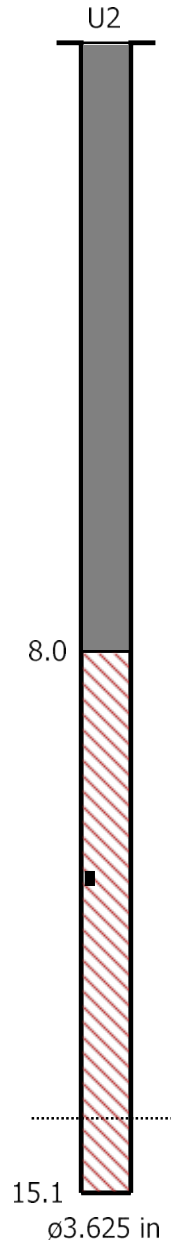
Blast Number: 19-014
Orica Order #: 2458373

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 12:50:17 March 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.314 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name __TEMP.EVT

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

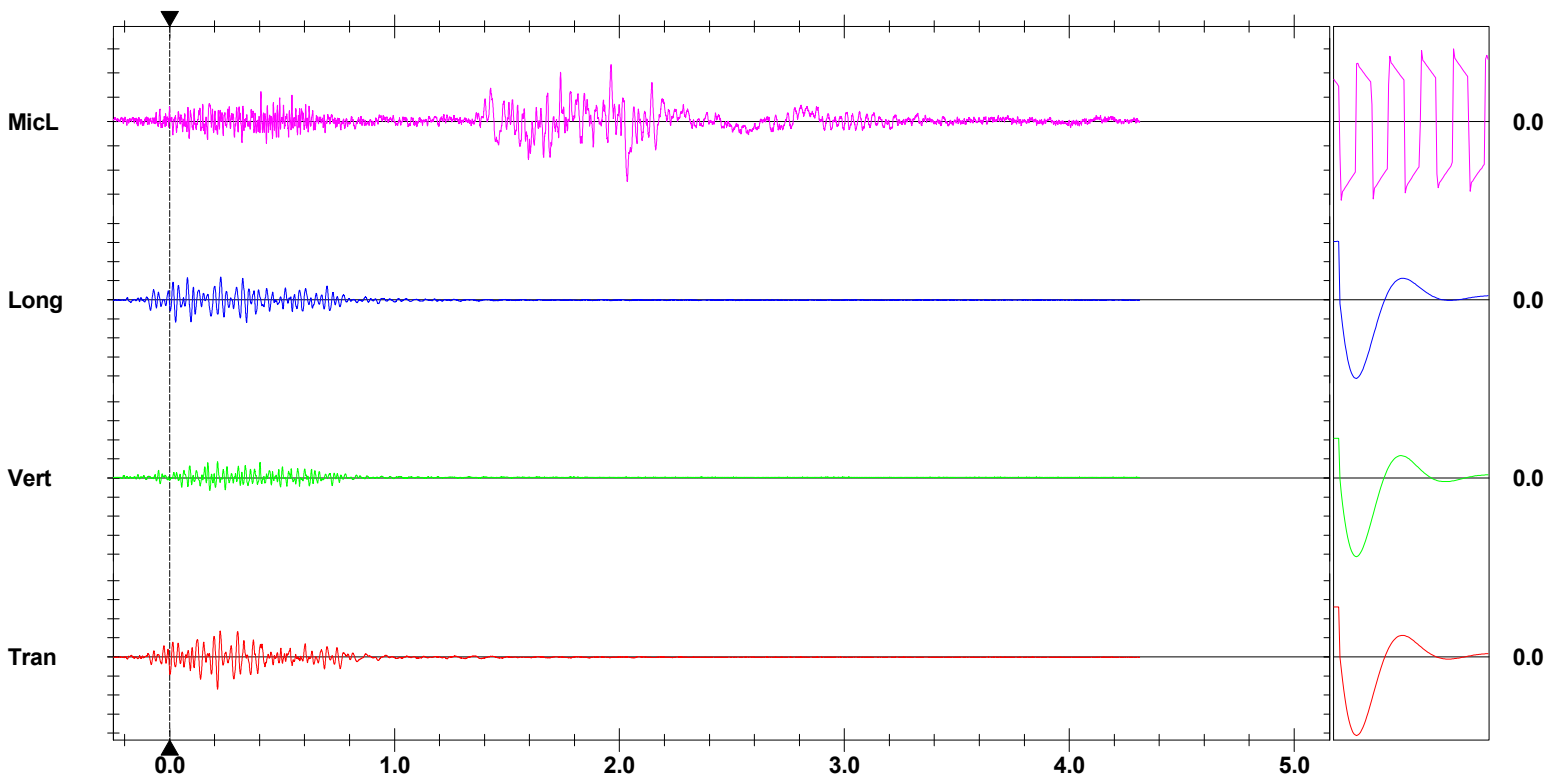
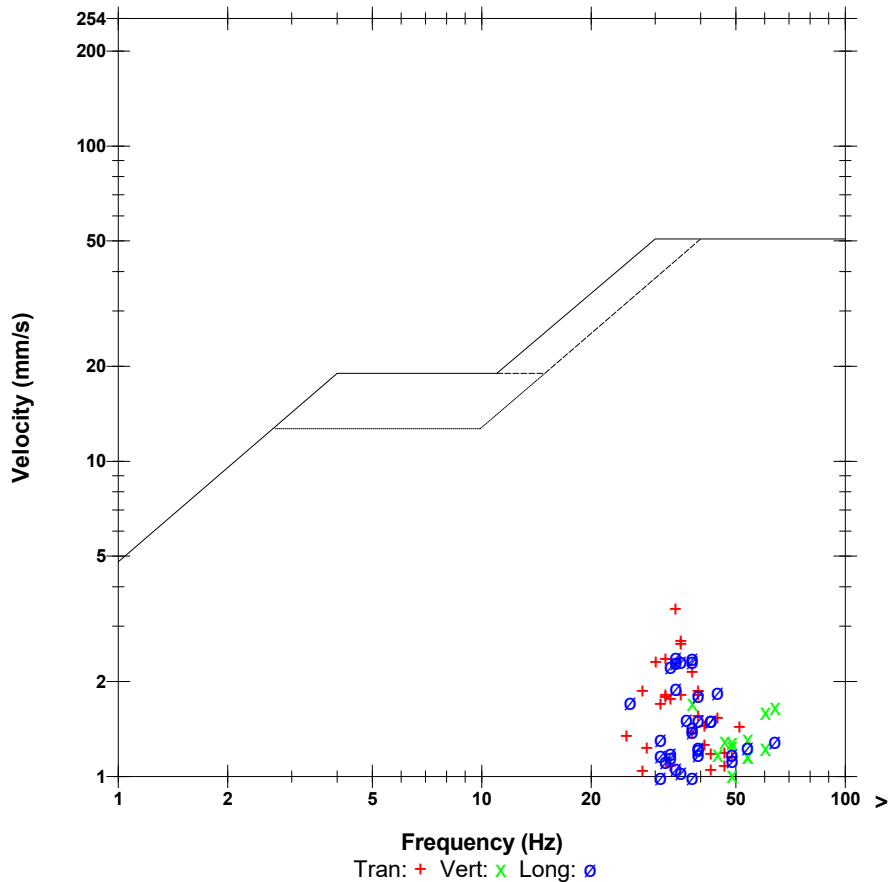
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 101.8 dB(L) at 2.035 sec
ZC Freq 14.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1553 mv)

	Tran	Vert	Long	
PPV	3.405	1.710	2.396	mm/s
ZC Freq	34	38	34	Hz
Time (Rel. to Trig)	0.213	0.213	0.227	sec
Peak Acceleration	0.089	0.092	0.100	g
Peak Displacement	0.014	0.006	0.011	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.7	

Peak Vector Sum 4.079 mm/s at 0.213 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-15**

Blast Number: **19-014**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89726** °N Latitude **79.29185** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **9,540** te
 Total Holes Loaded: **106** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical

Primary Bit diam: **88.9** mm **0**° # Holes: **106** = 1,599.6 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **28** front row

- Design Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: 78 main body
 Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.1** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **8.1** ft avg
 Main Body: **8.1** ft avg

- Design Charge Weight -

Front Row: **18.1** kg/hole
 Main Body: **18.1** kg/hole
 Max Chge Wt / delay: **17.0** kg/delay

Required kg Loaded: **2,136** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.224** kg/te (actual)
 0.880 lb/yd³ Front row: **0.201** kg/te (theoretical)
 0.880 lb/yd³ Main Body: **0.201** kg/te (theoretical)
 0.880 lb/yd³ "KPI" PF: **0.201** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,100

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	106	36.0

total explosives weight in Blast (kg): **2,136**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 7m	25/500	106
CONNECTADET 9M	65 ms	8
UNITRONIC 600 6M		1

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:		
BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-20**

Blast Number: **19-015**
 Orica Order #: **2459912**
 Blast Time: **10:39 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89495** °N Latitude **79.29317** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **15** kph Temperature: **1 to 5** °C

Clear: Partly Cloudy:
 Rain: Snow: Overcast: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical: **0** # Holes: **59** = 1,508.0 ft (**4** " diam)
 Secondary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,600	25,769	3,831

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	3	50

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	59	13.4
PENTEX 12 (OR EQUIVALENT)	0.34	59	20.1

total explosives weight in Blast (kg): **3,914**
 Pkgd Prod (50 kg) % of Total kg: **1.3%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 9m		25/500	58
EXEL HANDIDET 12m		25/500	60
UNITRONIC 600 9M			1
CONNECTADET 9M		65 ms	10

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	5.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **17,320** te **6,661** m³
 Total tonnes per day: **20,352** te **LML22-44** Rate Code
 Total Holes Loaded: **59** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **20** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **39** main body

Bench Height: **25.6** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **25.6** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **18.6** ft avg
 Main Body: **18.6** ft avg

- Charge Weight -

Front Row: **54.1** kg/hole
 Main Body: **54.1** kg/hole
 Max. per delay: **69.0** kg/delay
 SD () Equation: **111.0** kg/delay
 Total kg Loaded: **3,914** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.990 lb/yd³ Yield PF: **0.226** kg/te (actual)
 0.808 lb/yd³ Front row: **0.184** kg/te (theoretical)
 0.808 lb/yd³ Main Body: **0.184** kg/te (theoretical)
 0.808 lb/yd³ "KPI" PF: **0.184** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Package was used due to lean burdens and incompitant rock



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89493"/>	<input type="text" value="79.29311"/>	<input type="text" value="0.748658"/>	<input type="text" value="1.383926"/>
Front Row Corner	<input type="text" value="42.89499"/>	<input type="text" value="79.29350"/>	<input type="text" value="0.748659"/>	<input type="text" value="1.383933"/>
Back Row Corner	<input type="text" value="42.89491"/>	<input type="text" value="79.29291"/>	<input type="text" value="0.748657"/>	<input type="text" value="1.383922"/>
Average (Centre of Blast)	<input type="text" value="42.89495"/>	<input type="text" value="79.29317"/>	<input type="text" value="0.748658"/>	<input type="text" value="1.383927"/>

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	<input type="text" value="0.748619"/>	<input type="text" value="1.383886"/>
Distance (1st Seis. From Centre of Blast)	<input type="text" value="316.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="7.8"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="79.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="108.8"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	<input type="text" value="0.000000"/>	<input type="text" value="0.000000"/>
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	<input type="text" value="0.000000"/>	<input type="text" value="0.000000"/>
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(316.1)^2}{30^2} \text{ kg} \\
 &= \frac{99,919}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

jim bray

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

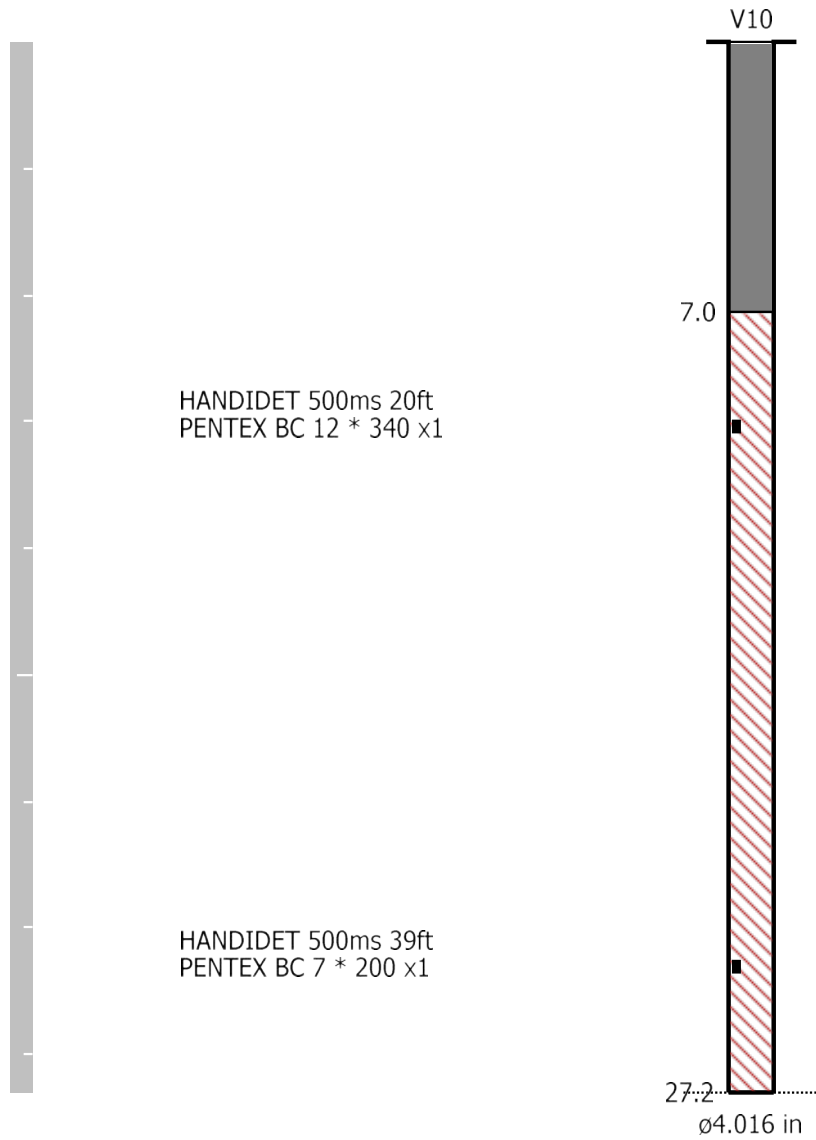
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **3/20/2019**

Blast Number: **19-015**
Orica Order #: **2459912**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 10:38:33 March 20, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.616 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190320103833.IDFW

Notes

Location: Erie Peat Rd
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: Sand Bagged

Extended Notes

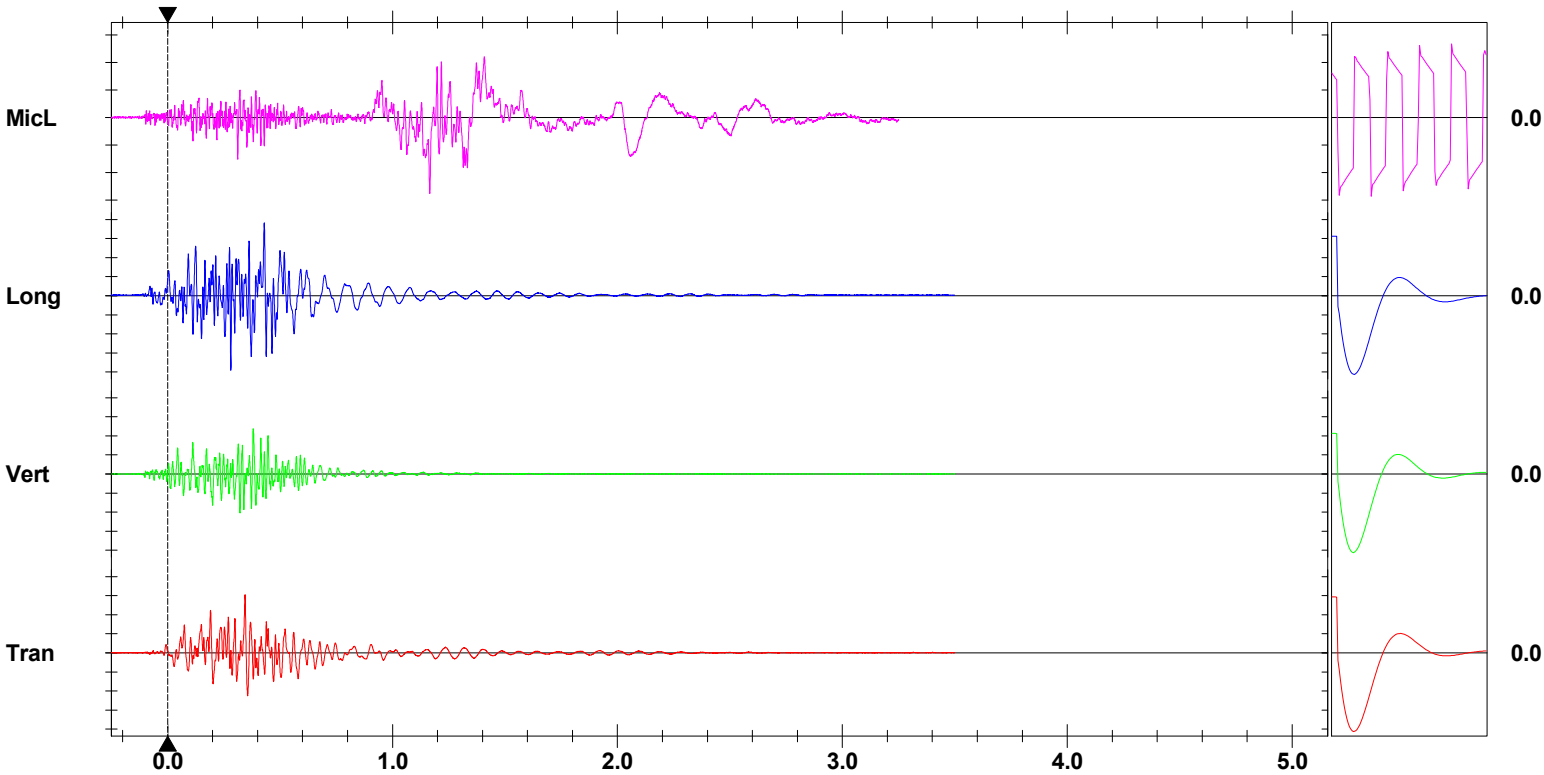
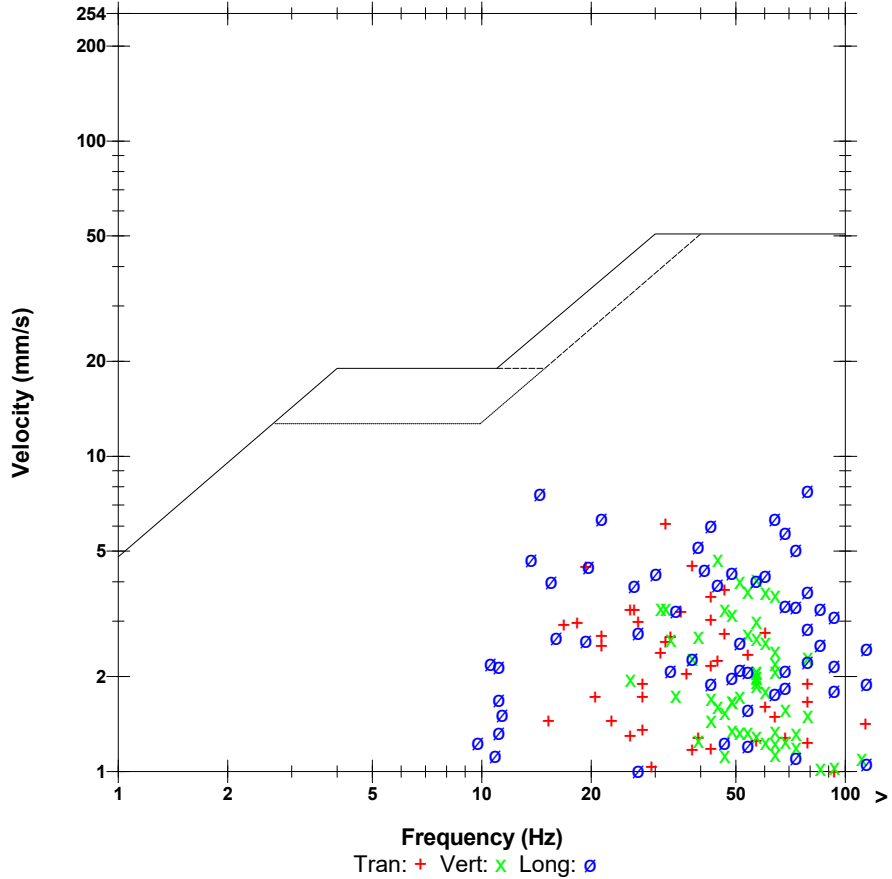
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 108.8 dB(L) at 1.166 sec
ZC Freq 10.9 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1524 mv)

	Tran	Vert	Long	
PPV	6.108	4.729	7.835	mm/s
ZC Freq	32	45	79	Hz
Time (Rel. to Trig)	0.344	0.380	0.281	sec
Peak Acceleration	0.163	0.262	0.456	g
Peak Displacement	0.024	0.016	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.0	4.0	4.3	

Peak Vector Sum 8.154 mm/s at 0.430 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-20**

Blast Number: **19-015**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89495** °N Latitude **79.29317** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **18,452** te
 Total Holes Loaded: **59** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:

Primary Bit diam: **101.6** mm **0**° # Holes: **59** = 1,606.6 ft (4 " diam)
 Secondary Bit diam: **0** mm **0**° # Holes: **0** = 0.0 ft (" diam)
 Tertiary Bit diam: **0** mm **0**° # Holes: **0** = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **20** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **39** main body
 Bench Height: **27.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.2** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.2** ft avg
 Main Body: **20.2** ft avg

- Design Charge Weight -

Front Row: **59.0** kg/hole
 Main Body: **59.0** kg/hole
 Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **4,033** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.219** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

0.827 lb/yd³
 0.827 lb/yd³
 0.827 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,000

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	59	13.4
PENTEX 12 (OR EQUIVALENT)	0.34	59	20.1

total explosives weight in Blast (kg): **4,033**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m		59
EXEL HANDIDET 12m		59
UNITRONIC 600 6M		1
CONNECTADET 9M	65 ms	8

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-20**

Blast Number: **19-016**
 Orica Order #: **2459912**
 Blast Time: **12:30 PM**

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Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)

GPS Coordinates: **42.89219** °N Latitude **79.30211** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **15** kph Temperature: **1 to 5** °C

Clear: Partly Cloudy:
 Rain: Snow: Overcast: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 8 = 176.0 ft (4 " diam)
Secondary Bit diam: 92.1 mm	0 °	# Holes: 4 = 88.0 ft (3 5/8 " diam)
Tertiary Bit diam: 0 mm	0 °	# Holes: 0 = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	25,769	25,270	499

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	3	50

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	3	0.7
PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1

total explosives weight in Blast (kg): **554**
 Pkgd Prod (50 kg) % of Total kg: **9.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			15

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **3,032** te **1,166** m³
 Total tonnes per day: **20,352** te **LML22-34** Rate Code
 Total Holes Loaded: **12** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** back row

Bench Height: **22.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **22.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **14.0** ft avg
 Back Row: **14.0** ft avg

- Charge Weight -

Front Row: **40.8** kg/hole
 Back Row: **40.8** kg/hole
 Max. per delay: **60.0** kg/delay
 SD () Equation: **97.7** kg/delay
 Total kg Loaded: **554** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.800 lb/yd³ Yield PF: **0.183** kg/te (actual)
 0.708 lb/yd³ Front row: **0.162** kg/te (theoretical)
 0.708 lb/yd³ Main Body: **0.162** kg/te (theoretical)
 0.708 lb/yd³ "KPI" PF: **0.162** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Package was use due to lean burden and incompitant rock



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89219"/>	<input type="text" value="79.30212"/>	0.748610	1.384083
Front Row Corner	<input type="text" value="42.89221"/>	<input type="text" value="79.30200"/>	0.748610	1.384081
Back Row Corner	<input type="text" value="42.89219"/>	<input type="text" value="79.30221"/>	0.748610	1.384085
Average (Centre of Blast)	<input type="text" value="42.89219"/>	<input type="text" value="79.30211"/>	0.748610	1.384083

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
2nd Reading				
Average	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	<input type="text" value="296.5"/>	m		
Post Blast Data:	ppV: <input type="text" value="3.6"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="25.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="108.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
2nd Reading				
Average	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="1127.4"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(296.5)^2}{30^2} \text{ kg} \\
 &= \frac{87,912}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **3/20/2019**

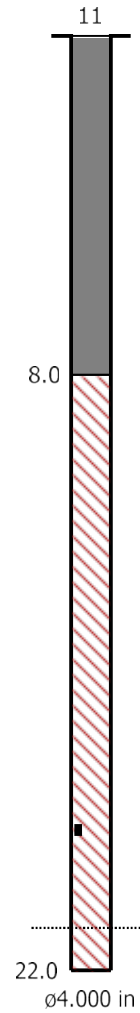
Blast Number: **19-016**
Orica Order #: **2459912**

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 12:30:29 March 20, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.2 Volts
Unit Calibration December 4, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: 10611 Hwy 3 Wainfleet Church
 Client: Waterford Group
 User Name: Orica Canada Inc.
 General: Laws Quarry

Extended Notes

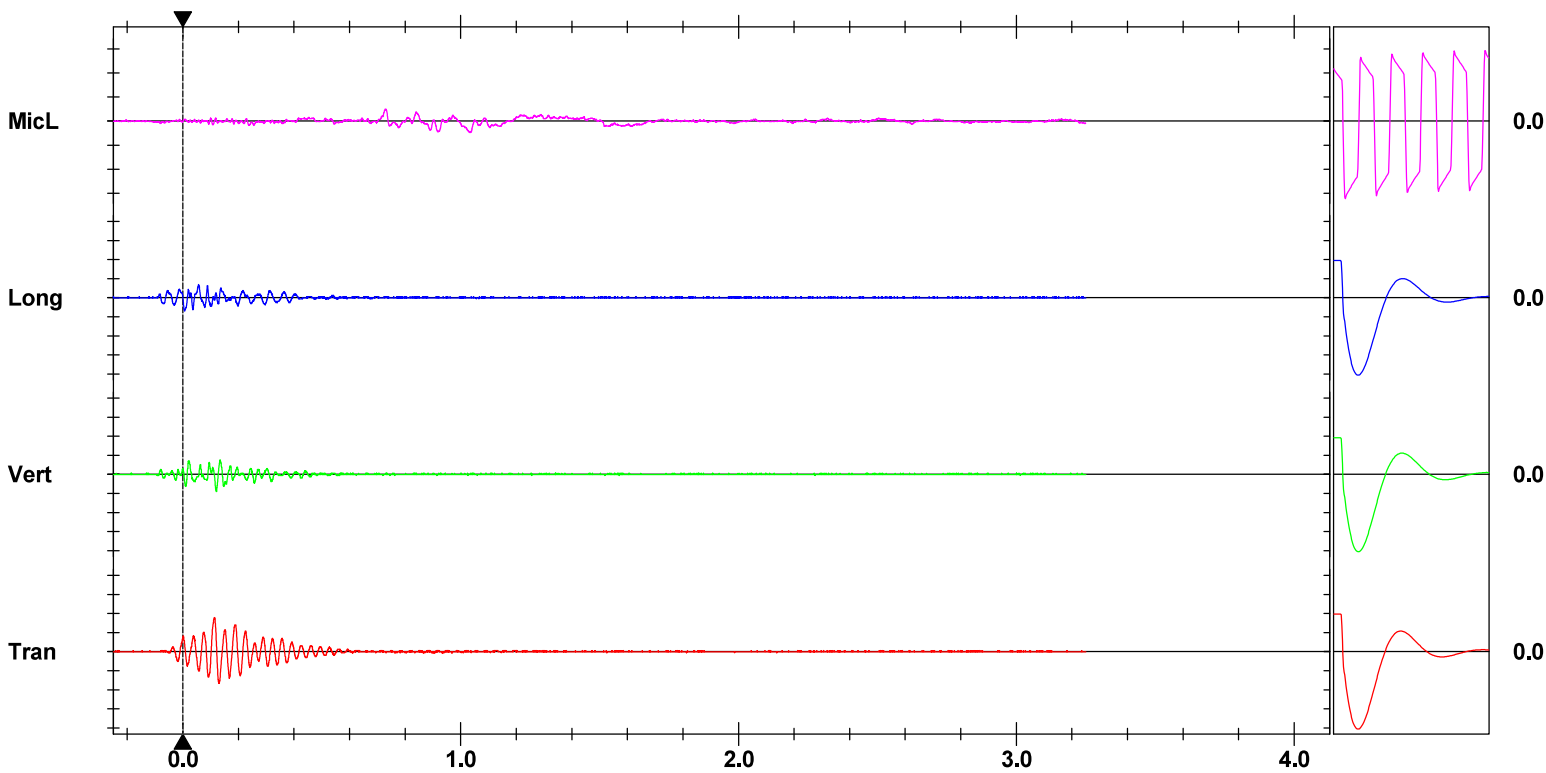
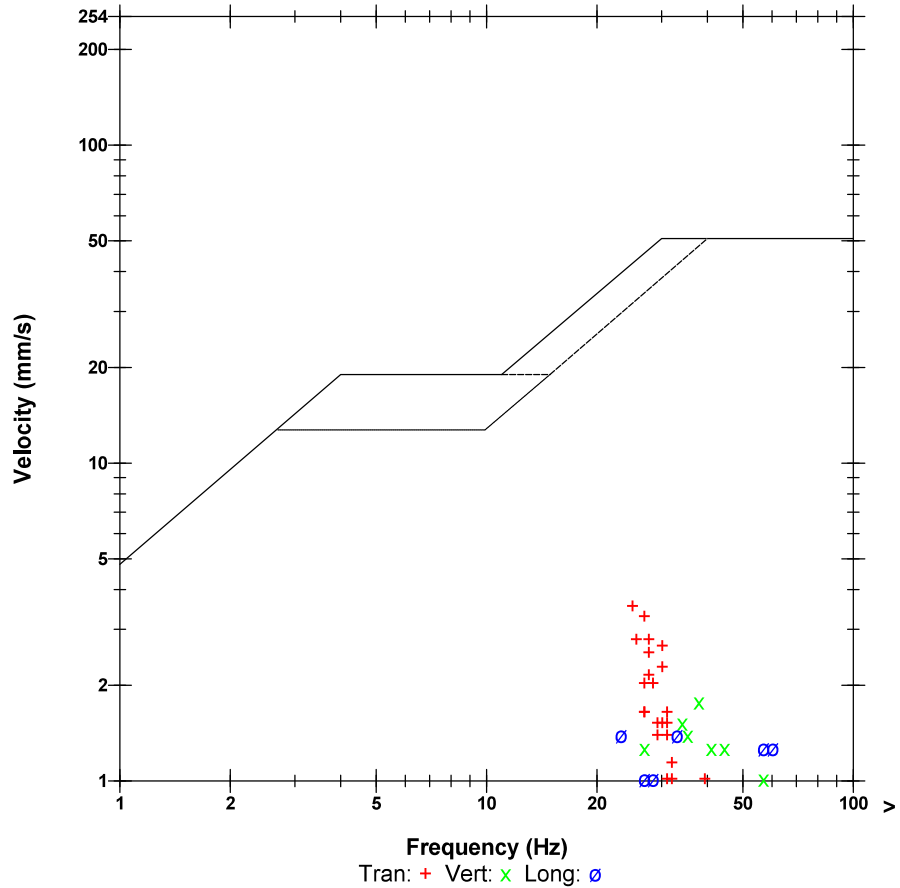
Front yard Beside tree stump
 N 25 40 245 W 79 9 7814
 Sandbagged Beside Flagpole
 42.89111
 79.30543

Microphone Linear Weighting
PSPL 108.0 dB(L) at 0.728 sec
ZC Freq 14.0 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 578 mv)

	Tran	Vert	Long	
PPV	3.556	1.778	1.397	mm/s
ZC Freq	25	38	33	Hz
Time (Rel. to Trig)	0.113	0.120	0.005	sec
Peak Acceleration	0.080	0.080	0.053	g
Peak Displacement	0.024	0.008	0.008	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.2	Hz
Overswing Ratio	3.8	3.7	4.1	

Peak Vector Sum 3.574 mm/s at 0.114 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

42.89214N, 79.31593W
Port Colbrne,On
WaterFord Group Law Crushed Stone

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Mar 20 /19 11:18:51		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Mar 20 /19 11:18:51	Mar 20 /19 12:33:31	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:



Blast Design

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-20**

Blast Number: **19-016**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench** (Bench / Face)
 GPS Coordinates: **42.89219** °N Latitude **79.30211** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **2,214** te
 Total Holes Loaded: **11** holes
 ... including: **1** Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Primary Bit diam: **101.6** mm **0**° Angle from Vertical # Holes: **8** = **175.0** ft (**4** " diam)
 Secondary Bit diam: **92.1** mm **0**° # Holes: **3** = **65.6** ft (**3 5/8** " diam)
 Tertiary Bit diam: mm **0**° # Holes: = **0.0** ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **4** main body
 Bench Height: **20.9** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **21.9** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **.75" Stone**

- Design Charge Length -

Front Row: **13.9** ft avg
 Main Body: **13.9** ft avg

- Design Charge Weight -

Front Row: **40.5** kg/hole
 Main Body: **40.5** kg/hole
 Max Chge Wt / delay: **40.0** kg/delay

Required kg Loaded: **629** kg
 Rock Density: **2.40** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.284** kg/te (actual)
 0.740 lb/yd³ Front row: **0.183** kg/te (theoretical)
 0.740 lb/yd³ Main Body: **0.183** kg/te (theoretical)
 0.740 lb/yd³ "KPI" PF: **0.183** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg

CENTRA GOLD 70		500
----------------	--	------------

Pkgd Expl. Required: kg

FORTEL PRO 75X400	5	125
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Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	11	3.7
---------------------------	------	-----------	------------

total explosives weight in Blast (kg): **629**
 Pkgd Prod (125 kg) % of Total kg: **19.9%**

Detonators Required: ms # req'd

UNITRONIC 600 9M		11
------------------	--	-----------

Cord & Access. Req'd: U of M # req'd

WIRE DUPLEX (6 PACK) 400M	units	1
---------------------------	-------	----------

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-25**

Blast Number: **19-017**
 Orica Order #: **2461543**
 Blast Time: **9:33 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)

GPS Coordinates: **42.89213** °N Latitude **79.32874** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **N** at **5** kph Temperature: **0** °C

Clear: Partly Cloudy:
 Rain: Snow: Overcast: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 12 = 264.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,780	29,157	623

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	3	50

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1

total explosives weight in Blast (kg): **677**
 Pkgd Prod (50 kg) % of Total kg: **7.4%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			12

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	1.0
HELPER HOURS	Enter total Helper man-hours	2.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **3,032** te **1,166** m³
 Total tonnes per day: **8,514** te **LML22-35** Rate Code
 Total Holes Loaded: **12** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** back row

Bench Height: **22.0** ft avg

Sub-drill: **0.0** ft avg

Hole Depth: **22.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **14.0** ft avg
 Back Row: **14.0** ft avg

- Charge Weight -

Front Row: **40.8** kg/hole
 Back Row: **40.8** kg/hole
 Max. per delay: **52.0** kg/delay
 SD () Equation: **1213.1** kg/delay
 Total kg Loaded: **677** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.223** kg/te (actual)
 Front row: **0.162** kg/te (theoretical)
 Main Body: **0.162** kg/te (theoretical)
 "KPI" PF: **0.162** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89212"/>	<input type="text" value="79.30208"/>	0.748609	1.384082
Front Row Corner	<input type="text" value="42.89216"/>	<input type="text" value="79.30196"/>	0.748609	1.384080
Back Row Corner	<input type="text" value="42.89212"/>	<input type="text" value="79.38218"/>	0.748609	1.385480
Average (Centre of Blast)	<input type="text" value="42.89213"/>	<input type="text" value="79.32874"/>	0.748609	1.384548

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
2nd Reading				
Average	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	<input type="text" value="1905.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="3.2"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="31.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="117.4"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="10611 On Road 3 Port Colborne,On"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
2nd Reading				
Average	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="1044.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="20804 Graybiel Road Port Colbourne,On"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(1044.9)^2}{30^2} \text{ kg} \\
 &= \frac{1,091,816}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **3/25/2019**

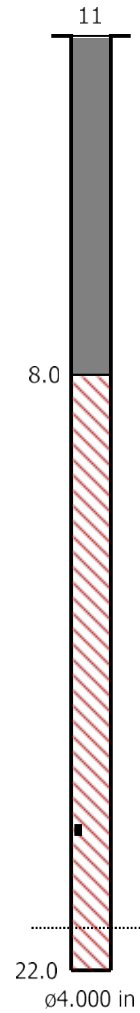
Blast Number: **19-017**
Orica Order #: **2461543**

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 09:33:08 March 25, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration December 4, 2018 by InstanTEL
File Name __TEMP.EVT

Notes

Location: 10611 Hwy 3 Wainfleet Church
 Client: Waterford Group
 User Name: Orica Canada Inc.
 General: Laws Quarry

Extended Notes

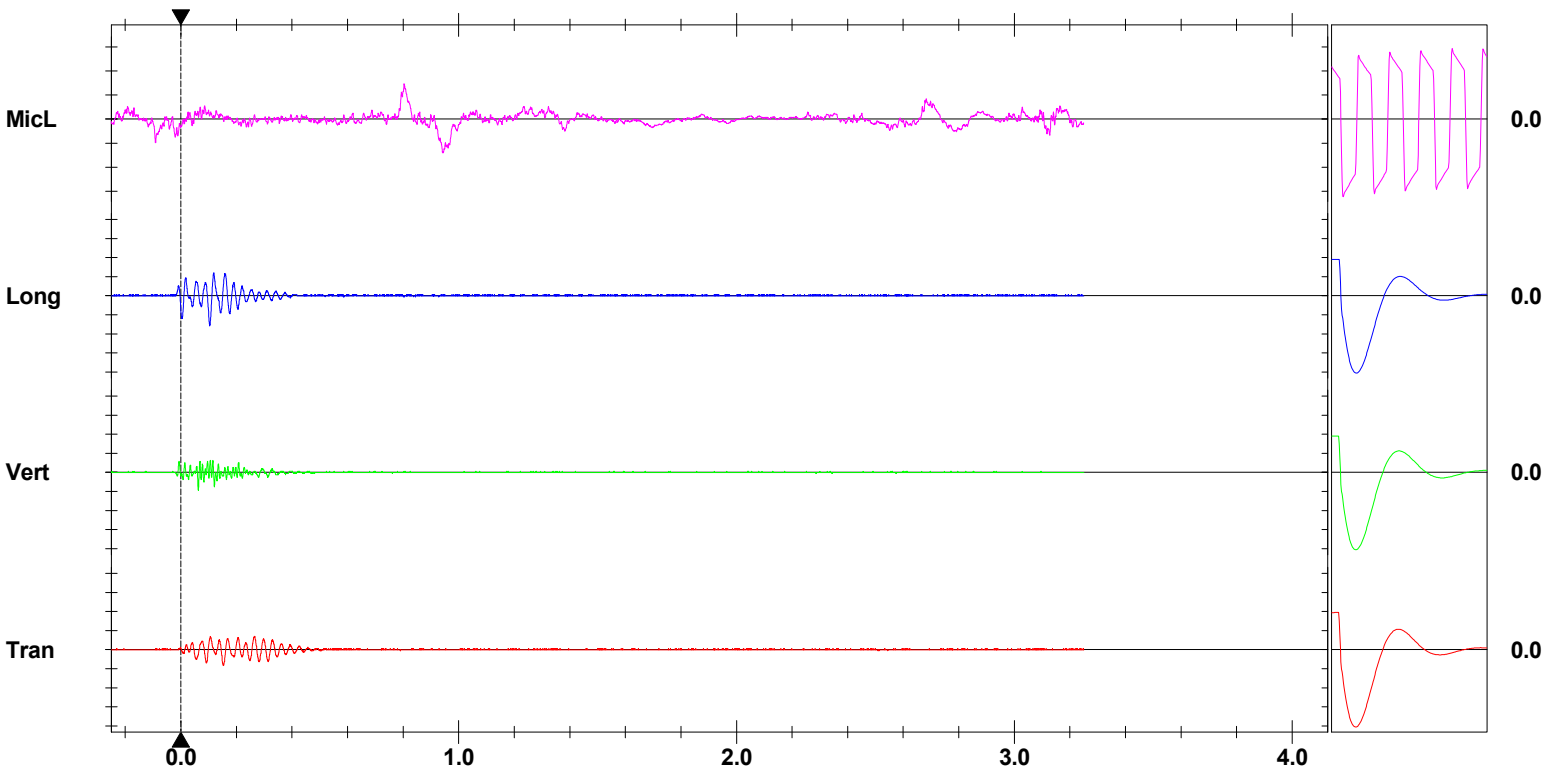
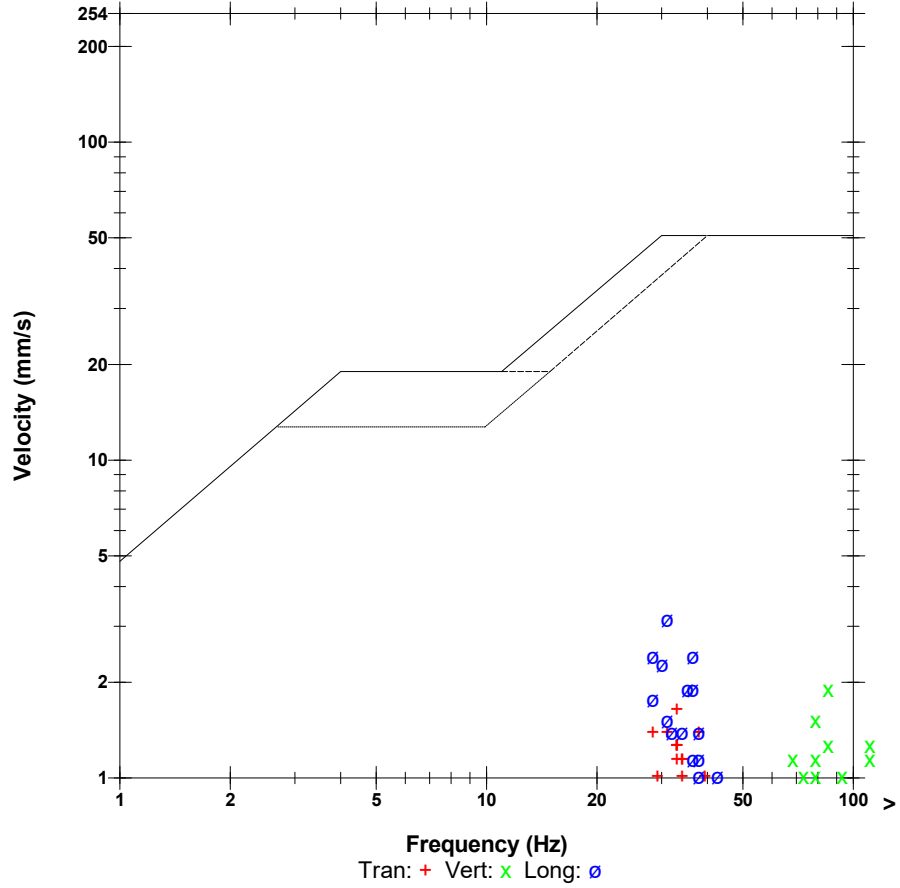
N-42.89111,W-79.30543
 Sandbagged Beside Flagpole

Microphone Linear Weighting
PSPL 117.4 dB(L) at 0.803 sec
ZC Freq 9.2 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 638 mv)

	Tran	Vert	Long	
PPV	1.651	1.905	3.175	mm/s
ZC Freq	33	85	31	Hz
Time (Rel. to Trig)	0.152	0.063	0.104	sec
Peak Acceleration	0.053	0.080	0.080	g
Peak Displacement	0.008	0.004	0.015	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.2	Hz
Overswing Ratio	3.9	3.7	4.1	

Peak Vector Sum 3.494 mm/s at 0.105 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

**GreyBiel Rd
Port Colbrne,On
WaterFord Group Law Crushed Stone**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Mar 25 /19 05:39:13		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB
Mar 25 /19 05:39:08	Mar 25 /19 08:47:03	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:
Mar 25 /19 08:54:39		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB
Mar 25 /19 11:24:38	Mar 25 /19 11:24:42	Event recorded. Trigger Level Tran: 1.50 mm/s
Mar 25 /19 11:24:42	Mar 25 /19 11:55:23	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 124.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-25**

Blast Number: **19-017**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)
 Blast Location: **Top Bench Beside Shop** (Bench / Face)
 GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **2,811** te
 Total Holes Loaded: **12** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Drilling Information -

Primary Bit diam: **101.6** mm **0**° Angle from Vertical # Holes: **14** = Nominal Bit Diameter: 299.5 ft (4 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Design Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 5 back row
 Bench Height: **20.4** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: 21.4 ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: 13.4 ft avg
 Back Row: 13.4 ft avg

- Design Charge Weight -

Front Row: 39.0 kg/hole
 Back Row: 39.0 kg/hole
 Max Chge Wt / delay: **50.0** kg/delay

Required kg Loaded: 729 kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.259 kg/te (actual)
 Front row: 0.167 kg/te (theoretical)
 Main Body: 0.167 kg/te (theoretical)
 "KPI" PF: 0.167 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	600

Pkgd Expl. Required:	kg
FORTELE PRO 75X400	5 125

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1

total explosives weight in Blast (kg): 729
 Pkgd Prod (125 kg) % of Total kg: 17.1%

Detonators Required:	ms	# req'd
UNITRONIC 600 9M		12

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:		
# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:		
BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Blast Date: **2019-03-25**

Blast Number: **19-018**
 Orica Order #: **2461543**
 Blast Time: **12:24 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89760** °N Latitude **79.29151** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **N** at **5** kph Temperature: **0** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **88.9** mm Angle from Vertical **0**° # Holes: **77** = 1,163.4 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	29,157	27,450	1,707

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	3	3	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	77	26.2

total explosives weight in Blast (kg): **1,733**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			77

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	4.0
HELPER HOURS	Enter total Helper man-hours	8.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **5,482** te **2,108** m³
 Total tonnes per day: **8,514** te **LLL15-25** Rate Code
 Total Holes Loaded: **77** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **28** front row

- Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **49** main body

Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.1** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **1/2" Clear**

- Charge Length -

Front Row: **7.1** ft avg
 Main Body: **7.1** ft avg

- Charge Weight -

Front Row: **15.9** kg/hole
 Main Body: **15.9** kg/hole
 Max. per delay: **24.0** kg/delay
 SD () Equation: **335.7** kg/delay
 Total kg Loaded: **1,733** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

1.386 lb/yd³ Yield PF: **0.316** kg/te (actual)
 0.977 lb/yd³ Front row: **0.223** kg/te (theoretical)
 0.977 lb/yd³ Main Body: **0.223** kg/te (theoretical)
 0.977 lb/yd³ "KPI" PF: **0.223** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

3 Holes were left out of the design on the open end due to lean burden



Blast Report

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 2019-03-25

Blast Number: 19-018
Orica Order #: 2461543
Blast Time: 12:24 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89762	79.29151	0.748705	1.383898
Front Row Corner	42.89794	79.29157	0.748710	1.383899
Back Row Corner	42.89725	79.29147	0.748698	1.383897
Average (Centre of Blast)	42.89760	79.29151	0.748704	1.383898

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	549.7	m		
Post Blast Data:	ppV: 1.6	mm/s	Trigger set at: 2.0	mm/s
	frequency: 37.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 103.2	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2133.0	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
Between 201 & 207 West Side Road, Port Colborne, ON				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(549.7)^2}{30^2} \text{ kg}$$

$$= \frac{302,170}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

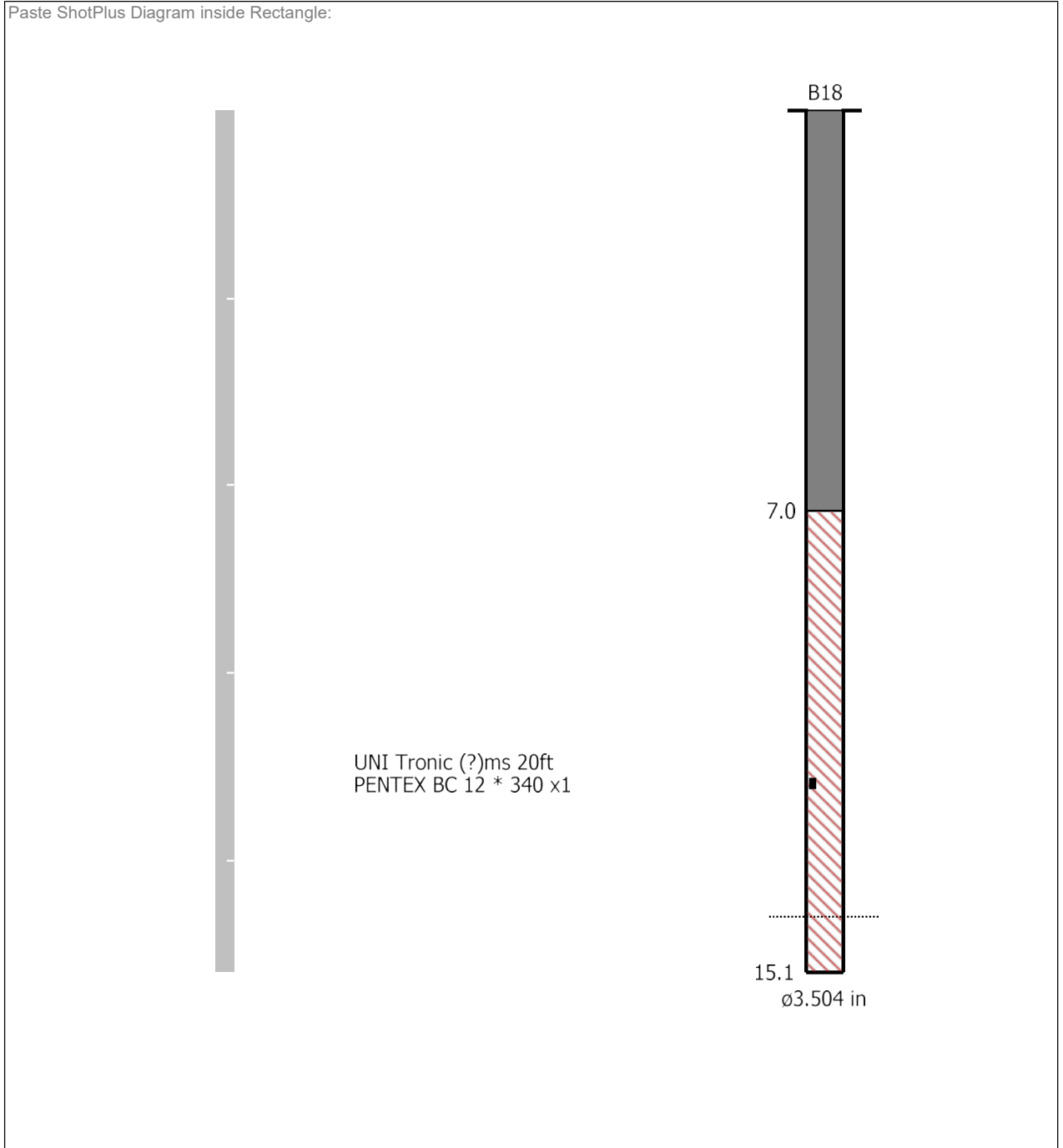
Waterford

Quarry: **Laws - Bottom Lift**
P.O. #: **S191856**
Blast Date: **3/25/2019**

Blast Number: **19-018**
Orica Order #: **2461543**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 11:24:38 March 25, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.093 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190325112438.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

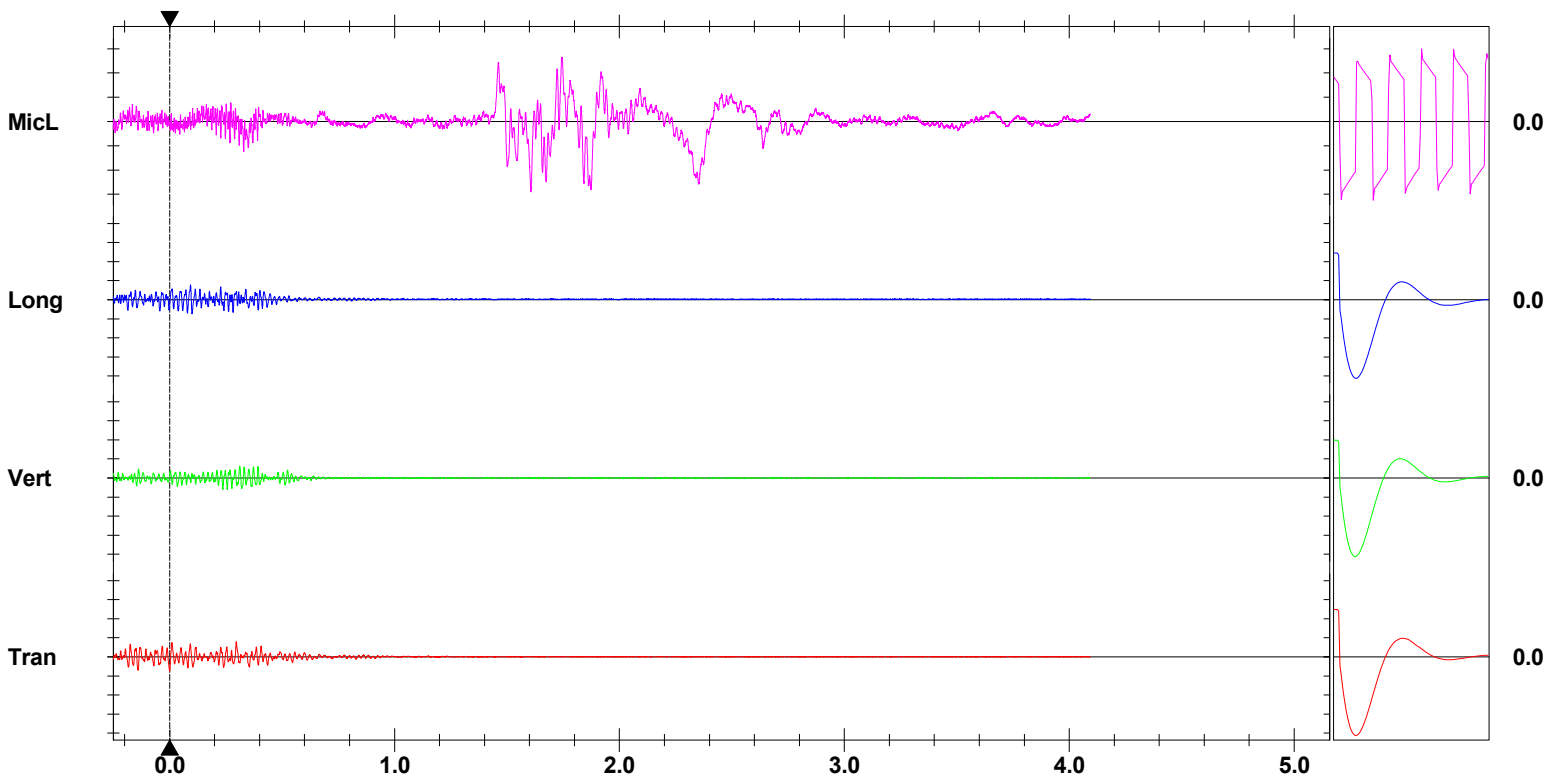
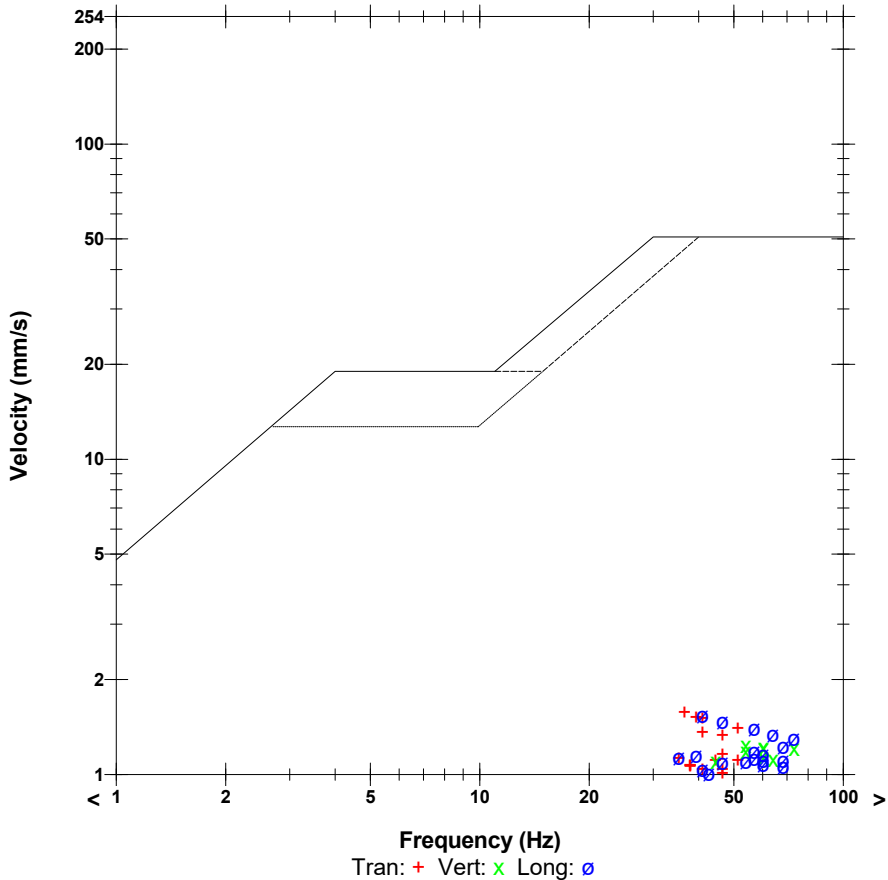
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 103.2 dB(L) at 1.606 sec
ZC Freq 16.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1528 mv)

	Tran	Vert	Long	
PPV	1.584	1.237	1.545	mm/s
ZC Freq	37	54	41	Hz
Time (Rel. to Trig)	0.296	0.312	0.093	sec
Peak Acceleration	0.056	0.087	0.087	g
Peak Displacement	0.006	0.004	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.2	4.1	4.4	

Peak Vector Sum 2.039 mm/s at 0.093 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S191856**
 Design Date: **2019-03-25**

Blast Number: **19-018**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)
 Blast Location: **Bottom Bench (HighWall)** (Bench / Face)
 GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **5,760** te
 Total Holes Loaded: **81** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **88.9** mm **0**° # Holes: **81** = 1,222.4 ft (3 1/2 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: **34** front row

- Design Pattern (Main Body) -

Burden: **8.0** ft avg
 Spacing: **8.0** ft avg
 # Holes: 47 main body
 Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: 15.1 ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: 8.1 ft avg
 Main Body: 8.1 ft avg

- Design Charge Weight -

Front Row: 18.1 kg/hole
 Main Body: 18.1 kg/hole
 Max Chge Wt / delay: **17.0** kg/delay

Required kg Loaded: 1,328 kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.230 kg/te (actual)
 Front row: 0.254 kg/te (theoretical)
 Main Body: 0.254 kg/te (theoretical)
 "KPI" PF: 0.254 kg/te (theoretical)

1.113 lb/yd³
 1.113 lb/yd³
 1.113 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	1,300

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	81	27.5

total explosives weight in Blast (kg): 1,328
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		81

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

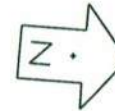
Resource Deployment:		
# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:		
BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

SHOTPlus 5 Plan

Blast Summary Data

Burden: 8.3ft	Spacing: 8.3ft	Subdrill: 1.0ft	Stemming: 8.2ft
1st row burden: 8.1ft	Hole Diameter: 3.5in	Number of holes: 73	Hole angle: 0.0°
Total drilled: 1101.7ft			



18-007 EAST WALL

open face

A28	A27	A26	A25	A24	A23	A22	A21	A20	A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	
B28	B27	B26	B25	B24	B23	B22	B21	B20	B19	B18	B17	B16	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1
15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	
											C17	C16	C15	C14	C13	C12	C11	C10	C9	C8	C7	C6	C5	C4	C3	C2	C1
											15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	15.1ft	



ADD ON BEHIND
8BB18

Design 19-005 EAST WALL - Fnl - 3.5" Blast Hole 8x8 169.1 and 164.8 + .3 SUB ELRV
DRILLER NAME: Stacy



DRILL TO SHALE



Scale 1:350

SHOTPlus™ Professional 5.7.4.4	3/6/2019
Mine	LAWS
Location	EAST WALL BOTTOM BENCH
Title/author	Design 19-005 BTM BNCH EAST WALL
Filename	Design 19-005 EAST WALL BOTTOM BENCH F

GODRILLING®

SHOT DIAGRAM

Client: Orica Lows

Driller: Stacy

Job: 18-80

Blast Num: 19-0085

Date: March 08 2019

Employee:

GPS Coordinates

GPS LF:

GPS RF:

GPS LR:

GPS RR:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35			
A	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15											
B	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15										
C																																						
D																																						
E																																						
F																																						
G																																						
H																																						
I																																						
J																																						
K																																						
L																																						
M																																						
N																																						
O																																						
P																																						
Q																																						
R																																						
S																																						
T																																						

Burden: 9' Spacing: 9' Hole Diameter: 3 3/8" Total Cubic Meters: Total Tonnes: Total Footage: 1102'
 Average Hole Depth: 15' Total Holes: 73

Shot Notes



GO DRILLING INC.

121 Walgreen Road, Ottawa (Carp), ON K0A 1L0
 Tel: 613-831-6868 Fax: 613-831-3731
 info@godrilling.com

OPERATED EQUIPMENT RENTAL AGREEMENT

CUSTOMER *Quinn Lewis*
 ADDRESS *10546 Hwy #3 Port Colborne Ont. Bluff # 19-005*
 JOB SITE *18-80*
 EQUIPMENT *11-75 Stary*

RENTAL RATE (Check One)

Hourly (8 Hr. Min.)
 Daily
 Weekly
 Other

RENTAL PERIOD

	Anticipated	Actual
DATE / TIME OUT <i>Wed 08/10/09</i>	<i>8-35/8 holes</i>	<i>8-35/8 holes</i>
DATE / TIME IN		
TRAVEL TIME	<i>60'</i>	<i>60'</i>
TOTAL HOURS		
FLOAT CHARGE/MOBILIZATION		

TERMS AND CONDITIONS

The Customer hereby agrees to rent from the Lessor the above described equipment for use at the above described job site at such rental rate and for such rental period as is stated above on the terms and conditions set out on the reverse.

PAYMENT DUE UPON RECEIPT

ADDITIONAL RENTAL TERMS AND CONDITIONS APPEAR ON THE REVERSE

DATE SIGNED by Customer *MALC* 20____

CUSTOMER NAME (please print) _____

CUSTOMER SIGNATURE *[Signature]*

13039



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-04-02**

Blast Number: **19-019MB**
 Orica Order #: **2465471**
 Blast Time: **11:53 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89483** °N Latitude **79.29321** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **20** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 35 = 980.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,450	28,218	2,232

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	35	11.9

total explosives weight in Blast (kg): **2,244**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 9M			35

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **11,256** te **4,329** m³
 Total tonnes per day: **32,104** te **LML22-43** Rate Code
 Total Holes Loaded: **35** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **14** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **21** main body

Bench Height: **28.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **28.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **21.0** ft avg
 Main Body: **21.0** ft avg

- Charge Weight -

Front Row: **61.2** kg/hole
 Main Body: **61.2** kg/hole
 Max. per delay: **68.0** kg/delay
 SD () Equation: **105.5** kg/delay
 Total kg Loaded: **2,244** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.874 lb/yd³ Yield PF: **0.199** kg/te (actual)
 0.834 lb/yd³ Front row: **0.190** kg/te (theoretical)
 0.834 lb/yd³ Main Body: **0.190** kg/te (theoretical)
 0.834 lb/yd³ "KPI" PF: **0.190** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Grand Valley orica did not have enough Non-Electronic detonators in stock
 We had to use unitronics instead



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89483"/>	<input type="text" value="79.29320"/>	0.748656	1.383927
Front Row Corner	<input type="text" value="42.89486"/>	<input type="text" value="79.29343"/>	0.748657	1.383931
Back Row Corner	<input type="text" value="42.89481"/>	<input type="text" value="79.29301"/>	0.748656	1.383924
Average (Centre of Blast)	<input type="text" value="42.89483"/>	<input type="text" value="79.29321"/>	0.748656	1.383928

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="308.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="9.1"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="27.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="114.9"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2338.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(308.1)^2}{30^2} \text{ kg} \\
 &= \frac{94,926}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **4/2/2019**

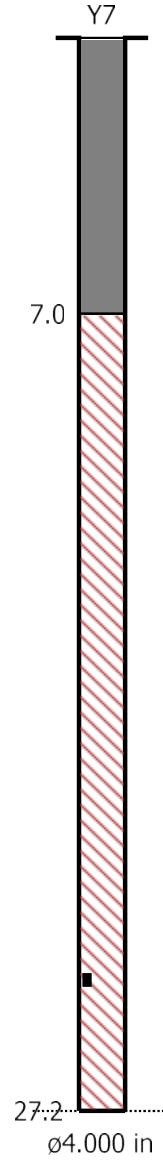
Blast Number: **19-019MB**
Orica Order #: **2465471**

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:53:37 April 2, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.618 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190402115337.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

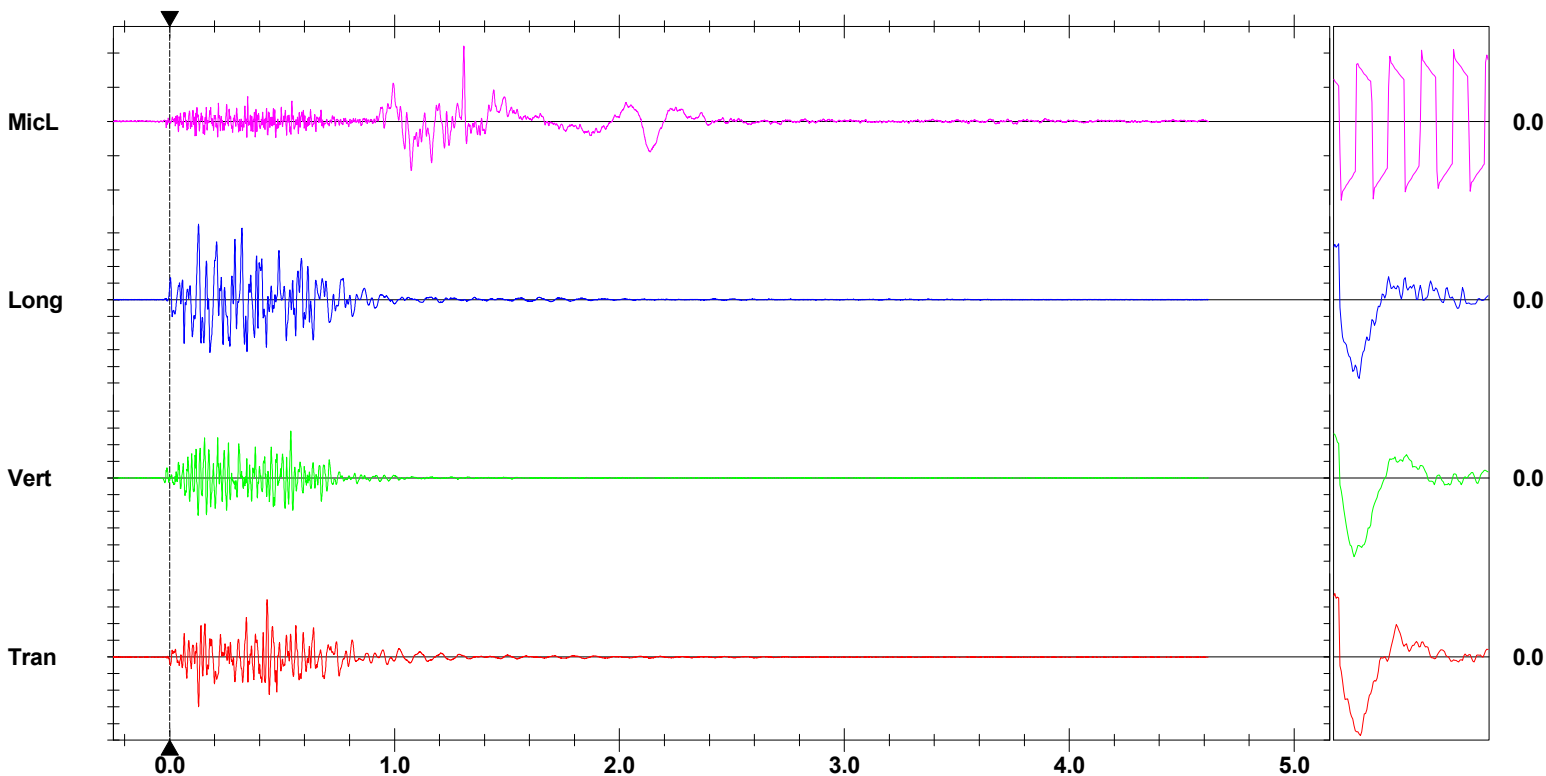
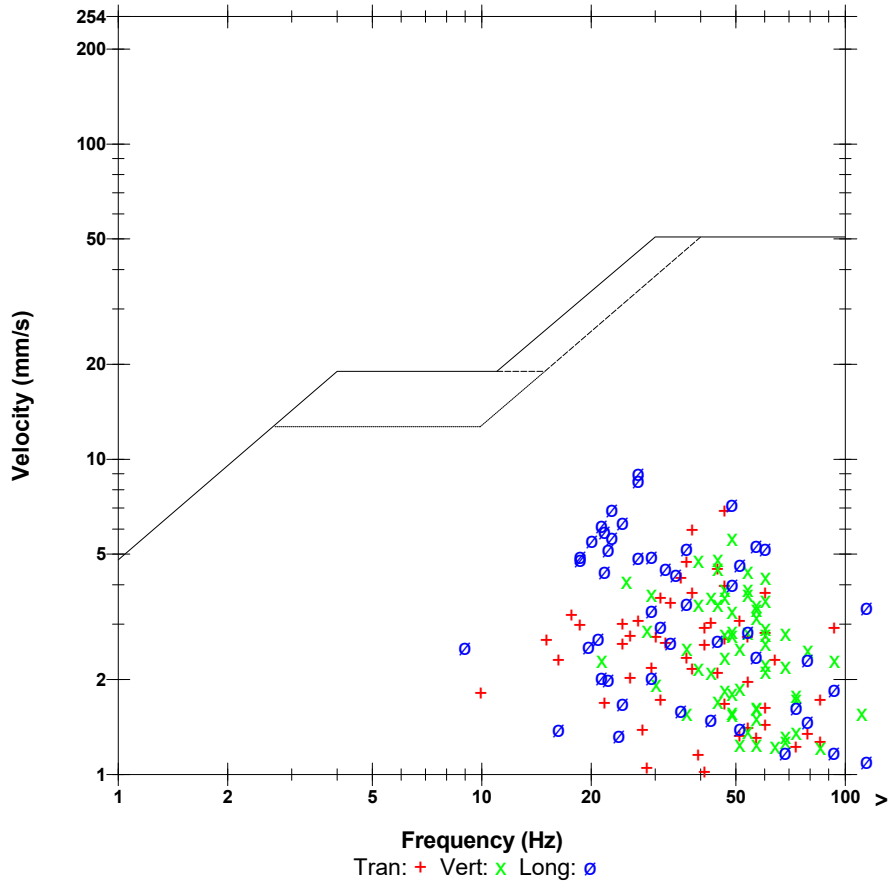
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 114.9 dB(L) at 1.308 sec
ZC Freq 11.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1435 mv)

	Tran	Vert	Long	
PPV	6.857	5.643	9.064	mm/s
ZC Freq	47	49	27	Hz
Time (Rel. to Trig)	0.434	0.539	0.128	sec
Peak Acceleration	0.219	0.327	0.347	g
Peak Displacement	0.028	0.018	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.1	7.7	Hz
Overswing Ratio	2.4	3.4	3.4	

Peak Vector Sum 11.45 mm/s at 0.128 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

**Laws
Waterford Group
207 West side drive Port Colbourne, On**

Event Report: Monitor Log - Micromate ISEE # UM6859

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Apr 2 /19 06:41:36		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 2 /19 11:01:57	Apr 2 /19 11:02:01	Event recorded. Trigger Level Vert: 1.50 mm/s
Apr 2 /19 12:28:53	Apr 2 /19 12:28:57	Event recorded. Trigger Level Long: 1.50 mm/s
Apr 2 /19 12:28:57	Apr 2 /19 12:29:16	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 123.0 d
Apr 2 /19 12:52:28		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB
Apr 2 /19 13:38:41	Apr 2 /19 13:38:45	Event recorded. Trigger Level Vert: 1.50 mm/s
Apr 2 /19 13:38:45	Apr 2 /19 13:52:04	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 124.0 d



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-04-02**

Blast Number: **19-019MB**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **10,946** te
 Total Holes Loaded: **35** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **35** = 953.1 ft (**4** " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 35 main body
 Bench Height: **27.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.2** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.2** ft avg
 Main Body: **20.2** ft avg

- Design Charge Weight -

Front Row: **59.0** kg/hole
 Main Body: **59.0** kg/hole
 Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **2,512** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.229** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

0.827 lb/yd³
 0.827 lb/yd³
 0.827 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	2,500

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	35	11.9

total explosives weight in Blast (kg): **2,512**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
UNITRONIC 600 9M		35

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:		
# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:		
BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-04-02**

Blast Number: **19-020**
 Orica Order #: **2465471**
 Blast Time: **11:53 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: **42.89502** °N Latitude **79.29270** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **15** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical: **0** # Holes: **60** = 1,558.5 ft (**4** " diam)
 Secondary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm Angle from Vertical: **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,450	26,624	3,826

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	56	12.7
PENTEX 12 (OR EQUIVALENT)	0.34	60	20.4

total explosives weight in Blast (kg): **3,859**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 9m		25/500	56
EXEL HANDIDET 12m		25/500	60
UNITRONIC 600 9M			1
CONNECTADET 9M		65 ms	8
CONNECTADET 9M		25 ms	3

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **17,900** te **6,885** m³
 Total tonnes per day: **32,104** te **LML22-43** Rate Code
 Total Holes Loaded: **60** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **42** main body

Bench Height: **26.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **19.0** ft avg
 Main Body: **19.0** ft avg

- Charge Weight -

Front Row: **55.3** kg/hole
 Main Body: **55.3** kg/hole
 Max. per delay: **70.0** kg/delay
 SD () Equation: **100.7** kg/delay
 Total kg Loaded: **3,859** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.945 lb/yd³ Yield PF: **0.216** kg/te (actual)
 0.813 lb/yd³ Front row: **0.185** kg/te (theoretical)
 0.813 lb/yd³ Main Body: **0.185** kg/te (theoretical)
 0.813 lb/yd³ "KPI" PF: **0.185** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2019-04-02

Blast Number: 19-020
Orica Order #: 2465471
Blast Time: 11:53 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89502	79.29270	0.748659	1.383919
Front Row Corner				
Back Row Corner				
Average (Centre of Blast)	42.89502	79.29270	0.748659	1.383919

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	301.0	m		
Post Blast Data:	ppV: 9.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 27.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 114.9	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2292.0	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
207 West Side drive, Port Colborne, On				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(301)^2}{30^2} \text{ kg}$$

$$= \frac{90,601}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

jim bray

Signature required, indicating that
Blast Report is Complete & Accurate.



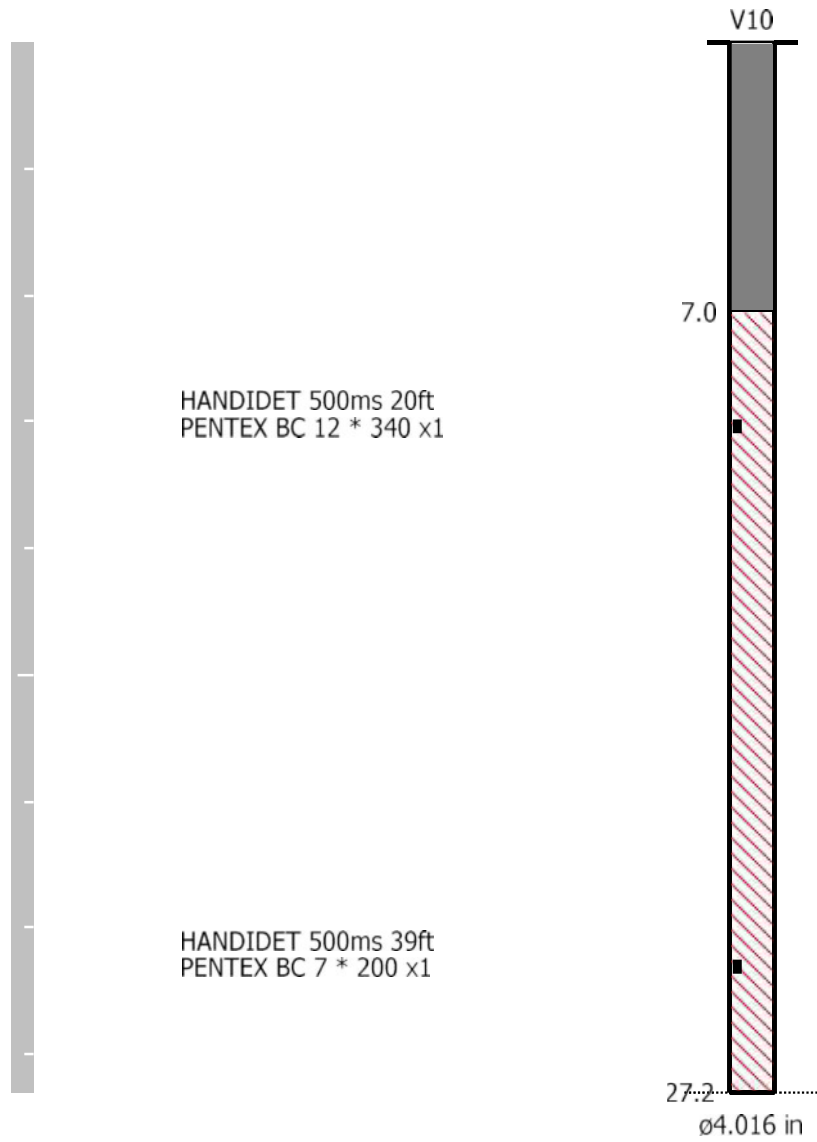
Blast Design
Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 4/2/2019

Blast Number: 19-020
Orica Order #: 2465471

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 11:53:37 April 2, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.618 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190402115337.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

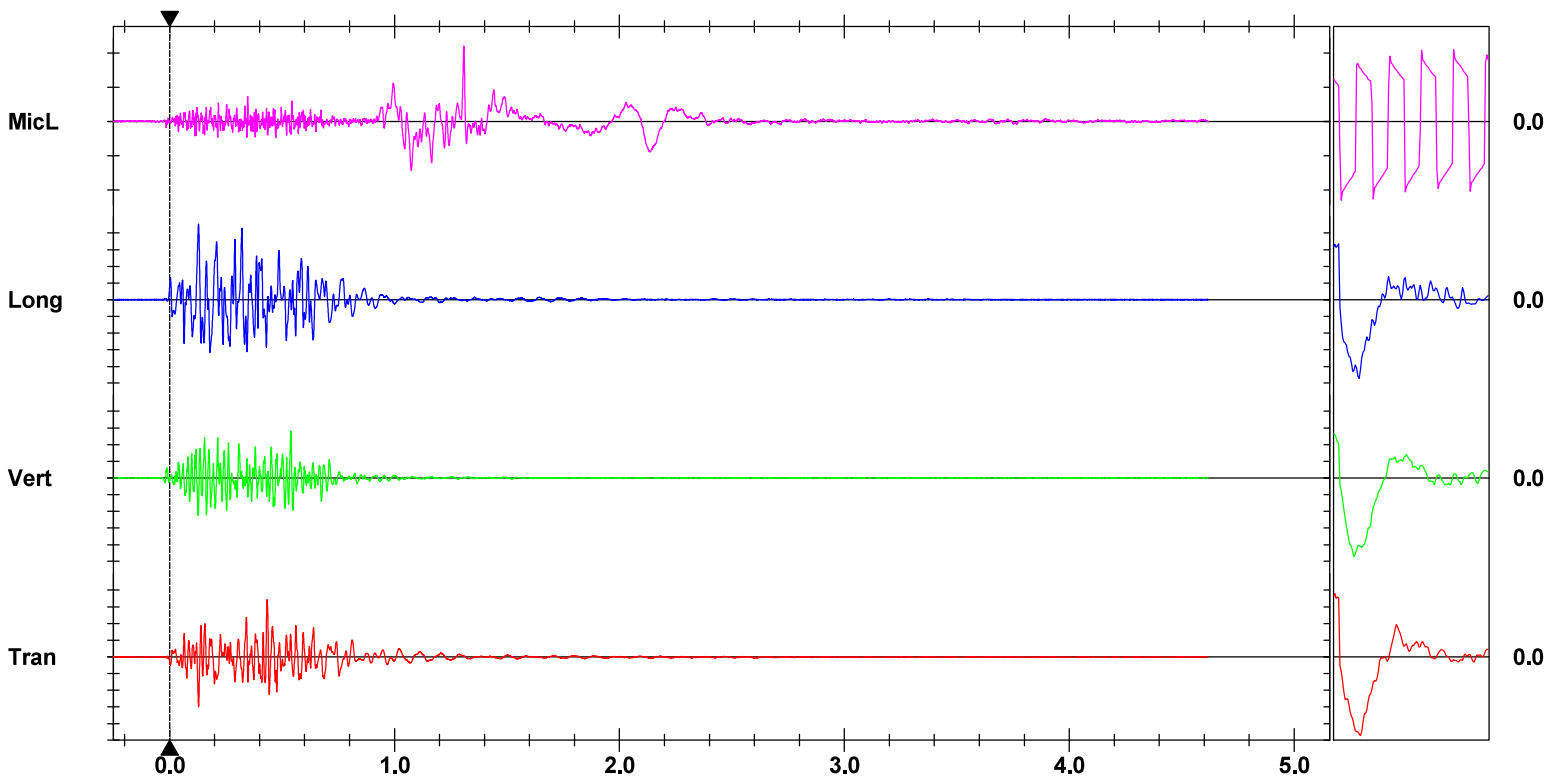
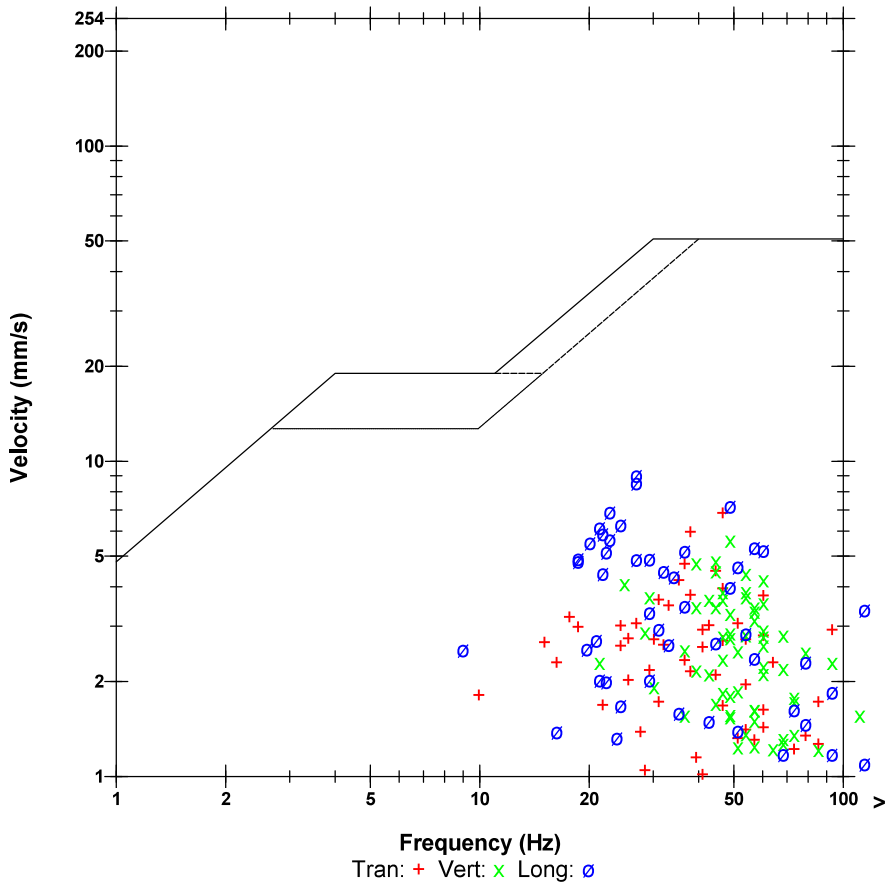
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 114.9 dB(L) at 1.308 sec
ZC Freq 11.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1435 mv)

	Tran	Vert	Long	
PPV	6.857	5.643	9.064	mm/s
ZC Freq	47	49	27	Hz
Time (Rel. to Trig)	0.434	0.539	0.128	sec
Peak Acceleration	0.219	0.327	0.347	g
Peak Displacement	0.028	0.018	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.1	7.7	Hz
Overswing Ratio	2.4	3.4	3.4	

Peak Vector Sum 11.45 mm/s at 0.128 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

**Laws
Waterford Group
207 West side drive Port Colbourne, On**

Event Report: Monitor Log - Micromate ISEE # UM6859

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Apr 2 /19 06:41:36		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 2 /19 11:01:57	Apr 2 /19 11:02:01	Event recorded. Trigger Level Vert: 1.50 mm/s
Apr 2 /19 12:28:53	Apr 2 /19 12:28:57	Event recorded. Trigger Level Long: 1.50 mm/s
Apr 2 /19 12:28:57	Apr 2 /19 12:29:16	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 2 /19 12:52:28		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB
Apr 2 /19 13:38:41	Apr 2 /19 13:38:45	Event recorded. Trigger Level Vert: 1.50 mm/s
Apr 2 /19 13:38:45	Apr 2 /19 13:52:04	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 124.0 dB



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-04-02**

Blast Number: **19-020**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)
 GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **18,776** te
 Total Holes Loaded: **60** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **60** = 1,634.8 ft (4 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 42 main body
 Bench Height: **27.2** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.2** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75" Stone**

- Design Charge Length -

Front Row: **20.2** ft avg
 Main Body: **20.2** ft avg

- Design Charge Weight -

Front Row: **59.0** kg/hole
 Main Body: **59.0** kg/hole
 Max Chge Wt / delay: **70.0** kg/delay

Required kg Loaded: **4,334** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.231** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

0.827 lb/yd³
 0.827 lb/yd³
 0.827 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	4,300

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	60	13.6
PENTEX 12 (OR EQUIVALENT)	0.34	60	20.4

total explosives weight in Blast (kg): **4,334**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 9m		60
EXEL HANDIDET 12m		60
UNITRONIC 600 6M		1
CONNECTADET 9M	65 ms	8

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-04-02**

Blast Number: **19-021**
 Orica Order #: **2465471**
 Blast Time: **1:39 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)

GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
 Centre of Blast Centre of Blast

Wind from the: **S** at **15** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical: **0**° # Holes: **12** = 256.7 ft (4 " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,450	29,910	540

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	3	50

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1

total explosives weight in Blast (kg): 594

Pkgd Prod (50 kg) % of Total kg: 8.4%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			12

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		3
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	1.0
HELPER HOURS	Enter total Helper man-hours	2.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **2,948** te **1,134** m³
 Total tonnes per day: **32,104** te **LML22-33** Rate Code
 Total Holes Loaded: **12** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 5 back row

Bench Height: **21.4** ft avg

Sub-drill: **0.0** ft avg

Hole Depth: **21.4** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **13.4** ft avg
 Back Row: **13.4** ft avg

- Charge Weight -

Front Row: **39.0** kg/hole
 Back Row: **39.0** kg/hole
 Max. per delay: **52.0** kg/delay
 SD () Equation: #VALUE! kg/delay
 Total kg Loaded: **594** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.883 lb/yd³ Yield PF: **0.201** kg/te (actual)
 0.697 lb/yd³ Front row: **0.159** kg/te (theoretical)
 0.697 lb/yd³ Main Body: **0.159** kg/te (theoretical)
 0.697 lb/yd³ "KPI" PF: **0.159** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Blank area for notes.



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast				
Front Row Corner				
Back Row Corner				
Average (Centre of Blast)	0.00000	0.00000	0.000000	0.000000

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89111	79.30543	0.748591	1.384141
2nd Reading				
Average	42.89111	79.30543	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 2.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 39.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 113.5	dB	Trigger set at: 115	dB

10611 On Road 3 Port Colborne, On

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89214	79.31593	0.748609	1.384324
2nd Reading				
Average	42.89214	79.31593	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 1.5	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB

20804 Graybiel Road Port Colbourne, On

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)		m		
Post Blast Data:	ppV:	mm/s	Trigger set at: 1.5	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure:	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{\#VALUE!}{30^2} \text{ kg} \\
 &= \frac{\#VALUE!}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **4/2/2019**

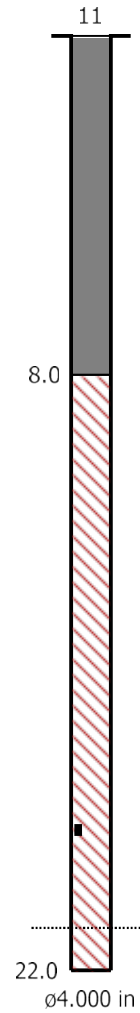
Blast Number: **19-021**
Orica Order #: **2465471**

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 13:38:55 April 2, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.0 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration December 4, 2018 by InstanTEL
File Name __TEMP.EVT

Notes

Location: 10611 On Road 3 Port Colborne, On
 Client: Waterford Group
 User Name: Orica Canada Inc.
 General: Laws

Extended Notes

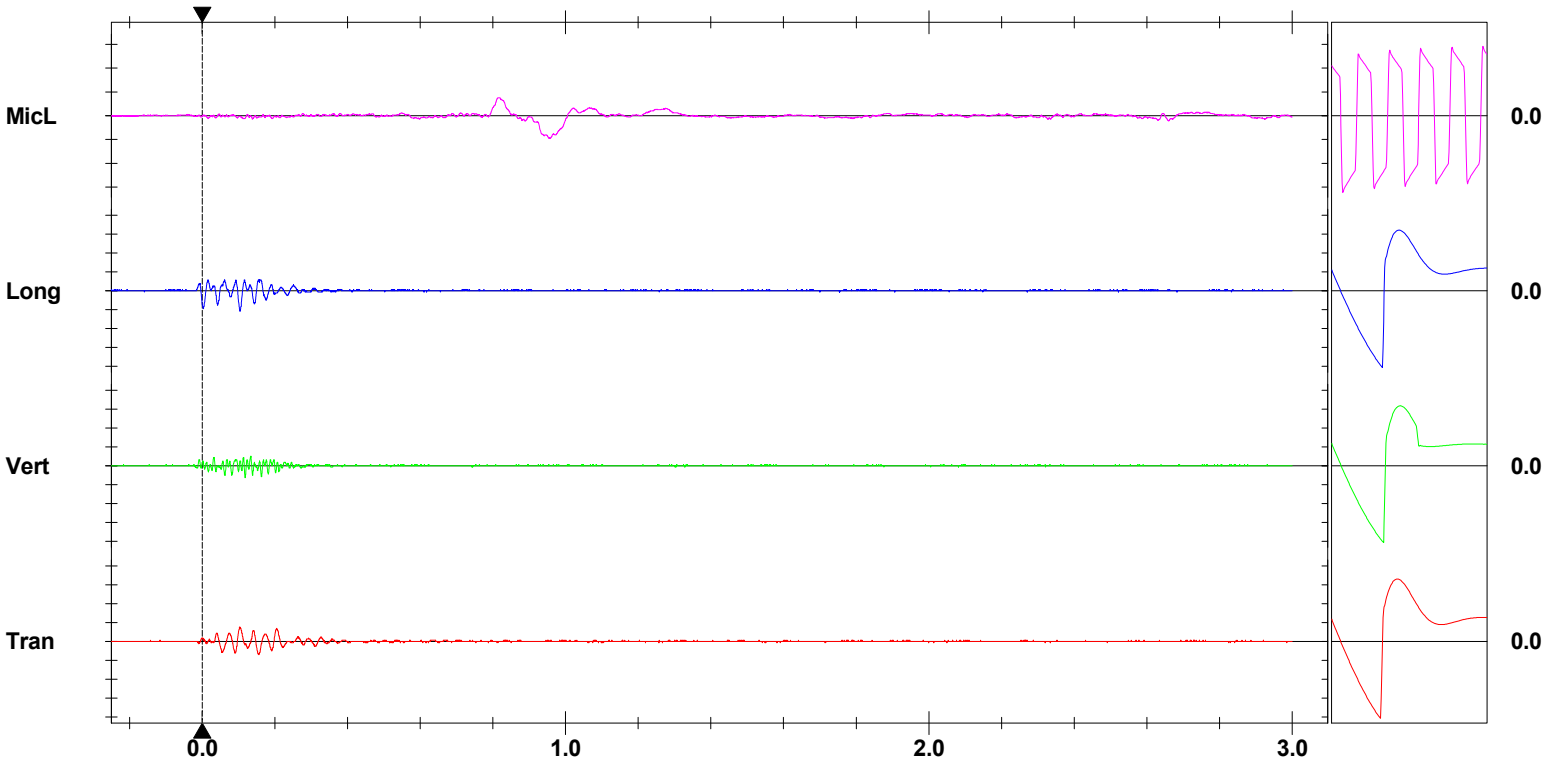
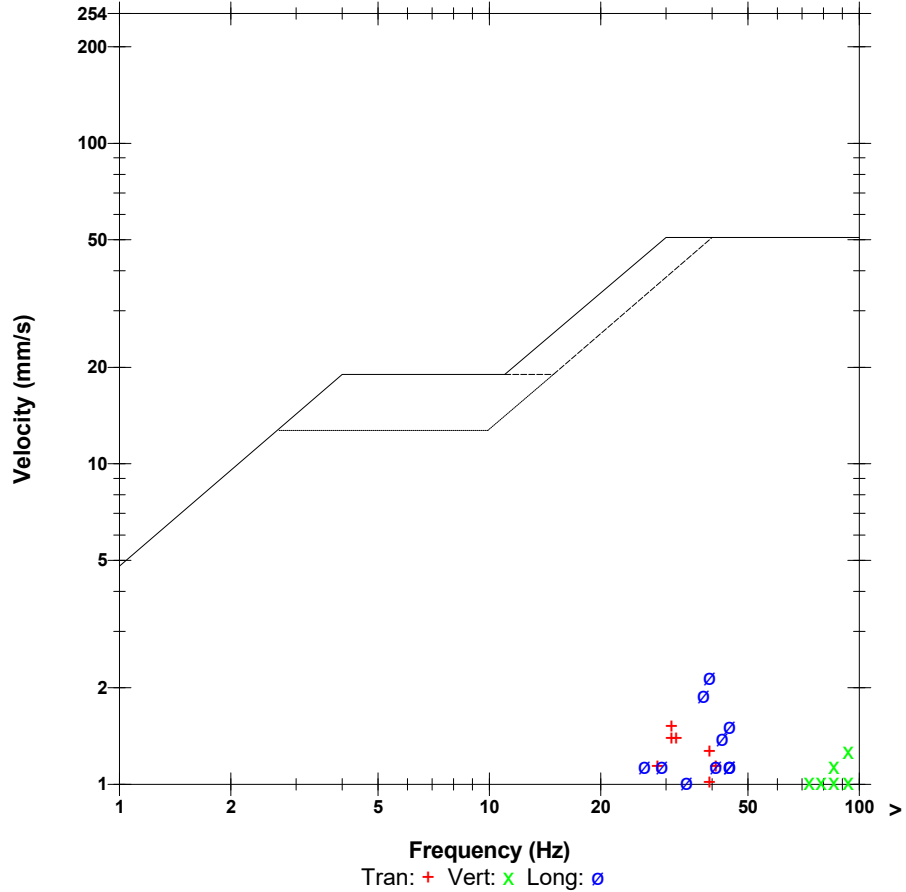
42.89111 -79.30543

Microphone Linear Weighting
PSPL 113.5 dB(L) at 0.955 sec
ZC Freq 4.7 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 603 mv)

	Tran	Vert	Long	
PPV	1.524	1.270	2.159	mm/s
ZC Freq	31	93	39	Hz
Time (Rel. to Trig)	0.103	0.118	0.104	sec
Peak Acceleration	0.053	0.080	0.080	g
Peak Displacement	0.008	0.003	0.009	mm
Sensor Check	Check	Check	Check	
Frequency	7.5	7.1	7.2	Hz
Overswing Ratio	1.2	1.3	1.3	

Peak Vector Sum 2.691 mm/s at 0.104 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

**Laws
Waterford Group
20816 GreBiel Rd**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Apr 2 /19 06:46:23		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Apr 2 /19 11:53:37	Apr 2 /19 11:53:41	Event recorded. Trigger Level Long: 1.50 mm/s
Apr 2 /19 12:36:36	Apr 2 /19 12:36:40	Event recorded. Trigger Level Tran: 1.50 mm/s
Apr 2 /19 12:36:40	Apr 2 /19 12:36:48	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Apr 2 /19 12:46:47		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Apr 2 /19 14:06:02	Apr 2 /19 14:06:03	Event recorded. Trigger Level Tran: 1.50 mm/s
Apr 2 /19 14:06:03	Apr 2 /19 14:06:10	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Apr 2 /19 14:06:13		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Apr 2 /19 14:06:12	Apr 2 /19 14:06:13	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-04-02**

Blast Number: **19-021**
 Orica Order #:

page 1 Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench Beside Shop** (Bench / Face)

GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **0** te
 Total Holes Loaded: **12** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **ft** avg
 # Rows Blasted: **2** rows

- Drilling Information -

Angle from Vertical

Primary Bit diam: **101.6** mm **0**° # Holes: **14** = **14.0** ft (**4** " diam)
 Secondary Bit diam: **mm** **0**° # Holes: **=** **0.0** ft (" diam)
 Tertiary Bit diam: **mm** **0**° # Holes: **=** **0.0** ft (" diam)

Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **7** front row

- Design Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** back row

Bench Height: **ft** avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **1.0** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **.75" Stone**

- Design Charge Length -

Front Row: **-7.0** ft avg
 Back Row: **-7.0** ft avg

- Design Charge Weight -

Front Row: **-20.4** kg/hole
 Back Row: **-20.4** kg/hole
 Max Chge Wt / delay: **50.0** kg/delay

Required kg Loaded: **729** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **#DIV/0!** kg/te (actual)
 Front row: **#DIV/0!** kg/te (theoretical)
 Main Body: **#DIV/0!** kg/te (theoretical)
 "KPI" PF: **#DIV/0!** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg

CENTRA GOLD 70		600
----------------	--	------------

Pkgd Expl. Required: kg

FORTEL PRO 75X400	5	125
-------------------	----------	------------

Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1
---------------------------	-------------	-----------	------------

total explosives weight in Blast (kg): **729**
 Pkgd Prod (125 kg) % of Total kg: **17.1%**

Detonators Required: ms # req'd

UNITRONIC 600 9M		12
------------------	--	-----------

Cord & Access. Req'd: U of M # req'd

WIRE DUPLEX (6 PACK) 400M	units	1
---------------------------	-------	----------

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

GODRILLING®

SHOT DIAGRAM

Client: Orica Laws

Driller: Stacy

Job: 18-80

Blast Num: 9TB003

Date: March 25 2019

Employee:

GPS Coordinates GPS LF:

GPS RF:

GPS LR:

GPS RR:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
A	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>																															
B	<u>22</u>																																				
C	<u>22</u>																																				
D	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>	<u>22</u>																															
E																																					
F																																					
G																																					
H																																					
I																																					
J																																					
K																																					
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N																																					
O																																					
P																																					
Q																																					
R																																					
S																																					
T																																					

Burden: 12' Spacing: 13' Hole Diameter: 4" Total Cubic Meters: Total Tonnes: Total Footage: 308
Average Hole Depth: 22' Total Holes: 19

Shot Notes



Blast Report

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Blast Date: **2019-04-15**

Blast Number: **19-022**
 Orica Order #: **2470464**
 Blast Time: **2:33 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench** (Bench / Face)

GPS Coordinates: **42.89446** °N Latitude **79.29530** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **25** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling **1,447** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical **0** # Holes: **178** = 1,845.3 ft (4 " diam)
 Secondary Bit diam: **92.1** mm # Holes: **29** = 300.6 ft (3 5/8 " diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	23,617	21,100	2,517

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	4	4	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	207	70.4

total explosives weight in Blast (kg): **2,587**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	
CONNECTADET 9M		25/500	130
UNITRONIC 600 9M			2
CONNECTADET 9M		33 ms	8
CONNECTADET 9M		65 ms	30

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	12.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **24,528** te **10,220** m³
 Total tonnes per day: **26,835** te **LTL12-24** Rate Code
 Total Holes Loaded: **207** holes
 ... including: **1** Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **5** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **23** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **184** main body

Bench Height: **10.4** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **10.4** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **3.4** ft avg
 Main Body: **3.4** ft avg

- Charge Weight -

Front Row: **9.8** kg/hole
 Main Body: **9.8** kg/hole
 Max. per delay: **17.0** kg/delay
 SD () Equation: **191.5** kg/delay
 Total kg Loaded: **2,587** kg
 Rock Density: **2.40** g/cc = te/m³

- Powder Factor -

Yield PF: **0.105** kg/te (actual)
 Front row: **0.082** kg/te (theoretical)
 Main Body: **0.082** kg/te (theoretical)
 "KPI" PF: **0.082** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

1.5 GPS



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89445"/>	<input type="text" value="79.29524"/>	0.748649	1.383963
Front Row Corner	<input type="text" value="42.89449"/>	<input type="text" value="79.29577"/>	0.748650	1.383972
Back Row Corner	<input type="text" value="42.89443"/>	<input type="text" value="79.29489"/>	0.748649	1.383957
Average (Centre of Blast)	<input type="text" value="42.89446"/>	<input type="text" value="79.29530"/>	0.748649	1.383964

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="415.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.1"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="N/A"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="116.6"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2513.5"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(415.1)^2}{30^2} \text{ kg}$$

$$= \frac{172,308}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

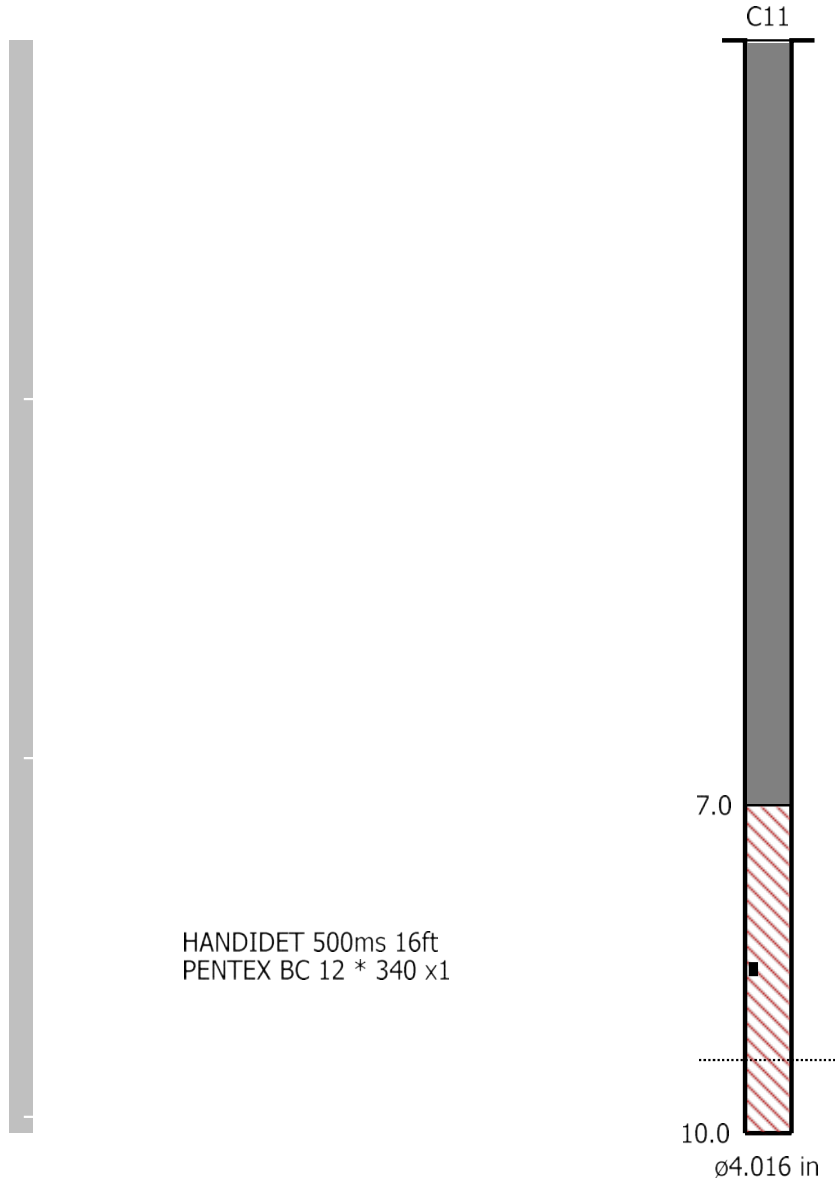
Waterford

Quarry: Laws - Top Lift
P.O. #: S191856
Blast Date: 4/15/2019

Blast Number: 19-022
Orica Order #: 2470464

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time MicL at 14:33:14 April 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.005 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190415143314.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

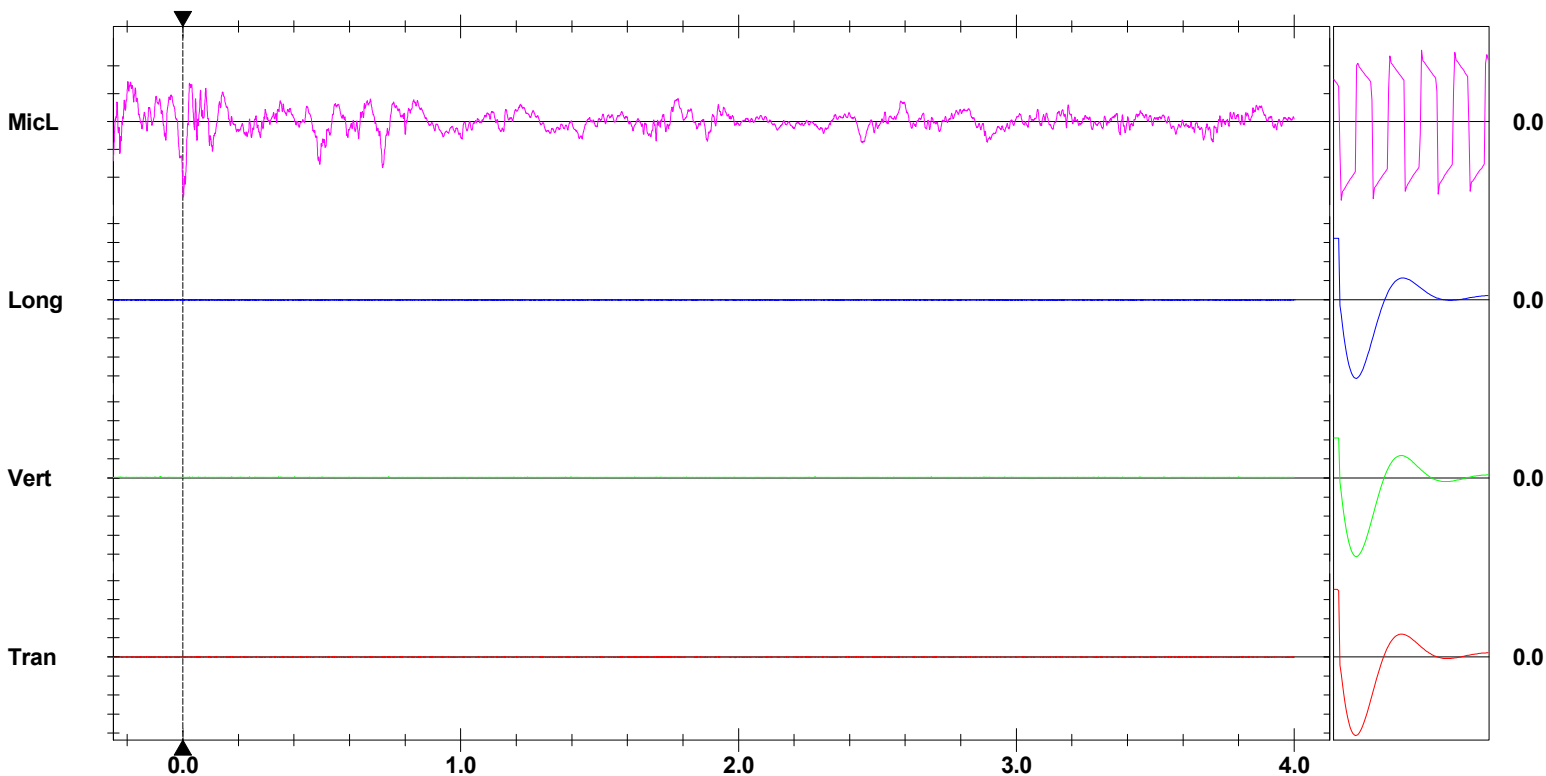
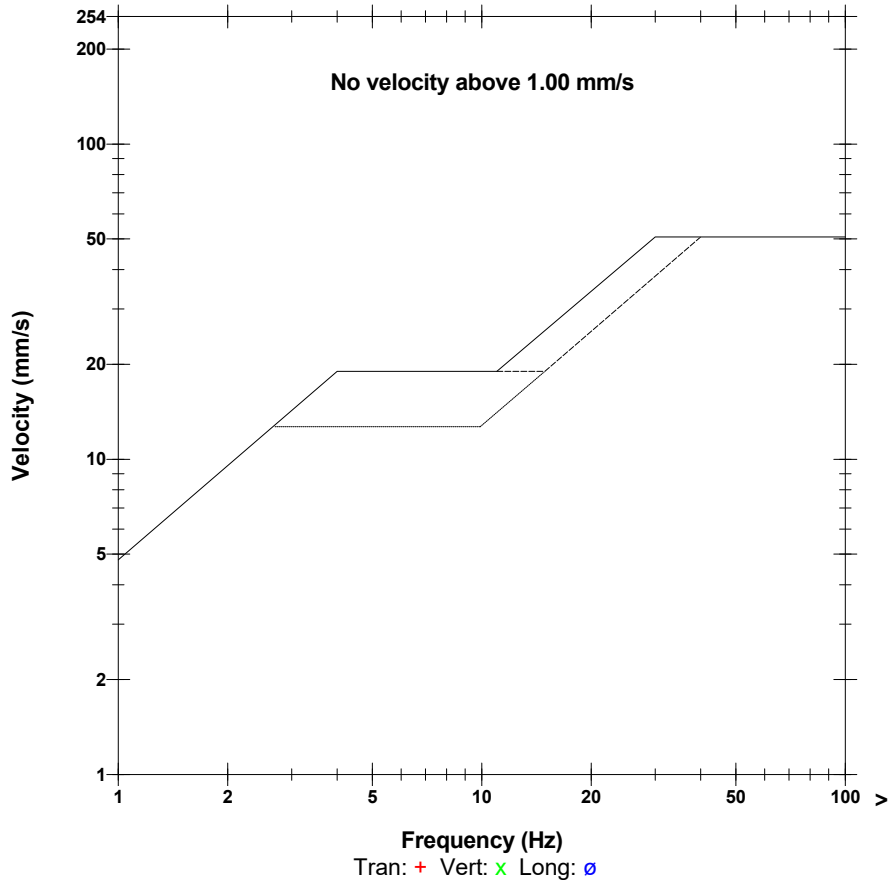
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 116.6 dB(L) at 0.002 sec
ZC Freq 12.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1552 mv)

	Tran	Vert	Long	
PPV	0.087	0.102	0.071	mm/s
ZC Freq	4.5	N/A	5.1	Hz
Time (Rel. to Trig)	1.987	2.959	1.351	sec
Peak Acceleration	0.012	0.008	0.012	g
Peak Displacement	0.004	0.000	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.4	3.5	3.6	

Peak Vector Sum 0.123 mm/s at 2.959 sec
N/A: Not Applicable

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

**201 & 207 West Side Drive
Waterford Group
Law Crushed Stone**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Apr 15 /19 06:49:06		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Apr 15 /19 07:19:21	Apr 15 /19 07:19:25	Event recorded. Trigger Level MicL: 121.0 dB
Apr 15 /19 09:33:12	Apr 15 /19 09:33:16	Event recorded. Trigger Level Long: 1.50 mm/s
Apr 15 /19 09:33:16	Apr 15 /19 09:51:36	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Apr 15 /19 09:58:17		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 15 /19 09:58:17	Apr 15 /19 09:58:17	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 15 /19 09:58:30		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Apr 15 /19 15:01:57	Apr 15 /19 15:02:01	Event recorded. Trigger Level Tran: 1.50 mm/s
Apr 15 /19 15:02:01	Apr 15 /19 15:03:03	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 123.0 dB



Blast Design

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Design Date: **2019-04-15**

Blast Number: **19-022**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench East** (Bench / Face)

GPS Coordinates: **42.89446** °N Latitude **79.29530** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **24,393** te
 Total Holes Loaded: **207** holes
 ... including: **1** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **5** rows

- Drilling Information -

Angle from Vertical: **0°** Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0°** # Holes: **192** = 1,979.5 ft (4 " diam)
 Secondary Bit diam: **92.1** mm **0°** # Holes: **15** = 154.7 ft (3 5/8 " diam)
 Tertiary Bit diam: mm **0°** # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **47** front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: 160 main body
 Bench Height: **10.3** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **10.3** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **3.3** ft avg
 Main Body: **3.3** ft avg

- Design Charge Weight -

Front Row: **9.7** kg/hole
 Main Body: **9.7** kg/hole
 Max Chge Wt / delay: **16.0** kg/delay

Required kg Loaded: **3,695** kg
 Rock Density: **2.40** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.151** kg/te (actual)
 Front row: **0.082** kg/te (theoretical)
 Main Body: **0.082** kg/te (theoretical)
 "KPI" PF: **0.082** kg/te (theoretical)

0.330 lb/yd³

0.330 lb/yd³

0.330 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:

	kg
CENTRA GOLD 70	3,500

Pkgd Expl. Required:

	kg
FORTEL PRO 75X400	5 125

Boosters Required:

	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	207	70.4

total explosives weight in Blast (kg): **3,695**

Pkgd Prod (125 kg) % of Total kg: **3.4%**

Detonators Required:

	ms	# req'd
EXEL H&NDIDET 7m		207

Cord & Access. Req'd:

	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-04-15**

Blast Number: **19-023**
 Orica Order #: **2470464**
 Blast Time: **9:33 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)

GPS Coordinates: **42.89200** °N Latitude **79.30207** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **15** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: Snow: Inversion: Ceiling: **840** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 12 = 253.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	24,030	23,617	413

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	4	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	10	3.4

total explosives weight in Blast (kg): **441**
 Pkgd Prod (25 kg) % of Total kg: **5.7%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			10

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	1.0
HELPER HOURS	Enter total Helper man-hours	1.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **2,307** te **887** m³
 Total tonnes per day: **26,835** te **LML22-33** Rate Code
 Total Holes Loaded: **10** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** front row

- Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** back row

Bench Height: **20.1** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **21.1** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **13.1** ft avg
 Back Row: **13.1** ft avg

- Charge Weight -

Front Row: **38.1** kg/hole
 Back Row: **38.1** kg/hole
 Max. per delay: **45.0** kg/delay
 SD () Equation: **94.5** kg/delay
 Total kg Loaded: **441** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.839 lb/yd³ Yield PF: **0.191** kg/te (actual)
 0.725 lb/yd³ Front row: **0.165** kg/te (theoretical)
 0.725 lb/yd³ Main Body: **0.165** kg/te (theoretical)
 0.725 lb/yd³ "KPI" PF: **0.165** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89199"/>	<input type="text" value="79.30198"/>	0.748606	1.384081
Front Row Corner	<input type="text" value="42.89202"/>	<input type="text" value="79.30216"/>	0.748607	1.384084
Back Row Corner	<input type="text" value="42.89199"/>	<input type="text" value="79.30207"/>	0.748606	1.384082
Average (Centre of Blast)	<input type="text" value="42.89200"/>	<input type="text" value="79.30207"/>	0.748607	1.384082

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
2nd Reading				
Average	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	<input type="text" value="291.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.7"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="41.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="110.6"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="10611 On Road 3 Port Colborne,On"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
2nd Reading				
Average	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="1130.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="20804 Graybiel Road Port Colbourne,On"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(291.6)^2}{30^2} \text{ kg}$$

$$= \frac{85,031}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **4/15/2019**

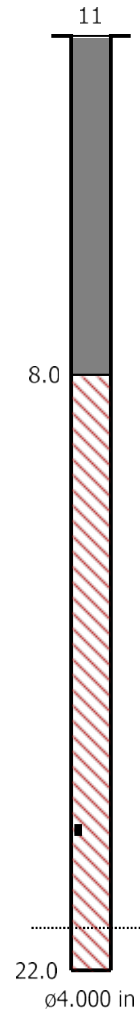
Blast Number: **19-023**
Orica Order #: **2470464**

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 09:33:12 April 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.142 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws 10611 CR3.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM6859_20190415093312.IDFW

Notes

Location: 10611 On Road 3 Port Colborne, On
 Client: Waterford Group
 User Name: Orica Canada Inc.
 General: Set up at base of flag pole

Extended Notes

N 42.89111

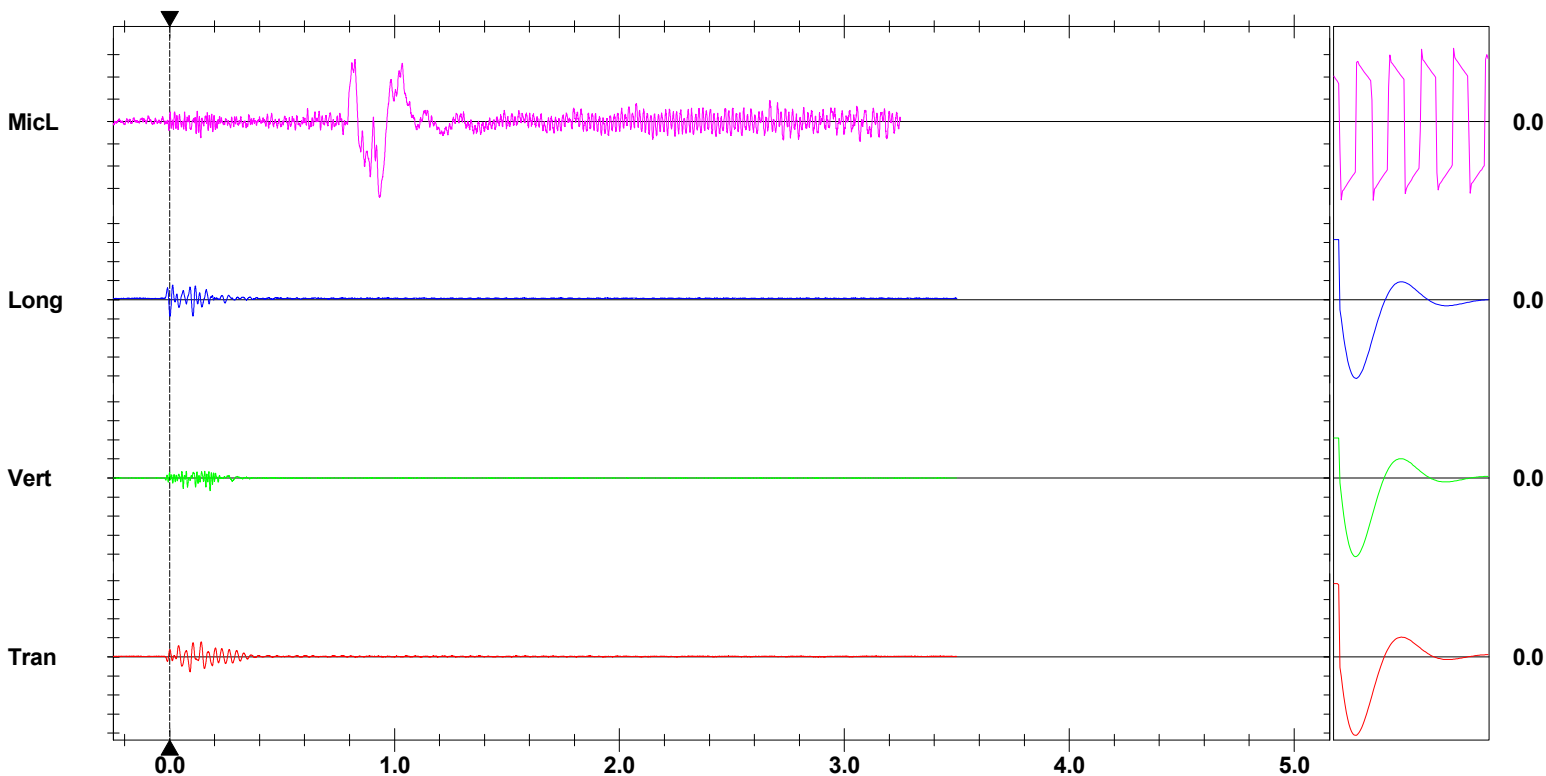
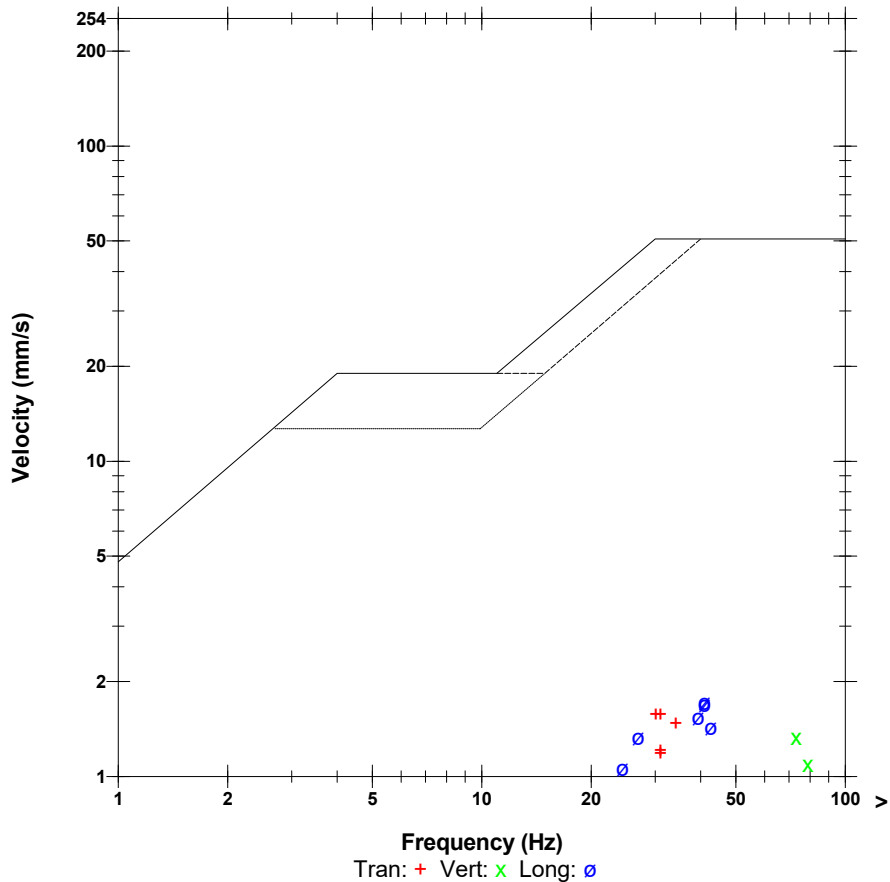
W 79.30543

Microphone Linear Weighting
PSPL 110.6 dB(L) at 0.934 sec
ZC Freq 8.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1634 mv)

	Tran	Vert	Long	
PPV	1.576	1.332	1.718	mm/s
ZC Freq	30	73	41	Hz
Time (Rel. to Trig)	0.091	0.180	0.104	sec
Peak Acceleration	0.043	0.097	0.089	g
Peak Displacement	0.026	0.003	0.022	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	4.0	4.1	4.3	

Peak Vector Sum 2.343 mm/s at 0.104 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Design Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Design Date: **2019-04-15**

Blast Number: **19-023**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench Beside Shop** (Bench / Face)
 GPS Coordinates: **42.89200** °N Latitude **79.30207** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **2,882** te
 Total Holes Loaded: **12** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **ft avg**
 # Rows Blasted: **2** rows

- Drilling Information -

Angle from Vertical

Primary Bit diam:	101.6 mm	0 °	# Holes:	12	=	250.9 ft (4 " diam)
Secondary Bit diam:	mm	0°	# Holes:		=	0.0 ft (" diam)
Tertiary Bit diam:	mm	0°	# Holes:		=	0.0 ft (" diam)

Nominal Bit Diameter:

- Design Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **6** front row

- Design Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **6** back row

Bench Height: **20.9** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **20.9** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **12.9** ft avg
 Back Row: **12.9** ft avg

- Design Charge Weight -

Front Row: **37.6** kg/hole
 Back Row: **37.6** kg/hole

Max Chge Wt / delay: **45.0** kg/delay

Required kg Loaded: **453** kg

Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.157** kg/te (actual)

Front row: **0.157** kg/te (theoretical)

Main Body: **0.157** kg/te (theoretical)

"KPI" PF: **0.157** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:

	kg
CENTRA GOLD 70	450

Pkgd Expl. Required:

	kg
FORTEL PRO 75X400	

Boosters Required:

	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	10	3.4

total explosives weight in Blast (kg): **453**

Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required:

	ms	# req'd
UNITRONIC 600 9M		10

Cord & Access. Req'd:

	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Enter #	
# of Blasts today (this Quarry)		
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Blast Date: **2019-05-08**

Blast Number: **19-024**
 Orica Order #: **2479446**
 Blast Time: **10:11 AM**

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Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench East** (Bench / Face)

GPS Coordinates: **42.89451** °N Latitude **79.29473** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **20** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 92.1 mm	0 °	# Holes: 56 = 448.0 ft (3 5/8 " diam)
Secondary Bit diam: mm	0 °	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm	0 °	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	15	6	225

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	56	19.0

total explosives weight in Blast (kg): **244**

Pkgd Prod (225 kg) % of Total kg: **92.2%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	56
UNITRONIC 600 6M			1
CONNECTADET 9M		65 ms	6
CONNECTADET 9M		25 ms	1

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)	Enter #	0

Services:

BULK TRUCK CHARGE		0.0
BLASTER HOURS	Enter Blaster hours	4.0
HELPER HOURS	Enter total Helper man-hours	8.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **1,126** te **469** m³
 Total tonnes per day: **1,126** te **TBA** Rate Code
 Total Holes Loaded: **56** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **10** rows

- Pattern (Front Row)-

Burden: **6.5** ft avg
 Spacing: **6.5** ft avg
 # Holes: **25** front row

- Pattern (Main Body) -

Burden: **6.5** ft avg
 Spacing: **6.5** ft avg
 # Holes: **31** main body

Bench Height: **7.0** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **8.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **5.0** ft avg
 Main Body: **5.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **3.0** ft avg
 Main Body: **3.0** ft avg

- Charge Weight -

Front Row: **7.2** kg/hole
 Main Body: **7.2** kg/hole
 Max. per delay: **5.0** kg/delay
 SD () Equation: **158.4** kg/delay
 Total kg Loaded: **244** kg
 Rock Density: **2.40** g/cc = te/m³

- Powder Factor -

Yield PF: **0.217** kg/te (actual)
 Front row: **0.357** kg/te (theoretical)
 Main Body: **0.357** kg/te (theoretical)
 "KPI" PF: **0.357** kg/te (theoretical)

0.877 lb/yd³
 1.446 lb/yd³
 1.446 lb/yd³
 1.446 lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

2 Sticks/ Hole of Fortel pro 75x400
 Original design was 65 hole, the loader operator was able to dig out most of the row to the ea therefore making the shot 9 holes less at 56



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89450"/>	<input type="text" value="79.29473"/>	0.748650	1.383954
Front Row Corner	<input type="text" value="42.89459"/>	<input type="text" value="79.29480"/>	0.748652	1.383955
Back Row Corner	<input type="text" value="42.89444"/>	<input type="text" value="79.29465"/>	0.748649	1.383953
Average (Centre of Blast)	<input type="text" value="42.89451"/>	<input type="text" value="79.29473"/>	0.748650	1.383954

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="377.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2466.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(377.6)^2}{30^2} \text{ kg}$$

$$= \frac{142,582}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



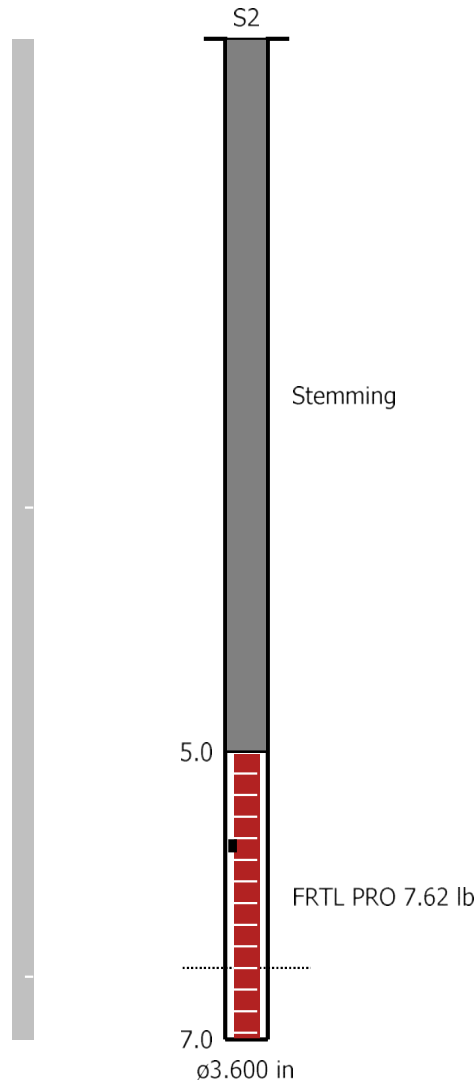
Blast Design
Waterford

Quarry: Laws - Top Lift
P.O. #: S191856
Blast Date: 5/8/2019

Blast Number: 19-024
Orica Order #: 2479446

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

**Waterford Group Laws
2019-05-08 Blast 19-024TB
Erie peat by Test wells**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
----- May 8 /19 06:49:35	----- May 8 /19 10:29:18	SERIAL NUMBER: UM6859 Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12

**Waterford Group Laws
2019-05-08 Blast 19-024TB
207 West side drive, port colborne**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
May 8 /19 06:43:01		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
May 8 /19 08:38:40	May 8 /19 08:38:44	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 08:40:12	May 8 /19 08:40:16	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 08:47:43	May 8 /19 08:47:47	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:08:33	May 8 /19 09:08:37	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:09:26	May 8 /19 09:09:30	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:09:41	May 8 /19 09:09:48	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:10:20	May 8 /19 09:10:23	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:11:11	May 8 /19 09:11:16	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:13:10	May 8 /19 09:13:17	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:13:41	May 8 /19 09:13:45	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:16:16	May 8 /19 09:16:20	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:16:58	May 8 /19 09:17:03	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:17:48	May 8 /19 09:17:52	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:18:18	May 8 /19 09:18:22	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:19:04	May 8 /19 09:19:08	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:23:08	May 8 /19 09:23:12	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:23:38	May 8 /19 09:23:43	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:23:51	May 8 /19 09:23:59	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:27:57	May 8 /19 09:28:01	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:28:53	May 8 /19 09:28:57	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:34:29	May 8 /19 09:34:33	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:38:20	May 8 /19 09:38:24	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:41:09	May 8 /19 09:41:17	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:43:27	May 8 /19 09:43:31	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:44:42	May 8 /19 09:44:45	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:55:02	May 8 /19 09:55:06	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 09:57:15	May 8 /19 09:57:19	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:05:40	May 8 /19 10:05:44	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:09:09	May 8 /19 10:09:13	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:13:53	May 8 /19 10:13:57	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:14:25	May 8 /19 10:14:29	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:16:03	May 8 /19 10:16:07	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:19:15	May 8 /19 10:19:19	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:23:03	May 8 /19 10:23:07	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:26:00	May 8 /19 10:26:05	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:28:46	May 8 /19 10:28:50	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:33:51	May 8 /19 10:33:55	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:34:44	May 8 /19 10:34:51	Event recorded. Trigger Level MicL: 115.0 dB
May 8 /19 10:34:51	May 8 /19 10:36:59	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-05-15**

Blast Number: **19-025**
 Orica Order #: **2482208**
 Blast Time: **2:20 PM**

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Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)

GPS Coordinates: **42.89193** °N Latitude **79.30207** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **N** at **15** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 12 = 252.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	26,250	25,872	378

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	4	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	10	3.4

total explosives weight in Blast (kg): **406**
 Pkgd Prod (25 kg) % of Total kg: **6.2%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			10

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	2

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	2.0
HELPER HOURS	Enter total Helper man-hours	1.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **2,297** te **883** m³
 Total tonnes per day: **47,569** te **LML22-32** Rate Code
 Total Holes Loaded: **10** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** front row

- Pattern (Back Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** back row

Bench Height: **20.0** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **21.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Back Row: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Back Row: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **13.0** ft avg
 Back Row: **13.0** ft avg

- Charge Weight -

Front Row: **37.9** kg/hole
 Back Row: **37.9** kg/hole
 Max. per delay: **35.0** kg/delay
 SD () Equation: **92.9** kg/delay
 Total kg Loaded: **406** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.177** kg/te (actual)
 Front row: **0.165** kg/te (theoretical)
 Main Body: **0.165** kg/te (theoretical)
 "KPI" PF: **0.165** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

LML22-32 Rate code



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2019-05-15

Blast Number: 19-025
Orica Order #: 2482208
Blast Time: 2:20 PM

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Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89192	79.30207	0.748605	1.384082
Front Row Corner	42.89196	79.30198	0.748606	1.384081
Back Row Corner	42.89192	79.30216	0.748605	1.384084
Average (Centre of Blast)	42.89193	79.30207	0.748605	1.384082

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89111	79.30543	0.748591	1.384141
2nd Reading				
Average	42.89111	79.30543	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	289.1	m		
Post Blast Data:	ppV: 2.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: 34.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 111.2	dB	Trigger set at: 115	dB
10611 On Road 3 Port Colborne, On				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89214	79.31593	0.748609	1.384324
2nd Reading				
Average	42.89214	79.31593	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	1131.1	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 1.5	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
20804 Graybiel Road Port Colbourne, On				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	mm/s	Trigger set at: 1.5	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure:	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(289.1)^2}{30^2} \text{ kg} \\
 &= \frac{83,579}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

jim bray

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date:

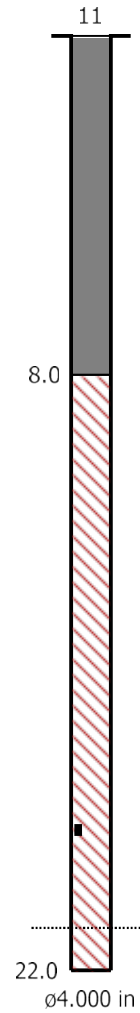
Blast Number: 19-025
Orica Order #: 2482208

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Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating sign off on Blast Design.

Date/Time Long at 14:09:55 May 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration December 4, 2018 by InstanTEL
File Name __TEMP.EVT

Notes

Location: 10611 Rd 3
 Client: Water Ford Group
 User Name: Orica Canada Inc.
 General: Laws

Extended Notes

Under Flage Pole
 42.89111 -79.30543

Microphone Linear Weighting

PSPL 111.2 dB(L) at 0.927 sec

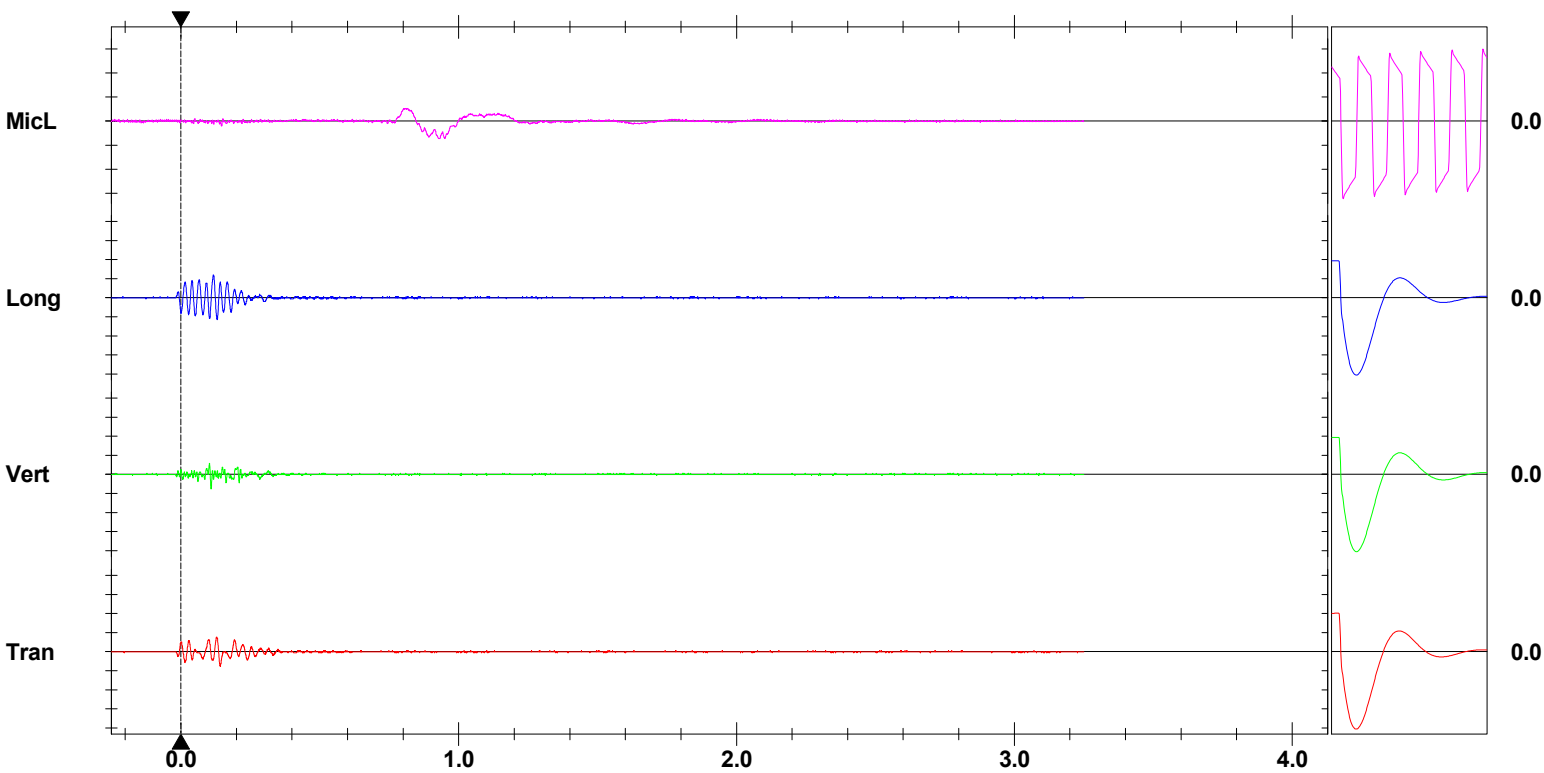
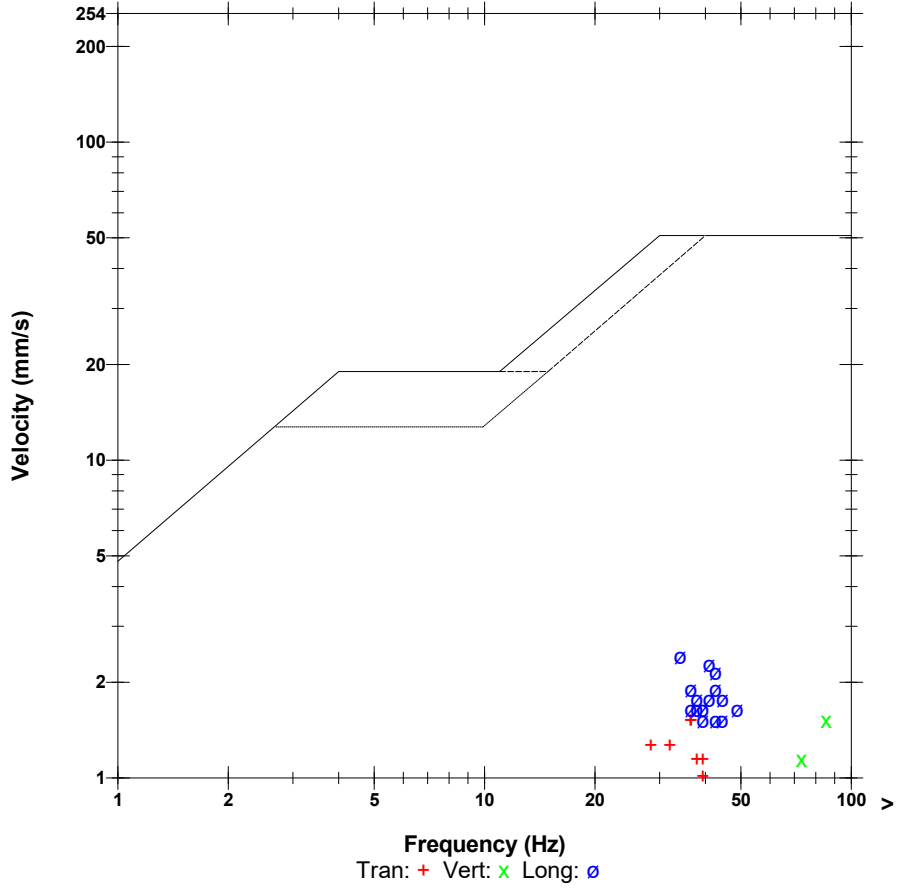
ZC Freq 3.3 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 499 mv)

	Tran	Vert	Long	
PPV	1.524	1.524	2.413	mm/s
ZC Freq	37	85	34	Hz
Time (Rel. to Trig)	0.127	0.108	0.117	sec
Peak Acceleration	0.053	0.080	0.080	g
Peak Displacement	0.007	0.004	0.011	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.3	Hz
Overswing Ratio	3.8	3.7	4.0	

Peak Vector Sum 2.750 mm/s at 0.130 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

**19-25TB(Shop)2019-05-15
GrayBeil Rd
Law Crushed Stone**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
May 15 /19 06:27:44		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
May 15 /19 11:17:40	May 15 /19 11:17:44	Event recorded. Trigger Level MicL: 115.0 dB
May 15 /19 11:17:44	May 15 /19 14:35:55	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115



Blast Design Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Design Date: _____

Blast Number: 19-025
Orica Order #: _____

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Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Top Bench Beside Shop (Bench / Face)

GPS Coordinates: 42.89193 °N Latitude 79.30207 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 3,032 te
Total Holes Loaded: 12 holes
... including: _____ Dead Holes
... and: _____ Helper Holes
Helper Hole Collar: _____ ft avg
Rows Blasted: 2 rows

- Drilling Information -

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam: <u>101.6</u> mm	<u>0</u> °	# Holes: <u>14</u>	= 322.0 ft (<u>4</u> " diam)
Secondary Bit diam: _____ mm	<u>0</u> °	# Holes: _____	= 0.0 ft (_____ " diam)
Tertiary Bit diam: _____ mm	<u>0</u> °	# Holes: _____	= 0.0 ft (_____ " diam)

- Design Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 13.0 ft avg
Holes: 5 front row

- Design Pattern (Back Row) -

Burden: 12.0 ft avg
Spacing: 13.0 ft avg
Holes: 7 back row

Bench Height: 22.0 ft avg

Sub-drill: 1.0 ft avg

Hole Depth: 23.0 ft avg

- Design Stone Decking -

Front Row: 0.0 ft avg

Back Row: 0.0 ft avg

- Design Collar Stemming -

Front Row: 8.0 ft avg

Back Row: 8.0 ft avg

Material used: .75" Stone

- Design Charge Length -

Front Row: 15.0 ft avg

Back Row: 15.0 ft avg

- Design Charge Weight -

Front Row: 43.7 kg/hole

Back Row: 43.7 kg/hole

Max Chge Wt / delay: 50.0 kg/delay

Required kg Loaded: 729 kg

Rock Density: 2.60 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.240 kg/te (actual)

Front row: 0.173 kg/te (theoretical)

Main Body: 0.173 kg/te (theoretical)

"KPI" PF: 0.173 kg/te (theoretical)

0.759 lb/yd³

0.759 lb/yd³

0.759 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg

CENTRA GOLD 70		600
----------------	--	-----

Pkgd Expl. Required: kg

FORTEL PRO 75X400	5	125
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Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	12	4.1
---------------------------	------	----	-----

total explosives weight in Blast (kg): 729

Pkgd Prod (125 kg) % of Total kg: 17.1%

Detonators Required: ms # req'd

UNITRONIC 600 9M		12
------------------	--	----

Cord & Access. Req'd: U of M # req'd

WIRE DUPLEX (6 PACK) 400M	units	1
---------------------------	-------	---

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Blast Date: **2019-05-15**

Blast Number: **19-026**
 Orica Order #: **2482208**
 Blast Time: **1:15 PM**

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Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench** (Bench / Face)

GPS Coordinates: **42.89446** °N Latitude **79.29530** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **N** at **20** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical **0**° # Holes: **408** = 3,941.7 ft (4 " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	25,872	20,440	5,432

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	395	134.3

total explosives weight in Blast (kg): **5,566**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			1
EXEL HANDIDET 7m		25/500	395
CONNECTADET 9M		25 ms	5
CONNECTADET 9M		42 ms	2
CONNECTADET 9M		65 ms	34

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	14.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **45,272** te **18,863** m³
 Total tonnes per day: **47,569** te **LTL12-23** Rate Code
 Total Holes Loaded: **408** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **9** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **46** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **362** main body

Bench Height: **9.7** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **9.7** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **6.5** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **2.7** ft avg
 Main Body: **3.2** ft avg

- Charge Weight -

Front Row: **7.8** kg/hole
 Main Body: **9.2** kg/hole
 Max. per delay: **15.0** kg/delay
 SD () Equation: **191.5** kg/delay
 Total kg Loaded: **5,566** kg
 Rock Density: **2.40** g/cc = te/m³

- Powder Factor -

Yield PF: **0.123** kg/te (actual)
 Front row: **0.070** kg/te (theoretical)
 Main Body: **0.083** kg/te (theoretical)
 "KPI" PF: **0.082** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

We were able to load 392 holes, some hole had been dug out by the loader while cleaning out the shot in front.

3 holes received a secondary primer because the primary would not pull.

Rate Code LTL12-23



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

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Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89445"/>	<input type="text" value="79.29524"/>	0.748649	1.383963
Front Row Corner	<input type="text" value="42.89449"/>	<input type="text" value="79.29577"/>	0.748650	1.383972
Back Row Corner	<input type="text" value="42.89443"/>	<input type="text" value="79.29489"/>	0.748649	1.383957
Average (Centre of Blast)	<input type="text" value="42.89446"/>	<input type="text" value="79.29530"/>	0.748649	1.383964

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="415.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="2.4"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="23.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="115.7"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2513.5"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(415.1)^2}{30^2} \text{ kg}$$

$$= \frac{172,308}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

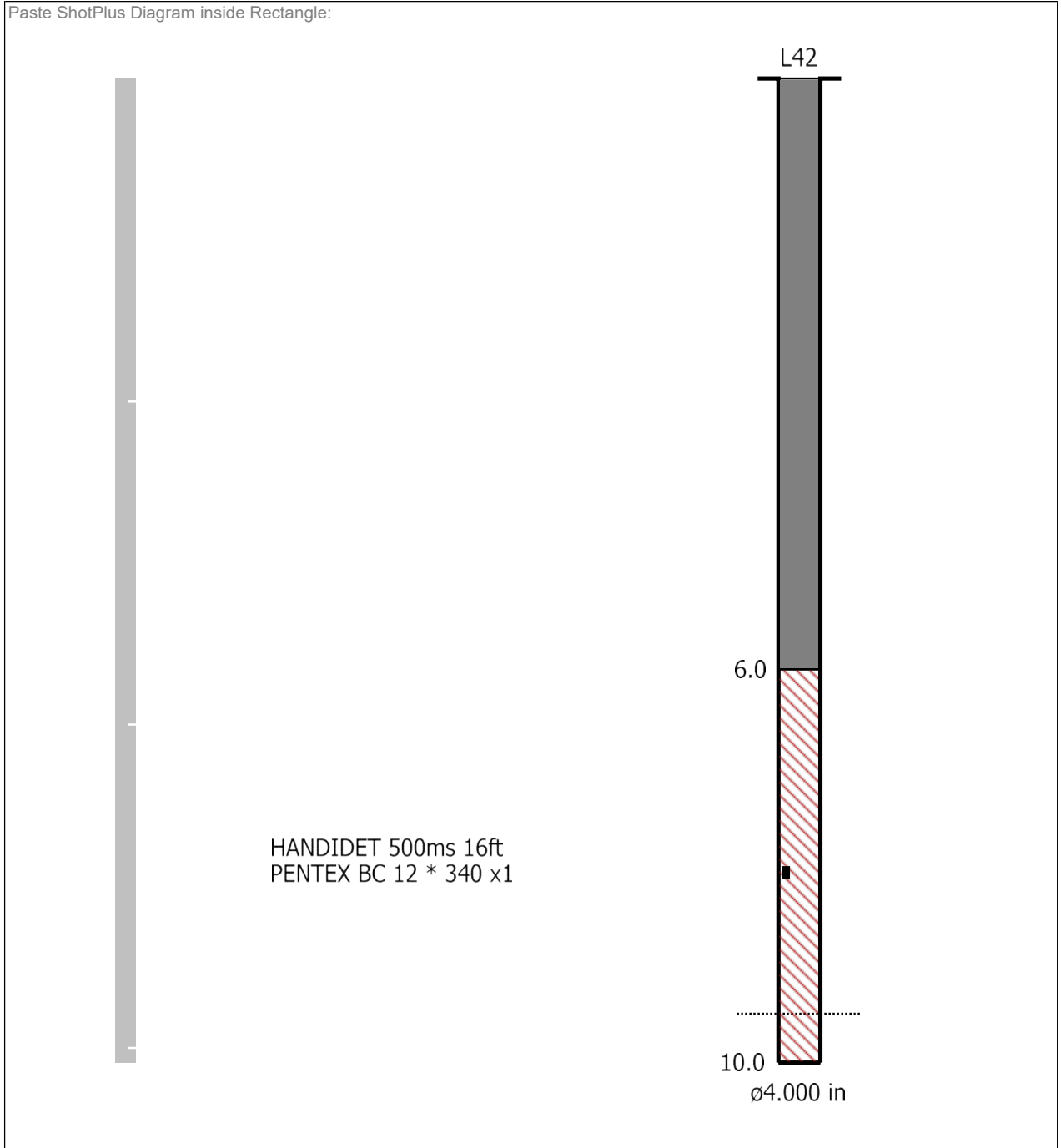
Waterford

Quarry: Laws - Top Lift
P.O. #: S191856
Blast Date: 5/15/2019

Blast Number: 19-026
Orica Order #: 2482208

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 13:15:53 May 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.0 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.3 Volts
Unit Calibration December 4, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: Erie peat Rd
 Client: Water Ford Group
 User Name: Orica Canada Inc.
 General: Laws

Extended Notes

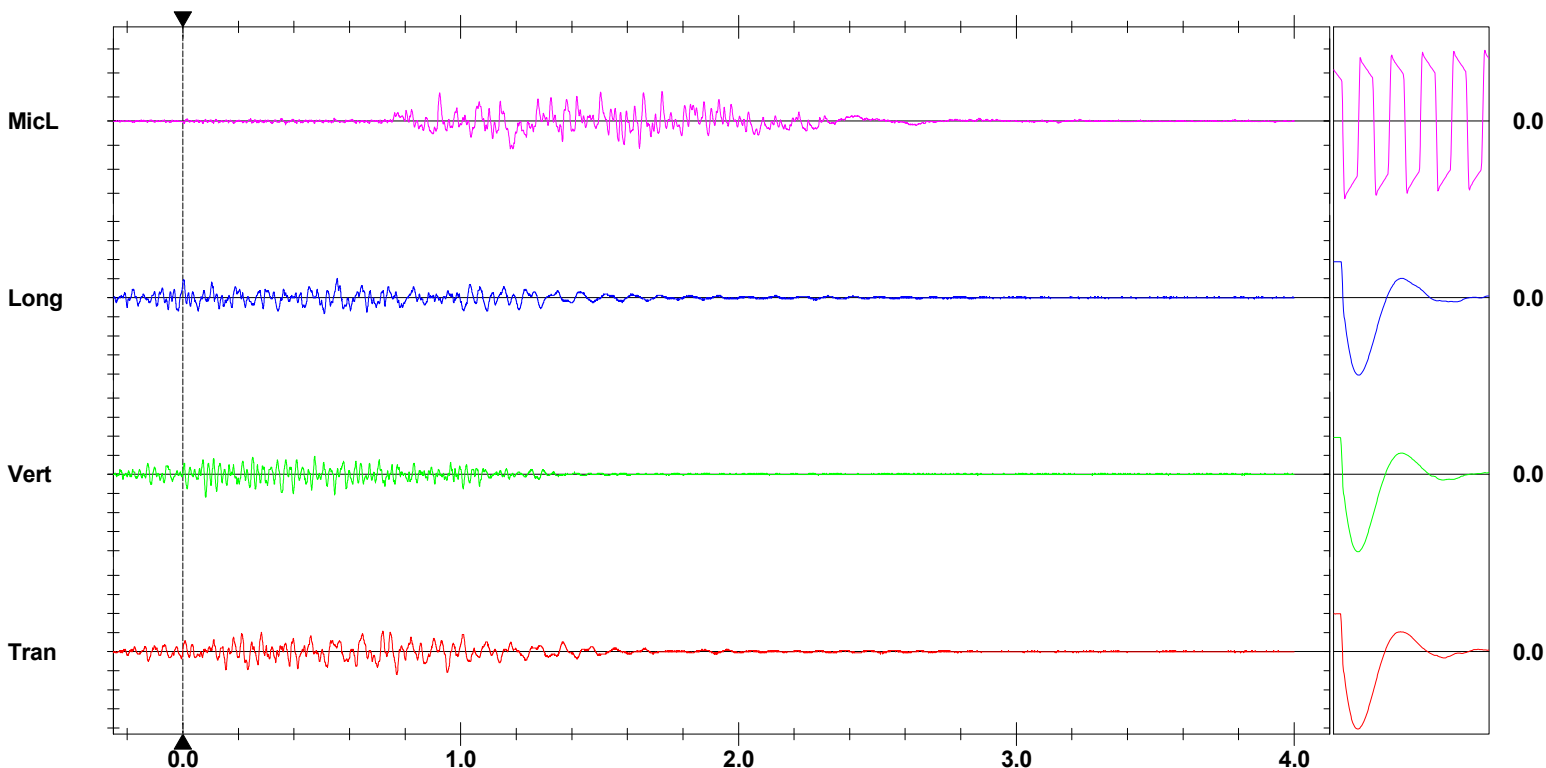
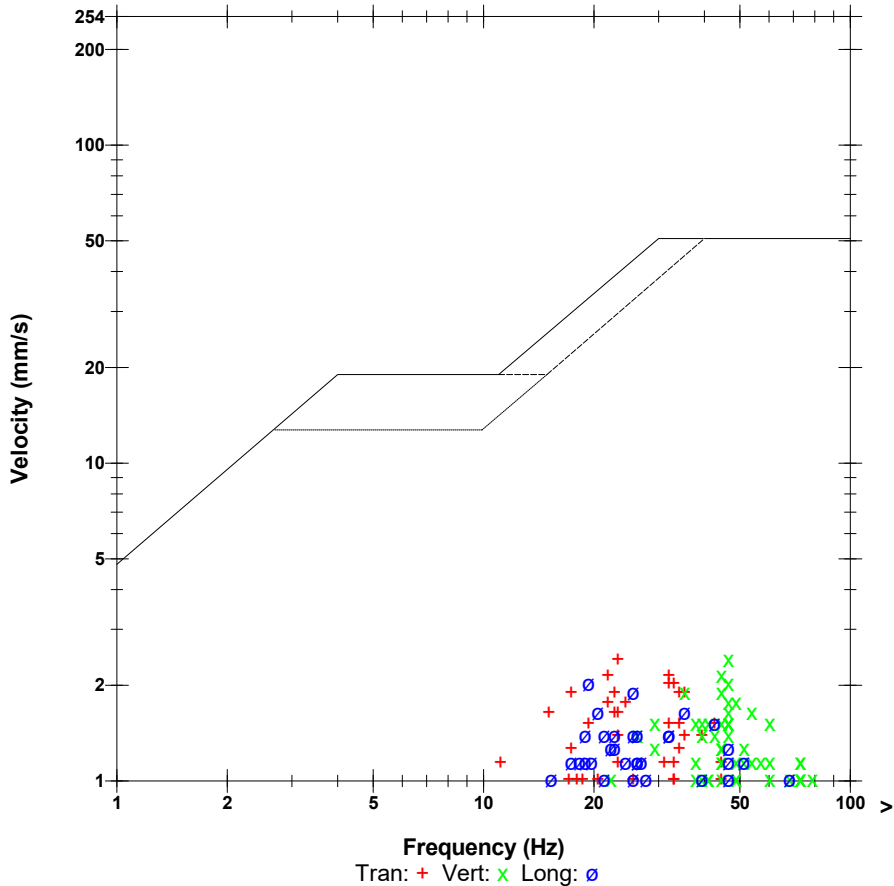
42.89269 -79.29082
 Beside test wells

Microphone Linear Weighting
PSPL 115.7 dB(L) at 1.725 sec
ZC Freq 29 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 574 mv)

	Tran	Vert	Long	
PPV	2.413	2.413	2.032	mm/s
ZC Freq	23	47	19.3	Hz
Time (Rel. to Trig)	0.769	0.082	0.555	sec
Peak Acceleration	0.080	0.080	0.080	g
Peak Displacement	0.018	0.009	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.1	Hz
Overswing Ratio	4.0	3.7	4.1	

Peak Vector Sum 2.664 mm/s at 1.008 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

19-026TB 2019-05-15
207 Westside drive Port Colbourne
Law Crushed Stone

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
May 15 /19 06:31:39		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
May 15 /19 08:17:57	May 15 /19 08:18:01	Event recorded. Trigger Level MicL: 121.0 dB
May 15 /19 08:18:01	May 15 /19 12:39:19	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0 dB
May 15 /19 12:45:17		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
May 15 /19 12:58:42	May 15 /19 12:58:46	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:01:56	May 15 /19 13:02:00	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:03:10	May 15 /19 13:03:14	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:03:41	May 15 /19 13:03:46	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:04:14	May 15 /19 13:04:18	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:07:48	May 15 /19 13:07:52	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:08:18	May 15 /19 13:08:22	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:12:02	May 15 /19 13:12:06	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:12:53	May 15 /19 13:12:57	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:16:08	May 15 /19 13:16:12	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:27:08	May 15 /19 13:27:12	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:28:38	May 15 /19 13:28:43	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:29:40	May 15 /19 13:29:44	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:30:06	May 15 /19 13:30:10	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:31:54	May 15 /19 13:31:58	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:32:09	May 15 /19 13:32:13	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:32:33	May 15 /19 13:32:37	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:33:55	May 15 /19 13:34:01	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:34:11	May 15 /19 13:34:15	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:35:17	May 15 /19 13:35:21	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:36:49	May 15 /19 13:36:56	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:38:29	May 15 /19 13:38:34	Event recorded. Trigger Level MicL: 123.0 dB
May 15 /19 13:38:34	May 15 /19 13:41:27	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 123.0 dB
May 15 /19 13:51:10		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 124.0 dB
May 15 /19 14:09:46	May 15 /19 14:09:50	Event recorded. Trigger Level Vert: 1.50 mm/s
May 15 /19 14:09:50	May 15 /19 14:16:22	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 124.0 dB



Blast Design

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S191856**
 Design Date:

Blast Number: **19-026**
 Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench East** (Bench / Face)

GPS Coordinates: **42.89446** °N Latitude **79.29530** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **46,860** te
 Total Holes Loaded: **408** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **9** rows

- Drilling Information -

Angle from Vertical

Primary Bit diam:	101.6 mm	0 °	# Holes:	408	=	4,080.0 ft (4 " diam)
Secondary Bit diam:	mm	0°	# Holes:		=	0.0 ft (" diam)
Tertiary Bit diam:	mm	0°	# Holes:		=	0.0 ft (" diam)

- Design Pattern (Front Row)-

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **47** front row

- Design Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **361** main body
 Bench Height: **10.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **10.0** ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg

- Design Charge Weight -

Front Row: **11.7** kg/hole
 Main Body: **11.7** kg/hole
 Max Chge Wt / delay: **15.0** kg/delay

Required kg Loaded: **5,764** kg
 Rock Density: **2.40** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.123** kg/te (actual)
 Front row: **0.102** kg/te (theoretical)
 Main Body: **0.102** kg/te (theoretical)
 "KPI" PF: **0.102** kg/te (theoretical)

0.411 lb/yd³

0.411 lb/yd³

0.411 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	5,500

Pkgd Expl. Required:	kg
FORTEL PRO 75X400	5 125

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	408	138.7

total explosives weight in Blast (kg): **5,764**
 Pkgd Prod (125 kg) % of Total kg: **2.2%**

Detonators Required:	ms	# req'd
EXEL HANDIDET 7m	25/500	408
CONNECTADET 9M	65 ms	32
CONNECTADET 9M	42 ms	4
UNITRONIC 600 6M		5
CONNECTADET 9M	25 ms	65

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)	Note Exception	2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-06-11**

Blast Number: **19-027**
 Orica Order #: **2492967**
 Blast Time: **9:59 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench (Shop)** (Bench / Face)
 GPS Coordinates: **42.89186** °N Latitude **79.30206** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **15** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical **0** # Holes: **27** = 563.9 ft (4 " diam)
 Secondary Bit diam: **92.1** mm # Holes: **15** = 313.3 ft (3 5/8 " diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	23,670	22,920	750

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	4	2	50

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	39	13.3

total explosives weight in Blast (kg): **813**
 Pkgd Prod (50 kg) % of Total kg: **6.1%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			15
UNITRONIC 600 9M			24

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	4

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	3.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **2,741** te **1,054** m³
 Total tonnes per day: **13,992** te **LML22-34** Rate Code
 Total Holes Loaded: **23** holes
 ... including: **3** Dead Holes
 ... and: **8** Helper Holes
 Helper Hole Collar: **15.0** ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **5** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **18** main body

Bench Height: **19.9** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **20.9** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **12.9** ft avg
 Main Body: **12.9** ft avg

- Charge Weight -

Front Row: **37.6** kg/hole
 Main Body: **37.6** kg/hole
 Max. per delay: **45.0** kg/delay
 SD () Equation: **91.3** kg/delay
 Total kg Loaded: **813** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.297** kg/te (actual)
 Front row: **0.165** kg/te (theoretical)
 Main Body: **0.165** kg/te (theoretical)
 "KPI" PF: **0.165** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Dunville and Laws combined tonnage	Laws	2721
Tonnage from toe is not calculated into todays blast	Dunville	11251
	total=	1399

Floor	Top Bench
15- 6M Unitronics	24-9M Unitronics
15- 340 Boosters	24-340 Boosters
1 Case 75x400 Fortel Pro	1 Case 75x400 Fortel Pro
	4 Stem Plugs

Rate Code **LML22-34**



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89186"/>	<input type="text" value="79.30206"/>	0.748604	1.384082
Front Row Corner	<input type="text" value="42.89189"/>	<input type="text" value="79.30216"/>	0.748605	1.384084
Back Row Corner	<input type="text" value="42.89183"/>	<input type="text" value="79.30197"/>	0.748604	1.384081
Average (Centre of Blast)	<input type="text" value="42.89186"/>	<input type="text" value="79.30206"/>	0.748604	1.384082

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
2nd Reading				
Average	<input type="text" value="42.89111"/>	<input type="text" value="79.30543"/>	0.748591	1.384141
Distance (1st Seis. From Centre of Blast)	<input type="text" value="286.7"/>	m		
Post Blast Data:	ppV: <input type="text" value="2.4"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="34.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="109.5"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="10611 On Road 3 Port Colborne,On"/>				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
2nd Reading				
Average	<input type="text" value="42.89214"/>	<input type="text" value="79.31593"/>	0.748609	1.384324
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="1131.4"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.5"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="38.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="93.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="20804 Graybiel Road Port Colbourne,On"/>				

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(286.7)^2}{30^2} \text{ kg} \\
 &= \frac{82,197}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Design Date: **2019-06-11**

Blast Number: **19-027**
Orica Order #:

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench Beside Shop** (Bench / Face)

GPS Coordinates: **42.89186** °N Latitude **79.30206** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **3,338** te
Total Holes Loaded: **23** holes
... including: **8** Dead Holes
... and: **8** Helper Holes
Helper Hole Collar: **15.0** ft avg
Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
Primary Bit diam: **101.6** mm **0** # Holes: **27** = 550.1 ft (4 " diam)
Secondary Bit diam: **92.1** mm **0** # Holes: **15** = 305.6 ft (3 5/8 " diam)
Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

- Design Pattern (Front Row)-

Burden: **12.0** ft avg
Spacing: **13.0** ft avg
Holes: **5** front row

- Design Pattern (Main Body) -

Burden: **12.0** ft avg
Spacing: **13.0** ft avg
Holes: 18 main body
Bench Height: **19.4** ft avg
Sub-drill: **1.0** ft avg
Hole Depth: 20.4 ft avg

- Design Stone Decking -

Front Row: **0.0** ft avg
Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
Main Body: **8.0** ft avg

Material used: **.75" Stone**

- Design Charge Length -

Front Row: 12.4 ft avg
Main Body: 12.4 ft avg

- Design Charge Weight -

Front Row: 36.1 kg/hole
Main Body: 36.1 kg/hole
Max Chge Wt / delay: **50.0** kg/delay

Required kg Loaded: 913 kg
Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.274** kg/te (actual)
Front row: 0.162 kg/te (theoretical)
Main Body: 0.162 kg/te (theoretical)
"KPI" PF: 0.162 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg

CENTRA GOLD 70		800
----------------	--	------------

Pkgd Expl. Required: kg

FORTEL PRO 75X400	4	100
-------------------	----------	-----

Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	38	12.9
---------------------------	------	-----------	------

total explosives weight in Blast (kg): 913
Pkgd Prod (100 kg) % of Total kg: 11.0%

Detonators Required: ms # req'd

UNITRONIC 600 6M		15
UNITRONIC 600 9M		27

Cord & Access. Req'd: U of M # req'd

WIRE DUPLEX (6 PACK) 400M	units	1
---------------------------	-------	----------

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Date/Time Tran at 09:58:34 June 11, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.0 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws GreyBiel .mm

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190611095834.IDFW

Notes

Location: 20804 GreyBiel Road
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: Sand Bagged 42.89175 - 79.30238

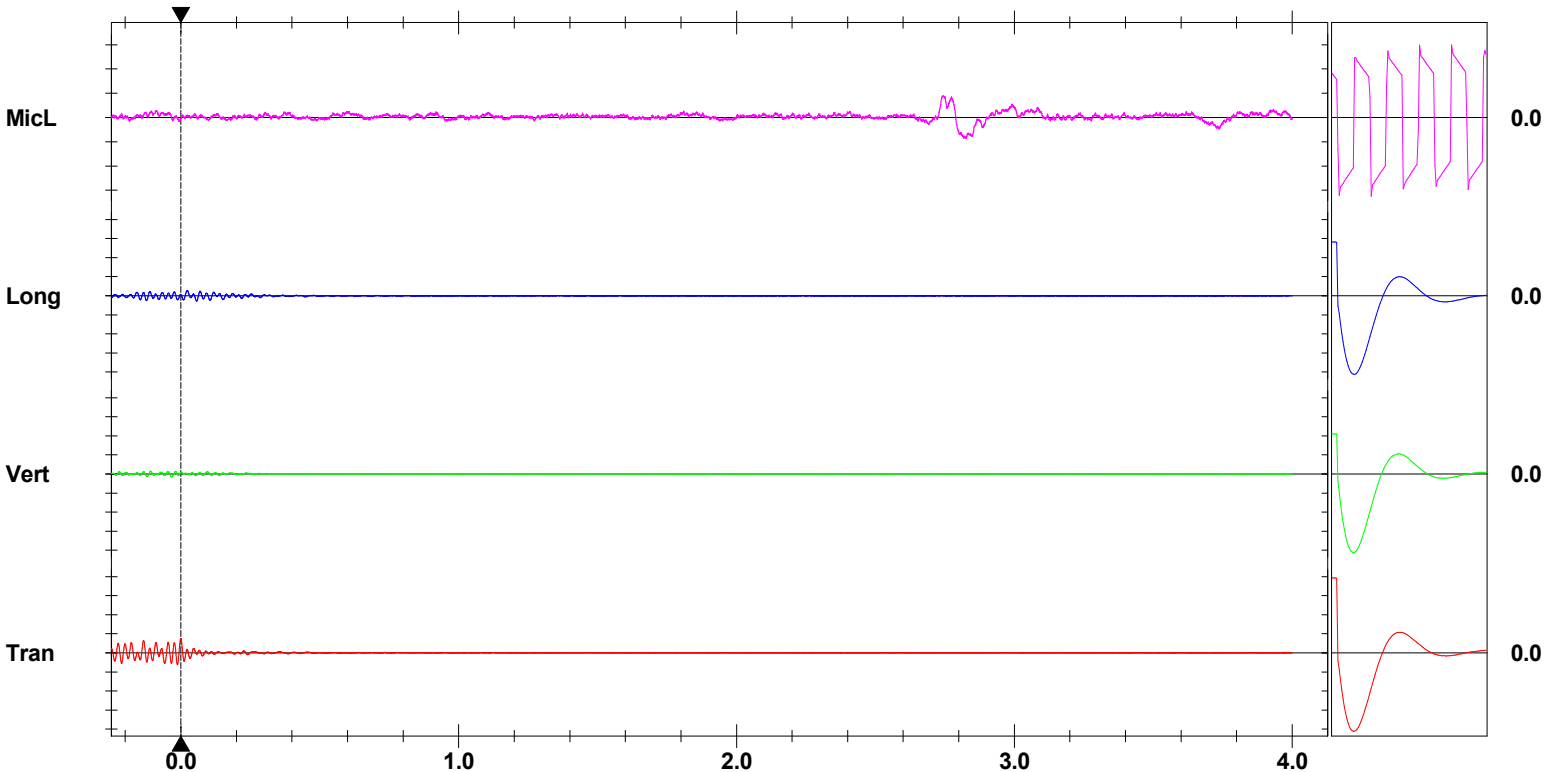
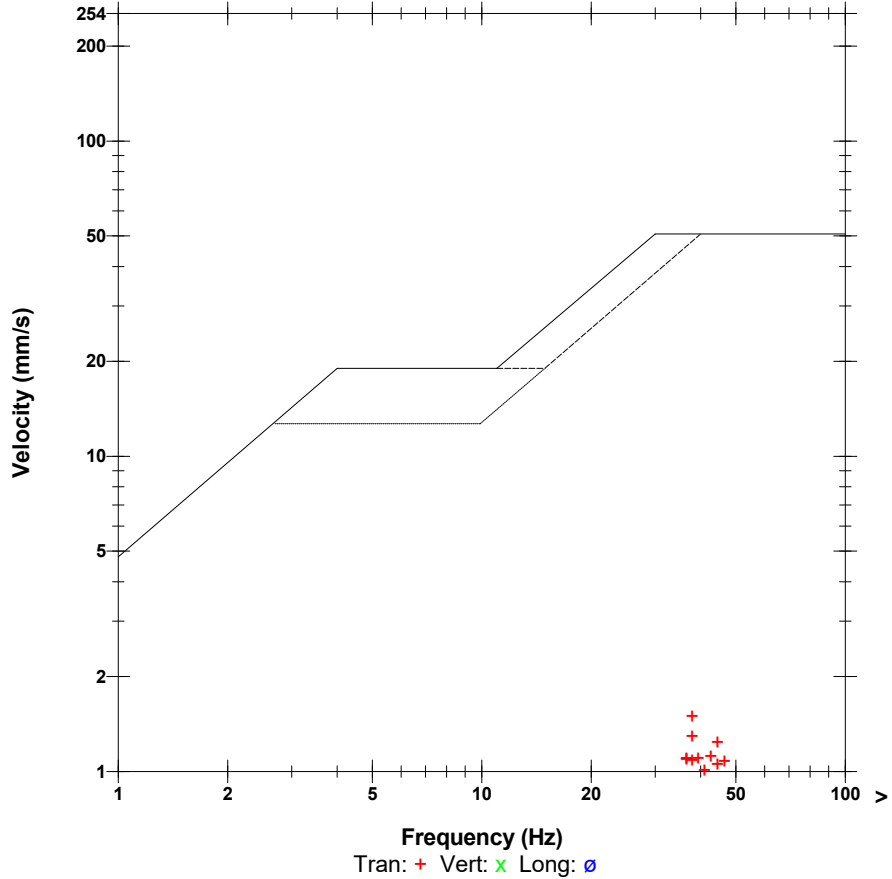
Extended Notes

Microphone Linear Weighting
PSPL 93.1 dB(L) at 2.744 sec
ZC Freq 7.9 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1439 mv)

	Tran	Vert	Long	
PPV	1.505	0.315	0.560	mm/s
ZC Freq	38	33	35	Hz
Time (Rel. to Trig)	0.000	-0.035	0.057	sec
Peak Acceleration	0.039	0.016	0.018	g
Peak Displacement	0.006	0.001	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.8	3.9	4.1	

Peak Vector Sum 1.521 mm/s at 0.000 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Long at 09:58:42 June 11, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.108 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws 10611 CR3.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190611095842.IDFW

Notes

Location: 10611 On Road 3 Port Colborne, On
 Client: Waterford Group
 User Name: ORICA CANADA
 General: Law Crushed Stone

Extended Notes

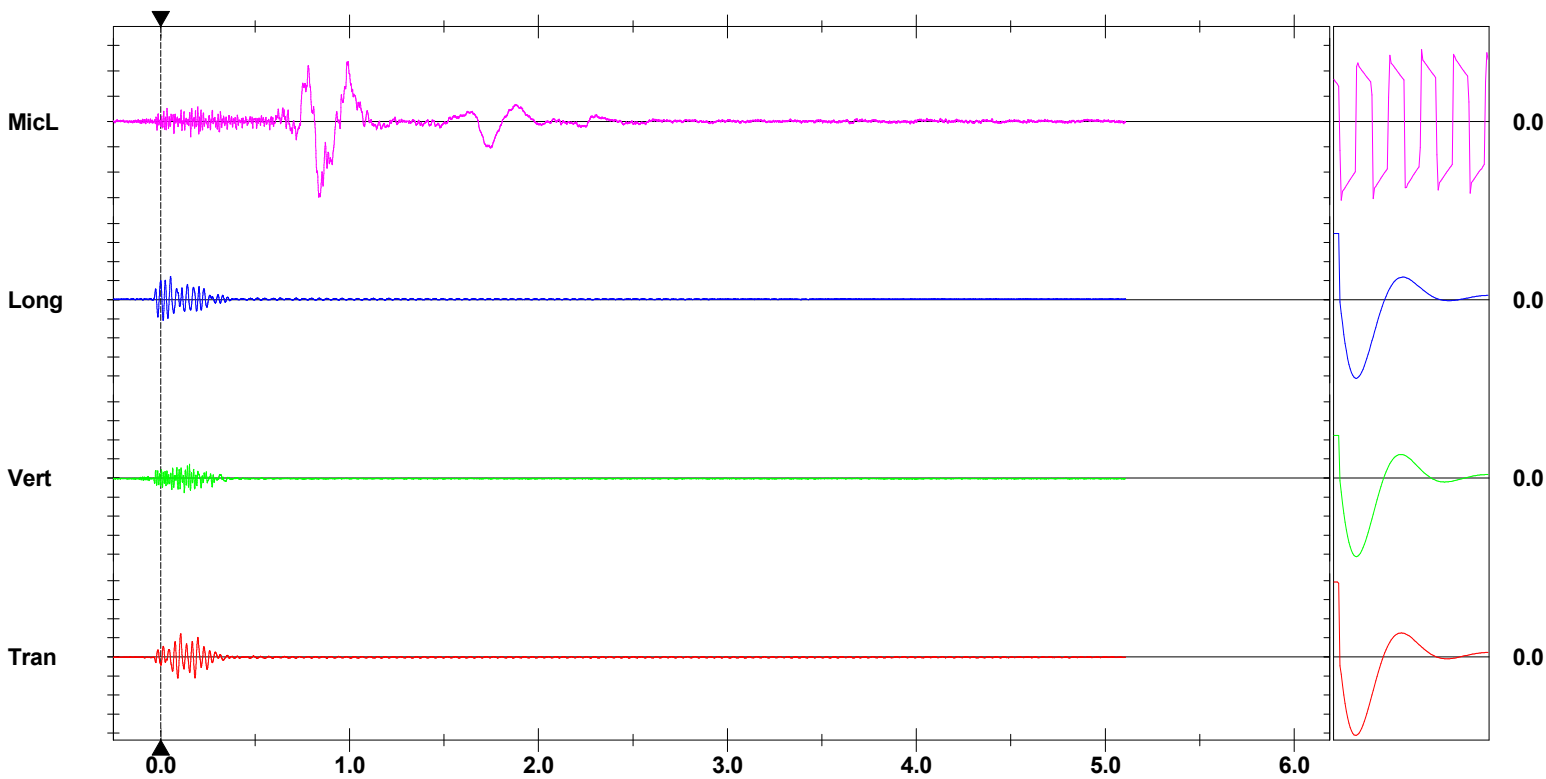
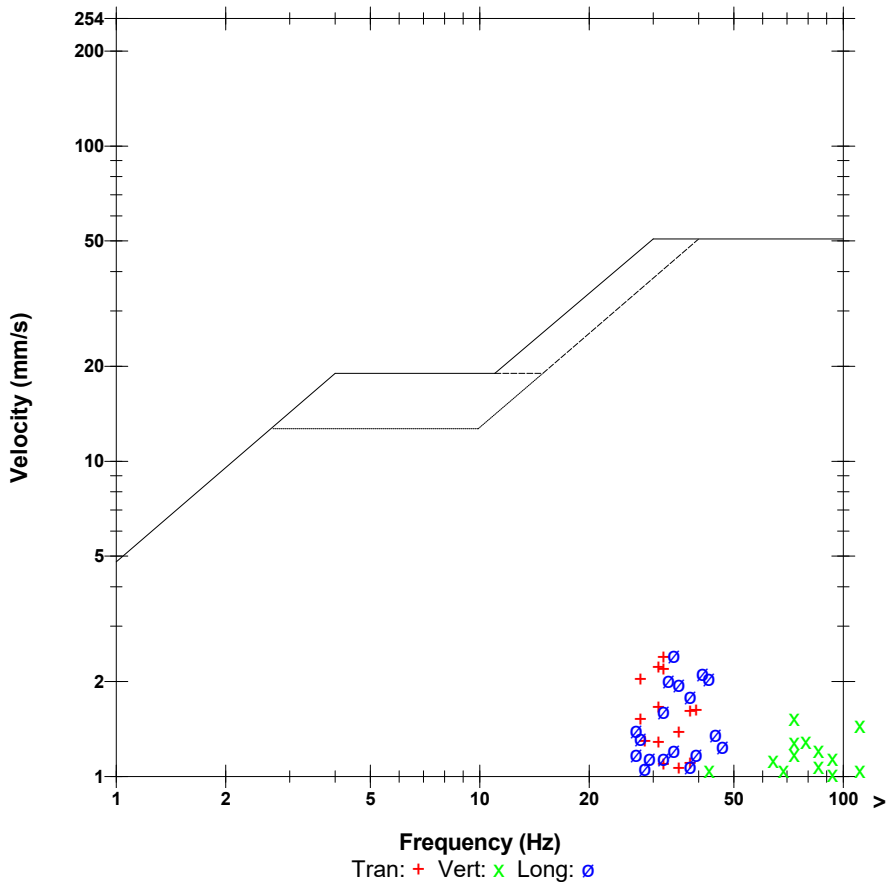
Under Flag Pole in front of church.
 N42.89111, W-79.30543

Microphone Linear Weighting
PSPL 109.5 dB(L) at 0.837 sec
ZC Freq 4.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1297 mv)

	Tran	Vert	Long	
PPV	2.404	1.529	2.435	mm/s
ZC Freq	32	73	34	Hz
Time (Rel. to Trig)	0.106	0.125	0.053	sec
Peak Acceleration	0.072	0.153	0.064	g
Peak Displacement	0.012	0.005	0.011	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.3	Hz
Overswing Ratio	3.3	3.3	3.5	

Peak Vector Sum 2.599 mm/s at 0.091 sec

USBM R18507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S191856**
 Blast Date: **2019-06-25**

Blast Number: **19-028MB**
 Orica Order #: **2498645**
 Blast Time: **10:04 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89471** °N Latitude **79.29495** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **15** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 59 = 1,593.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,330	29,430	3,900

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	59	20.1
PENTEX 8 (OR EQUIVALENT)	0.23	59	13.4

total explosives weight in Blast (kg): **3,933**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	59
EXEL HANDIDET 9m		25/500	59
CONNECTADET 9M		65 ms	6

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	4.5
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **18,296** te **7,037** m³
 Total tonnes per day: **18,296** te **LML22-43** Rate Code
 Total Holes Loaded: **59** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **22** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **37** main body

Bench Height: **27.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **20.0** ft avg
 Main Body: **20.0** ft avg

- Charge Weight -

Front Row: **58.3** kg/hole
 Main Body: **58.3** kg/hole
 Max. per delay: **68.0** kg/delay
 SD () Equation: **182.3** kg/delay
 Total kg Loaded: **3,933** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.215** kg/te (actual)
 Front row: **0.188** kg/te (theoretical)
 Main Body: **0.188** kg/te (theoretical)
 "KPI" PF: **0.188** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Combined tonnage with Dunnville quarry:

Law Crushed Stone: **18296**

Dunnville Rock: **12725**

Total: **31021**



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S191856
Blast Date: 2019-06-25

Blast Number: 19-028MB
Orica Order #: 2498645
Blast Time: 10:04 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89473	79.29488	0.748654	1.383957
Front Row Corner	42.89473	79.29539	0.748654	1.383966
Back Row Corner	42.89468	79.29459	0.748653	1.383952
Average (Centre of Blast)	42.89471	79.29495	0.748654	1.383958

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	405.0	m		
Post Blast Data:	ppV: 7.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 37.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 107.5	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2478.4	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
207 Westside Dr, Port Colborne, On				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(405)^2}{30^2} \text{ kg}$$

$$= \frac{164,025}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



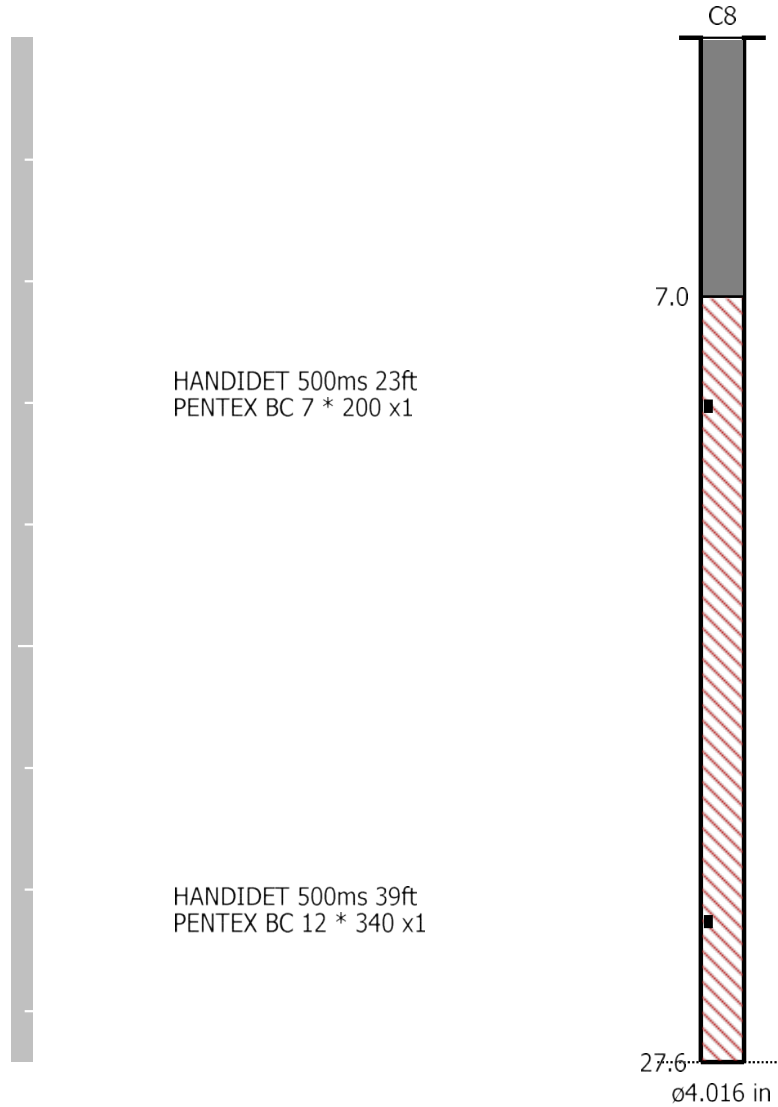
Blast Design
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S191856**
Blast Date: **6/25/2019**

Blast Number: **19-028MB**
Orica Order #: **2498645**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 10:04:22 June 25, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.844 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Dunroon 8592 26-27.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190625100422.IDFW

Notes

Location: 8592 Sideroad 26/27
 Client: Walkers Dunroon
 User Name: Orica Canada Inc.
 General: Monitoring Vibration and Airblast

Extended Notes

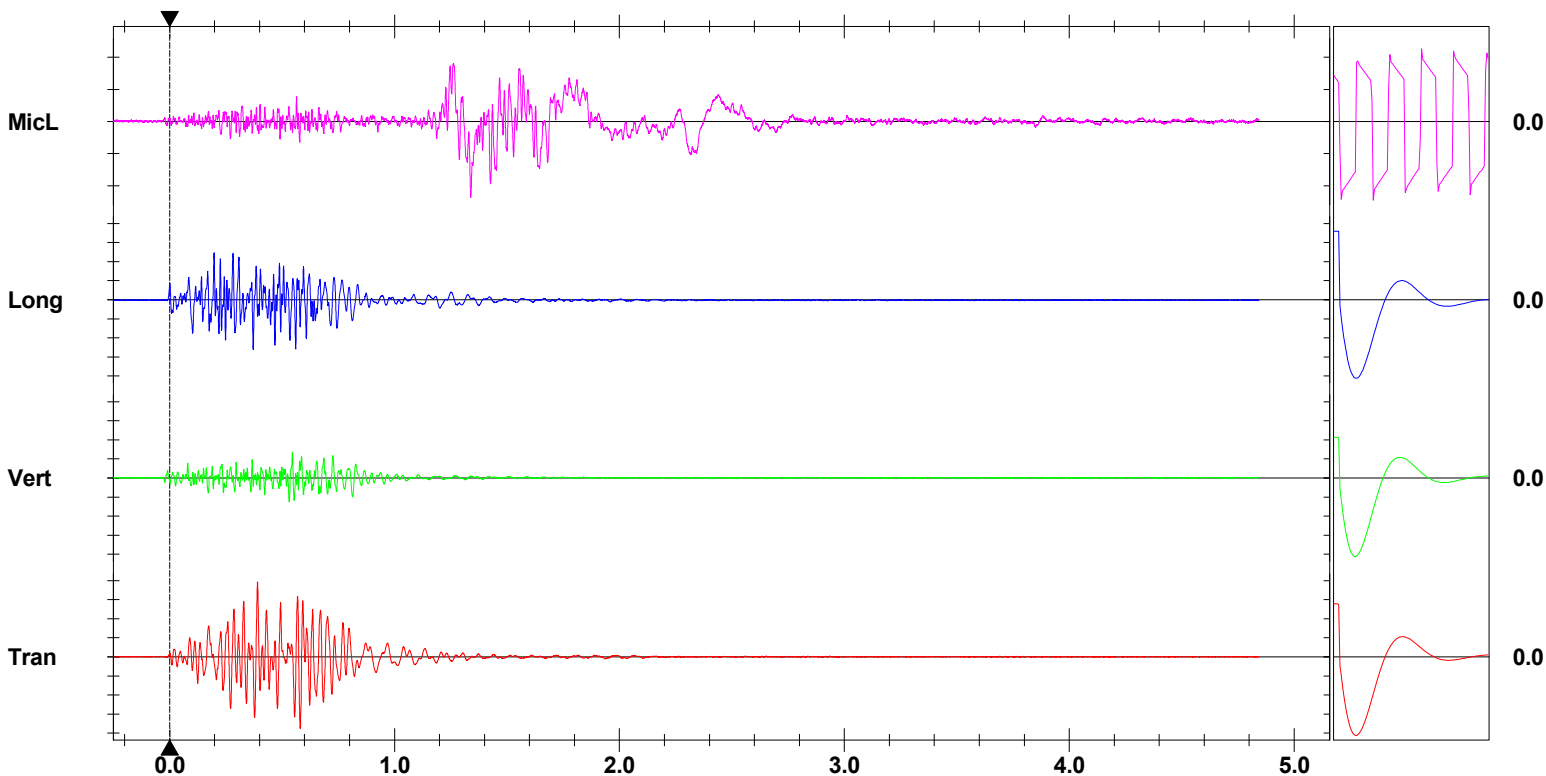
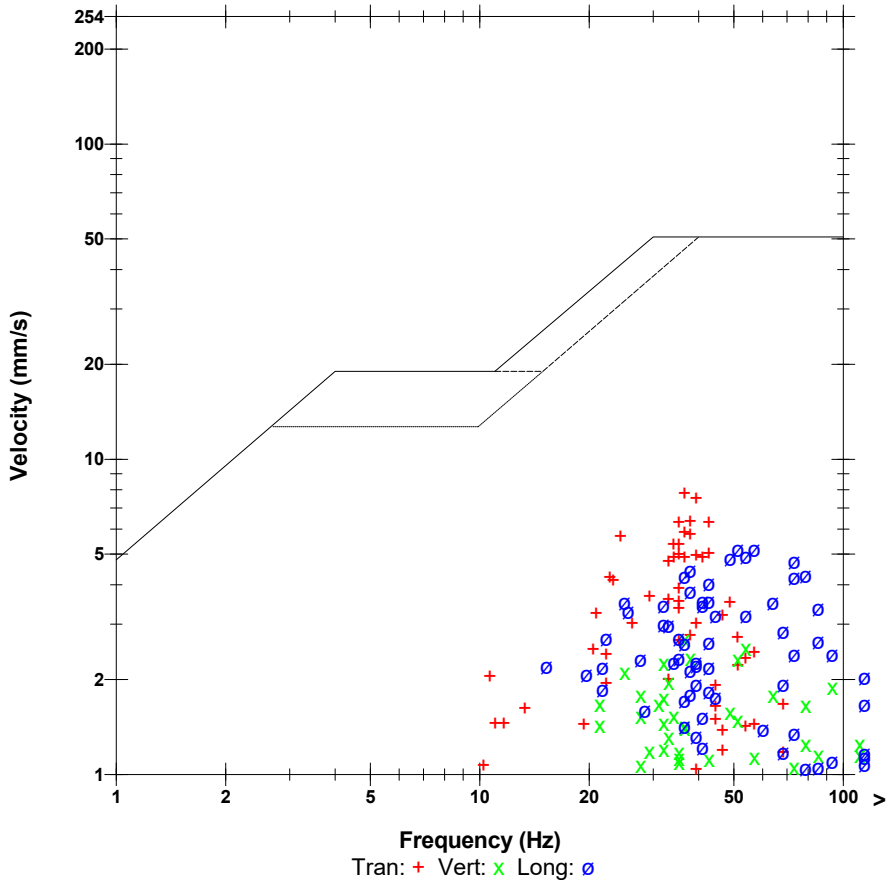
N 44.39617
 W 80.25529

Microphone Linear Weighting
PSPL 107.5 dB(L) at 1.339 sec
ZC Freq 6.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1136 mv)

	Tran	Vert	Long	
PPV	7.842	2.703	5.194	mm/s
ZC Freq	37	37	57	Hz
Time (Rel. to Trig)	0.391	0.546	0.372	sec
Peak Acceleration	0.239	0.166	0.337	g
Peak Displacement	0.031	0.010	0.019	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.5	7.1	Hz
Overswing Ratio	3.9	3.8	4.1	

Peak Vector Sum 8.107 mm/s at 0.581 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

**207 Westside Drive, Port Colborne
Waterford group (Laws)
Laws 2019-06-25 Blast 19-028MB**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Jun 25 /19 06:36:49		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Jun 25 /19 06:46:49	Jun 25 /19 06:46:53	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 08:43:21	Jun 25 /19 08:43:25	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 09:34:00	Jun 25 /19 09:34:05	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 09:36:36	Jun 25 /19 09:36:42	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 09:39:43	Jun 25 /19 09:39:47	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 09:43:47	Jun 25 /19 09:43:51	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 10:00:34	Jun 25 /19 10:00:38	Event recorded. Trigger Level MicL: 115.0 dB
Jun 25 /19 10:00:38	Jun 25 /19 10:31:56	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S192518**
 Blast Date: **2019-07-05**

Blast Number: **19-029MB**
 Orica Order #: **2503578**
 Blast Time: **11:04 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89472** °N Latitude **79.29402** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **S** at **10** kph Temperature: **26 to 30** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 56 = 1,539.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	26,830	23,320	3,510

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	56	19.0
PENTEX 8 (OR EQUIVALENT)	0.23	56	12.7

total explosives weight in Blast (kg): **3,542**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	58
EXEL HANDIDET 9m		25/500	54
CONNECTADET 9M		65 ms	3

Cord & Accessories:

	U of M	# used
MINI STEM PLUGS - 6015 (4")	units	5
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **17,676** te **6,798** m³
 Total tonnes per day: **17,676** te **LML22-43** Rate Code
 Total Holes Loaded: **56** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **20** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **36** main body

Bench Height: **27.5** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.5** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **20.5** ft avg
 Main Body: **20.5** ft avg

- Charge Weight -

Front Row: **59.7** kg/hole
 Main Body: **59.7** kg/hole
 Max. per delay: **68.0** kg/delay
 SD () Equation: **132.6** kg/delay
 Total kg Loaded: **3,542** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.200** kg/te (actual)
 Front row: **0.189** kg/te (theoretical)
 Main Body: **0.189** kg/te (theoretical)
 "KPI" PF: **0.189** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

NOTES (ANY VARIATION FROM STANDARD):

Laws Tonnage **17676**
 Dunnville Tonnage **12325**
 Total Tonnage= **30001**



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S192518
Blast Date: 2019-07-05

Blast Number: 19-029MB
Orica Order #: 2503578
Blast Time: 11:04 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89472	79.29396	0.748654	1.383941
Front Row Corner	42.89475	79.29443	0.748655	1.383949
Back Row Corner	42.89469	79.29367	0.748654	1.383936
Average (Centre of Blast)	42.89472	79.29402	0.748654	1.383942

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	345.4	m		
Post Blast Data:	ppV: 6.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 47.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 108.0	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2405.0	m		
Post Blast Data:	ppV: 1.5	mm/s	Trigger set at: 2.0	mm/s
	frequency: 31.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: <88	dB	Trigger set at: 115	dB
207 Westside Dr, Port Colborne, On (At edge of vegetable garden)				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(345.4)^2}{30^2} \text{ kg}$$

$$= \frac{119,301}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

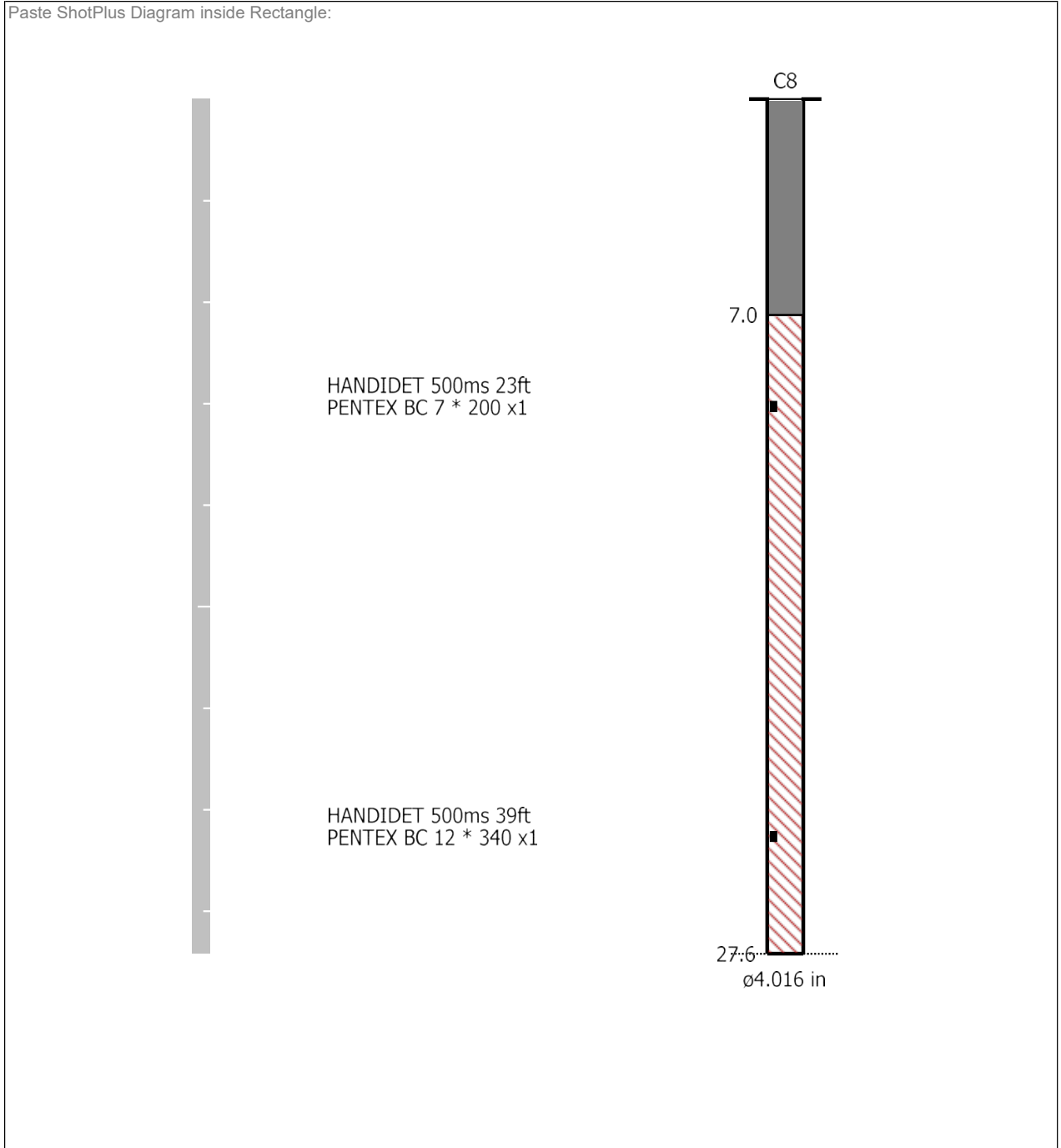
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S192518**
Blast Date: **7/5/2019**

Blast Number: **19-029MB**
Orica Order #: **2503578**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 11:04:44 July 5, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.62 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190705110444.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

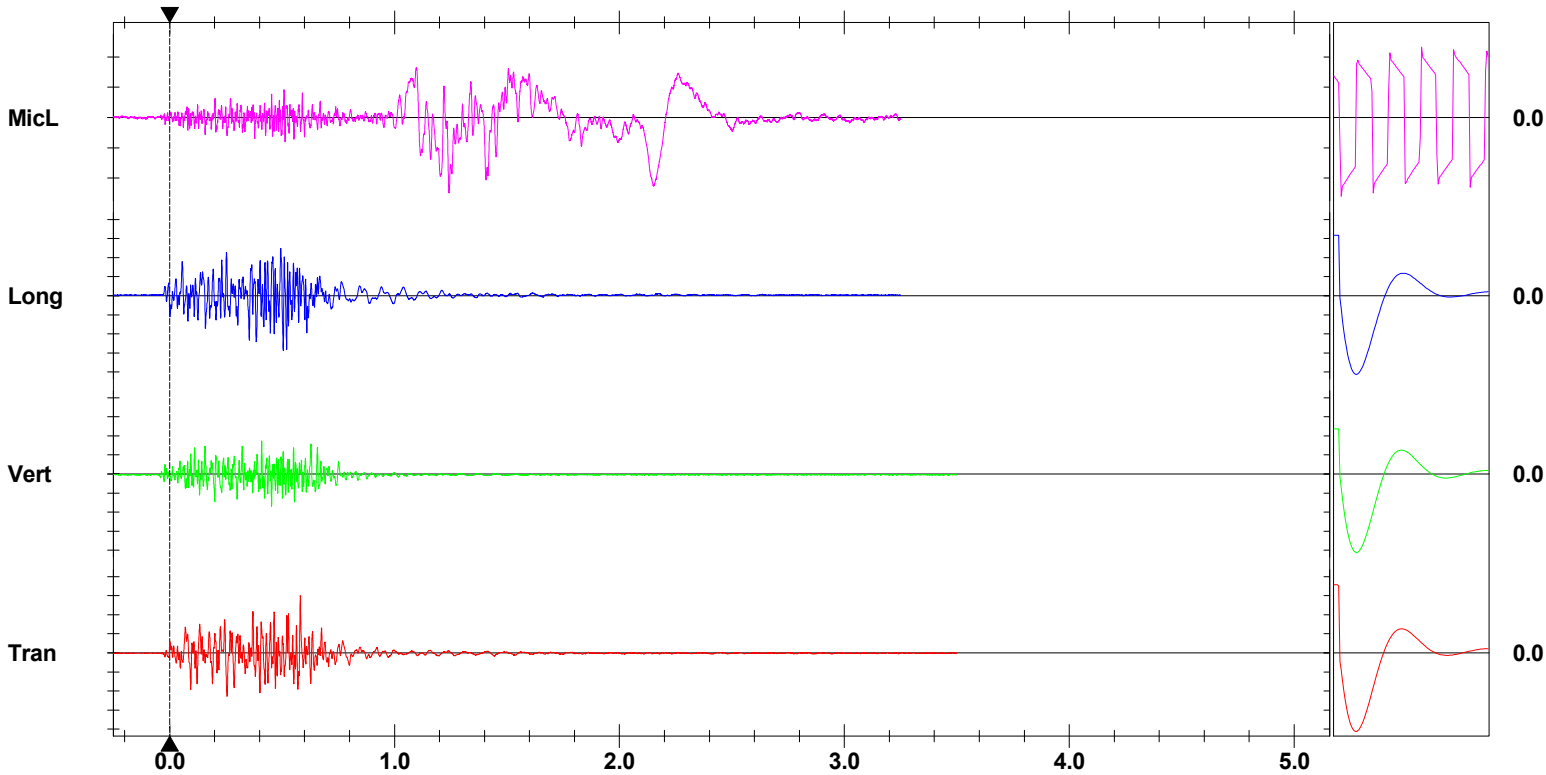
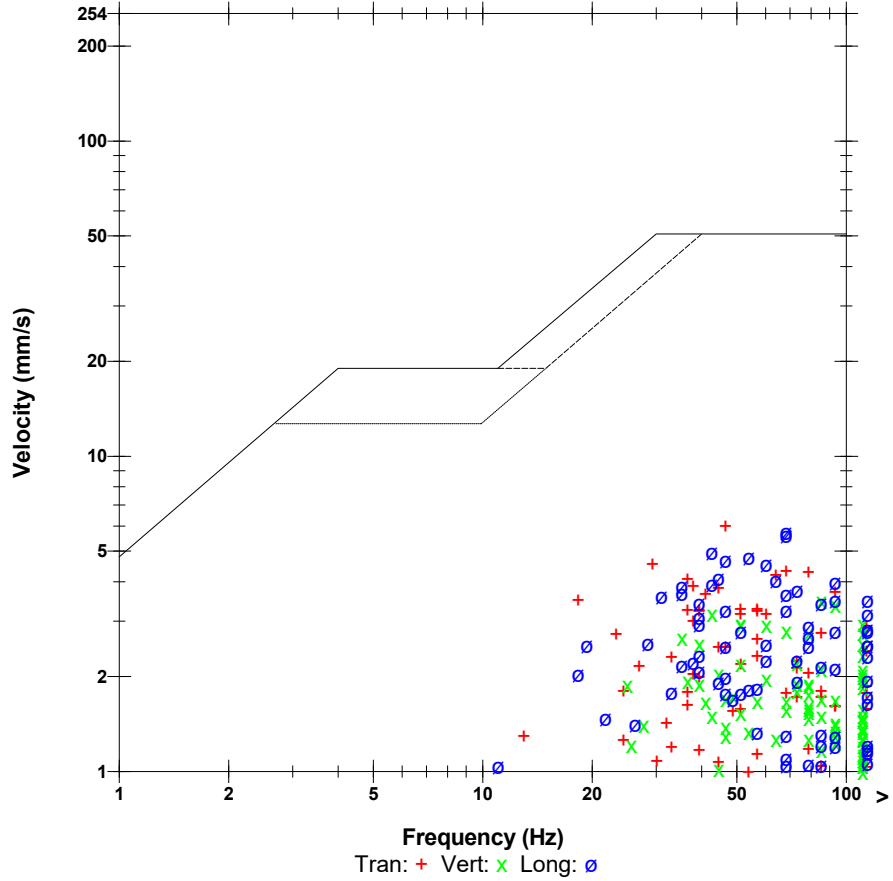
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 108.0 dB(L) at 1.242 sec
ZC Freq 6.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1205 mv)

	Tran	Vert	Long	
PPV	6.006	3.468	5.746	mm/s
ZC Freq	47	85	68	Hz
Time (Rel. to Trig)	0.582	0.409	0.505	sec
Peak Acceleration	0.267	0.271	0.369	g
Peak Displacement	0.019	0.011	0.021	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.2	3.3	3.5	

Peak Vector Sum 6.540 mm/s at 0.521 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 11:04:36 July 5, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 123.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.001 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Westside d.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20190705110436.IDFW

Notes

Location: Between 201 & 207 Westside Drive
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Port Colborne, ON

Extended Notes

Sand Bagged
 N-42.90081 W-79.26573

Microphone Linear Weighting

PSPL <88 dB(L)

ZC Freq 10.7 Hz

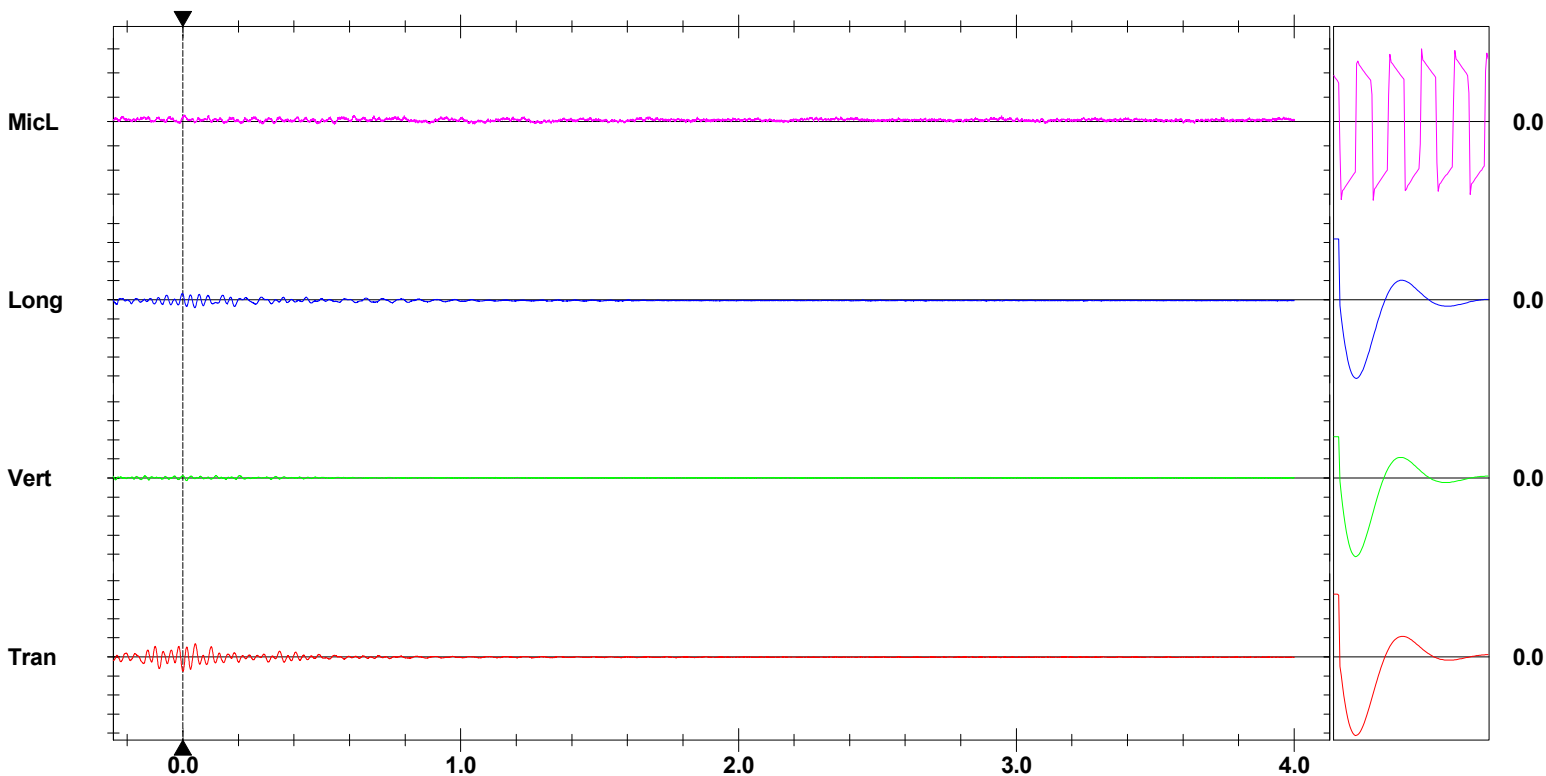
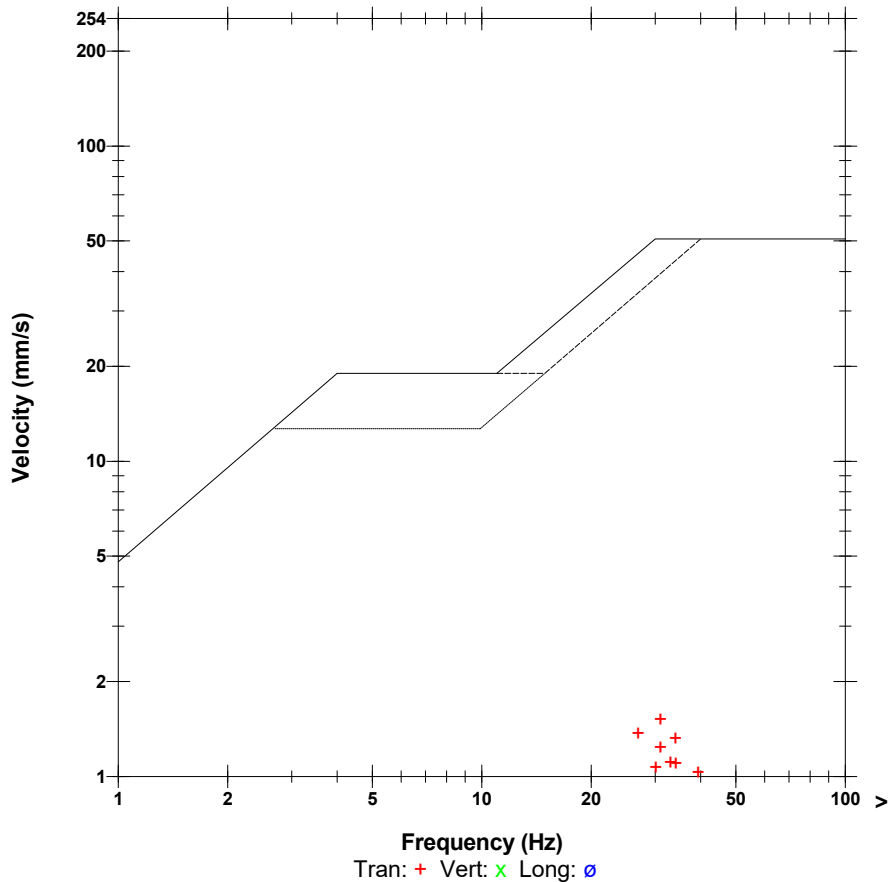
Channel Test Passed (Freq = 19.7 Hz Amp = 1180 mv)

	Tran	Vert	Long	
PPV	1.521	0.284	0.843	mm/s
ZC Freq	31	37	28	Hz
Time (Rel. to Trig)	0.001	0.013	0.043	sec
Peak Acceleration	0.035	0.012	0.021	g
Peak Displacement	0.008	0.002	0.016	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.8	3.8	4.0	

Peak Vector Sum 1.642 mm/s at 0.001 sec

N/A: Not Applicable

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S192518**
 Blast Date: **2019-08-09**

Blast Number: **19-030MB**
 Orica Order #: **2516631**
 Blast Time: **11:08 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89460** °N Latitude **79.29524** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical # Holes: **70** = 1,892.9 ft (4 " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,180	22,858	4,322

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	70	23.8
PENTEX 8 (OR EQUIVALENT)	0.23	70	15.9

total explosives weight in Blast (kg): **4,362**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	70
EXEL HANDIDET 9m		25/500	70
CONNECTADET 9M		33 ms	2
CONNECTADET 9M		65 ms	5

Cord & Accessories:

	U of M	# used
MINI STEM PLUGS - 6015 (4")	units	10
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	5.0
HELPER HOURS	Enter total Helper man-hours	8.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **21,741** te **8,362** m³
 Total tonnes per day: **40,301** te **LML22-42** Rate Code
 Total Holes Loaded: **70** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **26** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **44** main body

Bench Height: **27.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **20.0** ft avg
 Main Body: **20.0** ft avg

- Charge Weight -

Front Row: **58.4** kg/hole
 Main Body: **58.4** kg/hole
 Max. per delay: **72.0** kg/delay
 SD () Equation: **195.0** kg/delay
 Total kg Loaded: **4,362** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.201** kg/te (actual)
 Front row: **0.188** kg/te (theoretical)
 Main Body: **0.188** kg/te (theoretical)
 "KPI" PF: **0.188** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Depths to caculate tonnage were based on actual measured depths



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89460"/>	<input type="text" value="79.29526"/>	0.748652	1.383963
Front Row Corner	<input type="text" value="42.89465"/>	<input type="text" value="79.29464"/>	0.748653	1.383952
Back Row Corner	<input type="text" value="42.89456"/>	<input type="text" value="79.29583"/>	0.748651	1.383973
Average (Centre of Blast)	<input type="text" value="42.89460"/>	<input type="text" value="79.29524"/>	0.748652	1.383963

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="418.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="8.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="23.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="113.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2504.2"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="207 Westside Dr, Port Colborne, On (At edge of vegetable garden)"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(418.9)^2}{30^2} \text{ kg} \\
 &= \frac{175,477}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



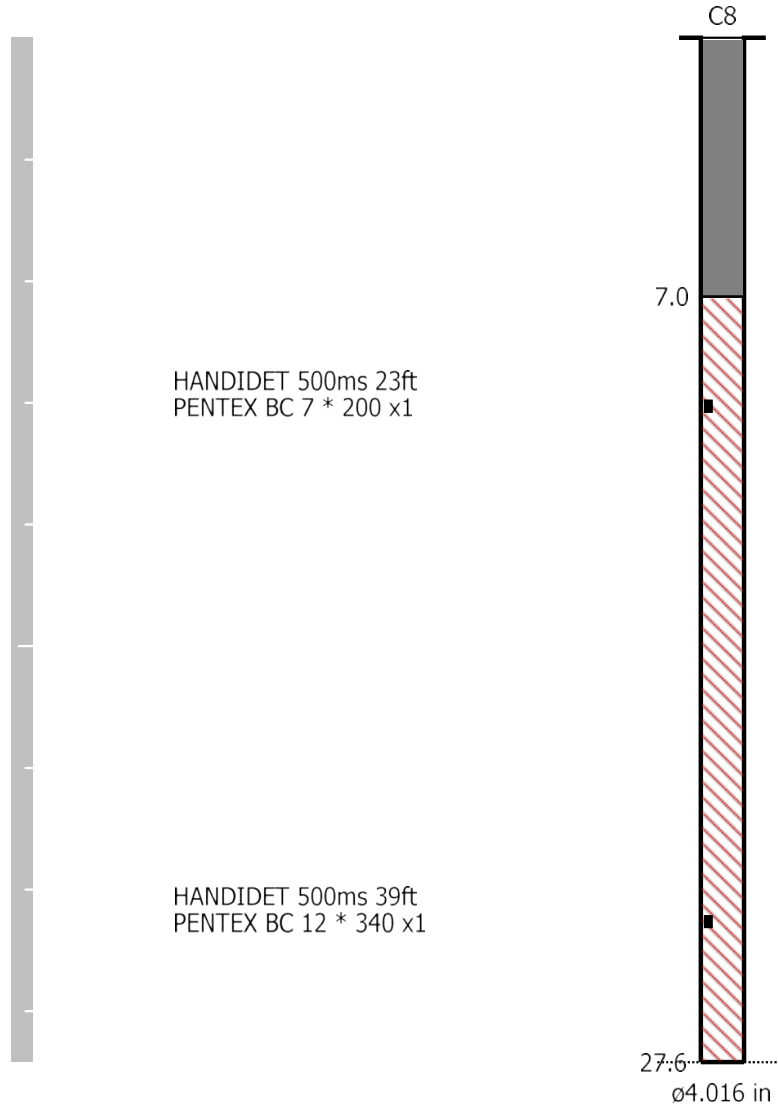
Blast Design
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S192518**
Blast Date: **8/9/2019**

Blast Number: **19-030MB**
Orica Order #: **2516631**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 11:08:14 August 9, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.01 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190809110814.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

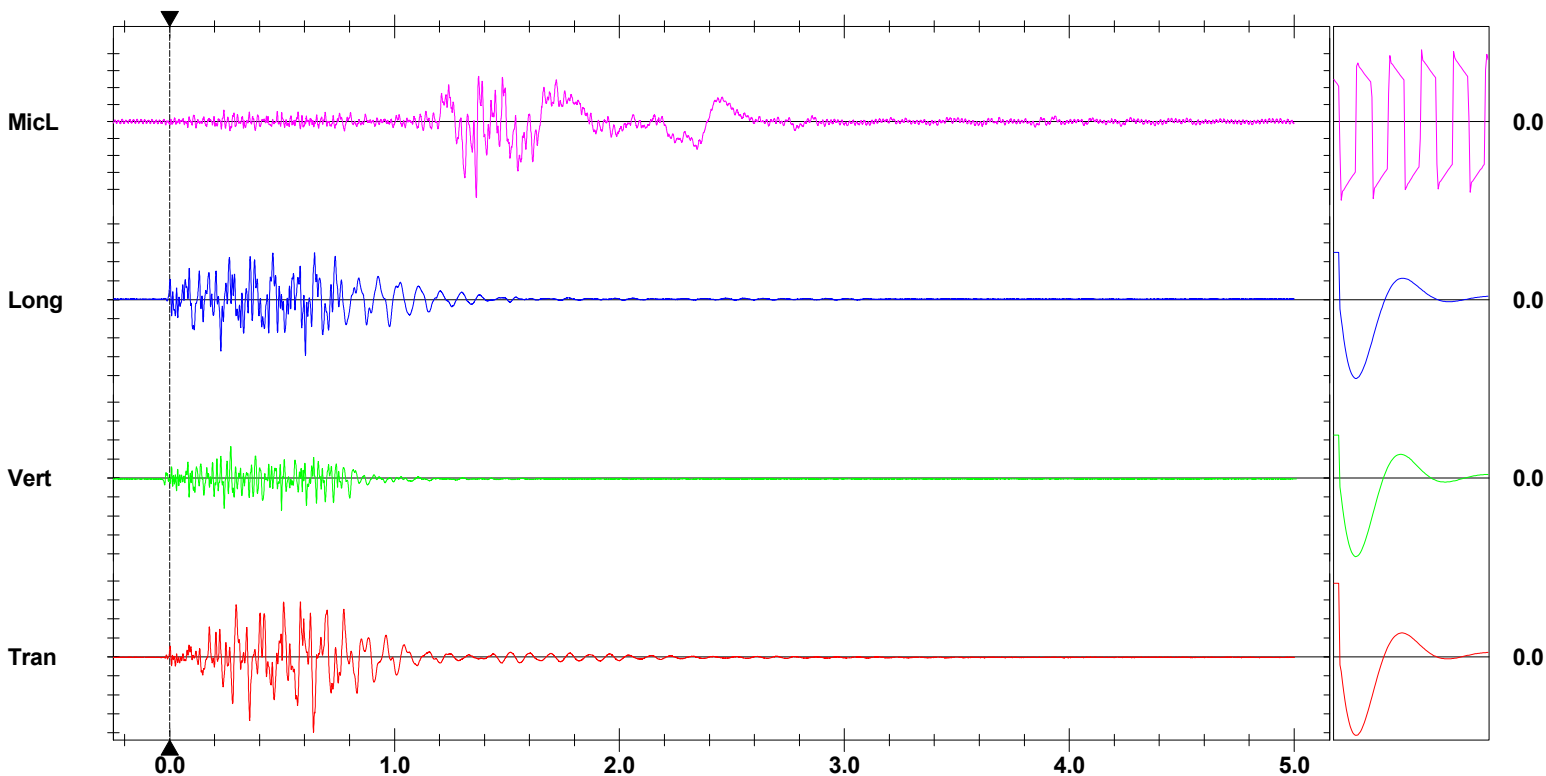
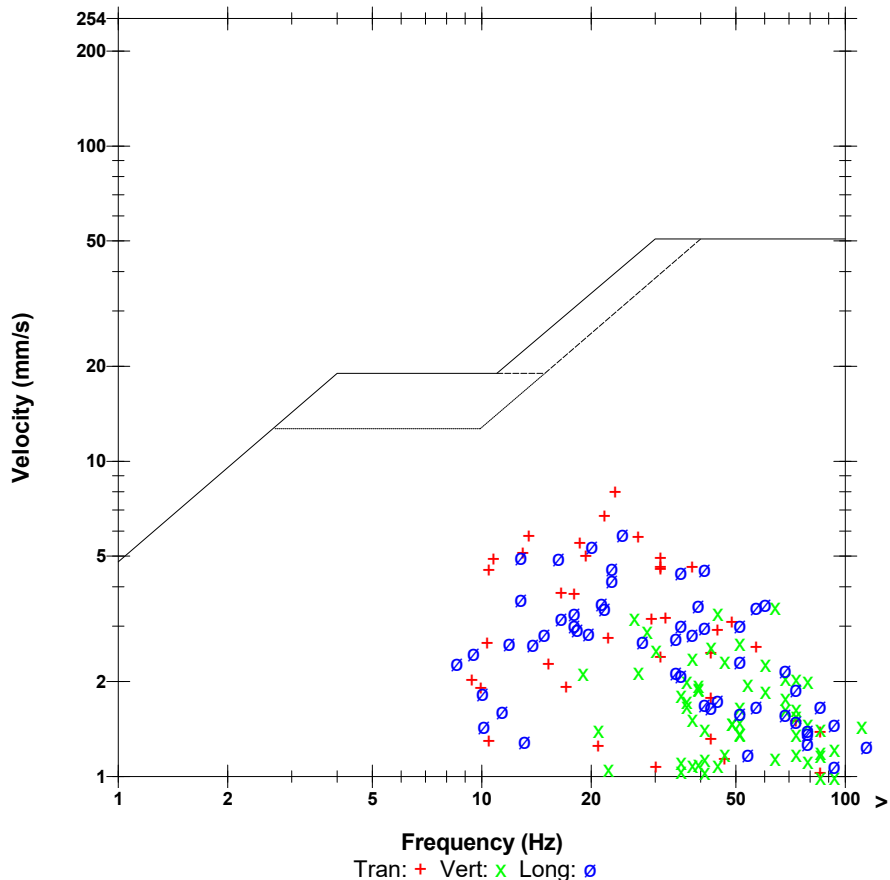
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 113.0 dB(L) at 1.363 sec
ZC Freq 33 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1199 mv)

	Tran	Vert	Long	
PPV	7.969	3.452	5.880	mm/s
ZC Freq	23	64	24	Hz
Time (Rel. to Trig)	0.640	0.498	0.604	sec
Peak Acceleration	0.179	0.202	0.304	g
Peak Displacement	0.049	0.014	0.045	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.5	7.1	Hz
Overswing Ratio	3.3	3.3	3.6	

Peak Vector Sum 8.872 mm/s at 0.640 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

207 Westside Drive, Portcolbourne, On
Waterford Group
Laws 2019-08-09 Blast 19-030MB & 19-031MB

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Aug 9 /19 06:39:12		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Aug 9 /19 06:39:12	Aug 9 /19 13:59:00	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S192518**
 Blast Date: **2019-08-09**

Blast Number: **19-031MB**
 Orica Order #: **2516631**
 Blast Time: **1:40 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89462** °N Latitude **79.29414** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **20** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 60 = 1,616.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	22,858	19,230	3,628

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	60	20.4
PENTEX 8 (OR EQUIVALENT)	0.23	60	13.6

total explosives weight in Blast (kg): **3,662**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	60
EXEL HANDIDET 9m		25/500	60
CONNECTADET 9M		65 ms	3

Cord & Accessories:

	U of M	# used
MINI STEM PLUGS - 6015 (4")	units	3
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	4.0
HELPER HOURS	Enter total Helper man-hours	8.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **18,560** te **7,138** m³
 Total tonnes per day: **40,301** te **LML22-42** Rate Code
 Total Holes Loaded: **60** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows

- Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **21** front row

- Pattern (Main Body) -

Burden: **12.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **39** main body

Bench Height: **26.9** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **26.9** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" Stone**

- Charge Length -

Front Row: **19.9** ft avg
 Main Body: **19.9** ft avg

- Charge Weight -

Front Row: **58.1** kg/hole
 Main Body: **58.1** kg/hole
 Max. per delay: **66.0** kg/delay
 SD () Equation: **132.5** kg/delay
 Total kg Loaded: **3,662** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.197** kg/te (actual)
 Front row: **0.188** kg/te (theoretical)
 Main Body: **0.188** kg/te (theoretical)
 "KPI" PF: **0.188** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

NOTES (ANY VARIATION FROM STANDARD):

Depths to caculate tonnage were based on actual measured depths



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S192518
Blast Date: 2019-08-09

Blast Number: 19-031MB
Orica Order #: 2516631
Blast Time: 1:40 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89462	79.29416	0.748652	1.383944
Front Row Corner	42.89465	79.29453	0.748653	1.383951
Back Row Corner	42.89459	79.29372	0.748652	1.383936
Average (Centre of Blast)	42.89462	79.29414	0.748652	1.383944

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	345.3	m		
Post Blast Data:	ppV: 8.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: 24.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 112.1	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2417.0	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
207 Westside Dr, Port Colborne, On (At edge of vegetable garden)				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(345.3)^2}{30^2} \text{ kg} \\
 &= \frac{119,232}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

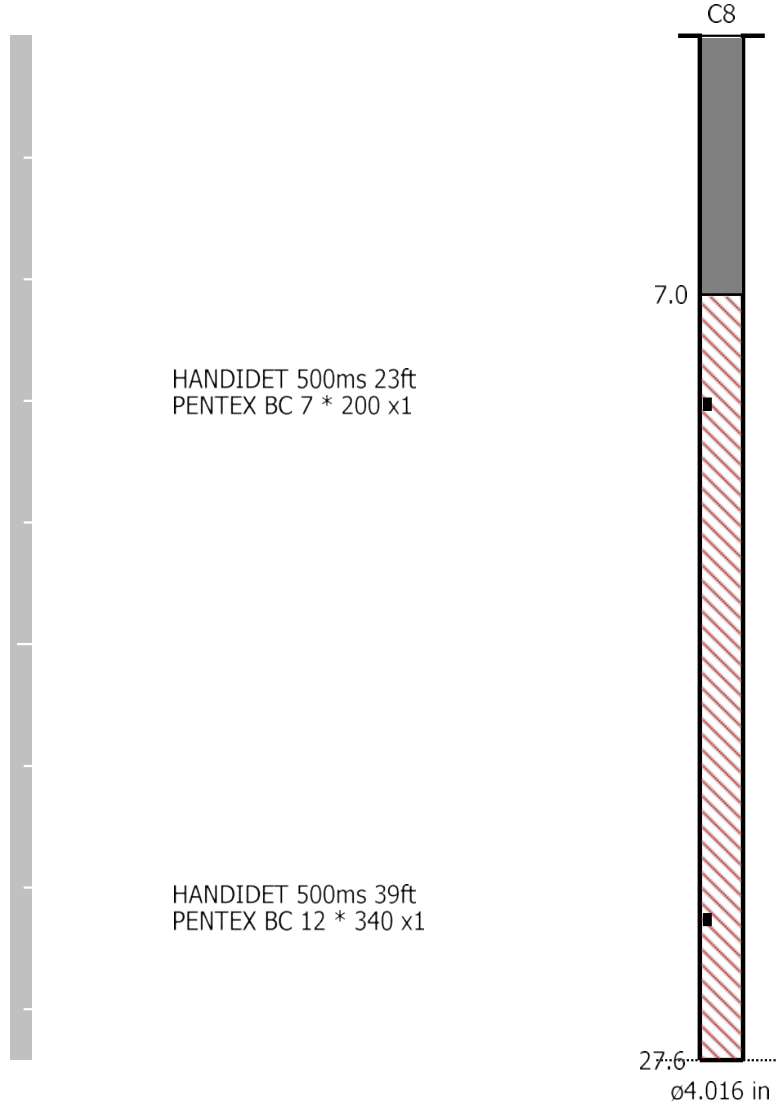
Waterford

Quarry: Laws - Middle Lift
P.O. #: S192518
Blast Date: 8/9/2019

Blast Number: 19-030MB
Orica Order #: 2516631

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 13:40:33 August 9, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.619 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190809134033.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

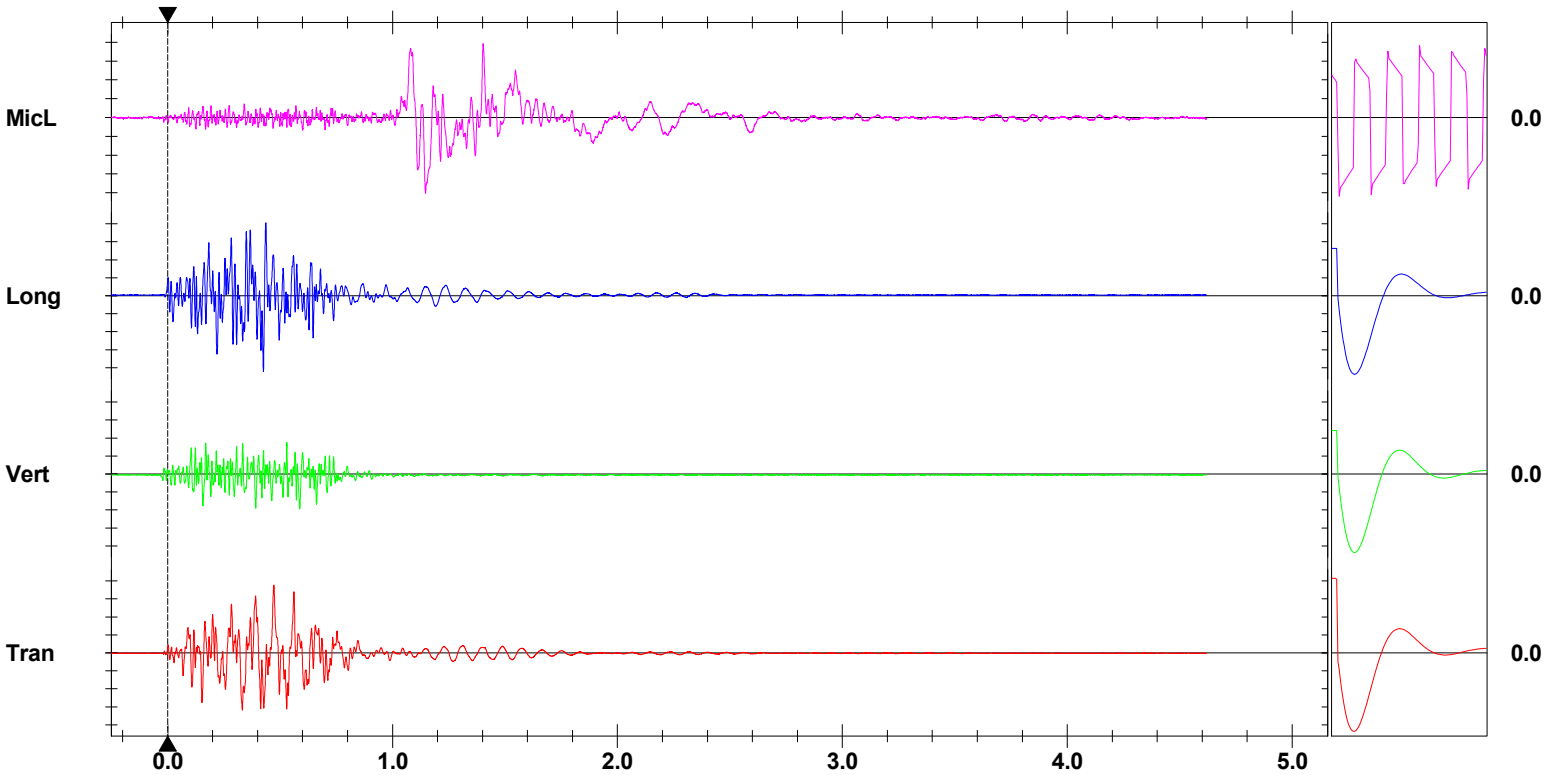
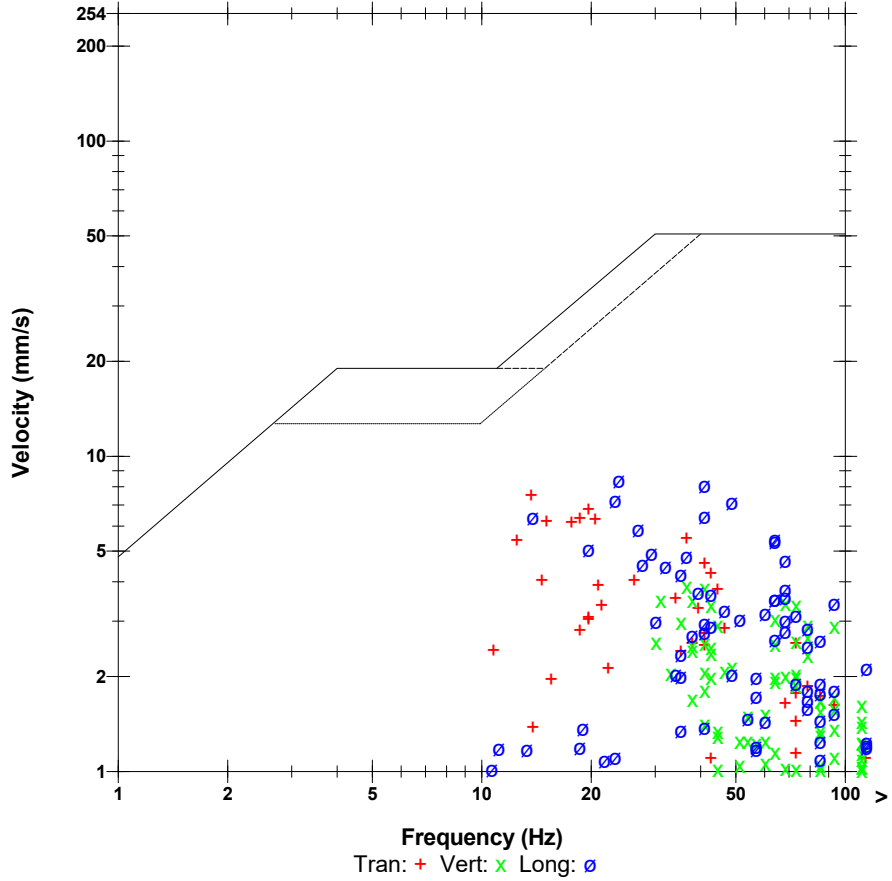
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 112.1 dB(L) at 1.146 sec
ZC Freq 13.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1118 mv)

	Tran	Vert	Long	
PPV	7.543	3.878	8.418	mm/s
ZC Freq	13.7	37	24	Hz
Time (Rel. to Trig)	0.472	0.587	0.426	sec
Peak Acceleration	0.197	0.271	0.369	g
Peak Displacement	0.059	0.016	0.047	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.2	3.3	3.6	

Peak Vector Sum 10.45 mm/s at 0.426 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

207 Westside Drive, Portcolbourne, On
Waterford Group
Laws 2019-08-09 Blast 19-030MB & 19-031MB

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Aug 9 /19 06:39:12		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 123.0 dB
Aug 9 /19 06:39:12	Aug 9 /19 13:59:00	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 12



Blast Report

Waterford

Quarry: Laws - Middle Lift
P.O. #: S192729
Blast Date: 2019-09-18

Blast Number: 19-032MB
Orica Order #: 2532517
Blast Time: 10:44 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	42.89450	79.29521	0.748650	1.383963
Front Row Corner	42.89453	79.29578	0.748651	1.383972
Back Row Corner	42.89448	79.29473	0.748650	1.383954
Average (Centre of Blast)	42.89450	79.29524	0.748650	1.383963

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.89269	79.29082	0.748619	1.383886
2nd Reading				
Average	42.89269	79.29082	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	413.3	m		
Post Blast Data:	ppV: 6.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 85.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 108.7	dB	Trigger set at: 115	dB
Erie Peat Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	42.90081	79.26573	0.748760	1.383448
2nd Reading				
Average	42.90081	79.26573	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	2507.1	m		
Post Blast Data:	ppV: Did	mm/s	Trigger set at: 2.0	mm/s
	frequency: Not	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB	Trigger set at: 115	dB
207 Westside Dr, Port Colborne, On (At edge of vegetable garden)				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 0.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 0.0	dB	Trigger set at: 115	dB

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(413.3)^2}{30^2} \text{ kg}$$

$$= \frac{170,817}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

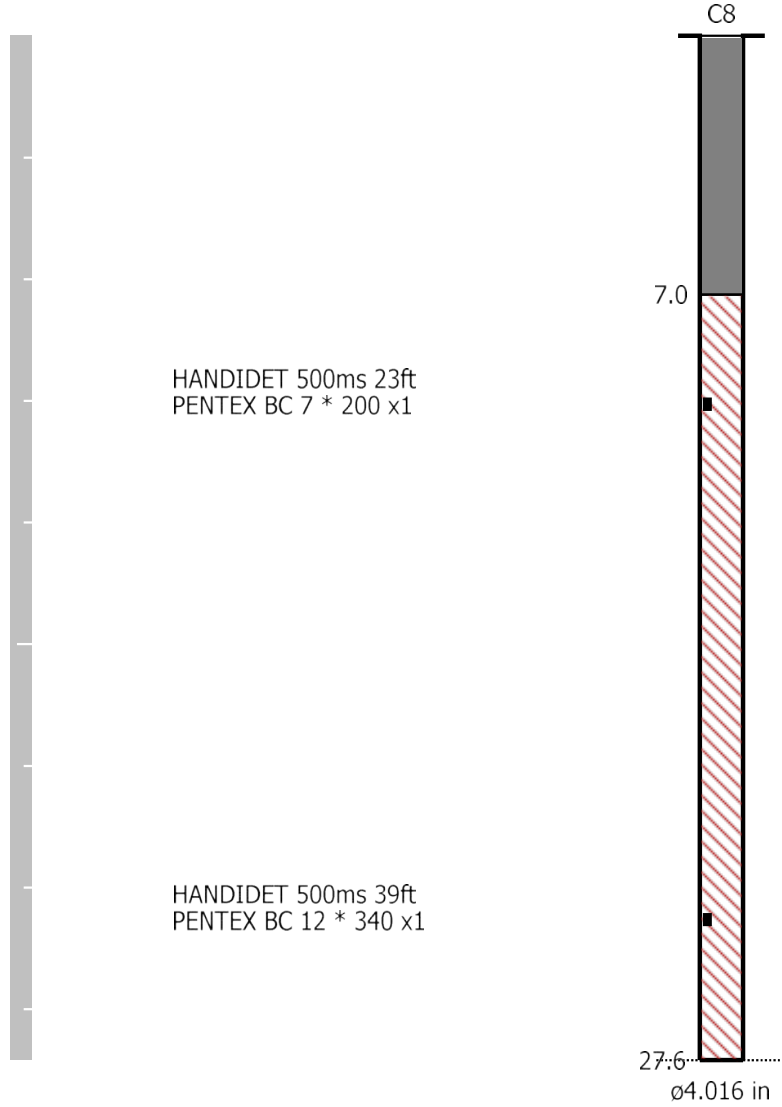
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S192729**
Blast Date: **9/18/2019**

Blast Number: **19-032MB**
Orica Order #: **2532517**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 10:44:33 September 18, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.866 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM6859_20190918104433.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

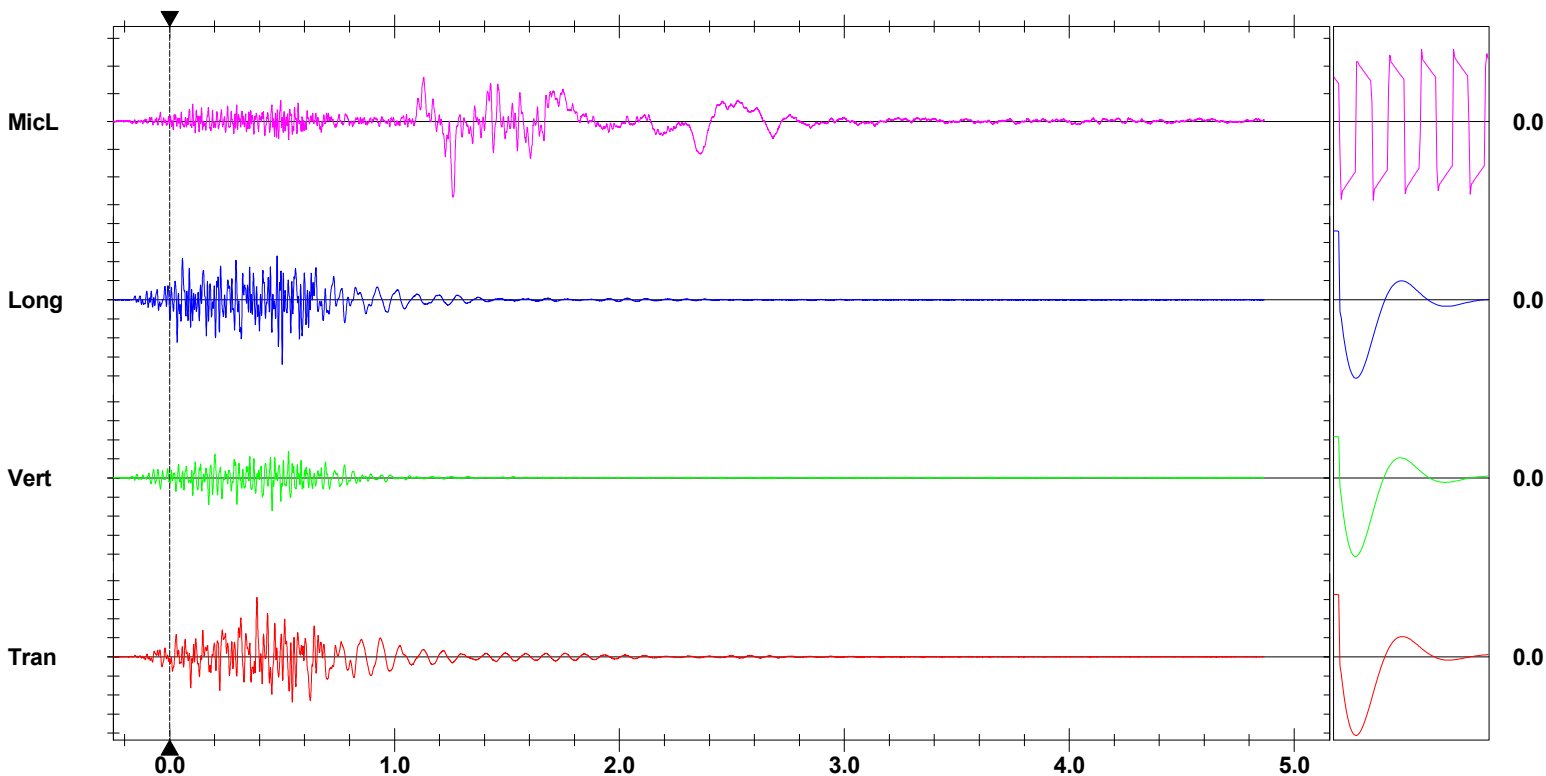
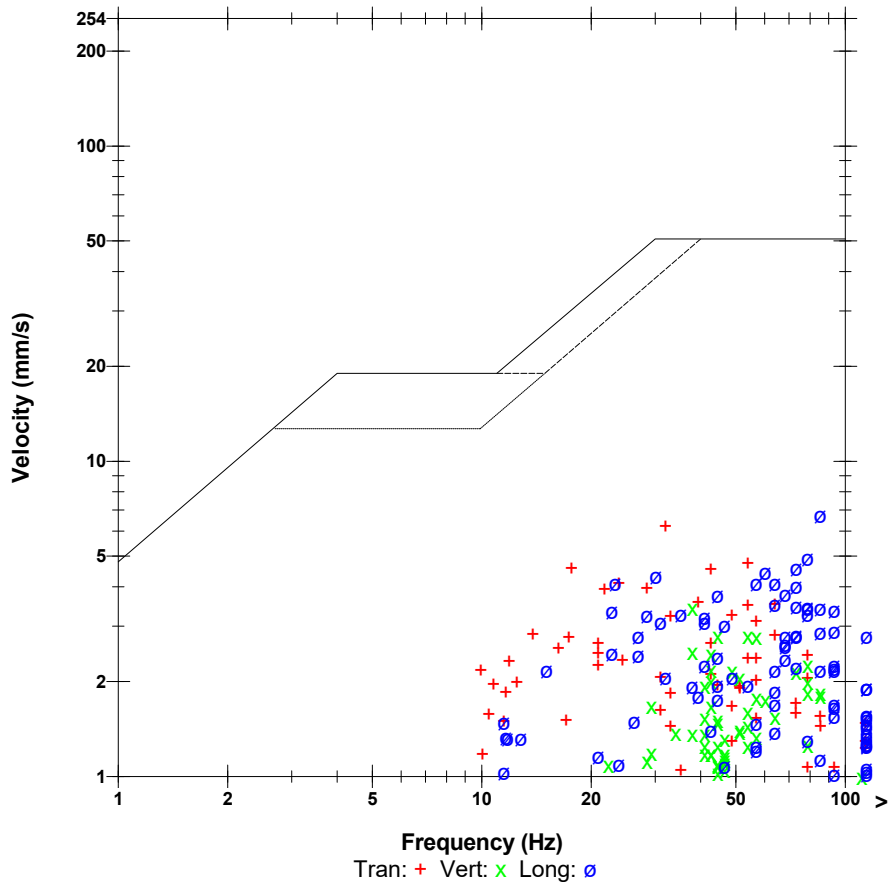
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 108.7 dB(L) at 1.260 sec
ZC Freq 12.8 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1389 mv)

	Tran	Vert	Long	
PPV	6.227	3.436	6.770	mm/s
ZC Freq	32	38	85	Hz
Time (Rel. to Trig)	0.388	0.456	0.500	sec
Peak Acceleration	0.181	0.179	0.362	g
Peak Displacement	0.034	0.010	0.022	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.9	4.1	

Peak Vector Sum 6.941 mm/s at 0.501 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div
Trigger =

Sensor Check

207 Westside Drive, Portcolborne, On
Waterford Group
Laws 2019-09-18 Blast 19-032&19-033MB

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Sep 18 /19 06:45:18		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Sep 18 /19 13:43:20	Sep 18 /19 13:43:24	Event recorded. Trigger Level MicL: 115.0 dB
Sep 18 /19 13:43:34	Sep 18 /19 13:43:38	Event recorded. Trigger Level Vert: 1.50 mm/s
Sep 18 /19 13:43:46	Sep 18 /19 13:43:50	Event recorded. Trigger Level Vert: 1.50 mm/s
Sep 18 /19 13:43:50	Sep 18 /19 13:43:57	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB



Blast Report

Waterford

Quarry: **Laws - Middle Lift**
 P.O. #: **S192729**
 Blast Date: **2019-09-18**

Blast Number: **19-033MB**
 Orica Order #: **2532517**
 Blast Time: **1:21 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Middle Bench** (Bench / Face)

GPS Coordinates: **42.89452** °N Latitude **79.29412** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **10** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 60 = 1,627.0 ft (4 " diam)
Secondary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="text"/> mm	0 °	# Holes: <input type="text"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	28,800	25,200	3,600

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	60	20.4
PENTEX 8 (OR EQUIVALENT)	0.23	60	13.6

total explosives weight in Blast (kg): **3,634**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	60
EXEL HANDIDET 9m		25/500	60
CONNECTADET 9M		65 ms	3

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	3.0
HELPER HOURS	Enter total Helper man-hours	6.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	18,686 te	7,187 m ³
Total tonnes per day:	42,231 te	LML22-42 Rate Code
Total Holes Loaded:	60 holes	
... including:	0 Dead Holes	
... and:	0 Helper Holes	
Helper Hole Collar:	0.0 ft avg	
# Rows Blasted:	3 rows	

- Pattern (Front Row)-

Burden:	12.0 ft avg
Spacing:	13.0 ft avg
# Holes:	21 front row

- Pattern (Main Body) -

Burden:	12.0 ft avg
Spacing:	13.0 ft avg
# Holes:	39 main body

Bench Height: **27.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **27.1** ft avg

- Stone Decking -

Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Decks:	0 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4" Stone

- Charge Length -

Front Row:	20.1 ft avg
Main Body:	20.1 ft avg

- Charge Weight -

Front Row:	58.7 kg/hole
Main Body:	58.7 kg/hole
Max. per delay:	63.0 kg/delay
SD () Equation:	126.4 kg/delay
Total kg Loaded:	3,634 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.194 kg/te (actual)
Front row:	0.188 kg/te (theoretical)
Main Body:	0.188 kg/te (theoretical)
"KPI" PF:	0.188 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

Blank area for notes.



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89452"/>	<input type="text" value="79.29410"/>	0.748651	1.383943
Front Row Corner	<input type="text" value="42.89455"/>	<input type="text" value="79.29453"/>	0.748651	1.383951
Back Row Corner	<input type="text" value="42.89449"/>	<input type="text" value="79.29372"/>	0.748650	1.383936
Average (Centre of Blast)	<input type="text" value="42.89452"/>	<input type="text" value="79.29412"/>	0.748651	1.383943

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="337.3"/>	m		
Post Blast Data:	ppV: <input type="text" value="9.3"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="34.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="106.4"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2418.8"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="207 Westside Dr, Port Colborne, On (At edge of vegetable garden)"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(337.3)^2}{30^2} \text{ kg} \\
 &= \frac{113,771}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

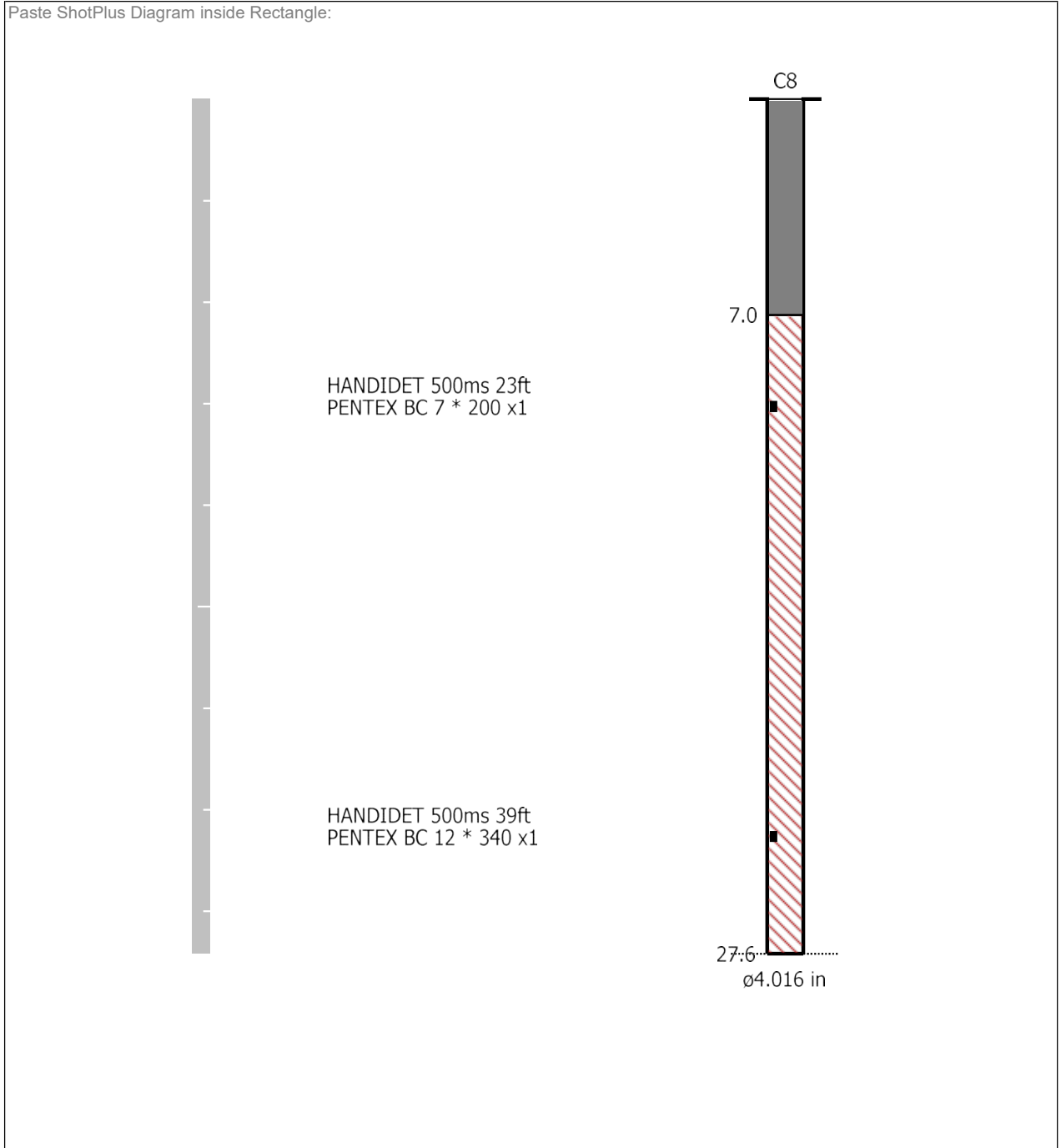
Waterford

Quarry: **Laws - Middle Lift**
P.O. #: **S192729**
Blast Date: **9/18/2019**

Blast Number: **19-033MB**
Orica Order #: **2532517**

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 13:21:32 September 18, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.875 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM6859_20190918132132.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

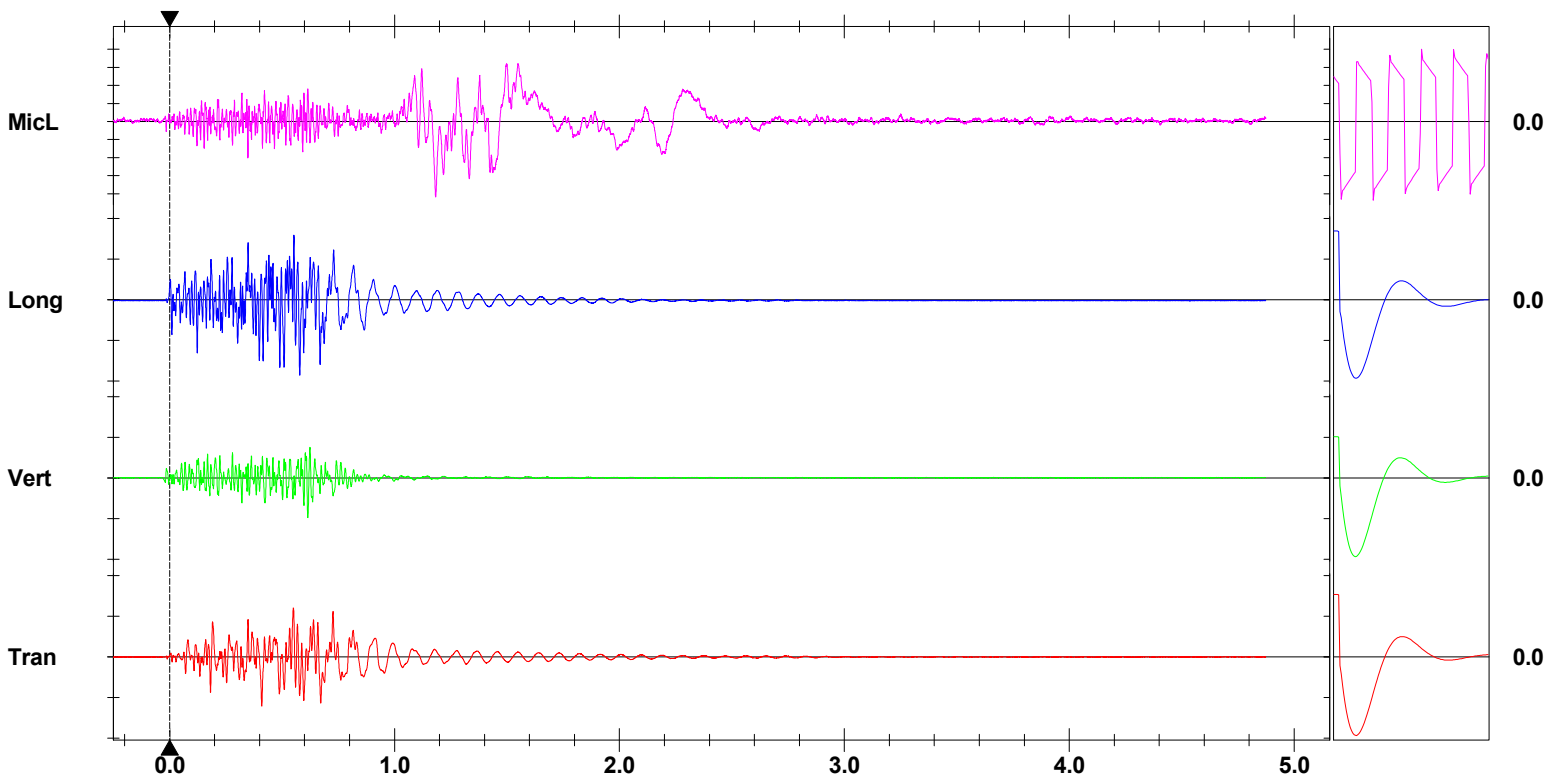
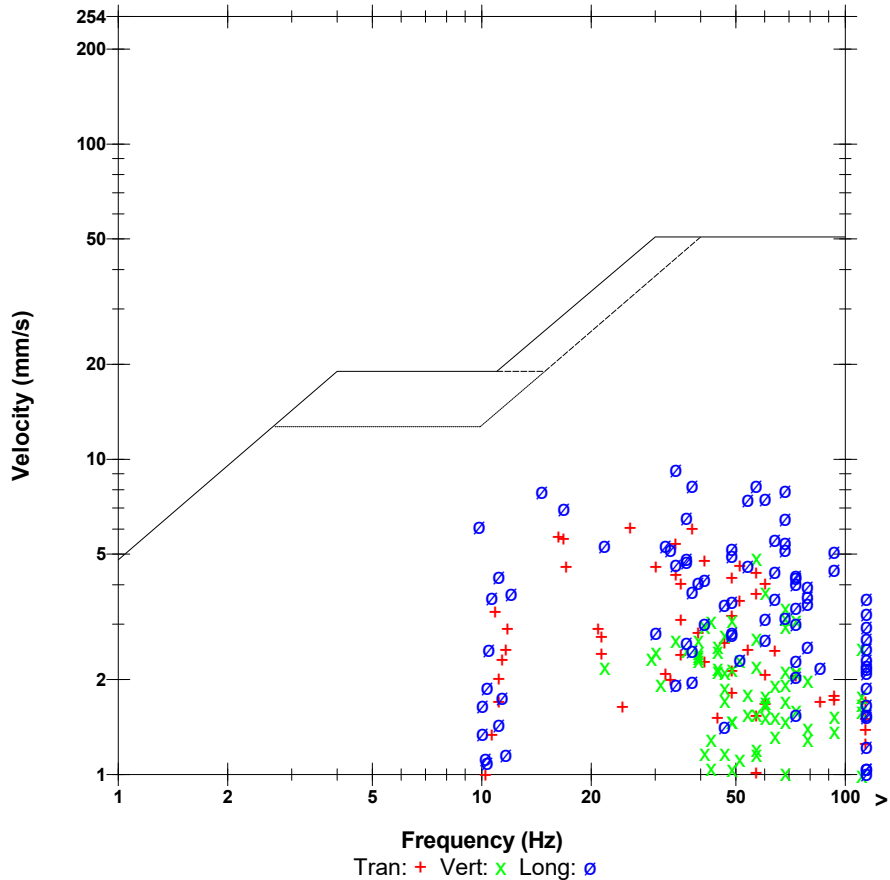
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 106.4 dB(L) at 1.183 sec
ZC Freq 6.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1389 mv)

	Tran	Vert	Long	
PPV	6.061	4.871	9.308	mm/s
ZC Freq	26	57	34	Hz
Time (Rel. to Trig)	0.410	0.615	0.579	sec
Peak Acceleration	0.169	0.260	0.420	g
Peak Displacement	0.045	0.013	0.063	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.9	4.1	

Peak Vector Sum 10.44 mm/s at 0.579 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 5.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

207 Westside Drive, Portcolborne, On
Waterford Group
Laws 2019-09-18 Blast 19-032&19-033MB

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Sep 18 /19 06:45:18		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Sep 18 /19 13:43:20	Sep 18 /19 13:43:24	Event recorded. Trigger Level MicL: 115.0 dB
Sep 18 /19 13:43:34	Sep 18 /19 13:43:38	Event recorded. Trigger Level Vert: 1.50 mm/s
Sep 18 /19 13:43:46	Sep 18 /19 13:43:50	Event recorded. Trigger Level Vert: 1.50 mm/s
Sep 18 /19 13:43:50	Sep 18 /19 13:43:57	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 115.0 dB



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S192770**
 Blast Date: **2019-10-02**

Blast Number: **19-034**
 Orica Order #: **2538966**
 Blast Time: **12:46 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89711** °N Latitude **79.29278** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **15** kph Temperature: **16 to 20** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **1,000** ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **92.1** mm **0** # Holes: **212** = 3,196.5 ft (3 5/8 " diam)
 Secondary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	25,820	21,860	3,960

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	222	75.5

total explosives weight in Blast (kg): **4,060**
 Pkgd Prod (25 kg) % of Total kg: **0.6%**

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 7m		25/500	222
CONNECTADET 9M		65 ms	6
UNITRONIC 600 6M			1

Cord & Accessories:

	U of M	# used
	units	
	units	
	units	

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	5.5
HELPER HOURS	Enter total Helper man-hours	11.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **19,063** te **7,332** m³
 Total tonnes per day: **19,063** te **TBD** Rate Code
 Total Holes Loaded: **212** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **50** front row

- Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **162** main body

Bench Height: **15.1** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.1** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **7.1** ft avg
 Main Body: **7.1** ft avg

- Charge Weight -

Front Row: **17.0** kg/hole
 Main Body: **17.0** kg/hole
 Max. per delay: **18.0** kg/delay
 SD () Equation: **297.2** kg/delay
 Total kg Loaded: **4,060** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

0.933 lb/yd³ Yield PF: **0.213** kg/te (actual)
 0.826 lb/yd³ Front row: **0.189** kg/te (theoretical)
 0.826 lb/yd³ Main Body: **0.189** kg/te (theoretical)
 0.826 lb/yd³ "KPI" PF: **0.189** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Dennis From WaterFord Group requested 8' collars to increase armour stone
 Design 19-002BB 16holes
 Design 19-003BB 16holes
 Design 19-007BB 78holes
 Design 19-008BB 102Holes
 Total holes = **212** Holes
 Rate code to be determined



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89710"/>	<input type="text" value="79.29275"/>	0.748696	1.383920
Front Row Corner	<input type="text" value="42.89713"/>	<input type="text" value="79.29319"/>	0.748696	1.383927
Back Row Corner	<input type="text" value="42.89710"/>	<input type="text" value="79.29241"/>	0.748696	1.383914
Average (Centre of Blast)	<input type="text" value="42.89711"/>	<input type="text" value="79.29278"/>	0.748696	1.383920

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="517.2"/>	m		
Post Blast Data:	ppV: <input type="text" value="4.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="33.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="107.8"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2244.6"/>	m		
Post Blast Data:	ppV: <input type="text" value="1.3"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="23.0"/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="Less than 88"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" input="" type="text" value="?"/>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(517.2)^2}{30^2} \text{ kg} \\
 &= \frac{267,496}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Waterford

Quarry: Laws - Bottom Lift
P.O. #: S191856
Blast Date: 4/2/2019

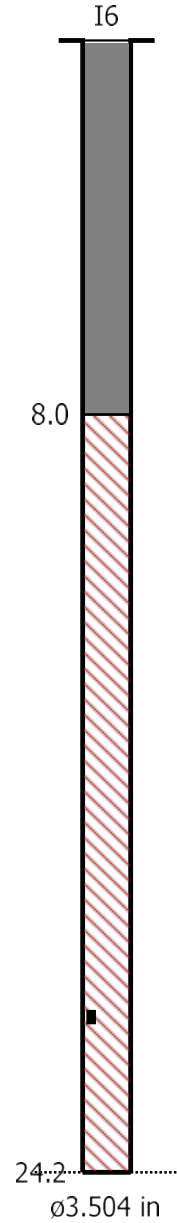
Blast Number: 19-019
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Long at 12:46:53 October 2, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.353 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM6859_20191002124653.IDFW

Notes

Location: Erie Peat Rd
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

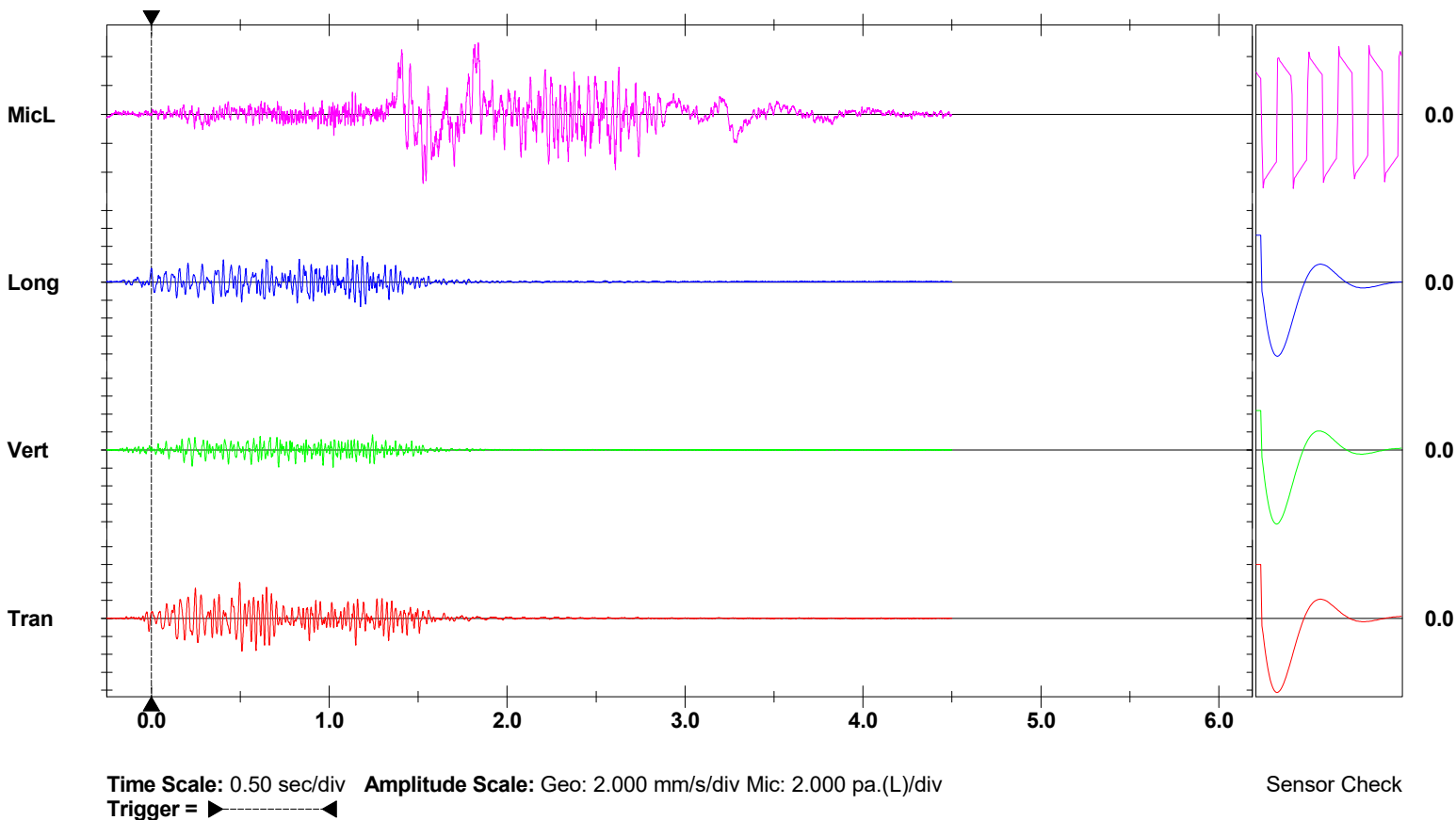
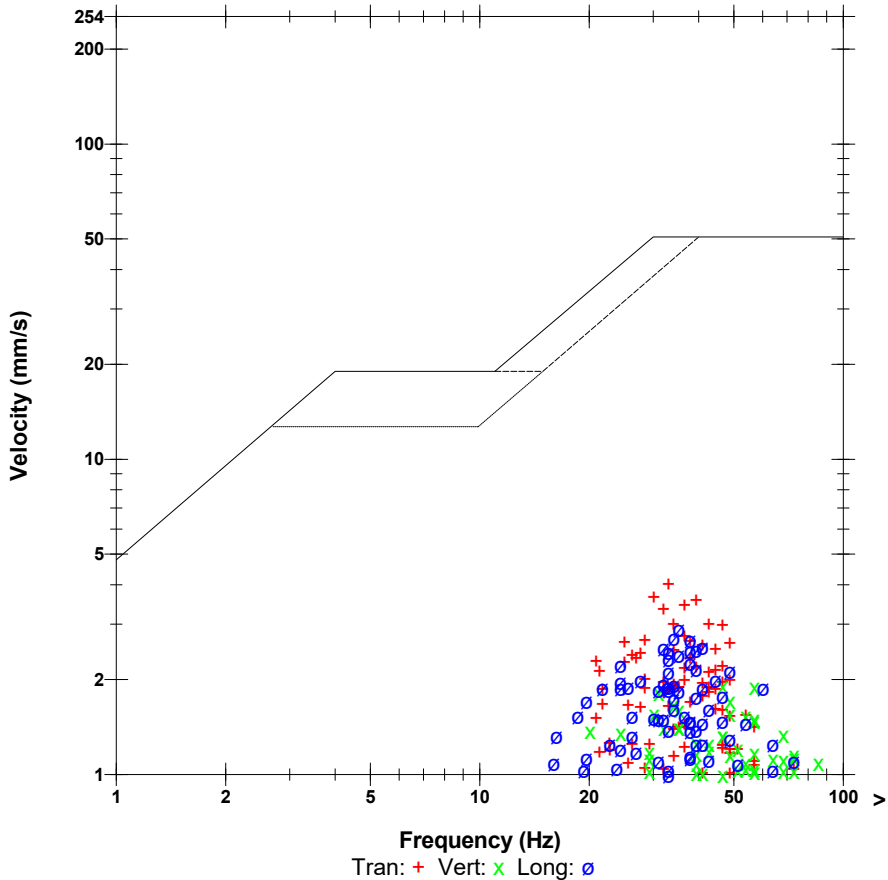
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 107.8 dB(L) at 1.838 sec
ZC Freq 10.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1369 mv)

	Tran	Vert	Long	
PPV	4.028	1.907	2.901	mm/s
ZC Freq	33	47	35	Hz
Time (Rel. to Trig)	0.497	0.716	1.187	sec
Peak Acceleration	0.135	0.087	0.150	g
Peak Displacement	0.019	0.008	0.015	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.8	3.9	4.1	

Peak Vector Sum 4.426 mm/s at 0.497 sec

USBM RI8507 And OSMRE



Date/Time Tran at 12:46:56 October 2, 2019
Trigger Source Geo: 0.200 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.54 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Westside.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20191002124656.IDFW

Notes

Location: 207 Westside rd
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: SAND BAGGED

Extended Notes

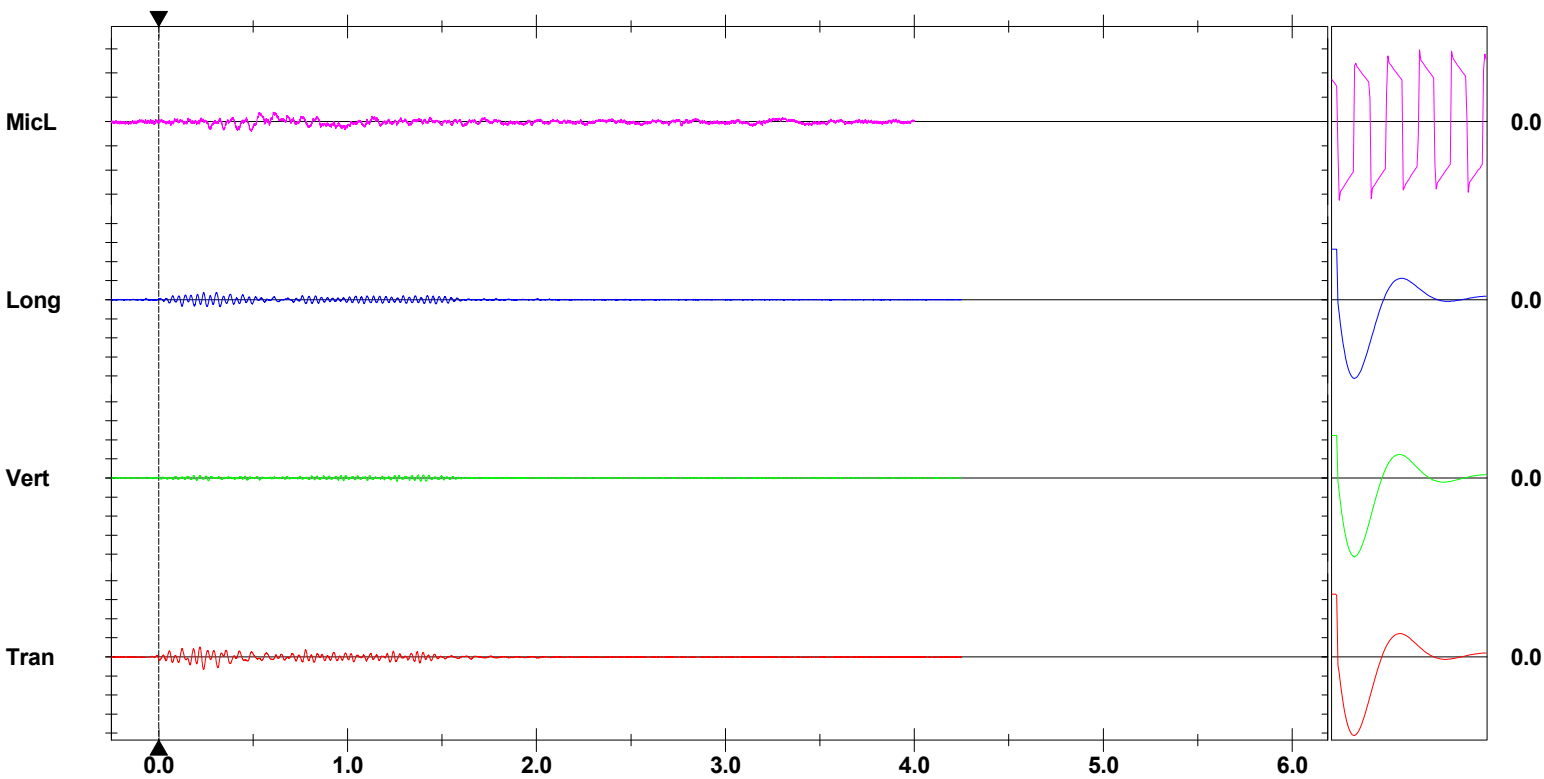
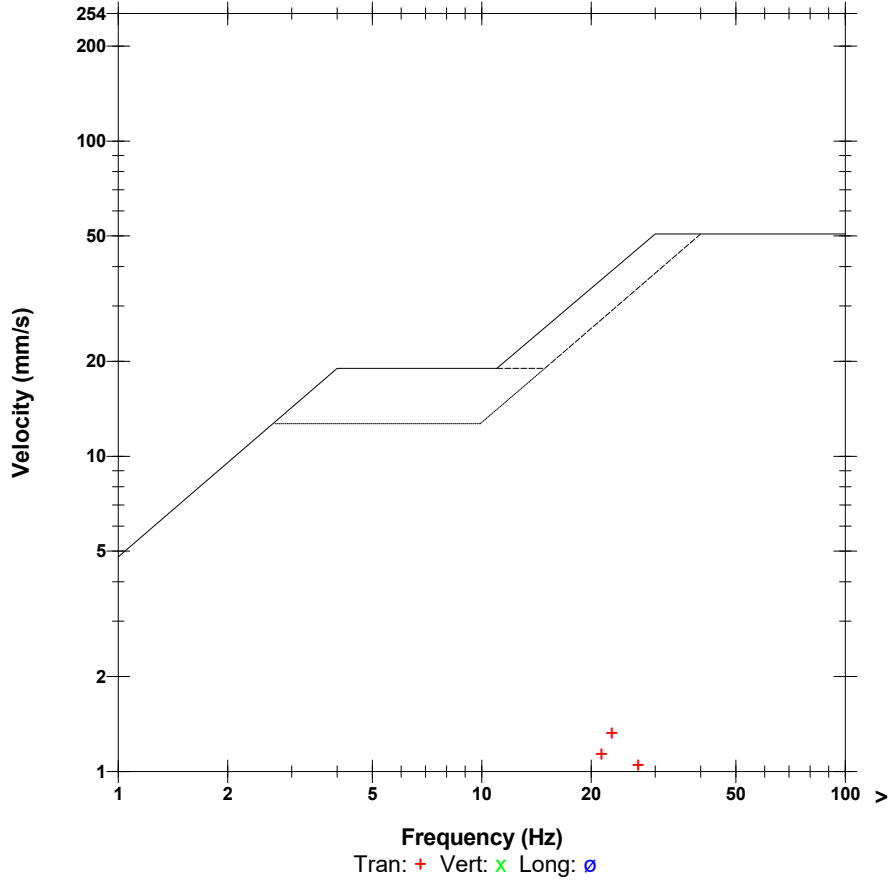
N42.90081,W-79.29082

Microphone Linear Weighting
PSPL <88 dB(L)
ZC Freq 11.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1382 mv)

	Tran	Vert	Long	
PPV	1.324	0.355	0.765	mm/s
ZC Freq	23	43	28	Hz
Time (Rel. to Trig)	0.238	1.261	0.238	sec
Peak Acceleration	0.026	0.018	0.028	g
Peak Displacement	0.009	0.002	0.005	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.3	3.7	

Peak Vector Sum 1.536 mm/s at 0.238 sec
 N/A: Not Applicable

USBM R18507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S192801**
 Blast Date: **2019-10-17**

Blast Number: **19-035**
 Orica Order #: **2545038**
 Blast Time: **2:02 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench** (Bench / Face)

GPS Coordinates: **42.89386** °N Latitude **79.29393** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NW** at **30** kph Temperature: **1 to 5** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling **2,400** ft

- Drilling Information -

Primary Bit diam: **101.6** mm **0** } # Holes: **439** = 4,390.0 ft (4 " diam)
Angle from Vertical
 Secondary Bit diam: mm **0** } # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm **0** } # Holes: = 0.0 ft (" diam)
 Nominal Bit Diameter:

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	24,900	20,700	4,200

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	4	4	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	441	149.9

total explosives weight in Blast (kg): **4,350**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			1
EXEL HANDIDET 7m		25/500	352
EXEL HANDIDET 12m		25/500	89
CONNECTADET 9M		25 ms	12
CONNECTADET 9M		33 ms	1
CONNECTADET 9M		42 ms	17

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	Note Exception	
# of Blasts today (this Quarry)		2
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	8.0
HELPER HOURS	Enter total Helper man-hours	18.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **49,387** te **20,578** m³
 Total tonnes per day: **49,387** te **LTL12-23** Rate Code
 Total Holes Loaded: **439** holes
 ... including: **9** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **9** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **45** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **394** main body

Bench Height: **10.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **10.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **3.0** ft avg
 Main Body: **3.0** ft avg

- Charge Weight -

Front Row: **8.7** kg/hole
 Main Body: **8.7** kg/hole
 Max. per delay: **13.0** kg/delay
 SD () Equation: **90.4** kg/delay
 Total kg Loaded: **4,350** kg
 Rock Density: **2.40** g/cc = te/m³

- Powder Factor -

Yield PF: **0.088** kg/te (actual)
 Front row: **0.076** kg/te (theoretical)
 Main Body: **0.076** kg/te (theoretical)
 "KPI" PF: **0.076** kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

- Connectadet 9M 65 ms sold 1
- 3 helpers due to the number of holes
- 2 Holes received secondary primers



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89389"/>	<input type="text" value="79.29478"/>	0.748640	1.383955
Front Row Corner	<input type="text" value="42.89387"/>	<input type="text" value="79.29351"/>	0.748639	1.383933
Back Row Corner	<input type="text" value="42.89381"/>	<input type="text" value="79.29351"/>	0.748638	1.383933
Average (Centre of Blast)	<input type="text" value="42.89386"/>	<input type="text" value="79.29393"/>	0.748639	1.383940

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="285.2"/>	m		
Post Blast Data:	ppV: <input type="text" value="2.8"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="26.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="123.6"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2427.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.2"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="29.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="104.4"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(285.2)^2}{30^2} \text{ kg}$$

$$= \frac{81,339}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



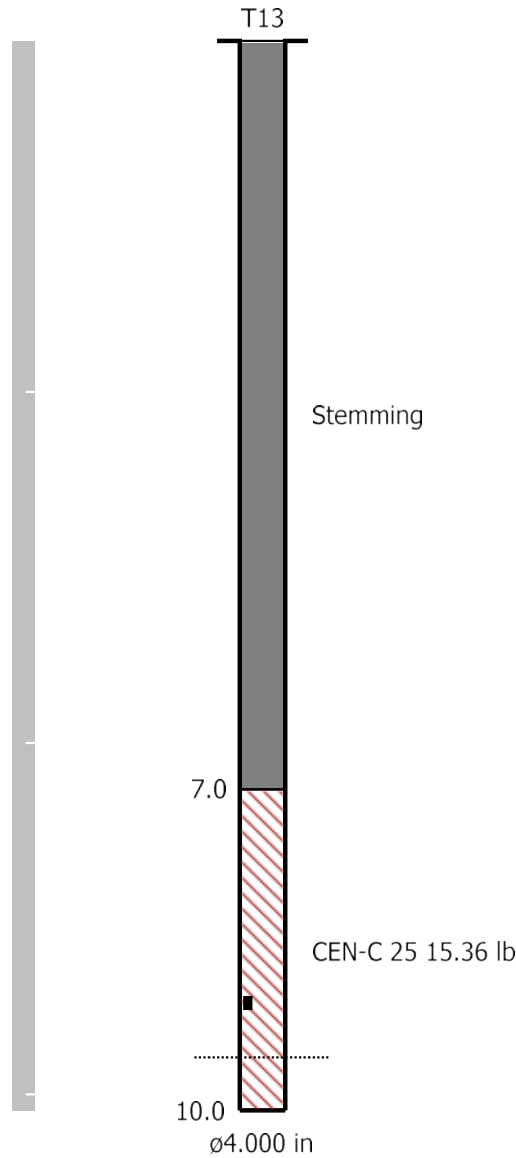
Blast Design
Waterford

Quarry: Laws - Top Lift
P.O. #: S192801
Blast Date: 10/17/2019

Blast Number: 19-035
Orica Order #: 2545038

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 14:02:27 October 17, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.761 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat S.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20191017140227.IDFW

Notes

Location: Erie Peat Rd
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: Sand Bagged

Extended Notes

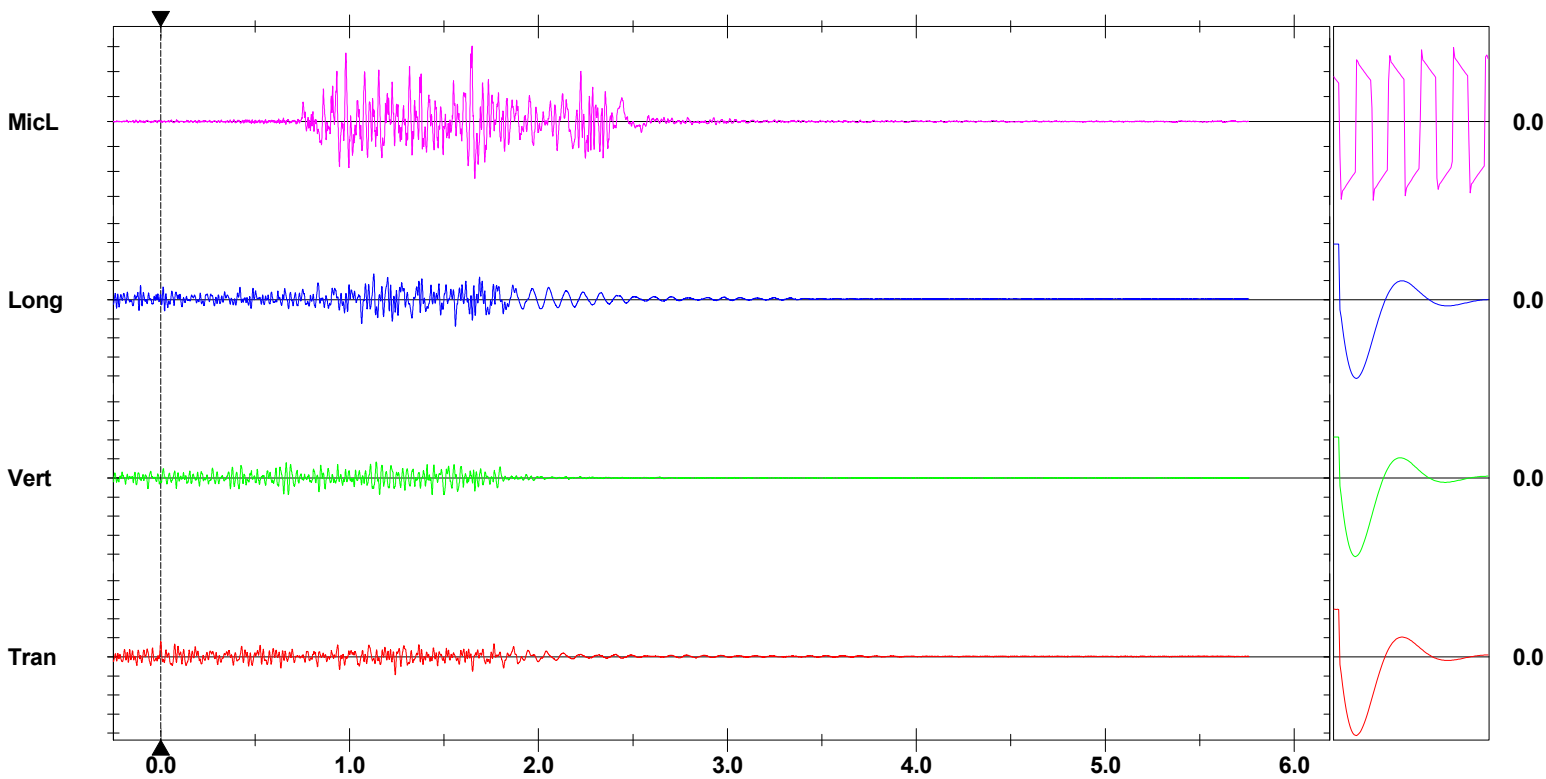
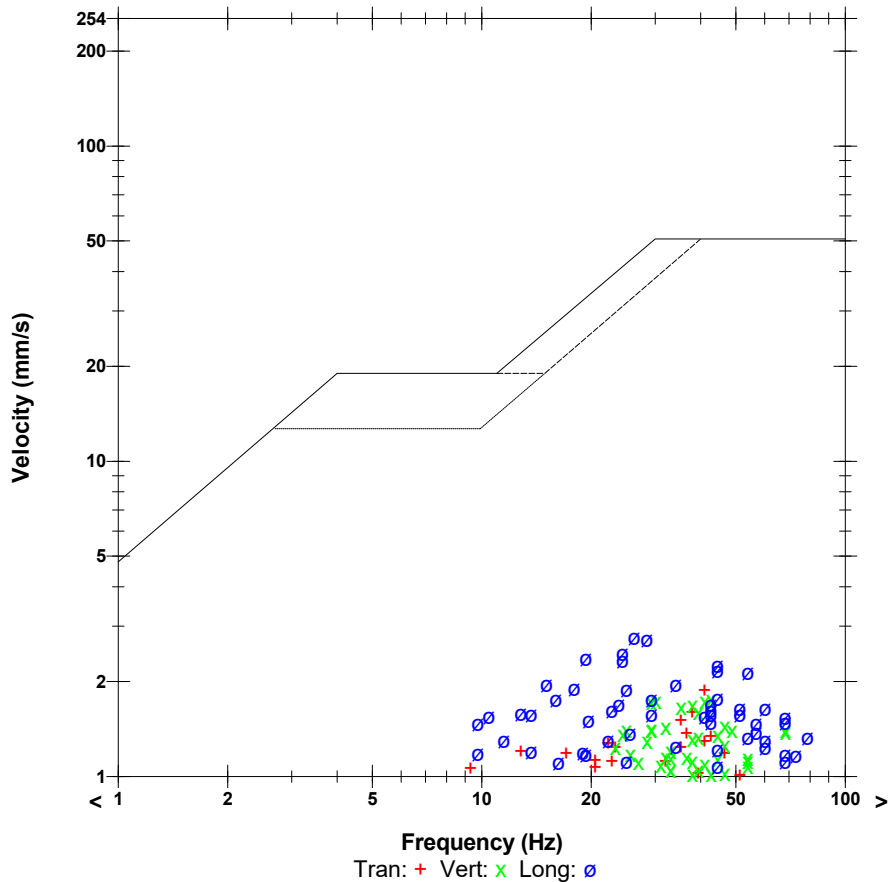
42.89959 79.29427
 Pipe line

Microphone Linear Weighting
PSPL 123.6 dB(L) at 1.648 sec
ZC Freq 24 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1358 mv)

	Tran	Vert	Long	
PPV	1.884	1.758	2.774	mm/s
ZC Freq	41	43	26	Hz
Time (Rel. to Trig)	1.242	0.676	1.560	sec
Peak Acceleration	0.072	0.084	0.137	g
Peak Displacement	0.020	0.009	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	4.0	3.9	4.1	

Peak Vector Sum 2.902 mm/s at 1.128 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 14:02:31 October 17, 2019
Trigger Source Geo: 0.200 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.324 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Westside.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20191017140231.IDFW

Notes

Location: 207 Westside rd
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: SAND BAGGED

Extended Notes

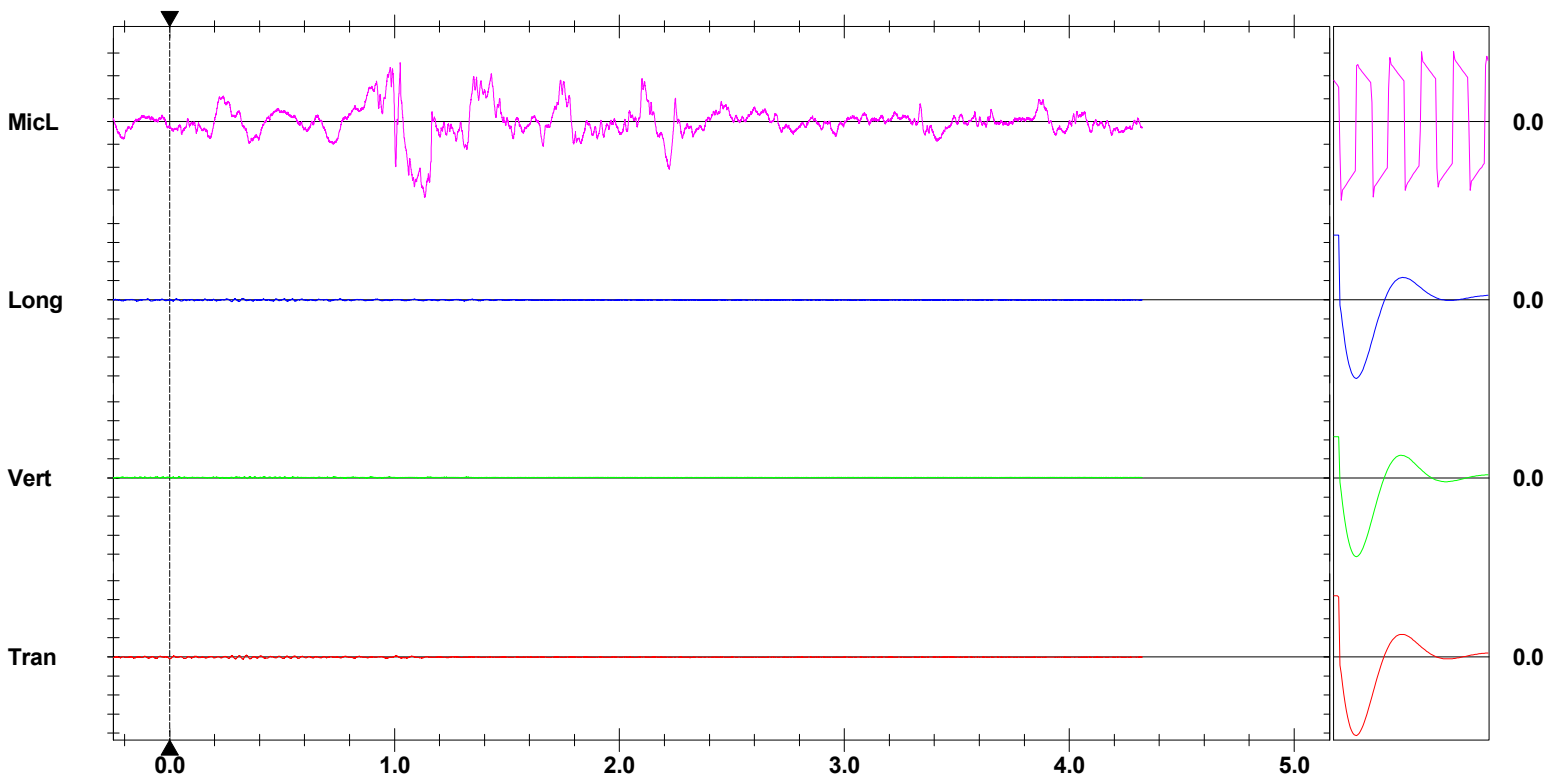
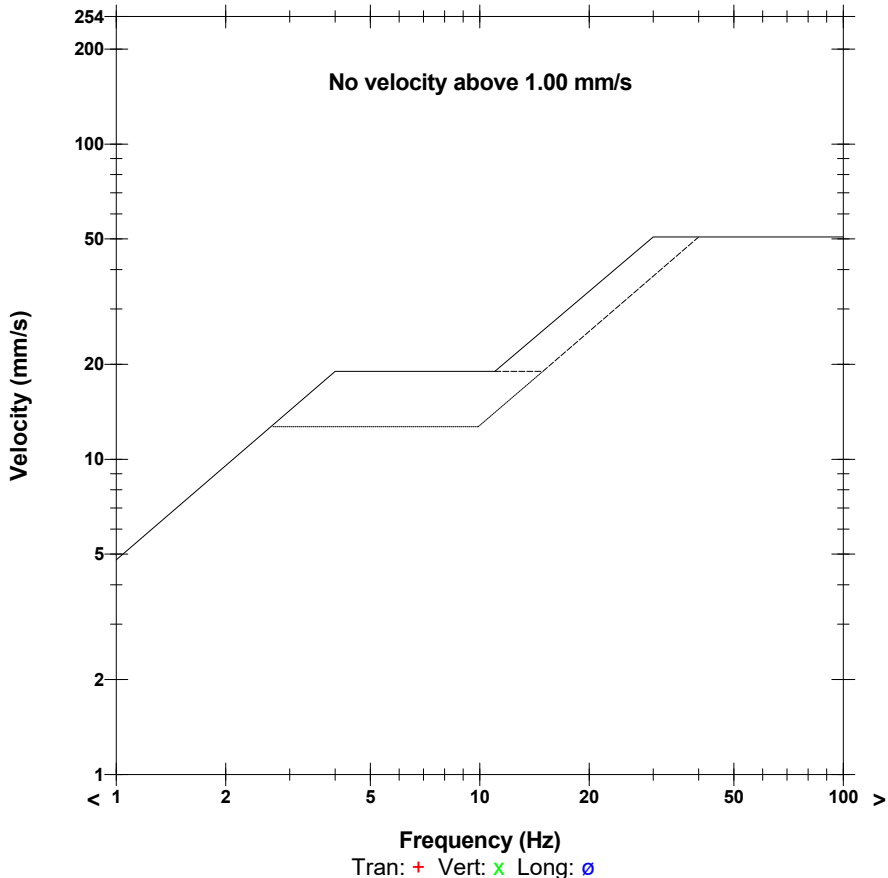
N42.90081,W-79.29082

Microphone Linear Weighting
PSPL 104.4 dB(L) at 1.135 sec
ZC Freq 4.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1525 mv)

	Tran	Vert	Long	
PPV	0.244	0.142	0.189	mm/s
ZC Freq	29	31	27	Hz
Time (Rel. to Trig)	0.325	0.356	0.276	sec
Peak Acceleration	0.012	0.010	0.012	g
Peak Displacement	0.007	0.039	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.5	3.4	3.5	

Peak Vector Sum 0.289 mm/s at 0.327 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Top Lift**
 P.O. #: **S192935**
 Blast Date: **2019-12-02**

Blast Number: **19-036**
 Orica Order #: **2563310**
 Blast Time: **2:52 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Top Bench** (Bench / Face)

GPS Coordinates: **42.89360** °N Latitude **79.29462** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SE** at **15** kph Temperature: **-1 to -5** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **2,700** ft

- Drilling Information -

Primary Bit diam: **101.6** mm Angle from Vertical # Holes: **396** = 3,960.0 ft (**4** " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	31,190	25,450	5,740

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	394	134.0

total explosives weight in Blast (kg): **5,899**
 Pkgd Prod (25 kg) % of Total kg: **0.4%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 7m		25/500	394
CONNECTADET 9M		25 ms	8
CONNECTADET 9M		33 ms	3
CONNECTADET 9M		65 ms	15

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	8.0
HELPER HOURS	Enter total Helper man-hours	16.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **44,104** te **18,376** m³
 Total tonnes per day: **44,104** te **LTL12-23** Rate Code
 Total Holes Loaded: **394** holes
 ... including: **10** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **10** rows

- Pattern (Front Row) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **40** front row

- Pattern (Main Body) -

Burden: **13.0** ft avg
 Spacing: **13.0** ft avg
 # Holes: **354** main body

Bench Height: **10.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **10.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **6.0** ft avg
 Main Body: **6.0** ft avg
 Material used: **3/4" stone**

- Charge Length -

Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg

- Charge Weight -

Front Row: **11.7** kg/hole
 Main Body: **11.7** kg/hole
 Max. per delay: **18.0** kg/delay
 SD () Equation: **118.2** kg/delay
 Total kg Loaded: **5,899** kg
 Rock Density: **2.40** g/cc = te/m³

- Powder Factor -

Yield PF: **0.134** kg/te (actual)
 Front row: **0.102** kg/te (theoretical)
 Main Body: **0.102** kg/te (theoretical)
 "KPI" PF: **0.102** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Package was needed on some front row holes due to lean burden



Blast Report

Waterford

Quarry:
P.O. #:
Blast Date:

Blast Number:
Orica Order #:
Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89357"/>	<input type="text" value="79.29452"/>	0.748634	1.383950
Front Row Corner	<input type="text" value="42.89379"/>	<input type="text" value="79.29570"/>	0.748638	1.383971
Back Row Corner	<input type="text" value="42.89345"/>	<input type="text" value="79.29364"/>	0.748632	1.383935
Average (Centre of Blast)	<input type="text" value="42.89360"/>	<input type="text" value="79.29462"/>	0.748635	1.383952

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="326.2"/>	m		
Post Blast Data:	ppV: <input type="text" value="4.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="10.6"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="120.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2489.1"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.4"/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value="27.0"/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value="103.1"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value=""/>	mm/s	Trigger set at: <input type="text" value="1.5"/>	mm/s
	frequency: <input type="text" value=""/>	Hz	V / T / L : <input <="" td="" type="text" value="?"/> <td>(Vertical, Transverse or Longitudinal)</td>	(Vertical, Transverse or Longitudinal)
	air overpressure: <input type="text" value=""/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value=""/>				

Scaling Factor denotes the degree of Blast confinement.
The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(326.2)^2}{30^2} \text{ kg}$$

$$= \frac{106,406}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



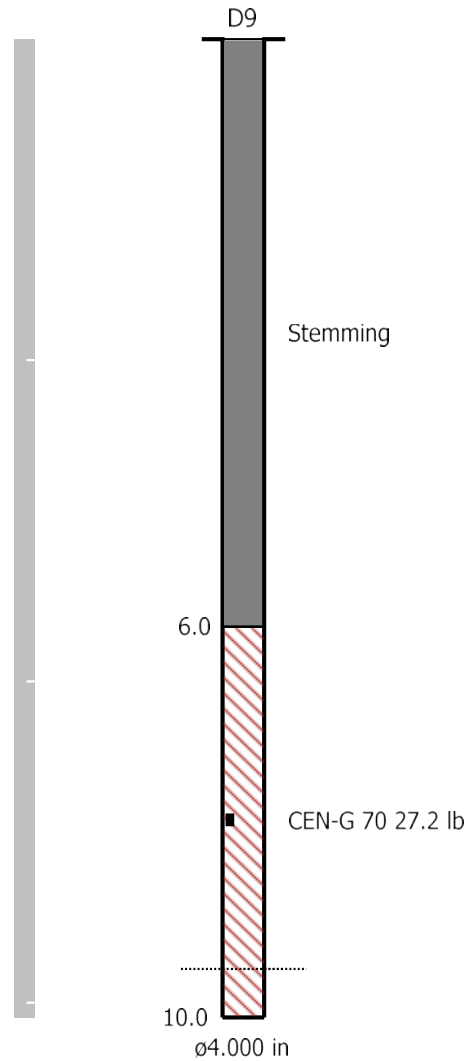
Blast Design
Waterford

Quarry: Laws - Top Lift
P.O. #: S192935
Blast Date: 12/2/2019

Blast Number: 19-036
Orica Order #: 2563310

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Vert at 14:52:30 December 2, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: Mike der Kinderen/Laws Erie Peat N.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTEL
File Name UM6859_20191202145230.IDFW

Notes

Location: Erie Peat Rd N
Client: Water Ford Group
User Name: Orica Canada Inc.
General: Sand Bagged

Extended Notes

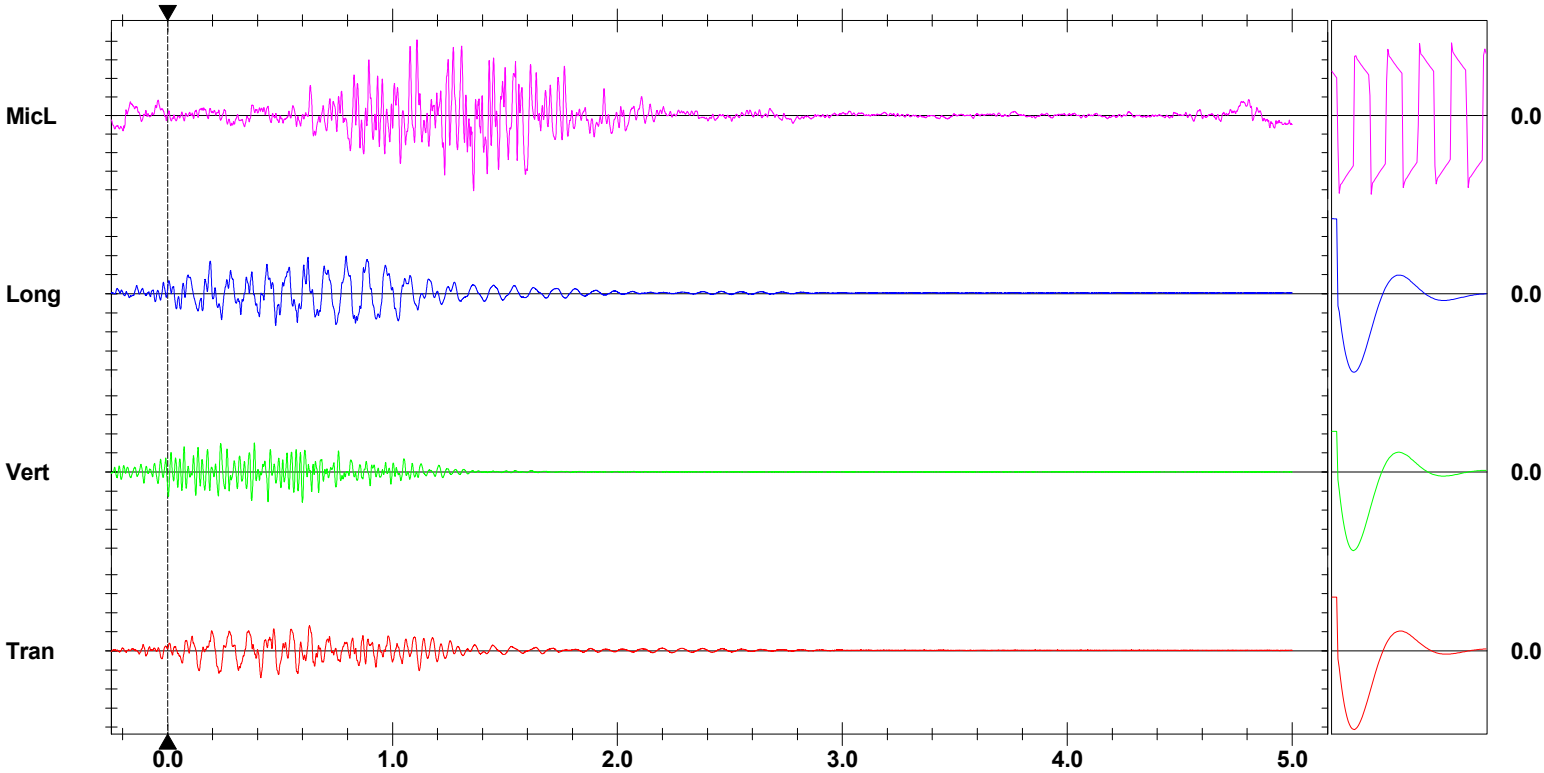
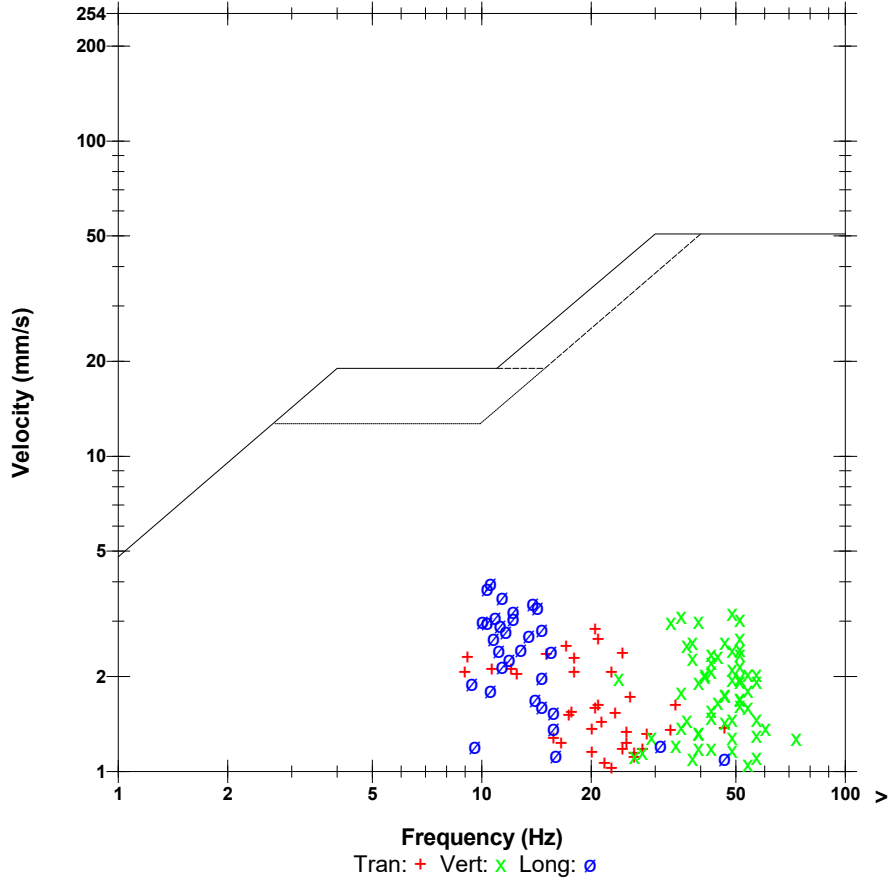
42.89959, -79.29427

Microphone Linear Weighting
PSPL 120.1 dB(L) at 1.109 sec
ZC Freq 21 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1459 mv)

	Tran	Vert	Long	
PPV	2.830	3.192	3.965	mm/s
ZC Freq	20	49	10.6	Hz
Time (Rel. to Trig)	0.415	0.599	0.793	sec
Peak Acceleration	0.081	0.153	0.107	g
Peak Displacement	0.029	0.013	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	4.0	4.2	

Peak Vector Sum 4.231 mm/s at 0.237 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Tran at 14:52:25 December 2, 2019
Trigger Source Geo: 0.200 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.832 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Westside.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20191202145225.IDFW

Notes

Location: 207 Westside rd
 Client: Waterford Laws Quarry
 User Name: Orica Canada Inc.
 General: SAND BAGGED

Extended Notes

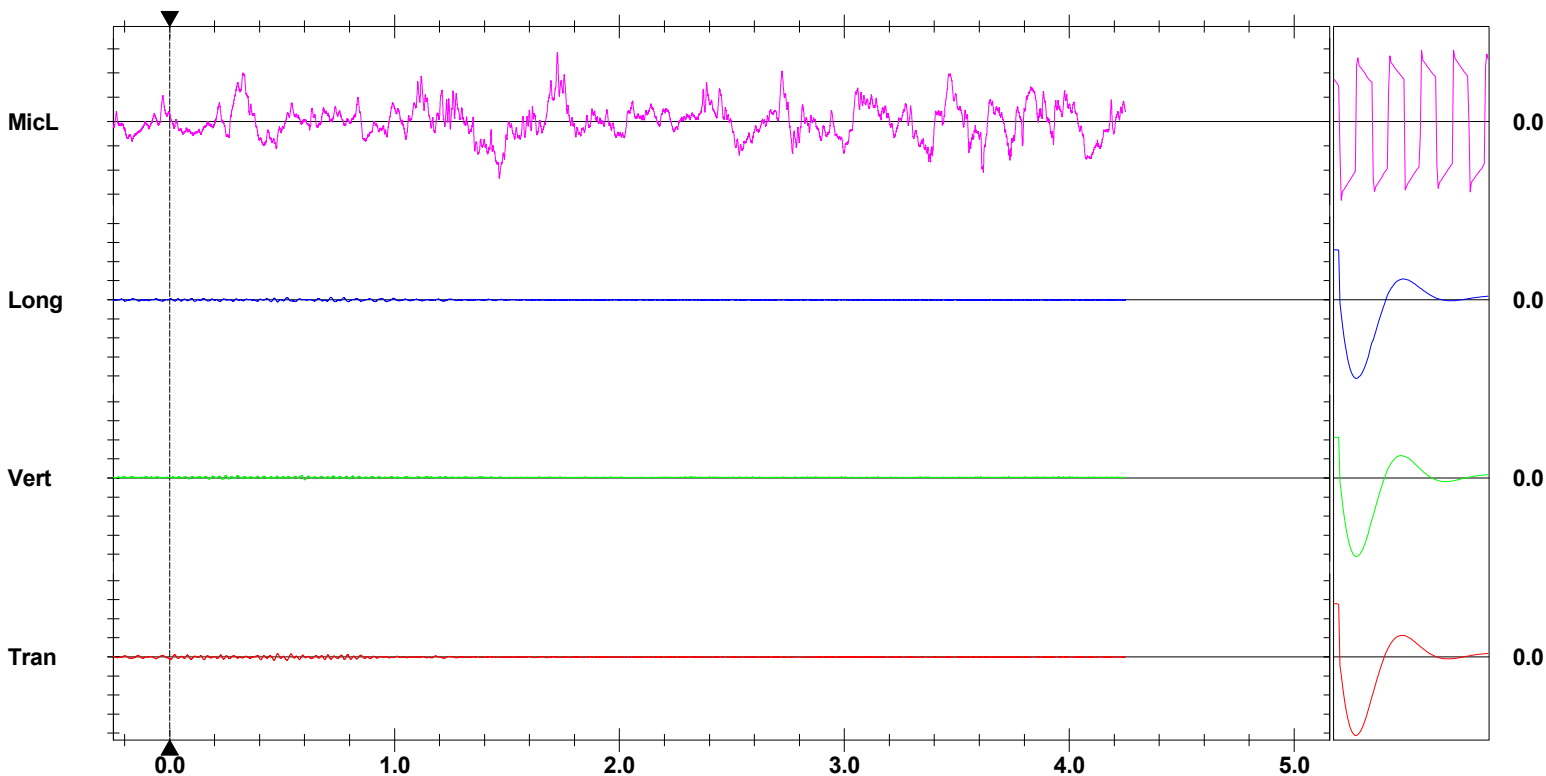
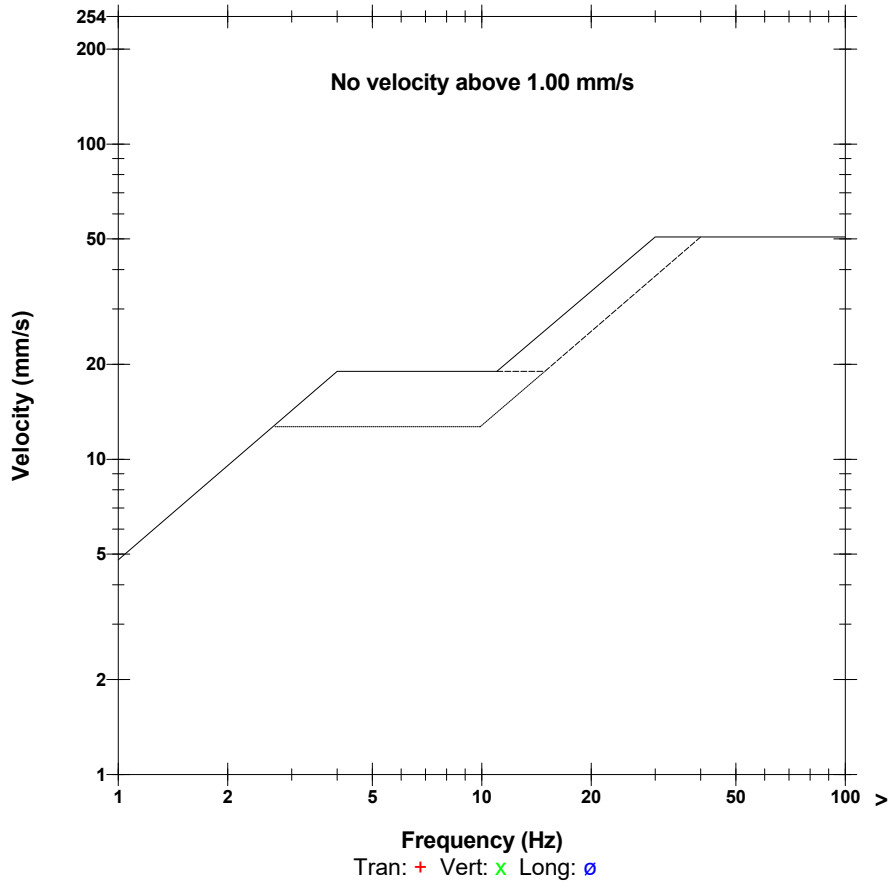
N42.90081,W-79.29082

Microphone Linear Weighting
PSPL 103.1 dB(L) at 1.724 sec
ZC Freq 4.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1663 mv)

	Tran	Vert	Long	
PPV	0.355	0.268	0.268	mm/s
ZC Freq	27	31	29	Hz
Time (Rel. to Trig)	0.464	0.250	0.717	sec
Peak Acceleration	0.013	0.015	0.013	g
Peak Displacement	0.002	0.003	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.6	3.5	3.8	

Peak Vector Sum 0.443 mm/s at 0.479 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check



Blast Report

Waterford

Quarry: **Laws - Bottom Lift**
 P.O. #: **S192980**
 Blast Date: **2019-12-11**

Blast Number: **19-037**
 Orica Order #: **2565903**
 Blast Time: **12:31 PM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)

Blast Location: **Bottom Bench** (Bench / Face)

GPS Coordinates: **42.89701** °N Latitude **79.29279** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **20** kph Temperature: **-6 to -10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30,000** ft

- Drilling Information -

Primary Bit diam: **92.1** mm Angle from Vertical # Holes: **212** = 3,180.0 ft (3 5/8 " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	23,600	19,610	3,990

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	210	71.4

total explosives weight in Blast (kg): **4,061**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 9m		25/500	209
CONNECTADET 9M		25 ms	3
CONNECTADET 9M		65 ms	6

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services:

BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	6.0
HELPER HOURS	Enter total Helper man-hours	12.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: **18,696** te **7,191** m³
 Total tonnes per day: **18,696** te **LLL15-49** Rate Code
 Total Holes Loaded: **209** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **51** front row

- Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **9.0** ft avg
 # Holes: **158** main body

Bench Height: **15.0** ft avg
 Sub-drill: **0.0** ft avg
 Hole Depth: **15.0** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Decks: **0** per blast

- Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg
 Material used: **1/2" Clear**

- Charge Length -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

- Charge Weight -

Front Row: **16.8** kg/hole
 Main Body: **16.8** kg/hole
 Max. per delay: **18.0** kg/delay
 SD () Equation: **285.3** kg/delay
 Total kg Loaded: **4,061** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.217** kg/te (actual)
 Front row: **0.187** kg/te (theoretical)
 Main Body: **0.187** kg/te (theoretical)
 "KPI" PF: **0.187** kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec)

NOTES (ANY VARIATION FROM STANDARD):

Design 19-009BB & Design 19-010BB

1 defective booster was disposed of, hence why the dets and boosters don't add up.



Blast Report

Waterford

Quarry:
 P.O. #:
 Blast Date:

Blast Number:
 Orica Order #:
 Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	<input type="text" value="42.89700"/>	<input type="text" value="79.29278"/>	0.748694	1.383920
Front Row Corner	<input type="text" value="42.89703"/>	<input type="text" value="79.29319"/>	0.748694	1.383927
Back Row Corner	<input type="text" value="42.89700"/>	<input type="text" value="79.29240"/>	0.748694	1.383913
Average (Centre of Blast)	<input type="text" value="42.89701"/>	<input type="text" value="79.29279"/>	0.748694	1.383920

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
2nd Reading				
Average	<input type="text" value="42.89269"/>	<input type="text" value="79.29082"/>	0.748619	1.383886
Distance (1st Seis. From Centre of Blast)	<input type="text" value="506.7"/>	m		
Post Blast Data:	ppV: <input type="text" value="2.9"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="27.0"/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value="106.2"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Erie Peat Rd"/>				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
2nd Reading				
Average	<input type="text" value="42.90081"/>	<input type="text" value="79.26573"/>	0.748760	1.383448
Distance (2nd Seis. From Centre of Blast)	<input type="text" value="2246.9"/>	m		
Post Blast Data:	ppV: <input type="text" value="Did"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="Not"/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value="Trigger"/>	dB	Trigger set at: <input type="text" value="115"/>	dB
<input type="text" value="Between 201 & 207 West Side Road, Port Colborne, ON"/>				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	<input type="text" value="0.00000"/>	<input type="text" value="0.00000"/>	0.000000	0.000000
Distance (3rd Seis. From Centre of Blast)	<input type="text" value="0.0"/>	m		
Post Blast Data:	ppV: <input type="text" value="0.0"/>	mm/s	Trigger set at: <input type="text" value="2.0"/>	mm/s
	frequency: <input type="text" value="0.0"/>	Hz	V / T / L : <input type="text" value="?"/> (Vertical, Transverse or Longitudinal)	
	air overpressure: <input type="text" value="0.0"/>	dB	Trigger set at: <input type="text" value="115"/>	dB

Scaling Factor denotes the degree of Blast confinement.
 The higher the SF, the more confined the Blast.
 A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(506.7)^2}{30^2} \text{ kg} \\
 &= \frac{256,745}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design
Waterford

Quarry: Laws - Bottom Lift
P.O. #: S192980
Blast Date: 12/11/2019

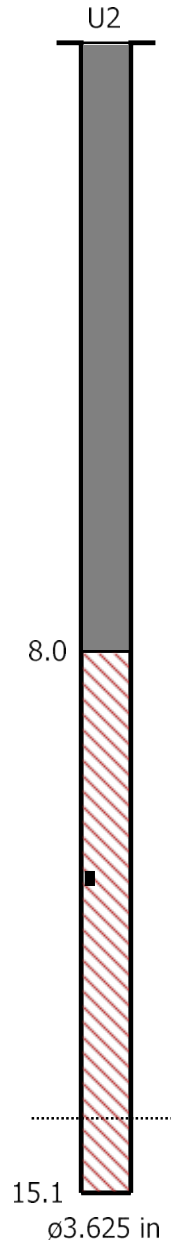
Blast Number: 19-037
Orica Order #: 2565903

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 20ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike Derkinderen

Quarry Manager:

Dennis Sodtka

Signature required, indicating
sign off on Blast Design.

Date/Time Tran at 12:31:04 December 11, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.054 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Laws Erie Peat S.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20191211123104.IDFW

Notes

Location: Erie Peat Road
Client: Waterford Laws Quarry
User Name: Orica Canada Inc.
General: SAND BAGGED

Extended Notes

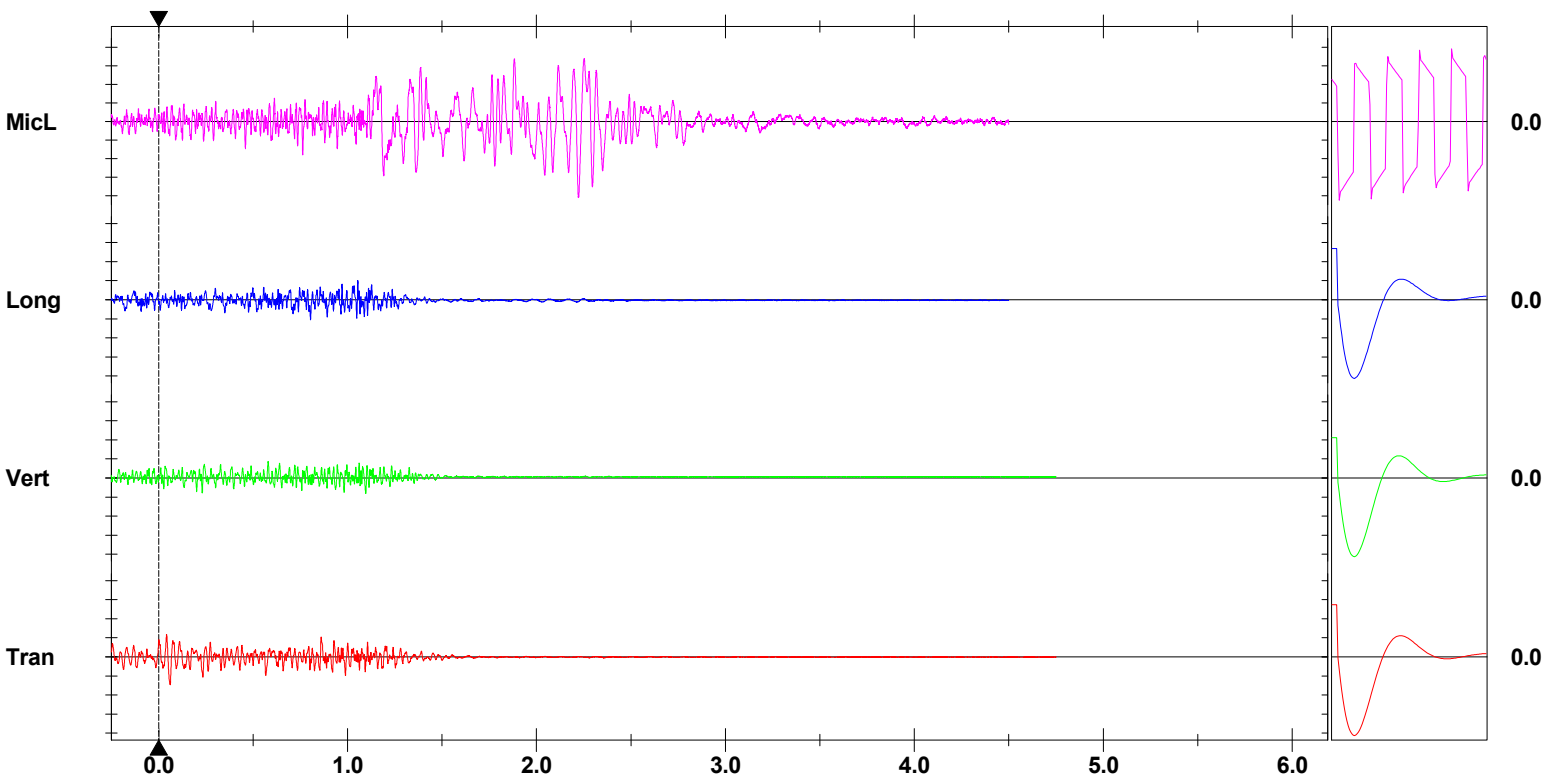
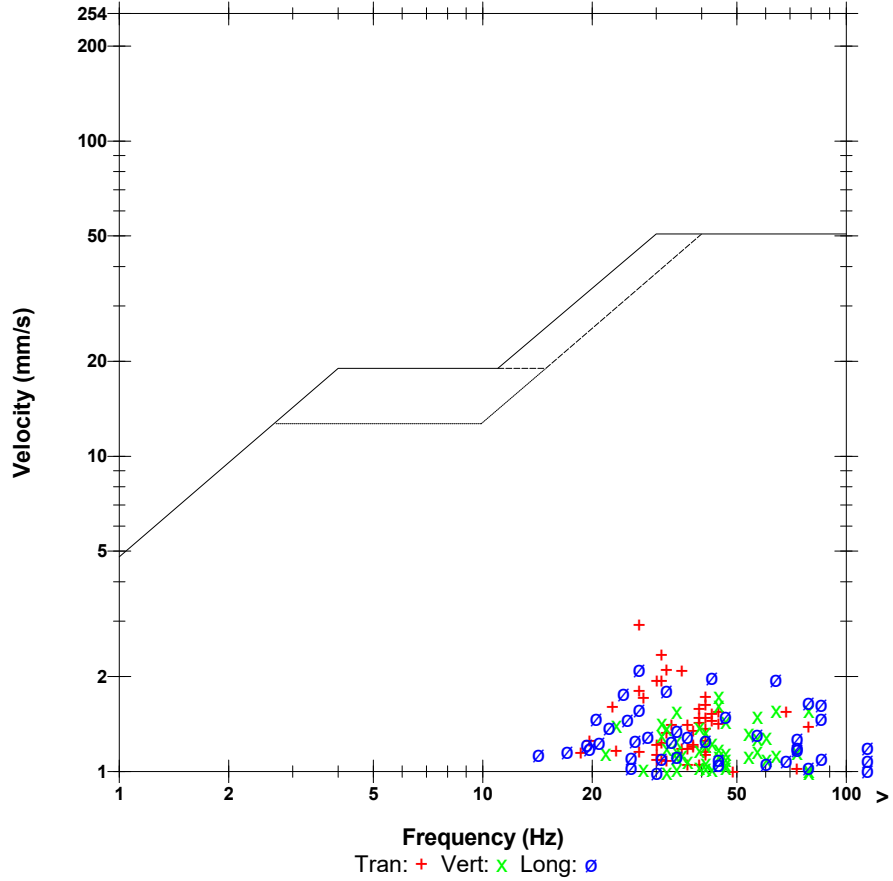
42.89269 , -79.29082

Microphone Linear Weighting
PSPL 106.2 dB(L) at 2.221 sec
ZC Freq 19.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1684 mv)

	Tran	Vert	Long	
PPV	2.908	1.742	2.120	mm/s
ZC Freq	27	45	27	Hz
Time (Rel. to Trig)	0.062	0.579	0.804	sec
Peak Acceleration	0.086	0.151	0.132	g
Peak Displacement	0.017	0.007	0.069	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.7	3.5	3.8	

Peak Vector Sum 2.916 mm/s at 0.062 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

Appendix D

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Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Robert J. Cyr, P. Eng.
Principal, Explotech Engineering Ltd.

EDUCATION

Bachelor of Applied Science,
Civil Engineering, Queen's University

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of Ontario (APEO)
Association of Professional Engineers and Geoscientists of BC (APEG)
Association of Professional Engineers, Geologists and Geophysicists of Alberta
Association of Professional Engineers and Geoscientists of New Brunswick
Association of Professional Engineers of Nova Scotia
Association of Professional Engineers and Geoscientists Manitoba
Professional Engineers and Geoscientists Newfoundland and Labrador
Northwest Territories and Nunavut Association of Professional Engineers (NAPEG)
International Society of Explosives Engineers (ISEE)
Ontario Stone Sand & Gravel Association (OSSGA)
Surface Blaster Ontario Licence 450109

SUMMARY OF EXPERIENCE

Over thirty five years experience in many facets of the construction and mining industry has provided the expertise and experience required to efficiently and accurately address a comprehensive range of engineering and construction conditions. Sound technical training is reinforced by formidable practical experience providing the tools necessary for accurate, comprehensive analysis and application of feasible solutions. Recent focus on vibration analysis, blast monitoring, blast design, damage complaint investigation for explosives consumers and specialized consulting to various consulting engineering firms.

PROFESSIONAL RECORD

2001 – Present	-Principal, Explotech Engineering Ltd.
1996 – 2001	-Leo Alarie & Sons Limited - Project Engineer/Manager
1993 – 1996	-Rideau Oxford Developments Inc. – Project Manager
1982 – 1993:	-Alphe Cyr Ltd. – Project Coordinator/Manager

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Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Mitch Malcomson, P.Eng.
Consulting Engineer, Explotech Engineering Ltd.

EDUCATION

Bachelor of Engineering,
Civil Engineering with Concentration in Business Management,
Carleton University

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of Ontario (APEO)
Association of Professional Engineers and Geoscientists of BC (APEG)
International Society of Explosives Engineers (ISEE)
Ontario Stone Sand and Gravel Association (OSSGA)

SUMMARY OF EXPERIENCE

A Consulting Engineer and Project Manager for Explotech Engineering Ltd., Mitch holds a Bachelor of Engineering degree from Carleton University in Civil Engineering with a Concentration in Business Management. Mitch has strong analytical, technical, business and leadership skills. As a Project Manager, Mitch is responsible for operational strategies, scheduling and contract procurement. As a Consulting Engineer, the technical responsibilities include detailed blast designs, blast investigations and reviews, implementation of vibration monitoring programs, development of monitoring equipment/ technologies and building assessments for construction and the drilling and blasting portions of mining, quarrying and construction projects across Canada.

PROFESSIONAL RECORD

2008 – Present - Consulting Engineer / Project Manager, Explotech Engineering Ltd.



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Andrew Campbell, P.Eng.
Explotech Engineering Ltd.

EDUCATION & QUALIFICATIONS

Bachelor of Engineering,
Mechanical Engineering, Carleton University

Advanced and Expert (Industry) CadnaA Modelling
DataKustik, Mississauga, Ontario

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of Ontario (APEO)
International Society of Explosive Engineers (ISEE)

SUMMARY OF EXPERIENCE

An engineer working for Explotech Engineering Ltd., Andrew holds a Bachelor of Engineering degree in Mechanical Engineering and has strong analytical, technical, and interpersonal skills. A proven leader in collaborative environments, Andrew is comfortable managing projects, specifying details, and communicating internally and externally. With a focus on blast designs, blast impact analyses, noise monitoring and modelling, damage complaint investigations, vibration analysis, and blast monitoring, Andrew has applied these skills across Canada.

PROFESSIONAL RECORD

- 2018 – Present - Engineer, Explotech Engineering Ltd.
- 2013 – 2018 - Technician / EIT, Explotech Engineering Ltd.
- 2012 – 2012 - Ride Technician, Canada's Wonderland



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Michael Tobin, P.Eng.

Explotech Engineering Ltd.

EDUCATION

Bachelor of Applied Science,
Geological Engineering, Queen's University

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of Ontario (APEO)
International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

An engineer working for Explotech Engineering Ltd., Michael holds a Bachelor of Applied Science degree from Queen's University in Geological Engineering. Michael has strong analytical, technical, and interpersonal skills. Recent projects have focused on blast monitoring, vibration analysis, job estimation, damage complaint investigation and blast design.

PROFESSIONAL RECORD

- 2021 – Present - Engineer, Explotech Engineering Ltd.
- 2017 – 2021 - Technician, Explotech Engineering Ltd.



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Mark Morelli, B.Eng.

Explotech Engineering Ltd.

EDUCATION

Bachelor of Engineering,
Civil Engineering, Carleton University

PROFESSIONAL AFFILIATIONS

International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

A technician working for Explotech Engineering Ltd., Mark holds a Bachelor of Engineering degree in Civil Engineering and has strong technical, leadership, interpersonal, communication, and presentation skills. Recent focus on blast monitoring, data management, scheduling, job estimations, vibration analysis, damage complaint investigation and attenuation analysis.

PROFESSIONAL RECORD

- 2006 – Present - Technician, Explotech Engineering Ltd.
- 2003 – 2004 - Labourer, Hydracorp Canada Ltd.
- 2002 – 2003 - Labourer, Quad Construction

Appendix E



Blasting Terminology

ANFO:	Ammonium Nitrate and Fuel Oil – explosive product
ANFO WR:	Water resistant ANFO
Blast Pattern:	Array of blast holes
Body hole:	Those blast holes behind the first row of holes (Face Holes)
Burden:	Distance between the blast hole and a free face
Column:	That portion of the blast hole above the required grade
Column Load:	The portion of the explosive loaded above grade
Collar:	That portion of the blast hole above the explosive column, filled with inert material, preferably clean crushed stone
Face Hole:	The blast holes nearest the free face
Overpressure:	A compressional wave in air caused by the direct action of the unconfined explosive or the direct action of confining material subjected to explosive loading.
Peak Particle Velocity:	The rate of change of amplitude, usually measured in mm/s or in/s. This is the velocity or excitation of the particles in the ground resulting from vibratory motion.
Scaled distance:	An equation relating separation distance between a blast and receptor to the energy (usually expressed as explosive weight) released at any given instant in time.
Sensitive Receptor:	Sensitive land use may include recreational uses which are deemed by the municipality or provincial agency to be sensitive; and/or any building or associated amenity area (i.e. may be indoor or outdoor space) which is not directly associated with the industrial use, where humans or the natural environment may be adversely affected by emissions generated by the operation of a nearby industrial facility. For example, the building or amenity area may be associated with residences, senior citizen homes, schools,

EXPLOTECH

day care facilities, hospitals, churches and other similar institutional uses, or campgrounds.

Spacing:	Distance between blast holes
Stemming:	Inert material, preferably clean crushed stone applied into the blast hole from the surface of the rock to the surface of the explosive in the blast hole.
Sub-grade:	That portion of the blast hole drilled and loaded below the required grade
Toe Load:	The portion of explosive loaded below grade



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