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Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Blast Impact Analysis
Burlington Quarry Extension
Concession 2, Part Lot 1,2,17 &18
Township of Burlington



Submitted to:

Nelson Aggregate
2433 No. 2 Side Road
Burlington, ON
L7P 0G8

A handwritten signature in black ink, appearing to read "Michael Kelly".

A handwritten signature in black ink, appearing to read "R. J. Cyr".

Prepared by

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EXECUTIVE SUMMARY

ExploTech Engineering Ltd. was retained in November 2018 to provide a Blast Impact Analysis for the proposed Nelson Aggregate – Burlington Quarry Extension operation located on Concession 2, Part Lot 1,2,17 and 18 – geographical City of Burlington, Ontario.

Vibration levels assessed in this report are based on the Ministry of the Environment, Conservation and Parks Model Municipal Noise Control By-law (NPC 119) with regard to guidelines for blasting in Mines and Quarries. We have assessed the area surrounding the proposed license area with regard to potential damage from blasting operations and compliance with the aforementioned by-law document. In addition, we have reviewed blast and/or vibration reports collected at the existing licenced quarry for the 2014 - 2019 blasting campaigns.

Golder Associates undertook a vibration attenuation study at the existing Burlington Quarry in 2006. The resultant data was analyzed in order to develop site specific vibration attenuation characteristics and equations.

We have inspected the site and reviewed the available site plans. ExploTech Engineering Ltd. is of the opinion that the planned mineral extraction extension on the site can be carried out safely and within Ministry of the Environment, Conservation and Parks guidelines as set out in NPC 119 of the By-Law.

Recommendations are included in this report for blasting operations to be carried out in a safe and productive manner and to suitably manage and mitigate the possibility of damage to any buildings, wells, structures or residences surrounding the property.



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INTRODUCTION

The proposed Nelson Aggregate – Burlington Quarry Extension operation is separated into two areas. The Burlington Quarry South Extension is located on the Southeast side of the existing licensed and operating Burlington Quarry (Licence 5499) while the Burlington Quarry West Extension is located along the Southwest face of the existing quarry. The legal description for the proposed licence is Concession 2, Part Lot 1,2,17 and 18 – geographical City of Burlington, Ontario.

This Blast Impact Analysis is based on the Ministry of the Environment, Conservation and Parks (MECP) Model Municipal Noise Control By-law (NPC 119) with regard to guidelines for blasting in mines and quarries. We have additionally assessed the area surrounding the proposed license with regard to potential damage from blasting operations. It is a recommendation of this report that a vibration monitoring program be continued on the existing licenced site as well as on the proposed Burlington Quarry extension lands and that this monitoring program be maintained for the duration of all blasting activities to permit timely adjustment to blast parameters as required.

While not specifically required as part of the required scope of the Blast Impact Analysis under the Aggregate Resources Act, this report reviews the topics of flyrock and residential water wells. Exhaustive details related to residential water wells are addressed in the hydrogeological report while specific flyrock control is addressed at the operational level given significant influences related to blast design, geology and field accuracy.

Recommendations are included in this report for blasting operations to be carried out in a safe and productive manner and to suitably manage and mitigate the possibility of damage to any buildings, wells, structures or residences surrounding the property.



EXISTING CONDITIONS

The current operating licensed area for the Nelson Aggregate Burlington Quarry (Licence 5499) is described as Concession 2, Lot 1 and 2 and Concession 3, Part Lot 1 and 2 – geographic City of Burlington. This property is bound by Colling Road to the Northeast, No. 2 Side Road to the Southeast, Burlington Springs Golf Club property to the Southwest and Guelph Line to the Northeast. The lands immediately surrounding the licence are sparsely populated with the areas of densest development lying to the Southwest.

The proposed Burlington Quarry extension is separated into two (2) areas designated as the South and West Extension Areas. The Burlington Quarry South Extension is legally described as Concession 2, Part Lot 17 and 18 and is located immediately Southeast of the existing licence separated by No. 2 Side Road. The Burlington Quarry South extension lands are bound by vacant lands to the Northeast and Southeast, No. 2 Side Road and the existing Burlington Quarry to the Northwest and residential properties located along No. 2 Side Road as well as the Camisle Golf Course to the Southwest. The South Extension lands are generally highest towards the Northeast boundary of the extension lands. The maximum elevations are in the order of 282MASL. The land drops in the South corner of the South extension lands to an elevation of approximately 274MASL.

The Burlington Quarry West Extension is legally described as Concession 2, Part Lot 1 & 2 and lies Southwest of the existing licence. The West Extension lands are bound by the existing quarry and Colling Road to the North, Cedar Springs Road and residential properties along Cedar Springs Road to the West, residential properties located along No. 2 Side Road and Cedar Springs Road to the South and East. The West Extension lands are generally highest towards the Northeast and South boundaries of the extension lands. The maximum elevations are in the order of 275MASL. The existing topography drops along the West boundary of the West Extension lands to an elevation of approximately 262MASL.

The licenced area for the proposed Burlington Quarry extension lands encompasses a total area of approximately 78.3HA. The associated extraction area is approximately 50.4HA when allowing for setbacks and sterilized areas.

The closest sensitive receptors located to the existing Burlington Quarry licence boundary and the proposed Burlington Quarry Extension extraction boundaries are listed in Table 1 below as well as on the Sensitive Receptor Overviews contained in Appendix A:

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Sensitive Receptor	Straight Line Distance from Existing Burlington Quarry Boundary to Receptor (m)	Straight Line Distance from proposed Burlington Quarry Extension Extraction Boundary to Receptor (m)	Extension Area Closest to Sensitive Receptor
2196 No. 2 Side Road	158	284	South
*2226 No. 2 Side Road	53	208	South
*2244 No. 2 Side Road	47	129	South
*2280 No. 2 Side Road	28	15	South
*2292 No. 2 Side Road	153	N/A	South
*2300 No. 2 Side Road	52	N/A	South
*2416 No. 2 Side Road	116	278	South
*2433 No 2 Side Road	69	280	South
2450 No. 2 Side Road	50	387	South
2462 No. 2 Side Road	60	423	South
2470 No. 2 Side Road	48	462	South
*2473 No. 2 Side Road	12	493	South
*2479 No. 2 Side Road	41	521	South
2485 No. 2 Side Road	75	549	South
2495 No. 2 Side Road	74	612	South
2496 No. 2 Side Road	449	636	South
2509 No. 2 Side Road	78	644	South
2519 No. 2 Side Road	118	664	South
4366 Guelph Line	613	740	South
4420 Guelph Line	380	517	South
4448 Guelph Line	349	663	South
4472 Guelph Line	312	674	South
4480 Guelph Line	288	669	South
4486 Guelph Line	183	535	South
4487 Guelph Line	329	672	South
4496 Guelph Line	282	668	South
5030 Guelph Line	35	697	South
<hr/>			
1385 No. 2 Side Road	560	285	West
1405 No. 2 Side Road	500	239	West
1425 No. 2 Side Road	453	202	West
*2015 No. 2 Side Road	307	95	West

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Sensitive Receptor	Straight Line Distance from Existing Burlington Quarry Boundary to Receptor (m)	Straight Line Distance from proposed Burlington Quarry Extension Extraction Boundary to Receptor (m)	Extension Area Closest to Sensitive Receptor
2080 No. 2 Side Road	144	143	West
2090 No. 2 Side Road	249	268	West
2102 No. 2 Side Road	90	118	West
2116 No. 2 Side Road	36	77	West
2126 No. 2 Side Road	39	100	West
2136 No. 2 Side Road	46	140	West
2170 No. 2 Side Road	167	298	West
5050 Cedar Springs Road	478	146	West
5070 Cedar Springs Road	523	154	West
5029 Cedar Springs Court	634	326	West
5059 Cedar Springs Court	620	279	West
5069 Cedar Springs Court	615	226	West
5079 Cedar Springs Court	610	188	West
5089 Cedar Springs Court	615	150	West
5106 Cedar Springs Court	735	237	West
5116 Cedar Springs Court	731	220	West
5132 Cedar Springs Court	738	245	West
5140 Cedar Springs Court	717	233	West
5158 Cedar Springs Road	707	237	West
5164 Cedar Springs Road	717	259	West
5165 Cedar Springs Road	625	189	West
5168 Cedar Springs Road	728	296	West
5172 Cedar Springs Road	729	266	West
5179 Cedar Springs Road	636	222	West
5191 Cedar Springs Road	542	139	West
5206 Cedar Springs Road	727	231	West
5214 Cedar Springs Road	747	234	West
5224 Cedar Springs Road	720	196	West
5234 Cedar Springs Road	712	184	West
*5235 Cedar Springs Road	327	N/A	West
5244 Cedar Springs Road	716	184	West
5245 Cedar Springs Road	642	110	West
5248 Cedar Springs Road	716	184	West
5254 Cedar Springs Road	713	173	West

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Sensitive Receptor	Straight Line Distance from Existing Burlington Quarry Boundary to Receptor (m)	Straight Line Distance from proposed Burlington Quarry Extension Extraction Boundary to Receptor (m)	Extension Area Closest to Sensitive Receptor
5255 Cedar Springs Road	637	103	West
5258 Cedar Springs Road	704	152	West
5264 Cedar Springs Road	705	138	West
5268 Cedar Springs Road	705	131	West
5300 Cedar Springs Road	721	146	West
5318 Cedar Springs Road	717	140	West
5336 Cedar Springs Road	710	144	West
5352 Cedar Springs Road	721	182	West
5353 Cedar Springs Road	524	149	West
5360 Cedar Springs Road	725	204	West
5380 Cedar Springs Road	752	284	West
2129 Colling Road	94	114	West
2139 Colling Road	67	103	West

* Denotes properties owned by the proponent. If these properties are unoccupied at the time of blasting operations or their use has changed (eg converted to offices) they will no longer be considered sensitive receptors and are thereby exempt from the MECP Guideline vibration and overpressure limits.

The structures located at 2280 No 2 Side Road located directly adjacent the proposed south expansion license are classified as culturally significant and will be vacant at the time of extraction. In this instance, 2280 No 2 Side Road would not qualify as a sensitive receptor as defined by the MECP (refer to Appendix E for Definitions). In order to safeguard the structural integrity of these structures, we recommend that vibrations at the 2280 No 2 Side Road property be maintained below 50mm/s (>40Hz) in accordance with research performed by the United States Bureau of Mines (USBM RI8507). The closest structure on the property shall be monitored for ground vibration and overpressure when vibration calculations suggest vibrations in excess of 35mm/s.



PROPOSED MINERAL EXTRACTION

As per the March 2020 Extraction Plan (Refer to Appendix A), the proposed initial quarry operations will commence with a sinking cut at the North corner of the Burlington Quarry South extension area. The South Extension Area will be extracted in three (3) phases designated as Phase 1a, Phase 1b and Phase 2. Retreat of the face will progress in a general Southeast direction.

Initial blasting for the South Extension lands will be located approximately 410m from the closest sensitive receptor not owned by the proponent outside of the proposed limits of extraction, namely 2450 No. 2 Side Road. (Note: The property located at 2280 No. 2 Sideroad is located approximately 205m from the initial blasting. This property is owned by the proponent and will be vacant upon commencement of extraction operations in which case it would be exempt from NPC 119 guideline limits. In the event that the property is being used a residence upon commencement of blasting, the NPC 119 limits would be applicable at this property). As operations progress during the South Extension, quarry faces along the Southwest limits of extraction will come as close as 15m removed from the closest receptor (namely 2280 No.2 Side Road) owned by the proponent or approximately 300m (namely 2196 No. 2 Side Road) to the closest privately owned sensitive receptor.

The Burlington Quarry West Extension will be extracted in four (4) phases designated as Phases 3 through 6 (Refer to Appendix A). The West Extension area will leverage the existing Southwest face of the Burlington Quarry in Phases 3 and 5 with a general East to West face retreat in Phase 3, 4 and 5. The Phase 6 face will retreat in a North to South direction leveraging the face created by the Phase 5 progress.

As operations progress during the Burlington Quarry West Extension, quarry faces along the East limits of extraction will come as close as 77m removed from the properties located on No. 2 Side Road. Table 2 denotes relevant extraction details as they pertain to each individual phase.

TABLE 2 Details for Extraction for Each Individual Phase of the Burlington Quarry Extension	
Phase 1a	<ul style="list-style-type: none">• Phase 1a will commence with a sinking cut in the Northeast corner of the Burlington Quarry South Extension lands• Extracted to a depth of 271MASL

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	<ul style="list-style-type: none"> Retreat in a general Southeasterly direction Likely extracted in 1-2 benches
Phase 1b	<ul style="list-style-type: none"> Initial operations for Phase 1b will leverage the existing face of Phase 1a thereby initially eliminating the need for a sinking cut. Extracted to a depth of 270MASL Retreat in a general Southeasterly direction Extracted in 1 bench
Phase 2	<ul style="list-style-type: none"> Initial operations of Phase 2 will leverage the existing face of Phase 1b thereby initially eliminating the need for a sinking cut. Once operations reach the quarry floor elevation achieved in Phase 1b a sinking cut will be required to extract rock to the Phase 2 final floor elevation of 252.5MASL. Extracted to a depth of 252.5MASL Retreat in a general Southeasterly direction. Likely extracted in 1-2 benches
Phase 3	<ul style="list-style-type: none"> Phase 3 will commence along the Southwest corner of the Burlington Quarry West Extension lands Phase 3 will leverage the existing face of the Burlington Quarry thereby eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly direction Likely extracted in 2-3 benches
Phase 4	<ul style="list-style-type: none"> Phase 4 will leverage the face of the previously excavated Phase 3 therefore eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly direction Likely extracted in 2-3 benches
Phase 5	<ul style="list-style-type: none"> Phase 5 will leverage the existing West face of the Burlington Quarry therefore eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly direction Likely extracted in 2-3 benches
Phase 6	<ul style="list-style-type: none"> Phase 6 will leverage the face of the previously excavated Phase 5 thereby eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Southerly direction Likely extracted in 2-3 benches

Current practice at the Nelson Aggregate Burlington Quarry operation employs 102-152mm diameter blast holes with a typical load per delay of between 10kg

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and 400kg per period. Calculations contained within this report suggest modifications to current blast designs will be necessary as operations progress towards adjacent receptors.

It is a recommendation of this report that all blasts shall, as a minimum, be monitored at the nearest sensitive receptors, or closer, in front and behind any given blast in order to ensure constant compliance with MECP guideline limits and to permit timely adjustment to blast designs as required.



BLAST VIBRATION AND OVERPRESSURE LIMITS

The Ontario MECP guidelines for blasting in quarries are among the most stringent in North America.

Recent studies by the U.S. Bureau of Mines have shown that normal temperature and humidity changes can cause more damage to residences than blast vibrations and overpressure in the range permitted by the MECP. The limits suggested by the MECP are as follows.

Vibration_____ 12.5mm/s Peak Particle Velocity (PPV)

Overpressure_____ 128dB Peak Sound Pressure Level (PSPL)

The above guidelines apply when blasts are being monitored. Cautionary levels are slightly lower and apply when blasts are not monitored on a routine basis. It is a recommendation of this report that all blasts at the operation be monitored to quantify and record ground vibration and overpressure levels employing a minimum of two (2) digital seismographs, one installed at the closest receptor behind the blast, or closer, and one installed at the closest receptor in front of the blast, or closer.



BLAST MECHANICS AND DERIVATIVES

The detonation of explosives within a blast hole results in the development of very high gas and shock pressures. This energy is transmitted to the surrounding rock mass, crushing the rock immediately surrounding the borehole (approximately 1 borehole radius) and permanently distorts the rock to several borehole diameters (5-25, depending on the rock type, prevalence of joint sets, etc).

The intensity of this stress wave decays quickly so that there is no further permanent deformation of the rock mass. The remaining energy from the detonation travels through the unbroken material in the form of a pressure wave or shock front which, although it causes no plastic deformation of the rock mass, is transmitted in the form of vibrations.

Particle velocity is the descriptor of choice when dealing with vibrations because of its superior correlation with the appearance of cosmetic cracking. As such, for the purposes this report, ground vibration units have been listed in mm/s.

In addition to the ground vibrations, overpressure, or air vibrations, are generated through the direct action of the explosive venting through cracks in the rock or through the indirect action of the rock movement. In either case, the result is a pressure wave which travels through the air, measured in linear decibels (or dBL) for the purposes of this report.



VIBRATION AND OVERPRESSURE THEORY

Transmission and decay of vibrations and overpressure can be estimated by the development of attenuation relations. These relations utilize empirical data relating measured velocities at specific separation distances from the vibration source to predict particle velocities at variable distances from the source. While the resultant prediction equations are reliable, divergence of data occurs as a result of a wide variety of variables, most notably site-specific geological conditions and blast geometry and design for ground vibrations and local prevailing climatic conditions for overpressure.

In order to circumvent this scatter and improve confidence in forecast vibration levels, probabilistic and statistical modeling is employed to increase conservatism built into prediction models, usually by the application of 95% confidence lines to attenuation data.

The attenuation relations are not designed to conclusively predict vibration levels at a specific location as a result of a specific blast design, application of this probabilistic model creates confidence that for any given scaled distance, 95% of the resultant velocities will fall below the calculated 95% regression line.

While the data still provides insight into probable vibration intensities, attenuation relations for overpressure tends to be less reliable and precise than results for ground vibrations. This is due primarily to wider variations in variables outside of the influence of the blast design which impact propagation of the vibrations. Atmospheric factors such as temperature gradients and prevailing winds (refer to Appendix B) as well as local topography can all serve to significantly alter overpressure attenuation characteristics.

Our experience and analysis demonstrates that blast overpressure is greatest when blasting towards receptors, and blast vibrations are greatest when retreating towards the receptors.

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VIBRATION LEVELS AT THE NEAREST SENSITIVE RECEPTOR

The most commonly used formula for predicting PPV is known as the Bureau of Mines (BOM) prediction formula or Propagation Law. We have used this formula to predict the PPV's at the closest house for the initial operations.

$$PPV = k \left(\frac{d}{\sqrt{w}} \right)^e$$

Where, PPV = the predicted peak particle velocity (mm/s)

K, e = site factors

d = distance from receptor (m)

w = maximum explosive charge per delay (kg)

The value of K is variable and is influenced by many factors (i.e. rock type, geology, thickness of overburden, blast parameters, etc.). Based on the data collected from the previous attenuation study prepared by Golder Associates, the values for "e" and "K" have been established at -1.32 and 896 respectively (refer to Appendix C).

An **example** of this calculation is as follows:

For a distance of 410m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the initial blasting of **Phase 1a** not owned by the proponent, namely 2450 No. 2 Sideroad) and a maximum explosive weight of 80kg (10m deep, 102mm blast hole, 2.4m collar, single hole per period), we can calculate the maximum PPV at the nearest receptor as follows:

$$ppv = 896 \left(\frac{410}{\sqrt{80}} \right)^{-1.32} = 5.75 \text{ mm / s}$$

As discussed in previous sections, the MECP guideline for blast-induced vibration is 12.5 mm/s (0.5 in/s). The calculated PPV based on the design parameters above would remain compliant at a calculated value of 5.75mm/s.

As noted previously, In the event that the proponent owned unit located at 2280 No. 2 Side Road qualifies as a sensitive receptor at the commencement of

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blasting, the above theoretical design would need to be adjusted to ensure compliance with MECP guidelines (i.e at a separation distance of 205m and a load of 80kg per delay, the above calculation results in a calculated vibration level of 14.35mm/s).

For the Phase 3 area in the West Extension lands it is recommended that the initial blasting take place in the North corner of the common boundary between the extension lands and the existing quarry. At a separation distance of 350m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the initial blasting of **Phase 3** not owned by the proponent, namely 2116 No. 2 Side Road, and a maximum explosive load per delay of 85kg (20m deep, 102mm blast hole, 2.5m surface collar, 2 explosive decks, single deck per period), we can calculate the maximum PPV at the nearest receptor to be 7.37mm/s.

Based on the data collected from the previous attenuation study, Table 3 below denotes the theoretical maximum charge per delay that can be used given the standoff distance to the nearest sensitive receptor:

TABLE 3 Maximum Load per Delay based on varied Stand-off Distance from Sensitive Receptors to Maintain 12.5mm/s Vibration Limit	
Distance from Sensitive Receptor (m)	Maximum Load per Delay (kg)
100	15.5
125	24.1
150	34.8
175	47.3
200	61.8
225	78.2
250	96.5
275	116.8
300	139.0

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As the separation distance between the blast and closest receptor decreases, it will be necessary to adjust blast parameters to ensure continued compliance with the guideline limit. Fortunately, a variety of blast design alternatives are available to accomplish this including but not limited to reductions in blast hole diameter, change in explosives types, adjustment in bench heights and decking of holes. Given the planned phasing of the extension, vibration data will be continually collected and analyzed as the adjacent receptors are approached in order to confirm the requirement for any design modifications.

OVERPRESSURE LEVELS AT THE NEAREST SENSITIVE RECEPTOR

It is unusual for overpressure to reach damaging levels, and when it does, the evidence is immediate and obvious in the form of broken windows in the area. However, overpressure remains of interest due to its ability to travel further distances as well as cause audible sounds and excitation in windows and walls.

Air overpressure decays in a known manner in a uniform atmosphere, however, a uniform atmosphere is not a normal condition. As such, air overpressure attenuation is far more variable due to its intimate relationship with environmental influences. Air vibrations decay slower than ground vibrations with an average decay rate of 6dB for every doubling of distance.

As part of the attenuation study performed on site, air overpressure levels were measured and analyzed using cube root scaling based on the following equation:

$$PSPL = k \left(\frac{d}{\sqrt[3]{w}} \right)^e$$

Where, PSPL = the peak sound pressure level particle velocity (dB)

K, e = site factors

d = distance from receptor (m)

w = maximum explosive charge per delay (kg)

The collection of points gathered in the linear arrays emanating from each blast vibration were again analyzed and used to develop the following 95% regression equation (refer to Appendix C). Based on the data collected from the previous attenuation study prepared by Golder Associates, the values for "e" and "K" have been established at -0.0867 and 181 respectively (refer Appendix C).

$$PSPL = 181 \left(\frac{D}{\sqrt[3]{W}} \right)^{-0.0867}$$

As discussed in previous sections, the MECP guideline for blast-induced overpressure is 128dB. For a separation distance of 410m (i.e. the standoff

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distance to the closest existing structure located outside of the extraction limits in front of the blast for initial blasting for **Phase 1a** not owned by the proponent, namely 2450 No. 2 Sideroad) and a maximum explosive weight of 80kg per delay (10m deep, 102mm blast hole, 2.4m collar, single hole per period delay), we can calculate the PSPL at the nearest receptor as follows:

$$PSPL = 181 \left(\frac{410}{\sqrt[3]{80}} \right)^{-0.0867} = 121.94dB(L)$$

As discussed in previous sections, the MECP guideline for blast-induced overpressure is 128dB(L). The calculated overpressure based on the above blast parameters would remain compliant at a calculated value of 121.94dB(L).

In the event that the proponent owned unit located at 2280 No. 2 Sideroad qualifies as a sensitive receptor at the commencement of blasting, the above theoretical design would need to be adjusted to ensure compliance with MECP guidelines (i.e at a separation distance of 205m and a load of 80kg per delay, the above calculation results in a calculated overpressure level of 129.5dB(L).

For the Phase 3 area in the West Extension lands, we again assume initial blasting will take place in the North corner of the common boundary between the extension lands and the existing quarry. At a separation distance of 350m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the proposed initial blasting of **Phase 3** not owned by the proponent, namely 2116 No 2 Side Road and a maximum explosive load per delay of 85kg (20m deep, 102mm blast hole, 2.5m surface collar, 2 explosive decks, single deck per period), we can calculate the maximum overpressure at the nearest receptor to be 123.84dB(L).

We reiterate that air overpressure attenuation is far more variable due to its intimate relationship with environmental influences and as such, the equation employed is less reliable than that developed for ground vibration. Overpressure monitoring performed on site shall be used to guide blast design as it pertains to the control of blast overpressures. Given the intimate correlation between overpressure and environmental conditions, care must be taken to avoid blasting on days when weather patterns are less favourable.



ADDITIONAL CONSIDERATIONS OUTSIDE OF THE BLAST IMPACT ANALYSIS SCOPE

The following headings are addressed for general information purposes and are not strictly required as part of the scope of the Blast Impact Analysis as required under the ARA to ensure compliance with MECP NPC-119 guidelines. The hydrogeological study prepared by EarthFX and Azimuth Environmental Consulting as part of the licence application will address residential water wells in detail. Flyrock control is addressed at the operational level given significant influences related to blast design, geology and field accuracy which render concrete recommendations related to control inappropriate at the licencing phase.

SUN CANADIAN HIGH PRESSURE OIL PIPELINE

A Sun Canadian High Pressure Oil Pipeline runs parallel to Colling Road adjacent to Phase 5 of the of the proposed West expansion quarry limits (refer to Appendix A). The MECP guideline for blast-induced vibration (12.5mm/s) does not apply to pipelines as they are not classified as sensitive receptors. Sun Canadian Policy employs a 50mm/s vibration limit for welded steel pipelines. For the Phase 5 area in the West Extension lands it is recommended that the initial blasting take place in the South corner of the common boundary between the extension lands of Phase 5 and the existing quarry. Initial blasting operations will take place approximately 370m from the subject pipeline if they are initiated at the South corner, however, will reach as close as 12.8m throughout the course of the Phase 5 extraction.

Applying the equation from Predicated Vibration Limits at the Nearest Sensitive Receptor, for a distance of 370m (the conservative standoff distance to the pipeline for the initial blasting in **Phase 5**) and a maximum explosives load per delay of 177kg (20m deep, 102mm blast hole, 2.5m collar, single hole per period), we can calculate the maximum PPV at the pipeline as follows for the initial blast:

$$ppv = 896 \left(\frac{370}{\sqrt{177}} \right)^{-1.32} = 11.12 \text{ mm / s}$$

The calculated 95% predicted PPV (based on the proposed blasting data discussed above) would be 11.12mm/s, well below the Sun Canadian limit of

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50mm/s for a steel welded pipeline located adjacent to the proposed quarry. While this initial value resides below the required threshold, it is anticipated that design modifications will be necessary to maintain compliance as the separation distance to the pipeline decreases and column loads increase. Fortunately, a variety of blast design alternatives are available to accomplish this including but not limited to reductions in blast hole diameter, change in explosives types, adjustment in bench heights and decking of holes.

We do note that the Sun Canadian Blasting Specification requires the presence of a vibration monitoring program conducted by an independent third party engineer when blasting operations are to be conducted within 60m of a pipeline. The proposed Operational Plan dictates that blasting is to encroach within approximately 12.8m of the ROW and as such, it remains a recommendation of this report that an independent third party firm be retained to conduct vibration monitoring on this pipeline when separation encroaches within 60m of the pipeline or when calculations suggest ground vibrations in excess of 35mm/s as measured at the pipeline are anticipated. The results of this monitoring program will determine what alterations shall be necessary as the separation distance to the subject pipeline decreases.

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FLYROCK

Flyrock is the term used to define rocks which are propelled from the blast area by the force of the explosion. This action is a predictable and necessary component of a blast and requires that every blast have an exclusion zone established within which no persons or property which may be harmed are permitted.

Government regulations strictly prohibit the ejection of flyrock off of a quarry property. The regulations regarding flyrock are enforced by the Ministries of Natural Resources and Forestry, Environment, Conservation and Parks and Labour. In the event of an incident where flyrock does leave a site, the punitive measures include suspension / revocation of licences and fines to both the blaster and quarry owner / operator. Fortunately, flyrock incidents are extremely rare due to the possible serious consequences of such an event. It is in the best interest of all, stakeholders and non-stakeholders, to ensure that dangerous flyrock does not occur. Through proper blast planning and design, it is possible to control and mitigate the possibility for flyrock.

THEORETICAL HORIZONTAL FLYROCK CALCULATIONS

Flyrock occurs when explosives in a hole are poorly confined by the stemming or rock mass and the high pressure gas breaks out of confinement and launches rock fragments into the air. The three primary sources of fly rock are as follows:

- **Face burst:** Lack of confinement by the rock mass in front of the blast hole results in fly rock in front of the face.
- **Cratering:** Insufficient stemming height or weakened collar rock results in a crater being formed around the hole collar with rock projected in any direction.
- **Stemming Ejection:** Poor stemming practice can result in a high angle throw of the stemming material and loose rocks in the blasthole wall and collar.

The horizontal distance flyrock can be thrown (L_H) from a blast hole is determined using the expression:

EXPLOTECH

$$L_H = \frac{V_o^2 \sin 2\theta_0}{g} \quad [1]$$

where:

V_o = launch velocity (m/s)

θ_0 = launch angle (degrees)

g = gravitational constant (9.8 m/s²)

The theoretical maximum horizontal distance fly rock will travel occurs when $\theta_0 = 45$ degrees, thereby yielding the equation:

$$L_{H \max} = \frac{V_o^2}{g} \quad [2]$$

The normal range of launch velocity for blasting is between 10m/s - 30m/s. To calculate the launch velocity of a blast the following formula is used:

$$V_o = k \left(\frac{\sqrt{m}}{B} \right)^{1.3} \quad [3]$$

where:

k = a constant

m = charge mass per meter (kg/m)

B = burden (m)

By combining equations 2 and 3 and taking into account the different sources of fly rock, the following equations can be used to calculate the maximum fly rock thrown from a blast:

Face burst:

$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{B} \right)^{2.6}$$

EXPLOTECH

Cratering:
$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{SH} \right)^{2.6}$$

Stemming Ejection:
$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{SH} \right)^{2.6} \sin 2\theta$$

where: θ = drill hole angle
 $L_{h\max}$ = maximum flyrock throw (m)
 m = charge mass per meter (kg/m)
 B = burden (m)
 SH = stemming height (m)
 g = gravitational constant
 k = a constant

For flyrock calculation purposes, we have applied the current blasting parameters used in the Burlington Quarry which utilize 102mm (4") diameter holes on a 3.5m x 3.5m (11.5'x 11.5') pattern, with total depths of up to 24m (80') and a collar length of 2m (8').

The range for the constant k is 13.5 for soft rocks and 27 for hard rocks. Given the proposed licence area is predominantly dolostone, we have applied a k value of 20. The explosive density is assigned to be 1.2 g/cc for emulsion products and the drill hole angles are assumed to be 90 degrees (i.e. vertical).

The following does not apply to the sinking cut which will require highly specialized designs and additional considerations for flyrock. Based on a free face blast, maximum anticipated horizontal flyrock projection distances are calculated as follows in Table 4:

Table 4 – Maximum Flyrock Horizontal		
Collar Lengths (m)	Maximum Throw Face Burst (m)	Maximum Throw Cratering and Stemming Ejection (m)
1.5	30	274
2.0	30	129
2.5	30	72
3.0	30	45
3.5	30	30

Different collar lengths are displayed in the table above to account for over or under loaded holes. As demonstrated with these various collar lengths, any deviation, no matter how slight, can greatly affect these maximum values. Blast mats or sand can be placed on top of the shot to further reduce the distance for potential flyrock.

Through proper blast design and diligence in inspecting the geology before every blast, flyrock can readily be maintained within the quarry limits. It may be necessary to increase collars and adjust designs accordingly when blasting along the perimeter to accommodate the reduced distance to receptors and to ensure flyrock remains within the property limit.



RESIDENTIAL WATER WELLS

Possible impacts to the water quality and production capacity of groundwater supply wells is a common concern for residents near blasting operations. Complaints related to changes in water quality often include the appearance of turbidity, water discolouration and changes in water. Complaints regarding water production most often involve loss of quantity production, air in water and damage to well screens and casings. A review of research and common causes of these problems indicates that most of these concerns are not related to blasting and can be shown to be the direct impact of environmental factors and poor well construction and maintenance.

There is an intuitive belief that blasting operations have dramatic and disastrous impacts on residential water wells for large distances around such operations. Unfortunately, there is no scientific basis for such claims. Outside of the immediate radius of approximately 20-25 blasthole diameters from a loaded hole, there is no permanent ground displacement. As such, barring blasting activity within several meters of an existing well, the probability of damage to residential wells is essentially non-existent.

Despite the scientific support for the above conclusion, numerous studies have been performed to verify the validity of this statement. These studies have investigated the effects of blasting on varied well configurations and in varied geological mediums to ensure results could be readily extrapolated to all blasting operations. The conclusion of these studies has confirmed that with the exception of possible temporary increases in turbidity, blasting operations did not result in any permanent impact on wells outside of the immediate blast zone of the blast until vibrations levels reached exceedingly high intensities. Applying universally accepted threshold levels for ground vibrations eliminates the possibility for any long term adverse effects on wells in the vicinity of blasting operations.

In a study by Froedge (1983), blast vibration levels of up to 32.3mm/s were recorded at the bottom of a shallow well located at a distance of 60 meters (200 feet) from an open pit blast. There was no report of visible damage to the well nor was there any change in the water pumping flow rate. This study concluded that the commonly accepted limit of 50mm/s PPV level is adequate to protect wells from any damage. We reiterate, the current guideline limit for vibrations from quarry and mining operations is 12.5mm/s.



REVIEW OF HISTORICAL BURLINGTON QUARRY DATA

A vibration and overpressure monitoring program has been in place for all blasts conducted at the Nelson Aggregate Burlington Quarry in recent years. As part of this analysis, Nelson Aggregates has provided copies of vibration data summaries collected for 2014 through 2019 inclusive. For continuity, summaries of the historical data collected and supplied by Nelson Aggregate are included in Appendix C to this report.

2014-2019 DATA

Vibration monitoring conducted during 2014 – 2019 has included the installation of seismographs at the following locations:

- 2479 No. 2 Side Road
- 2470 No. 2 Side Road
- 2450 No. 2 Side Road
- 2582 No. 2 Side Road
- Southwest Corner of the Quarry property along No. 2 Side Road (N 43.39339, W 79.88880)
- Colling Road and Blind Line Intersection (N 43.40605, W 79.89400)
- Northwest Corner of the Quarry Property along Colling Road
- Gas Line (N 43.40466, W 79.88098)

All vibration monitoring was performed by either the blasting contractor or the quarry owner. A review of the data supplied confirms that for 2014 through 2019 inclusive, two (2) blasts exceeded the MECP guideline limit of 12.5mm/s set for ground vibrations, while sixteen (16) blasts exceeded the MECP guideline limit of 128dB for overpressure. Table 5 below lists the blasts that exceeded these limits:



Table 5: Exceedances of NPC 119 Recorded During 2014-2019 Blasting Operations				
Date	Time	Location	Limit Exceeded	Value of Exceedance
August 25, 2014	13:52	*SW Corner	>128dB(L)	132.2dB(L)
September 16, 2014	12:12	*Colling Road and Blind Line Intersection	>128dB(L)	134.6dB(L)
October 2, 2014	13:40	*2479 # 2 Side Road	>128dB(L)	131.8dB(L)
October 22, 2014	12:02	*SW Corner	>128dB(L)	128.4dB(L)
November 11, 2014	12:00	*2479 # 2 Side Road	>128dB(L)	130.6dB(L)
November 24, 2014	12:08	*2479 # 2 Side Road	>128dB(L)	128.7dB(L)
December 2, 2014	11:57	*Colling Road and Blind Line Intersection	>128dB(L)	132.8 dB(L)
June 12, 2015	12:18	*SW Corner	>128dB(L)	133.0 dB(L)
June 17, 2015	12:03	*Colling Road and Blind Line Intersection	>128dB(L)	130.7 dB(L)
July 13, 2015	12:02	*Colling Road and Blind Line Intersection	>128dB(L)	129.2 dB(L)
July 30, 2015	12:00	*2479 # 2 Side Road	>128dB(L)	130.7 dB(L)
September 1, 2015	12:01	*2479 # 2 Side Road	>128dB(L)	130.5 dB(L)
October 21, 2015	12:03	*2479 # 2 Side Road	>128dB(L)	134.3 dB(L)
May 4 , 2016	12:00	SW Corner	>12.5mm/s	12.8 mm/s
May 9 , 2016	12:00	Colling Road	>128dB(L)	129.5 dB(L)
July 5, 2016	12:00	Colling Road	>128dB(L)	128.3 dB(L)
August 30, 2016	12:00	Colling Road	>128dB(L)	128.8 dB(L)
April 11, 2017	11:56	SW Corner	>12.5mm/s	15.6 mm/s

* These locations are assumed but cannot be verified due to insufficient information being recorded during the 2014 and 2015 blasting campaigns.

Although the above table denotes exceedances of the MECP guidelines, given the heavy conservatism inherent to the guideline, the risk of damage associated with these vibrations and overpressures remain extremely low.



RECOMMENDATIONS

It is recommended that the following conditions be applied for all blasting operations at the proposed Nelson Aggregates – Burlington Quarry Extension areas:

1. All blasts shall be monitored for both ground vibration and overpressure at the closest privately owned sensitive receptors adjacent the site, or closer, with a minimum of two (2) instruments – one installed in front of the blast and one installed behind the blast.
2. In order to safeguard the structural integrity of the structures located at 2280 No 2 Side Road, ground vibrations shall be maintained below 50mm/s (>40Hz) in accordance with research performed by the United States Bureau of Mines (USBM R18507). The closest structure located at 2280 No 2 Side Road shall be monitored for ground vibration and overpressure when vibration calculations suggest vibrations in excess of 35mm/s.
3. All blasts within 60m of the adjacent Sun-Canadian High Pressure Oil Pipeline will be designed and monitored by a registered engineer, licensed in the province of Ontario or any distance specified in later revisions of the Sun-Canadian guidelines or when vibration calculations suggest vibrations in excess of 35mm/s at the pipeline.
4. The guideline limits for vibration and overpressure shall adhere to standards as outlined in the MECP Model Municipal Noise Control By-law publication NPC 119 (1978) or any such document, regulation or guideline which supersedes this standard.
5. In the event of an exceedance of NPC 119 limits or any such document, regulation or guideline which supersedes this standard, blast designs and protocol shall be reviewed prior to any subsequent blasts and revised accordingly in order to return the operations to compliant levels.
6. Orientation of the aggregate extraction operation will be designed and maintained so that the direction of the overpressure propagation will be away from structures as much as possible.
7. Blast designs shall be continually reviewed with respect to fragmentation, ground vibration and overpressure. Blast designs shall be modified as

EXPLOTECH

required to ensure compliance with current applicable guidelines and regulations.

8. Blasting procedures such as drilling and loading shall be reviewed on a yearly basis and modified as required to ensure compliance with industry standards.
9. Detailed blast records shall be maintained in accordance with current industry best practices

The blast parameters described within this report are supported by the modeling in the attached appendices. As the quarry progresses and as site-specific data is collected from the on-going operation, the blast parameters can be refined, as necessary, to ensure continual compliance with MECP Guidelines.



CONCLUSION

Blasting operations required for mineral extraction at the proposed Nelson Aggregates – Burlington Quarry Extension lands can be carried out safely and within governing guidelines set by the Ministry of the Environment, Conservation and Parks.

Modern blasting techniques will permit blasting to take place with explosives charges below allowable charge weights ensuring that blast vibrations and overpressure will remain minimal at the nearest receptors.

Appendix A

- 5390 Cedar Spring Road
- 5380 Cedar Spring Road
- 5353 Cedar Spring Road
- 5360 Cedar Spring Road
- 5336 Cedar Spring Road
- 5318 Cedar Springs Road
- 5300 Cedar Springs Road
- 5264 Cedar Springs Road
- 5255 Cedar Spring Road
- 5254 Cedar Springs Road
- 5248 Cedar Springs Road
- 5244 Cedar Springs Road
- 5235 Cedar Springs Road
- 5224 Cedar Springs Road
- 5206 Cedar Springs Road
- 5191 Cedar Springs Road
- 5179 Cedar Springs Road
- 5165 Cedar Springs Road
- 5164 Cedar Springs Road
- 5158 Cedar Springs Road
- 5140 Cedar Springs Court
- 5132 Cedar Springs Court
- 5116 Cedar Springs Court
- 5106 Cedar Springs Court
- 5089 Cedar Springs Court
- 5079 Cedar Springs Court
- 5070 Cedar Springs Road
- 5069 Cedar Springs Court
- 5050 Cedar Springs Road
- 5050 Cedar Springs Court
- 1405 2 Side Road
- 1385 2 Side Road
- 1425 2 Side Road
- 2136 2 Side Road
- 2126 2 Side Road
- 2080 2 Side Road
- 2102 2 Side Road
- 2170 2 Side Road
- 2196 2 Side Road
- 2090 2 Side Road
- 2152 2 Side Road
- 2224 2 Side Road
- 2292 2 Side Road
- 2196 2 Side Road
- 2300 2 Side Road
- 2280 2 Side Road
- 2450 2nd Side Road
- 2433 No 2 Side Road
- 2473 2 Side Road
- 2470 2 Side Road
- 2482 2 Side Road
- 2496 No 2 Side Road
- 2479 2 Side Road
- 5030 Guelph Line
- 2509 2 Side Road
- 2519 2 Side Road
- 4496 Guelph Line
- 4486 Guelph Line
- 4480 Guelph Line
- 4487 Guelph Line
- 4472 Guelph Line
- 4448 Guelph Line
- 4420 Guelph Line
- 4366 Guelph Line



West Extension

Existing Burlington Quarry Licence No. 5499

Existing Burlington Quarry Licence No. 5499

Area subject to any future Size Place Amendment to reduce setback limits

Burlington Quarry South Extension

Google Earth

2080 2 Side Road
2102 2 Side Road

2126 2 Side Road
2136 2 Side Road

2170 2 Side Road
2196 2 Side Road

2226 2 Side Road
2244 2 Side Road

2280 2 Side Road
2300 2 Side Road

2292 2 Side Road

2433 No 2 Side Road

2450 2nd Side Road

2416 2 Side Road

2470 2 Side Road
2462 2 Side Road

5030 Guelph Line
2509 2 Side Road
2495 2 Side Road
2485 2 Side Road
2519 2 Side Road
2479 2 Side Road

2496 No 2 Side Road

4496 Guelph Line
4486 Guelph Line
4487 Guelph Line
4480 Guelph Line
4472 Guelph Line
4448 Guelph Line

4420 Guelph Line

4366 Guelph Line





280 2 Side Road

2300 2 Side Road

2450 2nd Side Road

2470 2 Side Road

2462 2 Side Road

2416 2 Side Road

4496 Guelph Line

2292 2 Side Road

4486 Guelph Line

4487 Guelph Line

4480 Guelph Line

4472 Guelph Line

4448 Guelph Line

Burlington Quarry
South Extension

4420 Guelph Line

4366 Guelph Line

Google Earth



Existing Burlington Quarry
Licence No. 5499

2280 2 Side Road

2300 2 Side Road

2292 2 Side Road

Shed

House

Shed

Barn

Shed

2416 2 Side Road

2450 2nd Side Road

2462 2 Side Road

2470 2 Side Road

4486 Guelph Line

4486 Guelph Line

4487 Guelph Line

4480 Guelph Line

4472 Guelph Line

4448 Guelph Line

4420 Guelph Line

Google Earth



Burlington
West Extension

Existing Burlington Quarry
Licence No. 5499

Existing Burlington
Licence No. 5499

Area subject to separate
Site Plan Amendment to
reduce setback to 10m

Burlington Quarry
South Extension

Google Earth

Springs Road

Springs Road

5 2 Side Road

425 2 Side Road

2015 2 Side Road

2080 2 Side Road

2102 2 Side Road

2126 2 Side Road

2136 2 Side Road

2196 2 Side Road

2170 2 Side Road

2244 2 Side Road
2226 2 Side Road

2280 2 Side Road

2292 2 Side Road

2300 2 Side Road

2090 2 Side Road



Burlington Quarry
West Extension

Area subject to separate
Site Plan Amendment to
reduce setback to 0m

Existing Burlington
Licence No



5300 Cedar Springs Road

5268 Cedar Springs Road

5264 Cedar Springs Road

5258 Cedar Springs Road

5254 Cedar Springs Road

5248 Cedar Springs Road

5244 Cedar Springs Road

5234 Cedar Springs Road

5224 Cedar Springs Road

5214 Cedar Springs Road

5206 Cedar Springs Road

5172 Cedar Springs Road

5188 Cedar Springs Road

5164 Cedar Springs Road

5158 Cedar Springs Road

5255 Cedar Spring Road

5245 Cedar Spring Road

5235 Cedar Springs Road

5191 Cedar Springs Road

5179 Cedar Springs Road

5165 Cedar Springs Road

Burlington Quarry
West Extension

Clubhouse

Golf Course
Irrigation
Channel

Google Earth

- 5390 Cedar Spring Road
- 5380 Cedar Spring Road
- 5353 Cedar Spring Road
- 5360 Cedar Spring Road
- 5352 Cedar Spring Road
- 5336 Cedar Spring Road
- 5318 Cedar Springs Road
- 5300 Cedar Springs Road
- 5268 Cedar Springs Road
- 5264 Cedar Springs Road
- 5258 Cedar Springs Road
- 5254 Cedar Springs Road
- 5255 Cedar Spring Road
- 5248 Cedar Springs Road
- 5245 Cedar Spring Road
- 5244 Cedar Springs Road
- 5234 Cedar Springs Road
- 5224 Cedar Springs Road
- 5235 Cedar Springs Road
- 2129 Colling Road
- 2139 Colling Road

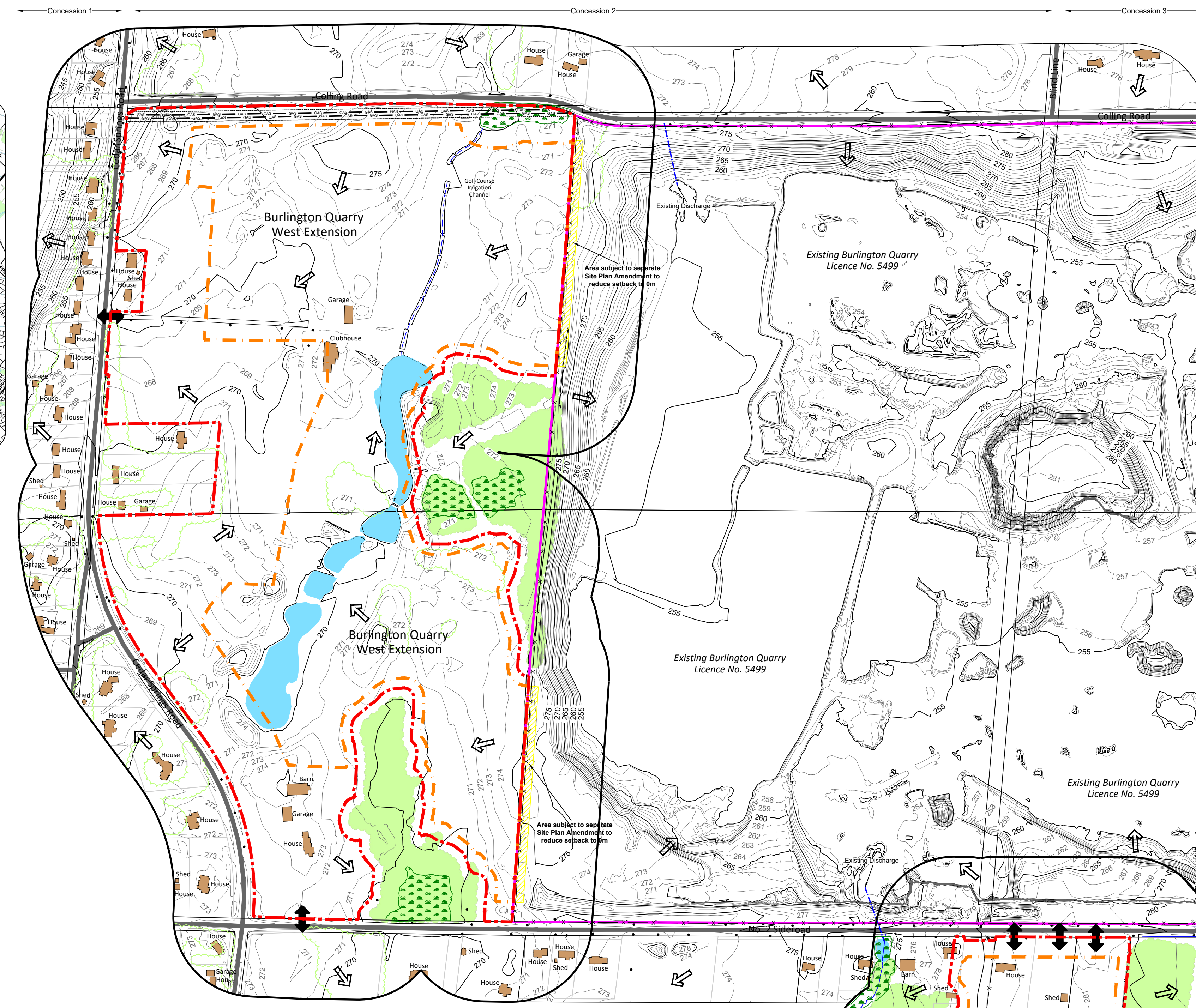
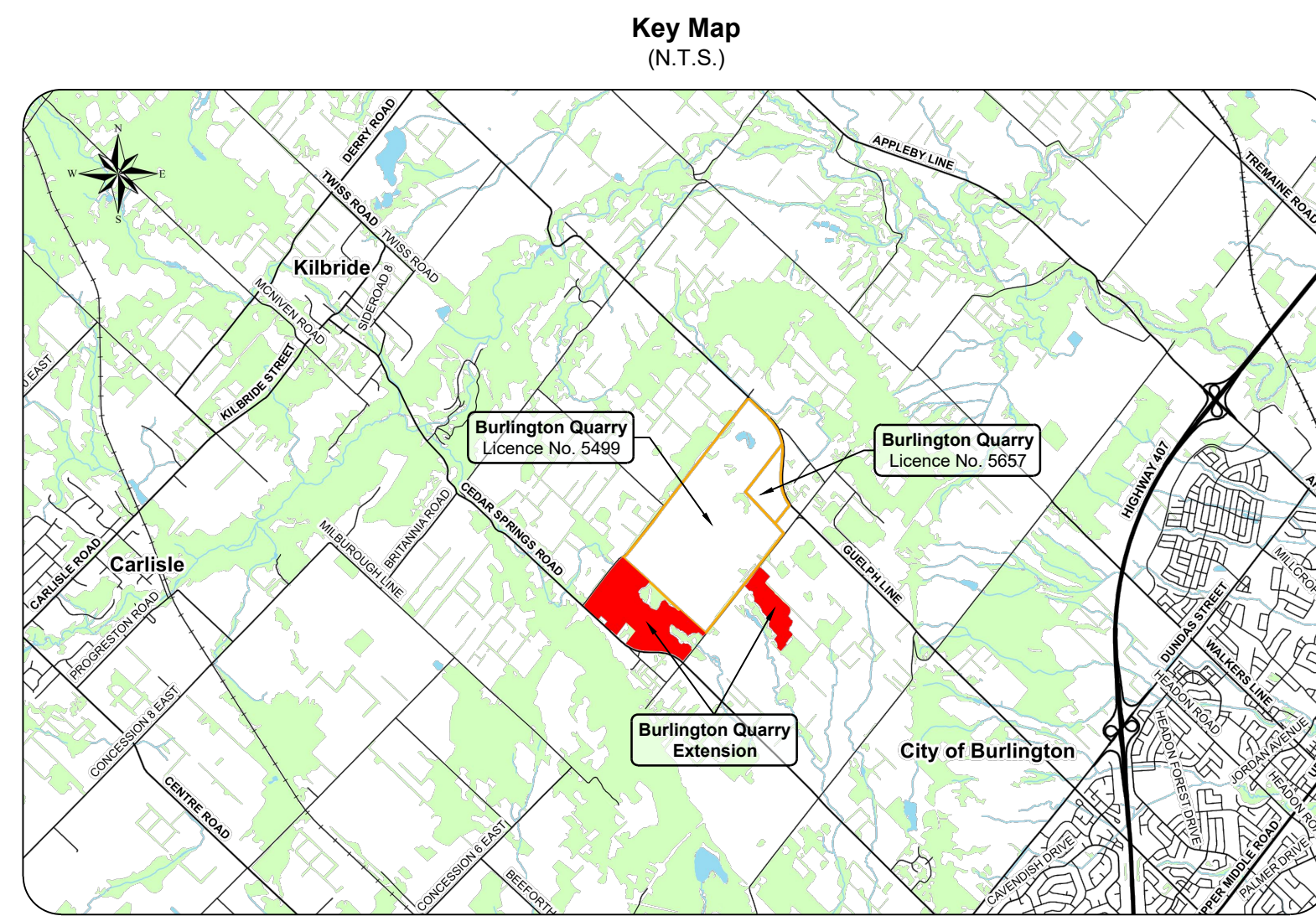
Burlington Quarry West Extension

Colling Road

Golf Course Irrigation Channel

Clubhouse

Area subject to separate Site Plan Amendment to reduce setback to 0m



Legal Description
 Part Lot 1 & 2, Concession 2 and Part Lot 17 & 18, Concession 2 NDS
 (former geographic Township of Nelson)
 City of Burlington
 Region of Halton

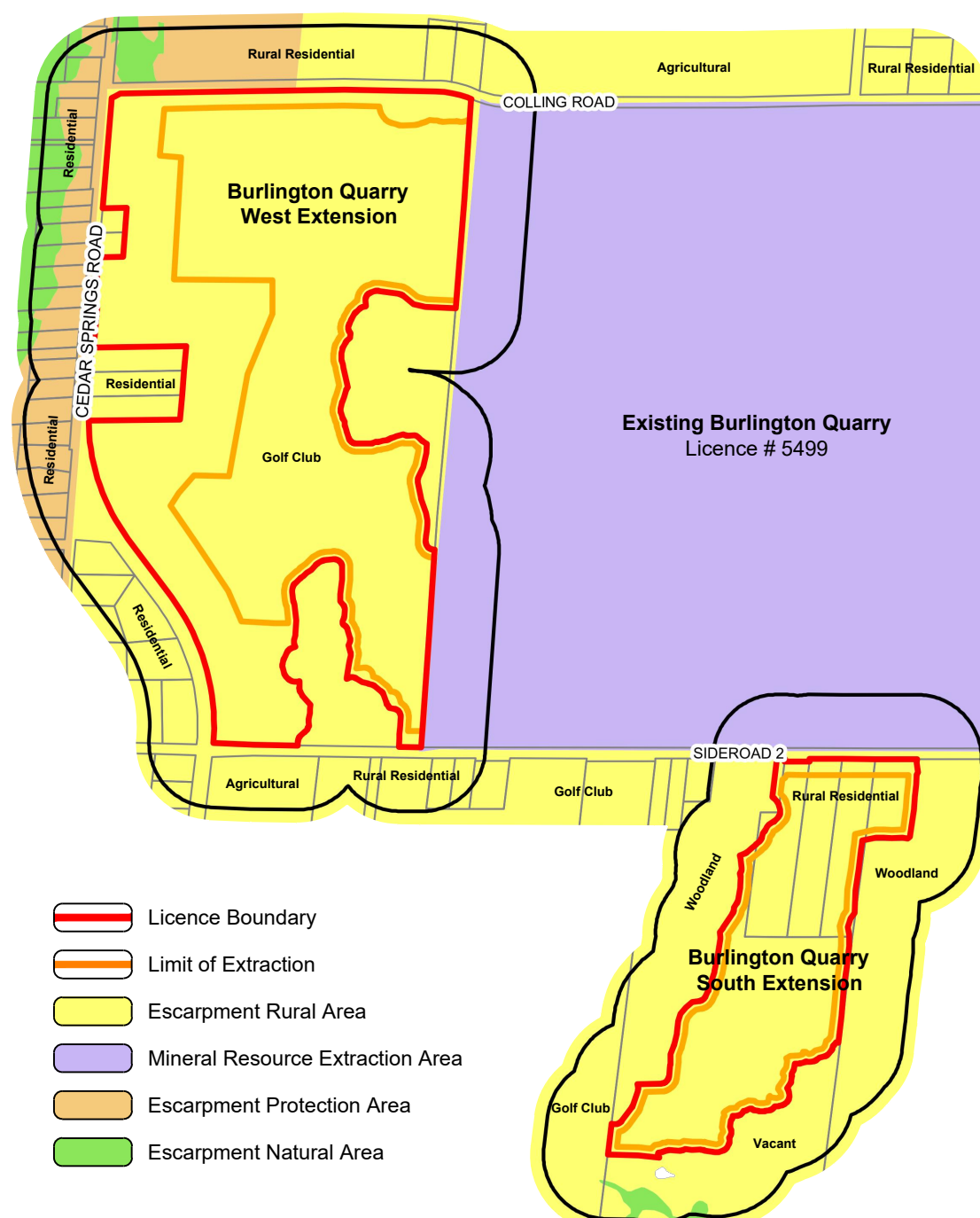
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	Licence Boundary		120m Offset From Licence Boundary
	Limit of Extraction All setbacks are drawn to scale and show labelled distances		Existing Licence Existing Licence Boundary (solid line) Existing Limit of Extraction (dashed line)
	Contours with Elevation Metres above sea level (MASL)		Parcel Fabric
	Public Road		Diversion or Discharge Pipe Existing - Single Dash
	Internal Haul Road		Sun-Canadian Pipe Line Pipe line location and easement
	Fence 1.2m post & wire farm fence unless otherwise noted		Entrance / Exit Existing
	Jefferson Salamander Regulatory Boundary		Gate
	Water Feature		Direction of Surface Drainage
	Woodlands Significant		Building/Structure Location and use for buildings on site & within 120m are shown
	Woodlands		Point Features Borehole Benchmark Test Pit Well
	Wetland		Cross Sections A1

- These Site Plans are prepared for submission to the Ministry of Natural Resources and Forestry (MNR) in conjunction with an application for a Class 'A' Licence (Category 2) under the Aggregate Resources Act (ARA) and its regulations.
- Contours and building footprints were obtained from the City of Burlington's open database. The contours were acquired in 2017 and are displayed in 1 metre intervals.
- Additional topographic features were obtained from a combination of the 2015 South Western Ontario Orthophotography Project (SWOOP) by the MNR and Google Earth Pro aerial photography captured May 7, 2018.
- Burlington Quarry Extension lands are within the Niagara Escarpment Plan area and are designated Escarpment Rural Area.
- Land use information compiled from (i) aerial photography, (ii) ARA Site Plans for adjacent Licence No. 5499 & 5657, and (iii) site inspection.
- Area to be licenced: 78.3 ha
- Area to be extracted: 50.4 ha
- Elevation of established water table varies from an elevation of _____ to _____
Groundwater table information provided by _____
- All measurements shown on this plan are in metres.
- Refer to drawing 2 of 4 for Operational Plan, 3 of 4 for Final Rehabilitation Landform and sheet 4 of 4 for Cross-sections.

Area Calculations			
	Burlington Quarry - West Extension	Burlington Quarry - South Extension	Total
Licence Boundary	60.0 ha	18.3 ha	78.3 ha
Extraction Area	35.9 ha	14.5 ha	50.4 ha

Niagara Escarpment Plan - Land Use Designations



Other Lands Owned by Licensee



Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
 113 COLLIER STREET, BARRE, ON, L4M 1H2 | P: 705.728.0045 F: 705.728.2010 | WWW.MHBCPLAN.COM

MNR Approval Stamp	MHBC Stamp
--------------------	------------

Applicant

NELSON AGGREGATE CO.
 2433 No. 2 Sideroad
 P.O. Box 1070 Burlington Ont. L7R 4L8
 phone: (905) 335-6250

Project
Burlington Quarry Extension

MNR Licence Reference No.	Pre-approval review:
Plan Scale: 1:4000 (Arch D)	Date: March 5, 2020
0 120 240 Meters	Drawn By: C.P. File No.: 9135D
Checked By: ***	

File Name
Existing Features

Drawing No.
1 of 4

File Path
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Legal Description
 Part Lot 1 & 2, Concession 2 and Part Lot 17 & 18, Concession 2 NDS
 (former geographic Township of Nelson)
 City of Burlington
 Region of Halton

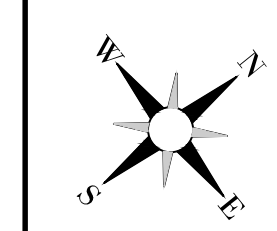
Legend	
	Licence Boundary
	Limit of Extraction All setbacks are drawn to scale and show labelled distances
	Contours with Elevation Metres above sea level (MASL)
	Public Road
	Internal Haul Road
	Fence 1.2m post & wire farm fence unless otherwise noted
	Jefferson Salamander Regulatory Boundary
	Water Feature
	Woodlands Significant
	Woodlands
	Wetland Significant
	Wetland
	Forested Setbacks
	120m Offset From Licence Boundary
	Existing Licence Existing Licence Boundary (solid line) Existing Limit of Extraction (dashed line)
	Parcel Fabric
	Diversion or Discharge Pipe Existing - Single Dash Proposed - Double Dash
	Sun-Canadian Pipe Line Pipe line location and easement
	Entrance / Exit Proposed
	Gate
	General Direction of Excavation & Boundary
	Berm Proposed Noise & Visual Berms
	Building/Structure Location and use for buildings on site & within 120m are shown
	Point Features Borehole, Benchmark, Test Pit, Well
	Proposed Quarry Floor Metres above sea level (MASL)
	Cross Sections

Site Plan Amendments			

No.	Date	Description	By

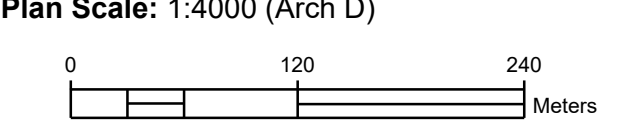

**PLANNING
URBAN DESIGN
& LANDSCAPE
ARCHITECTURE**
113 COLLIER STREET, BARRIE, ON, L4M 1H2 | P: 705.728.0045 F: 705.728.2010 | WWW.MHBCPLAN.COM

MNRF Approval Stamp	MHBC Stamp



Applicant


**NELSON
AGGREGATE
CO.**
2433 No. 2 Sideroad
P.O. Box 1070 Burlington Ont. L7R 4L8
phone: (905) 335-5250

Project <h2 style="text-align: center;">Burlington Quarry Extension</h2>	
MNRF Licence Reference No.	Pre-approval review:
Plan Scale: 1:4000 (Arch D)	Date: March 5, 2020
	Drawn By: C.P. File No.: 9135D
Checked By: ***	
File Name: <h3 style="text-align: center;">Operational Plan</h3>	
Drawing No.: <h2 style="text-align: center;">2 of 4</h2>	
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Legal Description
 Part Lot 1 & 2, Concession 2 and Part Lot 17 & 18, Concession 2 NDS
 (former geographic Township of Nelson)
 City of Burlington
 Region of Halton

Legend

	Licence Boundary		120m Offset From Licence Boundary
	Limit of Extraction All setbacks are drawn to scale and show labelled distances		Existing Licence Existing Licence Boundary (solid line) Existing Limit of Extraction (dashed line)
	Contours with Elevation Metres above sea level (MASL)		Parcel Fabric
	Public Road		Diversion or Discharge Pipe Existing - Single Dash Proposed - Double Dash
	Fence 1.2m post & wire farm fence unless otherwise noted		Sun-Canadian Pipe Line Pipe line location and easement
	Water Feature		Jefferson Salamander Regulatory Boundary
	Woodlands Significant		Gate
	Woodlands		Building/Structure Location and use for buildings on site & within 120m are shown
	Wetland Significant		Point Features Borehole - BM Test Pit - Well
	Wetland		Proposed Final Elevation of Land and Lake (MASL)
			Cross Sections A1

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
 113 COLLIER STREET, BARRIE, ON, L4M 1H2 | P: 705.728.0045 F: 705.728.2010 | WWW.MHBCPLAN.COM

MNRF Approval Stamp MHBC Stamp

Applicant

NELSON AGGREGATE CO.
 2433 No. 2 Sideroad
 P.O. Box 1070 Burlington Ont. L7R 4L8
 phone: (905) 335-5250

Project **Burlington Quarry Extension**

MNRF Licence Reference No.	Pre-approval review:
Plan Scale: 1:4000 (Arch D)	Date: March 5, 2020
Drawn By: C.P.	File No.: 9135D
Checked By: ***	

File Name: **Rehabilitation Plan**

Drawing No.: **3 of 4**

File Path: N:\Brian\9135D- Nelson - Project Sideways\Drawings\ARA Site Plans\CAD\9135D - Site Plan.dwg

Seismograph Location Overview



**Seismograph Location for
Blasting Operations
(2014-2019)**



Appendix B

Burlington Quarry Extension

PREVAILING METEOROLOGICAL CONDITIONS

Medians provided by Environment Canada
Canadian Climate Normals 1981-2010
Hamilton – Municipal Airport

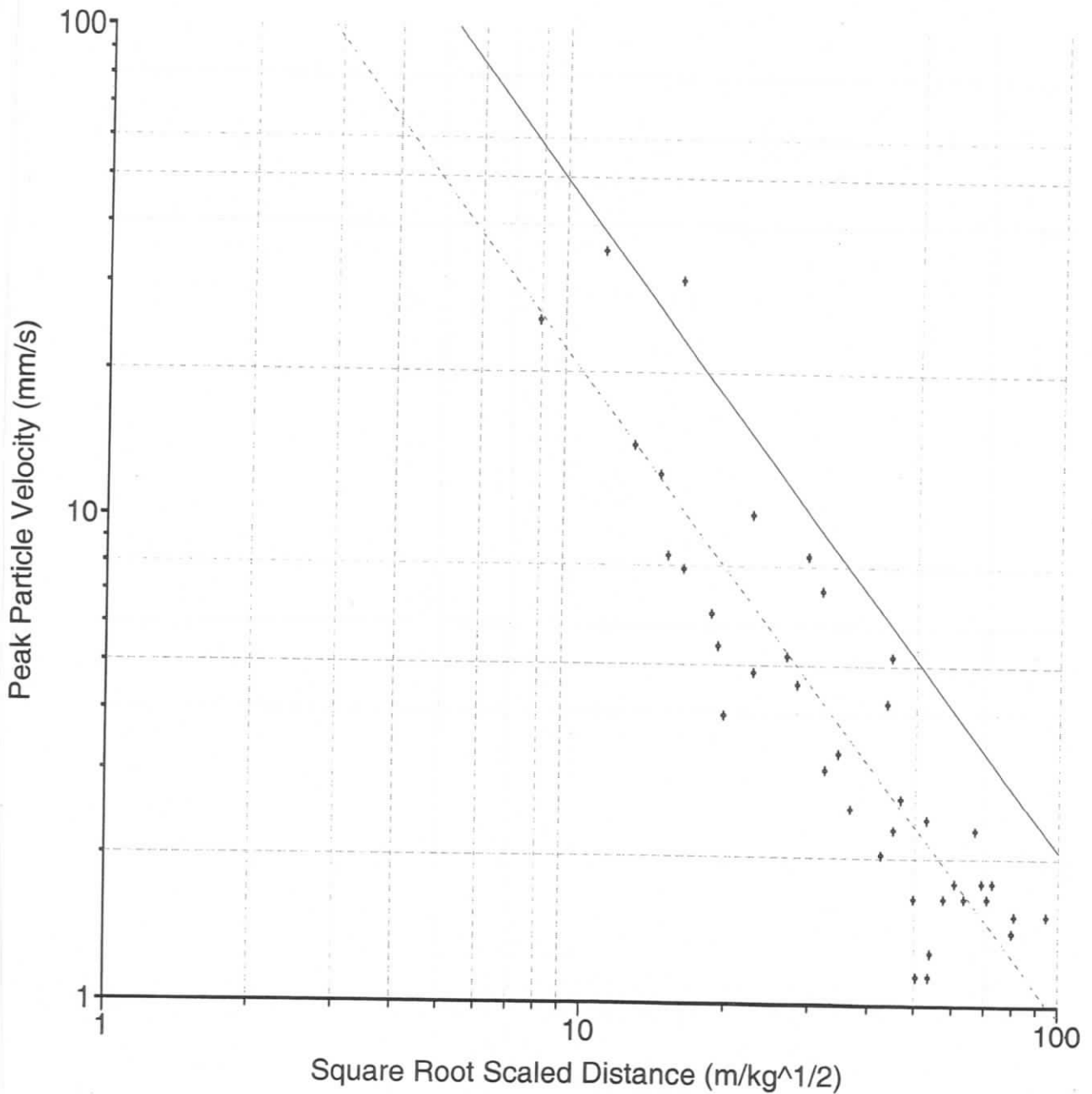
Date	Wind Direction	Wind Velocity Km/h	Temperature (Deg Celsius)
January	SW	19.5	-5.5
February	W	18.6	-4.6
March	W	18.5	-0.1
April	NE	15.9	6.7
May	NE	14.0	12.8
June	SW	14.0	18.3
July	W	12.6	20.9
August	SW	11.8	20.0
September	SW	13.1	15.8
October	SW	15.6	9.3
November	W	17.4	3.7
December	SW	18.7	-2.3

Appendix C

NELSON QUARRY GROUND VIBRATION
ATTENUATION CURVE

FIGURE 5

Coefficient of Determination = 0.811 Standard Deviation = 0.172



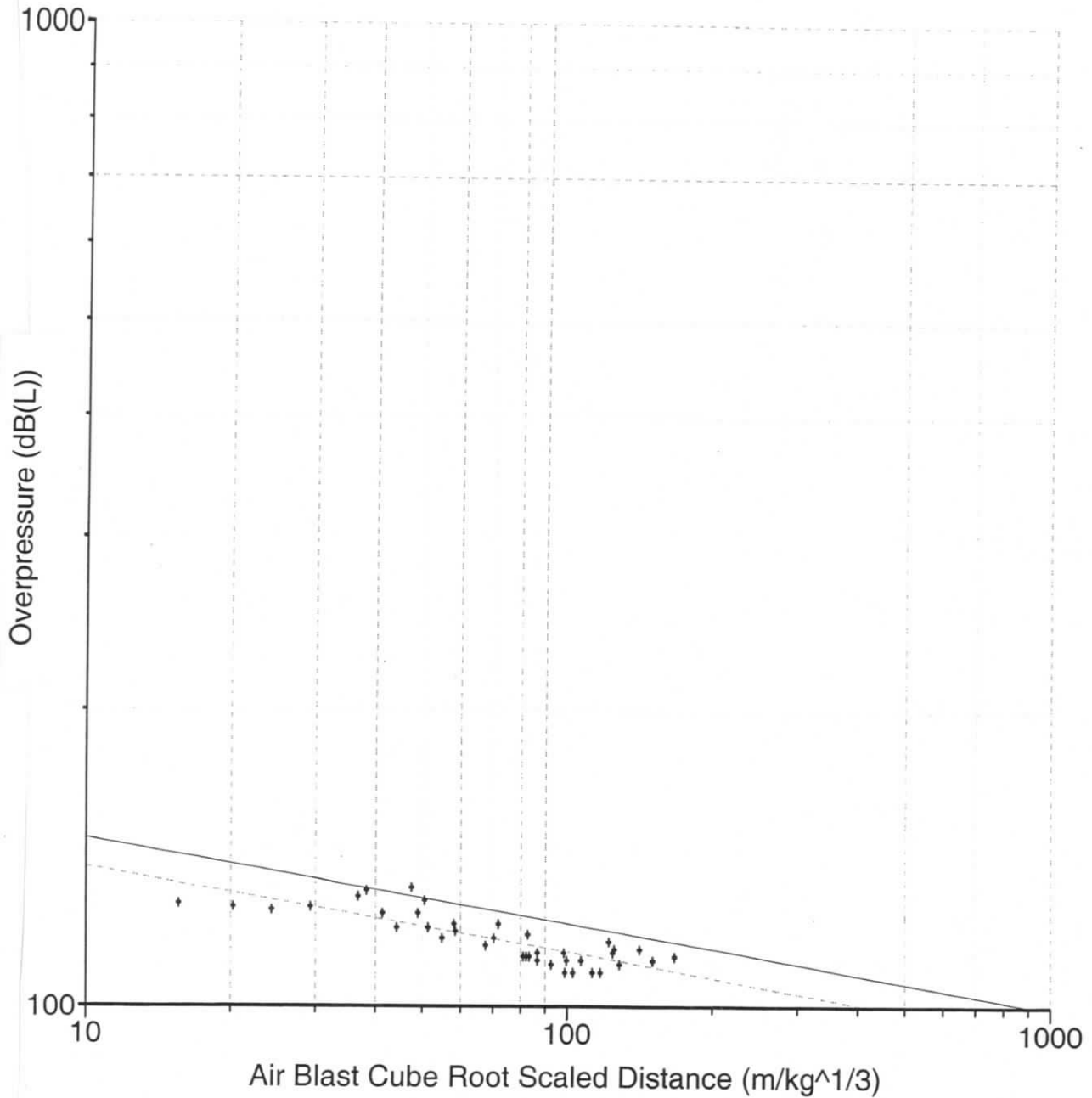
Date.....Aug 29/04.....
Project...021-1238.....

Drawn.....*AMB*.....
Chkd.....*AMB*.....

NELSON QUARRY AIR VIBRATION
ATTENUATION CURVE

FIGURE 6

Coefficient of Determination = 0.677 Standard Deviation = 0.0145



Date.....Aug 29/04.....
Project...021-1238.....

Drawn.....*MMB*.....
Chkd.....*MMB*.....



SEISMIC REPORT

Date: APRIL 11/17 Time: 11:56 AM Shot # 01-17
OVERCAST

Weather: 20°C Terrain: UNEVEN Wind From: SW Wind Velocity: 20 KPH

Location of Blast: BULIDGE, #2 SIDE RD.

Seismic Setup By: B. WHITE, NELSON Max. Kg/Delay: 92.15

Detonator System: Electric Non-Electric Electronic

Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLD

Hole Dia. 4 in. Pattern: Spacing 11 ft. x Burden 11 ft.

of Decks 2 # of Rows 5 # of Holes 46

Time Between: Decks 13 ms., Holes 26 ms., Rows 136 ms.

Subdrill 2 ft. Ave. Water 60.37 ft. Ave. Hole Depth 68.25 ft. Total Tons 26417.9

Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbI

Monitor 1
Location: 2450 #2 SIDE RD.
Vibration: 2.53 mm/s Airblast: 111.5 dbI.

Monitor 2
Location: COLLING RD, BLIND LINE INTERSECTION, NELSON PROPERTY
Vibration: N/R mm/s Airblast: N/R. dbI.

Monitor 3
Location: SOUTH WEST CORNER, CAMISLE
Vibration: 15.6 mm/s Airblast: 113.1 dbI.

Monitor 4
Location: NOT USED
Vibration: _____ mm/s Airblast: _____ dbI.

Prepared by: M. Nelson



SEISMIC REPORT

Date: APRIL 18/17 Time: 11:53 AM Shot # 02-17
Weather: CLEAR 10° Terrain: FLAT, Wind From: EAST Wind Velocity: 15 MPH
Location of Blast: HIGH WALL OLD SUB STATION
Seismic Setup By: B. WHITE, NELSON Max. Kg/Delay: 222.95
Detonator System: Electric Non-Electric Electronic
Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLD
Hole Dia. 4 in. Pattern: Spacing 10 1/2 ft. x Burden 11 1/2 ft.
of Decks 1 # of Rows 3 # of Holes 27
Time Between: Decks 0 ms., Holes 13 ms., Rows 58 ms.
Subdrill 2 ft. Ave. Water 22.82 ft. Ave. Hole Depth 80.5 ft. Total Tons 21384.4

Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbi

Monitor 1 Location: <u>NOT USED</u> Vibration: _____ mm/s Airblast: _____ dbi
Monitor 2 Location: <u>SOUTH WEST CORNER, CAMISLE</u> Vibration: <u>0.176</u> mm/s Airblast: <u>124.1</u> dbi
Monitor 3 Location: <u>2450 #2 SIDE ROAD</u> Vibration: <u>3.66</u> mm/s Airblast: <u>125.0</u> dbi
Monitor 4 Location: <u>NOT USED</u> Vibration: _____ mm/s Airblast: _____ dbi

Prepared by: M. Wilson



SEISMIC REPORT

Date: APRIL 21/17 Time: 11:53 AM Shot # 03-17
 Weather: RAIN, 10° Terrain: FLAT Wind From: WEST Wind Velocity: 22 KPH
 Location of Blast: LOW BENCH
 Seismic Setup By: B. WHITE, NELSON Max. Kg/Delay: 173.13
 Detonator System: Electric Non-Electric Electronic
 Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLD
 Hole Dia. 450 4" 12 1/2 in. Pattern: Spacing 10 1/2 ft. x Burden 11 1/2 ft.
 # of Decks 1 # of Rows 3 # of Holes 50
 Time Between: Decks 8 ms., Holes 13 ms., Rows ROW 1: 2 19ms ms. ROW 2: 3 91ms
 Subdrill 2 ft. Ave. Water 39.38 ft. Ave. Hole Depth 44.76 ft. Total Tons 21133.9

Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbi

Monitor 1

Location: COLLING RD BLIND LINE INTERSECTION, NELSON PROPERTY
 Vibration: N/R mm/s Airblast: N/R dbi.

Monitor 2

Location: 2450th 2 SIDE ROAD
 Vibration: 3.56 mm/s Airblast: 122.9 dbi.

Monitor 3

Location: SOUTH WEST CORNER, CAMISLE
 Vibration: 1.02 mm/s Airblast: 116.7 dbi.

Monitor 4

Location: NOT USED
 Vibration: _____ mm/s Airblast: _____ dbi.

Prepared by: M. Baker



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-05-01**

Blast Number: **17-004**
 Orica Order #: **2179557**
 Blast Time: **11:51 AM**

page 1 Blaster-in-charge: **Kevin Toplis** (Print Name)

Blast Location: **South Wall** (Bench / Face)
 GPS Coordinates: **43.39784** °N Latitude **79.88487** °W Longitude
 Centre of Blast Centre of Blast

Wind from the: **E** at **15** kph Temperature: **6 to 10** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **185** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam:	101.6 mm 0 °	# Holes: 32 = 2,230.4 ft (4 " diam)
Secondary Bit diam:	mm 0 °	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam:	mm *	# Holes: = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,020	20,900	6,120

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	95	32.3

total explosives weight in Blast (kg): **6,152**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 15M			31
UNITRONIC 600 30M			63

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	25

Resource Deployment:		
# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)		1
# of MMU's (this Blast)		1

Services:	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	Line Item (Fee per Blast)	1
3D LASER PROFILE	Enter "1" if 3D Profiled	
BORETRACK	Enter "1" if Boretraked	
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	16.0

tonnes Blasted:	17,585 te	6,763 m ³
Total tonnes per day:	te	m ³
Total Holes Loaded:	32 holes	
... including:	Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	3 rows	
- Pattern (Front Row)-		
Burden:	10.5 ft avg	
Spacing:	10.5 ft avg	
# Holes:	10 front row	

Burden:	10.5 ft avg
Spacing:	10.5 ft avg
# Holes:	22
Bench Height:	67.7 ft avg
Sub-drill:	2.0 ft avg
Hole Depth:	69.7 ft avg
- Stone Decking -	
Front Row:	4.0 ft avg
Main Body:	4.0 ft avg
# Stone Decks:	31 per blast

- Collar Stemming -	
Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	.75 clear

- Charge Length -	
Front Row:	58.7 ft avg
Main Body:	58.7 ft avg

- Charge Weight -	
Front Row:	171.2 kg/hole
Main Body:	171.2 kg/hole

Max. per delay:	128.0 kg/delay
SD () Equation:	622.8 kg/delay
Total kg Loaded:	6,152 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

1.533 lb/yd ³	Yield PF:	0.350 kg/te (actual)
1.365 lb/yd ³	Front row:	0.311 kg/te (theoretical)
1.365 lb/yd ³	Main Body:	0.311 kg/te (theoretical)
0.000 lb/yd ³	"KPI" PF:	0.000 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit . B. S. Expl or IS from previous Blast:

There is no video for this blast
 All holes got 88kg on the bottom and then adjusted loads for the tops. A1 was only too to 50ft.
 16 hours split between 1 blaster and 2 helper



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-05-01**

Blast Number: **17-004**
 Orica Order #: **2179557**
 Blast Time: **11:51 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
Mid Blast	43.39783	79.88548	0.757435	1.394265
Front Row Corner	43.39795	79.88469	0.757437	1.394251
Back Row Corner	43.39775	79.88443	0.757434	1.394246
Average (Centre of Blast)	43.39784	79.88487	0.757435	1.394254

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
1st Reading	43.40246	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40246	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	748.7	m		
Post Blast Data:	ppV:	2.6	mm/s	Trigger set at: 2.0
	frequency:	41.0	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:	121.0	dB	Trigger set at: 115

2nd concession (orica monitor)

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	3.1	mm/s	Trigger set at: 2.0
	frequency:	43.0	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:	108.0	dB	Trigger set at: 115

2450 2nd concession (Nelson monitor)

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
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
	frequency:		Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure:		dB	Trigger set at: 115

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(748.7)^2}{30^2} \text{ kg}$$

$$= \frac{560,552}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **623** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-05-15**

Blast Number: **17-005**
 Orica Order #: **2185675**
 Blast Time: **12:35PM**

page 1

Master-in-charge: **Mitch Ossington**

(Print Name)

Blast Location: **South face**

(Bench / Face)

GPS Coordinates: **43.39788 °N Latitude 79.88447 °W Longitude**
 Centre of Blast Centre of Blast

Wind from the: **NW** at **10 kph** Temperature: **16 to 20 °C**

Clear: **X** Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30000ft m**

tonnes Blasted: **21,062 te** | **8,101 m³**
 Total tonnes per day: **21,062 te** TBA Rate Code
 Total Holes Loaded: **34** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows
 - Pattern (Front Row) -
 Burden: **10.5** ft avg
 Spacing: **11.6** ft avg
 # Holes: **11** front row

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0°** # Holes: **34** = **2,516.0** ft (**4** " diam)
 Secondary Bit diam: mm **0°** # Holes: = **0.0** ft (" diam)
 Tertiary Bit diam: mm ° # Holes: = **0.0** ft (" diam)

Burden: **10.0** ft avg
 Spacing: **11.5** ft avg
 # Holes: **23**
 Bench Height: **72.0** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **74.0** ft avg
 - Stone Decking -
 Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg
 # Stone Decks: **33** per blast

Bulk Explosives: in (kg) out (kg) kg
CENTRA GOLD 70 **27,020** **19,900** **7,120**

Packaged Explosives: cs shipped cs returned kg

Boosters: kg / unit # usec kg
PENTEX 12 (OR EQUIVALENT) **0.34** **103** **35.0**

total explosives weight in Blast (kg): **7,155**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators: case #'s ms # used
UNITRONIC 600 15M **34**
UNITRONIC 600 20M **32**
UNITRONIC 600 30M **37**

Cord & Accessories: U of M # used
HARNES WIRE DUPLEX (8 PACK) 400M units **1**
STEMMING PLUG MINI units **12**
 units

Resource Deployment:
 # of Blasts today (this Quarry) **1**
 # of Blasters (this Blast) **1**
 # of Helpers (this Blast) **1**
 # of MMU's (this Blast) **1**

Services:
 GPS LAYOUT Line Item (Hourly Rate) **1**
 BULK TRUCK CHARGE >/=5,000kg <10,000kg **1**
 SHOT SERVICE FEE * Line Item (Fee per Blast) **1**
 SEISMOGRAPH RENTAL * 1 unit In Shot Service Fee
 3D LASER PROFILE Enter "1" if 3D Profiled
 BORETRACK Enter "1" If Boretraked
 LABOUR CHARGE (enter HOURS) Must be pre-authorized

Material used: **1/2" crush**
 - Charge Length -
 Front Row: **63.0** ft avg
 Main Body: **63.0** ft avg
 - Charge Weight -
 Front Row: **183.7** kg/hole
 Main Body: **183.7** kg/hole
 Max. per delay: **110.0** kg/delay
 SD () Equation: kg/delay
 Total kg Loaded: **7,155** kg
 Rock Density: **2.60** g/cc = te/m³

- Powder Factor -
 Yield PF: **0.340** kg/te (actual)
 Front row: **0.287** kg/te (theoretical)
 Main Body: **0.301** kg/te (theoretical)
 "KPI" PF: **#DIV/0!** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Blt , B. S. Expl or IS from previous Blast:

3D laser profile = 0.5hrs

Blaster hours = 6.5hrs

Helper hours = 6

All Nelsons seismographs used.

Salesman will have to provide a rate code.



Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
P.O. #: **NA**
Blast Date: **2017-05-15**

Blast Number: **17-005**
Orica Order #: **2185675**
Blast Time: **12:35PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.39805	79.88465
Front Row Corner	43.39790	79.88446
Back Row Corner	43.39770	79.88439
Average (Centre of Blast)	43.39788	79.88447

(N) Radians	(W) Radians
0.757439	1.394248
0.757436	1.394247
0.757433	1.394246
0.757436	1.394247

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (1st Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: 0.1	mm/s Trigger set at: 2.0 mm/s
frequency:		Hz V / T / L T (Vertical, Transverse or Longitudinal)
air overpressure:	88.0	dB Trigger set at: 115 dB

(N) Radians	(W) Radians
0.000000	0.000000

Colling Rd

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (2nd Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: 3.8	mm/s Trigger set at: 2.0 mm/s
frequency:		Hz V / T / L ? (Vertical, Transverse or Longitudinal)
air overpressure:	111.6	dB Trigger set at: 115 dB

(N) Radians	(W) Radians
0.000000	0.000000

2450 #2 sideroad

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: 3.3	mm/s Trigger set at: 2.0 mm/s
frequency:		Hz V / T / L ? (Vertical, Transverse or Longitudinal)
air overpressure:	95.9	dB Trigger set at: 115 dB

(N) Radians	(W) Radians
0.000000	0.000000

Camisle

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:

$$W = \frac{D^2}{2}$$

$$= \frac{(0)^2}{2} \text{ kg}$$

$$= \frac{0}{0} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mitch Ossington

Signature required, indicating that
Blast Report is Complete & Accurate



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-05-17**

Blast Number: **17-006**
 Orica Order #: **2187001**
 Blast Time: **11:53 AM**

page 1 Master-in-charge: **Kevin Topllis** (Print Name)

Blast Location: **Lower middle bench** (Bench / Face)

GPS Coordinates: **43.40414** °N Latitude **79.88442** °W Longitude
 Centre of Blast Centre of Blast

Wind from the: **SW** at **40** kph Temperature: **26 to 30** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **9,144** m

tonnes Blasted: **15,010** te **5,773** m³

Total tonnes per day: **15,010** te **5,773** m³

Total Holes Loaded: **42** holes

... including: Dead Holes

... and: Helper Holes

Helper Hole Collar: ft avg

Rows Blasted: **2** rows

- Pattern (Front Row) -

Burden: **10.5** ft avg

Spacing: **11.5** ft avg

Holes: **22** front row

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 ° # Holes: 41	= 1,689.2 ft (4 " diam)
Secondary Bit diam: 114.3 mm	" # Holes: 1	= 41.2 ft (4 1/2 " diam)
Tertiary Bit diam: <input type="checkbox"/> mm	"° # Holes: <input type="checkbox"/>	= 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,060	22,200	4,860

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	84	28.6

total explosives weight in Blast (kg): **4,889**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			41
UNITRONIC 600 15M			43

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	3

Resource Deployment:

# of Blasts today (this Quarry)	1
# of Blasters (this Blast)	1
# of Helpers (this Blast)	2 Note Exception
# of MMU's (this Blast)	1

Services:

Line Item (Hourly Rate)	#
GPS LAYOUT	1
BULK TRUCK CHARGE	1 >=2,000kg <5,000kg
SHOT SERVICE FEE *	1 Line Item (Fee per Blast)
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee
3D LASER PROFILE	1 Line Item (Hourly Rate)
BORETRACK	Enter "1" if Boretraked
LABOUR CHARGE (enter HOURS)	16.0 Line Item (Fee per Hour)

Burden: **10.5** ft avg

Spacing: **11.5** ft avg

Holes: **20**

Bench Height: **40.2** ft avg

Sub-drill: **1.0** ft avg

Hole Depth: **41.2** ft avg

- Stone Decking -

Front Row: ft avg

Main Body: ft avg

Stone Decks: **0** per blast

- Collar Stemming -

Front Row: **7.0** ft avg

Main Body: **7.0** ft avg

Material used: **.75** clear

- Charge Length -

Front Row: **34.2** ft avg

Main Body: **34.2** ft avg

- Charge Weight -

Front Row: **99.7** kg/hole

Main Body: **99.7** kg/hole

Max. per delay: **140.0** kg/delay

SD () Equation: **325.6** kg/delay

Total kg Loaded: **4,889** kg

Rock Density: **2.60** g/cc = te/m³

- Powder Factor -

Yield PF: **0.326** kg/te (actual)

Front row: **0.279** kg/te (theoretical)

Main Body: **0.279** kg/te (theoretical)

"KPI" PF: **0.000** kg/te (theoretical)

Cost Reduction Notes (this Blast) : change in Bit B. S. Expl or IS from previous Blast:

- Hole B2 is a 4 1/2"
- Hole B1 slumped to 18ft, a 15m uni was used instead of a 6m uni. The hole was plugged 10ft.
- Hole collars adjusted: A22 10ft, A21-19 10ft, A18-14 8ft.
- There was no Orica seismograph used.
- Labour hours is 16 split between 1 blaster and 2 helpers



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-05-17**

Blast Number: **17-006**
 Orica Order #: **2187001**
 Blast Time: **11:53 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40414	79.88444	0.757545	1.394246
Front Row Corner	43.40388	79.88413	0.757541	1.394241
Back Row Corner	43.40440	79.88469	0.757550	1.394251
Average (Centre of Blast)	43.40414	79.88442	0.757545	1.394246

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40246	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40246	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	541.3	m		
Post Blast Data:	ppV: DID	mm/s	Trigger set at: 2.0	mm/s
	frequency: NOT	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: TRIGGER	dB	Trigger set at: 115	dB
2nd concession (Nelson monitor)				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.1	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 111.8	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(541.3)^2}{30^2} \text{ kg} \\
 &= \frac{293,006}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **326** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-05-29**

Blast Number: **17-007**
 Orica Order #: **2191786**
 Blast Time: **12:00PM**

page 1

Blaster-in-charge: **Mitch Ossington** (Print Name)
 Blast Location: **South face** (Bench / Face)
 GPS Coordinates: **43.39805** °N Latitude **79.88433** °W Longitude
 Centre of Blast Centre of Blast
 Wind from the: **SE** at **5** kph Temperature: **21 to 25** °C
 Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30000ft** m

tonnes Blasted: **20,898** te **7,886** m³
 Total tonnes per day: **20,898** te TBA Rate Code
 Total Holes Loaded: **30** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows
 - Pattern (Front Row) -
 Burden: **10.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: **10** front row

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 ° # Holes: 30	= 2,442.0 ft (4 " diam)
Secondary Bit diam: mm	0 ° # Holes: =	0.0 ft (" diam)
Tertiary Bit diam: mm	" # Holes: =	0.0 ft (" diam)

Burden: **10.0** ft avg
 Spacing: **11.5** ft avg
 # Holes: **20**
 Bench Height: **79.4** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **81.4** ft avg
 - Stone Decking -
 Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg
Stone Decks: 29 per blast
 - Collar Stemming -
 Front Row: **10.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **1/2" crush**
 - Charge Length -
 Front Row: **67.4** ft avg
 Main Body: **70.4** ft avg
 - Charge Weight -
 Front Row: **196.5** kg/hole
 Main Body: **205.3** kg/hole
 Max. per delay: **130.0** kg/delay
 SD () Equation: **0.0** kg/delay
 Total kg Loaded: **6,860** kg
 Rock Density: **2.65** g/cc = te/m³

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,530	26,710	6,820

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	118	40.1

total explosives weight in Blast (kg): **6,860**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 800 6M			29
UNITRONIC 800 20M			29
UNITRONIC 800 30M			60

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:		
GPS LAYOUT	Line Item (Hourly Rate)	1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit In Shot Service Fee	0
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

Theoretical PF (based on a single hole)
 1,466 lb/yd³
 1,220 lb/yd³
 1,338 lb/yd³
 ##### lb/yd³
 "KPI" PF: #DIV/0! kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast
 salesman will provide a rate code.

Blaster Hours= 6hrs
 Helper Hours= 10hrs



Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-05-29**

Blast Number: **17-007**
 Orica Order #: **2191786**
 Blast Time: **12:00PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.39814	79.88442	0.757440	1.394246
Front Row Corner	43.39803	79.88434	0.757439	1.394245
Back Row Corner	43.39798	79.88423	0.757438	1.394243
Average (Centre of Blast)	43.39805	79.88433	0.757439	1.394245

1st 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 (1st Sels. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: DNT	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L	T (Vertical, Transverse or Longitudinal)
	air overpressure: DNT	dB	Trigger set at: 115	dB
Colling 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 Sels. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L	? (Vertical, Transverse or Longitudinal)
	air overpressure: 94.0	dB	Trigger set at: 115	dB
2450 #2 sideroad				

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 Sels. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 2.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L	? (Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Camisle				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mitch Ossington

Signature required, indicating that
 Blast Report is Complete & Accurate



Customer: **Nelson**
Blast Report

Quarry: Burlington
 P.O. #: n/a
 Blast Date: 2017-06-01

Blast Number: 17-008
 Orica Order #: 2194148
 Blast Time: 2:38 PM

page 1

Blaster-in-charge: Ken George

Blast Location: East Middle
 GPS Coordinates: 0 00000 °N Latitude 0 00000 °W Longitude

Wind from the: SW at 25 kph Temperature: -16 to -20 °C

Clear: X Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: m

tonnes Blasted: 29,085 te 10,976 m³
 Total tonnes per day: te Rate Code
 Total Holes Loaded: 86 holes
 Including: 0 Dead Holes
 .. and: 0 Helper Holes
 Helper Hole Collar: 0.0 ft avg
 # Rows Blasted: 4 rows
 Burden: 10.5 ft avg
 Spacing: 11.5 ft avg
 # Holes: 27

Nominal Bit Diameter:
 Primary Bit diam: 101.6 mm 0 # Holes: 86 = 3,382.0 ft (4 " diam)
 Secondary Bit diam: mm 0 # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm ° # Holes: = 0.0 ft (" diam)

Burden: 10.5 ft avg
 Spacing: 11.5 ft avg
 Bench Height: 37.3 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 39.3 ft avg
 Front Row: 0.0 ft avg
 Main Body: 0.0 ft avg
 # Stone Decks: 0 per blast

Bulk Explosives: in (kg) out (kg) kg
 CENTRA GOLD 70 26,860 17,350 9,510

Packaged Explosives: cs shipped cs returned kg

Boosters: kg / unit # usec kg
 PENTEX 12 (OR EQUIVALENT) 0 34 174 59.2

total explosives weight in Blast (kg): 9,569
 Pkgd Prod (0 kg) % of Total kg: 0 0%

Detonators: case #'s ms # used
 UNITRONIC 600 6M 84
 UNITRONIC 600 15M 90

Front Row: 9.0 ft avg
 Main Body: 7.0 ft avg
 Material used: 3/4 Clear

Front Row: 30.3 ft avg
 Main Body: 32.3 ft avg

Front Row: 88.4 kg/hole
 Main Body: 94.3 kg/hole
 Max per delay: 130.0 kg/delay
 SD () Equation: kg/delay
 Total kg Loaded: 9,569 kg
 Rock Density: 2.65 g/cc = te/m³

Cord & Accessories: U of M # used
 HARNESS WIRE DUPLEX (6 PACK) 400M units 1
 units
 units

1.470 lb/yd³

Yield PF: 0.329 kg/te (actual)

lb/yd³

"KPI" PF: #DIV/0! kg/te (theoretical)

1

1

3 Angled holes drill underneath concrete tunnel

2

MMU ran out of ammonium nitrate, 100% emulsion blend used to load last 9 holes

1

Services:

GPS LAYOUT Line Item (Hourly Rate) 1
 BULK TRUCK CHARGE >=5,000kg <10,000kg 1
 SHOT SERVICE FEE * Line Item (Fee per Blast) 1
 SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee
 3D LASER PROFILE Line Item (Hourly Rate) 1
 BORETRACK Line Item (Hourly Rate) 1



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O #: **n/a**
 Blast Date: **2017-06-01**

Blast Number: **17-008**
 Orica Order #: **2194148**
 Blast Time: **2:38 PM**

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				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (1st Seis. From Centre of Blast)		m		
Post Blast Data: ppV:	5.8	mm/s	2.0	
frequency:		Hz	T	
air overpressure:	101.0	dB	115	
2450 #2 Side 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)		m		
Post Blast Data: ppV:	3.8	mm/s	2.0	
frequency:		Hz	?	
air overpressure:	91.5	dB	115	
Northwest				

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:	1.5	mm/s	2.0	
frequency:		Hz	?	
air overpressure:	88.0	dB	115	
Southwest				

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:

$$W = \frac{D^2}{2}$$

$$= \frac{(0)^2}{2} \text{ kg}$$

$$= \frac{0}{0} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Ken George



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-06-08**

Blast Number: **17-009**
 Orica Order #: **2191786**
 Blast Time: **12:00PM**

page 1 Blaster-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South face** (Bench / Face)

GPS Coordinates: **43.39805** °N Latitude **79.88433** °W Longitude
 Centre of Blast Centre of Blast

Wind from the: **SE** at **5** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **30000** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 30 = 2,442.0 ft (4 " 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	33,530	26,710	6,820

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): **6,860**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			29
UNITRONIC 600 20M			29
UNITRONIC 600 30M			60

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	Line Item (Hourly Rate)	1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

tonnes Blasted:	20,898 te	7,886 m ³
Total tonnes per day:	20,898 te	TBA Rate Cube
Total Holes Loaded:	30 holes	
... including:	0 Dead Holes	
... and:	0 Helper Holes	
Helper Hole Collar:	0.0 ft avg	
# Rows Blasted:	3 rows	

- Pattern (Front Row) -
 Burden: **10.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: **10** front row

Burden: **10.0** ft avg
 Spacing: **11.5** ft avg
 # Holes: **20**
 Bench Height: **79.4** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **81.4** ft avg

- Stone Decking -
 Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg
Stone Decks: **29** per blast

- Collar Stemming -
 Front Row: **10.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **1/2" crush**

- Charge Length -
 Front Row: **67.4** ft avg
 Main Body: **70.4** ft avg

- Charge Weight -
 Front Row: **196.5** kg/hole
 Main Body: **205.3** kg/hole
 Max. per delay: **130.0** kg/delay
 SD () Equation: **0.0** kg/delay
 Total kg Loaded: **6,860** kg
 Rock Density: **2.65** g/cc = te/m³

- Powder Factor -
 Yield PF: **0.328** kg/te (actual)
 Front row: **0.273** kg/te (theoretical)
 Main Body: **0.300** kg/te (theoretical)
"KPI" PF: #DIV/0! kg/te (theoretical)

1.466 lb/yd³
 1.220 lb/yd³
 1.338 lb/yd³
 ##### lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastoc)

Cost Reduction Notes (this Blast) - change in Bl, S, Expl or IS from previous Blast:

saeman will provide a rate code.

Blaster Hours= 6hrs
 Helper Hours= 10hrs



Customer: **Nelsons**

Blast Design

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-06-08**

Blast Number: **17-009**
 Orica Order #: **2191786**
 Blast Time: **12:00PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
Mid Blast	43.39814	79.88442	0.757440	1.394246
Front Row Corner	43.39803	79.88434	0.757439	1.394245
Back Row Corner	43.39798	79.88423	0.757438	1.394243
Average (Centre of Blast)	43.39805	79.88433	0.757439	1.394245

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.000000
Distance (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: DNT	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: DNT	dB	Trigger set at: 115	dB
Colling Rd				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
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: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 94.0	dB	Trigger set at: 115	dB
2450 #2 sideroad				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radlans	(W) Radlans
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: 2.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Camisle				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(0)^2}{30^2} \text{ kg} \\
 &= \frac{0}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mitch Ossington

Signature required, indicating that
 Blast Report is Complete & Accurate



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-06-21**

Blast Number: **17-010**
 Orica Order #: **2202619**
 Blast Time: **12:35PM**

page 1

Blaster-in-charge: **Mitch Ossington**

Blast Location: **Lower Middle**
 GPS Coordinates: **43.40406 °N Latitude 79.88412 °W Longitude**

Wind from the: **W** at **10** kph Temperature: **21 to 25 °C**

Clear: Rain: Overcast:
 Partly Cloudy: **X** Snow: Inversion: Ceiling: **30000 m**

tonnes Blasted: **25,680** te **9,690** m³
 Total tonnes per day: **25,680** te TBA
 Total Holes Loaded: **84** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows
 Burden: **12.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **28**

Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0"** # Holes: **78** = **3,182.4** ft (**4** " diam)
 Secondary Bit diam: **114.3** mm **0"** # Holes: **6** = **244.8** ft (**4 1/2** " diam)
 Tertiary Bit diam: mm " # Holes: = **0.0** ft (" diam)

Burden: **9.0** ft avg
 Spacing: **10.5** ft avg
 Bench Height: **38.8** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **40.8** ft avg
 Front Row: **10.0** ft avg
 Main Body: **0.0** ft avg
Stone Decks: **1** per blast

Bulk Explosives: in (kg) out (kg) kg
CENTRA GOLD 70 **27,170** **18,720** **8,450**

Packaged Explosives: cs shipped cs returned kg

Boosters: kg / unit # used kg
PENTEX 12 (OR EQUIVALENT) **0.34** **95** **32.3**

total explosives weight in Blast (kg): **8,482**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators: case #'s ms # used
UNITRONIC 600 15M **91**
UNITRONIC 600 6M **4**

Cord & Accessories: U of M # used
HARNES WIRE DUPLEX (6 PACK) 400M units **1**
STEMMING PLUG MINI units **5**

Resource Deployment:
 # of Blasts today (this Quarry): **1**
 # of Blasts (this Blast): **1**
 # of helpers this Blast: **2**
 # of HMO's this Blast: **1**

Services:
 GPS LAYOUT Line Item (Hourly Rate) **1**
 BULK TRUCK CHARGE >=5,000kg <10,000kg **1**
 SHOT SERVICE FEE * Line Item (Fee per Blast) **1**
 SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee **0**
 3D LASER PROFILE Line Item (Hourly Rate) **1**
 BORETRACK Enter "1" if Boretraked **0**
 LABOUR CHARGE (enter HOURS) Must be pre-authorized

1.475 lb/yd³ Yield PF: **0.330** kg/te (actual)
 Front row **0.181** kg/te (theoretical)
 Main Body **0.358** kg/te (theoretical)
lb/yd³ "KPI" PF: **#DIV/0!** kg/te (theoretical)

Customer wants to try higher collars in back row to try to break the top better on the middle bench.



Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-06-21**

Blast Number: **17-010**
 Orica Order #: **2202619**
 Blast Time: **12:35PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40401	79.88408
Front Row Corner	43.40370	79.88380
Back Row Corner	43.40447	79.88447
Average (Centre of Blast)	43.40406	79.88412

(N) Radians	(W) Radians
0.757543	1.394240
0.757537	1.394235
0.757551	1.394247
0.757544	1.394241

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (1st Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: DNT	mm/s
	frequency: DNT	Hz
	air overpressure: DNT	dB

Colling Rd

(N) Radians	(W) Radians
0.000000	0.000000

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (2nd Seis. From Centre of Blast)	0.0	m
Post Blast Data:	ppV: DNT	mm/s
	frequency: DNT	Hz
	air overpressure: DNT	dB

2450 #2 sideroad

(N) Radians	(W) Radians
0.000000	0.000000

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: DNT	mm/s
	frequency: DNT	Hz
	air overpressure: DNT	dB

Camisle

(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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mitch Ossington



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-06-20**

Blast Number: **17-011**
 Orica Order #: **2201920**
 Blast Time: **12:02PM**

page 1

Blaster-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South Wall** (Bench / Face)
 GPS Coordinates: **43.39816** °N Latitude **79.88425** °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: **2540ft** m

tonnes Blasted: **23,583** te **8,899** m³
 Total tonnes per day: **23,583** te **TBA** Rate Code
 Total Holes Loaded: **36** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows
 - Pattern (Front Row) -
 Burden: **18.0** ft avg
 Spacing: **6.0** ft avg
 # Holes: **16** front row

- Drilling Information -

Primary Bit diam: **101.6** mm **0**° # Holes: **36** = 3,027.6 ft (**4** " diam)
 Secondary Bit diam: **mm** **0**° # Holes: **=** 0.0 ft (" diam)
 Tertiary Bit diam: **mm** ° # Holes: **=** 0.0 ft (" diam)

Burden: **10.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **20**
 Bench Height: **82.1** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **84.1** ft avg
 - Stone Decking -
 Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg
Stone Decks: 35 per blast

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	30,240	21,910	8,330

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	143	48.6

total explosives weight in Blast (kg): **8,379**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 9M			35
UNITRONIC 600 15M			36
UNITRONIC 600 30M			72

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	Line Item (Hourly Rate)	1
BULK TRUCK CHARGE	>/=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

Theoretical PF (Based on a single hole)


Yield Powder Factor (kg Loaded / kg Blasted)

1.587 lb/yd³ Yield PF: **0.355** kg/te (actual)
 1.411 lb/yd³ Front row 0.316 kg/te (theoretical)
 1.472 lb/yd³ Main Body: 0.330 kg/te (theoretical)
 ##### lb/yd³ "KPI" PF: **#DIV/0!** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B. S. Expl or IS from previous Blast

Hole A8 bottom dets would not pull so a 15m unitronic was used as a safety.
 Hole A4 collapsed at collar, no top deck.

Blaster Hours= 6.5
 Helper Hours= 11

 ORICA The Blasting Professionals™	Customer: Nelsons <h2 style="text-align: center;">Blast Design</h2>	Quarry: Burlington P.O. #: NA Blast Date: 2017-06-20	Blast Number: 17-011 Orica Order #: 2201920 Blast Time: 12:02PM
	2017-06-21 12:02 PM		

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.39823	79.88432	0.757442	1.394244
Front Row Corner	43.39816	79.88428	0.757441	1.394244
Back Row Corner	43.39810	79.88415	0.757440	1.394241
Average (Centre of Blast)	43.39816	79.88425	0.757441	1.394243

1st	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 (1st Seis. From Centre of Blast)	0.0	m		
	Post Blast Data:	ppV: DNT	mm/s	Trigger set at: 2.0 mm/s	
		frequency: DNT	Hz	V / T / L : T (Vertical, Transverse or Longitudinal)	
		air overpressure: DNT	dB	Trigger set at: 115 dB	
	<u>Colling Rd</u>				

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: 2.0	mm/s	Trigger set at: 2.0 mm/s	
		frequency: DNT	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)	
		air overpressure: 108.4	dB	Trigger set at: 115 dB	
	<u>2450 #2 sideroad</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: 2.4	mm/s	Trigger set at: 2.0 mm/s	
		frequency: DNT	Hz	V / T / L : ? (Vertical, Transverse or Longitudinal)	
		air overpressure: 101.9	dB	Trigger set at: 115 dB	
	<u>Camisle</u>				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(0)^2}{30^2} \text{ kg} \\
 &= \frac{0}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mitch Ossington

Signature required (indicating that blast design is complete & accurate)



Customer: **Nelsons**

Blast Design

Quarry: **Burlington**
P.O. #: **NA**
Design Date: **2017-06-20**

Blast Number: **17-011**
Orica Order #:

page 1

Master-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South Face** (Bench / Face)
GPS Coordinates: **43.39805** °N Latitude **79.88433** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **23,583** te
Total Holes Loaded: **36** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
Primary Bit diam: **101.6** mm **0**° # Holes: **36** = 3,027.6 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: **18.0** ft avg
Spacing: **6.0** ft avg
Holes: **16** front row

- Design Pattern (Main Body) -

Burden: **10.0** ft avg
Spacing: **10.5** ft avg
Holes: **20** main body
Bench Height: **82.1** ft avg
Sub-drill: **2.0** ft avg
Hole Depth: **84.1** ft avg

12:02 pm
22°C P. Cloudy
7km/h SW
2540'

- Design Stone Decking -

Front Row: **4.0** ft avg
Main Body: **4.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
Main Body: **7.0** ft avg

Material used: **1/2" crush**

- Design Charge Length -

Front Row: **73.1** ft avg
Main Body: **73.1** ft avg

- Design Charge Weight -

Front Row: **213.2** kg/hole
Main Body: **213.2** kg/hole
Max Chge Wt / delay: ~~130.0~~ kg/delay
130

Required kg Loaded: **8,565** kg
Rock Density: **2.65** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.363** kg/te (actual)
Front row: **0.320** kg/te (theoretical)
Main Body: **0.330** kg/te (theoretical)
"KPI" PF: **0.326** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

Hole A8 bottom dets would not pull, put in a 15m qs safety.
Hole A4 collapsed at collar, no top deck.

Bulk Explosives Req'd:	ChargeWt.exe	kg
CENTRA GOLD 70		8,500

Pkgd Explosives Req'd:		kg

Boosters Req'd:	kg/u # used	kg
PENTEX 16 (OR EQUIVALENT)	0.45 144	65.4

total explosives weight in Blast (kg): **8,565**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Req'd:	ms	# req'd
UNITRONIC 600 30M		72
UNITRONIC 600 45M 20m		36
UNITRONIC 600 9M		36

Cord & Access. Req'd:	U of M	# req'd
IRE DUPLEX (6 PACK) 400M	units	1
STEMMING PLUG MINI	units	

Resource Deployment

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MML's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Fee per Blast)	1
BORETRACK	Enter "1" if Boretraced	
LABOUR CHARGE (enter HOURS Must be pre-authorized)		



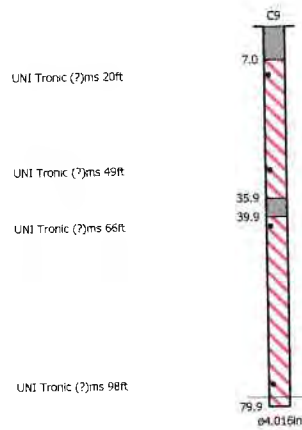
Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: ~~2017-08-21~~
2017/06/20

Blast Number: **17-011**
~~17-007~~
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mitch Ossington

#

Quarry Manager:

Signature required, indicating sign off on Blast Design



Orica Canada Inc.
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE

NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

Bill of Lading / Connaissance

*BLASTER MITCH
 HELP KEITH
 BRAD*

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
700	1230
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2201920	85682632

REPRINT

PAGE 2

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
20 Jun 2017	00:00:00	NELSON AGGREGATE COMPANY	n/a
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
20 Jun 2017	FOB Dest'n, Own Truck	F-73289	15001

SHIP VIA TRANSPORTEUR	ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck	STANDARD	

QTY. QTE	UM	DG MD	QTY. RET'D QTE. RET.	QTY. SOLD QTE. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
196	PC	X	53	143	PENTEX BC 340 (49/CS)	4	71.540
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
60	PC	X	25	35	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
66	PC	X	30	36	*uni tronic 600-15M C/Z SPL(50')66PC	1	11.286
108	PC	X	36	72	*uni tronic 600-30M C/Z SPL(100')36P	3	31.752
100	PC		100	0	MINI STEM PLUGS - PART #6015		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							126.998 KG
**** TOTAL PACKAGES ****						10	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO/24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFFERED / PLACARDS OFFERT
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.
 NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

DECLARED VALUE OF SHIPMENT
 VALEUR DÉCLARÉE \$

NETTE No. CONV
 PRESSAGE
 WT AGREEMENT NO.

FORWARD INVOICE FOR PREPAID FREIGHT
 QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE
 FOUR EXPÉDITION PORT PAYÉ EN RÉFÉRENT À
 Orica Canada Inc.

301 rue hotel de ville
 Brownsburg-Chatham, QC
 J8G 3B5

SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	CARRIER / TRANSPORTEUR	CONSIGNEE / DESTINATAIRE
GRAND VALLEY	Orica Truck	NELSON AGGREGATE COMPANY
SIGNATURE	SIGNATURE	SIGNATURE
<i>Brad Hutchins</i>	<i>B. Hutchins</i>	
DATE	DATE	DATE
20 JUN 17	20 JUN 17	

SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

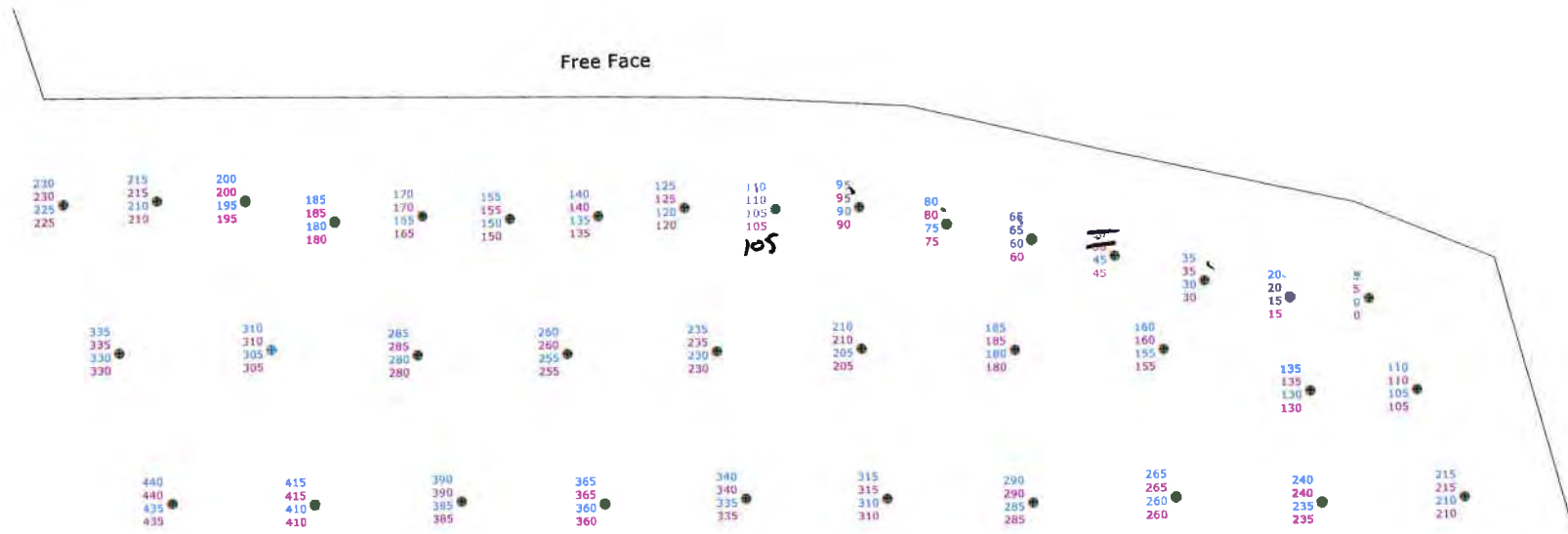
1st row burden: 18.0ft

Hole Diameter: 4.0in

Number of holes: 36

Hole angle: 0.0°

Total drilled: 3030.6ft



Scale 1:150

SHOTPlus 5.6.2.7	20/06/2017
Mine	
Location	
Title/author	17-011 South Face Final G. Palcso
Filename	17-011 South Face Final (2).spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 18.0ft

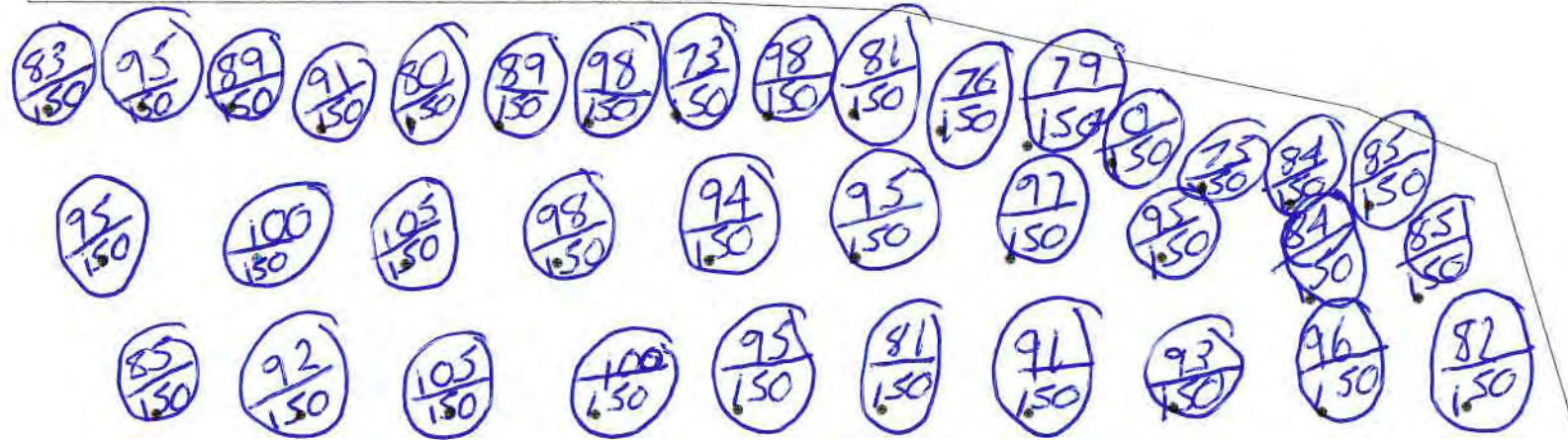
Hole Diameter: 4.0in

Number of holes: 36

Hole angle: 0.0°

Total drilled: 3030.6ft

Free Face



* 150 kg in all bottom decks:

SHOTPlus 5.6.2.7

20/06/2017

Mine

Location

Title/author 17-011 South Face Final G. Palcso

Filename 17-011 South Face Final.spf

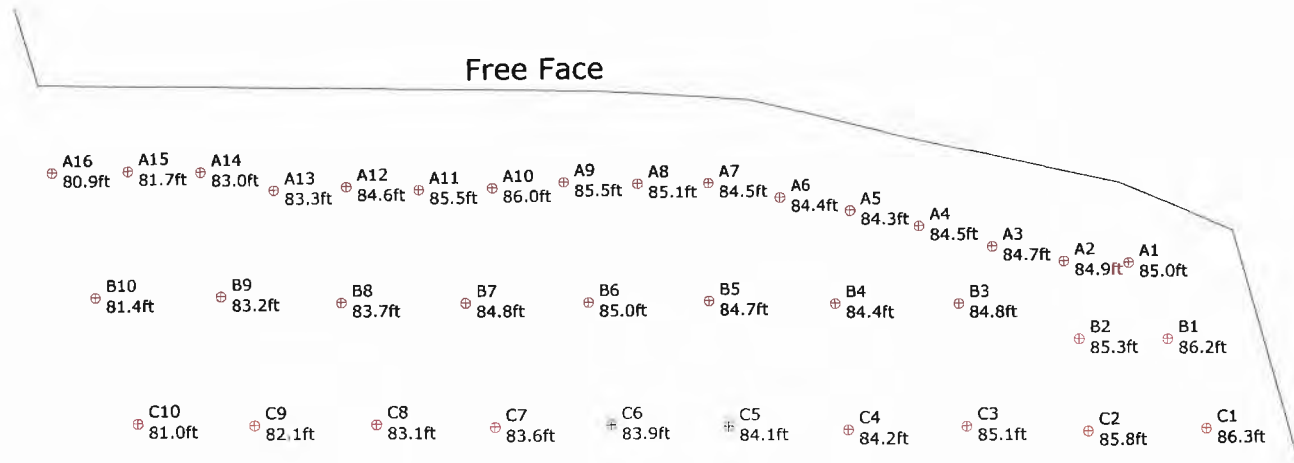


Scale 1:150

SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 18.0ft	Hole Diameter: 4.0in	Number of holes: 36	Hole angle: 0.0°
Total drilled: 3030.8ft			



17-011 South Face Final
 Front Row - 18' X 6' - Body - 10' X 10.5' - 4" Bit
 248.5 + .6 Sub



Not to scale

ShotPlus5 5.2.29.0	12/06/2017
Mine	
Location	
Title/author	17-011 South Face Final G. Palcso
Filename	17-011 South Face Final.spf



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #: **n/a**
 Blast Date: **2017-06-26**

Blast Number: **17-012**
 Orica Order #: **2204495**
 Blast Time: **1:14 PM**

page 1

Master-in-charge: **Ken George**
 Blast Location: **Floor**
 GPS Coordinates: **43.40250 °N Latitude 79.88614 °W Longitude**
 Wind from the: **SW at 15 kph** Temperature: **21 to 25 °C**
 Clear: Rain: Overcast:
 Partly Cloudy: **X** Snow: Inversion: Ceiling: **30000 m**

tonnes Blasted: **40,014 te** 15,099 m³
 Total tonnes per day: **40,014 te** Rate Code
 Total Holes Loaded: **252 holes**
 ... including: **0 Dead Holes**
 ... and: **0 Helper Holes**
 Helper Hole Collar: **0.0 ft avg**
 # Rows Blasted: **12 rows**
 Burden: **11.5 ft avg**
 Spacing: **11.5 ft avg**
 # Holes: **17**

Nominal Bit Diameter:
 Primary Bit diam: **101.6 mm** 0 # Holes: **252 = 4,032.0 ft (4 " diam)**
 Secondary Bit diam: **mm** 0 # Holes: **= 0.0 ft (" diam)**
 Tertiary Bit diam: **mm** " # Holes: **= 0.0 ft (" diam)**

Burden: **11.5 ft avg**
 Spacing: **11.5 ft avg**
 Bench Height: **16.0 ft avg**
 Sub-drill: **0.0 ft avg**
 Hole Depth: **16.0 ft avg**
 Front Row: **0.0 ft avg**
 Main Body: **0.0 ft avg**
 # Stone Decks: **0 per blast**
 Front Row: **7.0 ft avg**
 Main Body: **7.0 ft avg**
 Material used: **3/4 Clear**
 Front Row: **9.0 ft avg**
 Main Body: **9.0 ft avg**
 Front Row: **26.2 kg/hole**
 Main Body: **26.2 kg/hole**
 Max. per delay: **45.0 kg/delay**
 SD () Equation: **kg/delay**
 Total kg Loaded: **6,806 kg**
 Rock Density: **2.65 g/cc = te/m³**
 Yield PF: **0.170 kg/te (actual)**
 "KPI" PF: **#DIV/0! kg/te (theoretical)**

Bulk Explosives: in (kg) out (kg) kg
 CENTRA GOLD 70 34,290 27,570 6,720

Packaged Explosives: cs shipped cs returned kg

Boosters: kg / unit # usec kg
 PENTEX 12 (OR EQUIVALENT) 0.34 252 85.7

total explosives weight in Blast (kg): **6,806**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators: case #'s ms # used
 EXEL HANDIDET 12m 25/500 252
 CONNECTADET 12M 42 ms 18
 UNITRONIC 600 6M 1

Cord & Accessories: U of M # used
 HARNESS WIRE DUPLEX (6 PACK) 400M units 1
 units
 units

0.760 lb/yd³

Services:

GPS LAYOUT Line Item (Hourly Rate) 1
 BULK TRUCK CHARGE >/=5,000kg <10,000kg 1
 SHOT SERVICE FEE * Line Item (Fee per Blast) 1
 SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee
 3D LASER PROFILE Enter "1" if 3D Profiled
 BORETRACK Enter "1" if Boretraked

1
1
2
1



Customer: **Nelson**
Blast Design

Quarry: Burlington
 P.O. #: n/a
 Blast Date: 2017-06-26

Blast Number: 17-012
 Orica Order #: 2204495
 Blast Time: 1:14 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40254	79.88612	0.757517	1.394276
Front Row Corner	43.40207	79.88607	0.757509	1.394275
Back Row Corner	43.40288	79.88623	0.757523	1.394278
Average (Centre of Blast)	43.40250	79.88614	0.757516	1.394276

1st 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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV:	6.2	mm/s	2.0
	frequency:		Hz	T
	air overpressure:	91.5	dB	115
2450 #2 Side 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:	DNT	mm/s	2.0
	frequency:		Hz	?
	air overpressure:	DNT	dB	115
Northwest				

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:	1.8	mm/s	2.0
	frequency:		Hz	?
	air overpressure:	88.0	dB	115
Southwest				

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:

$$W = \frac{D^2}{7}$$

$$= \frac{(0)^2}{7} \text{ kg}$$

$$= \frac{0}{7} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Ken George

Customer: **Nelson****Blast Report**Quarry: **Burlington**

P.O. #:

Blast Date: **2017-07-10**Blast Number: **17-013**Orica Order #: **2210809**Blast Time: **1:40 PM**

page 1

Blaster-in-charge: **Kevin Toplis** (Print Name)Blast Location: **Floor** (Bench / Face)GPS Coordinates: **43.40152** °N Latitude **79.88959** °W Longitude
Centre of Blast Centre of BlastWind from the: **SW** at **10** kph Temperature: **21 to 25** °CClear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: Ceiling: **2.804** m**- Drilling Information -**

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam:	101.6 mm 0 °	# Holes: 299 = 5,980.0 ft (4 " diam)
Secondary Bit diam:	mm 0 °	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam:	mm °	# Holes: = 0.0 ft (" diam)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	34,150	25,680	8,470

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	300	102.0

total explosives weight in Blast (kg): 8,572
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:	case #'s	ms	# used
EXEL HANDIDET 12m		25/500	300
CONNECTADET 12M		42 ms	21
UNITRONIC 600 6M			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)	1

Services:

GPS LAYOUT	Enter "1" if Layout by GPS	0
BULK TRUCK CHARGE	>/=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	16.0

tonnes Blasted:	58,552 te	22,095 m ³
Total tonnes per day:	58,552 te	Rate Code
Total Holes Loaded:	295 holes	
... including:	0 Dead Holes	
... and:	0 Helper Holes	
Helper Hole Collar:	0.0 ft avg	
# Rows Blasted:	11 rows	
<i>- Pattern (Front Row)-</i>		
Burden:	11.5 ft avg	
Spacing:	11.5 ft avg	
# Holes:	28 front row	

Burden:	11.5 ft avg
Spacing:	11.5 ft avg
# Holes:	58,524
Bench Height:	20.0 ft avg
Sub-drill:	0.0 ft avg
Hole Depth:	20.0 ft avg
<i>- Stone Decking -</i>	
Front Row:	0.0 ft avg
Main Body:	0.0 ft avg
# Stone Decks:	0 per blast
<i>- Collar Stemming -</i>	
Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4 Clear
<i>- Charge Length -</i>	
Front Row:	13.0 ft avg
Main Body:	13.0 ft avg
<i>- Charge Weight -</i>	
Front Row:	37.9 kg/hole
Main Body:	37.9 kg/hole
Max. per delay:	46.0 kg/delay
SD () Equation:	0.0 kg/delay
Total kg Loaded:	8,572 kg
Rock Density:	2.65 g/cc = te/m ³

<i>- Powder Factor -</i>	
Yield PF:	0.146 kg/te (actual)
Front row:	0.191 kg/te (theoretical)
Main Body:	0.191 kg/te (theoretical)
"KPI" PF:	#DIV/0! kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Holes A1,2,3- B1,2- C1 where not drilled.
Holes A24, C24 where not loaded, but primed. They both where at 8ft.
Holes, K17, I15 det did not pull, a safety was used.
Holes, G28, H28 did not get loaded, do to both only being 3ft.

Blaster hours: **8.5**
Helper hours: **7.5**



Customer: **Nelson**

Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-10**

Blast Number: **17-013**
 Orica Order #: **2210809**
 Blast Time: **1:40 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40144	79.88941	0.757498	1.394333
Front Row Corner	43.40125	79.89002	0.757495	1.394344
Back Row Corner	43.40186	79.88933	0.757505	1.394332
Average (Centre of Blast)	43.40152	79.88959	0.757499	1.394336

1st Seismograph Co-ordinates

Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians	
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043

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: Hz V / T / L : **T** (Vertical, Transverse or Longitudinal)
 air overpressure: **91.5** dB Trigger set at: **115** dB

2450 #2 Side Rd (Nelson monitor)

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: **1.0** mm/s Trigger set at: **2.0** mm/s
 frequency: Hz V / T / L : **?** (Vertical, Transverse or Longitudinal)
 air overpressure: **104.2** dB Trigger set at: **115** dB

Northwest (Nelson monitor)

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: **4.2** mm/s Trigger set at: **2.0** mm/s
 frequency: Hz V / T / L : **?** (Vertical, Transverse or Longitudinal)
 air overpressure: **88.0** dB Trigger set at: **115** dB

Southwest (Nelson monitor)

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

jim bray

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Subdrill: 0.0ft Stemming: 7.0ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Number of holes: 305 Hole angle: 0.0°
 Total drilled: 6100.0ft

Free Face

.16 .22 .16 .16 x .20 .15 .15 .22 .22 .16 .22 .22 .22 .24 .29 .27 .21 .32 .29 .22 .35 .26 .34 .26 x x
 .8 .19 .22 .16 .14 .16 .13 .18 .26 .21 .22 .22 .24 .27 .26 .32 .32 .29 .34 .32 .32 .37 .35 .34 .34 .42 x x
 .13 .22 .22 .16 x .19 .16 .22 .22 .22 .22 .26 .27 .27 .29 .32 .32 .35 .34 .35 .38 .37 .37 .37 .38 .42 .38 x
 .16 .16 .18 .22 .14 .19 .22 .24 .26 .22 .22 .21 .22 .30 .30 .32 .30 .30 .32 .37 .38 .39 .37 .34 .35 .42 .42 .34
 .16 .16 .19 .16 .19 .21 .22 .27 .22 .22 .22 .21 .22 .29 .29 .32 .24 .32 .32 .34 .38 .38 .38 .38 .37 .42 .42 .42
 .29 .16 .19 .13 .16 .21 .22 .24 .22 .22 .22 .16 .22 .30 .30 .32 .32 .29 .34 .37 .38 .38 .37 .38 .38 .42 .42 .42
 .16 .29 .29 .13 .16 .16 .22 .22 .19 .19 .24 .26 .26 .26 .29 .26 .32 .26 .29 .34 .38 .42 .35 .35 .38 .42 .42 .42
 .19 .14 .22 .12 .16 .16 .20 .22 .19 .19 .26 .26 .29 .29 .29 .32 .30 .29 .32 .37 .35 .35 .27 .38 .38 .42 .42 .42
 x .16 .13 .19 .20 .19 .22 .19 .24 .26 .26 .29 .27 .22 .29 .32 .32 .35 .38 .38 .27 .38 .38 .42 .42 .38 .45
~~.16~~ .16 .20 .20 .22 .20 .22 .22 .19 .26 .26 .29 .29 .22 .29 .32 .37 .35 .42 .42 .40 .43 .42 .46 .45 .38 .45
 .19 .19 .22 .19 .19 .19 .22 .18 .22 .29 .29 .29 .26 .29 .32 .32 .34 .34 .29 .38 .42 .42 .45 .38 .45 .45 .45

17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale

8497



Not to scale

SHOTPlus 5.6.3.6		07/07/2017
Mine	Burlington	
Location		
Title/author	17-013 Floor Blast G. Palcso	
Filename	17-013_Floor_Blast_Final.spf	

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Subdrill: 0.0ft Stemming: 7.0ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Number of holes: 305 Hole angle: 0.0°
 Total drilled: 6100.0ft

Timing

Free Face



17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale



Not to scale

SHOTPlus 5.6.4.3	10/07/2017
Mine	Burlington
Location	
Title/author	17-013 Floor Blast G. Palcso
Filename	17-013_Floor_Blast_Final Timing Op

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft	Spacing: 11.5ft	Subdrill: 0.0ft	Stemming: 7.0ft
1st row burden: 11.5ft	Hole Diameter: 4.0in	Number of holes: 305	Hole angle: 0.0°
Total drilled: 4575.0ft			

Free Face

A28 15.0ft A27 15.0ft A26 15.0ft A25 15.0ft A24 15.0ft A23 15.0ft A22 15.0ft A21 15.0ft A20 15.0ft A19 15.0ft A18 15.0ft A17 15.0ft A16 15.0ft A15 15.0ft A14 15.0ft A13 15.0ft A12 15.0ft A11 15.0ft A10 15.0ft A9 15.0ft A8 15.0ft A7 15.0ft A6 15.0ft A5 15.0ft A4 15.0ft A3 15.0ft A2 15.0ft A1 15.0ft
 B28 15.0ft B27 15.0ft B26 15.0ft B25 15.0ft B24 15.0ft B23 15.0ft B22 15.0ft B21 15.0ft B20 15.0ft B19 15.0ft B18 15.0ft B17 15.0ft B16 15.0ft B15 15.0ft B14 15.0ft B13 15.0ft B12 15.0ft B11 15.0ft B10 15.0ft B9 15.0ft B8 15.0ft B7 15.0ft B6 15.0ft B5 15.0ft B4 15.0ft B3 15.0ft B2 15.0ft B1 15.0ft
 C28 15.0ft C27 15.0ft C26 15.0ft C25 15.0ft C24 15.0ft C23 15.0ft C22 15.0ft C21 15.0ft C20 15.0ft C19 15.0ft C18 15.0ft C17 15.0ft C16 15.0ft C15 15.0ft C14 15.0ft C13 15.0ft C12 15.0ft C11 15.0ft C10 15.0ft C9 15.0ft C8 15.0ft C7 15.0ft C6 15.0ft C5 15.0ft C4 15.0ft C3 15.0ft C2 15.0ft C1 15.0ft
 D28 15.0ft D27 15.0ft D26 15.0ft D25 15.0ft D24 15.0ft D23 15.0ft D22 15.0ft D21 15.0ft D20 15.0ft D19 15.0ft D18 15.0ft D17 15.0ft D16 15.0ft D15 15.0ft D14 15.0ft D13 15.0ft D12 15.0ft D11 15.0ft D10 15.0ft D9 15.0ft D8 15.0ft D7 15.0ft D6 15.0ft D5 15.0ft D4 15.0ft D3 15.0ft D2 15.0ft D1 15.0ft
 E28 15.0ft E27 15.0ft E26 15.0ft E25 15.0ft E24 15.0ft E23 15.0ft E22 15.0ft E21 15.0ft E20 15.0ft E19 15.0ft E18 15.0ft E17 15.0ft E16 15.0ft E15 15.0ft E14 15.0ft E13 15.0ft E12 15.0ft E11 15.0ft E10 15.0ft E9 15.0ft E8 15.0ft E7 15.0ft E6 15.0ft E5 15.0ft E4 15.0ft E3 15.0ft E2 15.0ft E1 15.0ft
 F28 15.0ft F27 15.0ft F26 15.0ft F25 15.0ft F24 15.0ft F23 15.0ft F22 15.0ft F21 15.0ft F20 15.0ft F19 15.0ft F18 15.0ft F17 15.0ft F16 15.0ft F15 15.0ft F14 15.0ft F13 15.0ft F12 15.0ft F11 15.0ft F10 15.0ft F9 15.0ft F8 15.0ft F7 15.0ft F6 15.0ft F5 15.0ft F4 15.0ft F3 15.0ft F2 15.0ft F1 15.0ft
 G28 15.0ft G27 15.0ft G26 15.0ft G25 15.0ft G24 15.0ft G23 15.0ft G22 15.0ft G21 15.0ft G20 15.0ft G19 15.0ft G18 15.0ft G17 15.0ft G16 15.0ft G15 15.0ft G14 15.0ft G13 15.0ft G12 15.0ft G11 15.0ft G10 15.0ft G9 15.0ft G8 15.0ft G7 15.0ft G6 15.0ft G5 15.0ft G4 15.0ft G3 15.0ft G2 15.0ft G1 15.0ft
 H28 15.0ft H27 15.0ft H26 15.0ft H25 15.0ft H24 15.0ft H23 15.0ft H22 15.0ft H21 15.0ft H20 15.0ft H19 15.0ft H18 15.0ft H17 15.0ft H16 15.0ft H15 15.0ft H14 15.0ft H13 15.0ft H12 15.0ft H11 15.0ft H10 15.0ft H9 15.0ft H8 15.0ft H7 15.0ft H6 15.0ft H5 15.0ft H4 15.0ft H3 15.0ft H2 15.0ft H1 15.0ft
 I27 15.0ft I26 15.0ft I25 15.0ft I24 15.0ft I23 15.0ft I22 15.0ft I21 15.0ft I20 15.0ft I19 15.0ft I18 15.0ft I17 15.0ft I16 15.0ft I15 15.0ft I14 15.0ft I13 15.0ft I12 15.0ft I11 15.0ft I10 15.0ft I9 15.0ft I8 15.0ft I7 15.0ft I6 15.0ft I5 15.0ft I4 15.0ft I3 15.0ft I2 15.0ft I1 15.0ft
 J27 15.0ft J26 15.0ft J25 15.0ft J24 15.0ft J23 15.0ft J22 15.0ft J21 15.0ft J20 15.0ft J19 15.0ft J18 15.0ft J17 15.0ft J16 15.0ft J15 15.0ft J14 15.0ft J13 15.0ft J12 15.0ft J11 15.0ft J10 15.0ft J9 15.0ft J8 15.0ft J7 15.0ft J6 15.0ft J5 15.0ft J4 15.0ft J3 15.0ft J2 15.0ft J1 15.0ft
 K27 15.0ft K26 15.0ft K25 15.0ft K24 15.0ft K23 15.0ft K22 15.0ft K21 15.0ft K20 15.0ft K19 15.0ft K18 15.0ft K17 15.0ft K16 15.0ft K15 15.0ft K14 15.0ft K13 15.0ft K12 15.0ft K11 15.0ft K10 15.0ft K9 15.0ft K8 15.0ft K7 15.0ft K6 15.0ft K5 15.0ft K4 15.0ft K3 15.0ft K2 15.0ft K1 15.0ft

17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale



Not to scale

ShotPlus5 5.2.29.0	16/06/2017
Mine	Burlington
Location	
Title/author	17-013 Floor Blast G. Palcso
Filename	17-013 Floor Blast Final.spf

Customer: **Nelson**Quarry: **Burlington**Blast Number: **17-013****Blast Design**P.O. #:
 Design Date: **2017-07-07**

Orica Order #:

page 1

Master-in-charge: **Kevin Toplis** (Print Name)Blast Location: **Floor** (Bench / Level)GPS Coordinates: **0.00000** °N Latitude **0.00000** °W Longitude
Centre of Blast Centre of BlastDesign to Blasted: **60,536** te
Total Holes Loaded: **305** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **11** rows*- Drilling Information -*

	Angle from Vertical:		Nominal Bit Diameter:	
Primary Bit diam:	101.6 mm	0 °	# Holes:	305 = 6,100.0 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: **11.5** ft avg
Spacing: **11.5** ft avg
Holes: **28** front row*- Design Pattern (Main Body) -*Burden: **11.5** ft avg
Spacing: **11.5** ft avg
Holes: **277** main body
Bench Height: **20.0** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **20.0** 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 avgMaterial used: **3/4 Clear***- Design Charge Length -*Front Row: **13.0** ft avg
Main Body: **13.0** ft avg*- Design Charge Weight -*Front Row: **37.9** kg/hole
Main Body: **37.9** kg/hole
Max Chge Wt / delay: **30.0** kg/delayRequired kg Loaded: **7,912** kg
Rock Density: **2.65** g/cc = te/m³*- Design Powder Factor -*Expected Yield PF: **0.131** kg/te (actual)
Front row: **0.191** kg/te (theoretical)
Main Body: **0.191** kg/te (theoretical)
"KPI" PF: **0.191** kg/te (theoretical)0.853 lb/yd³
0.853 lb/yd³
0.853 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

Bulk Explosives Req'd:

	ChargeWt.exe	kg
CENTRA GOLD 70		7,808

Pkgd Explosives Req'd:

		kg

Boosters Req'd:

	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	305	103.7

total explosives weight in Blast (kg): **7,912**Pkgd Prod (0 kg) % of Total kg: **0.0%****Detonators Req'd:**

	ms	# req'd
EXEL HANDIDET 12m	25/500	305
CONNECTADET 12M	42 ms	11
UNITRONIC 600 6M		1

Cord & Access. Req'd:

	U of M	# req'd
IRE DUPLEX (6 PACK) 400M	units	1
	units	
	units	

Resource Deployment

# of Blasts today (this Quarry)		1
# of Blasts (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1

Services Req'd:

BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS Must be pre-authorized)		



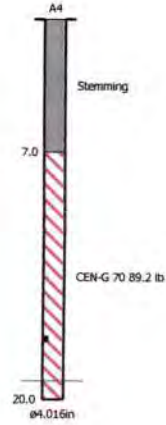
Customer: **Nelson**
Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: **2017-07-10**

Blast Number: **17-013**
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica
Blaster-in-charge:

Kevin Toplis

Quarry Manager:

Signature required, indicating
sign-off on Blast Design.

1085980

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.



Bill of Lading / Connaissancement

CONSIGNOR
 EXPÉDITEUR
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

*blaster Kevin
 Head - Neil
 Keith*

CONSIGNEE
 CONSIGNATAIRE
 NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
6:45	14:00
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSMENT
2210809	85701951

PAGE 2

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
10 Jul 2017	00:00:00	NELSON AGGREGATE COMPANY	n/a

DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
10 Jul 2017	FOB Dest'n, Own Truck	F-73289	PT115013

SHIP VIA TRANSPORTEUR	ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck	STANDARD	

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
NET EXPLOSIVES QUANTITY:					133.810 KG		
392	PC	X	92	300	PENTEX BC 340 (49/CS)	8	143.080
400	PC	X	100	300	EXEL HANDIDET 12M 25/500(40') 50/CS	8	49.200
65	PC	X	65	0	EXEL Connectadet 9M 25MS (30 FT) 65/CS	2	7.760
50	PC	X	29	21	EXEL Connectadet 12M 42MS (40 FT) 50/CS	1	6
5	PC	X	4	1	*uni tronic 600-06.0M CU/ZC(20')80PC	1	0.365
2	PC	X	1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							212.245 KG
**** TOTAL PACKAGES ****						21	

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES PALLETS RETURNED / PALETTES RETOURNÉES BAGS USED / SACS UTILISÉS

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE BRAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT <input checked="" type="checkbox"/> YES / OUI <input type="checkbox"/> NO / NON	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRENT À NO DE CONNAISSMENT ORICA:
--	---	---	--

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.
 NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

DECLARED VALUE OF SHIPMENT / VALEUR DÉCLARÉE: \$

NETTE No. CONV PRESSAGE WT AGREEMENT NO.

301 rue hotel de ville
 Brownsburg-Chatham, QC
 J8G 3B5

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
--	---------------------------------------	--

SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR <i>Kevin Pratt</i>	DRIVER'S NAME (PLEASE PRINT) / NOM DU CHAMIONNEUR <i>Kevin Pratt</i>	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
--	---	--

SIGNATURE <i>[Signature]</i>	DATE 10/7/17 D/J M/M Y/A	SIGNATURE <i>[Signature]</i>	DATE 10/7/17 D/J M/M Y/A	SIGNATURE	DATE D/J M/M Y/A
---------------------------------	--------------------------------	---------------------------------	--------------------------------	-----------	---------------------

**2 SHIPPING ORDER
 BON D'EXPÉDITION**

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
 (L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNE LA COPIE ORIGINALE (1) DU CONNAISSMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
 **** PAGE 2 OF 3 ****



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-04**

Blast Number: **17-014 A**
 Orica Order #: **2207581**
 Blast Time: **12:46 PM**

page 1 blaster-in-charge: **Kevin Topplis** (Print Name)

Blast Location: **Lower middle bench** (Bench / Face)
 GPS Coordinates: **43.40390** °N Latitude **79.88386** °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: **9,144** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 36 = 1,497.6 ft (4 " diam)
Secondary Bit diam: 114.3 mm	0 °	# Holes: 7 = 291.2 ft (4 1/2 " 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	34,050	29,193	4,857

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	86	29.2

total explosives weight in Blast (kg): 4,886

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			43
UNITRONIC 600 15M			43

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	20

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:

GPS LAYOUT	Line Item (Hourly Rate)	
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	14.0

tonnes Blasted:	11,970 te	4,517 m ³
Total tonnes per day:	33,601 te	TBA Rate Code
Total Holes Loaded:	43 holes	
... including:	0 Dead Holes	
... and:	4 Helper Holes	
Helper Hole Collar:	10.0 ft avg	
# Rows Blasted:	3 rows	
- Pattern (Front Row)-		
Burden:	12.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	12 front row	
- Pattern (Main Body) -		
Burden:	9.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	31 main body	
Bench Height:	39.6 ft avg	
Sub-drill:	2.0 ft avg	
Hole Depth:	41.6 ft avg	
- Stone Decking -		
Front Row:	0.0 ft avg	
Main Body:	0.0 ft avg	
# Stone Decks:	0 per blast	
- Collar Stemming -		
Front Row:	7.0 ft avg	
Main Body:	7.0 ft avg	
Material used:	.75 clear	
- Charge Length -		
Front Row:	34.6 ft avg	
Main Body:	34.6 ft avg	
- Charge Weight -		
Front Row:	100.9 kg/hole	
Main Body:	100.9 kg/hole	
Max. per delay:	125.0 kg/delay	
SD () Equation:	0.0 kg/delay	
Total kg Loaded:	4,886 kg	
Rock Density:	2.65 g/cc = te/m ³	
- Powder Factor -		
Yield PF:	0.408 kg/te (actual)	
Front row:	0.269 kg/te (theoretical)	
Main Body:	0.359 kg/te (theoretical)	
"KPI" PF:	0.350 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:

blaster hours: **7.5**
 helper hours: **6.5**
 This blast was shot with 17-014 B, with a 5 second delay
 Holes A1, X1, X2 got 10ft collars. Holes B1, X3, X4, C1 got 12ft collars.



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-04**

Blast Number: **17-014 A**
 Orica Order #: **2207581**
 Blast Time: **12:46 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40388	79.88387	0.757541	1.394236
Front Row Corner	43.40375	79.88372	0.757538	1.394234
Back Row Corner	43.40406	79.88399	0.757544	1.394239
Average (Centre of Blast)	43.40390	79.88386	0.757541	1.394236

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.3	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
northwest- colling rd. (Nelson monitor)				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 12.2	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 95.9	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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: 4.2	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
southwest- Camisle (Nelson Monitor)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 43	Hole angle: 0.0°
Total drilled: 1793.4ft			

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint



open face

timing



Lower Middle 17-014 Part A
 12x10.5 Front Row, 9x10.5 Body
 4" Hole Diameter
 250m Floor Elevation + 0.6m Subdrill



Not to scale

SHOTPlus 5.6.3.6	03/07/2017
Mine	Burlington
Location	Lower Middle
Title/author	Blast 17-014 Design Ken George
Filename	Blast 17-014 Lower Middle Design.spf

SHOTPlus 5 Plan

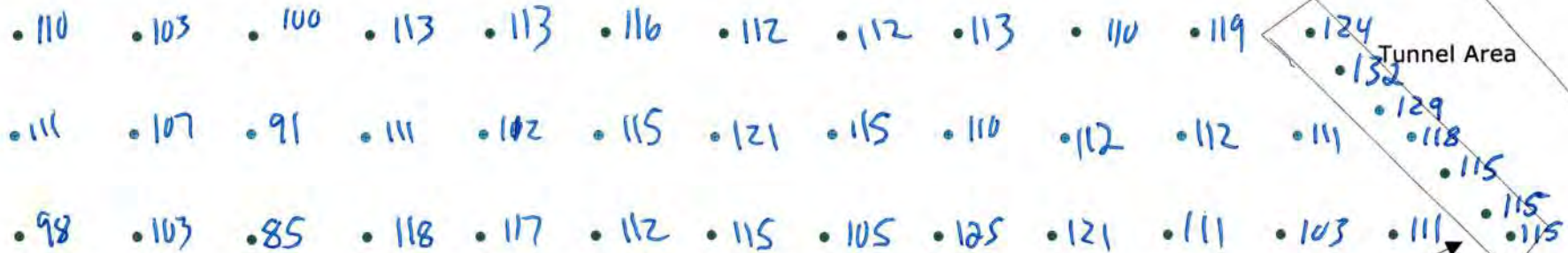
Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 43	Hole angle: 0.0°
Total drilled: 1793.4ft			

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint



open face
 load sheet
 pc counter
 max load: 140kg



Lower Middle 17-014 Part A
 12x10.5 Front Row, 9x10.5 Body
 4" Hole Diameter
 250m Floor Elevation + 0.6m Subdrill

4.5" holes

4811



Not to scale

SHOTPlus 5.6.3.6		03/07/2017
Mine	Burlington	
Location	Lower Middle	
Title/author	Blast 17-014 Design Ken George	
Filename	Blast 17-014 Lower Middle Design.spf	

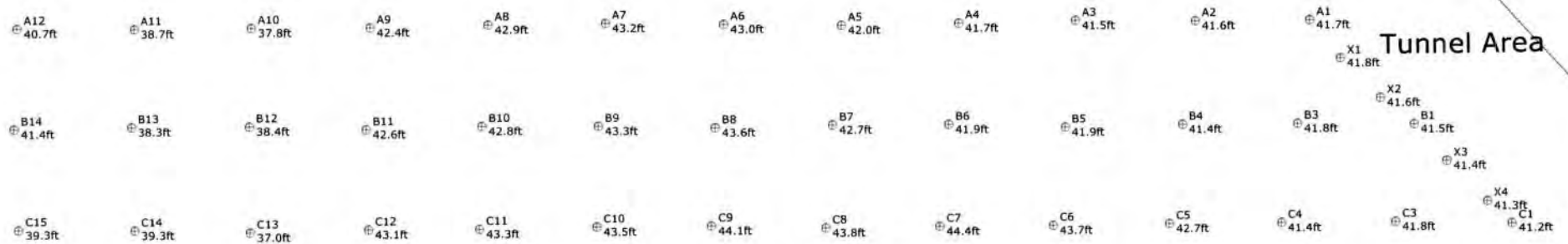
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 43 Hole angle: 0.0°
 Total drilled: 1793.4ft

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint

open face



Lower Middle 17-014 Part A
 12x10.5 Front Row, 9x10.5 Body
 4" Hole Diameter
 250m Floor Elevation + 0.6m Subdrill

SHOTPlus 5.6.4.3	22/06/2017
Mine	Burlington
Location	Lower Middle
Title/author	Blast 17-014 Design Ken George
Filename	Blast 17-014 Lower Middle Design.sp



Not to scale

Customer: **Nelson**Quarry: **Burlington**Blast Number: **17-014 A****Blast Design**

P.O. #:

Orica Order #:

Design Date: **2017-07-04**

page 1

Blaster-in-charge: **Kevin Toplis** (Print Name)Blast Location: **Lower middle bench** (Bench / Face)GPS Coordinates: **43.40390** °N Latitude **79.88386** °W Longitude
Centre of Blast Centre of BlastDesign te Blasted: **12,949** te
Total Holes Loaded: **43** holes
... including: **0** Dead Holes
... and: **4** Helper Holes
Helper Hole Collar: **7.0** ft avg
Rows Blasted: **3** rows**- Drilling Information -**

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 36	= 1,497.6 ft (4 " diam)
Secondary Bit diam: 114.3 mm	0 °	# Holes: 7	= 291.2 ft (4 1/2 " diam)
Tertiary Bit diam: mm	0 °	# Holes:	= 0.0 ft (" diam)

- Design Pattern (Front Row) -Burden: **12.0** ft avg
Spacing: **10.5** ft avg
Holes: **12** front row**- Design Pattern (Main Body) -**Burden: **9.0** ft avg
Spacing: **10.5** ft avg
Holes: **31** main bodyBench Height: **39.6** ft avgSub-drill: **2.0** ft avgHole Depth: **41.6** 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 avgMaterial used: **.75 clear****- Design Charge Length -**Front Row: **34.6** ft avg
Main Body: **34.6** ft avg**- Design Charge Weight -**Front Row: **100.9** kg/hole
Main Body: **100.9** kg/hole
Max Chge Wt / delay: **140.0** kg/delayRequired kg Loaded: **4,920** kg
Rock Density: **2.60** g/cc = te/m³**- Design Powder Factor -**Expected Yield PF: **0.380** kg/te (actual)
Front row: **0.275** kg/te (theoretical)
Main Body: **0.366** kg/te (theoretical)
"KPI" PF: **0.336** kg/te (theoretical)1.204 lb/yd³1.605 lb/yd³1.471 lb/yd³

Cost Reduction Notes (this Blast) - change in Bit - B, S, Expl or IS from previous Blast

Bulk Explosives Req'd:	kg
CENTRA GOLD 70 ChargeWt.exe	4,891

Pkgd Explosives Req'd:	kg

Boosters Req'd:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	86	29.2

total explosives weight in Blast (kg): **4,920**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Req'd:	ms	# req'd
UNITRONIC 600 15M		43
UNITRONIC 600 9M		43

Cord & Access. Req'd:	U of M	# req'd
IRE 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	>=2,000kg <5,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	



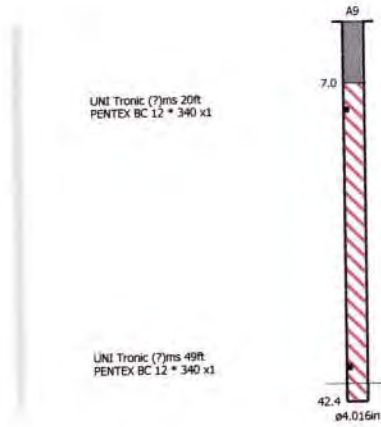
Customer: **Nelson**
Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: **2017-07-04**

Blast Number: **17-014 A**
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica
Blaster-in-charge:

Kevin Toplis

Quarry Manager:

Signature required, indicating
sign-off on Blast Design.

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance

Orica Canada Inc.
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
 NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 7:00	TIME OUT HEURE SORTIE 13:30
ORDER NUMBER N° DE COMMANDE 2207581	B/L NUMBER N° DE CONNAISSEMENT 85695134

DATE REQUIRED DATE REQUISE 04 Jul 2017	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a
DATE SHIPPED EXPÉDIÉ LE 04 Jul 2017	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE PT 12013

SHIP VIA TRANSPORTEUR Orica Truck	ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS
---	-----------------------------------	-------------------------------

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
245	PC	X	85	160	PENTEX BC 340 (49/CS)	5	89.425
160	PC	X	81	79	*uni tronic 600-06.0M CU/ZC(20')80PC	2	11.680
66	PC	X	23	43	*uni tronic 600-15M C/Z SPL(50')66PC	1	11.286
72	PC	X	34	38	*uni tronic 600-30M C/Z SPL(100')36P	2	21.168
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
200	PC		160	40	Stem + gnt		
							139.399 KG
**** TOTAL PACKAGES ****						11	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.
 NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

DECLARED VALUE OF SHIPMENT
VALEUR DÉCLARÉE \$

NETTE No. CONV
PRESSAGE
WT AGREEMENT NO.

301 rue hotel de ville
 Brownsburg-Chatham, QC
 J8G 3B5

CONSIGNOR / EXPÉDITEUR: GRAND VALLEY
 CARRIER / TRANSPORTEUR: Orica Truck
 CONSIGNEE / DESTINATAIRE: NELSON AGGREGATE COMPANY

SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR: Tristan Nelly
 DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR: Tristan Nelly
 RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR:

SIGNATURE: [Signature] DATE: 4 7 17 D/J M/M Y/A
 SIGNATURE: [Signature] DATE: 4 7 17 D/J M/M Y/A
 SIGNATURE: [Signature] DATE: D/J M/M Y/A

3 MEMORANDUM
 (THIS BILL OF LADING-EXPRESS SHIPPING CONTRACT IS TO BE SIGNED BY THE SHIPPER AND CARRIER)
 (CE CONNAISSEMENT-CONTRAT D'EXPÉDITION PAR MESSAGERIES DOIT ÊTRE SIGNÉ PAR L'EXPÉDITEUR ET LE TRANSPORTEUR)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
 **** PAGE 2 OF 2 ****
 D.F.G. S772



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-04**

Blast Number: **17-014 B**
 Orica Order #: **2207581**
 Blast Time: **12:46 PM**

page 1 blaster-in-charge: **Kevin Topplis** (Print Name)

Blast Location: **Lower middle bench** (Bench / Face)
 GPS Coordinates: **43.40347** °N Latitude **79.88363** °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: **9,144** m

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0**° # Holes: **36** = 2,840.4 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	29,193	20,540	8,653

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	74	25.2

total explosives weight in Blast (kg): 8,678

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			36
UNITRONIC 600 30M			38

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	20

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:

	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	14.0

tonnes Blasted: **21,631** te **8,163** m³
 Total tonnes per day: **33,601** te **TBA** Rate Code
 Total Holes Loaded: **36** 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: **10.5** ft avg

Holes: **11** front row

Burden: **9.0** ft avg

Spacing: **10.5** ft avg

Holes: **25**

Bench Height: **76.9** ft avg

Sub-drill: **2.0** ft avg

Hole Depth: **78.9** ft avg

- Stone Decking -

Front Row: **15.0** ft avg

Main Body: **0.0** ft avg

Stone Decks: 1 per blast

- Collar Stemming -

Front Row: **8.0** ft avg

Main Body: **7.0** ft avg

Material used: **.75 clear**

- Charge Length -

Front Row: **55.9** ft avg

Main Body: **71.9** ft avg

- Charge Weight -

Front Row: **163.0** kg/hole

Main Body: **209.7** kg/hole

Max. per delay: **250.0** kg/delay

SD () Equation: **0.0** kg/delay

Total kg Loaded: **8,678** kg

Rock Density: **2.65** g/cc = te/m³

- Powder Factor -

Yield PF: **0.401** kg/te (actual)

Front row: **0.224** kg/te (theoretical)

Main Body: **0.384** kg/te (theoretical)

"KPI" PF: **#DIV/0!** kg/te (theoretical)

1.792 lb/yd³
 1.001 lb/yd³
 1.717 lb/yd³
 ##### lb/yd³

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:

blaster hours: **7.5**

helper hours: **6.5**

This shot was fired with 17-014 A, with a 5 second delay.

Hole A11 was loaded to 65ft, stone deck to 41ft.

Hola A10 got a 14ft collar, Hole A1 got a 10ft collar, Holes, A4+5 got 14ft collar.



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-04**

Blast Number: **17-014 B**
 Orica Order #: **2207581**
 Blast Time: **12:46 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40345	79.88364	0.757533	1.394232
Front Row Corner	43.40335	79.88349	0.757531	1.394230
Back Row Corner	43.40362	79.88376	0.757536	1.394235
Average (Centre of Blast)	43.40347	79.88363	0.757533	1.394232

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.3	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Northwest- colling rd (Nelson monitor)				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 12.2	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 95.9	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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: 4.2	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Southwest- Camisle (Nelson monitor)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Kevin Toplis

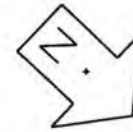
Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus 5 Plan

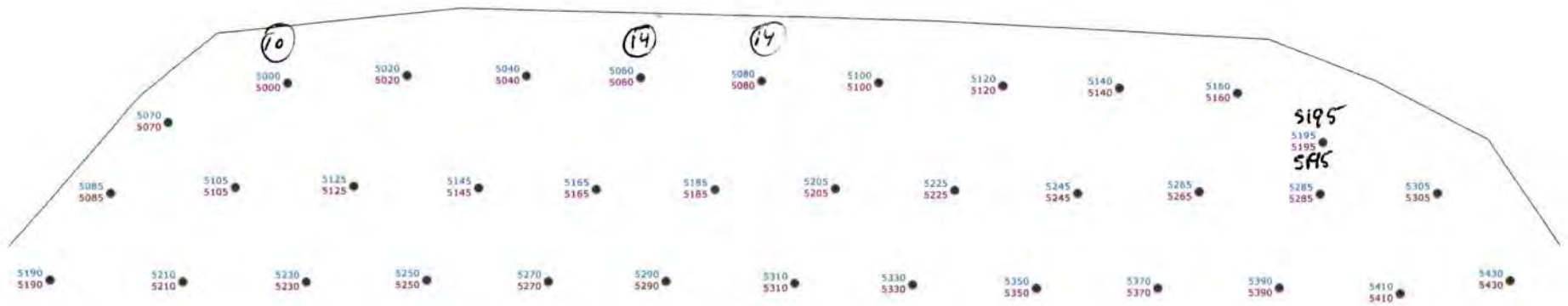
Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 36 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 2841.9ft Blasted tonnage: 20,509S/T

timing



open face



Lower Middle 17-014 Part B
 12x10.5 Front Row, 9x10.5 Body
 4" Hole Diameter
 250m Elevation + 0.6m subdrill



Not to scale

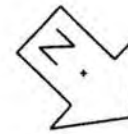
SHOTPlus 5.6.3.6	03/07/2017
Mine	Burlington
Location	Lower Middle Bench
Title/author	Lower Middle 17-014 Part B Ken George
Filename	Blast_17-014_Lower_Middle_Design_Part_B.s

SHOTPlus 5 Plan

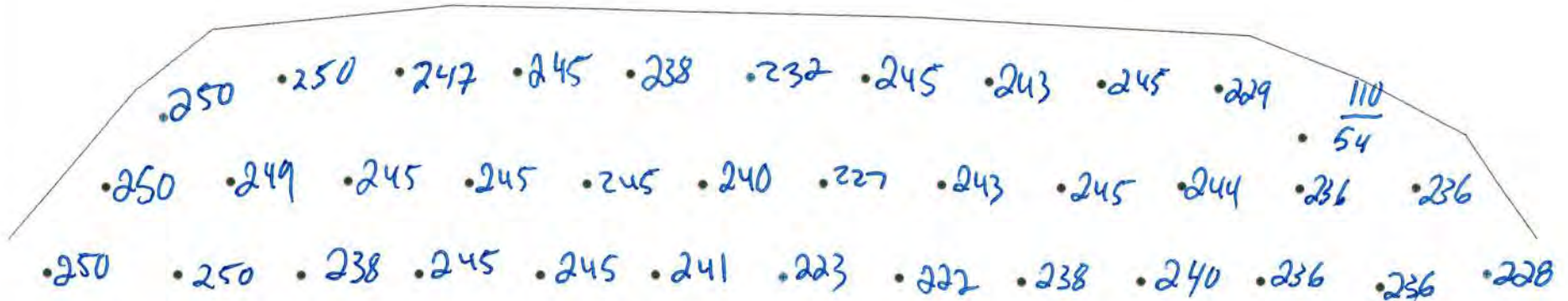
Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 36	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 2841.9ft	Blasted tonnage: 20,509S/T	

load sheet
pc counter:
max load 233kg



open face



Lower Middle 17-014 Part B
12x10.5 Front Row, 9x10.5 Body
4" Hole Diameter
250m Elevation + 0.6m subdrill

8570



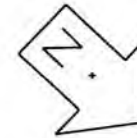
Not to scale

SHOTPlus 5.6.3.6	03/07/2017
Mine	Burlington
Location	Lower Middle Bench
Title/author	Lower Middle 17-014 Part B Ken George
Filename	Blast_17-014_Lower_Middle_Design_Part_B.s

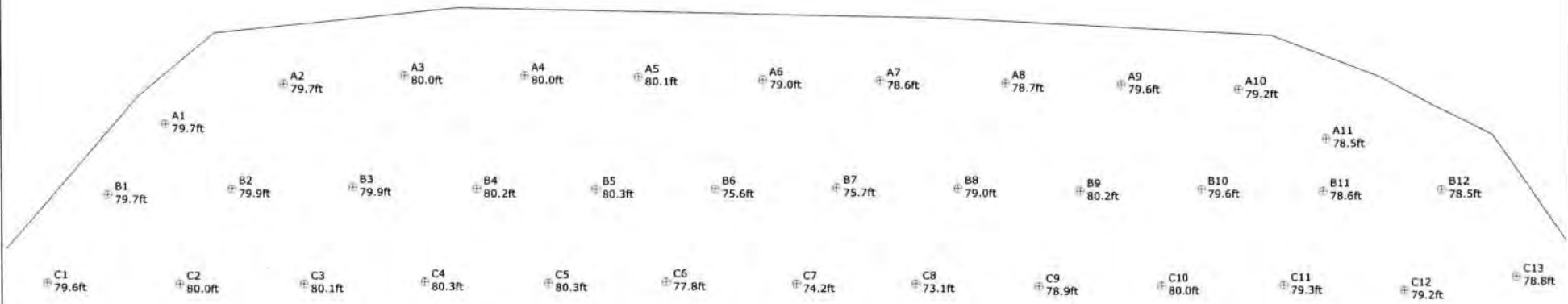
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 36	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 2841.9ft	Blasted tonnage: 20,509S/T	



open face



Lower Middle 17-014 Part B
 12x10.5 Front Row, 9x10.5 Body
 4" Hole Diameter
 250m Elevation + 0.6m subdrill



Not to scale

SHOTPlus 5.6.4.3	22/06/2017
Mine	Burlington
Location	Lower Middle Bench
Title/author	Lower Middle 17-014 Part B Ken Ge
Filename	Blast 17-014 Lower Middle Design Pa

Customer: **Nelson**Quarry: **Burlington**Blast Number: **17-014 B****Blast Design**

P.O. #:

Orica Order #:

Design Date: **2017-07-04**

page 1

Blaster-in-charge: **Kevin Toplis** (Print Name)Blast Location: **Lower middle bench** (Bench / Face)GPS Coordinates: **43.40347** °N Latitude **79.88363** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **21,631** te
 Total Holes Loaded: **36** holes
 ... including: **0** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **3** rows

- Drilling information -

Angle from Vertical

Primary Bit diam: **101.6** mm **0**° # Holes: **36** = 2,840.4 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:

- Design Pattern (Front Row) -

Burden: **12.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **11** front row

- Design Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **10.5** ft avg
 # holes: **25** main body

Bench Height: **76.9** ft avgSub-drill: **2.0** ft avgHole Depth: **78.9** ft avg*- Design Stone Decking -*Front Row: **0.0** ft avgMain Body: **0.0** ft avg*- Design Collar Stemming -*Front Row: **7.0** ft avgMain Body: **7.0** ft avgMaterial used: **.75** clear*- Design Charge Length -*Front Row: **71.9** ft avgMain Body: **71.9** ft avg*- Design Charge Weight -*Front Row: **209.7** kg/holeMain Body: **209.7** kg/holeMax Chge Wt / delay: **230.0** kg/delayRequired kg Loaded: **8,318** kgRock Density: **2.65** g/cc = te/m³*- Design Powder Factor -*Expected Yield PF: **0.385** kg/te (actual)Front row: **0.288** kg/te (theoretical)Main Body: **0.384** kg/te (theoretical)"KPI" PF: **0.352** kg/te (theoretical)1.288 lb/yd³1.717 lb/yd³1.574 lb/yd³

Cost Reduction Notes (this Blast) - change in Blt / B, S, Expl or IS from previous Blast

Bulk Explosives Req'd:

kg

CENTRA GOLD 70	ChargeWt.exe	8,294
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Pkgd Explosives Req'd:

kg

Boosters Req'd:

kg/u # used kg

PENTEX 12 (OR EQUIVALENT)	0.34	72	24.5
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total explosives weight in Blast (kg): **8,318**Pkgd Prod (0 kg) % of Total kg: **0.0%****Detonators Req'd:**

ms # req'd

UNITRONIC 600 30M		36
--------------------------	--	-----------

UNITRONIC 600 9M		36
-------------------------	--	-----------

Cord & Access. Req'd:

U of M # req'd

IRE 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	>/=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS Must be pre-authorized)		



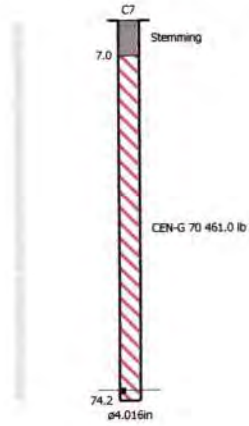
Customer: **Nelson**
Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: **2017-07-04**

Blast Number: **17-014B**
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Kevin Toplis

#

Quarry Manager:

Signature required, indicating
sign off on Blast Design.



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-25**

Blast Number: **17-015**
 Orica Order #: **2216725**
 Blast Time: **11:57 AM**

page 1 blaster-in-charge: **Kevin Topplis** (Print Name)

Blast Location: **Lower middle bench** (Bench / Face)

GPS Coordinates: **43.40395** °N Latitude **79.88376** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **NE** at **5** kph Temperature: **16 to 20** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **9,144** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 52 = 2,184.0 ft (4 " diam)
Secondary Bit diam: <input type="checkbox"/> mm	<input type="checkbox"/> °	# Holes: <input type="checkbox"/> = 0.0 ft (" diam)
Tertiary Bit diam: <input type="checkbox"/> mm	<input type="checkbox"/> °	# Holes: <input type="checkbox"/> = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,100	21,270	5,830

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	52	17.7

total explosives weight in Blast (kg): 5,848

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 15M			52

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:

	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	12.0

tonnes Blasted:	15,057 te	5,682 m ³
Total tonnes per day:	15,057 te	TBA Rate Code
Total Holes Loaded:	52 holes	
... including:	3 Dead Holes	
... and:	0 Helper Holes	
Helper Hole Collar:	0.0 ft avg	
# Rows Blasted:	4 rows	
- Pattern (Front Row)-		
Burden:	12.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	13 front row	
Burden:	9.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	39	
Bench Height:	40.0 ft avg	
Sub-drill:	2.0 ft avg	
Hole Depth:	42.0 ft avg	
- Stone Decking -		
Front Row:	0.0 ft avg	
Main Body:	0.0 ft avg	
# Stone Decks:	0 per blast	
- Collar Stemming -		
Front Row:	9.0 ft avg	
Main Body:	7.0 ft avg	
Material used:	.75 clear	
- Charge Length -		
Front Row:	33.0 ft avg	
Main Body:	35.0 ft avg	
- Charge Weight -		
Front Row:	96.2 kg/hole	
Main Body:	102.1 kg/hole	
Max. per delay:	125.0 kg/delay	
SD () Equation:	0.0 kg/delay	
Total kg Loaded:	5,848 kg	
Rock Density:	2.65 g/cc = te/m ³	
- Powder Factor -		
Yield PF:	0.388 kg/te (actual)	
Front row:	0.254 kg/te (theoretical)	
Main Body:	0.360 kg/te (theoretical)	
"KPI" PF:	#DIV/0! kg/te (theoretical)	

1.735 lb/yd³
 1.136 lb/yd³
 1.607 lb/yd³
 ##### lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

blaster hours: **6.5**
 helper hours: **5.5**
 Tech hours: **GPS 1hr**
 adjusted collars to holes: **A1,3,4-10ft +O21:AA54A7,8-11ft A9,10,11-10ft A12-12ft A13-B1, C1, D1-10ft X1-20ft X2-12ft X3-10ft**



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-07-25**

Blast Number: **17-015**
 Orica Order #: **2216725**
 Blast Time: **11:57 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40393	79.88378	0.757542	1.394235
Front Row Corner	43.40406	79.88393	0.757544	1.394238
Back Row Corner	43.40385	79.88356	0.757540	1.394231
Average (Centre of Blast)	43.40395	79.88376	0.757542	1.394235

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.1	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: 112.8	dB	Trigger set at: 115	dB
Northwest- colling rd (Nelson monitor)				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 3.6	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 91.5	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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: 2.2	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Southwest- Camisle (Nelson monitor)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

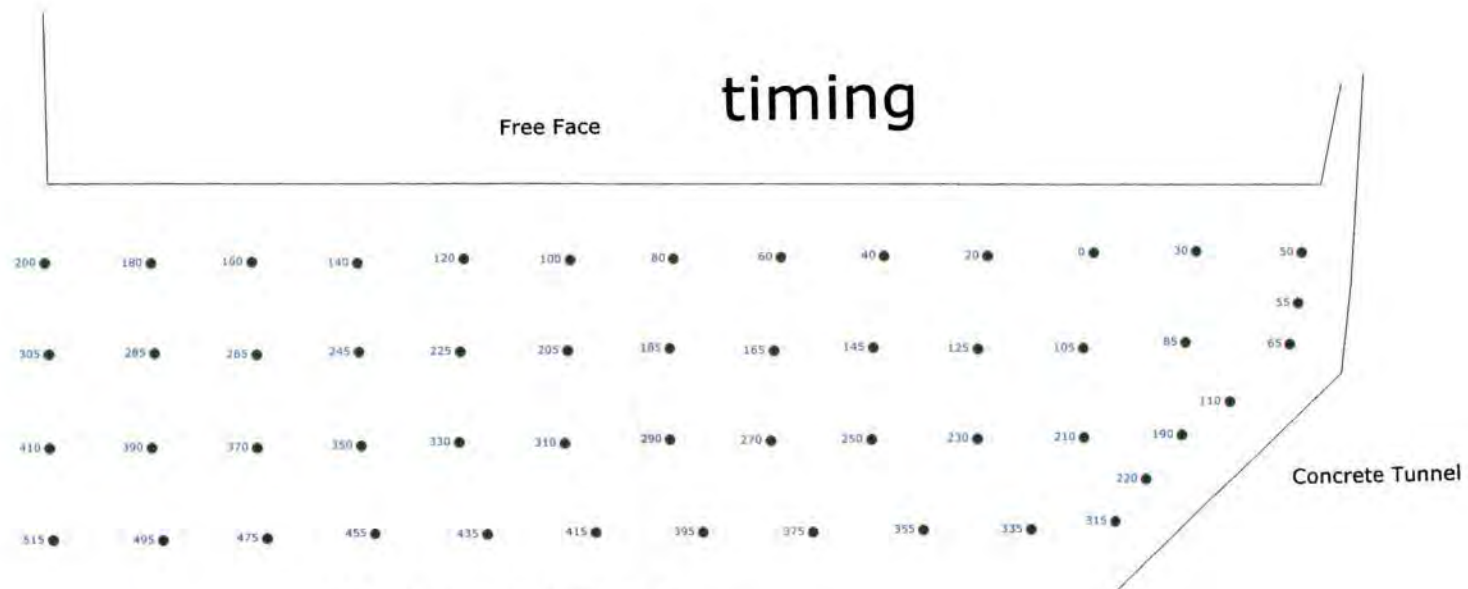
Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 52 Hole angle: 0.0°
 Total drilled: 2188.5ft



17-015 Lower Middle Bench
 12' X 10.5' Front Row - 9' X 10.5' Body
 4" Drill Bit
 250 Floor Elevation + .6 Sub



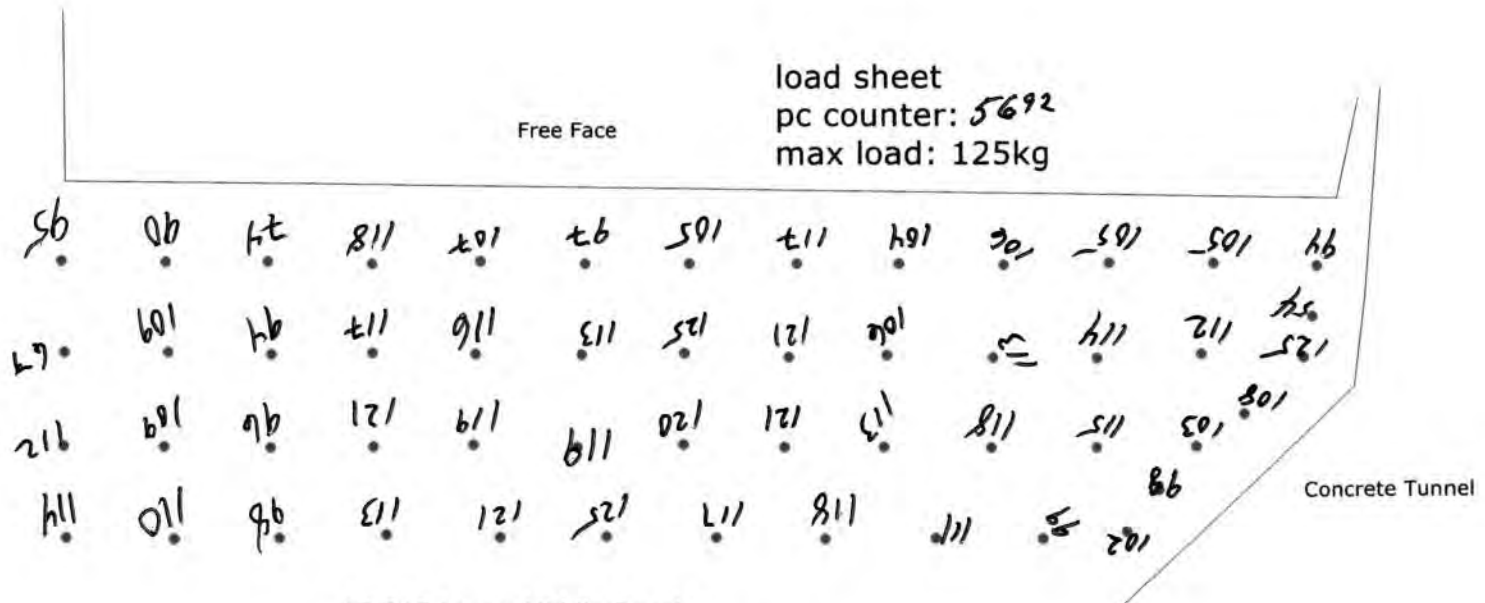
Not to scale

SHOTPlus 5.6.3.6	24/07/2017
Mine	Burlington
Location	
Title/author	17-015 Lower Middle Bench G. Palcso
Filename	17-015_Lower_Middle_Bench_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 52 Hole angle: 0.0°
 Total drilled: 2188.5ft



load sheet
 pc counter: 5692
 max load: 125kg

17-015 Lower Middle Bench
 12' X 10.5' Front Row - 9' X 10.5' Body
 4" Drill Bit
 250 Floor Elevation + .6 Sub



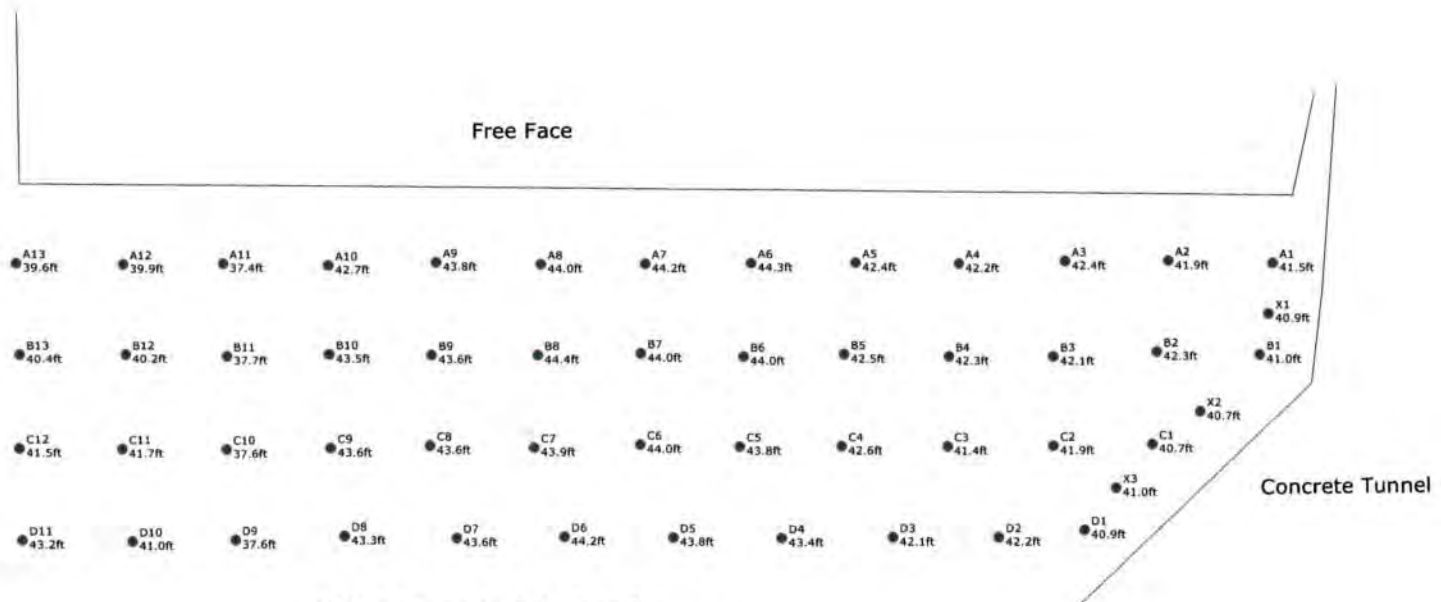
Not to scale

SHOTPlus 5.6.3.6	24/07/2017
Mine	Burlington
Location	
Title/author	17-015 Lower Middle Bench G. Palcso
Filename	17-015_Lower_Middle_Bench_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 52	Hole angle: 0.0°
Total drilled: 2188.5ft			



17-015 Lower Middle Bench
 12' X 10.5' Front Row - 9' X 10.5' Body
 4" Drill Bit
 250 Floor Elevation + .6 Sub

SHOTPlus 5.6.3.6		24/07/2017
Mine	Burlington	
Location		
Title/author	17-015 Lower Middle Bench G. Palcso	
Filename	17-015_Lower_Middle_Bench_Final.spf	



Not to scale

Customer: **Nelson**Quarry: **Burlington**Blast Number: **17-015****Blast Design**

P.O. #:

Orica Order #:

Design Date: **2017-07-25**

page 1

Master-in-charge: **Kevin Toplis** (Print Name)Blast Location: **Lower middle bench** (Bench / Face)GPS Coordinates: **43.40395** °N Latitude **79.88376** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: **15,057** te
 Total Holes Loaded: **52** holes
 ... including: **3** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **52** = 2,184.0 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: **10.5** ft avg
 # Holes: **13** (front row)

- Design Pattern (Main Body) -

Burden: **9.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **39** main body
 Bench Height: **40.0** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **42.0** ft avg

- Design Stang Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

- Design Collar Stemming -

Front Row: **8.0** ft avg
 Main Body: **7.0** ft avg

Material used: **.75** clear*- Design Charge Length -*

Front Row: **34.0** ft avg
 Main Body: **35.0** ft avg

- Design Charge Weight -

Front Row: **99.1** kg/hole
 Main Body: **102.1** kg/hole
 Max Chge Wt / delay: **115.0** kg/delay

Required kg Loaded: **5,842** kg
 Rock Density: **2.65** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.388** kg/te (actual)
 Front row: **0.262** kg/te (theoretical)
 Main Body: **0.360** kg/te (theoretical)
 "KPI" PF: **0.335** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Blt. B, S, Expl or IS from previous Blast

Bulk Explosives Req'd: kg
 CENTRA GOLD 70 ChargeWt.exe **5,824**

Pkgd Explosives Req'd: kg

Boosters Req'd: kg/u # used kg
 PENTEX 12 (OR EQUIVALENT) 0.34 **52** 17.7

total explosives weight in Blast (kg): **5,842**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Req'd: ms # req'd
 UNITRONIC 600 15M **52**

Cord & Access. Req'd: U of M # req'd
 IRE 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	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	



Bill of Lading / Connaissance

CONSIGNOR
EXPÉDITEUR
GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 16:50	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE 2216725	B/L NUMBER N° DE CONNAISSEMENT 85716915

PAGE 2

DATE REQUIRED DATE REQUISE 25 Jul 2017	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT N/A
DATE SHIPPED EXPÉDIÉ LE 25 Jul 2017	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE 16055

SHIP VIA TRANSPORTEUR Orica Truck	ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS
---	-----------------------------------	-------------------------------

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
98	PC	X	46	52	PENTEX BC 340 (49/CS)	2	35.770
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
80	PC	X	80	0	*uni tronic 600-06.0M CU/ZC(20')80PC	1	5.840
132	PC	X	80	52	*uni tronic 600-15M C/Z SPL(50')66PC	2	22.572
100	PC		100	0	MINI STEM PLUGS - PART #6015		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							70.722 KG
**** TOTAL PACKAGES ****						6	
GHS/WHMIS SDS documents available Website: www.oricaminingsservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

PALETTES USED / PALETTES UTILISÉES PALETTES RETURNED / PALETTES RETOURNÉES BAGS USED / SACS UTILISÉS

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMÉRO 1-877-561-2626	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA : Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
---	--	---	--

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR Neil Kwart	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR Neil Kwart	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE [Signature]	DATE 25 07 17 D/J M/M Y/A	SIGNATURE [Signature]

**2 SHIPPING ORDER
BON D'EXPÉDITION**

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
 (L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNÉ LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-08-30**

Blast Number: **17-016**
 Orica Order #: **2232326**
 Blast Time: **12:01 PM**

page 1

Blaster-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South face** (Bench / Face)
 GPS Coordinates: **43.39837** °N Latitude **79.88412** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **SW** at **5** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **3000ft** m

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0**° # Holes: **28** = 2,360.4 ft (4 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm ° # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,280	20,510	6,770

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): 6,808

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			28
UNITRONIC 600 20M			28
UNITRONIC 600 30M			56

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:

	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

tonnes Blasted:	16,211 te	6,118 m ³
Total tonnes per day:	16,211 te	TBA Rate Code
Total Holes Loaded:	28 holes	
... including:	0 Dead Holes	
... and:	3 Helper Holes	
Helper Hole Collar:	7.0 ft avg	
# Rows Blasted:	3 rows	
- Pattern (Front Row)-		
Burden:	10.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	14 front row	
- Pattern (Main Body) -		
Burden:	10.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	14 main body	
Bench Height:	82.3 ft avg	
Sub-drill:	2.0 ft avg	
Hole Depth:	84.3 ft avg	
- Stone Decking -		
Front Row:	4.0 ft avg	
Main Body:	4.0 ft avg	
# Stone Decks:	28 per blast	
- Collar Stemming -		
Front Row:	10.0 ft avg	
Main Body:	7.0 ft avg	
Material used:	1/2" crush	
- Charge Length -		
Front Row:	70.3 ft avg	
Main Body:	73.3 ft avg	
- Charge Weight -		
Front Row:	205.0 kg/hole	
Main Body:	213.7 kg/hole	
Max. per delay:	150.0 kg/delay	
SD () Equation:	0.0 kg/delay	
Total kg Loaded:	6,808 kg	
Rock Density:	2.65 g/cc = te/m ³	
- Powder Factor -		
Yield PF:	0.420 kg/te (actual)	
Front row:	0.316 kg/te (theoretical)	
Main Body:	0.330 kg/te (theoretical)	
"KPI" PF:	0.328 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:

Blaster Hours= 6hr
 Helper Hours= 10hrs



Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-08-30**

Blast Number: **17-016**
 Orica Order #: **2232326**
 Blast Time: **12:01 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.39827	79.88426	0.757443	1.394243
Front Row Corner	43.39837	79.88413	0.757444	1.394241
Back Row Corner	43.39847	79.88398	0.757446	1.394238
Average (Centre of Blast)	43.39837	79.88412	0.757444	1.394241

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.1	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: 107.5	dB	Trigger set at: 115	dB

Colling 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: 1.5	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 91.5	dB	Trigger set at: 115	dB

2450 #2 sideroad

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: 1.5	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB

Camisle

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(0)^2}{30^2} \text{ kg} \\
 &= \frac{0}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Mitch Ossington

Signature required, indicating that
 Blast Report is Complete & Accurate.

Customer: **Nelsons**Quarry: **Burlington**Blast Number: **17-016****Blast Design**P.O. #: **NA**

Orica Order #:

Design Date: **2017-08-30**

page 1

Master-in-charge: **Mitch Ossington** (Print Name)Blast Location: **South Face** (Bench / Face)GPS Coordinates: **43.39805** °N Latitude **79.88433** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **18,157** te
 Total Holes Loaded: **28** holes
 ... including: **0** Dead Holes
 ... and: **3** Helper Holes
 Helper Hole Collar: **7.0** ft avg
 # Rows Blasted: **3** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0'** # Holes: **28** = 2,360.4 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:

- Design Pattern (Front Row) -

Burden: **10.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **14** front row

- Design Pattern (Main Body) -

Burden: **10.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: 14 main body
 Bench Height: **82.3** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **84.3** ft avg

- Design Stone Decking -

Front Row: **4.0** ft avg
 Main Body: **4.0** ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **1/2" crush**

- Design Charge Length -

Front Row: **73.3** ft avg
 Main Body: **73.3** ft avg

- Design Charge Weight -

Front Row: **213.7** kg/hole
 Main Body: **213.7** kg/hole
 Max Chge Wt / delay: **130.0** kg/delay

Required kg Loaded: **6,551** kg
 Rock Density: **2.65** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.361** kg/te (actual)
 Front row: **0.330** kg/te (theoretical)
 Main Body: **0.330** kg/te (theoretical)
 "KPI" PF: **0.330** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast

130 kg in bottom deck. Bob the top deck to collar.**Bulk Explosives Req'd:**

	ChargeWt.exe	kg
CENTRA GOLD 70		6,500

Pkgd Explosives Req'd:

		kg

Boosters Req'd:

	kg/u	# used	kg
PENTEX 16 (OR EQUIVALENT)	0.45	112	50.8

total explosives weight in Blast (kg): **6,551**Pkgd Prod (0 kg) % of Total kg: **0.0%****Detonators Req'd:**

	ms	# req'd
UNITRONIC 600 30M		56
UNITRONIC 600 20M		28
UNITRONIC 600 9M		28

Cord & Access. Req'd:

	U of M	# req'd
IRE DUPLEX (6 PACK) 400M	units	1
STEMMING PLUG MINI	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 Req'd:

BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Fee per Blast)	1
BORETRACK	Enter "1" if Boretraked	
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	



Customer: **Nelsons**

Blast Design

Quarry: **Burlington**

P.O. #:

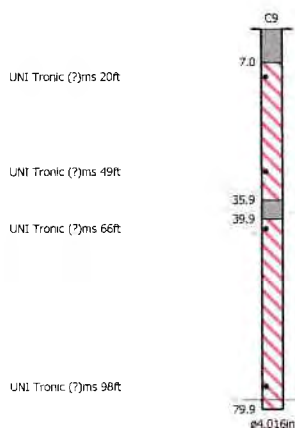
Blast Date: **2017-08-30**

Blast Number: **17-019**

Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mitch Ossington

#

Quarry Manager:

Signature required, indicating
sign off on Blast Design

1086863

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

Bill of Lading / Connaissance



CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON CA L7R 4L8

Table with fields: GROSS / BRUT, TARE, NET, TIME IN / HEURE D'ENTRÉE, TIME OUT / HEURE SORTIE, ORDER NUMBER / N° DE COMMANDE, B/L NUMBER / N° DE CONNAISSEMENT

Table with 4 columns: DATE REQUIRED / DATE REQUISE, TIME REQUIRED / HEURE REQUISE, INVOICE TO / BUYER / FACTURÉ À / ACHETEUR, CUSTOMER REFERENCE NO. / N° DE COMMANDE DU CLIENT

Main table with columns: QTY. QTE., UM, DG MD, QTY. RET'D QTE. RET., QTY. SOLD QTE. FACT, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT

Table with 3 columns: EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE, EMERGENCY RESPONSE NO./24 HOUR NUMBER / TÉLÉPHONE D'URGENCE/24 HEURE NUMÉRO, PLACARDS OFFERED / PLACARDS OFFERT

Table with 3 columns: THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED... / NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE... / DÉCLARED VALUE OF SHIPMENT / VALEUR DÉCLARÉE, NETTE No. CONV PRESSAGE WT AGREEMENT NO.

Table with 3 columns: CARRIER / TRANSPORTEUR, CONSIGNEE / DESTINATAIRE, DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR, RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR

3 MEMORANDUM (THIS BILL OF LADING-EXPRESS SHIPPING CONTRACT IS TO BE SIGNED BY THE SHIPPER AND CARRIER) / MÉMORANDUM (CE CONNAISSEMENT-CONTRAT D'EXPÉDITION PAR MESSAGERIES DOIT ÊTRE SIGNÉ PAR L'EXPÉDITEUR ET LE TRANSPORTEUR)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK / SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO ***** PAGE 2 OF 2 ***** D.F.G. S772

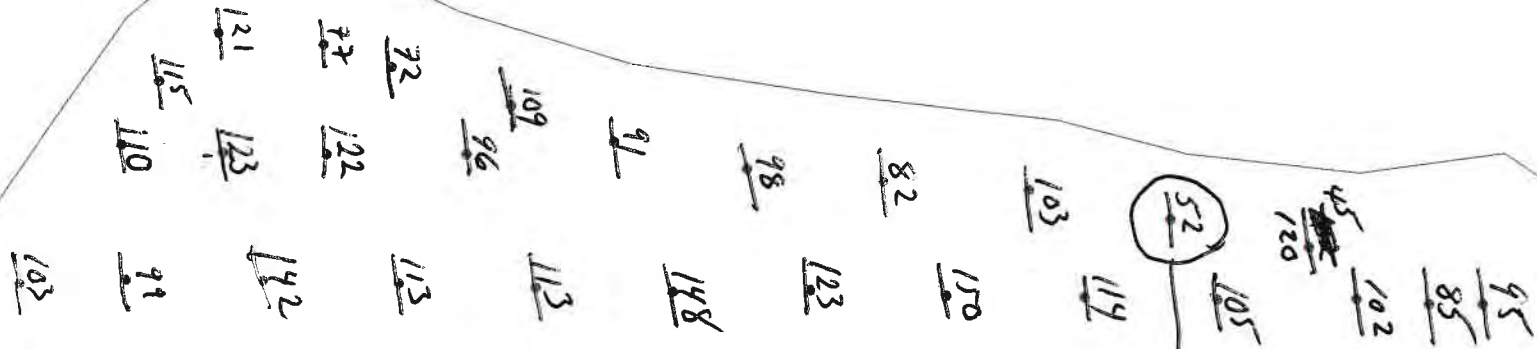
SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 10.0ft	Hole Diameter: 4.0in	Number of holes: 28	Hole angle: 0.0°
Total drilled: 2362.0ft			

Free Face

Free Face



17-016 South Wall Final
 10' X 10.5' - 4" Bit
 248.5 Floor Elevation + .6 Sub

ALL BOTTOM DECKS
 TOOK 130 Kg UNLESS
 MARKED.

SHOTPlus 5.6.2.7	29/08/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-016 South Wall Final Timing.spf



Scale 1:175

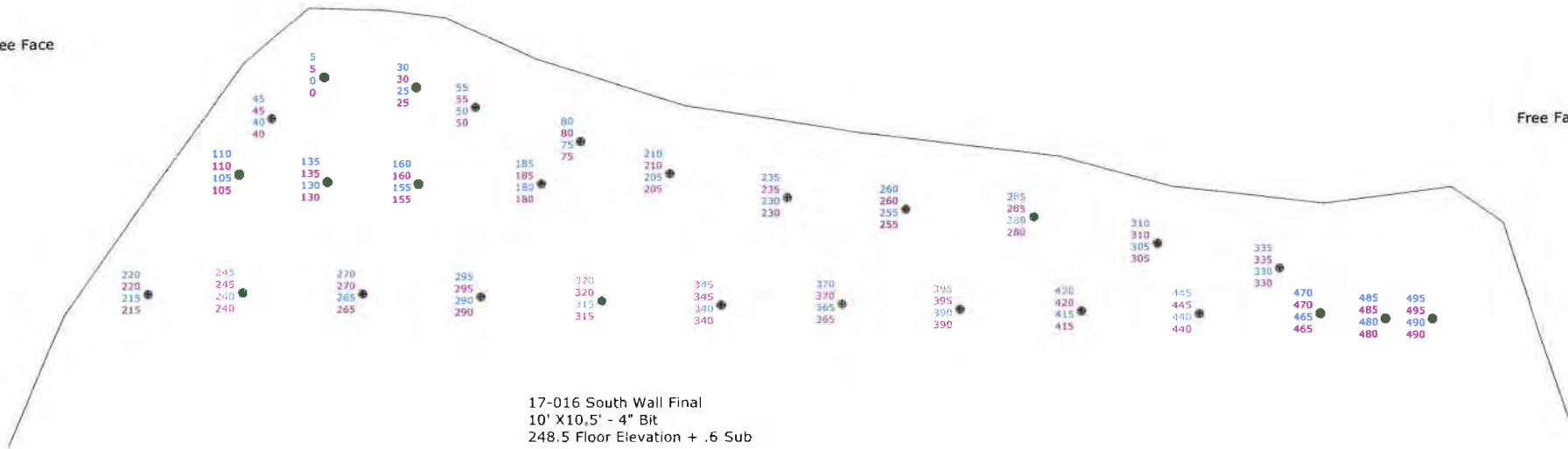
SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 10.0ft Hole Diameter: 4.0in Number of holes: 28 Hole angle: 0.0°
 Total drilled: 2362.0ft

Free Face

Free Face



Scale 1:175

SHOTPlus 5.6.2.7	29/08/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-016 South Wall Final Timing.spf

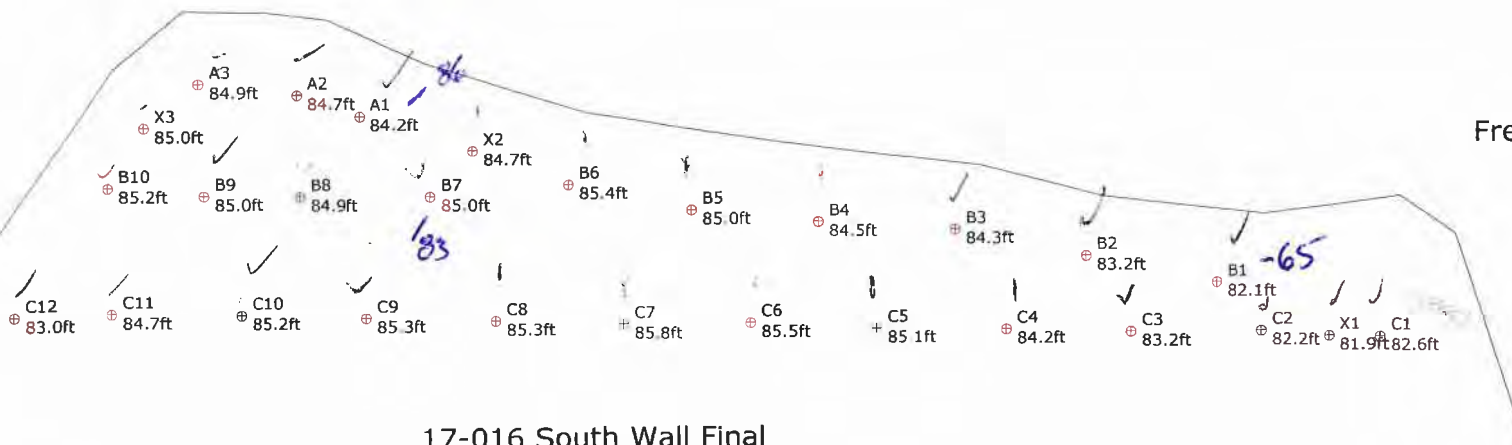
SHOTPlus 5 Plan

Blast Summary Data

Burden: 10.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 10.0ft	Hole Diameter: 4.0in	Number of holes: 28	Hole angle: 0.0°
Total drilled: 2362.1ft			

Free Face

Free Face



17-016 South Wall Final
 10' X10.5' - 4" Bit
 248.5 Floor Elevation + .6 Sub

over drilled 2' needs to be back filled.



Not to scale

ShotPlus5 5.2.29.0	13/07/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-016 South Wall Final.spf



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-08-03**

Blast Number: **17-017**
 Orica Order #: **2220757**
 Blast Time: **12:41 PM**

page 1

Blaster-in-charge: **Kevin Topplis** (Print Name)

Blast Location: **Upper middle bench** (Bench / Face)
 GPS Coordinates: **43.40358** °N Latitude **79.88363** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **N** at **0** kph Temperature: **26 to 30** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **9,144** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 ° # Holes: 7	= 539.7 ft (4 " diam)
Secondary Bit diam: 114.3 mm	° # Holes: 6	= 462.6 ft (4 1/2 " diam)
Tertiary Bit diam: 127.0 mm	° # Holes: 8	= 616.8 ft (5 " diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	31,090	25,230	5,860

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	46	15.6

total explosives weight in Blast (kg): 5,876

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 30M			26
UNITRONIC 600 9M			20

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	2

Resource Deployment:

# of Blasts today (this Quarry)	1
# of Blasters (this Blast)	1
# of Helpers (this Blast)	1
# of MMU's (this Blast)	1

Services:

	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	13.0

tonnes Blasted: **11,832** te **4,465** m³
 Total tonnes per day: **11,832** te **TBA** Rate Code
 Total Holes Loaded: **23** holes
 ... including: **2** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **4** rows

- Pattern (Front Row)-

Burden: **12.0** ft avg
 Spacing: **10.5** ft avg
 # Holes: **4** front row

Burden: **9.0** ft avg
 Spacing: **10.5** ft avg

Holes: **19**
 Bench Height: **75.1** ft avg
 Sub-drill: **2.0** ft avg

Hole Depth: **77.1** ft avg

- Stone Decking -

Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg

Stone Decks: **0** per blast

- Collar Stemming -

Front Row: **9.0** ft avg
 Main Body: **8.0** ft avg

Material used: **.75** clear

- Charge Length -

Front Row: **68.1** ft avg
 Main Body: **69.1** ft avg

- Charge Weight -

Front Row: **198.6** kg/hole
 Main Body: **201.5** kg/hole

Max. per delay: **393.0** kg/delay

SD () Equation: **0.0** kg/delay

Total kg Loaded: **5,876** kg

Rock Density: **2.65** g/cc = te/m³

- Powder Factor -

Yield PF: **0.497** kg/te (actual)

Front row: **0.280** kg/te (theoretical)

Main Body: **0.378** kg/te (theoretical)

"KPI" PF: **#DIV/0!** kg/te (theoretical)

2.218 lb/yd³
 1.249 lb/yd³
 1.690 lb/yd³
 ##### lb/yd³

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:

Blaster hours: **7**
 helper hours: **6**
 B1 and X1 are 6"
 Adjusted collars to holes: A1-23ft, A2-16ft, A3-14ft, A4-16ft, A5-20ft, B1-20ft, C1-15ft
 C6-load to 63ft 10ft collar, D1-20ft, D7-12ft, D8-12ft, X1 load to 35ft 10ft collar, X2-28ft
 Holes C6, X1 and X2 got 2 30m uni,



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-08-03**

Blast Number: **17-017**
 Orica Order #: **2220757**
 Blast Time: **12:41 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40358	79.88365	0.757535	1.394233
Front Row Corner	43.40365	79.88370	0.757537	1.394234
Back Row Corner	43.40350	79.88355	0.757534	1.394231
Average (Centre of Blast)	43.40358	79.88363	0.757535	1.394232

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: did	mm/s	Trigger set at: 2.0	mm/s
	frequency: not	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: trigger	dB	Trigger set at: 115	dB
Northwest- colling rd (Nelson monitor)				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 2.9	mm/s	Trigger set at: 2.0	mm/s
	frequency: ?	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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: 1.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: ?	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Southwest- Camisle (Nelson monitor)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

jim bray

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 23	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 1775.1ft	Blasted tonnage: 18,453S/T	

Timing

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter
 A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter
 all other holes drill 4" Diameter

open face



Upper Middle 17-017 Final
 12x10.5 9x10.5 Pattern
 4" - 4.5" - 5" Hole Diameter
 250m Elevation + 0.6m Subdrill

SHOTPlus 5.6.3.6	03/08/2017
Mine	
Location	
Title/author	Middle/ Upper 17-015 Design G. Palcso
Filename	17-017_Upper_Middle_Final.spf



Not to scale

Blast Summary Data

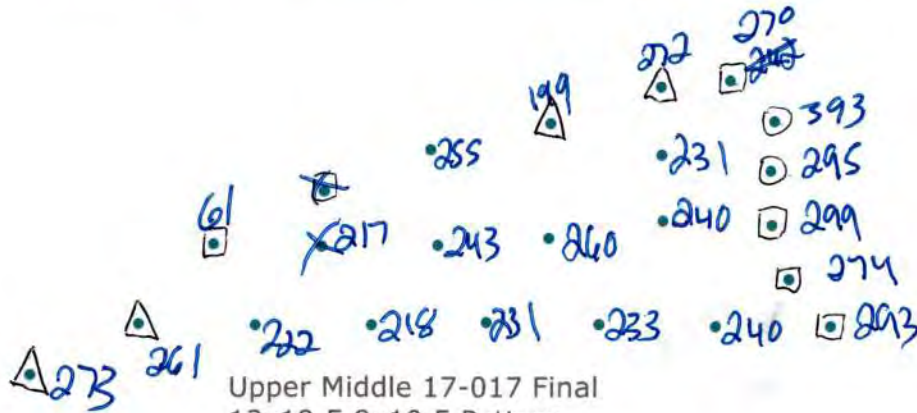
Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 23	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 1775.1ft	Blasted tonnage: 14,442S/T	

○-6"
 □-5"
 △-4.5"

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter
 A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter
 all other holes drill 4" Diameter

load sheet pc counter:

open face



Upper Middle 17-017 Final
 12x10.5 9x10.5 Pattern
 4" - 4.5" - 5" Hole Diameter
 250m Elevation + 0.6m Subdrill

5731 kg/s



Not to scale

SHOTPlus 5.6.3.6	03/08/2017
Mine	
Location	
Title/author	Middle/ Upper 17-015 Design G. Palcso
Filename	17-017_Upper_Middle_Final.spf

[Handwritten signature]



Customer: **Nelson**

Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: **2017-08-03**

Blast Number: **17-017**
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle



Orica

Blaster-in-charge:

Kevin Toplis

#

Quarry Manager:

Signature required, indicating sign-off on Blast Design

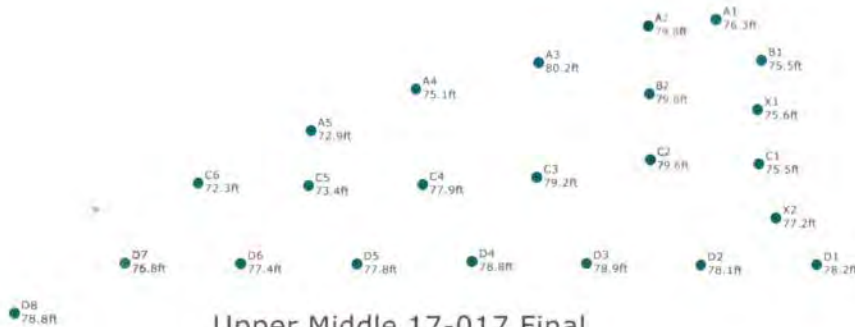
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 23	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 1775.1ft	Blasted tonnage: 14,442S/T	

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter
 A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter
 all other holes drill 4" Diameter

open face



Upper Middle 17-017 Final
 12x10.5 9x10.5 Pattern
 4" - 4.5" - 5" Hole Diameter
 250m Elevation + 0.6m Subdrill



Not to scale

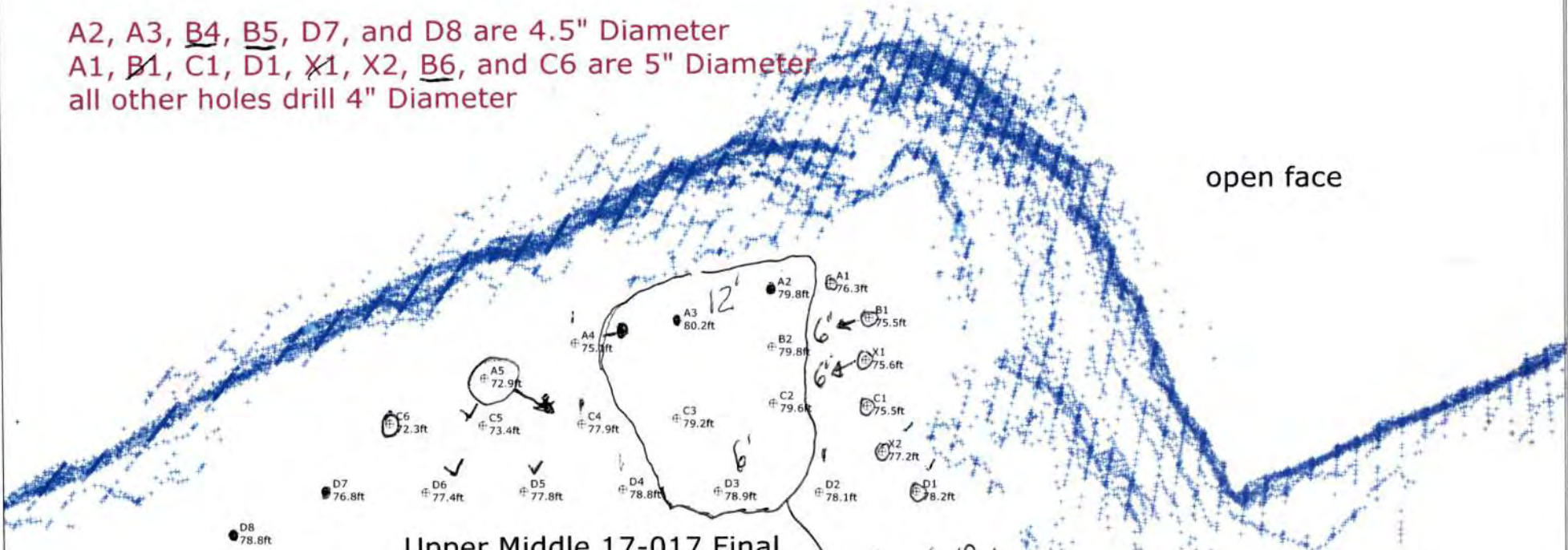
SHOTPlus 5.6.3.6	03/08/2017
Mine	
Location	
Title/author	Middle/ Upper 17-015 Design G. Palcso
Filename	17-017_Upper_Middle_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.5ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 23	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 1775.1ft	Blasted tonnage: 14,442S/T	

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter
A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter
all other holes drill 4" Diameter



open face

Upper Middle 17-017 Final
12x10.5 9x10.5 Pattern
4" - 4.5" - 5" Hole Diameter
250m Elevation + 0.6m Subdrill

Top shelf loose layered rock 12' front - 6' Back

holes overdilled need to be back filled



Not to scale

INDEMNITY & RELEASE AGREEMENT

Orica	Orica Canada Inc. , a Canadian corporation with its principal place of business at 301 Hotel de Ville, Brownsburg, Quebec J8G 3B5 ("Orica")
Customer	Cox Construction Limited , with a place of business at 965 York Road, Guelph, Ontario Canada.
Date	June 1, 2017
Site	Nelson Aggregates, Burlington Quarry
Blasting Plan	Crushing production requires that a the crushing plant and other equipment and property be left in the designated blast area during the blast. Crusher is 64 meters from blast.

Subject to the terms and conditions of this Indemnity & Release Agreement (this "Agreement"), Orica has agreed to perform certain blasting services (the "Services") for Customer in accordance with the Blasting Plan. Customer recognizes and acknowledges that the performance of the Services in accordance with the Blasting Plan, despite the use of best practices, subjects Orica and Customer to increased risks (a) that the intended blasting results will not be obtained, and (b) of injury and/or death to persons and damage and/or destruction to real and personal property, including without limitation, any property listed above in the Blasting Plan.

Customer, for itself and its parent companies, subsidiaries, shareholders, affiliates and each of their respective agents, representatives, managers, members, directors, officers, employees, heirs, executors, successors and assigns (the "Customer Parties"), shall forever release, discharge, defend and indemnify Orica, its direct and indirect shareholders, subsidiaries, affiliates and parent companies, and each of their respective agents, representatives, managers, members, directors, officers, employees, successors and assigns (collectively, the "Orica Parties"), of, from and against each and every claim made, asserted or threatened and any and all disputes, suits, losses, demands, actions, causes of action, damages, compensation, costs, fees, expenses, interest, awards, judgment, diminution in value, fines, contracts, covenants, obligations, liens, debts and liabilities of every kind and nature whatsoever, presently known or unknown, that the Customer Parties or any third party may now or in the future claim, assert or have, whether in tort, contract, law, equity or otherwise, against the Orica Parties, resulting from, arising out of or relating in any way to the performance of the Services in accordance with the Blasting Plan.

This Agreement constitutes the entire agreement between Customer and Orica with respect to all matters referred to herein and there is no other understanding, agreement, warranty or representation whether express or implied (whether by statute or otherwise) in any way extending, defining or otherwise relating to this Agreement. This Agreement may only be varied or amended by an agreement in writing between Orica and Customer. This Agreement shall be governed and construed in accordance with the laws of the Province of Ontario, without reference to its rules regarding conflicts of laws. This Agreement may be executed by electronic signature and in one or more counterparts.

Cox Constuction Limited

By: Bill White
Name: Bill White
Title: Super

1086458

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

Bill of Lading / Connaissance

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON CA L7R 4L8

Table with 2 columns: TIME IN / HEURE D'ENTRÉE (7:00), TIME OUT / HEURE SORTIE (1:00), ORDER NUMBER / N° DE COMMANDE (2220757), B/L NUMBER / N° DE CONNAISSEMENT (85726282)

Table with 4 columns: DATE REQUIRED / DATE REQUISE (03 Aug 2017), TIME REQUIRED / HEURE REQUISE (00:00:00), INVOICE TO / BUYER / FACTURÉ À / ACHETEUR (NELSON AGGREGATE COMPANY), CUSTOMER REFERENCE NO. / N° DE COMMANDE DU CLIENT (n/a)

Main table with columns: QTY. QTE., UM, DG MD, QTY. RET'D QTE. RET., QTY. SOLD QTE. FACT, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT. Includes items like PENTEX BC 340, Harness Wire Duplex, and LABOUR CHARGE.

24 HOUR TECHNICAL INFORMATION table with columns: EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE, EMERGENCY RESPONSE NO./24 HOUR NUMBER / TÉLÉPHONE D'URGENCE/24 HEURE NUMÉRO, PLACARDS OFFERED / PLACARDS OFFERT

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.

Table with 4 columns: CONSIGNOR / EXPÉDITEUR (GRAND VALLEY), CARRIER / TRANSPORTEUR (Orica Truck), CONSIGNEE / DESTINATAIRE (NELSON AGGREGATE COMPANY), SHIPPER'S NAME (Tristan Neely), DRIVER'S NAME (Tristan Neely), RECEIVER'S NAME



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-08-28**

Blast Number: **17-018**
 Orica Order #: **2230835**
 Blast Time: **12:32 PM**

page 1

Blaster-in-charge: **Kevin Toplis** (Print Name)

Blast Location: **Floor** (Bench / Face)

GPS Coordinates: **43.37370** °N Latitude **79.92779** °W Longitude
 Centre of Blast Centre of Blast

Wind from the: **W** at **5** kph Temperature: **21 to 25** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **9.144** m

tonnes Blasted: **26,351** te **9,944** m³
 Total tonnes per day: **26,351** te **tba** Rate Code
 Total Holes Loaded: **167** holes
 ... including: **8** Dead Holes
 ... and: **0** Helper Holes
 Helper Hole Collar: **0.0** ft avg
 # Rows Blasted: **8** rows
 - Pattern (Front Row) -
 Burden: **11.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: **26** front row

- Drilling Information -

Angle from Vertical

Nominal Bit Diameter:

Primary Bit diam: **101.6** mm **0**° # Holes: **188** = 3,327.6 ft (4 " diam)
 Secondary Bit diam: mm **0**° # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm * # Holes: = 0.0 ft (" diam)

Burden: **11.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: **26,325**
 Bench Height: **16.7** ft avg
 Sub-drill: **1.0** ft avg
 Hole Depth: **17.7** ft avg
 - Stone Decking -
 Front Row: **0.0** ft avg
 Main Body: **0.0** ft avg
 # Stone Decks: **0** per blast
 - Collar Stemming -
 Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **3/4 Clear**
 - Charge Length -
 Front Row: **10.7** ft avg
 Main Body: **10.7** ft avg
 - Charge Weight
 Front Row: **31.2** kg/hole
 Main Body: **31.2** kg/hole
 Max. per delay: **45.0** kg/delay
 SD () Equation: **0.0** kg/delay
 Total kg Loaded: **5,277** kg
 Rock Density: **2.65** g/cc = te/m³
 - Powder Factor -
 Yield PF: **0.200** kg/te (actual)
 Front row: **0.188** kg/te (theoretical)
 Main Body: **0.188** kg/te (theoretical)
 "KPI" PF: **#DIV/0!** kg/te (theoretical)

Bulk Explosives:	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,130	21,910	5,220

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	167	56.8

total explosives weight in Blast (kg): **5,277**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
EXEL HANDIDET 12m		25/500	167
CONNECTADET 12M		42 ms	31
UNITRONIC 600 6M			1
CONNECTADET 9M		25 ms	3

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 "1" if Layout by GPS	0
BULK TRUCK CHARGE	>/=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Line Item (Fee per Hour)	12.0

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Holes F1, 16, 21, 22, 23, G18,19,20,21 H9, 11, 17,18,19 D24, 25 E20,21,22,23,24,25 where left out of the shot, due to not being drilled, or to short on depth.

Blaster hours: 7
 Helper hours: 5



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-08-28**

Blast Number: **17-018**
 Orica Order #: **2230835**
 Blast Time: **12:32 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.31765	80.00309	0.756036	1.396317
Front Row Corner	43.40165	79.88986	0.757502	1.394341
Back Row Corner	43.40179	79.89043	0.757504	1.394351
Average (Centre of Blast)	43.37370	79.92779	0.757014	1.395003

1st

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 4.7	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L: T	(Vertical, Transverse or Longitudinal)
	air overpressure: 104.9	dB	Trigger set at: 115	dB
2450 #2 Side Rd (Nelson monitor)				

2nd

Selsmograph 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: 1.1	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L: ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 107.5	dB	Trigger set at: 115	dB
Northwest (Nelson monitor)				

3rd

Selsmograph 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: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L: ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
Southwest (Nelson monitor)				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(0)^2}{30^2} \text{ kg} \\
 &= \frac{0}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate



Customer: **Nelson**
Blast Report

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-09-12**

Blast Number: **17-019**
 Orica Order #: **2237955**
 Blast Time: **11:49 AM**

page 1 | Blaster-in-charge: **Kevin Topplis** (Print Name)

Blast Location: **Lower middle bench-north** (Bench / Face)

GPS Coordinates: **43.40436** °N Latitude **79.88425** °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: **9,144** m

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0 °	# Holes: 37 = 1,513.3 ft (4 " 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	30,317	24,940	5,377

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	41	13.9

total explosives weight in Blast (kg): **5,391**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 15M			39
UNITRONIC 600 9M			2

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
SPIDER STEMMING PLUG 8"	units	6

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:

GPS LAYOUT	Line Item (Hourly Rate)	
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

tonnes Blasted:	10,087 te	3,806 m ³
Total tonnes per day:	21,101 te	TBA Rate Code
Total Holes Loaded:	37 holes	
... including:	3 Dead Holes	
... and:	1 Helper Holes	
Helper Hole Collar:	0.0 ft avg	
# Rows Blasted:	3 rows	
- Pattern (Front Row)-		
Burden:	12.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	12 front row	
Burden:	9.0 ft avg	
Spacing:	10.5 ft avg	
# Holes:	25	
Bench Height:	38.9 ft avg	
Sub-drill:	2.0 ft avg	
Hole Depth:	40.9 ft avg	
- Stone Decking -		
Front Row:	4.0 ft avg	
Main Body:	4.0 ft avg	
# Stone Decks:	2 per blast	
- Collar Stemming -		
Front Row:	8.0 ft avg	
Main Body:	7.0 ft avg	
Material used:	.75 clear	
- Charge Length -		
Front Row:	28.9 ft avg	
Main Body:	29.9 ft avg	
- Charge Weight -		
Front Row:	84.3 kg/hole	
Main Body:	87.2 kg/hole	
Max. per delay:	140.0 kg/delay	
SD () Equation:	0.0 kg/delay	
Total kg Loaded:	5,391 kg	
Rock Density:	2.65 g/cc = te/m ³	
- Powder Factor -		
Yield PF:	0.534 kg/te (actual)	
Front row:	0.229 kg/te (theoretical)	
Main Body:	0.316 kg/te (theoretical)	
"KPI" PF:	#DIV/0! kg/te (theoretical)	

2.387 lb/yd³
 1.023 lb/yd³
 1.412 lb/yd³
 ##### lb/yd³

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

total labour charge, see blast report 17-021
 4ft stone decks where used in holes A1 and B8
 This blast was shot with 17-021, 6 second delay, this shot going first
 adjusted collars to following holes: A1 12ft, A4 13ft, A9 14ft A12 15ft



Customer: **Nelson**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2017-09-12**

Blast Number: **17-019**
 Orica Order #: **2237955**
 Blast Time: **11:49 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40436	79.88428	0.757549	1.394244
Front Row Corner	43.40423	79.88413	0.757547	1.394241
Back Row Corner	43.40450	79.88436	0.757551	1.394245
Average (Centre of Blast)	43.40436	79.88425	0.757549	1.394243

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 1.0	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: 114.6	dB	Trigger set at: 115	dB
Northwest- colling rd (Nelson monitor)				

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.71939	80.38847	0.763047	1.403043
2nd Reading				
Average	43.71939	80.38847	0.763047	1.403043
Distance (2nd Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: 2.9	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB
2450 2nd concession (Nelson monitor)				

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: 1.9	mm/s	Trigger set at: 2.0	mm/s
	frequency:	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 94.0	dB	Trigger set at: 115	dB
Southwest- Camisle (Nelson monitor)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} \text{ kg}$$

$$= \frac{0}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 37

Hole angle: 0.0°

Total drilled: 1515.0ft

Free Face

timing



17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit
250 + .6m Sub



Not to scale

SHOTPlus 5.6.3.6	11/09/2017
Mine	Burlington
Location	
Title/author	17-019 Lower Middle North Final G. Palcso
Filename	17-019_Lower_Middle_North_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 37 Hole angle: 0.0°
 Total drilled: 1515.0ft

Free Face

load sheet
 pc counter:
 max load: 115kg

83	109	112	89	105	105	109	106	94	106	104	$\frac{30}{88}$
108	122	111	110	$\frac{37}{103}$	105	102	110	106	104	69	105
61											
111	111	106	113	107	118	114	114	107	107	98	111

17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit
 250 + .6m Sub

8148



Not to scale

SHOTPlus 5.6.3.6	11/09/2017
Mine	Burlington
Location	
Title/author	17-019 Lower Middle North Final G. Palcso
Filename	17-019_Lower_Middle_North_Final.spf



Customer: Nelson

Blast Design

Quarry: Burlington

P.O. #:

Design Date: 2017-09-12

Blast Number: 17-019

Orica Order #:

page 1

Blaster-in-charge: Kevin Toplis

Blast Location: Lower middle bench-north
GPS Coordinates: 43.40436 °N Latitude 79.88425 °W Longitude

Design to Blasted: 10,393 te
Total Holes Loaded: 37 holes
... including: 3 Dead Holes
... and: 1 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 3 rows

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0° # Holes: 37 =	1,513.3 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: 10.5 ft avg
Holes: 12 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.5 ft avg
Holes: 25 main body
Bench Height: 38.9 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 40.9 ft avg

- Design Stone Decking -

Front Row: 0.0 ft avg
Main Body: 0.0 ft avg

- Design Collar Stamping -

Front Row: 8.0 ft avg
Main Body: 7.0 ft avg

Material used: .75 clear

- Design Charge Length -

Front Row: 32.9 ft avg
Main Body: 33.9 ft avg

- Design Charge Weight -

Front Row: 95.9 kg/hole
Main Body: 98.8 kg/hole
Max Chge Wt / delay: 115.0 kg/delay

Required kg Loaded: 4,038 kg
Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.388 kg/te (actual)
Front row: 0.261 kg/te (theoretical)
Main Body: 0.358 kg/te (theoretical)
"KPI" PF: 0.326 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast

Bulk Explosives Req'd:	ChargeWt.exe	kg
CENTRA GOLD 70		4,025

Pkgd Explosives Req'd:		kg

Boosters Req'd:	kg/u # used	kg
PENTEX 12 (OR EQUIVALENT)	0.34 37	12.6

total explosives weight in Blast (kg): 4,038
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Req'd:	ms	# req'd
UNITRONIC 600 15M		37

Cord & Access. Req'd:	U of M	# req'd
IRE 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	>=2,000kg <5,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1/2
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Enter "1" if 3D Profiled	0
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS Must be pre-authorized)		



Customer: **Nelson**

Blast Design

Quarry: **Burlington**

P.O. #:

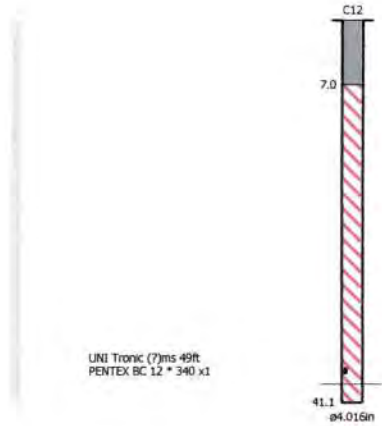
Blast Date: **2017-09-12**

Blast Number: **17-019**

Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Kevin Toplis

#

Quarry Manager:

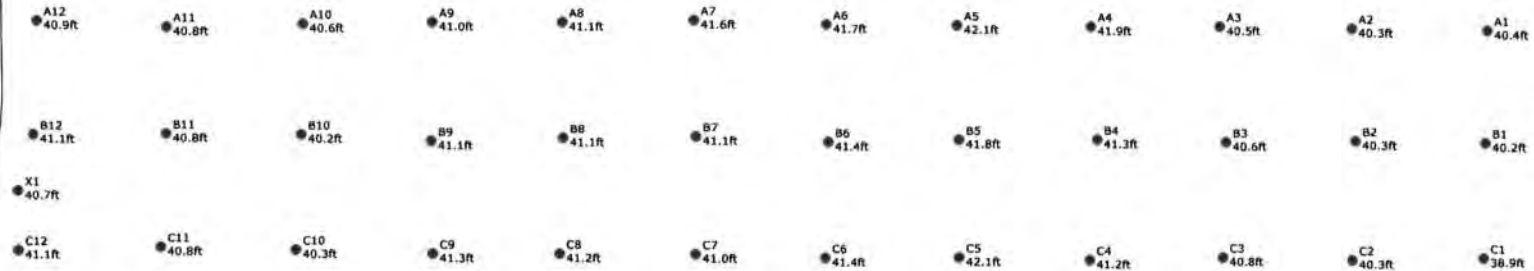
Signature required, indicating sign-off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 37 Hole angle: 0.0°
 Total drilled: 1515.0ft

Free Face



17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit
250 + .6m Sub



Not to scale

SHOTPlus 5.6.3.6	11/09/2017
Mine	Burlington
Location	
Title/author	17-019 Lower Middle North Final G. Palcso
Filename	17-019_Lower_Middle_North_Final.spf

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSANCE NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance



CONSIGNOR
 EXPÉDITEUR
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
 NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2237955	85765597

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHÉTEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
12 Sep 2017	00:00:00	NELSON AGGREGATE COMPANY	n/a
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
12 Sep 2017	FOB Dest'n, Own Truck	F-73289	16055
SHIP VIA TRANSPORTEUR		ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck		STANDARD	

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
98	PC	X	19	79	PENTEX BC 340 (49/CS)	2	35.770
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
60	PC	X	36	4	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
132	PC	X	57	75	*uni tronic 600-15M C/Z SPL(50')66PC	2	22.572
100	PC		88	12	MINI STEM PLUGS - PART #6015		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							70.762 KG
**** TOTAL PACKAGES ****						6	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24 HOUR TECHNICAL INFORMATION

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMÉRO	PLACARDS OFFERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA:
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON	Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE	NETTE No. CONV PRESSAGE WT AGREEMENT NO.
CONSIGNOR / EXPÉDITEUR GRAND VALLEY		CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR BRAD HUTCHINS		DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR BRAD HUTCHINS	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE	DATE 12/9/17	SIGNATURE	DATE 12/9/17
	D/J M/M Y/A		D/J M/M Y/A



(THIS BILL OF LADING-EXPRESS SHIPPING CONTRACT IS TO BE SIGNED BY THE SHIPPER AND CARRIER)
 (CE CONNAISSANCE-CONTRAT D'EXPÉDITION PAR MESSAGERIES DOIT ÊTRE SIGNÉ PAR L'EXPÉDITEUR ET LE TRANSPORTEUR)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO



Customer: **Nelsons**
Blast Report

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-09-27**

Blast Number: **17-020**
 Orica Order #: **2244865**
 Blast Time: **12:01 PM**

page 1

Blaster-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South face** (Bench / Face)
 GPS Coordinates: **43.39828** °N Latitude **79.88401** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **10** kph Temperature: **26 to 30** °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: **3000ft** m

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: **101.6** mm **0**° # Holes: **34** = 2,852.6 ft (4 " diam)
 Secondary Bit diam: **114.3** mm **0**° # Holes: **6** = 503.4 ft (4 1/2 " diam)
 Tertiary Bit diam: mm ° # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	34,070	24,600	9,470

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	157	53.4

total explosives weight in Blast (kg): 9,523

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			36
UNITRONIC 600 20M			41
UNITRONIC 600 30M			80

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
STEMMING PLUG MINI	units	2

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:

	Line Item (Hourly Rate)	
GPS LAYOUT		1
BULK TRUCK CHARGE	>=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	0
3D LASER PROFILE	Line Item (Hourly Rate)	1
BORETRACK	Enter "1" if Boretraked	0
LABOUR CHARGE (enter HOURS)	Must be pre-authorized	

tonnes Blasted: **27,877** te **10,520** m³
 Total tonnes per day: **27,877** te **TBA** Rate Code
 Total Holes Loaded: **40** 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: **10.5** ft avg

Holes: **16** front row

Burden: **10.0** ft avg

Spacing: **10.5** ft avg

Holes: **24**

Bench Height: **81.9** ft avg

Sub-drill: **2.0** ft avg

Hole Depth: **83.9** ft avg

- Stone Decking -

Front Row: **6.0** ft avg

Main Body: **6.0** ft avg

Stone Decks: 40 per blast

- Collar Stemming -

Front Row: **10.0** ft avg

Main Body: **7.0** ft avg

Material used: **1/2" crush**

- Charge Length -

Front Row: **67.9** ft avg

Main Body: **70.9** ft avg

- Charge Weight -

Front Row: **198.0** kg/hole

Main Body: **206.7** kg/hole

Max. per delay: **150.0** kg/delay

SD () Equation: **0.0** kg/delay

Total kg Loaded: **9,523** kg

Rock Density: **2.65** g/cc = te/m³

- Powder Factor -

Yield PF: **0.342** kg/te (actual)

Front row: **0.256** kg/te (theoretical)

Main Body: **0.320** kg/te (theoretical)

"KPI" PF: **#DIV/0!** kg/te (theoretical)

1.526 lb/yd³

1.142 lb/yd³

1.431 lb/yd³

lb/yd³

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:

Deck height varied if deck was in a void.

Blaster Hours= 6hr

Helper Hours= 11hrs



Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
 P.O. #: **NA**
 Blast Date: **2017-09-27**

Blast Number: **17-020**
 Orica Order #: **2244865**
 Blast Time: **12:01 PM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.39844	79.88387	0.757446	1.394237
Front Row Corner	43.39826	79.88401	0.757443	1.394239
Back Row Corner	43.39813	79.88414	0.757440	1.394241
Average (Centre of Blast)	43.39828	79.88401	0.757443	1.394239

1st

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 (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data:	ppV: DNT	mm/s	Trigger set at: 2.0	mm/s
	frequency: DNT	Hz	V / T / L : T	(Vertical, Transverse or Longitudinal)
	air overpressure: DNT	dB	Trigger set at: 115	dB

Colling 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: 2.5	mm/s	Trigger set at: 2.0	mm/s
	frequency: ?	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 103.5	dB	Trigger set at: 115	dB

2450 #2 sideroad

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: 3.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: ?	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.0	dB	Trigger set at: 115	dB

Camisle

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(0)^2}{30^2} \text{ kg} \\
 &= \frac{0}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = **0** kg

Orica
 Blaster-in-charge:

Mitch Ossington

Signature required, indicating that
 Blast Report is Complete & Accurate.



Customer: **Nelsons**

Quarry: **Burlington**

Blast Number: **17-020**

Blast Design

P.O. #: **NA**

Orica Order #:

Design Date: **2017-09-27**

page 1

Blaster-in-charge: **Mitch Ossington** (Print Name)

Blast Location: **South Face** (Bench / Face)

GPS Coordinates: **0.00000** °N Latitude **0.00000** °W Longitude
Centre of Blast Centre of Blast

Design te Blasted:	27,877 te
Total Holes Loaded:	40 holes
... including:	0 Dead Holes
... and:	3 Helper Holes
Helper Hole Collar:	0.0 ft avg
# Rows Blasted:	3 rows

- Drilling Information -

	Primary Bit diam:	Secondary Bit diam:	Tertiary Bit diam:	Angle from Vertical	# Holes:	Nominal Bit Diameter:
	101.6 mm			0'	40	3,356.0 ft (4 " diam)
				0'		0.0 ft (" diam)
				0'		0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden:	12.0 ft avg
Spacing:	10.5 ft avg
# Holes:	16 front row

- Design Pattern (Main Body) -

Burden:	10.0 ft avg
Spacing:	10.5 ft avg
# Holes:	24 main body

Bench Height:	81.9 ft avg
Sub-drill:	2.0 ft avg
Hole Depth:	83.9 ft avg

- Design Stone Decking -

Front Row:	4.0 ft avg
Main Body:	4.0 ft avg

- Design Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg

Material used: 1/2" crush

- Design Charge Length -

Front Row:	72.9 ft avg
Main Body:	72.9 ft avg

- Design Charge Weight -

Front Row:	212.6 kg/hole
Main Body:	212.6 kg/hole

Max Chge Wt / delay: 150.0 kg/delay

Required kg Loaded:	9,554 kg
Rock Density:	2.65 g/cc = te/m ³

- Design Powder Factor -

Expected Yield PF:	0.343 kg/te (actual)
Front row:	0.275 kg/te (theoretical)
Main Body:	0.329 kg/te (theoretical)
"KPI" PF:	0.311 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast

12:01 pm
28c fanclouds
11km/h W
30,000 ft

Bulk Explosives Req'd:	kg
CENTRA GOLD 70	ChargeWt exe 9,500

Pkgd Explosives Req'd:	kg

Boosters Req'd:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	160	54.4

total explosives weight in Blast (kg):	9,554
Pkgd Prod (0 kg) % of Total kg:	0.0%

Detonators Req'd:	ms	# req'd
UNITRONIC 600 30M		80
UNITRONIC 600 20M		40
UNITRONIC 600 9M		40

Cord & Access. Req'd:	U of M	# req'd
IRE DUPLEX (6 PACK) 400M	units	1
STEMMING PLUG MINI	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 Req'd:

BULK TRUCK CHARGE	>/=5,000kg <10,000kg	1
SHOT SERVICE FEE *	Line Item (Fee per Blast)	1
SEISMOGRAPH RENTAL	* 1 unit in Shot Service Fee	
3D LASER PROFILE	Line Item (Fee per Blast)	1
BORETRACK	Enter "1" if Boretraked	
LABOUR CHARGE (enter HOURS Must be pre-authorized)		



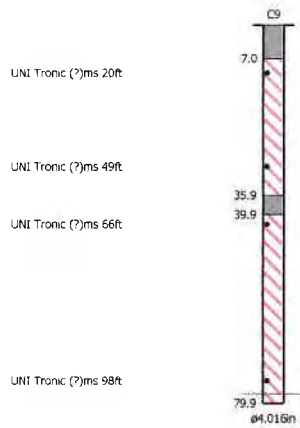
Customer: **Nelsons**
Blast Design

Quarry: **Burlington**
P.O. #:
Blast Date: **2017-09-27**

Blast Number: **17-020**
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mitch Ossington

#

Quarry Manager:

Signature required, indicating
sign off on Blast Design

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSANCEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.



Bill of Lading / Connaissancement

CONSIGNOR
 EXPÉDITEUR
GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

*Blaster Milton
 Taylor Nelson*

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 6:30	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE 2244865	B/L NUMBER N° DE CONNAISSANCEMENT 85781592

DATE REQUIRED DATE REQUISE 27 Sep 2017	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a
DATE SHIPPED EXPÉDIÉ LE 27 Sep 2017	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR E-73289	VEHICLE NO. N° DE VÉHICULE DT-15001
SHIP VIA TRANSPORTEUR Orica Truck		ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS

QTY. QTE.	UM	DG MD	QTY. RET'D QTE. RET.	QTY. SOLD QTE. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
196	PC	X	34	157	PENTEX BC 340 (49/CS)	4	71.540
2	PC		2	0	Harness Wire Duplex (6 pack) 400m	1	5.840
60	PC	X	24	36	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
66	PC	X	25	41	*uni tronic 600-20M CU/ZC SPL(65')66P	1	13.464
140	PC	X	64	80	*uni tronic 600-30M C/Z SPL(100')36P	4	35.280 42.75
75	PC		73	2	MINI STEM PLUGS - PART #6015		0.525
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							132.529 KG
**** TOTAL PACKAGES ****						11	
GHS/WHMIS SDS documents available Website: www.oricaminingsservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510		EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636		PLAGARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON		FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSANCEMENT D'ORICA : Orica Canada Inc. 301 rue hotel de ville Brownburg-Chatham, QC J8G 3B5	
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$		NETTE No. CONV PRESSAGE WT AGREEMENT NO.			
CONSIGNOR / EXPÉDITEUR GRAND VALLEY		CARRIER / TRANSPORTEUR Orica Truck		CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY			
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR <i>Taylor Nelson</i>		DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR <i>Taylor Nelson</i>		RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR			
SIGNATURE <i>[Signature]</i>	DATE 27 9 17 D/J M/M Y/A	SIGNATURE <i>[Signature]</i>	DATE 27 9 17 D/J M/M Y/A	SIGNATURE	DATE	SIGNATURE	DATE

3 MEMORANDUM
 MÉMORANDUM

(THIS BILL OF LADING-EXPRESS SHIPPING CONTRACT IS TO BE SIGNED BY THE SHIPPER AND CARRIER)
 (CE CONNAISSANCEMENT-CONTRAT D'EXPÉDITION PAR MESSAGERIES DOIT ÊTRE SIGNÉ PAR L'EXPÉDITEUR ET LE TRANSPORTEUR)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO

SHOTPlus 5 Plan

Blast Summary Data

Burden: 12.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

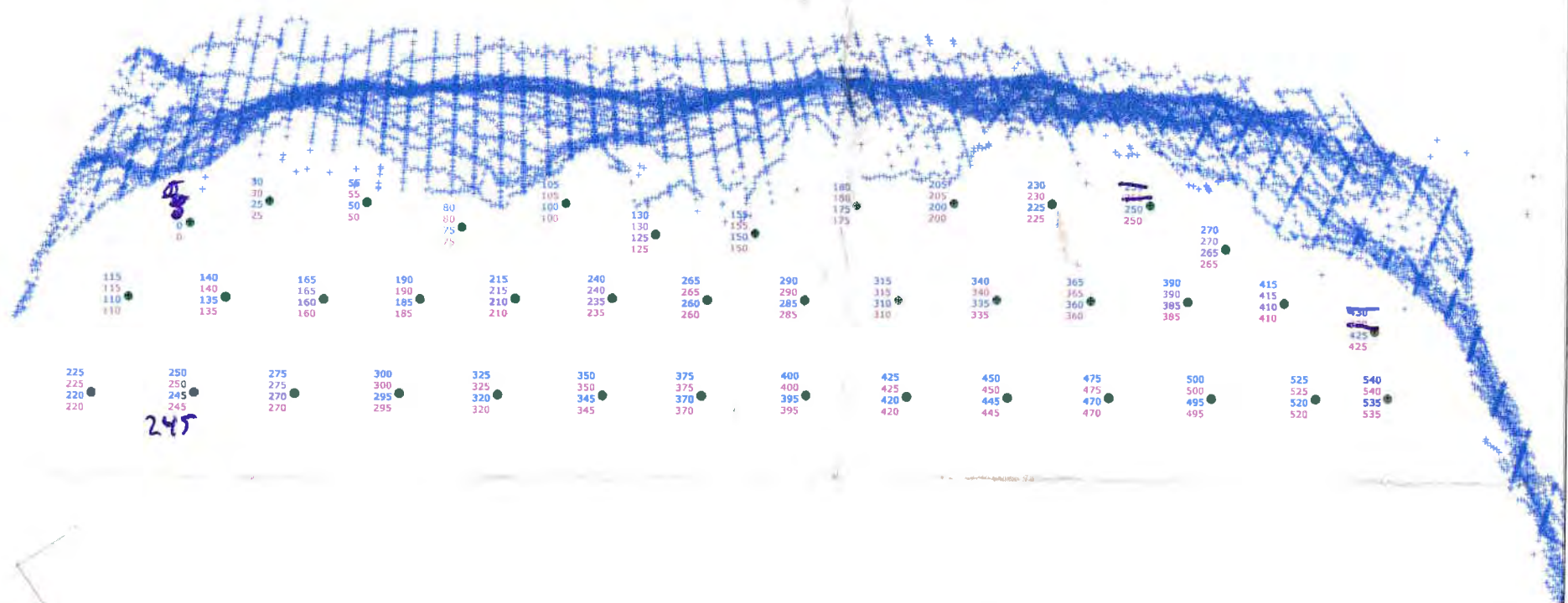
1st row burden: 10.0ft

Hole Diameter: 4.0in

Number of holes: 40

Hole angle: 0.0°

Total drilled: 3358.0ft



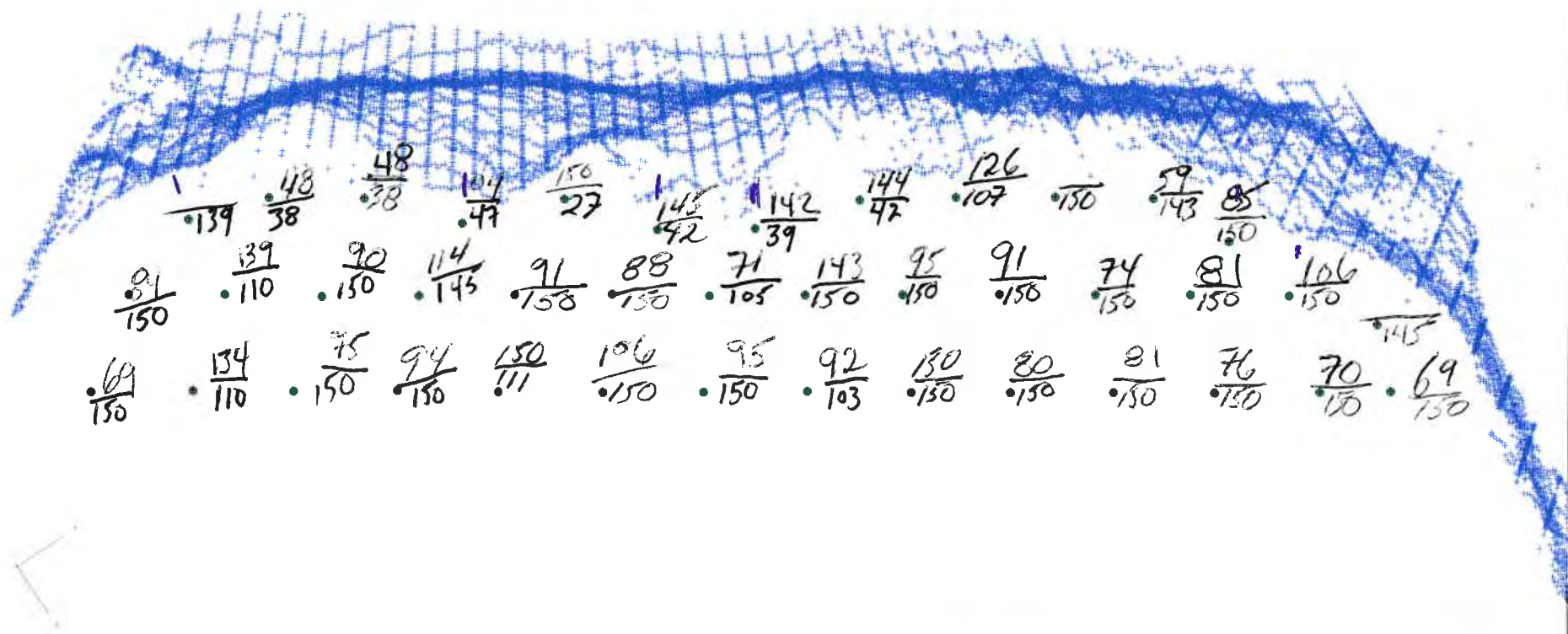
Scale 1:200

SHOTPlus 5.6.2.7	27/09/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-020_South_Wall_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 12.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 10.0ft Hole Diameter: 4.0in Number of holes: 40 Hole angle: 0.0°
 Total drilled: 3358.0ft



Scale 1:200

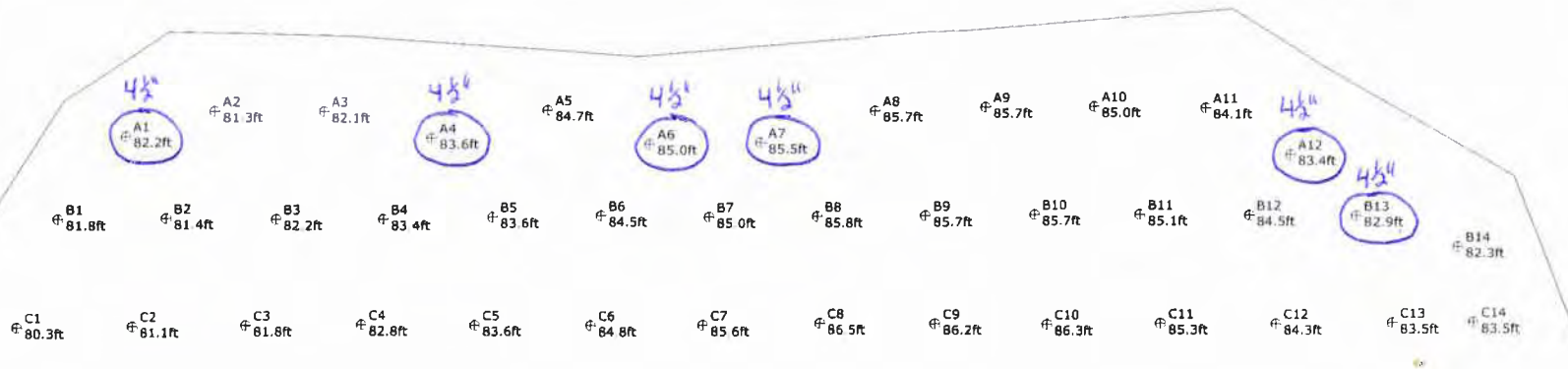
SHOTPlus 5.6.2.7	27/09/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-020_South_Wall_Final.spf

Blast Summary Data

Burden: 12.0ft Spacing: 10.5ft Subdrill: 2.0ft Stemming: 7.0ft
1st row burden: 10.0ft Hole Diameter: 4.0in Number of holes: 40 Hole angle: 0.0°
Total drilled: 3358.0ft

Hole A1, A4, A6, A7, A12 and B13 are 4.5 Hole Diameter
Marked in Green

open face



South Face 17-020
12x10.5 Front Row - 10x10.5 Body
4" Hole Diameter
248.5m Floor Elevation + 0.6m Sub



Not to scale

Customer: **Nelson Aggregat**

Blast Report

Quarry: **Burlington**

P.O. #:

Blast Date: **2018-04-09**Blast Number: **18-001**Orica Order #: **2322201**Blast Time: **11:56 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)Blast Location: **Upper Middle** (Bench / Face)GPS Coordinates: **43.40358** °N Latitude **79.88337** °W Longitude
Centre of Blast Centre of BlastWind from the: **SE** at **5** kph Temperature: **1 to 5** °CClear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: **30000****- Drilling Information -**

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 49 = 3,797.5 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	34,030	21,700	12,330

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	102	34.7

total explosives weight in Blast (kg): 12,365

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			48
UNITRONIC 600 30M			52

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1

Resource Deployment:

	# req'd
# of Blasts today (this Quarry)	1
# of Blasters (this Blast)	1 6 hr
# of Helpers (this Blast)	Note Exceptior 2 12 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	Enter # of Seismographs Use	0

tonnes Blasted:	27,194 te	10,262 m ³
# Holes Loaded:	49 holes	
... including:	0 Dead Holes	
... and:	3 Helper Holes	
Helper Hole Collar:	8.0 ft avg	
# Rows Blasted:	3 rows	

- Pattern (Front Row)-Burden: **12.0** ft avgSpacing: **10.0** ft avg# Holes: **13** front row**- Pattern (Main Body) -**Burden: **9.0** ft avgSpacing: **10.0** ft avg

Holes: 36 main body

Bench Height: **75.5** ft avgSub-drill: **2.0** ft avg

Hole Depth: 77.5 ft avg

- Stone Decking -Front Row: **0.0** ft avgMain Body: **0.0** ft avg**# Stone Decks:** **0** per blast**- Collar Stemming -**Front Row: **7.0** ft avgMain Body: **7.0** ft avgMaterial used: **.75 clear****- Charge Length -**

Front Row: 70.5 ft avg

Main Body: 70.5 ft avg

- Charge Weight -

Front Row: 205.6 kg/hole

Main Body: 205.6 kg/hole

Max. per delay: **256.0** kg/delay

SD () Equation: #NUM! kg/delay

Total kg Loaded: 12,365 kg

Rock Density: **2.65** g/cc = te/m³**- Powder Factor -**2.031 lb/yd³Yield PF: **0.455** kg/te (actual)1.351 lb/yd³

Front row: 0.302 kg/te (theoretical)

1.801 lb/yd³

Main Body: 0.403 kg/te (theoretical)

1.651 lb/yd³

"KPI" PF: 0.370 kg/te (theoretical)

NOTES:

Hole A-10 Received A stone deck from 50'-32 due to lean burden

Hole X-3 Received A stone deck from 60'-50' due to lean burden

Hole X-1 Received a toe load to 55'

Hole X-2 was plugged at 24'

Rate Code TBA by sale representative

6 Blaster hours

6 Helper hours times 2 Helpers



Customer: **Nelson Aggregat**
Blast Design

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2018-04-09**

Blast Number: **18-001**
 Orica Order #: **2322201**
 Blast Time: **11:56 AM**

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40358	79.88339	0.757535	1.394228
Front Row Corner	43.40343	79.88334	0.757533	1.394227
Back Row Corner	43.40374	79.88338	0.757538	1.394228
Average (Centre of Blast)	43.40358	79.88337	0.757535	1.394228

1st

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	441.3	m		
Post Blast Data:	ppV: 3.6	mm/s	Trigger set at: 2.0	mm/s
	frequency: 7.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 115.3	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	902.8	m		
Post Blast Data:	ppV: 0.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: 7.4	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 121.9	dB	Trigger set at: 115	dB

Colling Road & Blind line Bruce Trail

3rd

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	#NUM!	m		
Post Blast Data:	ppV: 1.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 7.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.7	dB	Trigger set at: 115	dB

South West Corner Of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{\#NUM!}{30^2} \text{ kg}$$

$$= \frac{\#NUM!}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **#NUM!** kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate

Customer: **Nelson Aggregat****Blast Report**Quarry: **Burlington**
P.O. #:
Blast Date: **2018-04-11**Blast Number: **18-002**
Orica Order #: **2323512**
Blast Time: **11:16 AM**

page 1

Blaster-in-charge: **Mike Derkinderen** (Print Name)Blast Location: **Floor** (Bench / Face)
GPS Coordinates: **43.40235** °N Latitude **79.88634** °W Longitude
Centre of Blast Centre of BlastWind from the: **SW** at **10** kph Temperature: **1 to 5** °CClear: Rain: Overcast:
Partly Cloudy: Snow: Inversion: **30000****- Drilling Information -**

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam:	101.6 mm 0 °	# Holes: 180 = 1,980.0 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	30,150	27,630	2,520

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	182	61.9

total explosives weight in Blast (kg): **2,582**
Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	182
CONNECTADET 9M		25 ms	3
CONNECTADET 9M		42 ms	30

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)	Enter # 1
# of Blasters (this Blast)	1 7 hr
# of Helpers (this Blast)	Note Exception 2 10 hr
# of MMU's (this Blast)	1

Services:	
ADVANCED BLAST DESIGN	Enter "1" if Advance Blast Des 1
BULK TRUCK CHARGE	As per agreement 1
SHOT SERVICE FEE *	As per agreement #DIV/0!
BORETRACK	Enter "1" if Boretraked 0
SEISMOGRAPH RENTAL	Enter # of Seismographs Used 0

tonnes Blasted: **19,279** te **7,415** m³# Holes Loaded: **180** holes
... including: **0** Dead Holes
... and: **0** Helper Holes
Helper Hole Collar: **0.0** ft avg
Rows Blasted: **9** rows**- Pattern (Front Row) -**Burden: **11.5** ft avg
Spacing: **11.5** ft avg
Holes: **28** front row**- Pattern (Main Body) -**Burden: **11.5** ft avg
Spacing: **11.5** ft avg
Holes: **152** main bodyBench Height: **11.0** ft avg
Sub-drill: **0.0** ft avg
Hole Depth: **11.0** ft avg**- Stone Decking -**Front Row: **0.0** ft avg
Main Body: **0.0** ft avg# Stone Decks: **0** per blast**- Collar Stemming -**Front Row: **7.0** ft avg
Main Body: **7.0** ft avgMaterial used: **.75** clear**- 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/holeMax. per delay: **14.0** kg/delaySD () Equation: **#NUM!** kg/delayTotal kg Loaded: **2,582** kgRock Density: **2.60** g/cc = te/m³**- Powder Factor -**Yield PF: **0.134** kg/te (actual)Front row: **0.109** kg/te (theoretical)Main Body: **0.109** kg/te (theoretical)"KPI" PF: **0.109** kg/te (theoretical)0.587 lb/yd³0.477 lb/yd³0.477 lb/yd³0.477 lb/yd³**NOTES:****5 Holes in the pattern had caved in when we measured the shot the morning of, we were unable to load those 5 holes**



Customer: **Nelson Aggregat**
Blast Design

Quarry: Burlington
 P.O. #:
 Blast Date: 2018-04-11

Blast Number: 18-002
 Orica Order #: 2323512
 Blast Time: 11:16 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40230	79.88635	0.757513	1.394280
Front Row Corner	43.40209	79.88602	0.757509	1.394274
Back Row Corner	43.40267	79.88664	0.757519	1.394285
Average (Centre of Blast)	43.40235	79.88634	0.757514	1.394280

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	663.1	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

2450 2nd Line Did not set up for this blast (as per bill)

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	744.0	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

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	#NUM!	m		
Post Blast Data:	ppV: 2.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 3.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 88.4	dB	Trigger set at: 115	dB

SouthWest Corner of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{\#NUM!}{30^2} \text{ kg}$$

$$= \frac{\#NUM!}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = **#NUM!** kg

Orica
 Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Report

Quarry:
P.O. #:
Blast Date: 2018-04-18

Blast Number: 18-003
Orica Order #: 2326529
Blast Time: 10:54 AM

page 1

Blaster-in-charge: Mike der Kinderen

Blast Location: Lower Middle
GPS Coordinates: 43.40418 °N Latitude 79.88352 °W Longitude

Wind from the: W at 10 kph Temperature: 1 to 5 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: Ceiling: 30 000 ft

Tonnes Blasted: 11,087 te 4,184 m³
Total tonnes per day: 11,087 te TBA Rate Code
Total Holes Loaded: 39 holes
... including: 0 Dead Holes
... and: 1 Helper Holes
Helper Hole Collar: 7.0 ft avg
Rows Blasted: 4 rows

Range: Front Row:
Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 9

Range: Main Body:
Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 30

Bench Height: 40.1 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 42.1 ft avg

Stone Decking:
Front Row: 8.0 ft avg
Main Body: 0.0 ft avg
Decks: 1 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: 27.1 ft avg
Main Body: 35.1 ft avg

Charge Weight:
Front Row: 79.1 kg/hole
Main Body: 102.4 kg/hole
Max. per delay: 129.0 kg/delay
SD () Equation: 251.0 kg/delay
Total kg Loaded: 4,817 kg
Rock Density: 2.65 g/cc = te/m³

Explosive Weight:
Yield PF: 0.434 kg/te (actual)
Front row: 0.219 kg/te (theoretical)
Main Body: 0.378 kg/te (theoretical)
"KPI" PF: 0.338 kg/te (theoretical)

Drilling Information

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0° # Holes: 39	= 1,642.4 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	29,810	25,070	4,740

Packaged Explosives:	cs shipped	cs returned	kg
FORTEL PRO 75X400	6	4	50

Boosters:	kg / unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	78	26.5

total explosives weight in Blast (kg): 4,817
Pkgd Prod (50 kg) % of Total kg: 1.0%

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			39
UNITRONIC 600 15M			39

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 Blasts (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of BMA'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	0
3D LASER PROFILE	Enter hours	0.0
BORETRACK	Enter hours	4.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Cost Reduction Notes (this Blast) - change in Bit B-3 expl or (S) from previous Blast

Holes D-1 D-2 D-3 Had either caved in or were to short to load

Hole B-1 Was loaded to 18' then package was used on the top

A-7 Received a stone deck from 16'-24' due to a void identified on the drill log

Please contact our sales rep for Rate code



Blast Report

Quarry:
P.O. #:
Blast Date: 2018-04-18

Blast Number: 18-003
Orica Order #: 2326529
Blast Time: 10:54 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40418	79.88317
Front Row Corner	43.40423	79.88351
Back Row Corner	43.40412	79.88387
Average (Centre of Blast)	43.40418	79.88352

(N) Radians	(W) Radians
0.757546	1.394224
0.757547	1.394230
0.757545	1.394236
0.757546	1.394230

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814
Distance (1st Seis. From Centre of Blast)	476.3	m
Post Blast Data:	ppV: 2.7	mm/s
	frequency: 43.0	Hz
	air overpressure: 119.7	dB

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40605	79.89400
2nd Reading		
Average	43.40605	79.89400
Distance (2nd Seis. From Centre of Blast)	673.3	m
Post Blast Data:	ppV: DID	mm/s
	frequency: NOT	Hz
	air overpressure: TRIGGER	dB

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

Colling Road & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.39339	79.88880
2nd Reading		
Average	43.39339	79.88880
Distance (3rd Seis. From Centre of Blast)	1274.5	m
Post Blast Data:	ppV: DID	mm/s
	frequency: NOT	Hz
	air overpressure: TRIGGER	dB

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

South West Corner of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(476.3)^2}{30^2} \text{ kg}$$

$$= \frac{225,910}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der kinderen



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-05-22

Blast Number: 18-004
Orica Order #: 2339509
Blast Time: 12:02 PM

page 1

Blaster-in-charge: Mike der Kinderen

Blast Location: Upper Middle
GPS Coordinates: 43.40364 °N Latitude 79.88324 °W Longitude

Wind from the: SE at 5 kph Temperature: 11 to 15 °C

Clear: Rain: Overcast: x
Partly Cloudy: Snow: Inversion: Ceiling 1062 ft

Tonnes Blasted: 26,332 te 9,937 m³
Total tonnes per day: 26,332 te NB80-01 Rate Code
Total Holes Loaded: 49 holes
... including: 0 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 3 rows
Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 8

Primary Bit diam: 101.6 mm 0" # Holes: 40 = 3,098.6 ft (4 " diam)
Secondary Bit diam: 114.3 mm 0" # Holes: 9 = 697.2 ft (4 1/2 " diam)
Tertiary Bit diam: mm 0" # Holes: = 0.0 ft (" diam)

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Bench Height: 75.5 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 77.5 ft avg

Bulk Explosives: In (kg) out (kg) kg
CENTRA GOLD 70 33,680 21,760 11,920

Packaged Explosives: cs shipped cs returned kg

Boosters: kg / unit # used kg
PENTEX 12 (OR EQUIVALENT) 0.34 98 33.3

total explosives weight in Blast (kg): 11,953
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators: case #'s ms # used
UNITRONIC 600 9M 49
UNITRONIC 600 25M 14
UNITRONIC 600 30M 35

Cord & Accessories: U of M # used
HARNES WIRE DUPLEX (6 PACK) 400M units 1

Resource Deployment
of Blasts today (this Quarry): 1
of Blasts (this Blast): 1
of Helpers (this Blast): 1
of MMU's (this Blast): 1

Services:
GPS LAYOUT Enter hours 0.0
BULK TRUCK CHARGE >=10,000 kg 1
BLASTER HOURS Enter Blaster hours 7.0
HELPER HOURS Enter total Helper man-hours 5.5
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

Front Row: ft avg
Main Body: ft avg
Decks: per blast

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg
Material used: 75" Stone

Front Row: 70.5 ft avg
Main Body: 70.5 ft avg

Front Row: 205.5 kg/hole
Main Body: 205.5 kg/hole
Max. per delay: 298.0 kg/delay
SD () Equation: 208.9 kg/delay
Total kg Loaded: 11,953 kg
Rock Density: 2.65 g/cc = te/m³

2.028 lb/yd³
1.651 lb/yd³
Yield PF: 0.454 kg/te (actual)
Front row: 3,302 kg/te (theoretical)
Main Body: 0,403 kg/te (theoretical)
"KPI" PF: 0.370 kg/te (theoretical)

Cast Residual Water (this Blast): orange in B1 B2 B3/B4/B5 from previous Blast
It was extremely foggy during the blast



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #: 2018-05-22
 Blast Date: 2018-05-22

Blast Number: 18-004
 Orica Order #: 2339509
 Blast Time: 12:02 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40362	79.88325	0.757536	1.394226
Front Row Corner	43.40349	79.88326	0.757534	1.394226
Back Row Corner	43.40382	79.88322	0.757540	1.394225
Average (Centre of Blast)	43.40364	79.88324	0.757536	1.394226

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	433.6	m		
Post Blast Data:	ppV:	3.3	mm/s	1.5
	frequency:	8.1	Hz	?
	air overpressure:	124.3	dB	115

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	910.4	m		
Post Blast Data:	ppV:	0.3	mm/s	1.5
	frequency:	8.9	Hz	?
	air overpressure:	123.1	dB	115

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1228.7	m		
Post Blast Data:	ppV:	0.3	mm/s	1.5
	frequency:	100.0	Hz	?
	air overpressure:	39.1	dB	115

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(433.6)^2}{30^2} \text{ kg} \\
 &= \frac{188,009}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike der Kinderen



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2018-06-04

Blast Number: 18-005
 Orica Order #: 2345753
 Blast Time: 11:50 AM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Lower Middle South (Bench / Face)
 GPS Coordinates: 43.40398 °N Latitude 79.88319 °W Longitude
Centre of Blast (Cent) of Blast

Wind from the: W at 15 kph Temperature: 16 to 20 °C

Clear: Rain: Overcast:
 Partly Cloudy: Snow: Inversion: Ceiling: 2.563 ft

Tonnes Blasted: 20,811 te 7,853 m³
 Total tonnes per day: 20,811 te NB40-07 Rate Code
 Total Holes Loaded: 67 holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 8 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 8 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 59 main body

Bench Height: 44.2 ft avg
 Sub-drill: 0.0 ft avg
 Hole Depth: 44.2 ft avg

- Stone Decking -

Front Row: 0.0 ft avg
 Main Body: 5.0 ft avg
 # Decks: 2 per blast

- Collar Stemming -

Front Row: 7.0 ft avg
 Main Body: 7.0 ft avg
 Material used: .75" stone

- Charge Length -

Front Row: 37.2 ft avg
 Main Body: 32.2 ft avg

- Charge Weight -

Front Row: 108.6 kg/hole
 Main Body: 94.0 kg/hole
 Max. per delay: 132.0 kg/delay
 SD () Equation: 217.6 kg/delay
 Total kg Loaded: 8,227 kg
 Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

1.766 lb/yd³ Yield PF: 0.395 kg/te (actual)
 1.218 lb/yd³ Front row: 0.273 kg/te (theoretical)
 1.405 lb/yd³ Main Body: 0.315 kg/te (theoretical)
 1.382 lb/yd³ "KPI" PF: 0.309 kg/te (theoretical)

- Drilling Information -

Primary Bit diam: 101.6 mm 0° Angle from Vertical # Holes: 67 = 2,963.5 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	33,890	25,710	8,180

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	138	46.9

total explosives weight in Blast (kg): 8,227
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			69
UNITRONIC 600 15M			69

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	>/=5,000kg <10,000kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	11.0
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

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast

Stone decks were required at E-7 & F-7 due to voids identified on drill log

Hole H-5 was at 38'

1st seismograph was set to trigger at 100db and when I went to pick it up the memory was full truck traffic going by.



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-04

Blast Number: 18-005
Orica Order #: 2345753
Blast Time: 11:50 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40399	79.88318	0.757542	1.394225
Front Row Corner	43.40400	79.88336	0.757543	1.394228
Back Row Corner	43.40396	79.88302	0.757542	1.394222
Average (Centre of Blast)	43.40398	79.88319	0.757542	1.394225

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137

Distance (1st Seis. From Centre of Blast) **442.5** m

Post Blast Data: ppV: **Memory** mm/s Trigger set at: 2.0 mm/s
frequency: **Was** Hz V / T / L ? (Vertical, Transverse or Longitudinal)
air overpressure: **Full** dB Trigger set at: 100 dB

2450 2nd Line

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413

Distance (2nd Seis. From Centre of Blast) **904.3** 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

Colling Rd & Blind Line Bruce Trail

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323

Distance (3rd Seis. From Centre of Blast) **1263.7** 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

SouthWest Corner of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(442.5)^2}{30^2} \text{ kg}$$

$$= \frac{195,806}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



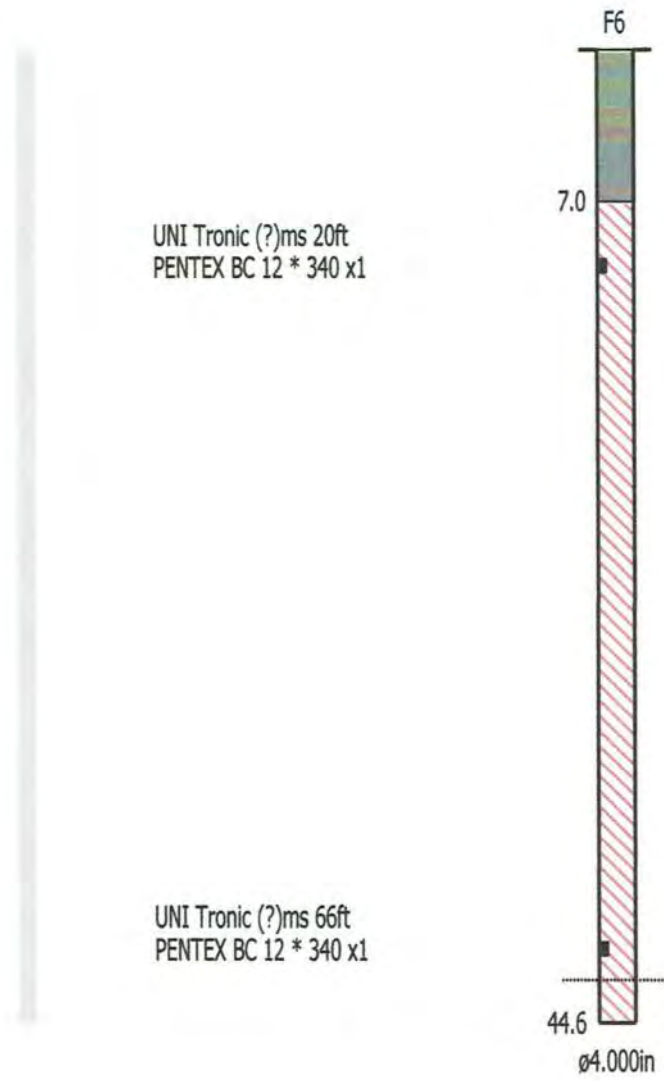
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 6/4/2018

Blast Number: 18-005
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

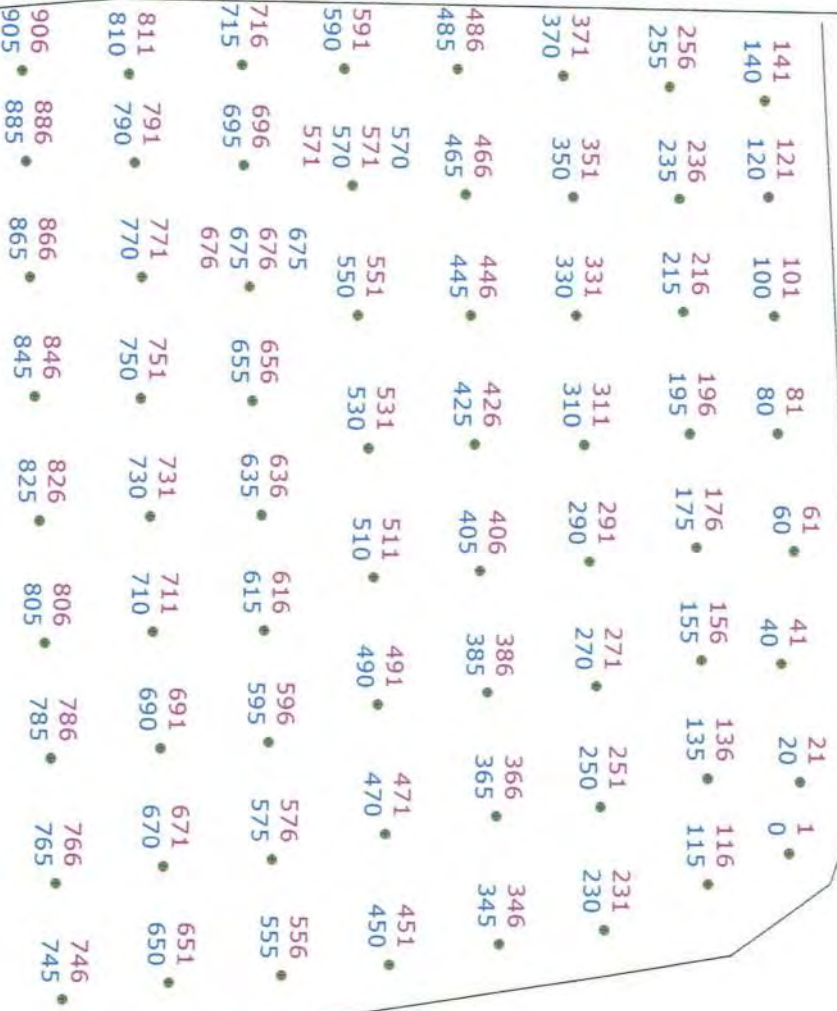
Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating sign off on Blast Design.

Timing



Not to scale

SHOTPlus 5.7.1.1		6/4/2018
Mine	Burlington	
Location		
Title/author	18-005 Bottom Middle South I. Deemert	
Filename	2018-06-04 18-005 Lower Middle.spf	

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 67 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 2963.6ft Blasted tonnage: 21,880S/T

Load Sheet 132kg MAX

Highwall

•74 • 108 • 92 • 117 • 114 • 116 • 114 • ~~112~~
 •114 • 116 • 108 • 121 • 113 • 113 • 131 • ~~107~~
 •118 • 114 • 118 • 116 • 117 • 126 • 119 • 112
 •124 • 124 • 122 • 132 • 123 • 116 • 106 • 109
 •119 • $\frac{15}{124}$ • 121 • 123 • 125 • 124 • 109 • 116
 •123 • 126 • $\frac{7}{132}$ • 119 • 122 • 107 • 119 • 111 • 97
 •131 • 104 • 128 • 121 • 119 • 94 • 115 • 129 • 121
 •129 • 129 • 132 • 123 • 99 • 121 • 121 • 120 • 107



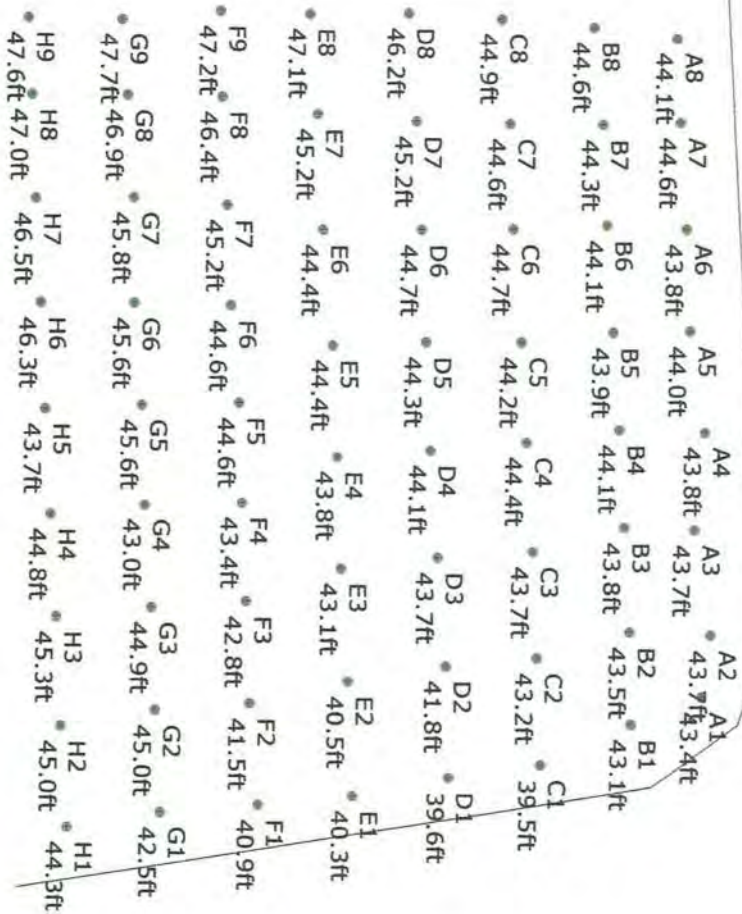
Not to scale

SHOTPlus 5.7.1.1	5/30/2018
Mine	Burlington
Location	
Title/author	18-005 Bottom Middle South I. Deenert
Filename	2018-06-04 18-005 Lower Middle.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 0.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 67 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 2963.6ft Blasted tonnage: 21,8805/T



Highwall



SHOTPlus 5.7.1.1 5/30/2018

Mine Burlington

Location

Title/author 18-005 Bottom Middle South I. Deemert

Filename 2018-06-04 18-005 Lower Middle.spf

Not to scale

1089712

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSANCE NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.



Orica Canada Inc.

Bill of Lading / Connaissance

CONSIGNOR / EXPÉDITEUR
GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE / CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

*BLASTER: MIKE D
 HCLP: MIKE A
 KEITH
 BULK: JEFF*

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE <i>6:50</i>	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE 2345753	B/L NUMBER N° DE CONNAISSANCE 86028794

DATE REQUIRED DATE REQUISE 04 Jun 2018	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a
DATE SHIPPED EXPÉDIÉ LE 04 Jun 2018	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE 15013
SHIP VIA TRANSPORTEUR Orica Truck		ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
196	PC	X	58	138	PENTEX BC 340 (49/CS)	4	71.540
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
80	PC	X	11	69	*uni tronic 600-06.0M CU/ZC(20')30PC	1	5.840
132	PC	X	63	69	*uni tronic 600-15M C/Z SPL(50')66PC	2	22.572
66	PC	X	66	0	*uni tronic 600-20M CU/ZC SPL(65')66P	1	13.464
100	PC		95	5	MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							119.956 KG
**** TOTAL PACKAGES ****						9	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSANCE D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORT AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$	NETTE No. CONV PRESSAGE WT AGREEMENT NO.

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR <i>K. PLATT</i>	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR <i>K. PLATT</i>	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE <i>K. Platt</i>	SIGNATURE <i>K. Platt</i>	SIGNATURE
DATE 4 6 18 D/J M/M Y/A	DATE 4 6 18 D/J M/M Y/A	DATE

**2 SHIPPING ORDER
BON D'EXPÉDITION**

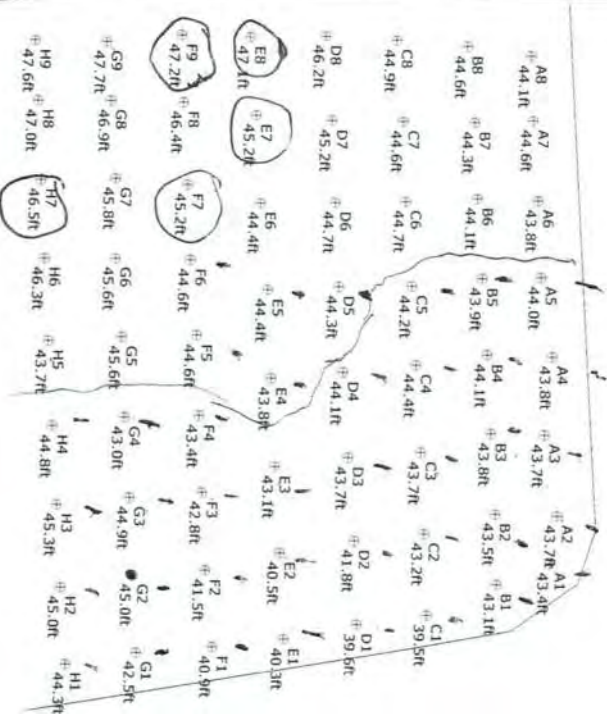
(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
 (L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNE LA COPIE ORIGINALE (1) DU CONNAISSANCE CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO

Blast Summary Data

Burden : 9.0ft Spacing: 10.0ft Subdrill: 0.0ft Stemming: 6.0ft
 1st row burden : 12.0ft Hole Diameter: 4.0in Number of holes : 67 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled : 2963.6ft Blasted tonnage: 21,8805/T

Open Face



Bottom Middle South 18-005
 12x10 Front Row 9x10 Body
 4" Hole Diameter
 250m Floor Elevation + 0.6m Su

Highwall



Not to scale

SHOTPlus 5.7.2.1	02/05/2018
Mine Burlington	
Location	
Title/author 18-005 Bottom Middle South I. Dee	
Filename 18-005 Design Final.spf	



Blast Report

Nelson Aggregate

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2018-06-06**

Blast Number: **18-006**
 Orica Order #: **2346925**
 Blast Time: **12:10 PM**

page 1 Blaster-in-charge: **Mike der Kinderen** (Print Name)

Blast Location: **Lower Bench** (Bench / Face)
 GPS Coordinates: **43.40428** °N Latitude **79.88387** °W Longitude
Centre of Blast Centre of Blast

Wind from the: **W** at **5** kph Temperature: **11 to 15** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling: **3,116** ft

- Drilling Information -

Angle from Vertical **Nominal Bit Diameter:**
 Primary Bit diam: **101.6** mm **0**° # Holes: **61** = **2,668.2** 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	26,650	19,410	7,240

Packaged Explosives:	cs shipped	cs returned	kg

Boosters:	kg / unit	# usec	kg
PENTEX 8 (OR EQUIVALENT)		0.23	130

total explosives weight in Blast (kg): **7,270**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			59
UNITRONIC 600 15M			71

Cord & Accessories:	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	8

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	>=5,000kg <10,000kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	11.0
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: **17,948** te **6,773** m³
 Total tonnes per day: **17,948** te **NB40-08** Rate Code
 Total Holes Loaded: **61** holes
 ... including: **Dead Holes**
 ... and: **Helper Holes**
 Helper Hole Collar: **ft** avg
 # Rows Blasted: **11** rows
- Pattern (Front Row) -
 Burden: **12.0** ft avg
 Spacing: **10.0** ft avg
 # Holes: **8** front row
- Pattern (Main Body) -
 Burden: **9.0** ft avg
 Spacing: **10.0** ft avg
 # Holes: **53** main body
 Bench Height: **41.7** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **43.7** ft avg
- Stone Decking -
 Front Row: **7.0** ft avg
 Main Body: **5.0** ft avg
 # Decks: **6** per blast
- Collar Stemming -
 Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg
 Material used: **.75"** stone
- Charge Length -
 Front Row: **29.7** ft avg
 Main Body: **31.7** ft avg
- Charge Weight -
 Front Row: **86.7** kg/hole
 Main Body: **92.6** kg/hole
 Max. per delay: **145.0** kg/delay
 SD () Equation: **284.6** kg/delay
 Total kg Loaded: **7,270** kg
 Rock Density: **2.65** g/cc = te/m³

Theoretical PF (Based on a single row)

Yield Powder Factor (kt Loaded / in Blast)

- Powder Factor -
 Yield PF: **0.405** kg/te (actual)
 Front row: **0.231** kg/te (theoretical)
 Main Body: **0.328** kg/te (theoretical)
 "KPI" PF: **0.319** kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or iS from previous Blast:
 Due to voids identified on drill log and found while loading we had to put in 6 stone decks rang from 5'-7'
 Every front row hole had lean burden, therefore we used toe loads and stem plugs
 See load adjustment sheet in report



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-06

Blast Number: 18-006
Orica Order #: 2346925
Blast Time: 12:10 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40427	79.88388	0.757547	1.394237
Front Row Corner	43.40428	79.88368	0.757548	1.394233
Back Row Corner	43.40428	79.88405	0.757548	1.394240
Average (Centre of Blast)	43.40428	79.88387	0.757548	1.394237

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137

Distance (1st Seis. From Centre of Blast)	506.1	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: 120 dB
2450 2nd Line		

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413

Distance (2nd Seis. From Centre of Blast)	842.9	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
Colling Rd & Blind Line Bruce Trail		

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323

Distance (3rd Seis. From Centre of Blast)	1276.3	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
SouthWest Corner of Property		

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(506.1)^2}{30^2} \text{ kg} \\
 &= \frac{256,137}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



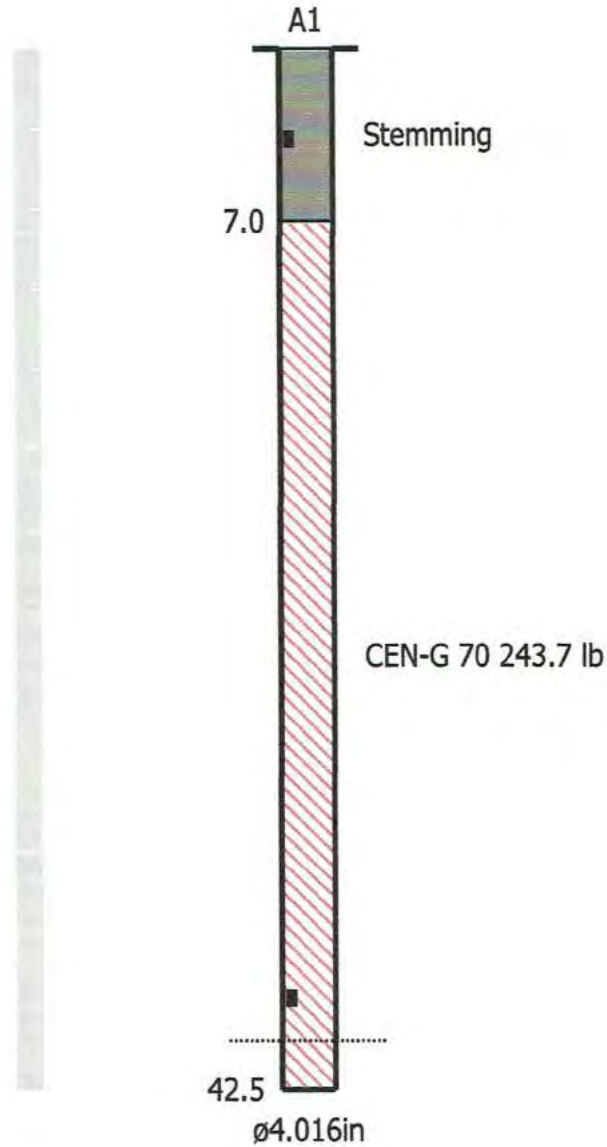
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 6/6/2018

Blast Number: 18-006
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

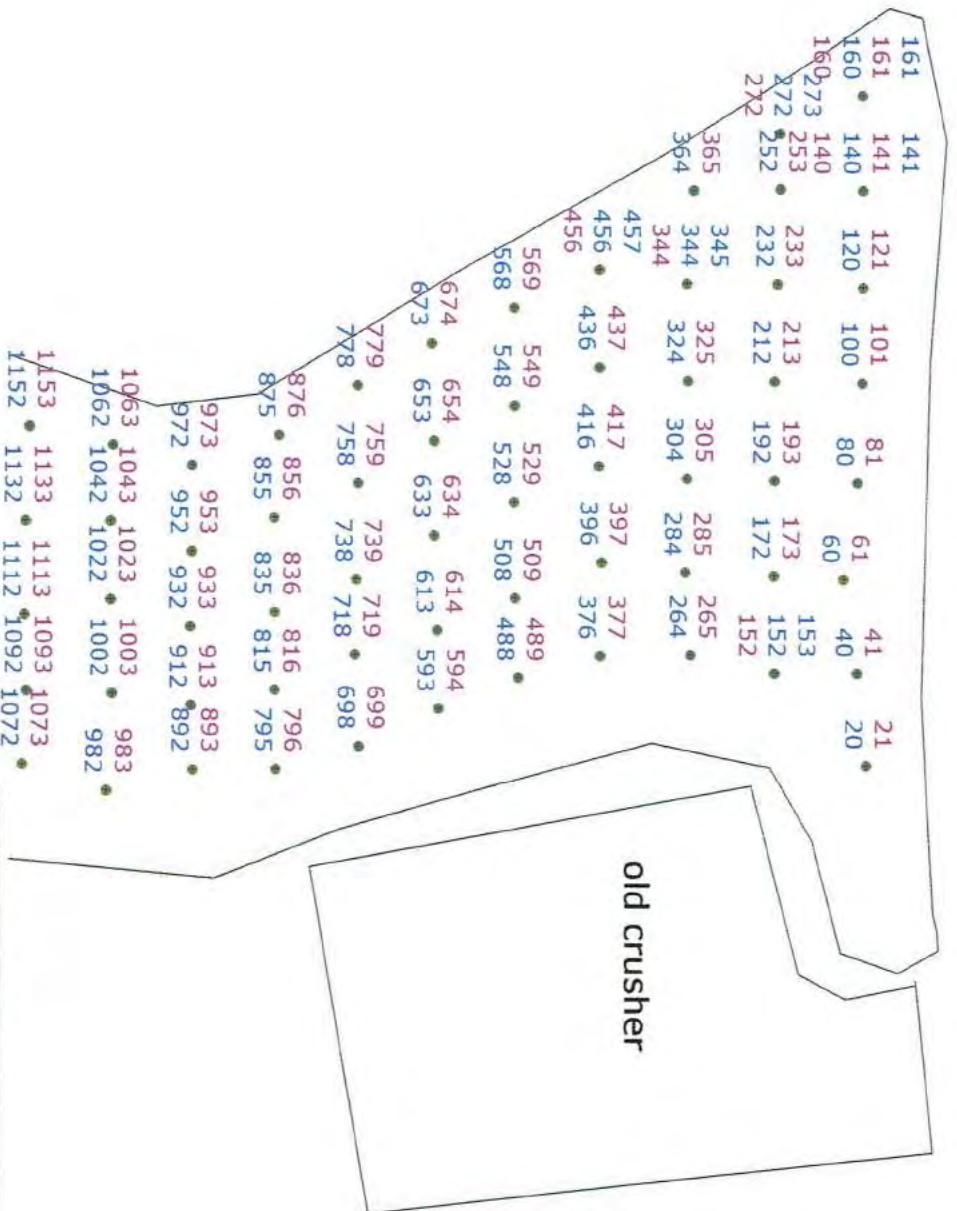
Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating
sign off on Blast Design.

Timing



open face

old crusher



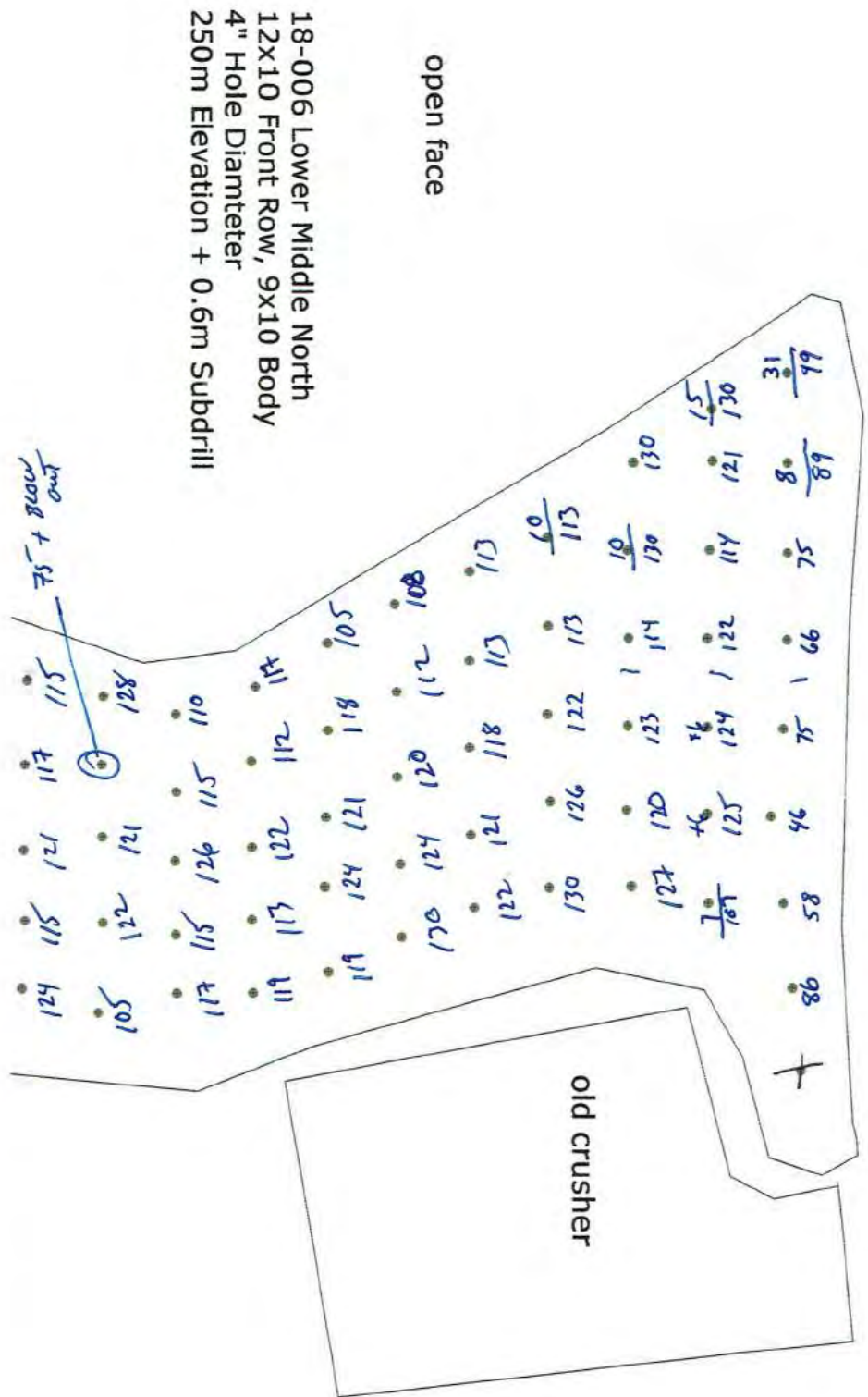
Not to scale

SHOTPlus 5.7.1.1	6/7/2018
Mine	Burlington
Location	
Title/author	18-006 K. George
Filename	2018-06-06 18-006.spf

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 62 Hole angle: 0.0°
 Total drilled: 2588.0ft

Load Sheet 130kg MAX



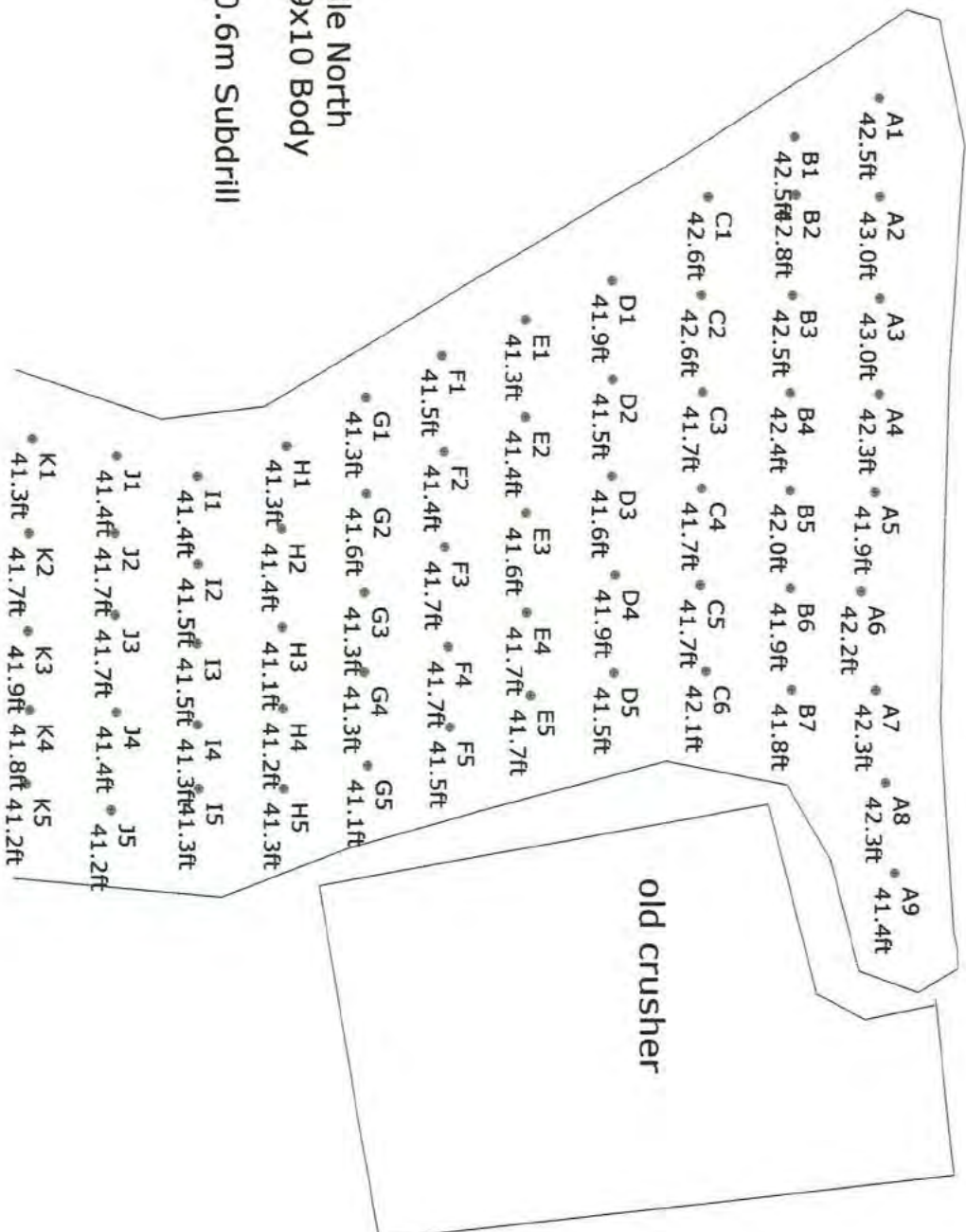
Not to scale

SHOTPlus 5.7.1.1	6/4/2018
Mine	Burlington
Location	
Title/author	18-006 K. George
Filename	2018-06-06 18-006.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 62 Hole angle: 0.0°
 Total drilled: 2588.0ft



open face

18-006 Lower Middle North
 12X10 Front Row, 9X10 Body
 4" Hole Diameter
 250m Elevation + 0.6m Subdrill

old crusher



Not to scale

SHOTPlus 5.7.1.1	6/4/2018
Mine	Burlington
Location	
Title/author	18-006 K. George
Filename	2018-06-06 18-006.spf

1089736

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

Bill of Lading / Connaissancement



Orica Canada Inc.

CONSIGNOR EXPÉDITEUR

GRAND VALLEY
033411 SIDE ROAD 21-22
GRAND VALLEY ON
CA L9W 7G1

Blaster - Mike
Helpers - Dylan
Ken

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY
BURLINGTON ON
CA L7R 4L8

Table with columns: GROSS / BRUT, TARE, NET, TIME IN HEURE D'ENTRÉE, TIME OUT HEURE SORTIE, ORDER NUMBER N° DE COMMANDE, B/L NUMBER N° DE CONNAISSEMENT. Values: 2346925, 86032192.

Table with columns: DATE REQUIRED DATE REQUISE, TIME REQUIRED HEURE REQUISE, INVOICE TO / BUYER FACTURÉ À / ACHETEUR, CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT, DATE SHIPPED EXPÉDIÉ LE, FREIGHT TERMS CONDITIONS DE LIVRAISON, SHIP. MAG. LIC. PERMIS EXPÉDITEUR, VEHICLE NO. N° DE VÉHICULE, SHIP VIA TRANSPORTEUR, ROUTING ITINÉRAIRE, MAG. LIC. NO. N° DE PERMIS.

Main table with columns: QTY. QTÉ., UM, DG MD, QTY. RET'D QTÉ. RET., QTY. SOLD QTÉ. FACT, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT. Includes items like PENTEX BC 340, Harness Wire Duplex, uni tronic cables, MINI STEM PLUGS, LABOUR CHARGE, and ROG (ROCK ON GROUND). Total Gross Weight: 106.492 KG.

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

Table with columns: EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE, EMERGENCY RESPONSE NO.24 HOUR NUMBER, PLACARDS OFFERED / PLACARDS OFFERT, FORWARD INVOICE FOR PREPAID FREIGHT.

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION...

Table with columns: CONSIGNOR / EXPÉDITEUR, CARRIER / TRANSPORTEUR, CONSIGNEE / DESTINATAIRE, SHIPPER'S NAME, DRIVER'S NAME, RECEIVER'S NAME, SIGNATURE, DATE.

2 SHIPPING ORDER BON D'EXPÉDITION

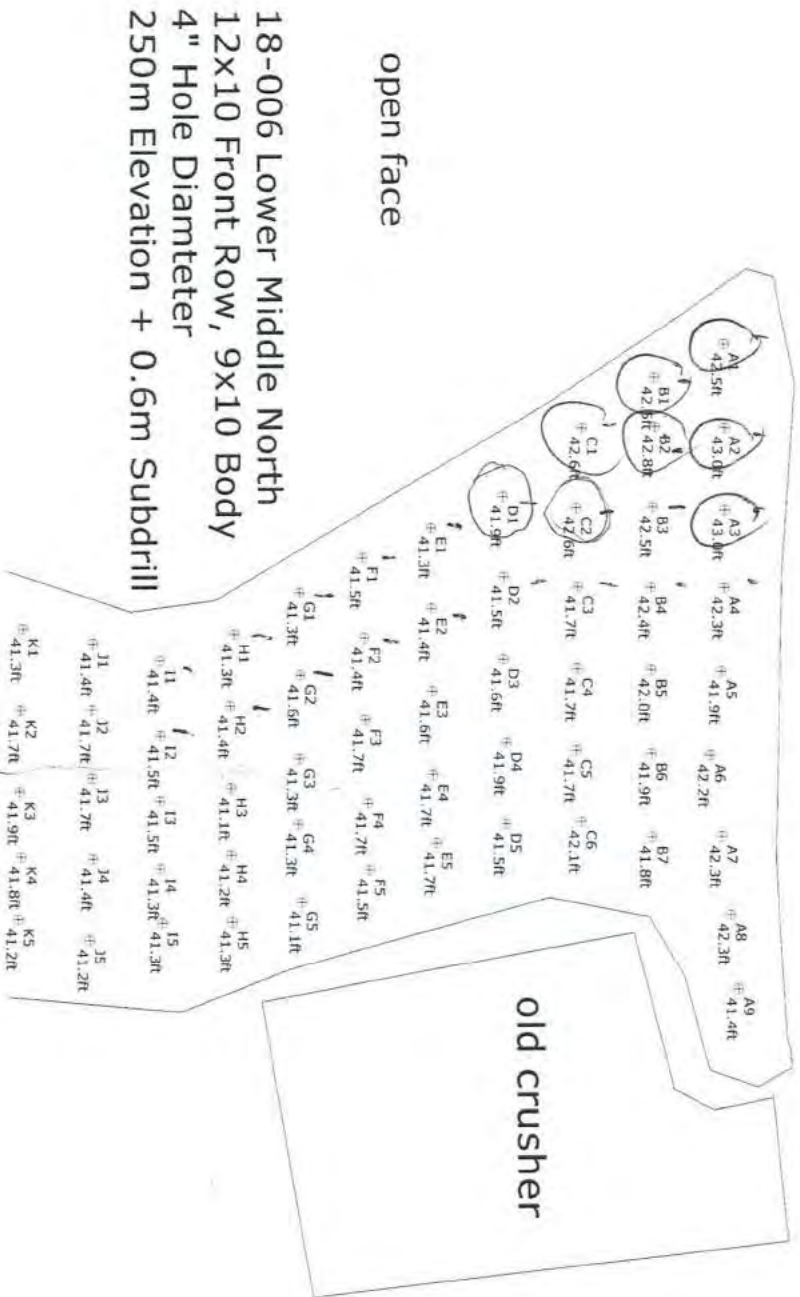
(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 62 Hole angle: 0.0°
 Total drilled: 2588.0ft

0



open face

18-006 Lower Middle North
 12X10 Front Row, 9X10 Body
 4" Hole Diameter
 250m Elevation + 0.6m Subdrill

Not to scale



SHOTPlus 5.7.2.1	02/05/2018
Mine	Burlington
Location	
Title/author	18-006 K. George
Filename	18-006 Lower Middle.spf



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-06-11

Blast Number: 18-007

Orica Order #: 2348563

Blast Time: 11:56 AM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40368 °N Latitude 79.88315 °W Longitude
Centre of Blast Centre of Blast

Wind from the: E at 15 kph Temperature: 21 to 25 °C

Clear: Partly Cloudy: X Rain: Snow: Inversion: Ceiling: 30,000 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 54 = 4,055.1 ft (4 " diam)
Secondary Bit diam: 101.6 mm	0°	# Holes: 1 = 75.1 ft (4 " diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
	33,850	21,090	12,760

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): 12,797
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			54
UNITRONIC 600 15M			1
UNITRONIC 600 25M			55

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	10

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	>=10,000 kg	1
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	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted:	28,467 te	10,742 m ³
Total tonnes per day:	28,467 te	NB80-01 Rate Code
Total Holes Loaded:	55 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:	10.0 ft avg
# Holes:	8 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	47 main body

Bench Height: 73.1 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 75.1 ft avg

- Stone Decking -

Front Row:	ft avg
Main Body:	ft avg
# Decks:	per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	.75" Stone

- Charge Length -

Front Row:	68.1 ft avg
Main Body:	68.1 ft avg

- Charge Weight -

Front Row:	198.6 kg/hole
Main Body:	198.6 kg/hole
Max. per delay:	261.0 kg/delay
SD () Equation:	202.9 kg/delay
Total kg Loaded:	12,797 kg
Rock Density:	2.65 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.450 kg/te (actual)
Front row:	0.302 kg/te (theoretical)
Main Body:	0.402 kg/te (theoretical)
"KPI" PF:	0.377 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

Some holes received an 8' or 9' collar due to broken rock on top or lean burden at the crest



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-11

Blast Number: 18-007
Orica Order #: 2348563
Blast Time: 11:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40364	79.88314	0.757536	1.394224
Front Row Corner	43.40353	79.88317	0.757535	1.394224
Back Row Corner	43.40386	79.88312	0.757540	1.394223
Average (Centre of Blast)	43.40368	79.88315	0.757537	1.394224

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	427.3	m		
Post Blast Data:	ppV: 2.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.9	dB	Trigger set at: 115	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	916.8	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 10.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 120.2	dB	Trigger set at: 115	dB
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1233.5	m		
Post Blast Data:	ppV: 0.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 0.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.6	dB	Trigger set at: 115	dB
SouthWest Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(427.3)^2}{30^2} \text{ kg}$$

$$= \frac{182,585}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



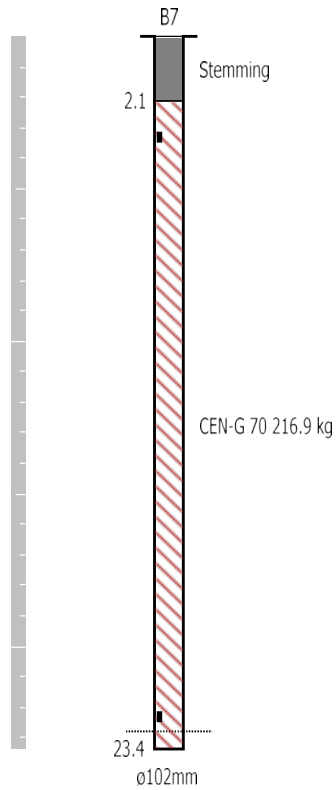
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 6/11/2018

Blast Number: 18-007
Orica Order #: 2348563

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating
sign off on Blast Design.

SHOTPlus 5 Plan

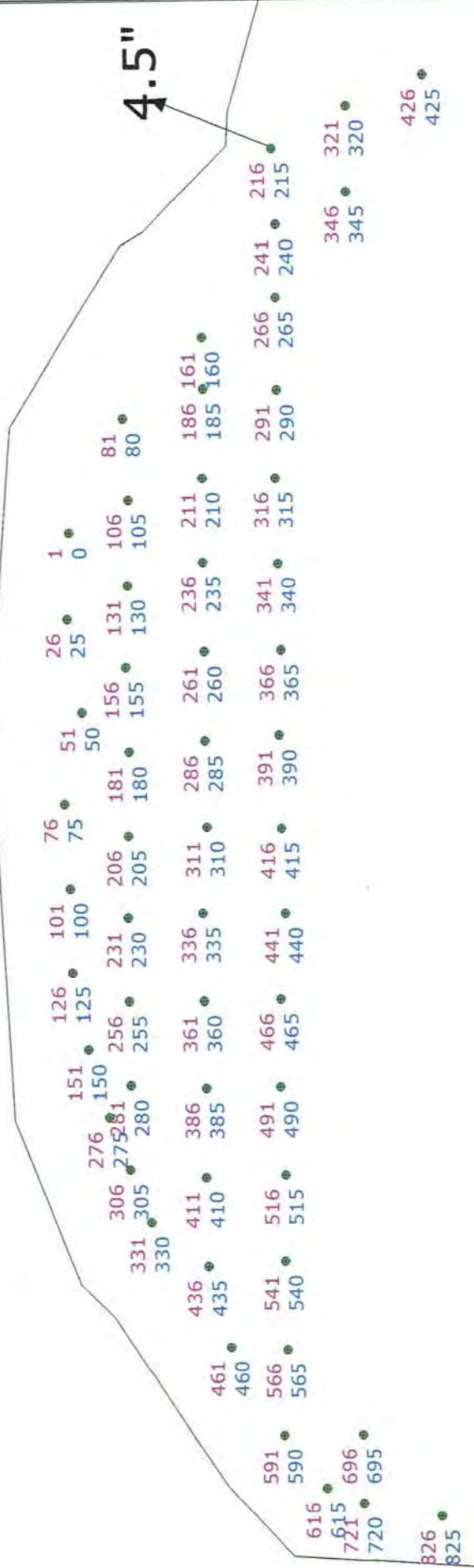
Blast Summary Data

Burden: 2.7m Spacing: 3.0m Stemming: 2.1m
 1st row burden: 3.7m Hole Diameter: 102.0mm Number of holes: 55 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 1292.0m Blasted tonnage: 29,020tne



open face

4.5"



SHOTPlus 5.7.1.1		6/11/2018
Mine	Burlington	
Location	Upper Middle Bench	
Title/author	18-007 Upper Middle Design	Ken George
Filename	18-007_Upper_Middle_Final.spf	

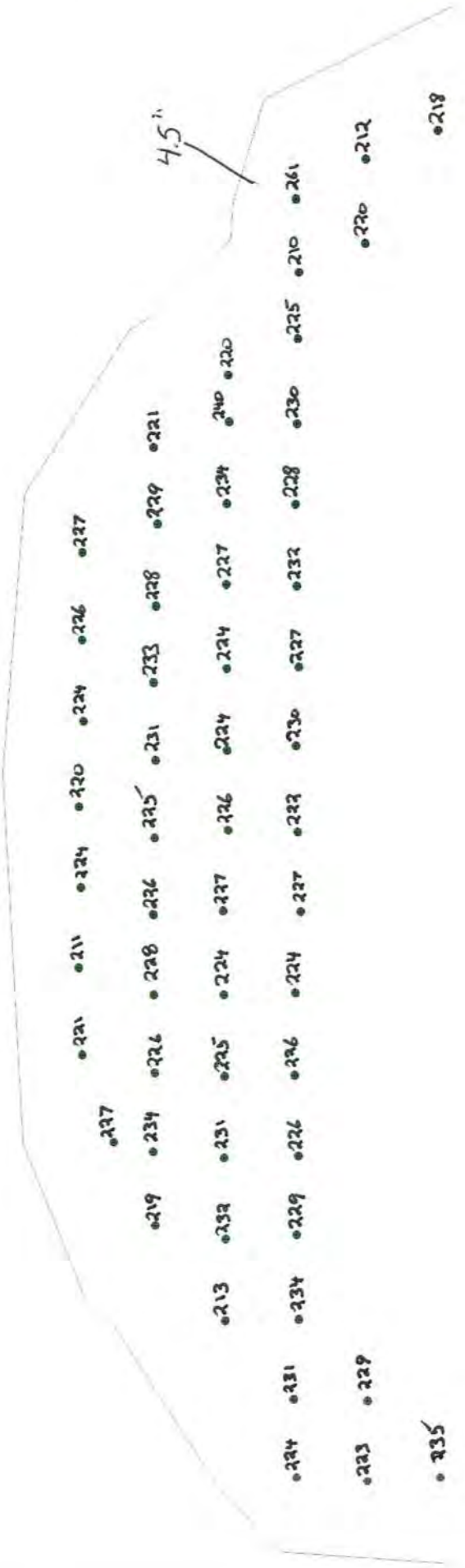


Not to scale

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 55 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 4130.2ft Blasted tonnage: 25,592S/T

Load Sheet Max Load 240kg



SHOTPlus 5.7.1.1	6/7/2018
Mine	Burlington
Location	Upper Middle Bench
Title/author	18-007 Upper Middle Design Ken George
Filename	18-007_Upper_Middle_Final.spf



Not to scale

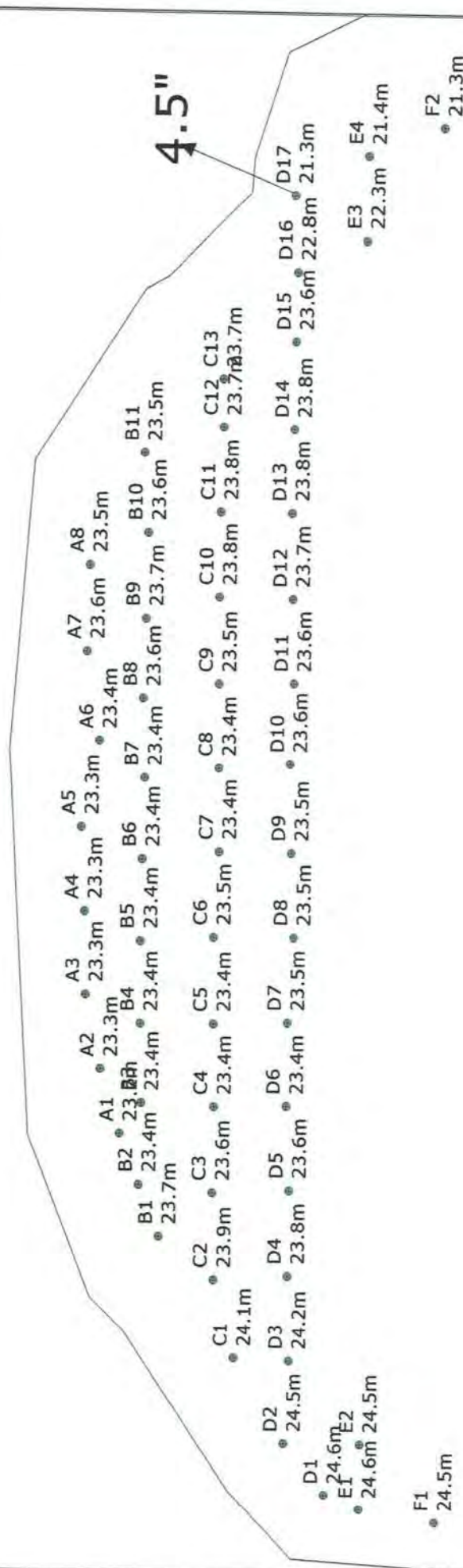
SHOTPlus 5 Plan

Blast Summary Data

Burden: 2.7m Spacing: 3.0m Stemming: 2.1m
 1st row burden: 3.7m Hole Diameter: 102.0mm Number of holes: 55 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 1292.0m Blasted tonnage: 29,020tne



open face



SHOTPlus 5.7.1.1	6/11/2018
Mine	Burlington
Location	Upper Middle Bench
Title/author	18-007 Upper Middle Design Ken George
Filename	18-007_Upper_Middle_Final.spf



Not to scale

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSANCE NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance

Orica Canada Inc.
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
 NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2348563	86036212

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
11 Jun 2018	00:00:00	NELSON AGGREGATE COMPANY	n/a

DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
11 Jun 2018	FOB Dest'n, Own Truck	F-73289	PT 15013

SHIP VIA TRANSPORTEUR	ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck	STANDARD	

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
147	PC	X	37	110	PENTEX BC 340 (49/CS)	3	53.655
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
80	PC	X	26	54	*uni tronic 600-06.0M CU/ZC(20')80PC	1	5.840
66	PC	X	65	1	*uni tronic 600-15M C/Z SPL(50')66PC	1	11.286
108	PC	X	53	55	*uni tronic 600-25M CU/ZC SPL(80')54P	2	26.352
100	PC		90	10	MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							103.673 KG
**** TOTAL PACKAGES ****						8	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE BRAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.
 NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

DECLARED VALUE OF SHIPMENT / VALEUR DÉCLARÉE \$

NETTE No. CONV PRESSAGE WT AGREEMENT NO.

301 rue hotel de ville
 Brownsburg-Chatham, QC
 J8G 3B5

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR Ryan Behnam	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR Ryan Behnam	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE <i>[Signature]</i>	DATE 11 06 18 D/J M/M Y/A	SIGNATURE <i>[Signature]</i>
	DATE 11 06 18 D/J M/M Y/A	DATE D/J M/M Y/A



Blast Design Nelson Aggregate

Quarry:
 P.O. #:
 Design Date:

Blast Number:
 Orica Order #:

page 1

Blaster-in-charge: (Print Name)

Blast Location: (Bench / Face)
 GPS Coordinates: °N Latitude °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: te
 Total Holes Loaded: holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: rows

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
 Primary Bit diam: mm # Holes: = 4,130.2 ft (4 " diam)
 Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
 Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: ft avg
 Spacing: ft avg
 # Holes: front row

- Design Pattern (Main Body) -

Burden: ft avg
 Spacing: ft avg
 # Holes: main body

Bench Height: ft avg

Sub-drill: ft avg

Hole Depth: ft avg

- Design Stone Decking -

Front Row: ft avg

Main Body: ft avg

- Design Collar Stemming -

Front Row: ft avg

Main Body: ft avg

Material used: Stone

- Design Charge Length -

Front Row: ft avg

Main Body: ft avg

- Design Charge Weight -

Front Row: kg/hole

Main Body: kg/hole

Max Chge Wt / delay: kg/delay

Required kg Loaded: kg

Rock Density: g/cc = te/m^3

- Design Powder Factor -

Expected Yield PF: kg/te (actual)

Front row: kg/te (theoretical)

Main Body: kg/te (theoretical)

"KPI" PF: kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit E. S. Expl or IS from previous Blast

A-3 (9)
 C-1 (8)
 D-17 C-20 P-8

Bulk Expl. Required:

	kg
CENTRA GOLD 70	13,200

Pkgd Expl. Required:

	kg

Boosters Required:

	kg/u	# usec	kg
PENTEX 12 (OR EQUIVALENT)	0.34	110	37.4

total explosives weight in Blast (kg):

Pkgd Prod (0 kg) % of Total kg:

Detonators Required:

	ms	# req'd
UNITRONIC 600 6M		55
UNITRONIC 600 25M		55

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:

	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	0
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

SHOTPlus 5 Plan

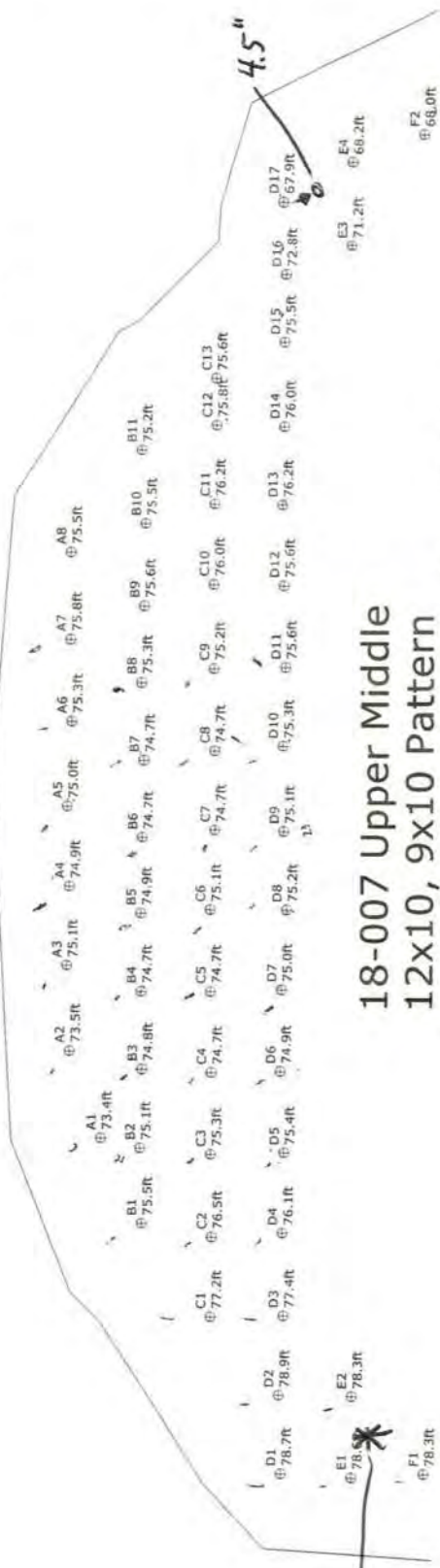
A1-A8
B1
C1
D1
E1

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 0.6ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 55	Hole angle: 0.0°
Rock density: 2.65g/cc	Total drilled: 4130.2ft	Blasted tonnage: 25,8625/T	



open face



18-007 Upper Middle
12x10, 9x10 Pattern
4" Hole Unless otherwise noted
250m + 0.6m Subdrill



Not to scale

SHOTPlus5Beta 5.7.3.9	04/06/2018
Mine Burlington	
Location Upper Middle Bench	
Title/author 18-004 Upper Middle Design Ken G	
Filename 18-007 Upper Middle Final.spf	

Date/Time Long at 11:56:25 June 11, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration May 3, 2017 by InstanTel
File Name __TEMP.EVT

Notes

Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: N.43.40245 W.79.87814

Extended Notes

Sand Bagged

Microphone Linear Weighting

PSPL 116.9 dB(L) at 1.206 sec

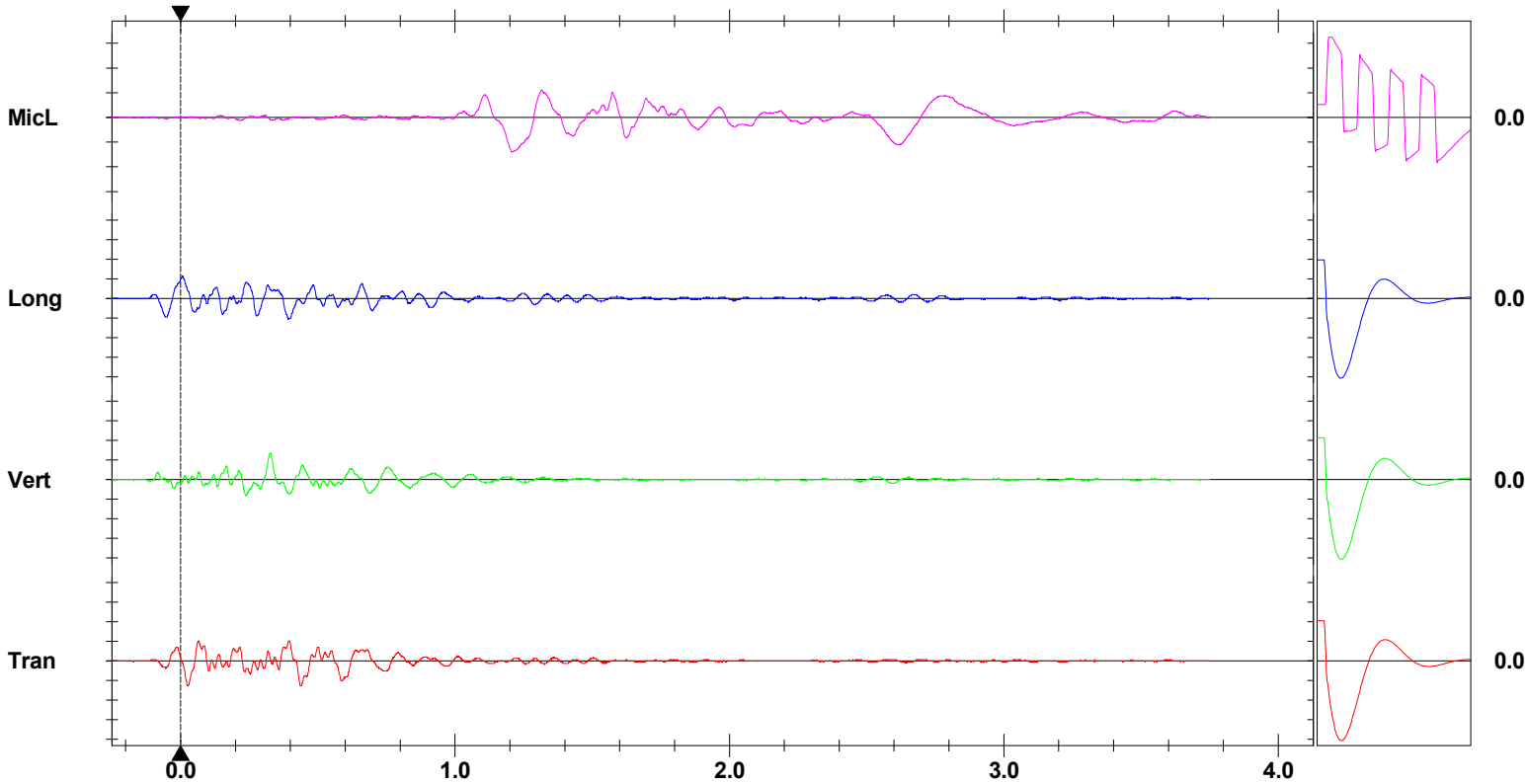
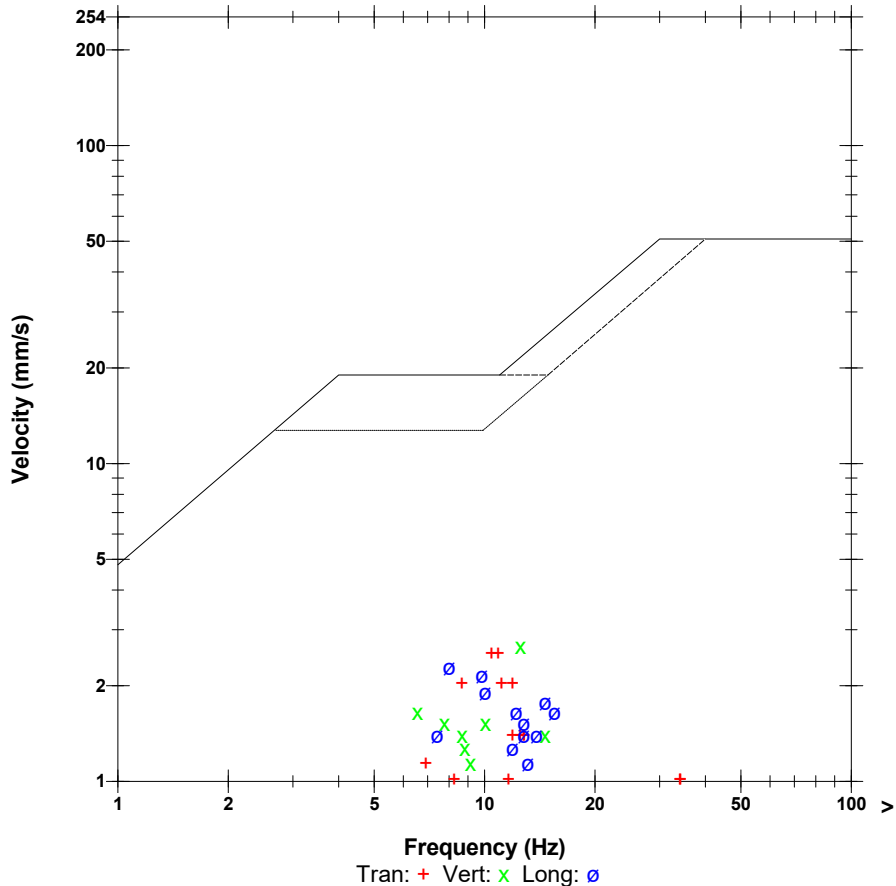
ZC Freq 3.5 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 693 mv)

	Tran	Vert	Long	
PPV	2.540	2.667	2.286	mm/s
ZC Freq	11	12	8.0	Hz
Time (Rel. to Trig)	0.024	0.324	0.006	sec
Peak Acceleration	0.040	0.027	0.040	g
Peak Displacement	0.038	0.031	0.042	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.4	7.4	Hz
Overswing Ratio	3.8	3.8	4.2	

Peak Vector Sum 3.277 mm/s at 0.393 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 MicL at 11:56:27 June 11, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.107 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/BURLINGTON.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration February 14, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: COLLING RD & BLINDLINE
Client: NELSON AGGREGATES
User Name: ORICA CANADA
General:

Extended Notes

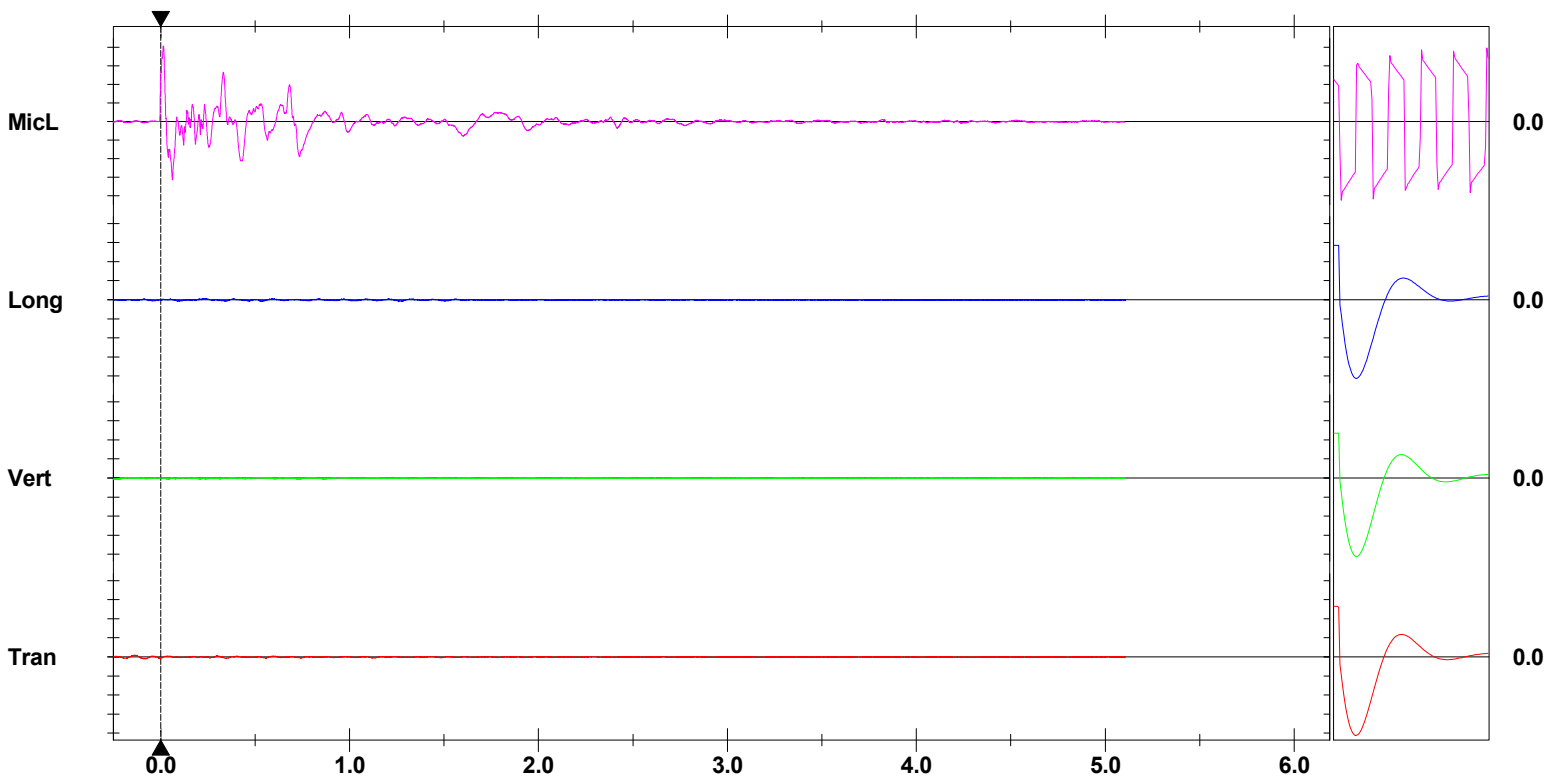
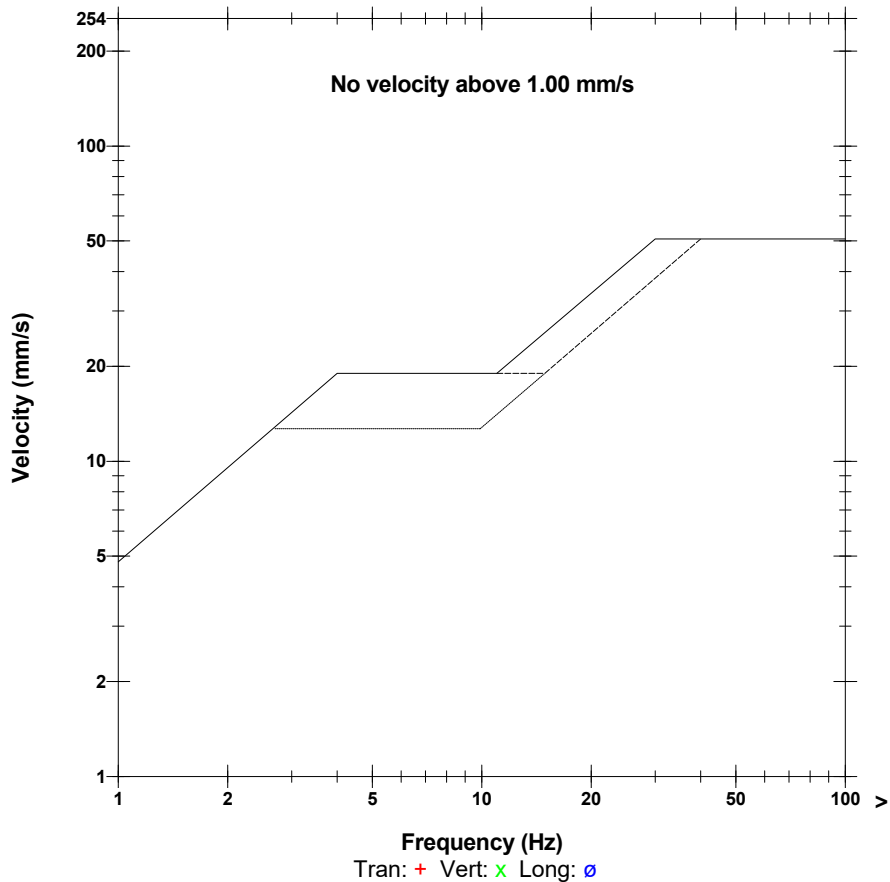
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 120.2 dB(L) at 0.015 sec
ZC Freq 13.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1331 mv)

	Tran	Vert	Long	
PPV	0.213	0.126	0.158	mm/s
ZC Freq	9.7	9.3	10.0	Hz
Time (Rel. to Trig)	-0.085	-0.241	0.533	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.004	0.004	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.3	3.6	

Peak Vector Sum 0.227 mm/s at -0.084 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

Date/Time MicL at 11:56:29 June 11, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 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 6.3 Volts
Unit Calibration November 3, 2017 by InstanTEL
File Name __TEMP.EVT
Scaled Distance 3879.2 (1226.7 m, 0.1 kg)

Notes

Location: South West Corner of Property
Client: Nelson Aggregates Burlington Quarry
User Name: ORICA CANADA INC.
General:

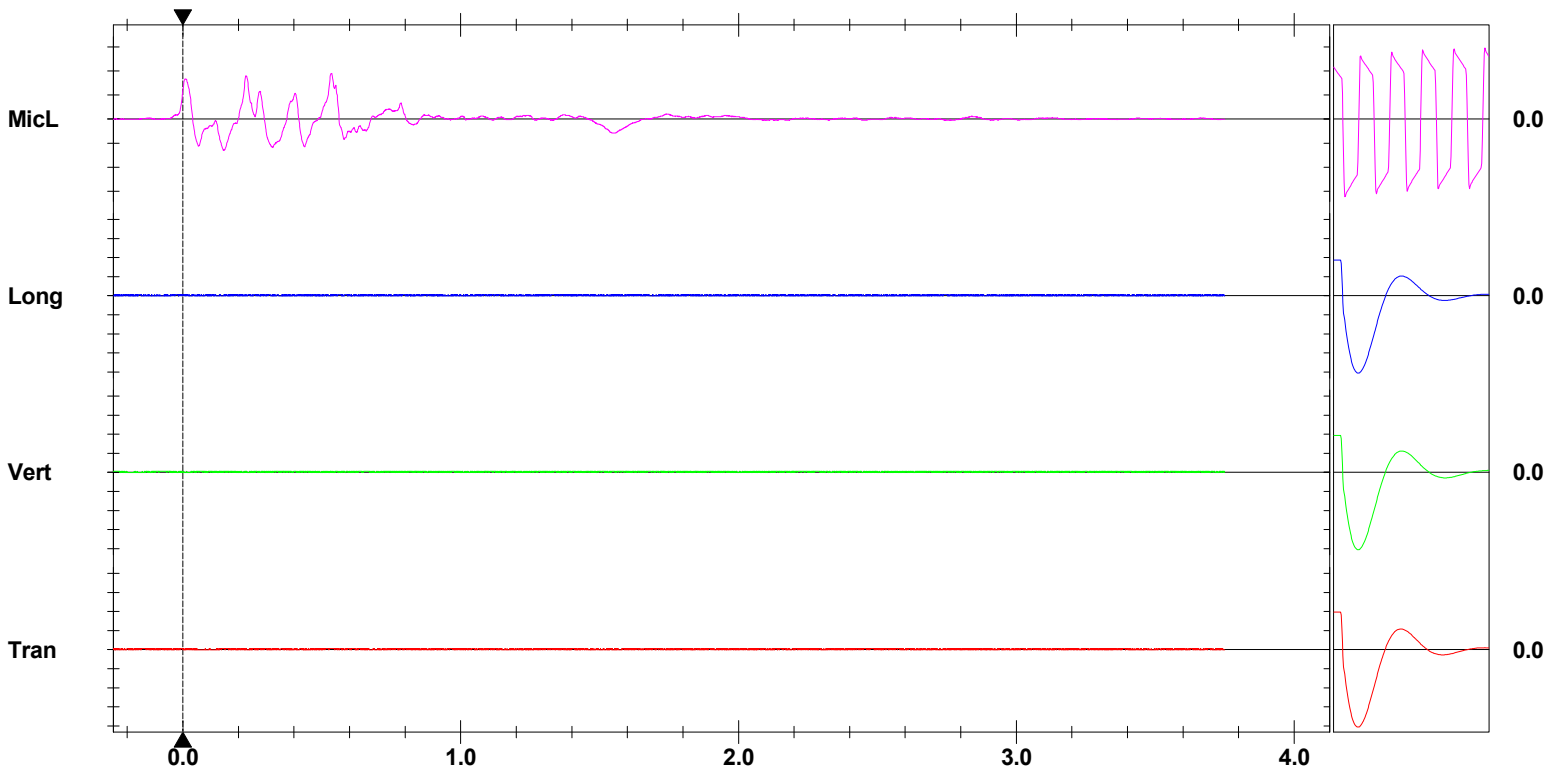
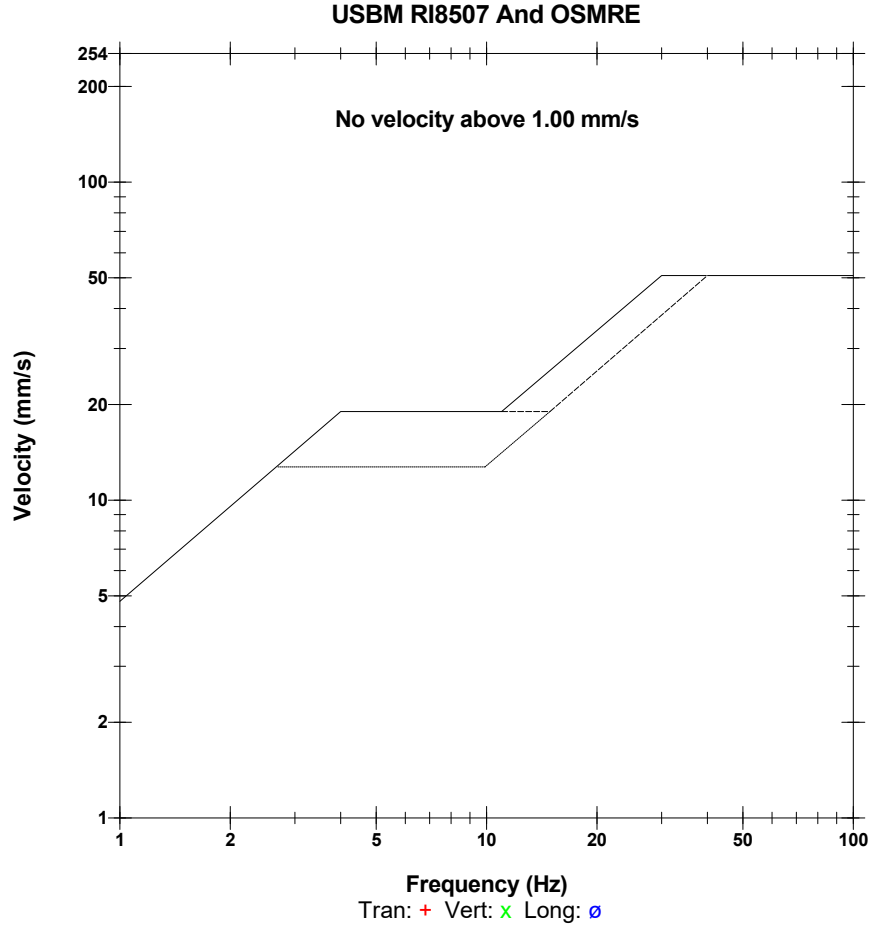
Extended Notes

43.39339 ,79.88880

Microphone Linear Weighting
PSPL 119.6 dB(L) at 0.533 sec
ZC Freq 6.8 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 618 mv)

	Tran	Vert	Long	
PPV	0.127	0.127	0.127	mm/s
ZC Freq	N/A	N/A	>100	Hz
Time (Rel. to Trig)	-0.250	-0.250	-0.246	sec
Peak Acceleration	0.013	0.013	0.013	g
Peak Displacement	0.000	0.000	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.7	4.0	

Peak Vector Sum 0.220 mm/s at -0.244 sec
N/A: Not Applicable



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

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-06-13

Blast Number: 18-008

Orica Order #: 2349625

Blast Time: 11:52 AM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Lower Middle (Bench / Face)

GPS Coordinates: 43.40407 °N Latitude 79.88289 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 10 kph Temperature: 21 to 25 °C

Clear: Partly Cloudy: X Rain: Overcast: Snow: Inversion: Ceiling: 2,554 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 89 = 4,450.9 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	33,790	20,940	12,850

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	3	2	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	187	63.6

total explosives weight in Blast (kg): 12,939

Pkgd Prod (25 kg) % of Total kg: 0.2%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			87
UNITRONIC 600 15M			8
UNITRONIC 600 20M			92

Cord & Accessories:

	U of M	# used
HARNESS 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	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	10.0
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:	28,929 te	10,917 m ³
Total tonnes per day:	28,929 te	NB40-06 Rate Code
Total Holes Loaded:	89 holes	
... including:	Dead Holes	
... and:	3 Helper Holes	
Helper Hole Collar:	9.0 ft avg	
# Rows Blasted:	7 rows	

- Pattern (Front Row) -

Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	10 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	79 main body

Bench Height: 48.0 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 50.0 ft avg

- Stone Decking -

Front Row: 5.0 ft avg

Main Body: 5.0 ft avg

Decks: 8 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: .75" Stone

- Charge Length -

Front Row: 38.0 ft avg

Main Body: 38.0 ft avg

- Charge Weight -

Front Row: 110.8 kg/hole

Main Body: 110.8 kg/hole

Max. per delay: 157.0 kg/delay

SD () Equation: 200.0 kg/delay

Total kg Loaded: 12,939 kg

Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

Yield PF: 0.447 kg/te (actual)

Front row: 0.256 kg/te (theoretical)

Main Body: 0.342 kg/te (theoretical)

"KPI" PF: 0.330 kg/te (theoretical)

1.998 lb/yd³

1.145 lb/yd³

1.527 lb/yd³

1.472 lb/yd³

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:

Hole X-3 & G9 Could not be found once loading had been started

A-8,C-4,B-8,C-12,C-7,C-8,F-4,F-10 All Received a 5' stone deck due to incompetent rock

See Attached Load Adjustment sheet for any more Changes



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-13

Blast Number: 18-008
Orica Order #: 2349625
Blast Time: 11:52 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40407	79.88286	0.757544	1.394219
Front Row Corner	43.40417	79.88310	0.757546	1.394223
Back Row Corner	43.40397	79.88271	0.757542	1.394216
Average (Centre of Blast)	43.40407	79.88289	0.757544	1.394219

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	424.3	m		
Post Blast Data:	ppV: 1.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 15.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 120.6	dB	Trigger set at: 115	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	925.3	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
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1281.4	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
SouthWest Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(424.3)^2}{30^2} \text{ kg}$$

$$= \frac{180,030}{900} \text{ kg}$$

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

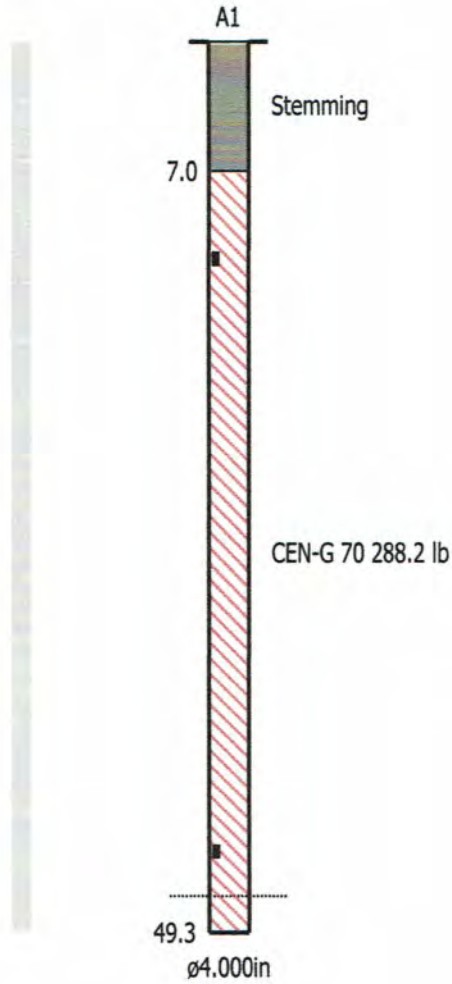
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 6/13/2018

Blast Number: 18-008
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

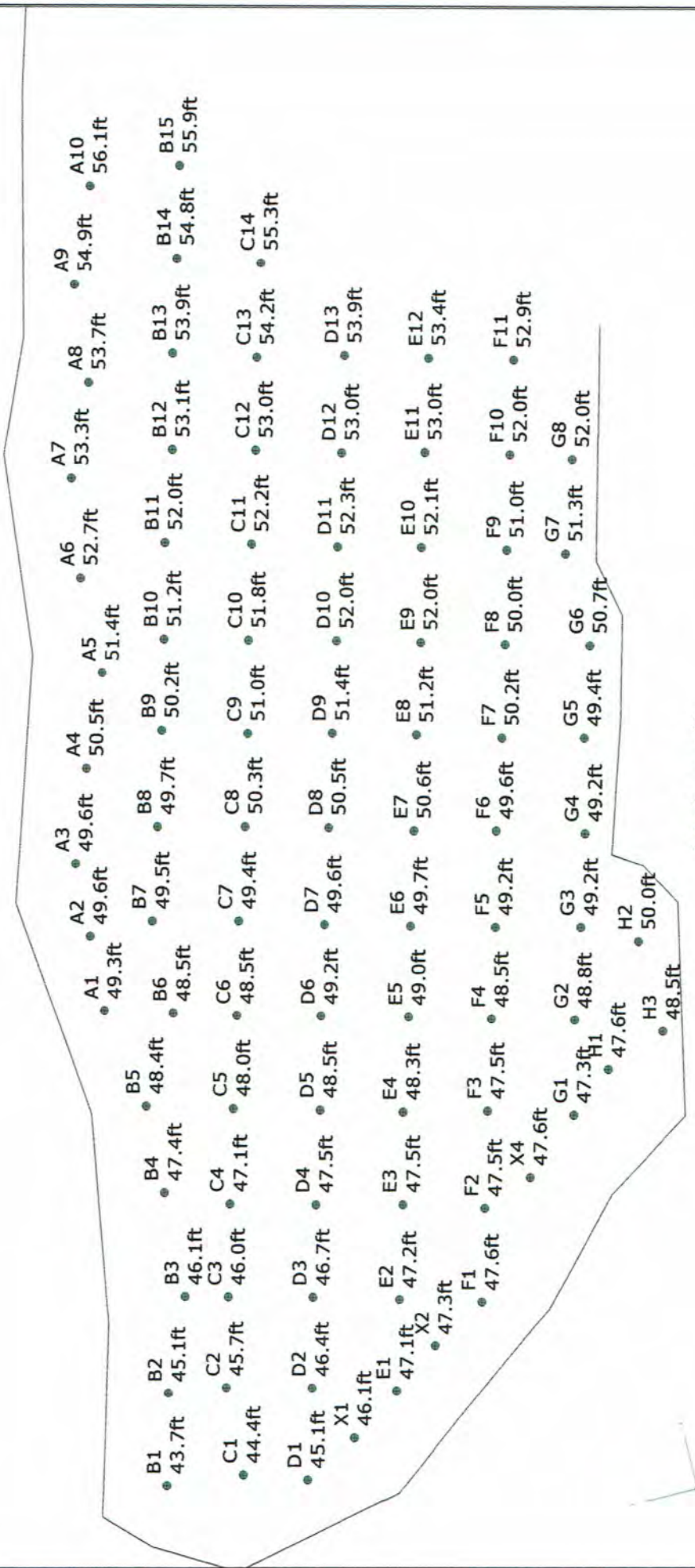
Bill White

Signature required, indicating sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 89 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 4446.2ft Blasted tonnage: 33,192S/T



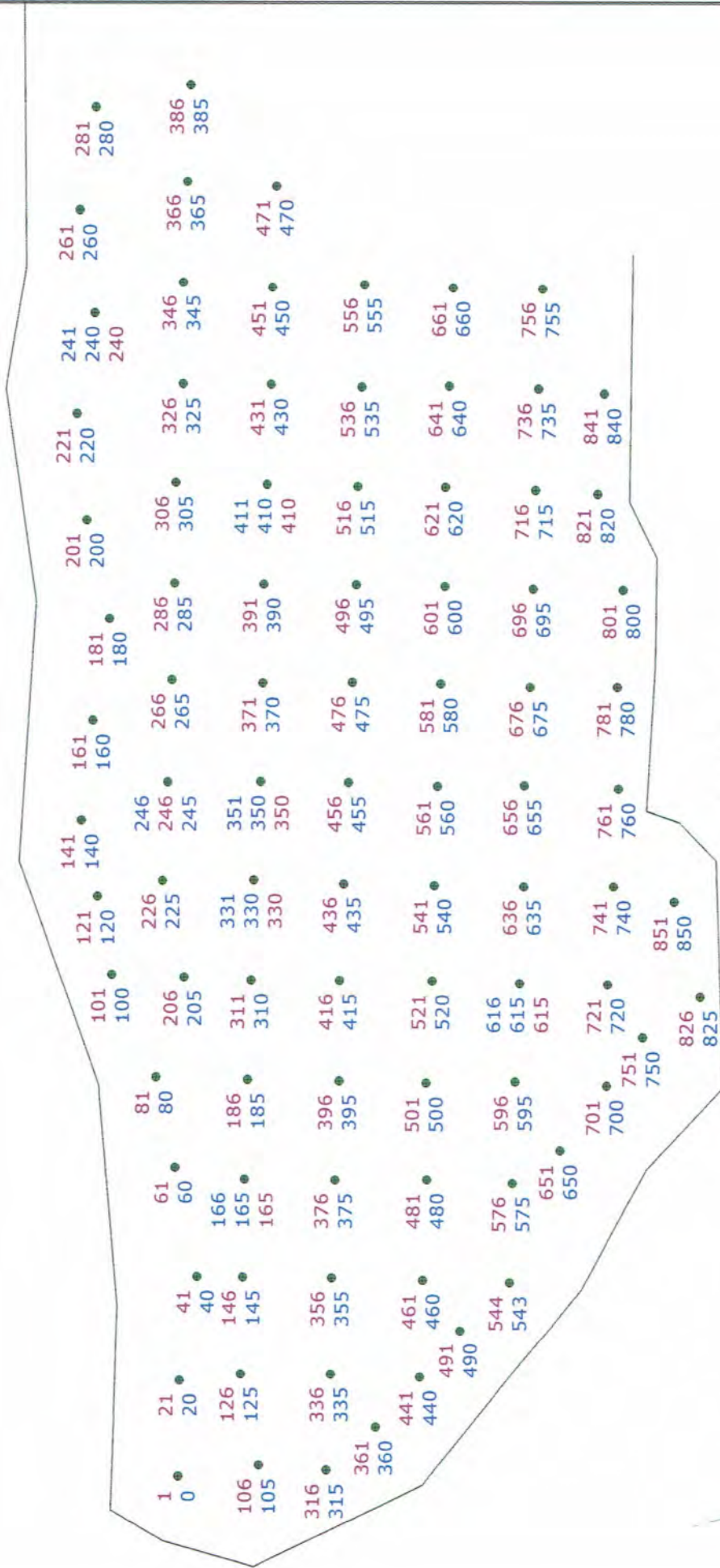
high wall

SHOTPlus 5.7.1.1	6/13/2018
Mine	Burlington
Location	
Title/author	18-008 Bottom Middle South K George
Filename	2018-06-13 18-008 Lower Middle.spf



Not to scale

Timing



high wall



Not to scale

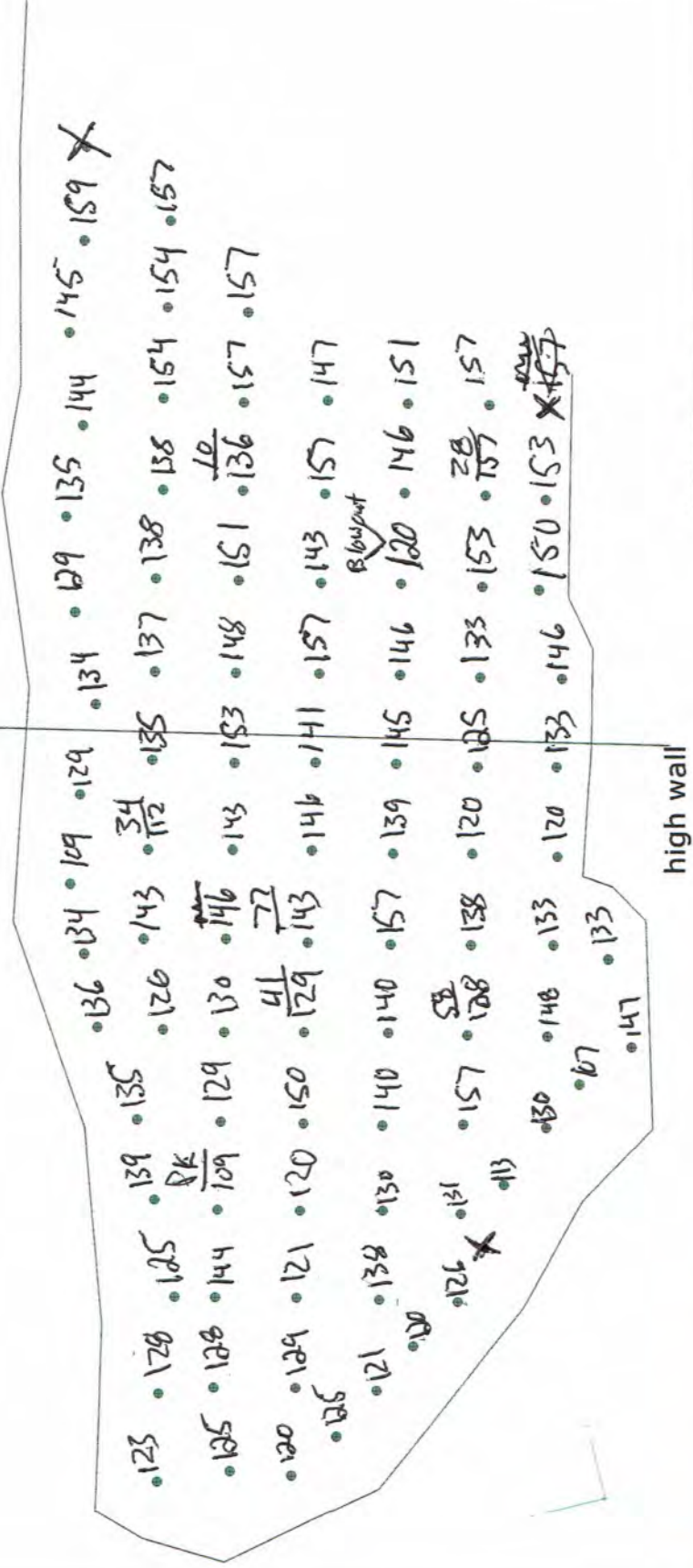
SHOTPlus 5.7.1.1	6/13/2018
Mine	Burlington
Location	
Title/author	18-008 Bottom Middle South K George
Filename	2018-06-13 18-008 Lower Middle.spf

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 92 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 4601.0ft Blasted tonnage: 34,239S/T

Load Sheet

138 Kg Max
157 Kg Max



SHOTPlus 5.7.1.1	6/11/2018
Mine	Burlington
Location	
Title/author	18-008 Bottom Middle South K George
Filename	2018-06-13 18-008 Lower Middle.spr



Not to scale

1089815

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance



CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON CA L7R 4L8

Table with 2 columns: TIME IN HEURE D'ENTRÉE, TIME OUT HEURE SORTIE; ORDER NUMBER N° DE COMMANDE, B/L NUMBER N° DE CONNAISSEMENT. Values: 2349625, 86039399

Table with 4 columns: DATE REQUIRED DATE REQUISE, TIME REQUIRED HEURE REQUISE, INVOICE TO / BUYER FACTURÉ À / ACHETEUR, CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT. Values: 13 Jun 2018, 00:00:00, NELSON AGGREGATE COMPANY, n/a

Main table with columns: QTY. QTÉ., UM, DG MD, QTY. RET'D QTÉ. RET., QTY. SOLD QTÉ. FACT, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT. Includes items like FORTEL PRO 75X400 (3X16), PENTEX BC 340 (49/CS), etc.

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666

Table with 4 columns: EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE, EMERGENCY RESPONSE NO.24 HOUR NUMBER, PLACARDS OFFERED / PLACARDS OFFERT, FORWARD INVOICE FOR PREPAID FREIGHT. Values: ERAP 2-1510, 1-877-561-3636, YES / OUI, NO / NON

Table with 4 columns: CONSIGNOR / EXPÉDITEUR, CARRIER / TRANSPORTEUR, CONSIGNEE / DESTINATAIRE, SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR, DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR, RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR. Includes signatures and dates.

Date/Time MicL at 11:52:09 June 13, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 1024 sps

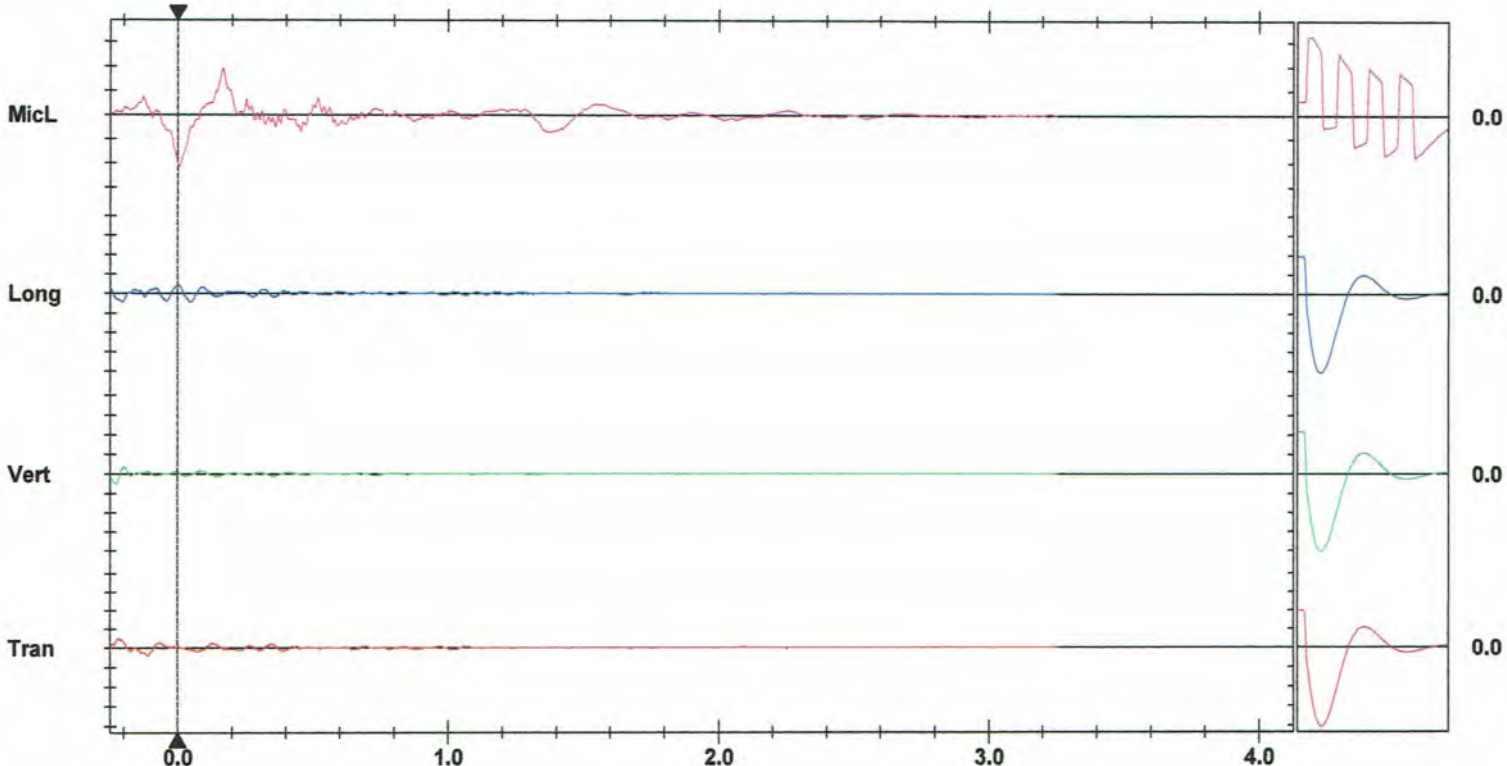
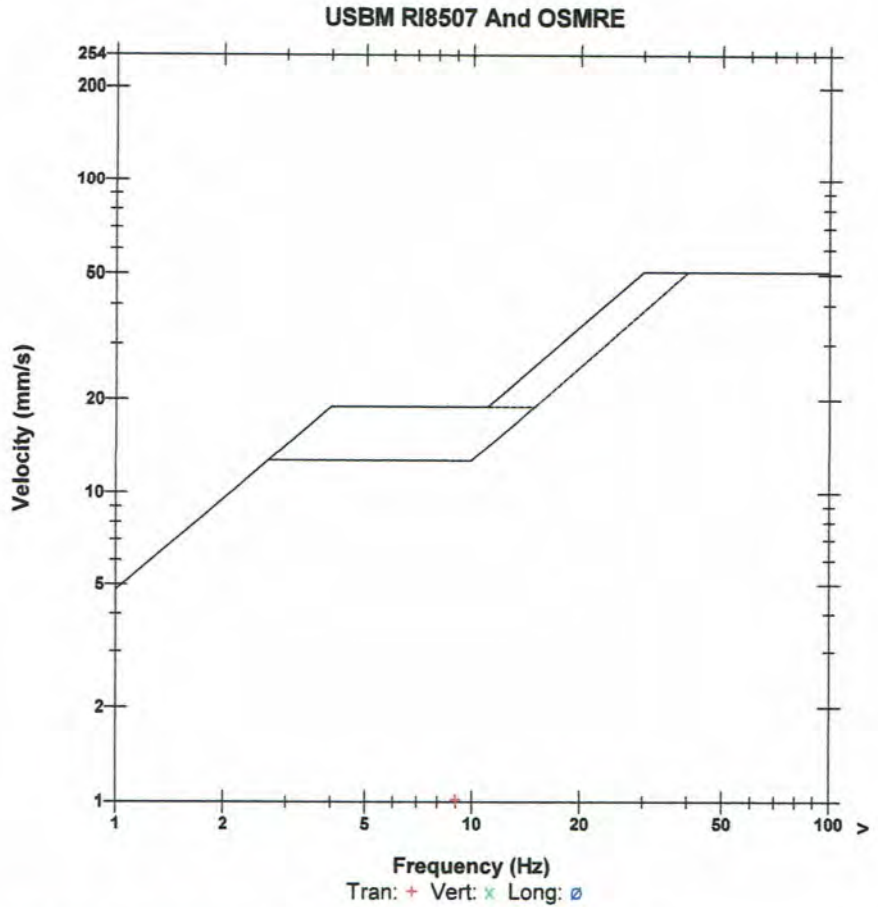
Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration May 3, 2017 by InstanTel
File Name _TEMP.EVT

Notes
 Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: N.43.40245 W.79.87814

Extended Notes
 Sand Bagged

Microphone Linear Weighting
PSPL 120.6 dB(L) at 0.004 sec
ZC Freq 3.4 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 615 mv)

	Tran	Vert	Long	
PPV	1.016	1.016	0.889	mm/s
ZC Freq	9.0	15	10	Hz
Time (Rel. to Trig)	-0.223	-0.228	-0.208	sec
Peak Acceleration	0.013	0.013	0.027	g
Peak Displacement	0.017	0.012	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.4	7.4	Hz
Overswing Ratio	3.8	3.8	4.2	
Peak Vector Sum	1.420 mm/s at -0.228 sec			



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

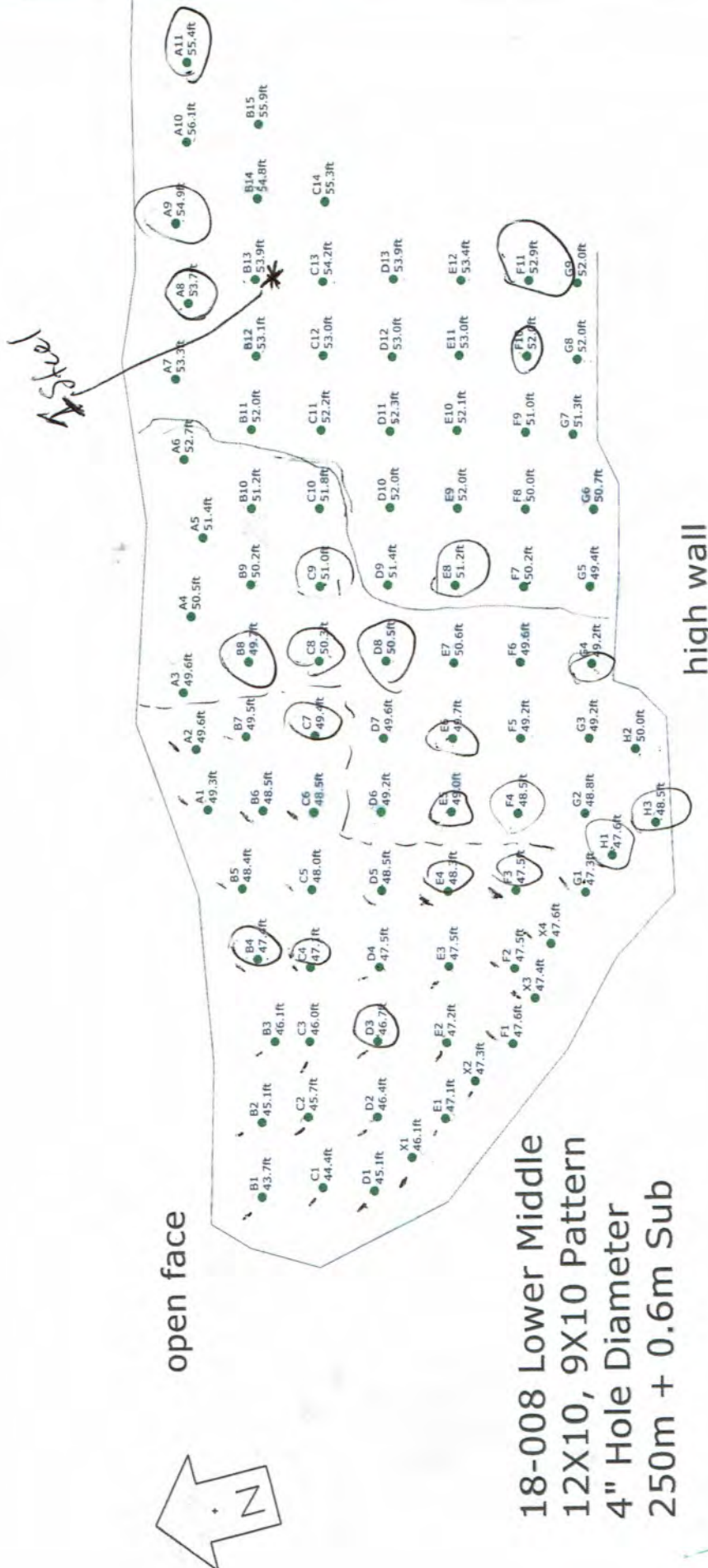
Sensor Check

613 305 0454

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 92 Hole angle: 0.0°
 Rock density: 2.65g/cc Total drilled: 4601.0ft Blasted tonnage: 34,239S/T



open face

high wall

18-008 Lower Middle
 12X10, 9X10 Pattern
 4" Hole Diameter
 250m + 0.6m Sub



SHOTPlusBeta 5.7.3.9	06/06/2018
Mine Burlington	
Location	
Title/author 18-005 Bottom Middle South I. Dee	
Filename 18-008 Lower Middle South Design F	

Not to scale





Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Design Date: 2018-06-13

Blast Number: 18-008
 Orica Order #:

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)
 Blast Location: Lower Middle (Bench / Face)
 GPS Coordinates: 43.40407 °N Latitude 79.88289 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 29,670 te
 Total Holes Loaded: 97 holes
 ... including: Dead Holes
 ... and: 4 Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 8 rows

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:

Primary Bit diam: 101.6 mm 0' # Holes: 92 = 4,600.9 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: 10.0 ft avg
 # Holes: 11 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 81 main body

Bench Height: 48.0 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 50.0 ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: 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: 43.0 ft avg
 Main Body: 43.0 ft avg

- Design Charge Weight -

Front Row: 125.4 kg/hole
 Main Body: 125.4 kg/hole
 Max Chge Wt / delay: 170.0 kg/delay

Required kg Loaded: 12,875 kg
 Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.434 kg/te (actual)
 Front row: 0.290 kg/te (theoretical)
 Main Body: 0.387 kg/te (theoretical)
 "KPI" PF: 0.375 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Bulk Expl. Required:

	kg
	12,700

Pkgd Expl. Required:

	kg
FORTEL PRO 75X400	3 75

Boosters Required:

	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	294	100.0

total explosives weight in Blast (kg): 12,875

Pkgd Prod (75 kg) % of Total kg: 0.6%

Detonators Required:

	ms	# req'd
UNITRONIC 600 6M		160
UNITRONIC 600 15M		66
UNITRONIC 600 20M		132

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:

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

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-25

Blast Number: 18-009
Orica Order #: 2354121
Blast Time: 12:01 PM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Lower Middle (Bench / Face)

GPS Coordinates: 43.40451 °N Latitude 79.88425 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SE at 10 kph Temperature: 16 to 20 °C

Clear: X Rain: X 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: 99 = 3,692.3 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	27,280	17,620	9,660

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	3	0	75

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	200	68.0

total explosives weight in Blast (kg): 9,803
Pkgd Prod (75 kg) % of Total kg: 0.8%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			98
UNITRONIC 600 15M			102

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	>=5,000kg <10,000kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	11.0
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: 25,983 te 9,805 m³
Total tonnes per day: 25,893 te NB40-07 Rate Code
Total Holes Loaded: 99 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 13 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 30 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 69 main body

Bench Height: 35.3 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 37.3 ft avg

- Stone Decking -

Front Row: 5.0 ft avg
Main Body: 5.0 ft avg
Decks: 2 per blast

- Collar Stemming -

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg
Material used: .75" Stone

- Charge Length -

Front Row: 25.3 ft avg
Main Body: 25.3 ft avg

- Charge Weight -

Front Row: 73.8 kg/hole
Main Body: 73.8 kg/hole
Max. per delay: 118.0 kg/delay
SD () Equation: 329.8 kg/delay
Total kg Loaded: 9,803 kg
Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

1.685 lb/yd³ Yield PF: 0.377 kg/te (actual)
1.037 lb/yd³ Front row: 0.232 kg/te (theoretical)
1.382 lb/yd³ Main Body: 0.309 kg/te (theoretical)
1.356 lb/yd³ "KPI" PF: 0.303 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:

Hole B-1 and B-2 Reviewed stone decks due to voids found while loading
Hole N-5 to N-11 were not loaded because we ran out of product in our MMU



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-25

Blast Number: 18-009
Orica Order #: 2354121
Blast Time: 12:01 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40452	79.88424
Front Row Corner	43.40442	79.88402
Back Row Corner	43.40458	79.88449
Average (Centre of Blast)	43.40451	79.88425

(N) Radians	(W) Radians
0.757552	1.394243
0.757550	1.394239
0.757553	1.394247
0.757552	1.394243

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Distance (1st Seis. From Centre of Blast)	544.8	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
2450 2nd Line		

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40605	79.89400
2nd Reading		
Average	43.40605	79.89400

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

Distance (2nd Seis. From Centre of Blast)	807.0	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
Colling Rd & Blind Line Bruce Trail		

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.39339	79.88880
2nd Reading		
Average	43.39339	79.88880

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Distance (3rd Seis. From Centre of Blast)	1291.1	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
SouthWest Corner of Property		

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(544.8)^2}{30^2} \text{ kg}$$

$$= \frac{296,807}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-07-05

Blast Number: 18-010

Orica Order #: 2359087

Blast Time: 11:51 AM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40369 °N Latitude 79.88327 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SW at 5 kph Temperature: 26 to 30 °C

Clear: X

Rain: X

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: 53 = 4,133.5 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	33,780	21,100	12,680

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): 12,720

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			53
UNITRONIC 600 25M			16
UNITRONIC 600 30M			49

Cord & Accessories:

	U of M	# used
HARNESS 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	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	10.0
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:	30,963 te	11,684 m ³
Total tonnes per day:	30,963 te	NB80-01 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: 12.0 ft avg

Spacing: 10.0 ft avg

Holes: 22 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg

Spacing: 10.0 ft avg

Holes: 31 main body

Bench Height: 76.0 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 78.0 ft avg

- Stone Decking -

Front Row: 0.0 ft avg

Main Body: 15.0 ft avg

Decks: 6 per blast

- Collar Stemming -

Front Row: 8.0 ft avg

Main Body: 7.0 ft avg

Material used: .75" Stone

- Charge Length -

Front Row: 70.0 ft avg

Main Body: 56.0 ft avg

- Charge Weight -

Front Row: 204.1 kg/hole

Main Body: 163.3 kg/hole

Max. per delay: 250.0 kg/delay

SD () Equation: 212.6 kg/delay

Total kg Loaded: 12,720 kg

Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

Yield PF: 0.411 kg/te (actual)

Front row: 0.298 kg/te (theoretical)

Main Body: 0.318 kg/te (theoretical)

"KPI" PF: 0.311 kg/te (theoretical)

1.835 lb/yd³

1.332 lb/yd³

1.421 lb/yd³

1.391 lb/yd³

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:

While measuring the blast we discovered Hole B-4 was only at a depth of 59' (19'short of the v
I told Bill White from Nelson Aggregates and he told us to proceed with loading.
Attached is a load adjustment sheet showing all the deck that were added due to voids and se



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-07-05

Blast Number: 18-010
Orica Order #: 2359087
Blast Time: 11:51 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40367	79.88381	0.757537	1.394235
Front Row Corner	43.40348	79.88299	0.757534	1.394221
Back Row Corner	43.40391	79.88301	0.757541	1.394222
Average (Centre of Blast)	43.40369	79.88327	0.757537	1.394226

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	437.4	m		
Post Blast Data:	ppV: 2.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 9.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 115.9	dB	Trigger set at: 115	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	906.7	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
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1230.8	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
SouthWest Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(437.4)^2}{30^2} \text{ kg}$$

$$= \frac{191,319}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



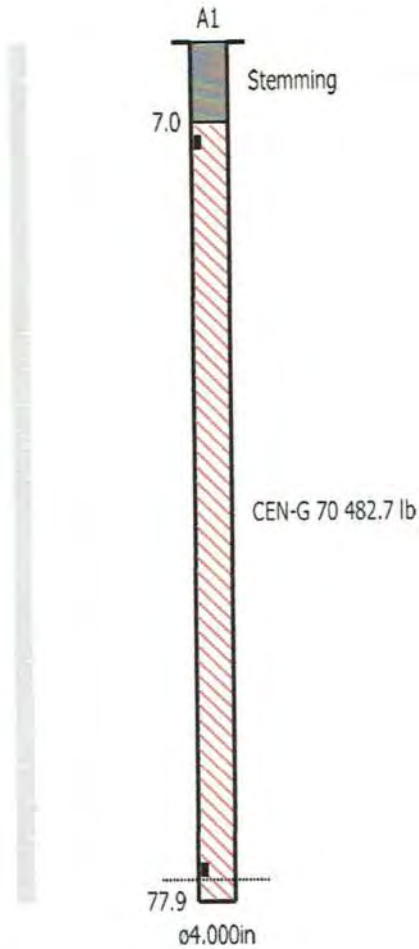
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 7/5/2018

Blast Number: 18-010
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

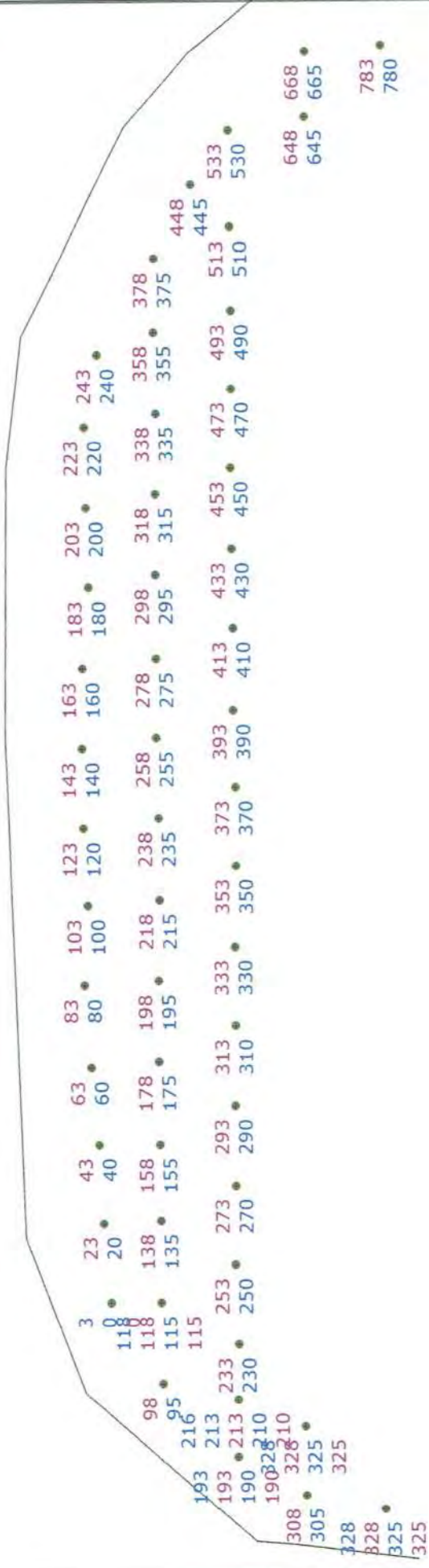
Bill White

Signature required, indicating sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Hole angle: 0.0°
 Total drilled: 4133.5ft Number of holes: 53



Not to scale

SHOTPlus 5.7.1.1		7/6/2018
Mine	Burlington	
Location		
Title/author	18-010 Upper Middle Final	
Filename	2018-07-05 18-010 Upper Middle.spf	

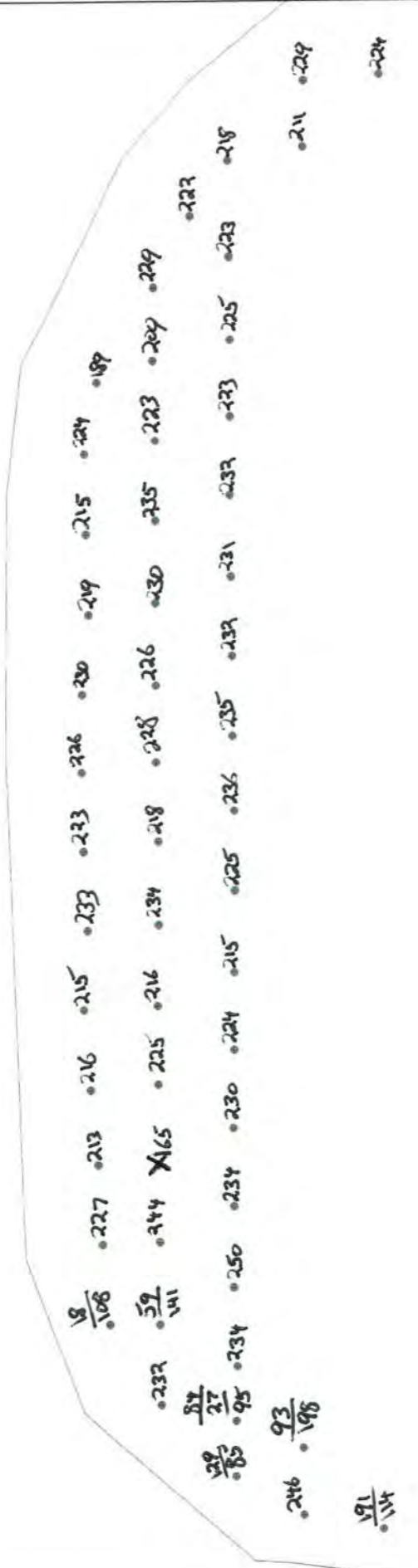
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 4133.5ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Subdrill: 2.0ft
 Number of holes: 53
 Stemming: 7.0ft
 Hole angle: 0.0°

Load Sheet 250 Kg Max

Free Face



6426
 = 41
 4025

SHOTPlus 5.7.1.1	6/27/2018
Mine	Burlington
Location	
Title/author	18-010 Upper Middle Final
Filename	18-010_Upper_Middle_Final.spf

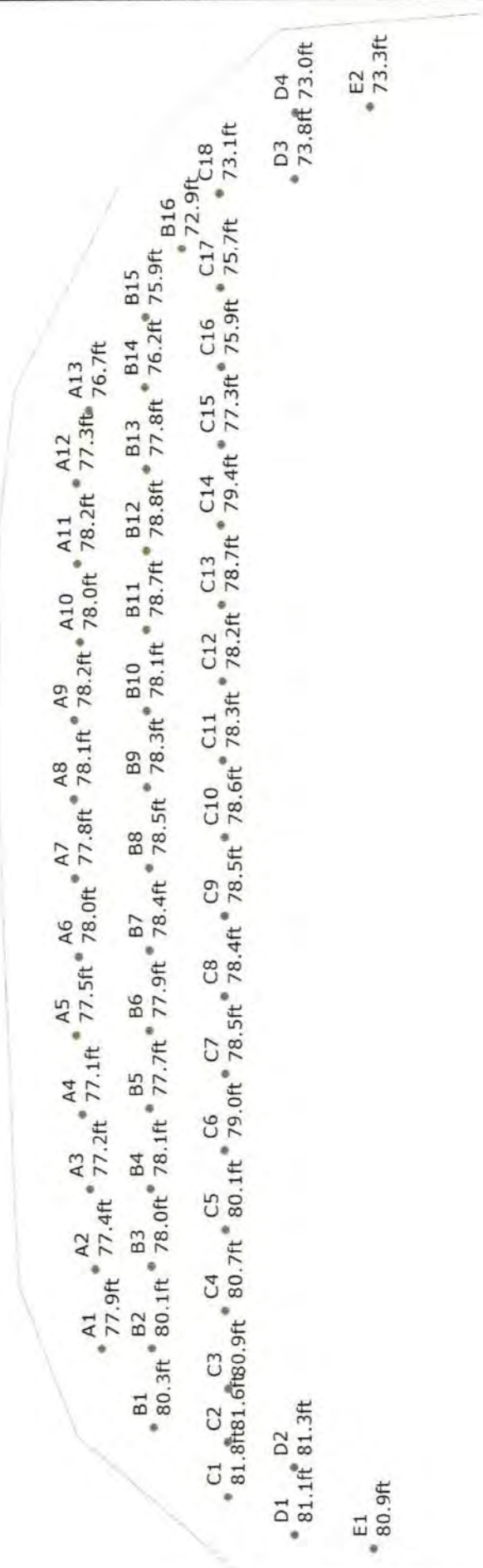


Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 4133.5ft Hole Diameter: 4.0in Number of holes: 53



A1 77.9ft A2 77.4ft A3 77.2ft A4 77.1ft A5 77.5ft A6 78.0ft A7 77.8ft A8 78.1ft A9 78.2ft A10 78.0ft A11 78.2ft A12 77.3ft A13 76.7ft

B1 80.3ft B2 78.0ft B3 78.1ft B4 77.7ft B5 77.9ft B6 78.4ft B7 78.5ft B8 78.3ft B9 78.1ft B10 78.7ft B11 78.8ft B12 77.8ft B13 76.2ft B14 75.9ft B15 72.9ft B16 75.7ft

C1 81.8ft C2 80.9ft C3 80.7ft C4 80.1ft C5 79.0ft C6 78.5ft C7 78.4ft C8 78.5ft C9 78.6ft C10 78.3ft C11 78.2ft C12 78.7ft C13 79.4ft C14 77.3ft C15 75.9ft C16 75.7ft C17 73.1ft C18 73.1ft

D1 81.1ft D2 81.3ft D3 73.8ft D4 73.0ft

E1 80.9ft E2 73.3ft

SHOTPlus 5.7.1.1		7/4/2018
Mine	Burlington	
Location		
Title/author	18-010 Upper Middle Final	
Filename	2018-07-05 18-010 Upper Middle.spf	



Not to scale

1089976

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance



Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY 118 49053 BURLINGTON ON CA L7R 4L8

Table with fields: GROSS / BRUT, TARE, NET, TIME IN HEURE D'ENTRÉE (6.45), TIME OUT HEURE SORTIE, ORDER NUMBER (2359087), B/L NUMBER (86063385)

Table with 4 columns: DATE REQUIRED, TIME REQUIRED, INVOICE TO / BUYER, CUSTOMER REFERENCE NO. Includes handwritten 'n/a' and '9712103'.

Main table with columns: QTY., UOM, DG MD, QTY. RET'D, QTY. SOLD, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT. Lists items like PENTEX BC 340, uni tronic, MINI STEM PLUGS, LABOUR CHARGE, ROG, Harness Wire Duplex. Includes totals for weight and packages.

Table with 4 columns: EMERGENCY RESPONSE PLAN, EMERGENCY RESPONSE NO./24 HOUR NUMBER, PLACARDS OFFERED, FORWARD INVOICE FOR PREPAID FREIGHT. Includes ERAP 2-1510 and phone numbers.

Table with 4 columns: CONSIGNOR / EXPÉDITEUR, CARRIER / TRANSPORTEUR, CONSIGNEE / DESTINATAIRE, SHIPPER'S NAME, DRIVER'S NAME, RECEIVER'S NAME. Includes signatures and dates.

Date/Time Long at 11:51:55 July 5, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.5 Volts
Unit Calibration May 3, 2017 by InstanTel
File Name _TEMP.EVT

Notes
 Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: N.43.40245 W.79.87814

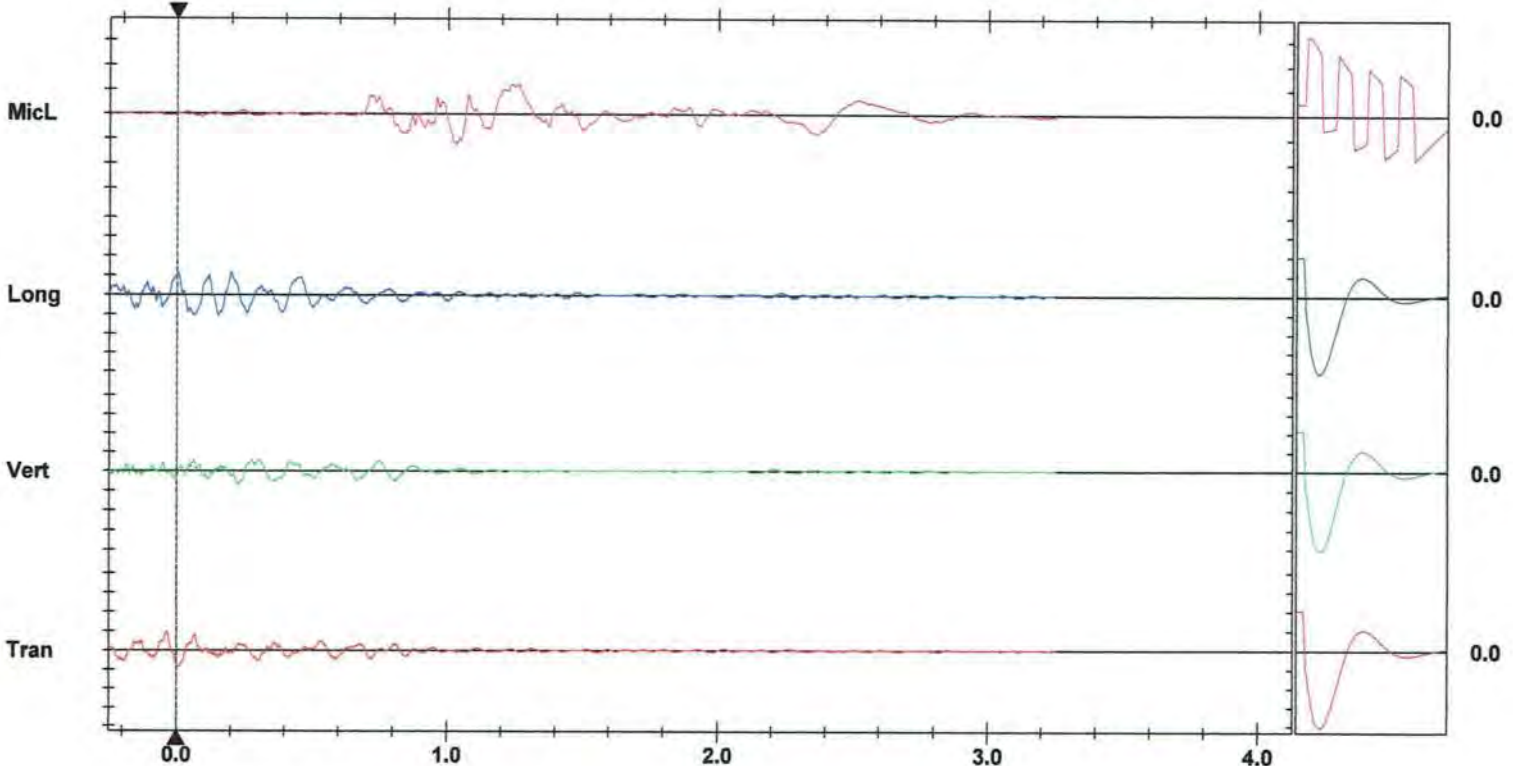
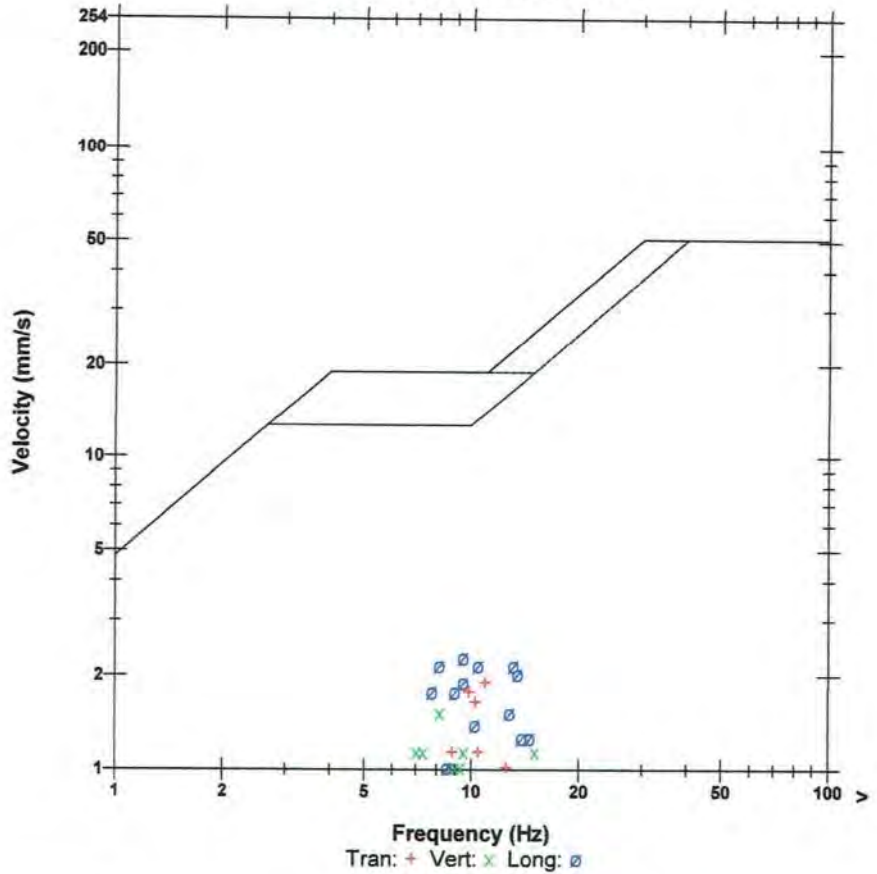
Extended Notes
 Sand Bagged

Microphone Linear Weighting
PSPL 115.9 dB(L) at 1.240 sec
ZC Freq 3.6 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 673 mv)

	Tran	Vert	Long	
PPV	1.905	1.524	2.286	mm/s
ZC Freq	11	8.1	9.5	Hz
Time (Rel. to Trig)	-0.037	0.226	0.198	sec
Peak Acceleration	0.027	0.027	0.040	g
Peak Displacement	0.028	0.029	0.046	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.2	7.4	7.5	Hz
Overswing Ratio	3.8	3.7	4.1	

Peak Vector Sum 2.823 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 =

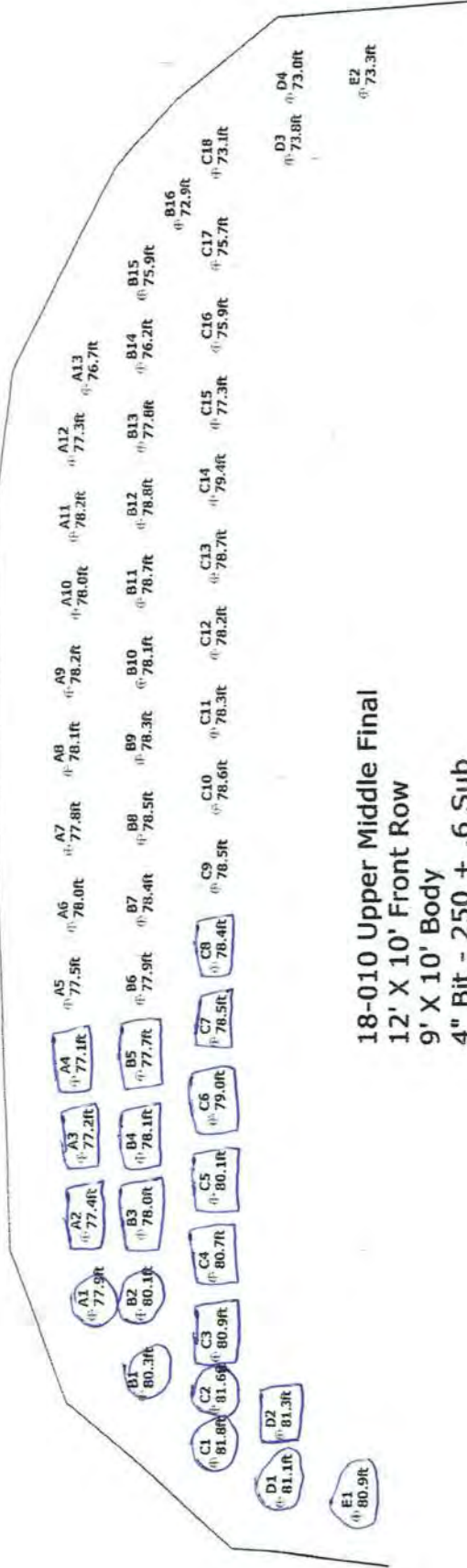
Sensor Check

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Hole Diameter: 4.0in Number of holes: 53
 Total drilled: 4133.5ft

Free Face



18-010 Upper Middle Final
 12' X 10' Front Row
 9' X 10' Body
 4" Bit - 250 + .6 Sub

SHOTPlus 5.7.2.1	12/06/2018
Mine Burlington	
Location	
Title/author 18-010 Upper Middle Final	
Filename 18-010 Upper Middle Final.spf	

Not to scale

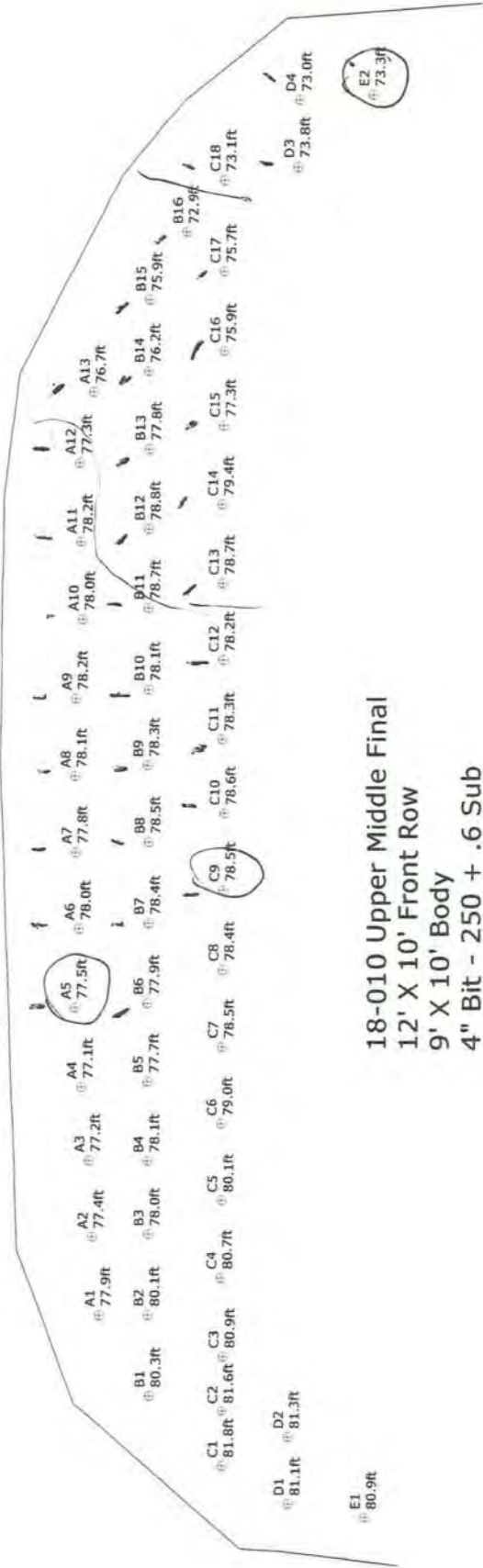


SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 4133.5ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Subdrill: 2.0ft
 Number of holes: 53
 Stemming: 7.0ft
 Hole angle: 0.0°

Free Face



18-010 Upper Middle Final
 12' X 10' Front Row
 9' X 10' Body
 4" Bit - 250 + .6 Sub

SHOTPlus 5.7.2.1 12/06/2018

Mine Burlington

Location

Title/author 18-010 Upper Middle Final

Filename 18-010 Upper Middle Final.spf



Not to scale



Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Design Date: 2018-07-05

Blast Number: 18-010
 Orica Order #:

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Upper Middle (Bench/Plat)
 GPS Coordinates: 43.40369 °N Latitude 79.88327 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 30,963 te
 Total Holes Loaded: 53 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: 53 = 4,133.5 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: 10.0 ft avg
 # Holes: 22 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 31 main body
 Bench Height: 76.0 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 78.0 ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: 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: 71.0 ft avg
 Main Body: 71.0 ft avg

- Design Charge Weight -

Front Row: 207.0 kg/hole
 Main Body: 207.0 kg/hole
 Max Chge Wt / delay: 250.0 kg/delay

Required kg Loaded: 13,236 kg
 Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.427 kg/te (actual)
 Front row: 0.303 kg/te (theoretical)
 Main Body: 0.403 kg/te (theoretical)
 "KPI" PF: 0.370 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:

Bulk Expl. Required: kg

	13,200
--	--------

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): 13,236

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required: ms # req'd

UNITRONIC 600 6M		80
UNITRONIC 600 25M		54
UNITRONIC 600 30M		36

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)		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 Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-06-20

Blast Number: 18-011

Orica Order #: 2367871

Blast Time: 11:59 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Lower Middle (Bench / Face)

GPS Coordinates: 43.40486 °N Latitude 79.88449 °W Longitude
Centre of Blast Centre of Blast

Wind from the: E at 5 kph Temperature: 21 to 25 °C

Clear: Partly Cloudy: X Rain: X Overcast: X Snow: Inversion: X Ceiling: 30,000 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 125 = 3,500.0 ft (4 " diam)
Secondary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	34,090	25,800	8,290

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	270	91.8

total explosives weight in Blast (kg): 8,382
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			123
UNITRONIC 600 9M			51
UNITRONIC 600 15M			96

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	3

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	>/=5,000kg <10,000kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	12.0
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: 24,173 te 9,122 m³
 Total tonnes per day: te NB40-07 Rate Code
 Total Holes Loaded: 125 holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 15 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 38 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 87 main body

Bench Height: 26.0 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 28.0 ft avg

- Stone Decking -

Front Row: 5.0 ft avg
 Main Body: 6.0 ft avg
 # Decks: 10 per blast

- Collar Stemming -

Front Row: 7.0 ft avg
 Main Body: 7.0 ft avg
 Material used: .75" Stone

- Charge Length -

Front Row: 16.0 ft avg
 Main Body: 15.0 ft avg

- Charge Weight -

Front Row: 46.7 kg/hole
 Main Body: 43.7 kg/hole
 Max. per delay: 90.0 kg/delay
 SD () Equation: 372.7 kg/delay
 Total kg Loaded: 8,382 kg
 Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

1.549 lb/yd³ Yield PF: 0.347 kg/te (actual)
 0.890 lb/yd³ Front row: 0.199 kg/te (theoretical)
 1.113 lb/yd³ Main Body: 0.249 kg/te (theoretical)
 1.098 lb/yd³ "KPI" PF: 0.246 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

10 Stone decks were added to this blast due to the drill logs showing voids
 The timing sheet identifies where they are as well as the drill log and load sheet.
 Attached is a load adjustment sheet



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-20

Blast Number: 18-011
Orica Order #: 2367871
Blast Time: 11:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40487	79.88448
Front Row Corner	43.40462	79.88452
Back Row Corner	43.40508	79.88446
Average (Centre of Blast)	43.40486	79.88449

(N) Radians	(W) Radians
0.757558	1.394247
0.757554	1.394248
0.757562	1.394247
0.757558	1.394247

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Distance (1st Seis. From Centre of Blast)	579.2	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
2450 2nd Line		

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40605	79.89400
2nd Reading		
Average	43.40605	79.89400

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

Distance (2nd Seis. From Centre of Blast)	780.7	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
Colling Rd & Blind Line Bruce Trail		

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.39339	79.88880
2nd Reading		
Average	43.39339	79.88880

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Distance (3rd Seis. From Centre of Blast)	1323.3	m
Post Blast Data:	ppV: Did	mm/s Trigger set at: 2.0
	frequency: Not	Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
	air overpressure: Trigger	dB Trigger set at: 115
SouthWest Corner of Property		

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(579.2)^2}{30^2} \text{ kg}$$

$$= \frac{335,473}{900} \text{ kg}$$

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

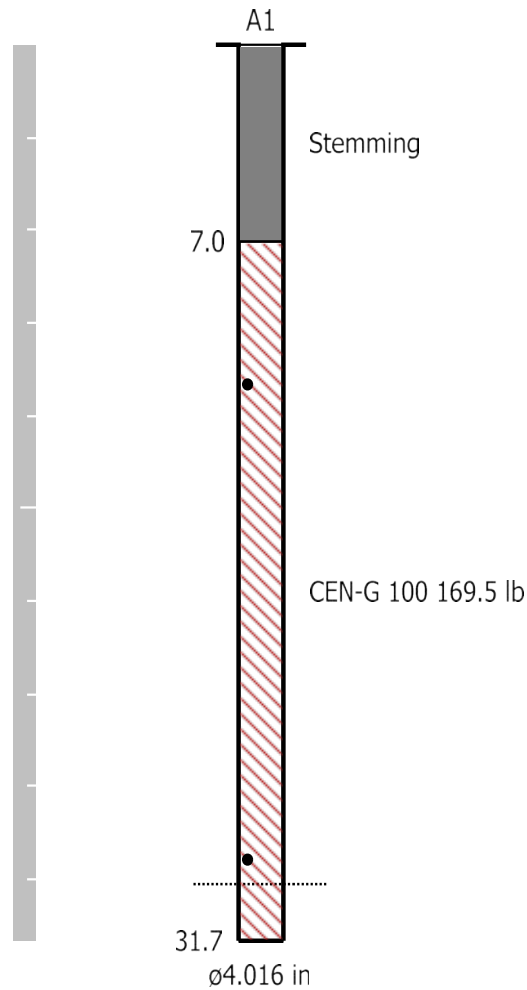
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 7/30/2018

Blast Number: 18-011
Orica Order #: 2367871

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

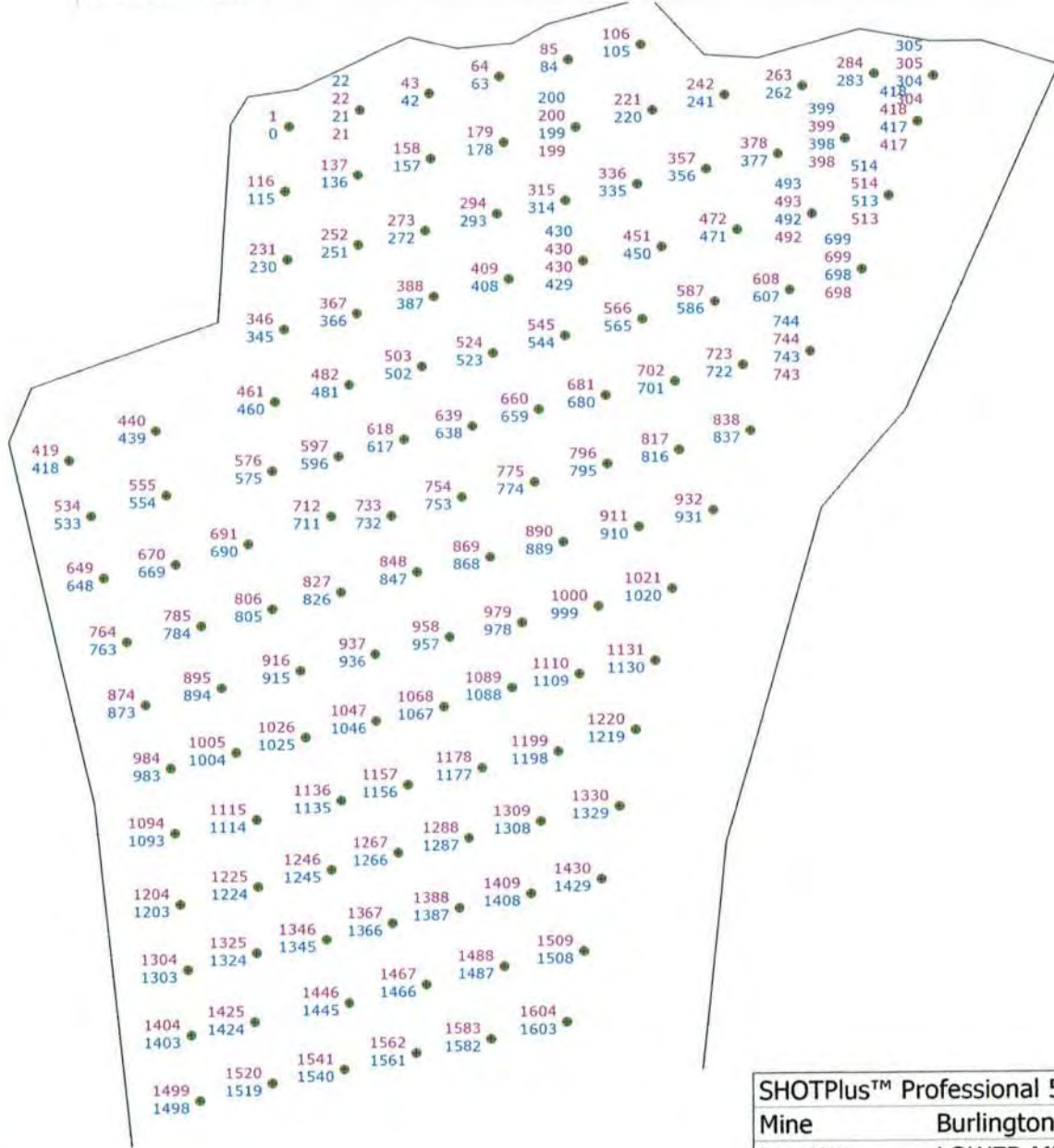
Bill White

Signature required, indicating sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 5.9ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 125 Hole angle: 0.0°
 Total drilled: 3500.1ft



Not to scale

SHOTPlus™ Professional 5.7.3.0		7/30/2018
Mine	Burlington	
Location	LOWER MIDDLE	
Title/author	DESIGN 18-011 LOWER MIDDLE	
Filename	Timing from A-1.spf	

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 5.9ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 125	Hole angle: 0.0°
Total drilled: 3500.1ft			

80 KG Max

65KG Max



18-011 Lower Middle North
 12x10 Front Row, 9x10 Body
 4" Hole Diameter
 250m Elevation + 0.6m Subdrill

SHOTPlus™ Professional 5.7.3.0		7/27/2018
Mine	Burlington	
Location	LOWER MIDDLE	
Title/author	DESIGN 18-011 LOWER MIDDLE	
Filename	Blast_18-011_Lower_Middle.spf	

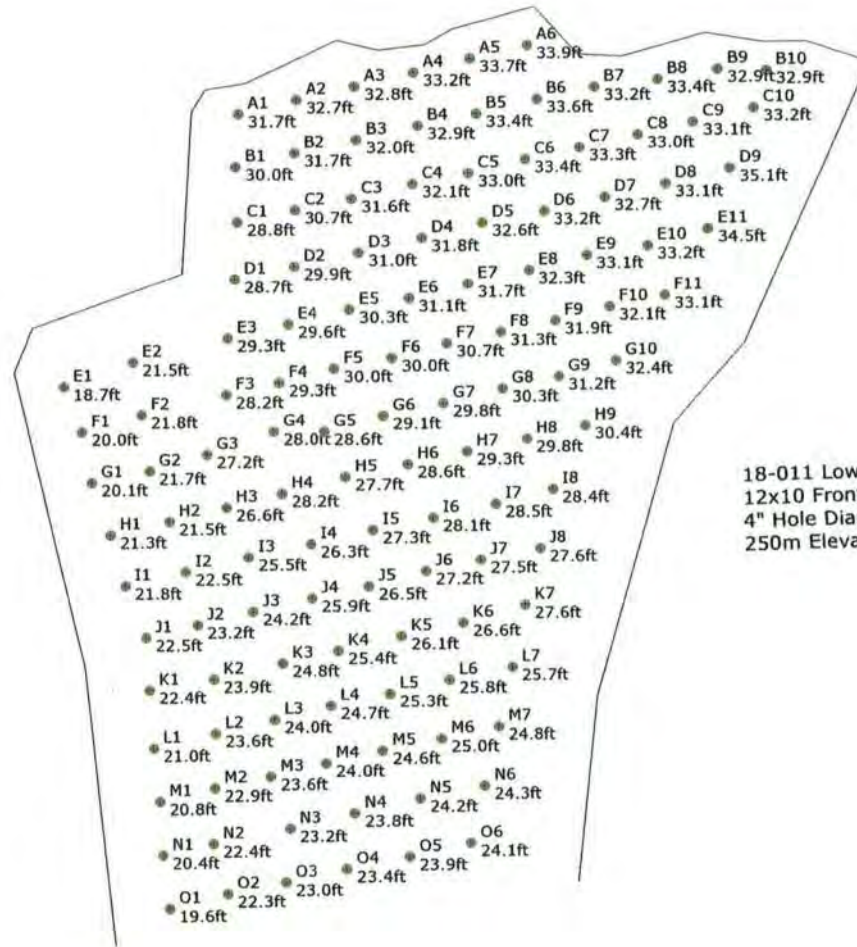


Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 5.9ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 125	Hole angle: 0.0°
Total drilled: 3500.1ft			



18-011 Lower Middle North
 12x10 Front Row, 9x10 Body
 4" Hole Diameter
 250m Elevation + 0.6m Subdrill



Not to scale

SHOTPlus™ Professional 5.7.3.0		7/30/2018
Mine	Burlington	
Location	LOWER MIDDLE	
Title/author	DESIGN 18-011 LOWER MIDDLE	
Filename	2018-07-30 18-011 Lower Middle.spf	

1090217

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSANCE NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissance



Orica Canada Inc.

CONSIGNOR
EXPÉDITEUR

GRAND VALLEY
033411 SIDE ROAD 21-22
GRAND VALLEY ON
CA L9W 7G1

CONSIGNEE
CONSIGNATAIRE

NELSON AGGREGATE COMPANY
BURLINGTON ON
CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 6:55	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE 2367871	B/L NUMBER N° DE CONNAISSANCE 86087520

PAGE 2

DATE REQUIRED DATE REQUISE 30 Jul 2018	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a
DATE SHIPPED EXPÉDIÉ LE 30 Jul 2018	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE 18230
SHIP VIA TRANSPORTEUR Orica Truck		ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
294	PC	X	24	270	PENTEX BC 340 (49/CS)	6	107.310
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
184	PC	X	61	123	*uni tronic 600-06.0M CU/ZC(20')80PC	3	13.432
60	PC	X	9	51	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
102	PC	X	6	96	*uni tronic 600-15M C/Z SPL(50')66PC	2	17.442
131	PC	X	131	0	*uni tronic 600-20M CU/ZC SPL(65')66P	2	26.724
100	PC		97	3	MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							177.328 KG
**** TOTAL PACKAGES ****						15	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT.
NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES S'USMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

DECLARED VALUE OF SHIPMENT
VALEUR DÉCLARÉE \$

NETTE No. CONV
PRESSAGE
WT AGREEMENT NO.

FORWARD INVOICE FOR PREPAID FREIGHT
QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE
POUR EXPÉDITION PORT PAYÉ EN RÉFÉRENT À
UN B/L DE CONNAISSANCE D'ORICA :

301 rue hotel de ville
Brownsburg-Chatham, QC
J8G 3B5

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR K. Kaban	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR K. PATTI	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE K. Kaban	SIGNATURE K. Patti	SIGNATURE
DATE 30 7 18 D/J M/M Y/A	DATE 30 7 18 D/J M/M Y/A	DATE

**2 SHIPPING ORDER
BON D'EXPÉDITION**

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
(L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRÈS AVOIR SIGNÉ LA COPIE ORIGINALE (1) DU CONNAISSANCE CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
**** PAGE 2 OF 2 ****

D.F.G. S7772

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft

Spacing: 10.0ft

Subdrill: 2.0ft

Stemming: 5.9ft

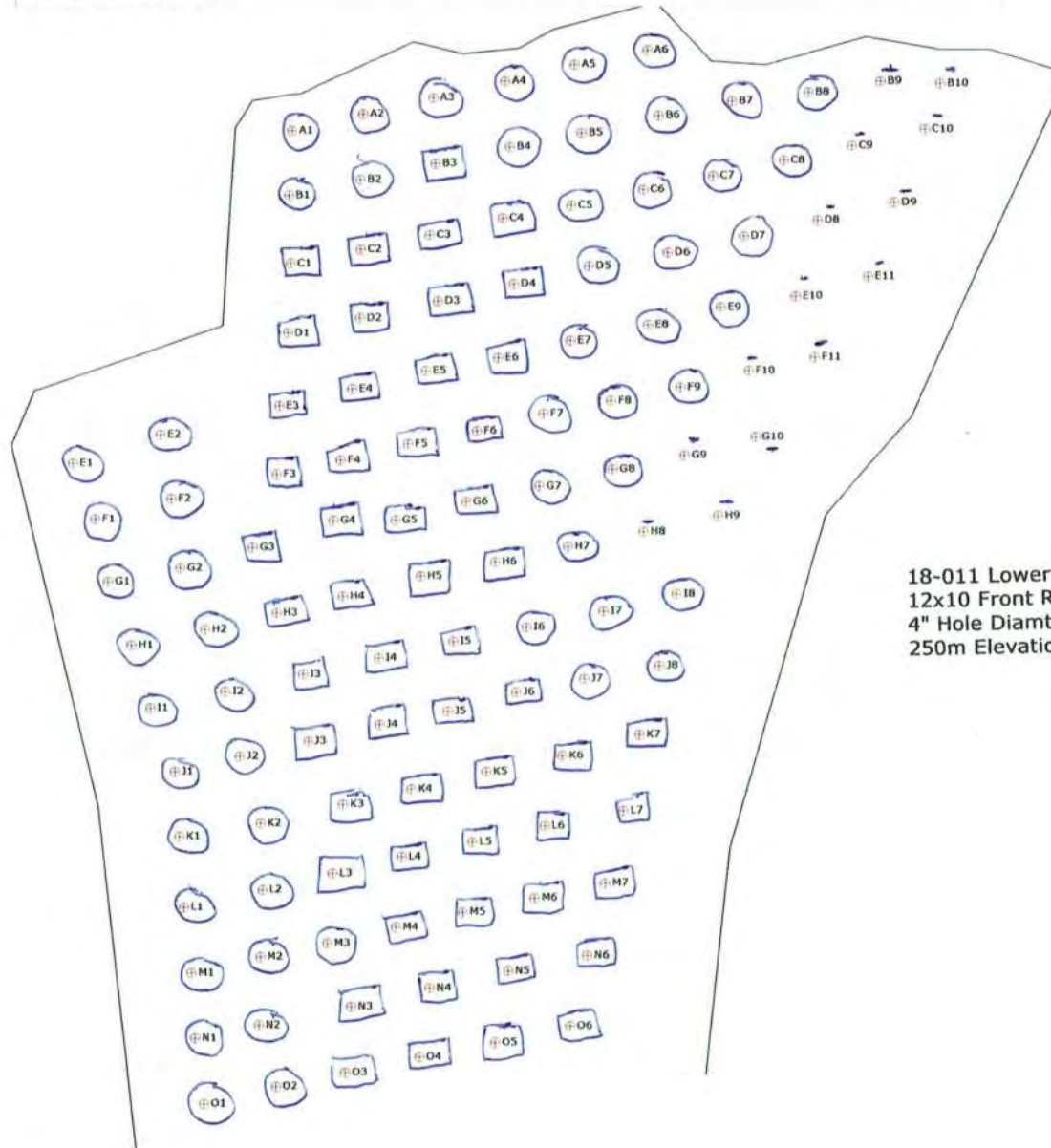
1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 125

Hole angle: 0.0°

Total drilled: 3500.1ft



18-011 Lower Middle North
12x10 Front Row, 9x10 Body
4" Hole Diameter
250m Elevation + 0.6m Subdrill



Not to scale



Blast Report

Nelson Aggregate

Quarry: **Burlington**
 P.O. #:
 Blast Date: **2018-08-03**

Blast Number: **18-012**
 Orica Order #: **2370307**
 Blast Time: **11:52 AM**

page 1

Blaster-in-charge: **Mike derkinderen** (Print Name)

Blast Location: **Upper Middle** (Bench / Face)

GPS Coordinates: **43.40371** °N Latitude **79.88291** °W Longitude
Centre of Blast Centre of Blast

Wind from the: at **0** kph Temperature: **16 to 20** °C

Clear: Rain: Overcast: X
 Partly Cloudy: Snow: Inversion: Ceiling **24,791** ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 46 = 3,606.6 ft (4 " diam)
Secondary Bit diam: 127.0 mm	0	# Holes: 1 = 78.4 ft (5 " 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	33,800	22,760	11,040

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): **11,076**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			45
UNITRONIC 600 25M			25
UNITRONIC 600 30M			36

Cord & Accessories:

	U of M	# used
MINI STEM PLUGS - 6015 (4")	units	12

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	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	6.0
HELPER HOURS	Enter total Helper man-hours	11.0
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:	27,176 te	10,255 m ³
Total tonnes per day:	27,176 te	NB80-01 Rate Code
Total Holes Loaded:	47 holes	
... including:	Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	<input type="text"/> ft avg	
# Rows Blasted:	3 rows	

- Pattern (Front Row)-

Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	17 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	30 main body

Bench Height: **76.4** ft avg

Sub-drill: **2.0** ft avg

Hole Depth: **78.4** ft avg

- Stone Decking -

Front Row:	10.0 ft avg
Main Body:	10.0 ft avg
# Decks:	6 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	.75" Stone

- Charge Length -

Front Row:	61.4 ft avg
Main Body:	61.4 ft avg

- Charge Weight -

Front Row:	179.0 kg/hole
Main Body:	179.0 kg/hole
Max. per delay:	265.0 kg/delay
SD () Equation:	187.2 kg/delay
Total kg Loaded:	11,076 kg
Rock Density:	2.65 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.408 kg/te (actual)
Front row:	0.260 kg/te (theoretical)
Main Body:	0.347 kg/te (theoretical)
"KPI" PF:	0.318 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B , S , Expl or IS from previous Blast:

3 Siesmographs set up

Holes D-1,D2 and E1 were not loaded due to lean burden on profiles



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-08-03

Blast Number: 18-012
Orica Order #: 2370307
Blast Time: 11:52 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40369	79.88291
Front Row Corner	43.40351	79.88288
Back Row Corner	43.40392	79.88295
Average (Centre of Blast)	43.40371	79.88291

(N) Radians	(W) Radians
0.757537	1.394220
0.757534	1.394219
0.757541	1.394220
0.757538	1.394220

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814
Distance (1st Seis. From Centre of Blast)	410.5	m
Post Blast Data:	ppV: 2.4	mm/s
	frequency: 7.2	Hz
	air overpressure: 115.0	dB

2450 2nd Line

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40605	79.89400
2nd Reading		
Average	43.40605	79.89400
Distance (2nd Seis. From Centre of Blast)	934.1	m
Post Blast Data:	ppV: 0.1	mm/s
	frequency: 7.1	Hz
	air overpressure: 116.4	dB

Colling Rd & Blind Line Bruce Trail

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.39339	79.88880
2nd Reading		
Average	43.39339	79.88880
Distance (3rd Seis. From Centre of Blast)	1243.6	m
Post Blast Data:	ppV: 0.1	mm/s
	frequency: 7.4	Hz
	air overpressure: 117.1	dB

SouthWest Corner of Property

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(410.5)^2}{30^2} \text{ kg}$$

$$= \frac{168,510}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-08-14

Blast Number: 18-013

Orica Order #: 2374191

Blast Time: 10:54 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40146 °N Latitude 79.88807 °W Longitude
Centre of Blast Centre of Blast

Wind from the: S at 5 kph Temperature: 21 to 25 °C

Clear: Partly Cloudy: X Rain: Snow: Inversion: Ceiling: 30,420 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 182 = 1,820.0 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	27,500	26,290	1,210

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	182	61.9

total explosives weight in Blast (kg): 1,272
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	182
CONNECTADET 9M		25 ms	4
CONNECTADET 12M		42 ms	44

Cord & Accessories:

	U of M	# used
HARNESS 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	1
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	0.0
BORETRACK	Enter hours	0.0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Tonnes Blasted:	17,069 te	6,441 m ³
Total tonnes per day:	17,069 te	NF-15 Rate Code
Total Holes Loaded:	182 holes	
... including:	10 Dead Holes	
... and:	Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	11 rows	

- Pattern (Front Row)-

Burden:	11.5 ft avg
Spacing:	11.5 ft avg
# Holes:	18 front row

- Pattern (Main Body) -

Burden:	11.5 ft avg
Spacing:	11.5 ft avg
# Holes:	164 main body

Bench Height: 10.0 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 10.0 ft avg

- Stone Decking -

Front Row:	ft avg
Main Body:	ft avg
# Decks:	per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	.75" 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:	16.0 kg/delay
SD () Equation:	545.1 kg/delay
Total kg Loaded:	1,272 kg
Rock Density:	2.65 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.075 kg/te (actual)
Front row:	0.088 kg/te (theoretical)
Main Body:	0.088 kg/te (theoretical)
"KPI" PF:	0.088 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit, B, S, Expl or IS from previous Blast:



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2018-08-14

Blast Number: 18-013
 Orica Order #: 2374191
 Blast Time: 10:54 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40115	79.88796	0.757493	1.394308
Front Row Corner	43.40147	79.88808	0.757499	1.394310
Back Row Corner	43.40176	79.88818	0.757504	1.394312
Average (Centre of Blast)	43.40146	79.88807	0.757498	1.394310

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	811.0	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
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	700.4	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
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	900.7	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
SouthWest Corner of Property				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(700.4)^2}{30^2} \text{ kg} \\
 &= \frac{490,560}{900} \text{ kg}
 \end{aligned}$$

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

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/9/2018

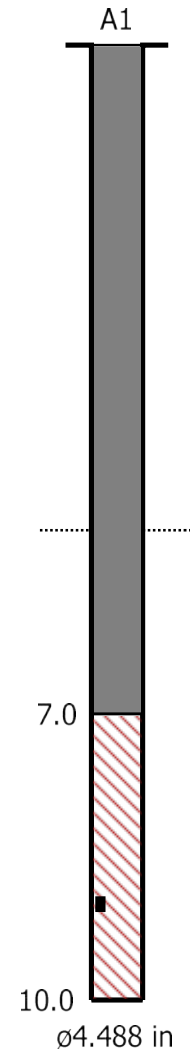
Blast Number: 18-013
Orica Order #: 2374191

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 16ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating
sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft	Spacing: 11.5ft	Subdrill: 0.0ft	Stemming: 8.2ft
1st row burden: 11.5ft	Hole Diameter: 4.0in	Number of holes: 182	Hole angle: 0.0°
Total drilled: 1819.9ft			

Blasted and Backfilled



Blast 18-013 Floor
4" Hole
11.5 X 11.5

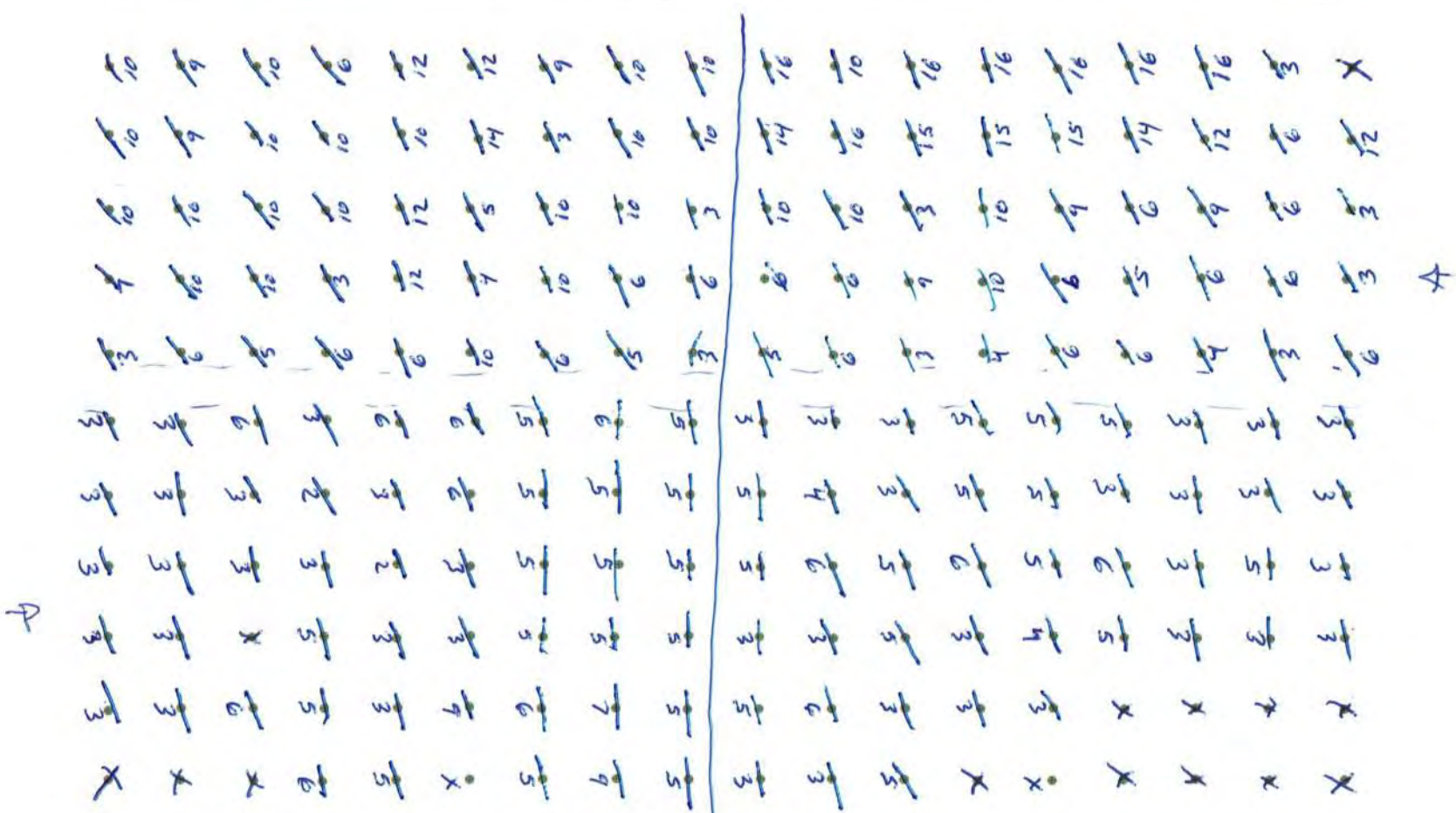


Not to scale

SHOTPlus™ Professional 5.7.3.0		8/14/2018
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	2018-08-14 18-013 Floor.spf	

Load Sheet

24
24
24
24



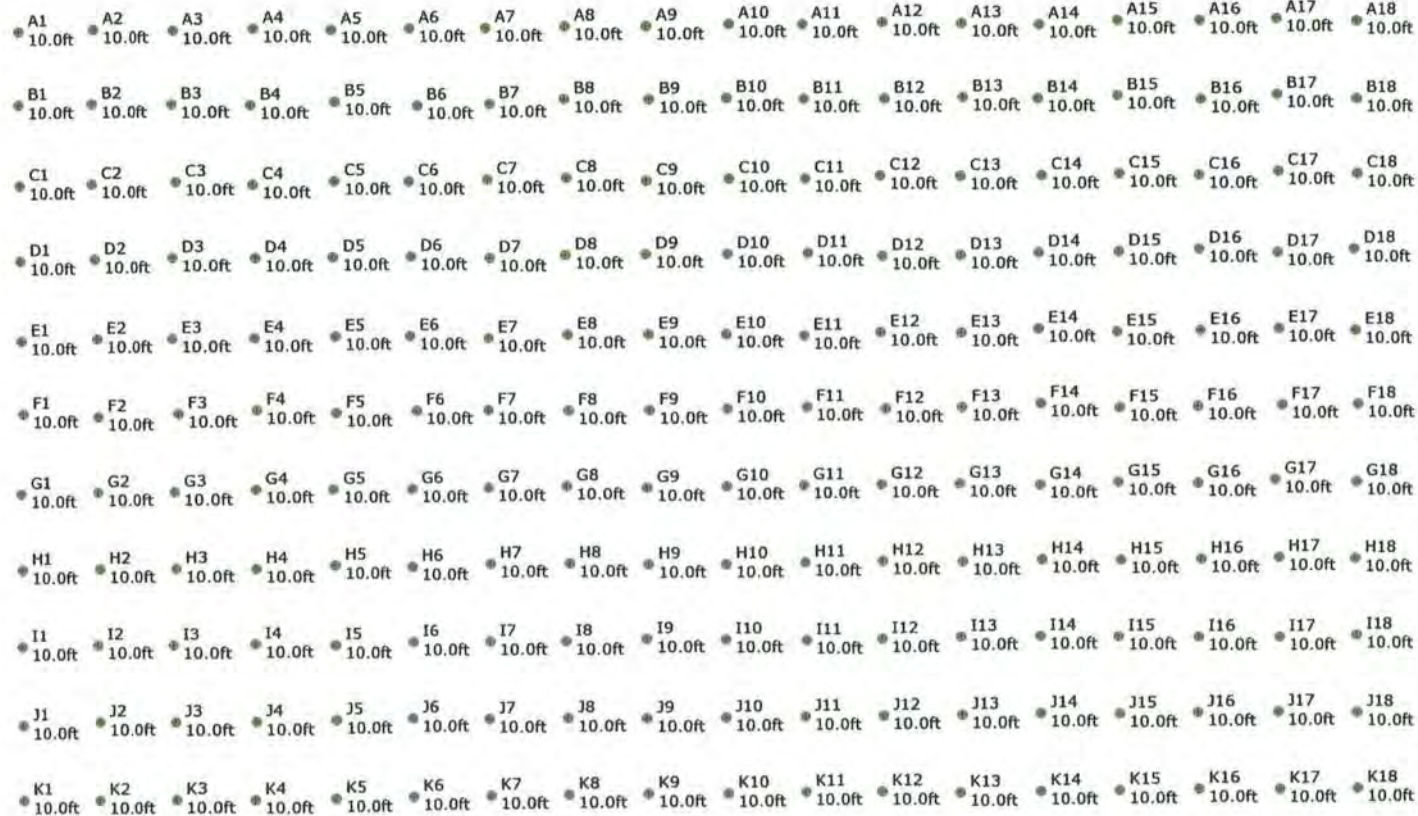
Blast 18-013 Floor
4" Hole
11.5 X 11.5



Not to scale

SHOTPlus™ Professional 5.7.3.0	8/7/2018
Mine	Burlington
Location	
Title/author	18-013 Floor
Filename	Timing.spf

Blasted and Backfilled



Blast 18-013 Floor
 4" Hole
 11.5 X 11.5



Not to scale

SHOTPlus™ Professional 5.7.3.0	8/7/2018
Mine	Burlington
Location	
Title/author	18-013 Floor
Filename	Timing.spf



Orica Canada Inc.

CONSIGNOR
EXPÉDITEUR
GRAND VALLEY
033411 SIDE ROAD 21-22
GRAND VALLEY ON
CA L9W 7G1

Bill of Lading / Connaissance

CONSIGNEE
CONSIGNATAIRE
NELSON AGGREGATE COMPANY
BURLINGTON ON
CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
7 TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2374191	86102967

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR		CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT			
14 Aug 2018	00:00:00	NELSON AGGREGATE COMPANY		n/a			
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON		SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE			
14 Aug 2018	FOB Dest'n, Own Truck		F-73289				
SHIP VIA TRANSPORTEUR		ROUTING ITINÉRAIRE		MAG. LIC. NO. N° DE PERMIS			
Orica Truck		STANDARD					
QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
NET EXPLOSIVES QUANTITY:					83.718 KG		
245	PC	X	63	182	PENTEX BC 340 (49/CS)	5	89.425
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
18	PC	X	16	2	*uni tronic 600-06.0M CU/ZC(20')80PC	1	1.314
100	PC		100	0	MINI STEM PLUGS - PART #74853		0.700
260	PC	X	78	182	EXEL HANDIDET 9M 25/500(30') 65/CS	4	26.260
50	PC	X	50	0	EXEL HANDIDET 12M 25/500(40') 50/CS	1	6.150
27	PC	X	23	4	EXEL Connectadet 9M 25MS (30 FT) 65/CS	1	2.619
50	PC	X	6	44	EXEL Connectadet 12M 42MS (40 FT) 50/CS	1	6
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							138.308 KG
**** TOTAL PACKAGES ****						14	

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA:
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFFERED / PLACARDS OFFERT	
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE	NETTE No. CONV PRESSAGE WT AGREEMENT NO.
CONSIGNOR / EXPÉDITEUR GRAND VALLEY		CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY

SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
Neil Kwast	Neil Kwast	
SIGNATURE	DATE	SIGNATURE
<i>Neil Kwast</i>	14 08 18	<i>Neil Kwast</i>
D/J M/M Y/A	D/J M/M Y/A	D/J M/M Y/A

**2 SHIPPING ORDER
BON D'EXPÉDITION**

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
(L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNÉ LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO



Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Design Date: 2018-08-09

Blast Number: 18-013
Orica Order #:

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40146 °N Latitude 79.88807 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: 19,650 te
Total Holes Loaded: 198 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 11 rows

- Drilling Information -

Angle from Vertical
Primary Bit diam: 101.6 mm 0° # Holes: 198 = 1,980.0 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: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 38 front row

- Design Pattern (Main Body) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 160 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: 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: 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: 20.0 kg/delay

Required kg Loaded: 3,567 kg
Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.182 kg/te (actual)
Front row: 0.118 kg/te (theoretical)
Main Body: 0.118 kg/te (theoretical)
"KPI" PF: 0.118 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 3,500

Pkgd Expl. Required: kg

Boosters Required: kg/u # used kg

PENTEX 12 (OR EQUIVALENT) 0.34 198 67.3

total explosives weight in Blast (kg): 3,567
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required: ms # req'd

UNITRONIC 600 6M 6
EXEL HANDIDET 9m 25/500 198
EXEL HANDIDET 12m 25/500 50
CONNECTADET 9M 25 ms 50
CONNECTADET 12M 42 ms

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:

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

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-08-30

Blast Number: 18-014

Orica Order #: 2380811

Blast Time: 11:55 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40372 °N Latitude 79.88278 °W Longitude
Centre of Blast Centre of Blast

Wind from the: NE at 5 kph Temperature: 16 to 20 °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: 50 = 3,859.1 ft (4 " diam)
Secondary Bit diam: 127.0 mm	0°	# Holes: 8 = 617.4 ft (5 " diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,770	20,690	13,080

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	154	52.4

total explosives weight in Blast (kg): 13,132

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			50
UNITRONIC 600 9M			4
UNITRONIC 600 20M			22
UNITRONIC 600 25M			6
UNITRONIC 600 30M			72

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	3
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	6.0
HELPER HOURS	Enter total Helper man-hours	15.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	
3D LASER PROFILE	Enter hours	
BORETRACK	Enter hours	
TECHNICAL BLAST DESIGN	(per day) Enter # of days	

Tonnes Blasted:	31,778 te	11,992 m ³
Total tonnes per day:	31,778 te	NB80-01 Rate Code
Total Holes Loaded:	58 holes	
... including:	Dead Holes	
... and:	3 Helper Holes	
Helper Hole Collar:	60.0 ft avg	
# Rows Blasted:	3 rows	

- Pattern (Front Row)-

Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	24 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	34 main body

Bench Height: 75.2 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 77.2 ft avg

- Stone Decking -

Front Row: 8.4 ft avg

Main Body: 9.8 ft avg

Decks: 19 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: .75" Stone

- Charge Length -

Front Row: 61.8 ft avg

Main Body: 60.4 ft avg

- Charge Weight -

Front Row: 180.1 kg/hole

Main Body: 176.1 kg/hole

Max. per delay: 307.0 kg/delay

SD () Equation: 178.7 kg/delay

Total kg Loaded: 13,132 kg

Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

Yield PF: 0.413 kg/te (actual)

Front row: 0.266 kg/te (theoretical)

Main Body: 0.347 kg/te (theoretical)

"KPI" PF: 0.320 kg/te (theoretical)

1.846 lb/yd³

1.189 lb/yd³

1.549 lb/yd³

1.429 lb/yd³

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 Helpers requested due to the amount of voids located on drill log and stone decking require Holes A3,A7,B5,B8,C8,C12 All measured short in depth by an average of 12'.

Bill White from Nelson Burlington said we have to blast it, the drill wont be back until Sept.4, 2

3 Siesmographs supplied and set-up



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-08-30

Blast Number: 18-014
Orica Order #: 2380811
Blast Time: 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40374	79.88277	0.757538	1.394217
Front Row Corner	43.40351	79.88279	0.757534	1.394218
Back Row Corner	43.40392	79.88277	0.757541	1.394217
Average (Centre of Blast)	43.40372	79.88278	0.757538	1.394217

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	401.0	m		
Post Blast Data:	ppV: 3.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 113.3	dB	Trigger set at: 115	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	943.9	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
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1249.2	m		
Post Blast Data:	ppV: 2.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 2.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 93.2	dB	Trigger set at: 115	dB
SouthWest Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(401)^2}{30^2} \text{ kg}$$

$$= \frac{160,801}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



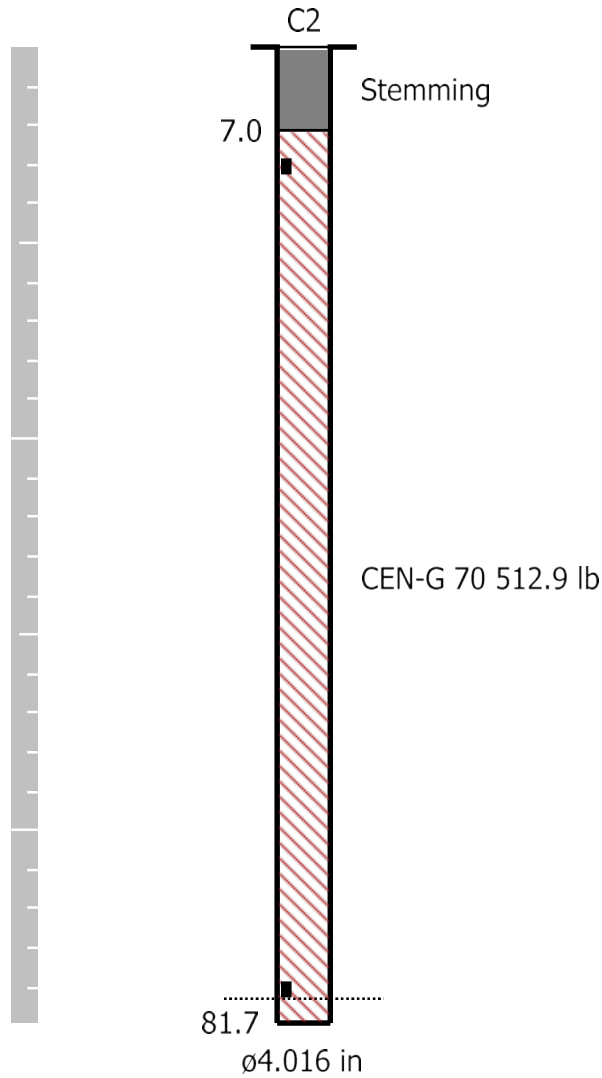
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/30/2018

Blast Number: 18-014
Orica Order #: 2380811

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

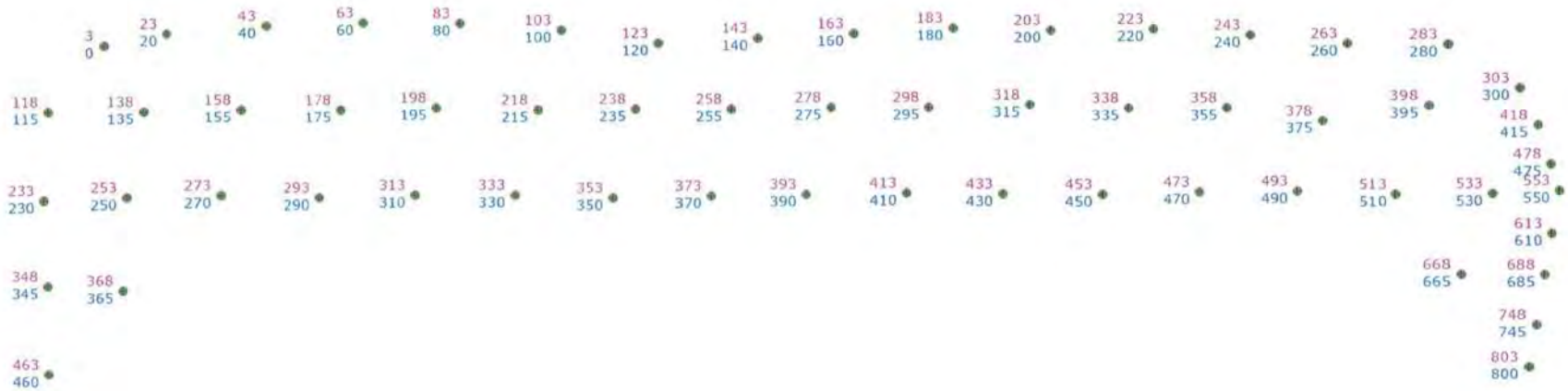
Bill White

Signature required, indicating
sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.2ft	Spacing: 10.2ft	Subdrill: 2.0ft	Stemming: 6.9ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 58	Hole angle: 0.0°
Total drilled: 4476.5ft			



Not to scale

SHOTPlus™ Professional 5.7.3.0	8/16/2018
Mine	Burlington
Location	UPPER MIDDLE
Title/author	Design 18-013 UPPER MIDDLE Partial Final
Filename	Design_18-014_UPPER_MIDDLE_Final.spf

SHOTPlus 5 Plan

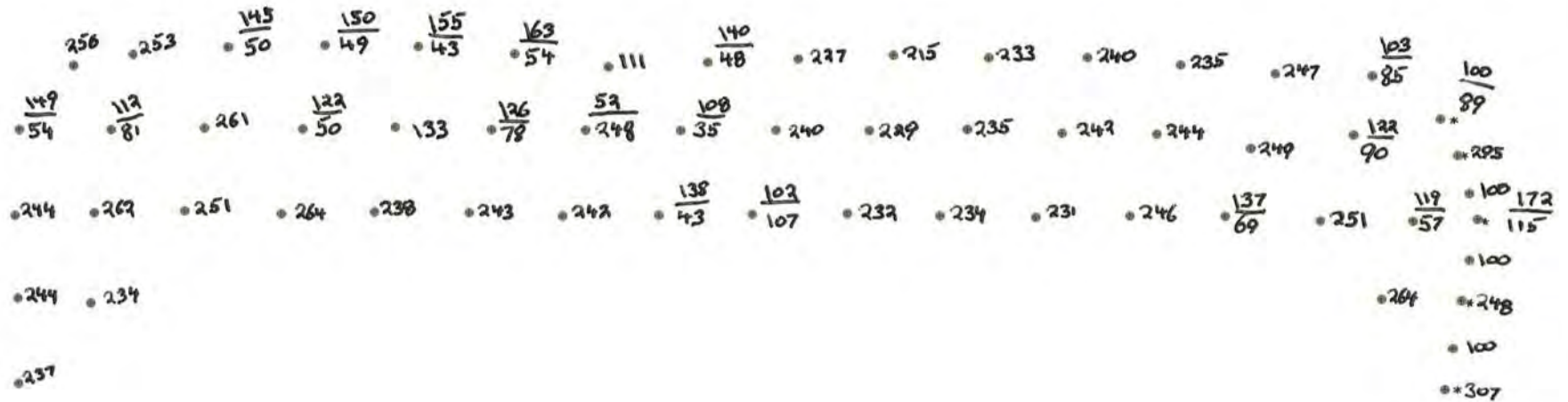
Blast Summary Data

Burden: 9.2ft Spacing: 10.2ft Subdrill: 2.0ft Stemming: 6.9ft
 1st row burden: 12.1ft Hole Diameter: 4.0in Number of holes: 58 Hole angle: 0.0°
 Total drilled: 4476.5ft

Load Sheet

4" 270kg Max

5" 350Kg Max



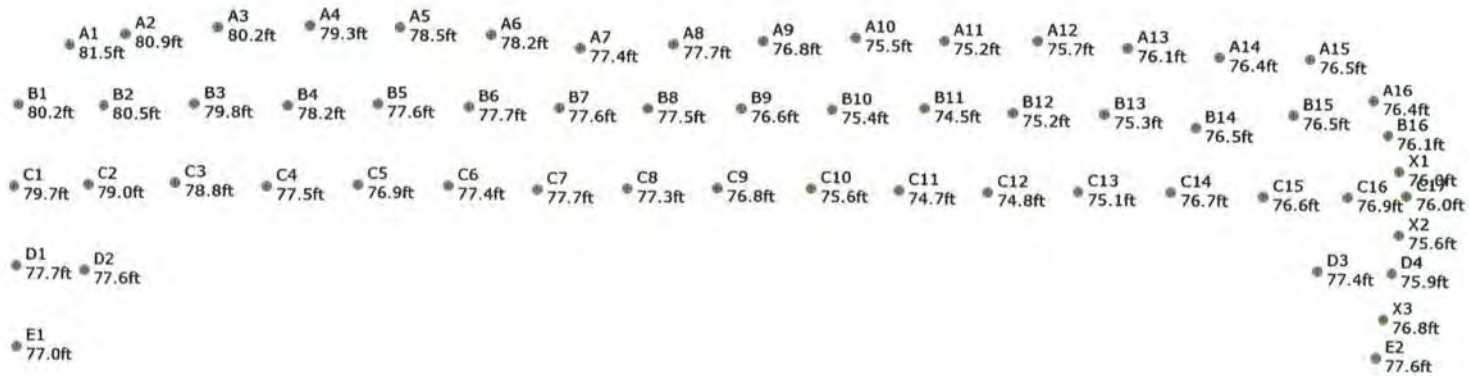
Not to scale

SHOTPlus™ Professional 5.7.3.0	8/29/2018
Mine	Burlington
Location	UPPER MIDDLE
Title/author	Design 18-013 UPPER MIDDLE Partial Final
Filename	2018-08-00 18-014 Upper Middle.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.2ft	Spacing: 10.2ft	Subdrill: 2.0ft	Stemming: 6.9ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 58	Hole angle: 0.0°
Total drilled: 4476.5ft			



Not to scale

SHOTPlus™ Professional 5.7.3.0		8/29/2018
Mine	Burlington	
Location	UPPER MIDDLE	
Title/author	Design 18-013 UPPER MIDDLE Partial Final	
Filename	2018-08-00 18-014 Upper Middle.spf	

1090563

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissancement



CONSIGNOR
EXPÉDITEUR

GRAND VALLEY
033411 SIDE ROAD 21-22
GRAND VALLEY ON
CA L9W 7G1

CONSIGNEE
CONSIGNATAIRE

NELSON AGGREGATE COMPANY
BURLINGTON ON
CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 6:45 AM	TIME OUT HEURE SORTIE 12:30 PM
ORDER NUMBER N° DE COMMANDE 2380811	B/L NUMBER N° DE CONNAISSEMENT 86120203

PAGE 2

DATE REQUIRED DATE REQUISE 30 Aug 2018	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a
DATE SHIPPED EXPÉDIÉ LE 30 Aug 2018	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE PT 15013
SHIP VIA TRANSPORTEUR Orica Truck		ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
245	PC	X	91	154	PENTEX BC 340 (49/CS)	5	89.425
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
80	PC	X	30	50	*uni tronic 600-06.0M CU/ZC(20')80PC	1	5.840
60	PC	X	56	4	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
66	PC	X	44	22	*uni tronic 600-20M CU/ZC SPL(65')66P	1	13.464
54	PC	X	48	6	*uni tronic 600-25M CU/ZC SPL(80')54P	1	13.176
72	PC	X	0	72	*uni tronic 600-30M C/Z SPL(100')36P	2	21.168
100	PC		90	10	MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							155.493 KG
**** TOTAL PACKAGES ****						12	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO.24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT YES / OUI NO / NON
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$
CONSIGNOR / EXPÉDITEUR GRAND VALLEY		CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR Ryan Benjamin		DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR Ryan Benjamin
SIGNATURE [Signature]		DATE 30 08 18
DATE 30 08 18		SIGNATURE [Signature]
DATE D/J M/M Y/A		DATE D/J M/M Y/A

FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5	
---	--

Date/Time Tran at 12:17:50 August 30, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.758 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Nelson Agg.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by Instantel
File Name UM6859_20180830121750.IDFW

Notes

Location: SouthWest Corner Of Property
Client: Nelson Aggregates
User Name: Orica Canada
General: Burlington

Extended Notes

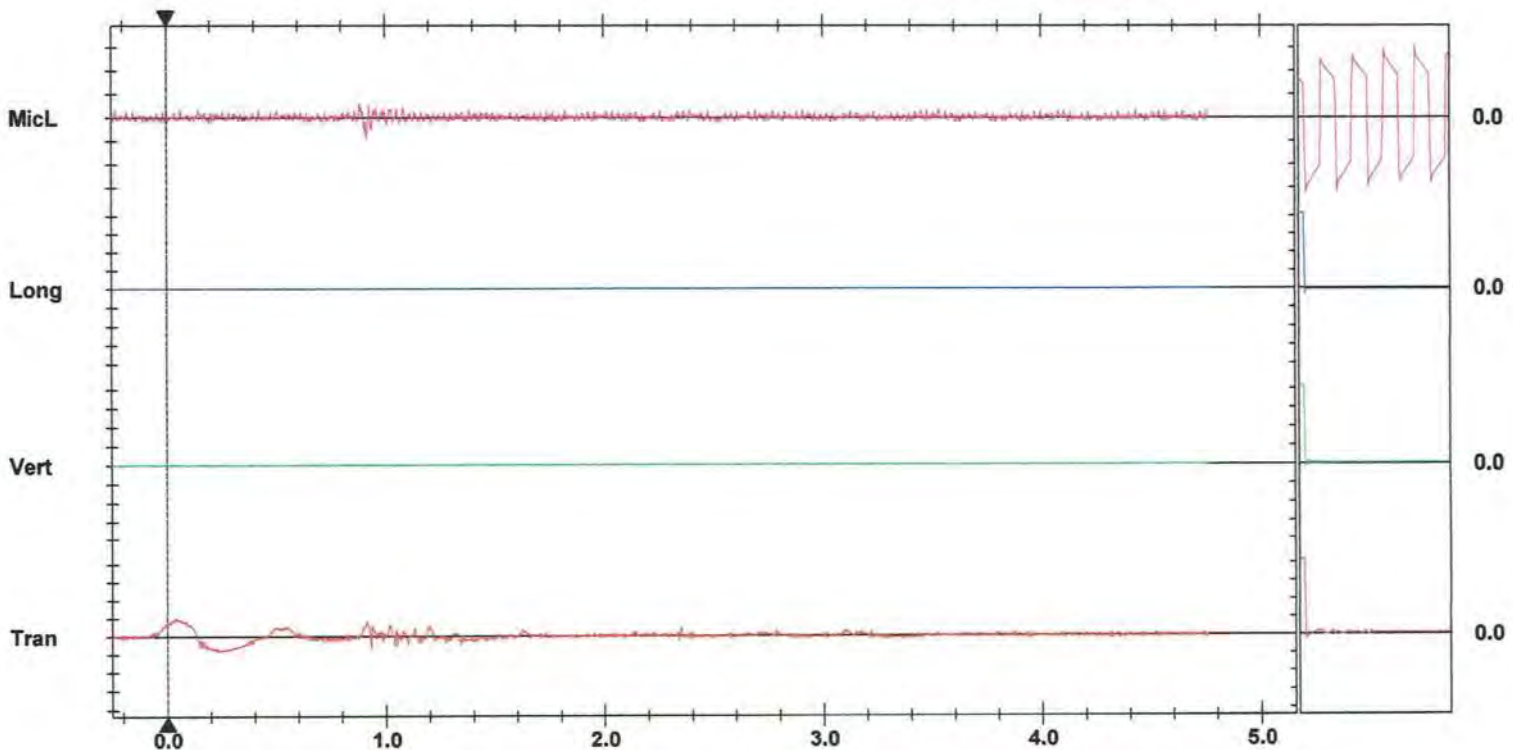
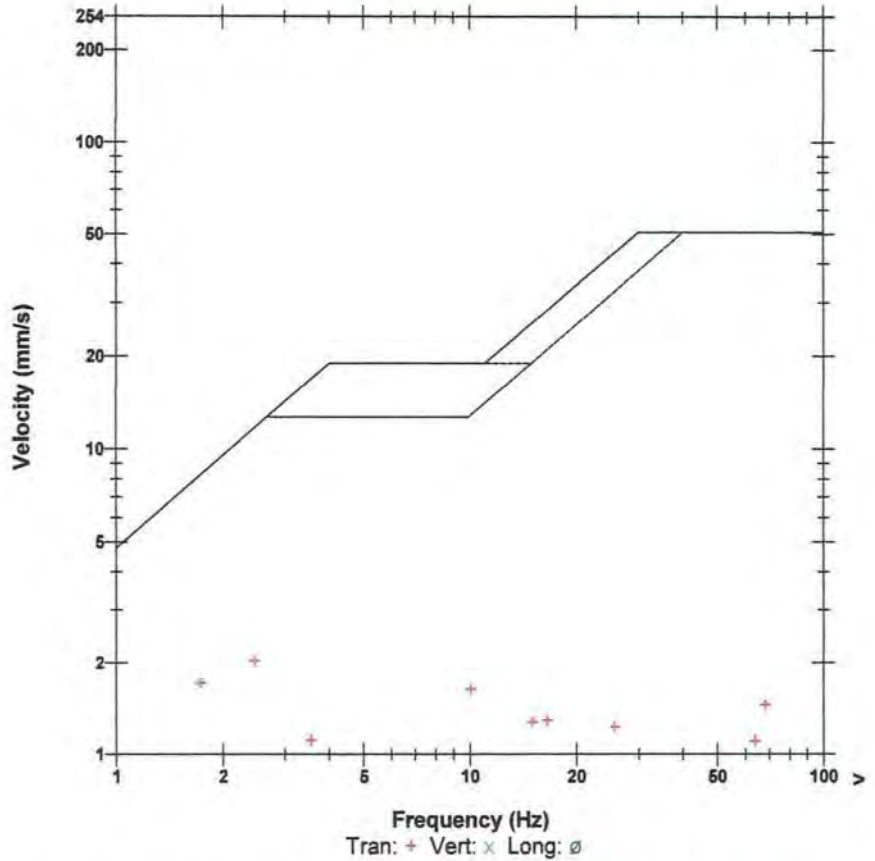
Sand Bagged
 43.39339-79.88880

Microphone Linear Weighting
PSPL 93.2 dB(L) at 0.916 sec
ZC Freq 22 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1334 mv)

	Tran	Vert	Long	
PPV	2.041	0.110	0.055	mm/s
ZC Freq	2.5	68	>200	Hz
Time (Rel. to Trig)	0.044	0.822	4.283	sec
Peak Acceleration	0.142	0.012	0.008	g
Peak Displacement	0.152	0.000	0.000	mm
Sensor Check	Check	Check	Check	
Frequency	20.9	1024.0	1024.0	Hz
Overswing Ratio	1.2	0.0	0.0	

Peak Vector Sum 2.041 mm/s at 0.044 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 11:55:00 August 30, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.25 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)

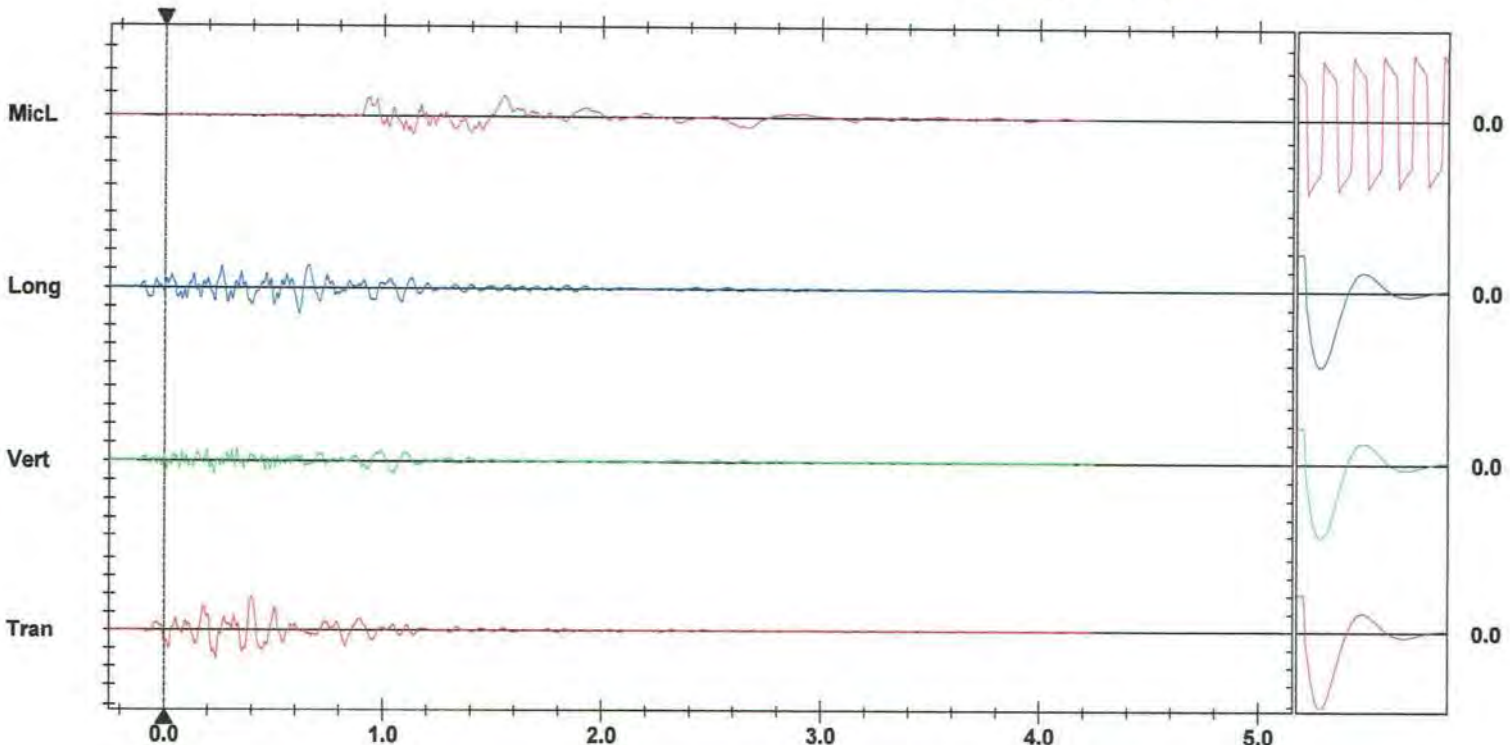
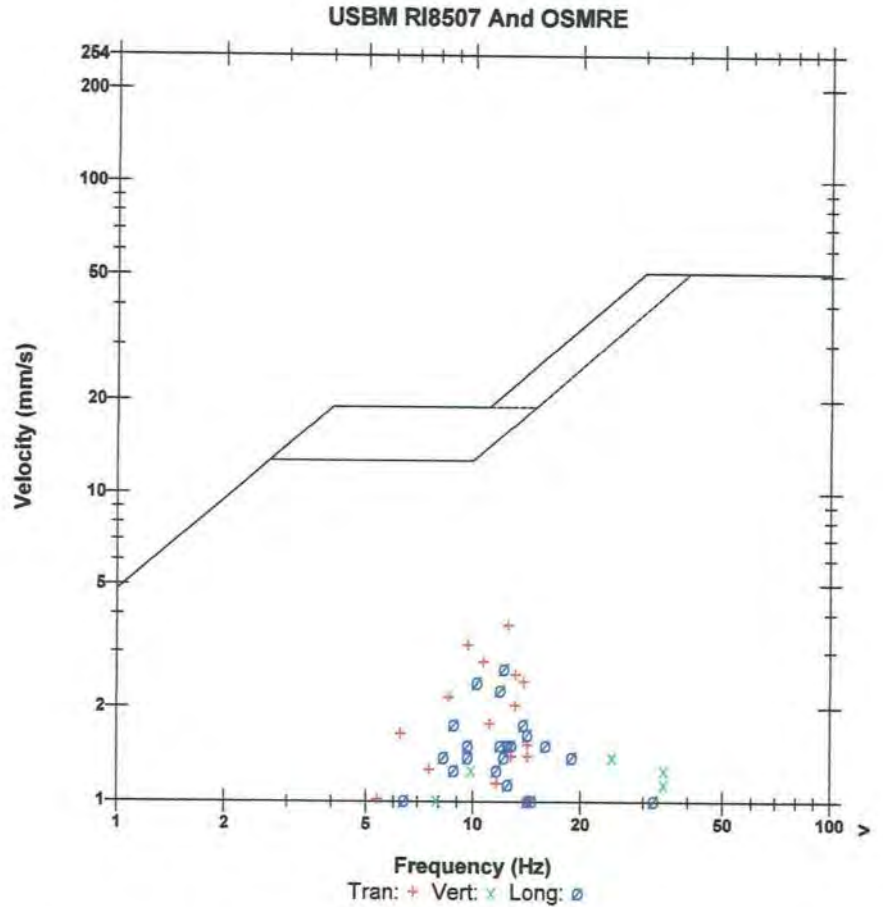
Notes
 Location: 2450 2nd Line
 Client: Nelson Aggregate
 User Name: Orica Canada
 General: Burlington

Extended Notes
 Sand Bagged
 43.40245-79.87814

Microphone Linear Weighting
PSPL 113.3 dB(L) at 1.545 sec
ZC Freq 3.0 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 558 mv)

	Tran	Vert	Long	
PPV	3.683	1.397	2.667	mm/s
ZC Freq	12	24	12	Hz
Time (Rel. to Trig)	0.395	0.229	0.614	sec
Peak Acceleration	0.053	0.040	0.040	g
Peak Displacement	0.050	0.022	0.037	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 4.139 mm/s at 0.396 sec



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

Sensor Check

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.2ft

Spacing: 10.2ft

Subdrill: 2.0ft

Stemming: 6.9ft

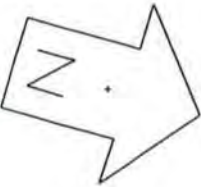
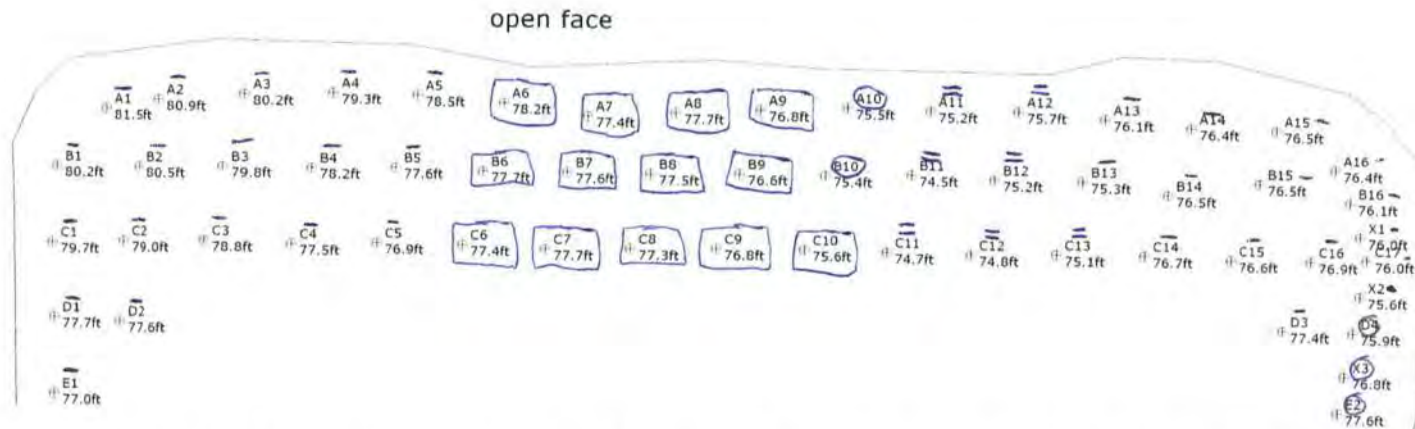
1st row burden: 12.1ft

Hole Diameter: 4.0in

Number of holes: 58

Hole angle: 0.0°

Total drilled: 4476.5ft



- 5" HOLES IN GREEN
- A16
 - B16
 - C17
 - D4
 - E2
 - X1 X2 X3

Design 18-013 UPPER MIDDLE Final- 4" Blast Hole 12x10 9x10 274 and 250 + .6 SUB ELEV



Scale 1:275

SHOTPlus 5.7.0.8	8/7/2018
Mine	Burlington
Location	UPPER MIDDLE
Title/author	Design 18-013 UPPER MIDDLE Partial Final
Filename	Design 18-013 UPPER MIDDLE Partial.spf



Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Design Date: 2018-08-30

Blast Number: 18-014
 Orica Order #:

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Pitize)
 GPS Coordinates: 43.40372 °N Latitude 79.88278 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: 31,778 te
 Total Holes Loaded: 58 holes
 ... including: Dead Holes
 ... and: 3 Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 3 rows

- Drilling Information -

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 50 =	3,859.1 ft (4 " diam)
Secondary Bit diam: 127.0 mm	0°	# Holes: 8 =	617.4 ft (5 " diam)
Tertiary Bit diam: mm	0°	# Holes: =	0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: 12.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 24 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 34 main body
 Bench Height: 75.2 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 77.2 ft avg

- Design Stone Decking -

Front Row: 5.0 ft avg
 Main Body: 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: 65.2 ft avg
 Main Body: 70.2 ft avg

- Design Charge Weight -

Front Row: 190.1 kg/hole
 Main Body: 204.6 kg/hole
 Max Chge Wt / delay: 240.0 kg/delay

Required kg Loaded: 13,539 kg
 Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.426 kg/te (actual)
 Front row: 0.281 kg/te (theoretical)
 Main Body: 0.403 kg/te (theoretical)
 "KPI" PF: 0.362 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast.

3 Helpers

Bulk Expl. Required:	kg
CENTRA GOLD 70	13,500

Pkgd Expl. Required:	kg

Boosters Required:	kg/u # used	kg
PENTEX 12 (OR EQUIVALENT)	0.34 116	39.4

total explosives weight in Blast (kg): 13,539
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		58
UNITRONIC 600 15M		
UNITRONIC 600 30M		58

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)		1
# of Helpers (this Blast)	Note Exception	3
# 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 Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-09-10

Blast Number: 18-015

Orica Order #: 2384839

Blast Time: 11:49 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40084 °N Latitude 79.88808 °W Longitude
Centre of Blast Centre of Blast

Wind from the: E at 15 kph Temperature: 11 to 15 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 1,324 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 204 = 2,244.0 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	31,670	29,370	2,300

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	235	79.9

total explosives weight in Blast (kg): 2,380

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
EXEL HANDIDET 9m		25/500	235
CONNECTADET 9M		25 ms	11 X
CONNECTADET 9M		42 ms	34

Cord & Accessories:

	U of M	# used
HARNESS 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	3
# 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	7.0
HELPER HOURS	Enter total Helper man-hours	16.0
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: 22,269 te 8,404 m3
Total tonnes per day: 22,269 te NF-15 Rate Code
Total Holes Loaded: 204 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 9 rows

- Pattern (Front Row) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 20 front row

- Pattern (Main Body) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 184 main body

Bench Height: 11.0 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 11.0 ft avg

- Stone Decking -

Front Row: ft avg
Main Body: ft avg
Decks: per blast

- Collar Stemming -

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg
Material used: .75" 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: 30.0 kg/delay
SD () Equation: 629.5 kg/delay
Total kg Loaded: 2,380 kg

Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

0.477 lb/yd³ Yield PF: 0.107 kg/te (actual)
0.477 lb/yd³ Front row: 0.107 kg/te (theoretical)
0.477 lb/yd³ Main Body: 0.107 kg/te (theoretical)
0.477 lb/yd³ "KPI" PF: 0.107 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 Helpers needed due to the number of holes and conditions
31 additional primers were needed because the primary was stuck and would not pull into product.



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-09-10

Blast Number: 18-015
Orica Order #: 2384839
Blast Time: 11:49 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40083	79.88805	0.757487	1.394310
Front Row Corner	43.40067	79.88858	0.757485	1.394319
Back Row Corner	43.40102	79.88760	0.757491	1.394302
Average (Centre of Blast)	43.40084	79.88808	0.757487	1.394310

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	823.6	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: 124	dB
2450 2nd Line (set to 124DB trigger due to continuous truck traffic)				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	752.7	m		
Post Blast Data:	ppV: 0.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 7.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 118.0	dB	Trigger set at: 115	dB
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	831.0	m		
Post Blast Data:	ppV: Not	mm/s	Trigger set at: 2.0	mm/s
	frequency: Set	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Up	dB	Trigger set at: 115	dB
SouthWest Corner of Property (Only require 2 Siesmographs for floor blasts)				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(752.7)^2}{30^2} \text{ kg}$$

$$= \frac{566,557}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



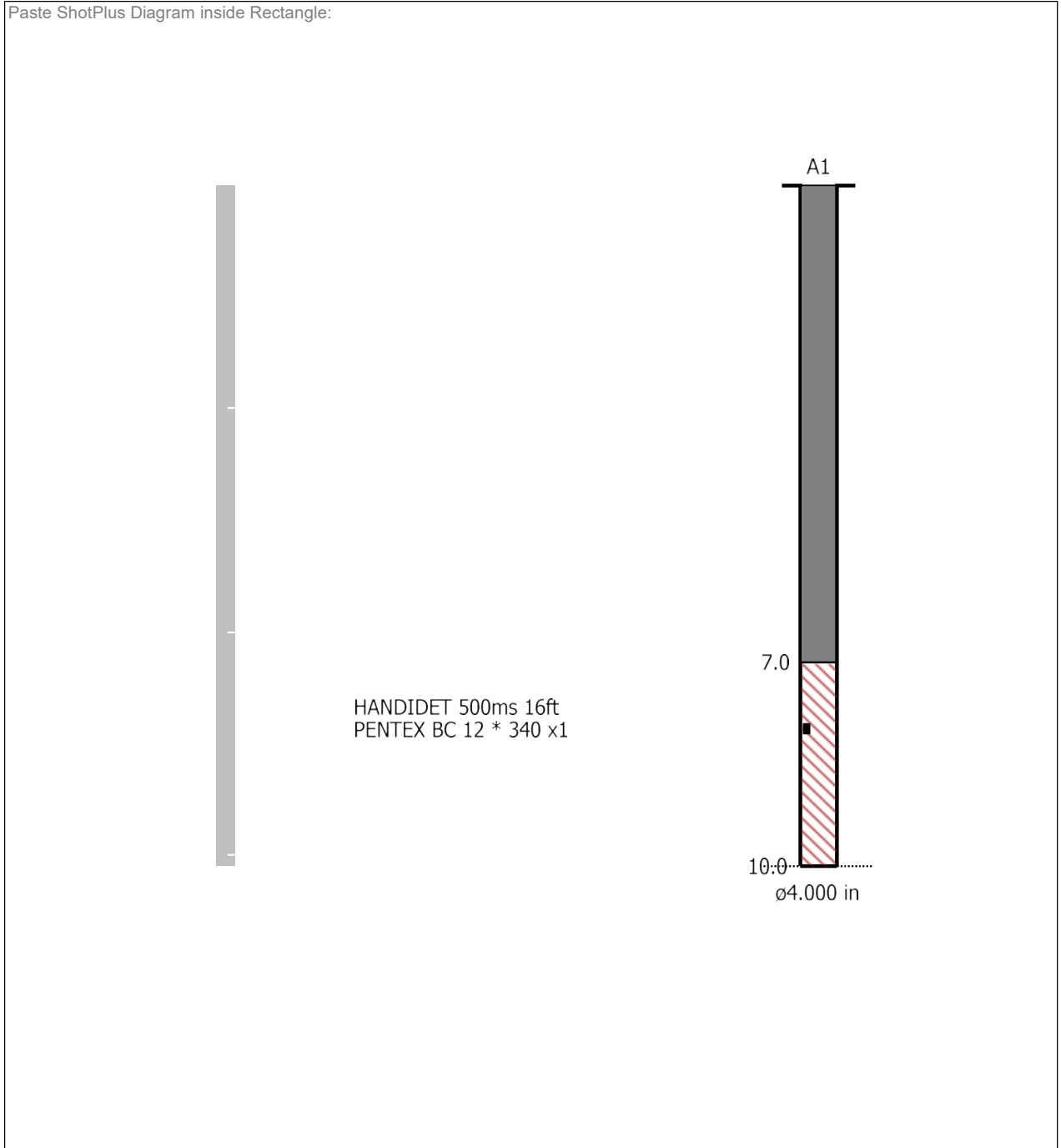
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/10/2018

Blast Number: 18-015
Orica Order #: 2384839

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating
sign off on Blast Design.

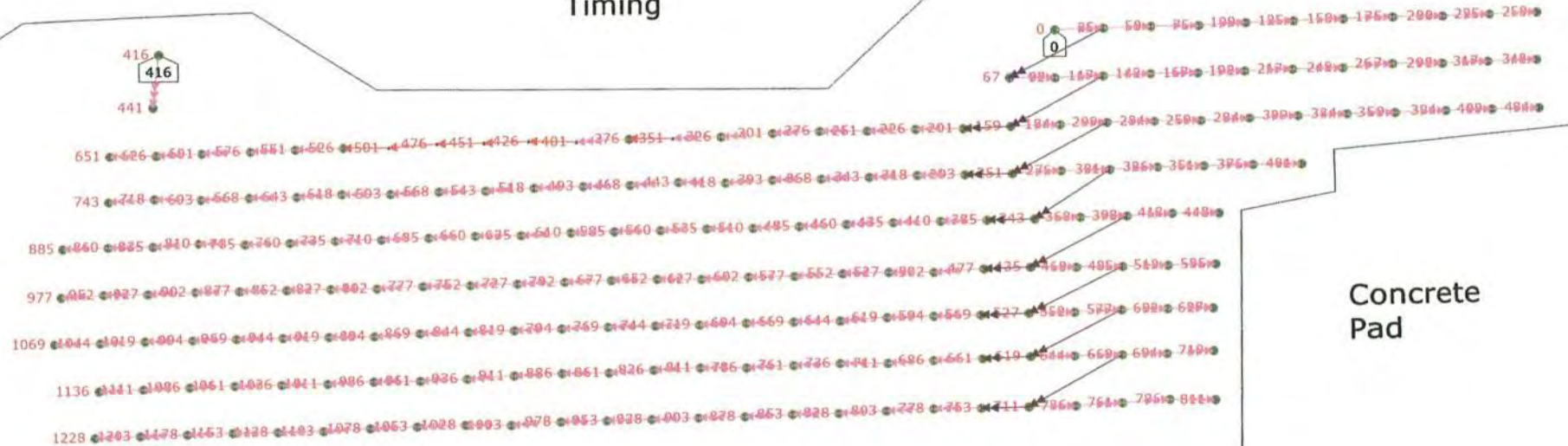
SHOTPlus 5 Plan

Blast Summary Data

Burden: 3.5m Spacing: 3.5m Subdrill: 0.0m Stemming: 2.5m
 1st row burden: 3.5m Hole Diameter: 101.6mm Number of holes: 204 Hole angle: 0.0°
 Total drilled: 673.2m

-013
 Floor
 Previous Blast

Timing



Concrete
 Pad



Not to scale

SHOTPlus™ Professional 5.7.3.0		9/10/2018
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	18-015 Floor Final Not timed.spf	

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft
1st row burden: 11.5ft
Total drilled: 2360.2ft

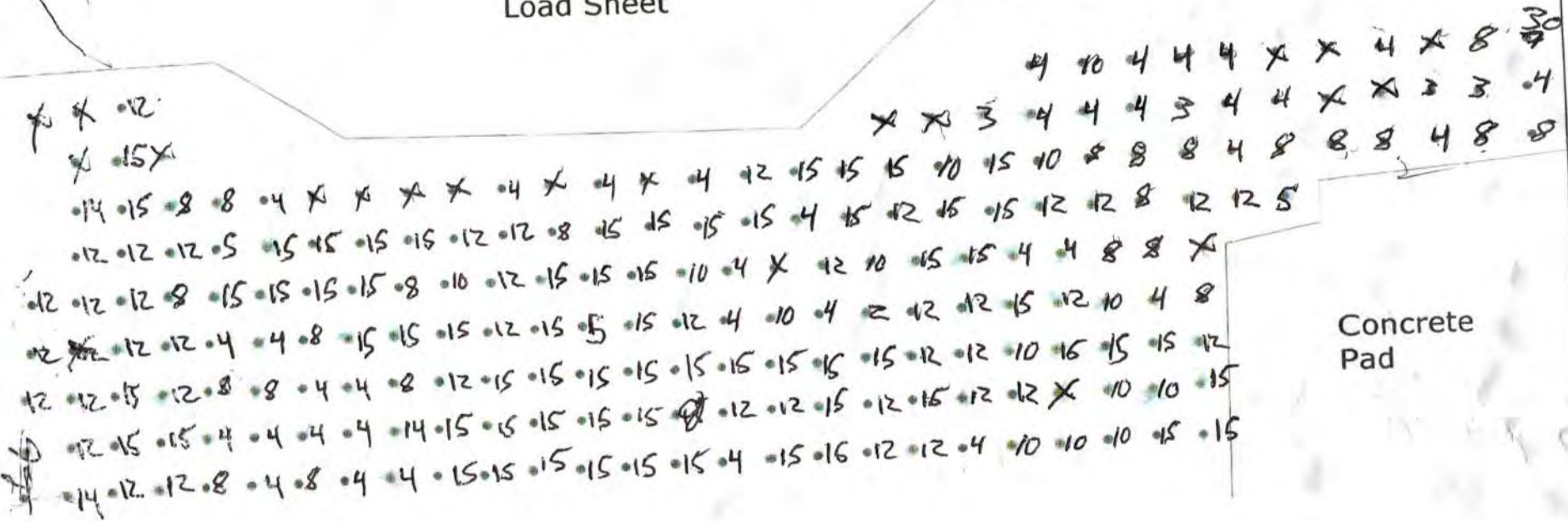
Spacing: 11.5ft
Hole Diameter: 4.0in

Subdrill: 0.0ft
Number of holes: 218

Stemming: 8.2ft
Hole angle: 0.0°

8-013
floor
Previous Blast

Load Sheet



DRILL TO SHALE

SHOTPlus™ Professional 5.7.3.0		9/9/2018
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	18-015 Floor Final.spf	



Not to scale

Date/Time MicL at 11:49:28 September 10, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.03 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/BURLINGTON.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration February 14, 2018 by InstanTEL
File Name UM6857_20180910114928.IDFW

Notes
 Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

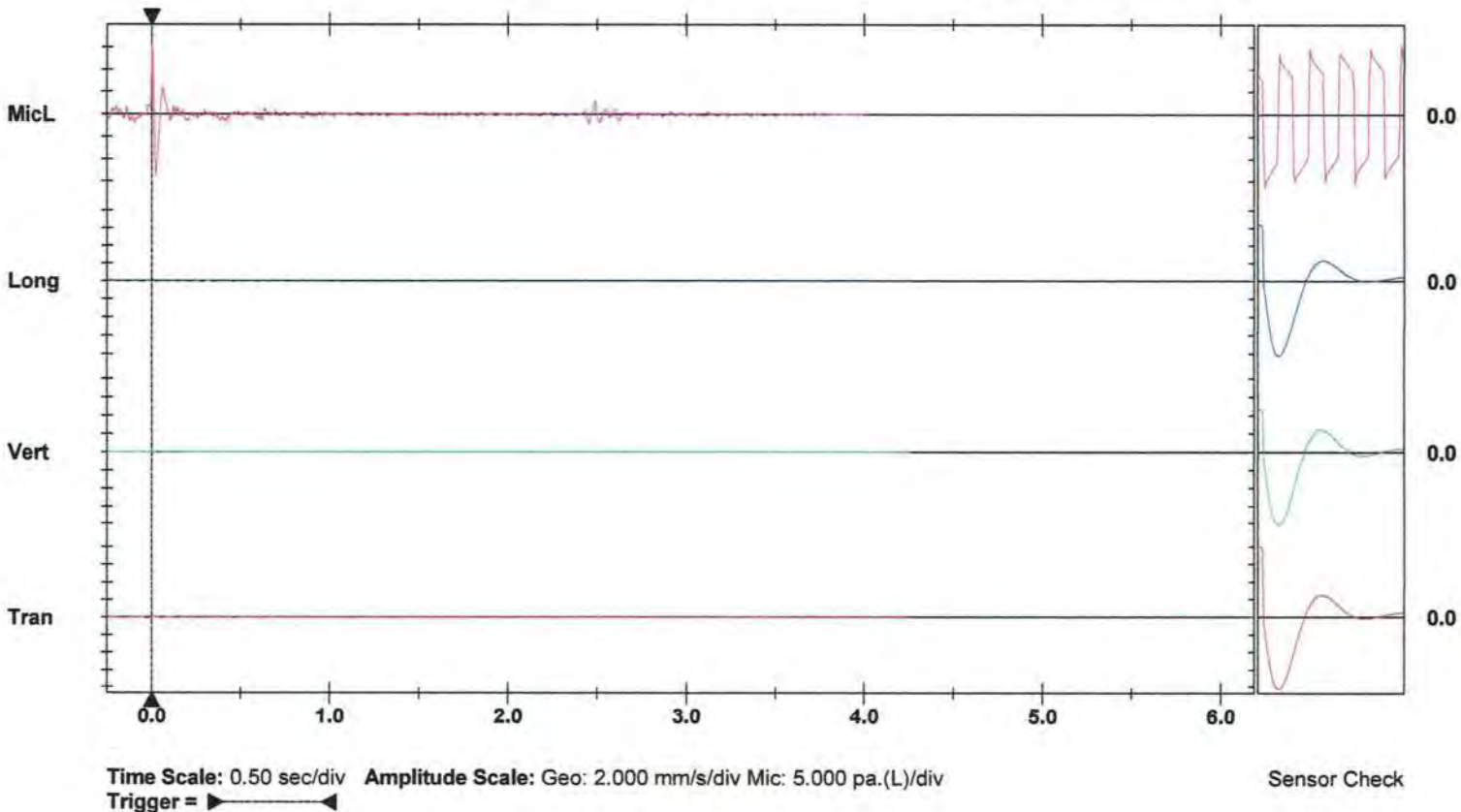
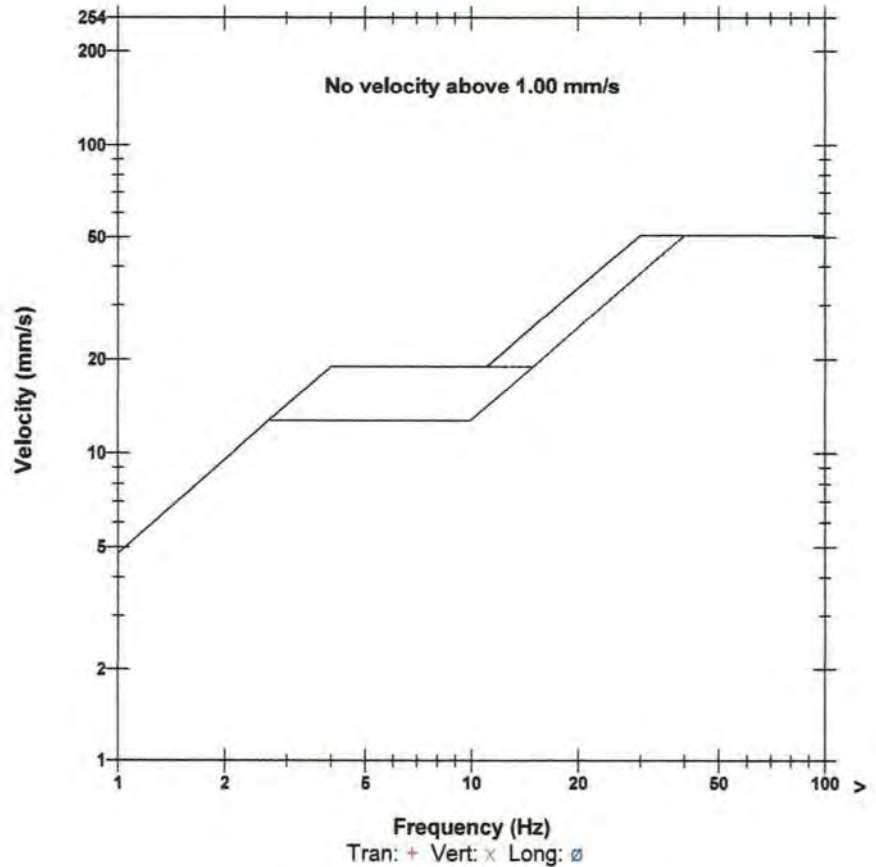
Extended Notes
 N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 118.0 dB(L) at 0.001 sec
ZC Freq 11.1 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1457 mv)

	Tran	Vert	Long	
PPV	0.110	0.110	0.110	mm/s
ZC Freq	11.6	27	16.0	Hz
Time (Rel. to Trig)	-0.020	0.049	0.026	sec
Peak Acceleration	0.010	0.010	0.012	g
Peak Displacement	0.001	0.001	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.3	3.4	3.6	

Peak Vector Sum 0.136 mm/s at 0.049 sec

USBM RI8507 And OSMRE



1090658



Bill of Lading / Connaissance

CONSIGNOR
EXPÉDITEUR
Orica Canada Inc.
GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE 6 45 AM	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE 2384839	B/L NUMBER N° DE CONNAISSEMENT 86129828

PAGE 2

DATE REQUIRED DATE REQUISE 10 Sep 2018	TIME REQUIRED HEURE REQUISE 00:00:00	INVOICE TO / BUYER FACTURÉ À / ACHETEUR NELSON AGGREGATE COMPANY	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT n/a				
DATE SHIPPED EXPÉDIÉ LE 10 Sep 2018	FREIGHT TERMS CONDITIONS DE LIVRAISON FOB Dest'n, Own Truck	SHIP. MAG. LIC. PERMIS EXPÉDITEUR F-73289	VEHICLE NO. N° DE VÉHICULE AT15013				
SHIP VIA TRANSPORTEUR Orica Truck		ROUTING ITINÉRAIRE STANDARD	MAG. LIC. NO. N° DE PERMIS				
QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
NET EXPLOSIVES QUANTITY:						100.426 KG	
294	PC	X	59	235	PENTEX BC 340 (49/CS)	6	107.310
12	PC		0	1	Harness Wire Duplex (6 pack) 400m	1	5.840
30	PC	X	28	2	*uni tronic 600-06.0M CU/ZC(20')80PC	1	2.190
100	PC		100	6	MINI STEM PLUGS - PART #74853		0.700
325	PC	X	90	235	EXEL HANDIDET 9M 25/500(30') 65/CS	5	32.825
65	PC	X	59	6	EXEL Connectadet 9M 25MS (30 FT) 65/CS	1	6.305
65	PC	X	31	34	EXEL Connectadet 9M 42MS (30 FT) 65/CS	1	6.370
108	PC	X	10	4	EXEL Connectadet 12M 42MS (40 FT) 50/CS	1	1.080
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT						162.620 KG	
**** TOTAL PACKAGES ****						16	

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES

PALLETS RETURNED / PALETTES RETOURNÉES

BAGS USED / SACS UTILISÉS

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE ERAP 2-1510	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636	PLACARDS OFFERED / PLACARDS OFFERT <input checked="" type="checkbox"/> YES / OUI <input type="checkbox"/> NO / NON	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À N° DE CONNAISSEMENT ORICA: 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SONT MENTIONNÉS DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$	NETTE No. CONV PRESSAGE WT AGREEMENT NO.

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR K. PLATT	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR K. PLATT	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE K. Platt	DATE 10 9 18 D/J M/M Y/A	SIGNATURE K. Platt
	DATE 10 9 18 D/J M/M Y/A	SIGNATURE
		DATE D/J M/M Y/A

2 SHIPPING ORDER BON D'EXPÉDITION
 (AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
 (L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNÉ LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
 **** PAGE 2 OF 3 ****
 D.F.G. S772

SHOTPlus 5 Plan

Blast Summary Data

Burden: 3.5m

Spacing: 3.5m

Subdrill: 0.0m

Stemming: 2.5m

1st row burden: 3.5m

Hole Diameter: 101.6mm

Number of holes: 259

Hole angle: 0.0°

Total drilled: 789.4m

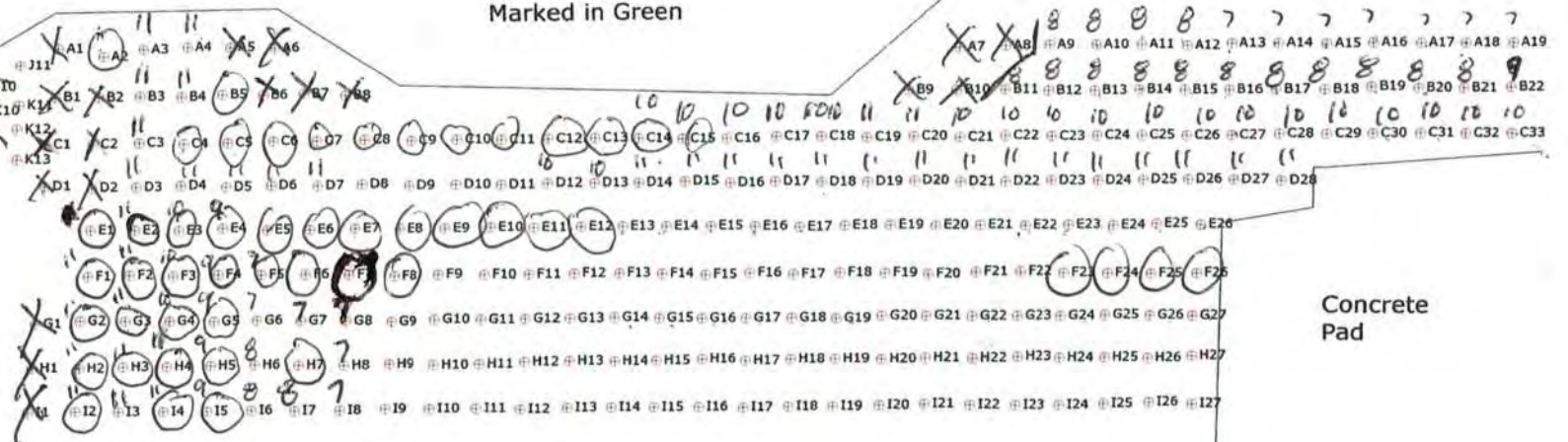


18-013
Floor
Previous Blast

Blast 18-015 Floor
4" Hole
11.5 X 11.5

3.5" Hole
9 X 9.5
Marked in Green

Ramp



Concrete
Pad

DRILL TO SHALE



Not to scale



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-09-21

Blast Number: 18-018
Orica Order #: 2390035
Blast Time: 12:34 PM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40052 °N Latitude 79.88765 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SW at 15 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: 345 = 3,877.8 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	30,490	26,640	3,850

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	349	118.7

total explosives weight in Blast (kg): 3,969

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			349

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	2

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# 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	7.0
HELPER HOURS	Enter total Helper man-hours	18.0
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: 38,483 te 14,522 m3
Total tonnes per day: 38,483 te NF-14 Rate Code
Total Holes Loaded: 345 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 21 rows

- Pattern (Front Row) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 26 front row

- Pattern (Main Body) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 319 main body

Bench Height: 11.2 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 11.2 ft avg

- Stone Decking -

Front Row: ft avg
Main Body: ft avg
Decks: per blast

- Collar Stemming -

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg
Material used: .75" Stone

- Charge Length -

Front Row: 4.2 ft avg
Main Body: 4.2 ft avg

- Charge Weight -

Front Row: 12.4 kg/hole
Main Body: 12.4 kg/hole
Max. per delay: 30.0 kg/delay
SD () Equation: 709.0 kg/delay
Total kg Loaded: 3,969 kg
Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

Yield PF: 0.103 kg/te (actual)
Front row: 0.111 kg/te (theoretical)
Main Body: 0.111 kg/te (theoretical)
"KPI" PF: 0.111 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:

Unitronic detonators were used due to a shortage of non-electronic detonators.

The rate code will show use of non-electronic detonators, therefore no additional cost will be incurred by the customer

4 holes received a secondary primers because the bottom primer was stuck additional helper due to number of hole and difficulty of blast



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-09-21

Blast Number: 18-018
Orica Order #: 2390035
Blast Time: 12:34 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40053	79.88773	0.757482	1.394304
Front Row Corner	43.40099	79.88756	0.757490	1.394301
Back Row Corner	43.40004	79.88767	0.757474	1.394303
Average (Centre of Blast)	43.40052	79.88765	0.757482	1.394303

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	798.8	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: 124	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	801.6	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
Colling Rd & Blind Line Bruce Trail				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	799.3	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: Set-up	dB	Trigger set at: 115	dB
SouthWest Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(798.8)^2}{30^2} \text{ kg}$$

$$= \frac{638,081}{900} \text{ kg}$$

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
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/21/2018

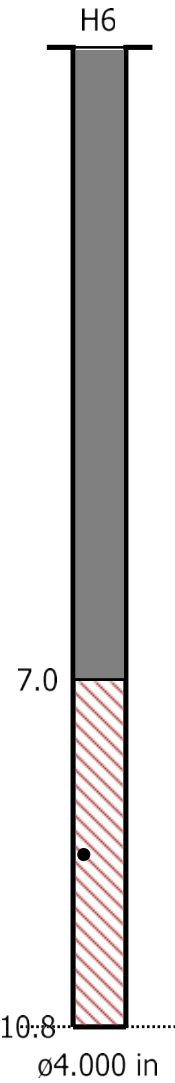
Blast Number: 18-018
Orica Order #: 2390035

page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating sign off on Blast Design.

240 * 220 * 200 * 180 * 160 * 140 * 120 * 100 * 80 * 60 * 40 * 20 * 0 * 29 * 49 * 69 * 89 * 109 * 129 * 149 * 169 * 189 * 209 * 229 * 249 * 269 *
 355 * 335 * 315 * 295 * 275 * 255 * 235 * 215 * 195 * 175 * 155 * 135 * 115 * 144 * 164 * 184 * 204 * 224 * 244 * 264 * 284 * 304 * 324 * 344 * 364 * 384 *
 470 * 450 * 430 * 410 * 390 * 370 * 350 * 330 * 310 * 290 * 270 * 250 * 230 * 259 * 279 * 299 * 319 * 339 * 359 * 379 * 399 * 419 * 439 * 459 * 479 * 499 *
 585 * 565 * 545 * 525 * 505 * 485 * 465 * 445 * 425 * 405 * 385 * 365 * 345 * 374 * 394 * 414 * 434 * 454 * 474 * 494 * 514 * 534 * 554 * 574 * 594 * 614 *
 700 * 680 * 660 * 640 * 620 * 600 * 580 * 560 * 540 * 520 * 500 * 480 * 460 * 489 * 509 * 529 * 549 * 569 * 589 * 609 * 629 * 649 * 669 * 689 * 709 * 729 *
 795 * 775 * 755 * 735 * 715 * 695 * 675 * 655 * 635 * 615 * 595 * 575 * 604 * 624 * 644 * 664 * 684 * 704 * 724 * 744 * 764 * 784 * 804 * 824 * 844 *
 910 * 890 * 870 * 850 * 830 * 810 * 790 * 770 * 750 * 730 * 710 * 690 * 719 * 739 * 759 * 779 * 799 * 819 * 839 * 859 * 879 * 899 * 919 * 939 * 959 *
 1025 * 1005 * 985 * 965 * 945 * 925 * 905 * 885 * 865 * 845 * 825 * 805 * 834 * 854 * 874 * 894 * 914 * 934 * 954 * 974 * 994 * 1014 * 1034 * 1054 * 1074 *
 1140 * 1120 * 1100 * 1080 * 1060 * 1040 * 1020 * 1000 * 980 * 960 * 940 * 920 * 949 * 969 * 989 * 1009 * 1029 * 1049 * 1069 * 1089 * 1109 *
 1255 * 1235 * 1215 * 1195 * 1175 * 1155 * 1135 * 1115 * 1095 * 1075 * 1055 * 1035 * 1064 * 1084 * 1104 * 1124 * 1144 * 1164 * 1184 * 1204 *
 1350 * 1330 * 1310 * 1290 * 1270 * 1250 * 1230 * 1210 * 1190 * 1170 * 1150 * 1179 * 1199 * 1219 * 1239 * 1259 * 1279 * 1299 *
 1465 * 1445 * 1425 * 1405 * 1385 * 1365 * 1345 * 1325 * 1305 * 1285 * 1265 * 1294 * 1314 * 1334 * 1354 * 1374 * 1394 *
 1580 * 1560 * 1540 * 1520 * 1500 * 1480 * 1460 * 1440 * 1420 * 1400 * 1380 * 1409 * 1429 * 1449 * 1469 *
 1695 * 1675 * 1655 * 1635 * 1615 * 1595 * 1575 * 1555 * 1535 * 1515 * 1495 * 1524 * 1544 *
 1810 * 1790 * 1770 * 1750 * 1730 * 1710 * 1690 * 1670 * 1650 * 1630 * 1610 *
 1935 * 1915 * 1895 * 1875 * 1855 * 1835 * 1815 * 1795 * 1775 *
 2050 * 2030 * 2010 * 1990 * 1970 * 1950 * 1930 *
 2165 * 2145 * 2125 * 2105 * 2085 * 2065 *
 2280 * 2260 * 2240 * 2220 *
 2395 * 2375 * 2355 *
 2510 * 2490 *

X = HOLE UNLOADABLE
 O = DOUBLE PRIMED



Not to scale

SHOTPlus™ Professional 5.7.3.0		9/20/2018
Mine	Burlington	
Location		
Title/author	18-018 Floor I. Deemert	
Filename	18-018_Floor_Design_Final.spf	

1090791

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissancement



CONSIGNOR
 EXPÉDITEUR
GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2390035	86143198

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURE À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
21 Sep 2018	00:00:00	NELSON AGGREGATE COMPANY	n/a
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
21 Sep 2018	FOB Dest'n, Own Truck	F-73289	18230
SHIP VIA TRANSPORTEUR		ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck		STANDARD	

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
392	PC	X	43	349	PENTEX BC 340 (49/CS)	8	143.080
3	PC		1	2	Harness Wire Duplex (6 pack) 400m	1	8.760
400	PC	X	51	349	*uni tronic 600-06.0M CU/ZC(20')80PC	5	29.200
60	PC	X	60	0	*uni tronic 600-09.0M CU/ZC(30')60PC	1	5.880
100	PC		100	0	MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							187.620 KG
**** TOTAL PACKAGES ****						15	
GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)							

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMÉRO	PLACARDS OFFERED / PLACARDS OFFERT
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÈGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE
		NETTE No. CONV PRESSAGE WT AGREEMENT NO.
		FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5

CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR K. Platt	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR K. Platt	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE K. Platt	DATE 21 9 18 D/J M/M Y/A	SIGNATURE K. Platt
	DATE 21 9 18 D/J M/M Y/A	DATE D/J M/M Y/A

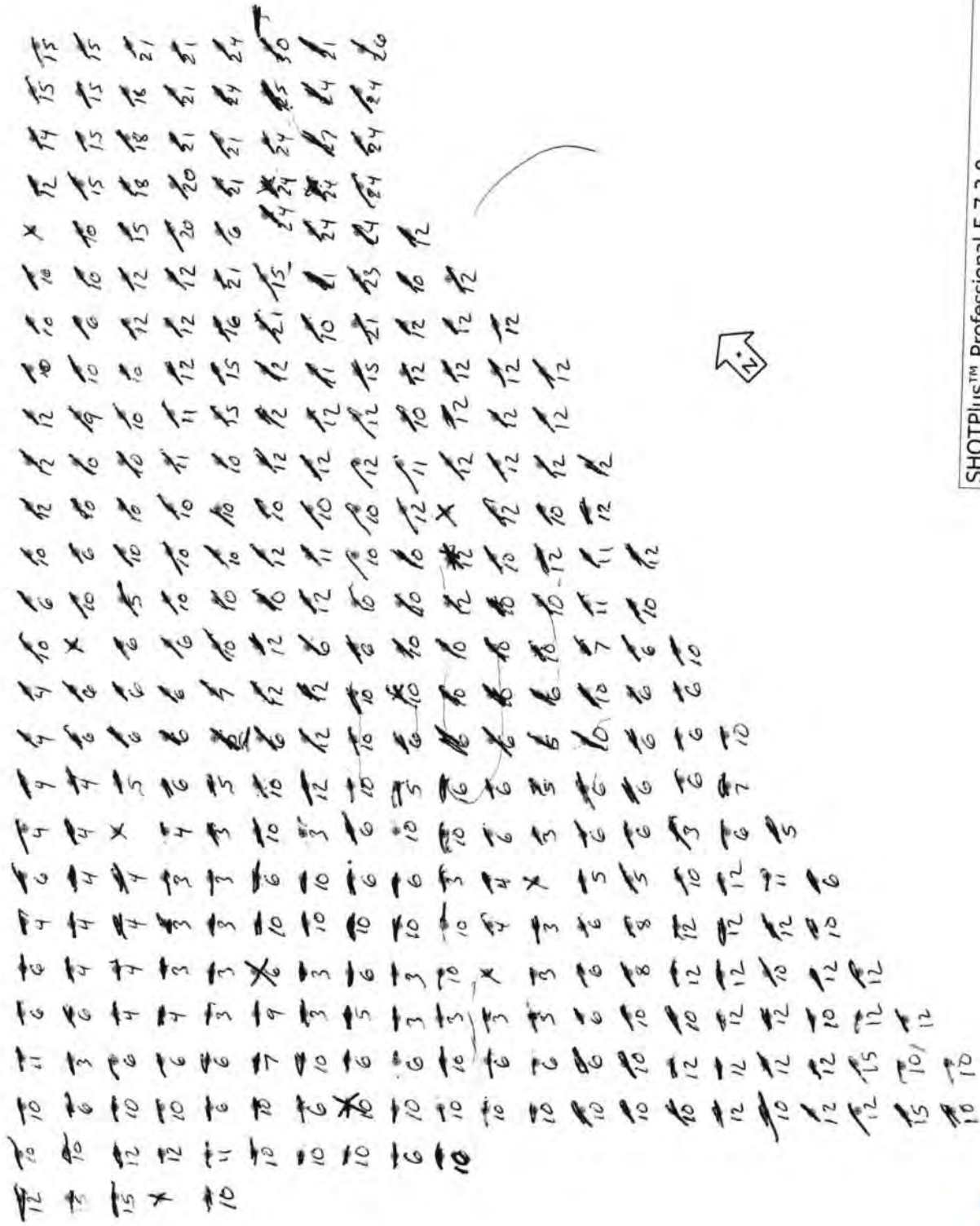
2 SHIPPING ORDER
BON D'EXPÉDITION
 (AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
 (L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRÈS AVOIR SIGNÉ LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
 SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
 **** PAGE 2 OF 2 ****
 D.F.G. 57772

Open Face

Load Sheet 16 Kg Max

Previous Blast

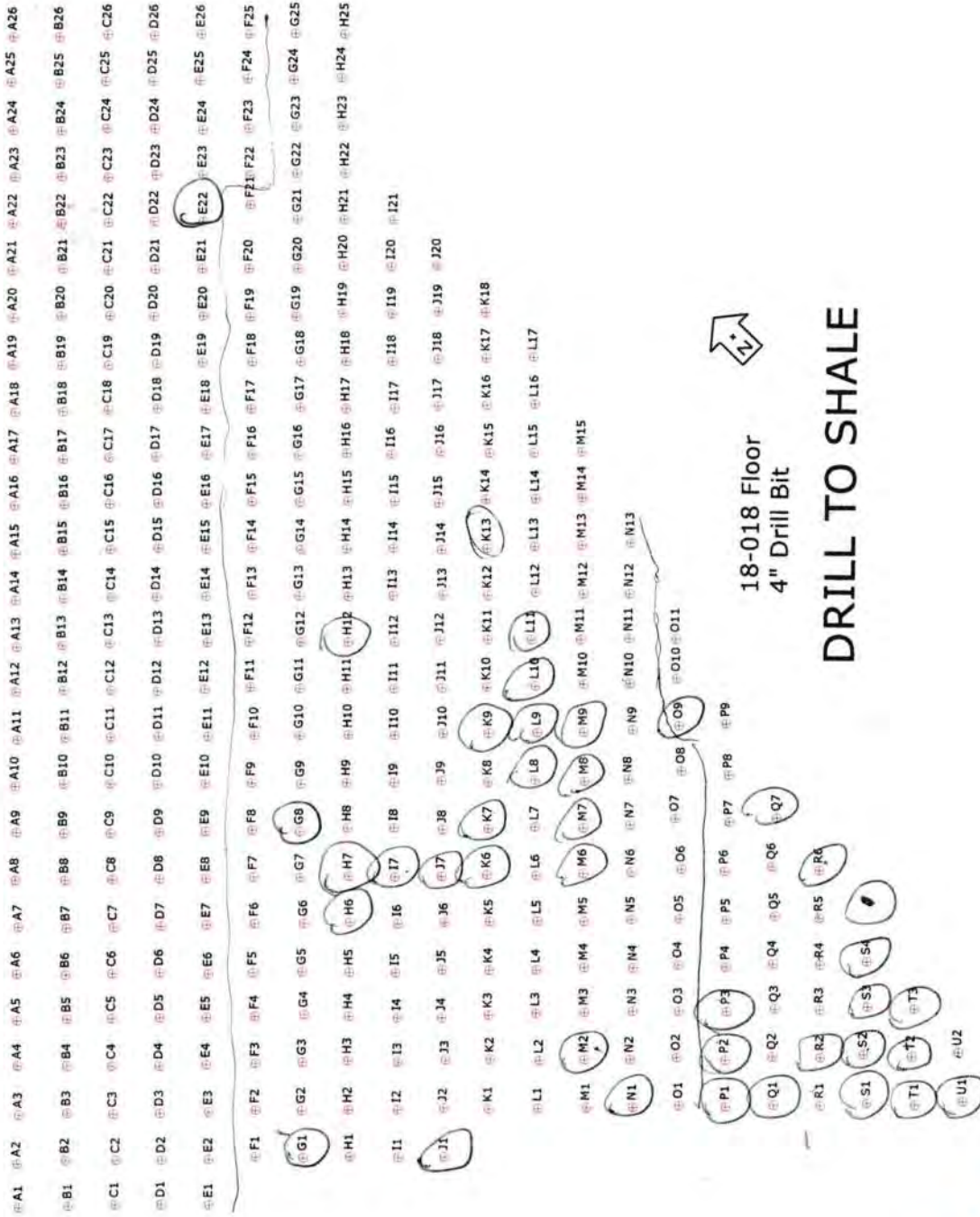


Not to scale

SHOTPlus™ Professional 5.7.3.0	9/20/2018
Mine	Burlington
Location	
Title/author	18-018 Floor I. Deemert
Filename	18-018_Floor_Design_Final.spf

Blast 18-015 Floor
Previous Blast

Open Face



18-018 Floor
4" Drill Bit

Not to scale



~~F5-6 4.5' OB~~ F4-7' OB
~~Q4-7' OB~~ F4-6' OB

F5-7' OB F6-7' OB
~~Q4-7' OB~~

GODRILLING

SHOT DIAMETER

Client:

Job:

Date:

Driller:

Blast Num:

Employee:

1 foot into the Shale
 134 holes Footage - 1531'
 in shot so far

~~776' OB~~
 574.5' OB
 559' OB
 569' OB
 584.5' OB

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																																						
B	12	12	12	11	11	10	9	10	9	9	9	10	10	10	11	11	11	11	11	10	10	11	11	11	11	12	12	12	12	11	11	11	11	11	11	11		
C	13	12	12	11	10	9	9	9	9	9	9	10	10	10	10	11	11	11	11	11	11	12	12	12	13	13	14	14	14	14	14	14	14	14	14	14	14	
D	13	12	12	12	10	9	9	9	9	9	9	10	10	10	10	11	11	11	11	11	11	12	12	12	13	13	14	14	14	14	14	14	14	14	14	14	14	
E	12	11	11	11	11	10	9	9	9	9	9	10	10	10	11	11	11	11	11	11	11	12	12	12	13	13	14	14	14	14	14	14	14	14	14	14	14	
F																																						
G																																						
H																																						
I																																						
J																																						
K																																						
L																																						
M																																						
N																																						
O																																						
P																																						
Q																																						
R																																						
S																																						
T																																						

Burden: Spacing: Total Cubic Meters: Total Tonnes: Total Footage:

Average Hole Depth: Total Holes:

Shot Notes: F23-9-15 - Fractured
 F4-6' OB
 F5-6' OB
 F6-7' OB
 F7-7.5' OB
 F8-7' OB
 F9-7' OB
 F10-7' OB
 F11-7' OB
 F12-7' OB
 F13-7' OB
 F14-7' OB
 F15-7' OB
 F16-7' OB
 F17-7' OB
 F18-7' OB
 F19-7' OB
 F20-7' OB
 F21-7' OB
 F22-7' OB
 F23-7' OB
 F24-7' OB
 F25-7' OB
 F26-7' OB
 F27-7' OB
 F28-7' OB
 F29-7' OB
 F30-7' OB
 F31-7' OB
 F32-7' OB
 F33-7' OB
 F34-7' OB
 F35-7' OB



Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #: _____
 Design Date: 2018-09-21

Blast Number: 18-018
 Orica Order #: _____

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Party)
 GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude
Centre of Blast Centre of Blast

Design te Blasted: 39,153 te
 Total Holes Loaded: 351 holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 21 rows

- Drilling Information -

Nominal Bit Diameter: _____

Primary Bit diam:	<u>101.6</u> mm	Angle from Vertical: <u>0</u> °	# Holes: <u>351</u>	=	3,945.2 ft (<u>4</u> " diam)
Secondary Bit diam:				=	0.0 ft (" diam)
Tertiary Bit diam:				=	0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: 11.5 ft avg
 Spacing: 11.5 ft avg
 # Holes: 26 front row

- Design Pattern (Main Body) -

Burden: 11.5 ft avg
 Spacing: 11.5 ft avg
 # Holes: 325 main body
 Bench Height: 11.2 ft avg
 Sub-drill: 0.0 ft avg
 Hole Depth: 11.2 ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: 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: 4.2 ft avg
 Main Body: 4.2 ft avg

- Design Charge Weight -

Front Row: 12.4 kg/hole
 Main Body: 12.4 kg/hole
 Max Chge Wt / delay: 16.0 kg/delay

Required kg Loaded: 10,119 kg
 Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.258 kg/te (actual)
 Front row: 0.111 kg/te (theoretical)
 Main Body: 0.111 kg/te (theoretical)
 "KPI" PF: 0.111 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Blr, B, S, Expl or IS from previous Blast:

Bulk Expl. Required:	kg
CENTRA GOLD 70	10,000

Pkgd Expl. Required:	kg

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	351	119.3

total explosives weight in Blast (kg): 10,119
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		351

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 3
# 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 Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-10-02

Blast Number: 18-017

Orica Order #: 2394470

Blast Time: 12:02 PM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40374 °N Latitude 79.88268 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SW at 5 kph Temperature: 11 to 15 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 751 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 48 = 3,763.4 ft (4 " diam)
Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,740	22,350	11,390

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	108	36.7

total explosives weight in Blast (kg): 11,427
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			45
UNITRONIC 600 25M			26
UNITRONIC 600 30M			36
UNITRONIC 600 15M			1

Cord & Accessories:

	U of M	# used
HARNESS 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	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	11.0
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: 26,868 te 10,139 m3
Total tonnes per day: 26,868 te NB80-01 Rate Code
Total Holes Loaded: 48 holes
... including: Dead Holes
... and: 2 Helper Holes
Helper Hole Collar: 50.0 ft avg
Rows Blasted: 3 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 19 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 29 main body

Bench Height: 76.4 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 78.4 ft avg

- Stone Decking -

Front Row: 10.0 ft avg

Main Body: 10.0 ft avg

Decks: 6 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: .75" Stone

- Charge Length -

Front Row: 61.4 ft avg

Main Body: 61.4 ft avg

- Charge Weight -

Front Row: 179.0 kg/hole

Main Body: 179.0 kg/hole

Max. per delay: 265.0 kg/delay

SD () Equation: 172.7 kg/delay

Total kg Loaded: 11,427 kg

Rock Density: 2.65 g/cc = te/m³

- Powder Factor -

Yield PF: 0.425 kg/te (actual)

Front row: 0.260 kg/te (theoretical)

Main Body: 0.347 kg/te (theoretical)

"KPI" PF: 0.318 kg/te (theoretical)

1.900 lb/yd³
1.162 lb/yd³
1.550 lb/yd³
1.421 lb/yd³

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

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-10-02

Blast Number: 18-017
Orica Order #: 2394470
Blast Time: 12:02 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40371	79.88267
Front Row Corner	43.40358	79.88266
Back Row Corner	43.40393	79.88271
Average (Centre of Blast)	43.40374	79.88268

(N) Radians	(W) Radians
0.757538	1.394216
0.757535	1.394215
0.757541	1.394216
0.757538	1.394216

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Distance (1st Seis. From Centre of Blast)	394.2	m
Post Blast Data:	ppV:	5.3 mm/s
	frequency:	7.6 Hz
	air overpressure:	114.2 dB
	Trigger set at:	2.0 mm/s
	V / T / L :	? (Vertical, Transverse or Longitudinal)
	Trigger set at:	124 dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40605	79.89400
2nd Reading		
Average	43.40605	79.89400

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

Distance (2nd Seis. From Centre of Blast)	951.1	m
Post Blast Data:	ppV:	0.2 mm/s
	frequency:	7.1 Hz
	air overpressure:	121.6 dB
	Trigger set at:	2.0 mm/s
	V / T / L :	? (Vertical, Transverse or Longitudinal)
	Trigger set at:	115 dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.39339	79.88880
2nd Reading		
Average	43.39339	79.88880

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Distance (3rd Seis. From Centre of Blast)	1253.8	m
Post Blast Data:	ppV:	0.5 mm/s
	frequency:	7.3 Hz
	air overpressure:	123.5 dB
	Trigger set at:	2.0 mm/s
	V / T / L :	? (Vertical, Transverse or Longitudinal)
	Trigger set at:	115 dB

SouthWest Corner of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(394.2)^2}{30^2} \text{ kg}$$

$$= \frac{155,394}{900} \text{ kg}$$

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

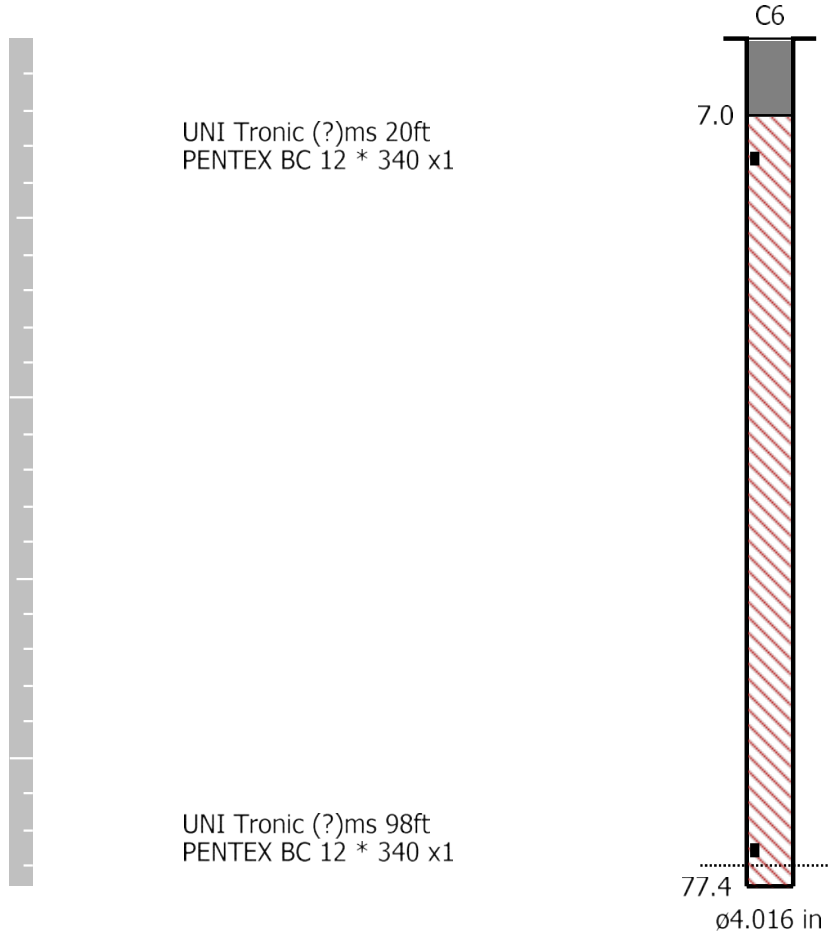
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 10/2/2018

Blast Number: 18-017
Orica Order #: 2394470

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating
sign off on Blast Design.

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 6.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 49	Hole angle: 0.0°
Total drilled: 3733.8ft			

open face



TRY C17A 4" FIRST POSITION IF UNSUC
 TRY C17B 5" SECOND POSITION
 NO ROUNDING DUE TO RAMP



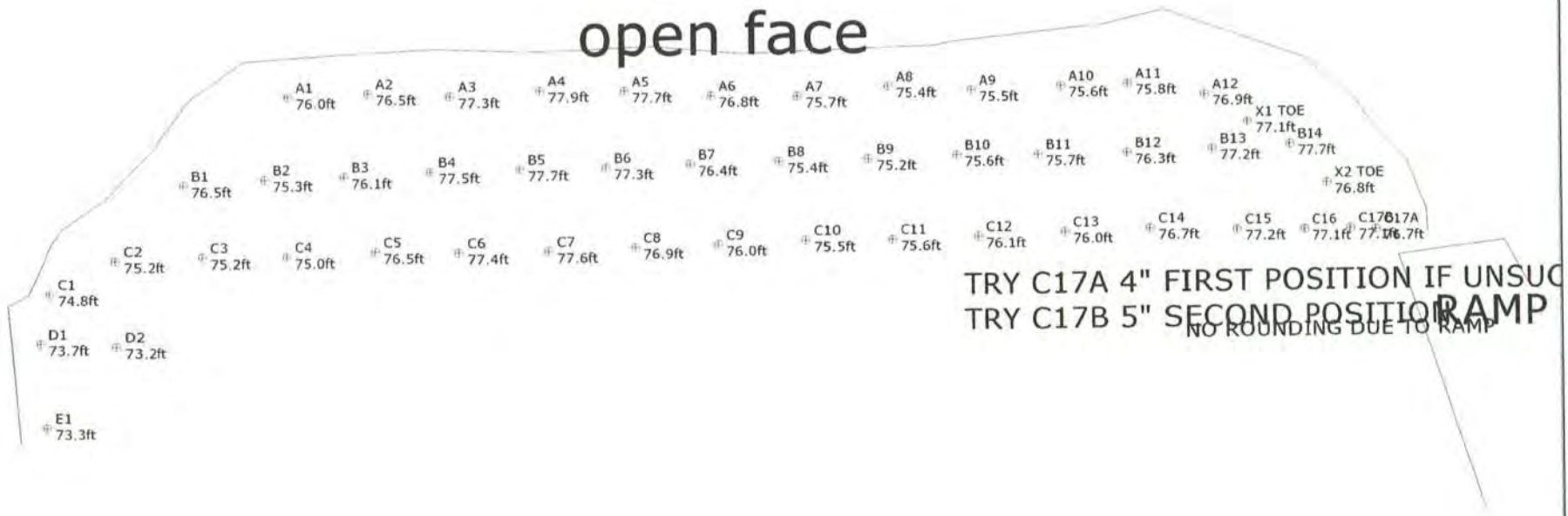
Not to scale

SHOTPlus™ Professional 5.7.3.0	10/1/2018
Mine	Burlington
Location	UPPER MIDDLE NO ROUNDING ON NORTH
Title/author	Design 18-017 UPPER MIDDLE
Filename	2018-10-02 18-017 Upper Middle.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 6.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 49	Hole angle: 0.0°
Total drilled: 3733.8ft			



Not to scale

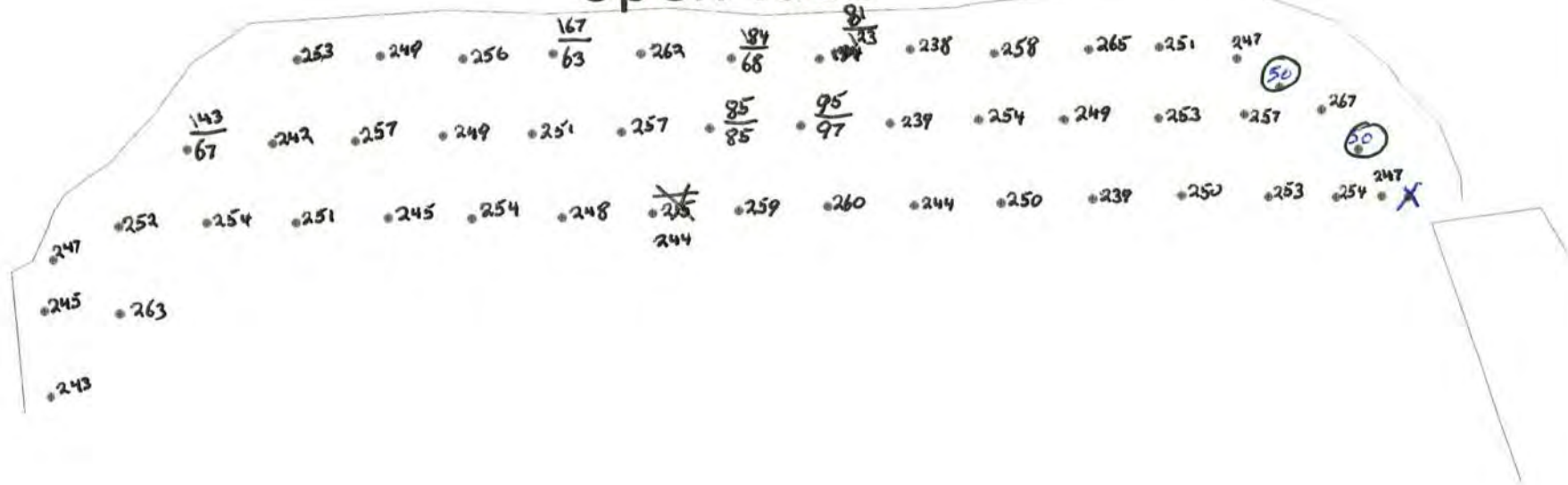
SHOTPlus™ Professional 5.7.3.0	9/17/2018
Mine	Burlington
Location	UPPER MIDDLE NO ROUNDING ON NORTH
Title/author	Design 18-017 UPPER MIDDLE
Filename	Design_18-017_UPPER_MIDDLE_Fnl.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 6.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 49	Hole angle: 0.0°
Total drilled: 3733.8ft			

Load Sheet 240 Kg Max open face



Not to scale

SHOTPlus™ Professional 5.7.3.0	9/28/2018
Mine	Burlington
Location	UPPER MIDDLE NO ROUNDING ON NORTH
Title/author	Design 18-017 UPPER MIDDLE
Filename	Design_18-017_UPPER_MIDDLE_Fnl.spf

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissancement

Orica Canada Inc.
 GRAND VALLEY
 033411 SIDE ROAD 21-22
 GRAND VALLEY ON
 CA L9W 7G1

CONSIGNEE
 CONSIGNATAIRE
NELSON AGGREGATE COMPANY
 BURLINGTON ON
 CA L7R 4L8

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSMENT
2394470	86154431

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
02 Oct 2018	00:00:00	NELSON AGGREGATE COMPANY	n/a
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
02 Oct 2018	FOB Dest'n, Own Truck	F-73289	PT 18230
SHIP VIA TRANSPORTEUR		ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS
Orica Truck		STANDARD	

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT.	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
147	PC	X	39	108	PENTEX BC 340 (49/CS)	3	53.655
2	PC		1	1	Harness Wire Duplex (6 pack) 400m	1	5.840
80	PC	X	35	45	*uni tronic 600-06.0M CU/ZC(20')80PC	1	5.840
66	PC	X	65	1	*uni tronic 600-15M C/Z SPL(50')66PC	1	11.286
54	PC	X	28	26	*uni tronic 600-25M CU/ZC SPL(80')54P	1	13.176
36	PC	X	0	36	*uni tronic 600-30M C/Z SPL(100')36P	1	8.820
100	PC				MINI STEM PLUGS - PART #74853		0.700
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							99.317 KG
**** TOTAL PACKAGES ****						8	

GHS/WHMIS SDS documents available
 Website: www.oricaminingservices.com
 Email: sds.na@orica.com
 Phone: 1-855-26-ORICA (1-855-266-7422)

24-HOUR NUMBER: 1-613-996-6666

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFFERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À N° DE CONNAISSMENT D'ORICA:
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON	Orica Canada Inc.

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QU'É LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QU'É LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE	NETTE No. CONV PRESSAGE WT AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER / TRANSPORTEUR Orica Truck	CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR Jeff Norwood	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR Jeff Norwood	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR		
SIGNATURE	DATE 2-10-18	SIGNATURE	DATE 2-10-18	
	D/J M/M Y/A		D/J M/M Y/A	

Date/Time MicL at 12:02:29 October 2, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.308 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/BURLINGTON.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration February 14, 2018 by Instantel
File Name UM6857_20181002120229.IDFW

Notes

Location: COLLING RD & BLINDLINE
Client: NELSON AGGREGATES
User Name: ORICA CANADA
General:

Extended Notes

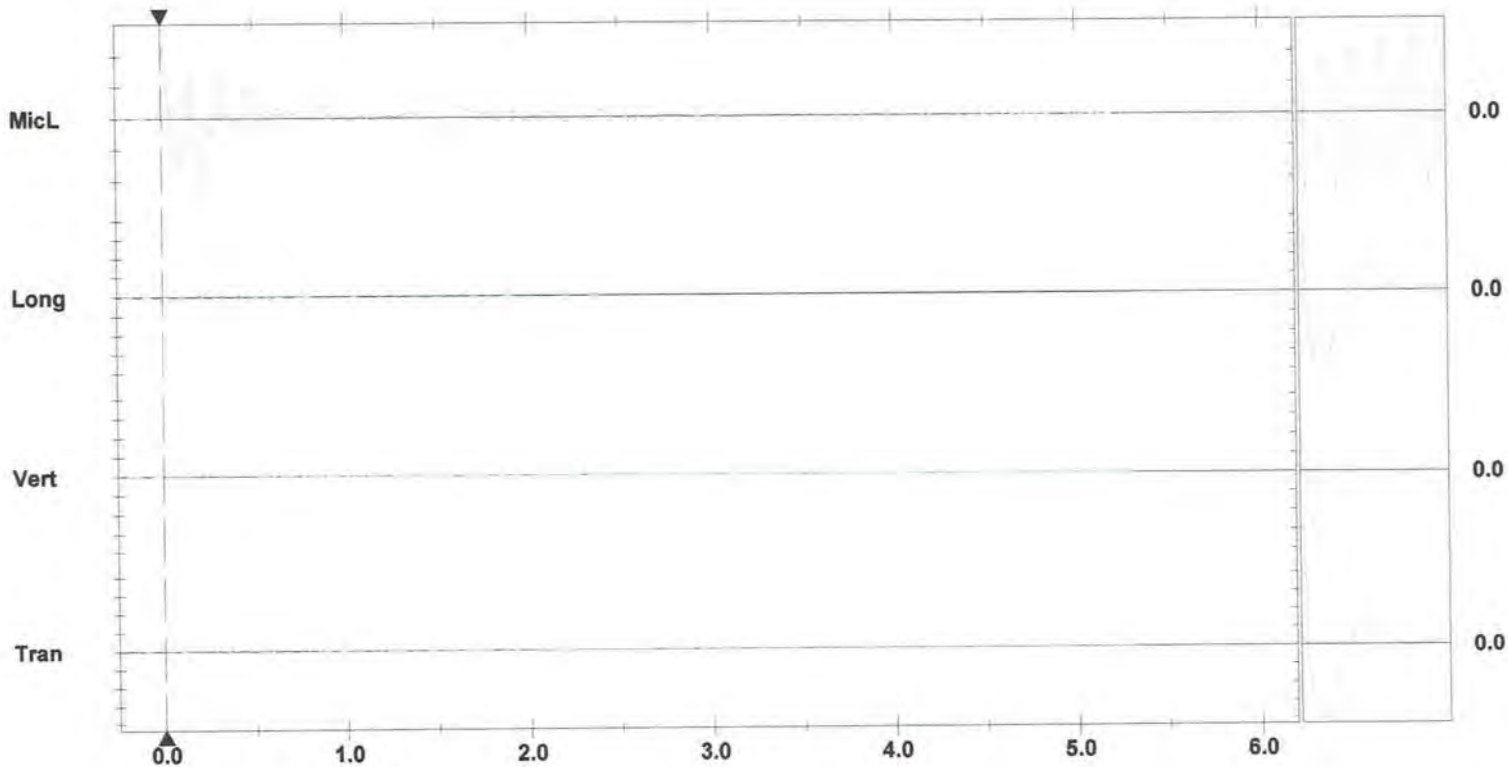
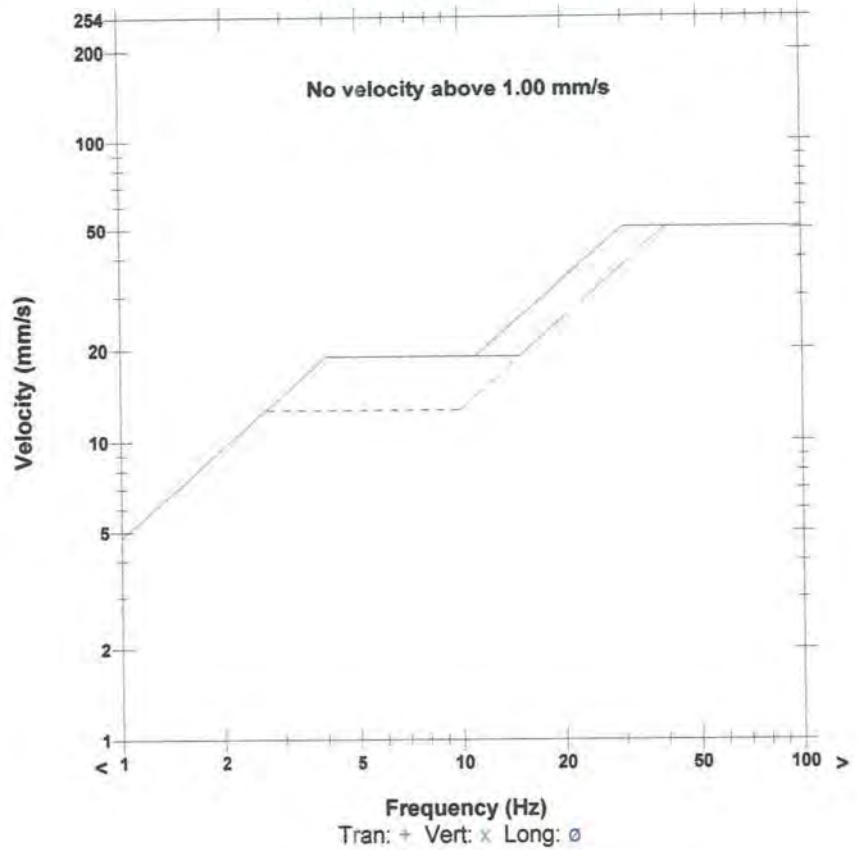
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 121.6 dB(L) at 0.202 sec
ZC Freq 4.3 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1470 mv)

	Tran	Vert	Long	
PPV	0.150	0.189	0.205	mm/s
ZC Freq	16.5	17.1	7.9	Hz
Time (Rel. to Trig)	0.407	0.215	0.388	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.002	0.002	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.4	3.6	

Peak Vector Sum 0.214 mm/s at 0.394 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 Long at 12:02:24 October 2, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name _TEMP.EVT

Notes
 Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: N.43.40245 W.79.87814

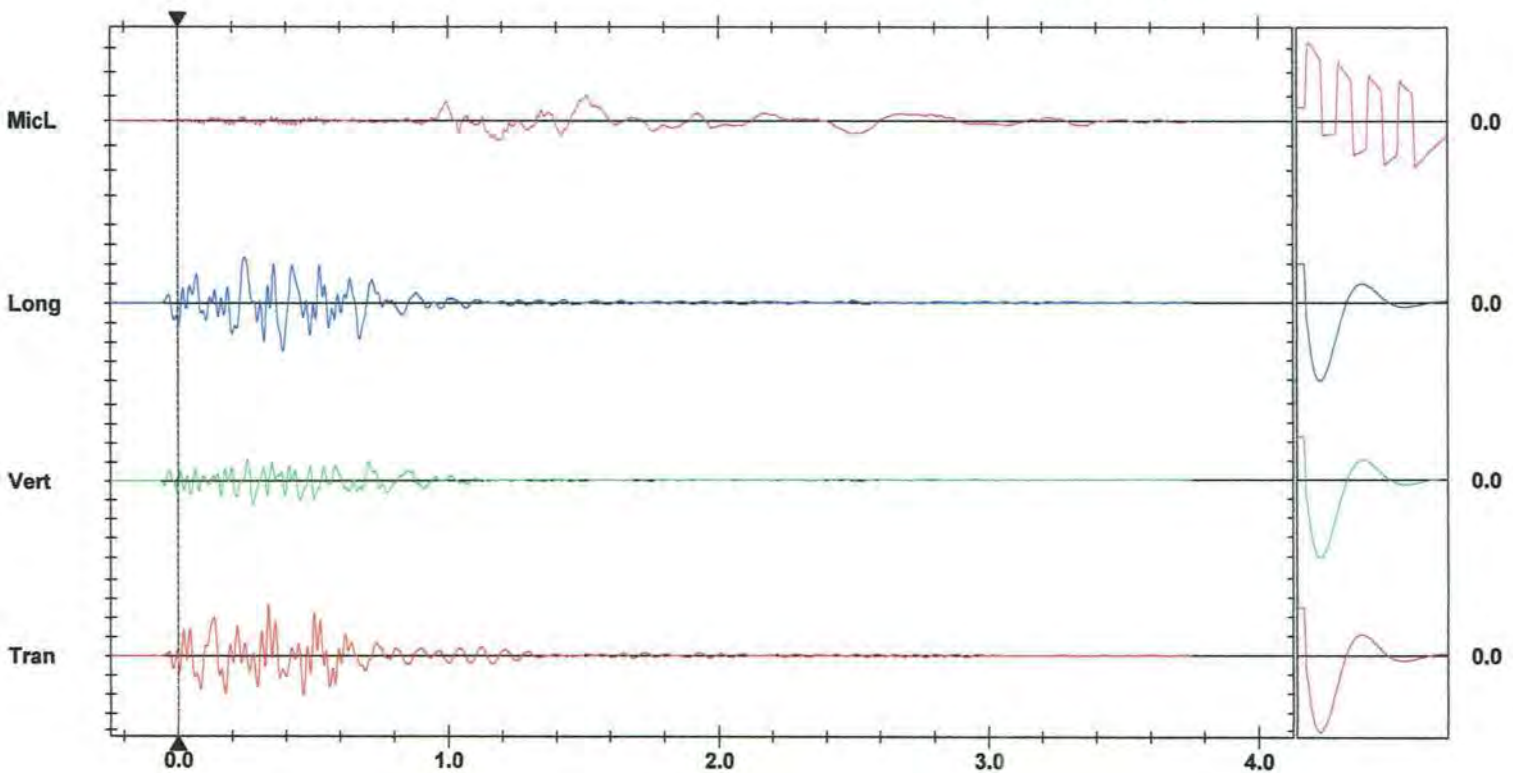
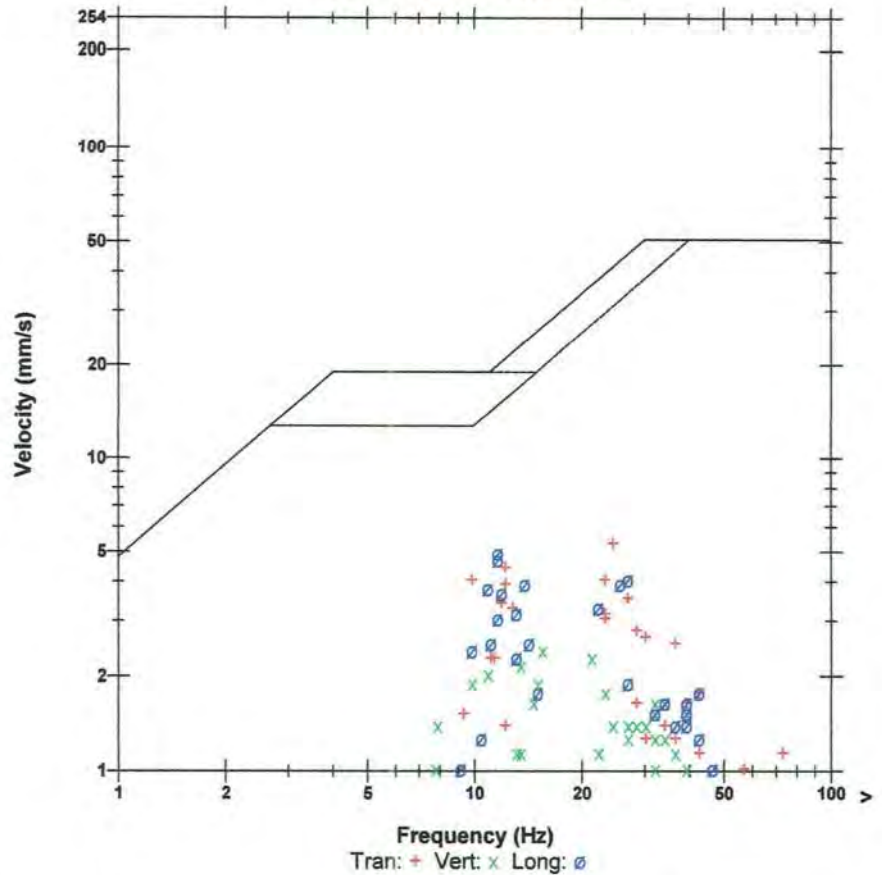
Extended Notes
 Sand Bagged

Microphone Linear Weighting
PSPL 114.2 dB(L) at 1.513 sec
ZC Freq 3.5 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 692 mv)

	Tran	Vert	Long	
PPV	5.334	2.413	4.953	mm/s
ZC Freq	24	16	12	Hz
Time (Rel. to Trig)	0.334	0.275	0.388	sec
Peak Acceleration	0.093	0.053	0.066	g
Peak Displacement	0.056	0.027	0.066	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.4	7.4	Hz
Overswing Ratio	3.7	3.9	4.2	

Peak Vector Sum 5.677 mm/s at 0.333 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 MicL at 12:02:29 October 2, 2018
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 1024 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.2 Volts
Unit Calibration November 3, 2017 by InstanTEL
File Name _TEMP.EVT
Scaled Distance 5850.2 (1850.0 m, 0.1 kg)

Notes

Location: SouthWest Corner of property
Client: Nelson Aggregates
User Name: Orica Canada
General: N. 44.39585; W-80.25085

Extended Notes

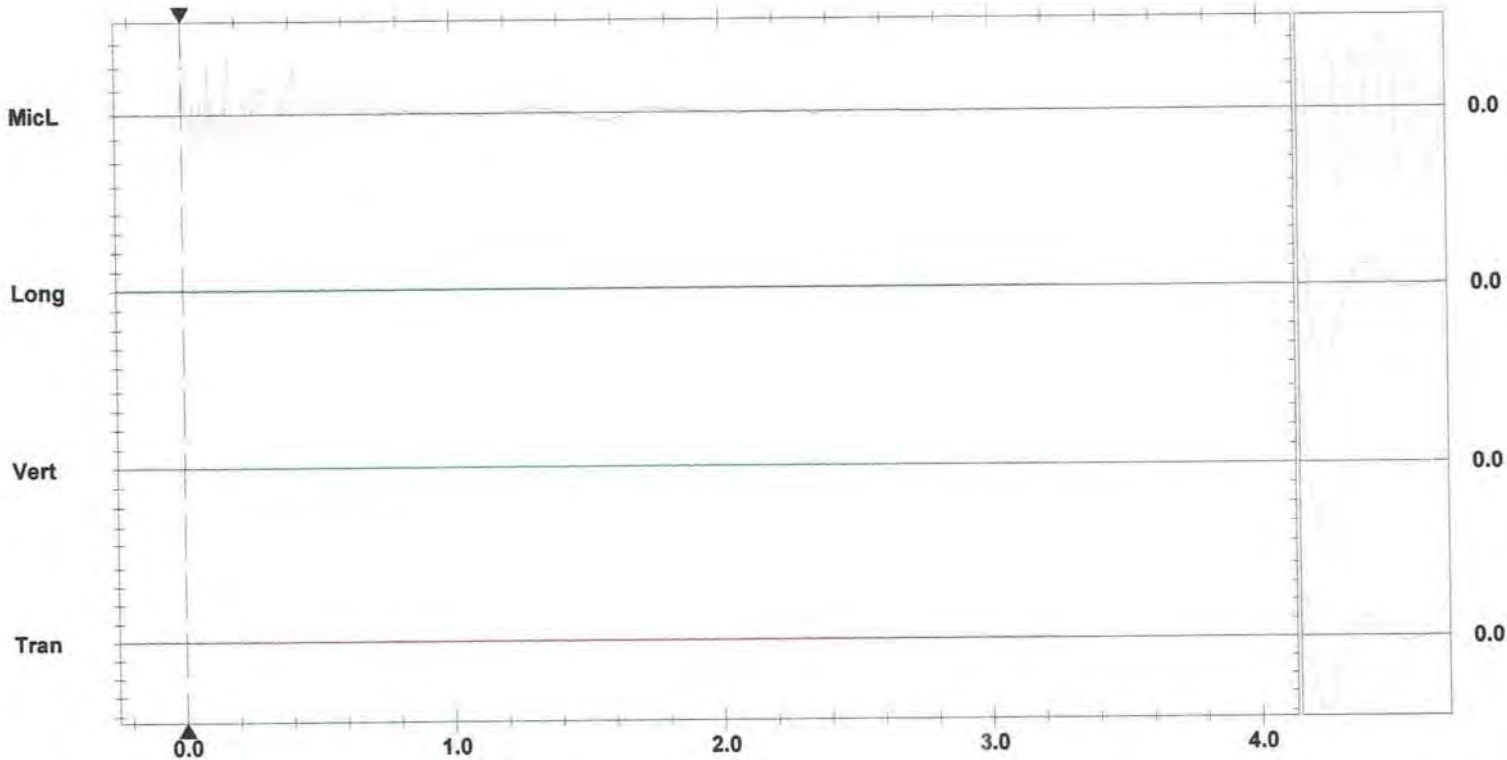
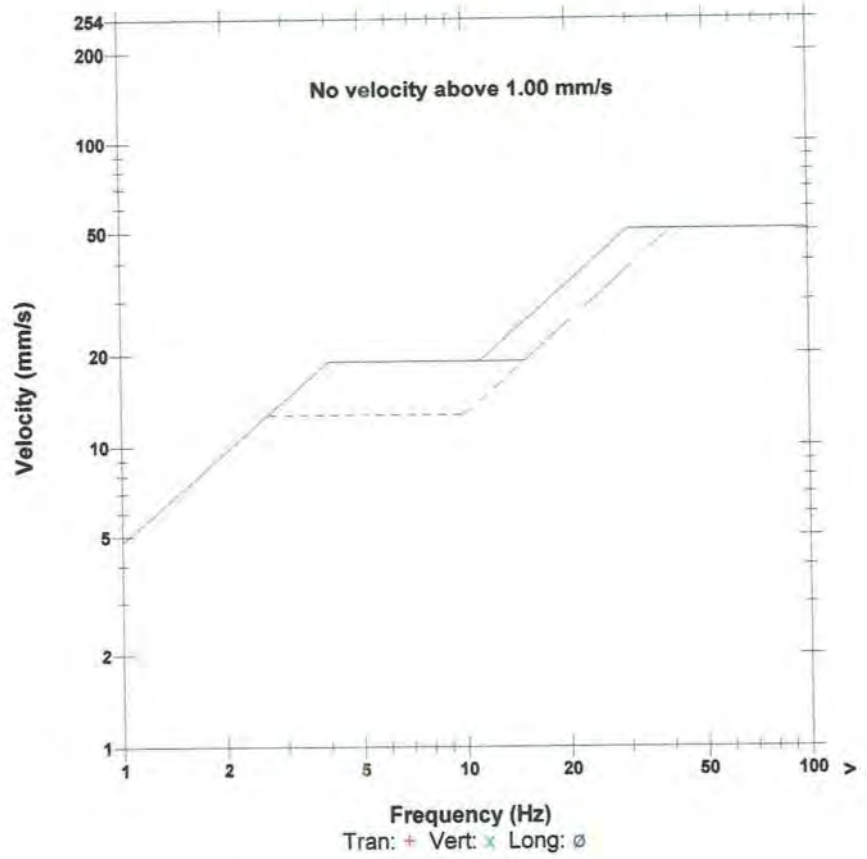
Sand Bagged

Microphone Linear Weighting
PSPL 123.5 dB(L) at 0.004 sec
ZC Freq 20 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 584 mv)

	Tran	Vert	Long	
PPV	0.254	0.508	0.254	mm/s
ZC Freq	>100	47	73	Hz
Time (Rel. to Trig)	0.032	0.197	0.037	sec
Peak Acceleration	0.013	0.013	0.027	g
Peak Displacement	0.001	0.002	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.9	3.7	4.1	

Peak Vector Sum 0.568 mm/s at 0.197 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

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Design Date: 2018-10-02

Blast Number: 18-017
 Orica Order #:

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)
 GPS Coordinates: 43.40374 °N Latitude 79.88268 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 26,093 te
 Total Holes Loaded: 48 holes
 ... including: Dead Holes
 ... and: 2 Helper Holes
 Helper Hole Collar: 60.0 ft avg
 # Rows Blasted: 4 rows

- Drilling Information -

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam:	<u>101.6</u> mm <u>0</u> °	# Holes: <u>48</u>	= 3,657.6 ft (<u>4</u> " diam)
Secondary Bit diam:	<u> </u> mm <u>0</u> °	# Holes: <u> </u>	= 0.0 ft (" diam)
Tertiary Bit diam:	<u> </u> mm <u>0</u> °	# Holes: <u> </u>	= 0.0 ft (" diam)

- Design Pattern (Front Row) -

Burden: 12.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 19 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 29 main body

Bench Height: 74.2 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 76.2 ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: 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: 69.2 ft avg
 Main Body: 69.2 ft avg

- Design Charge Weight -

Front Row: 201.8 kg/hole
 Main Body: 201.8 kg/hole
 Max Chge Wt / delay: 250.0 kg/delay

Required kg Loaded: 12,533 kg
 Rock Density: 2.65 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.480 kg/te (actual)
 Front row: 0.302 kg/te (theoretical)
 Main Body: 0.403 kg/te (theoretical)
 "KPI" PF: 0.377 kg/te (theoretical)

1.349 lb/yd³

1.799 lb/yd³

1.686 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	<u>12,500</u>

Pkgd Expl. Required:	kg

Boosters Required:	kg/u # used	kg
PENTEX 12 (OR EQUIVALENT)	<u>0.34 98</u>	<u>33.3</u>

total explosives weight in Blast (kg): 12,533
 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		<u>80</u>
UNITRONIC 600 15M		<u>66</u>
UNITRONIC 600 25M		<u>54</u>
UNITRONIC 600 30M		<u>36</u>

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	<u>units</u>	<u>1</u>
	<u>units</u>	
	<u>units</u>	

Resource Deployment:

# of Blasts today (this Quarry)		<u>1</u>
# of Blasters (this Blast)		<u>1</u>
# of Helpers (this Blast)	Note Exception	<u>2</u>
# of MMU's (this Blast)		<u>1</u>

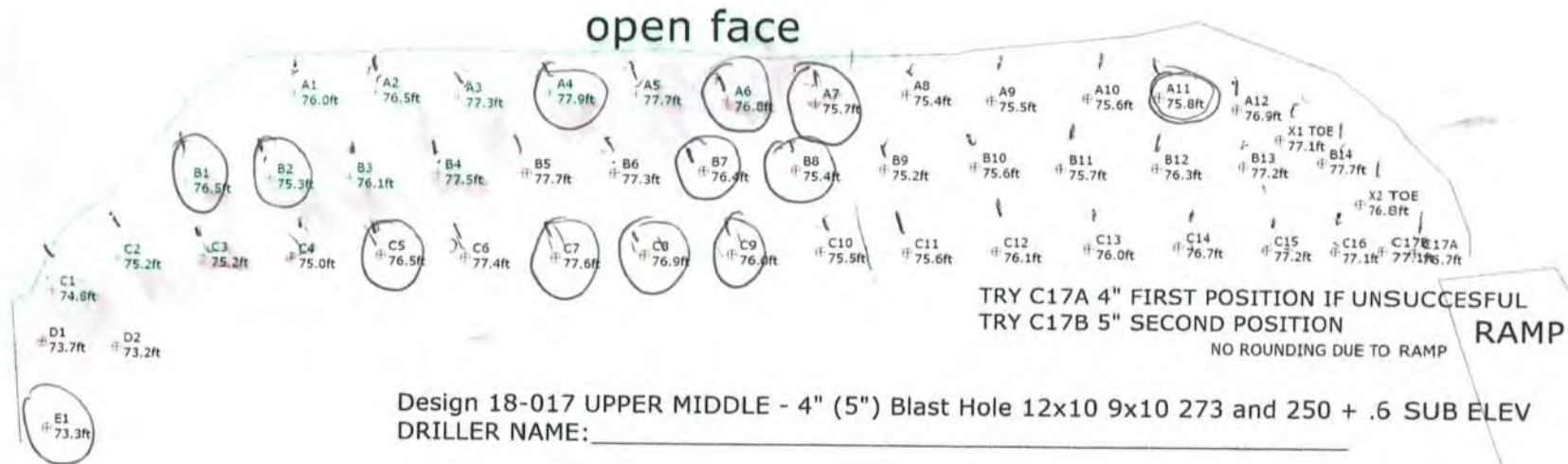
Services Req'd:

GPS LAYOUT	Enter hours	<u>0.0</u>
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	
HELPER HOURS	Enter total Helper man-hours	
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	<u>0</u>
3D LASER PROFILE	Enter hours	<u>0</u>
BORETRACK	Enter hours	<u>0</u>
TECHNICAL BLAST DESIGN	(per day) Enter # of days	<u>0.0</u>

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 6.0ft
 1st row burden: 12.1ft Hole Diameter: 4.0in Number of holes: 49 Hole angle: 0.0°
 Total drilled: 3733.8ft



Design 18-017 UPPER MIDDLE - 4" (5") Blast Hole 12x10 9x10 273 and 250 + .6 SUB ELEV
 DRILLER NAME: _____

SHOTPlus 5.7.0.8	9/5/2018
Mine	Burlington
Location	UPPER MIDDLE NO ROUNDING ON NORTH
Title/author	Design 18-017 UPPER MIDDLE
Filename	



Scale 1:250



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-11-01

Blast Number: 18-019

Orica Order #: 2407202

Blast Time: 11:57 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40371 °N Latitude 79.88251 °W Longitude
Centre of Blast Centre of Blast

Wind from the: at 0 kph Temperature: 6 to 10 °C

Clear: Partly Cloudy: Rain: X Snow: Overcast: Inversion: Ceiling 7.842 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 44 = 3,319.4 ft (4 " diam)
Secondary Bit diam: 114.3 mm	0	# Holes: 6 = 452.6 ft (4 1/2 " diam)
Tertiary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,970	22,720	11,250

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): 11,295
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			49
UNITRONIC 600 15M			10
UNITRONIC 600 20M			7
UNITRONIC 600 25M			66

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	5

Resource Deployment:

# of Blasts today (this Quarry)		1
# 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	>=10,000 kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	15.0
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	1.0

Tonnes Blasted:	27,342 te	10,516 m ³
Total tonnes per day:	27,342 te	NB80-01 Rate Code
Total Holes Loaded:	50 holes	
... including:	Dead Holes	
... and:	1 Helper Holes	
Helper Hole Collar:	60.0 ft avg	
# Rows Blasted:	5 rows	

- Pattern (Front Row) -

Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	22 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	28 main body

Bench Height: 73.4 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 75.4 ft avg

- Stone Decking -

Front Row:	8.0 ft avg
Main Body:	8.0 ft avg
# Decks:	16 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	.75' Stone

- Charge Length -

Front Row:	60.4 ft avg
Main Body:	60.4 ft avg

- Charge Weight -

Front Row:	176.2 kg/hole
Main Body:	176.2 kg/hole
Max. per delay:	288.0 kg/delay
SD () Equation:	160.6 kg/delay
Total kg Loaded:	11,295 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.413 kg/te (actual)
Front row:	0.272 kg/te (theoretical)
Main Body:	0.362 kg/te (theoretical)
"KPI" PF:	0.344 kg/te (theoretical)

1.810 lb/yd³
1.190 lb/yd³
1.587 lb/yd³
1.508 lb/yd³

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 Helper due to the amount of voids found on the drill log.

16 Stone decks in total



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-11-01

Blast Number: 18-019
Orica Order #: 2407202
Blast Time: 11:57 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40371	79.88251	0.757538	1.394213
Front Row Corner	43.40391	79.88264	0.757541	1.394215
Back Row Corner	43.40352	79.88237	0.757534	1.394210
Average (Centre of Blast)	43.40371	79.88251	0.757538	1.394213

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	380.2	m		
Post Blast Data:	ppV: 5.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 11.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.3	dB	Trigger set at: 124	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	965.3	m		
Post Blast Data:	ppV: 0.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.2	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 118.8	dB	Trigger set at: 120	dB
Coling rd & Blind Line (Bruce Trail)				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1257.1	m		
Post Blast Data:	ppV: 1.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 41.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 114.2	dB	Trigger set at: 120	dB
South West Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(380.2)^2}{30^2} \text{ kg}$$

$$= \frac{144,552}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 10/23/2018

Blast Number: 18-019

Orica Order #: 2407202

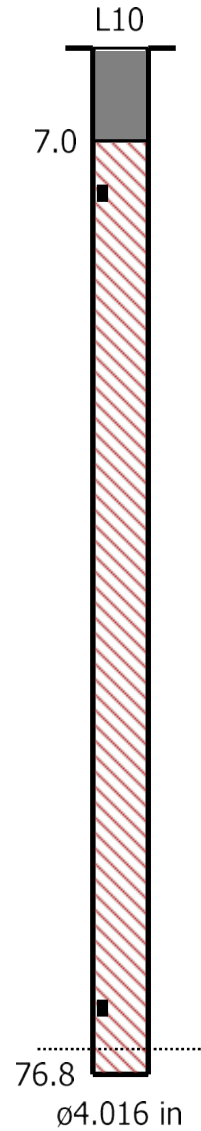
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
PENTEX BC 12 * 340 x1

UNI Tronic (?)ms 98ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Signature required, indicating sign off on Blast Design.

Date/Time MicL at 11:57:30 November 1, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.357 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/COLLING RD_BURLINGTO.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration February 14, 2018 by InstanTEL
File Name UM6857_20181101115730.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

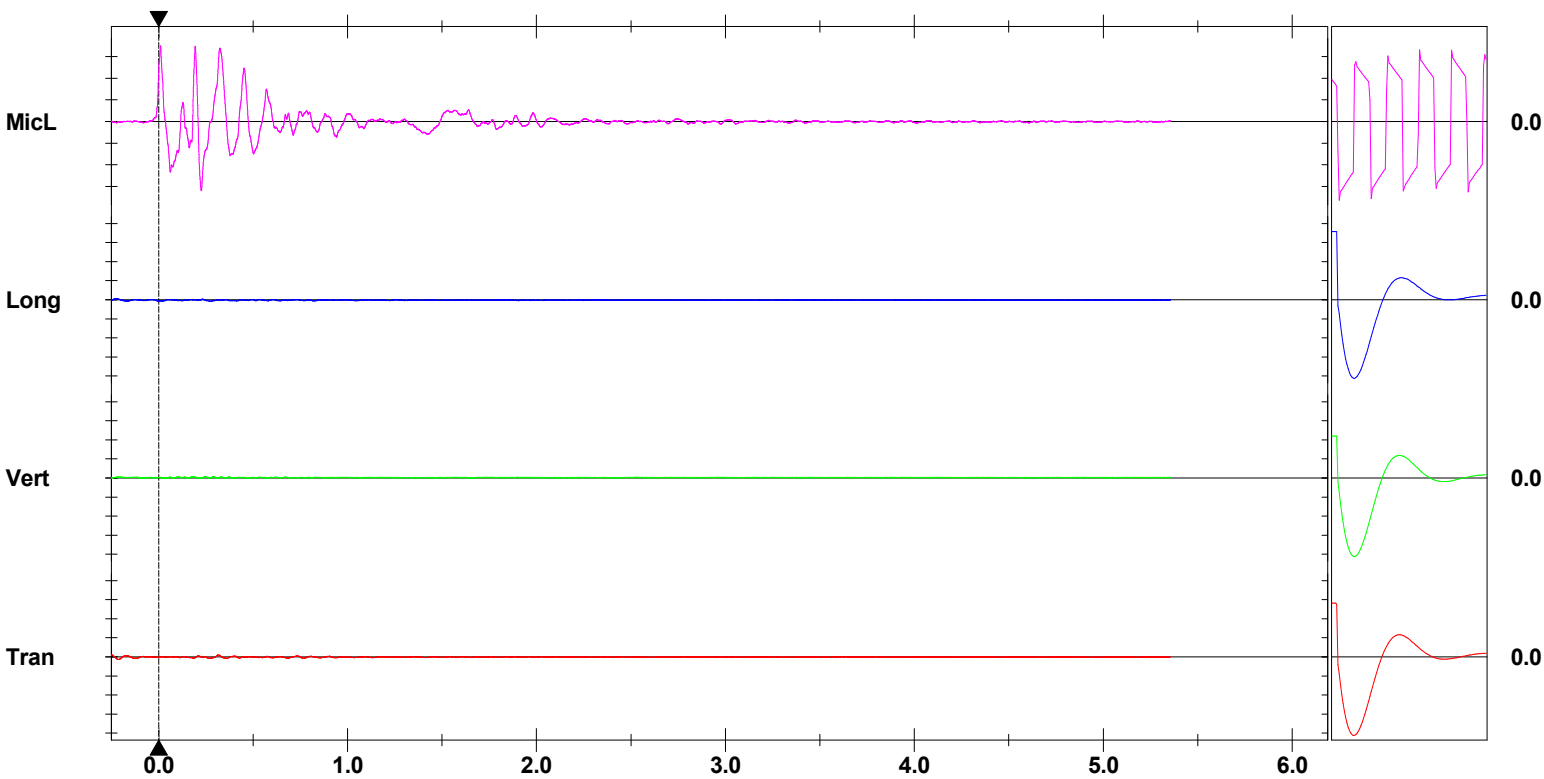
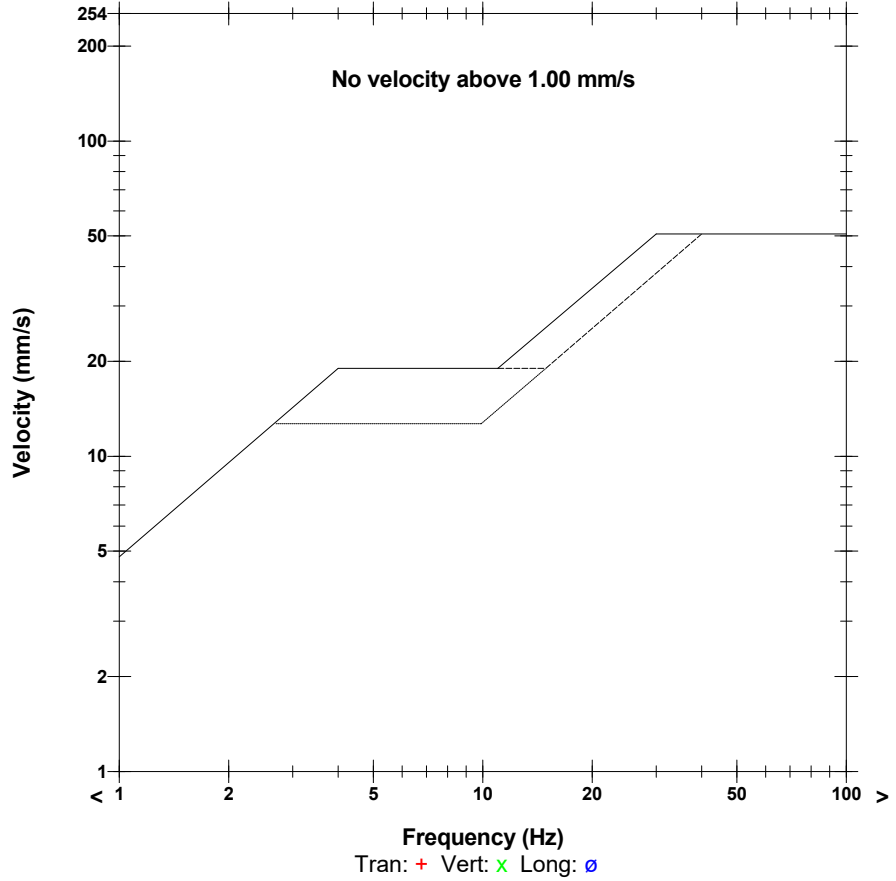
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 118.8 dB(L) at 0.010 sec
ZC Freq 5.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1551 mv)

	Tran	Vert	Long	
PPV	0.284	0.166	0.181	mm/s
ZC Freq	12.2	17.7	7.5	Hz
Time (Rel. to Trig)	-0.209	0.292	0.275	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.004	0.023	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.5	3.5	

Peak Vector Sum 0.299 mm/s at -0.209 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

Date/Time Long at 11:57:29 November 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/Nelson 2450 2nd.MMB

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 7, 2017 by InstanTel
File Name UM9119_20181101115729.IDFW

Notes

Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

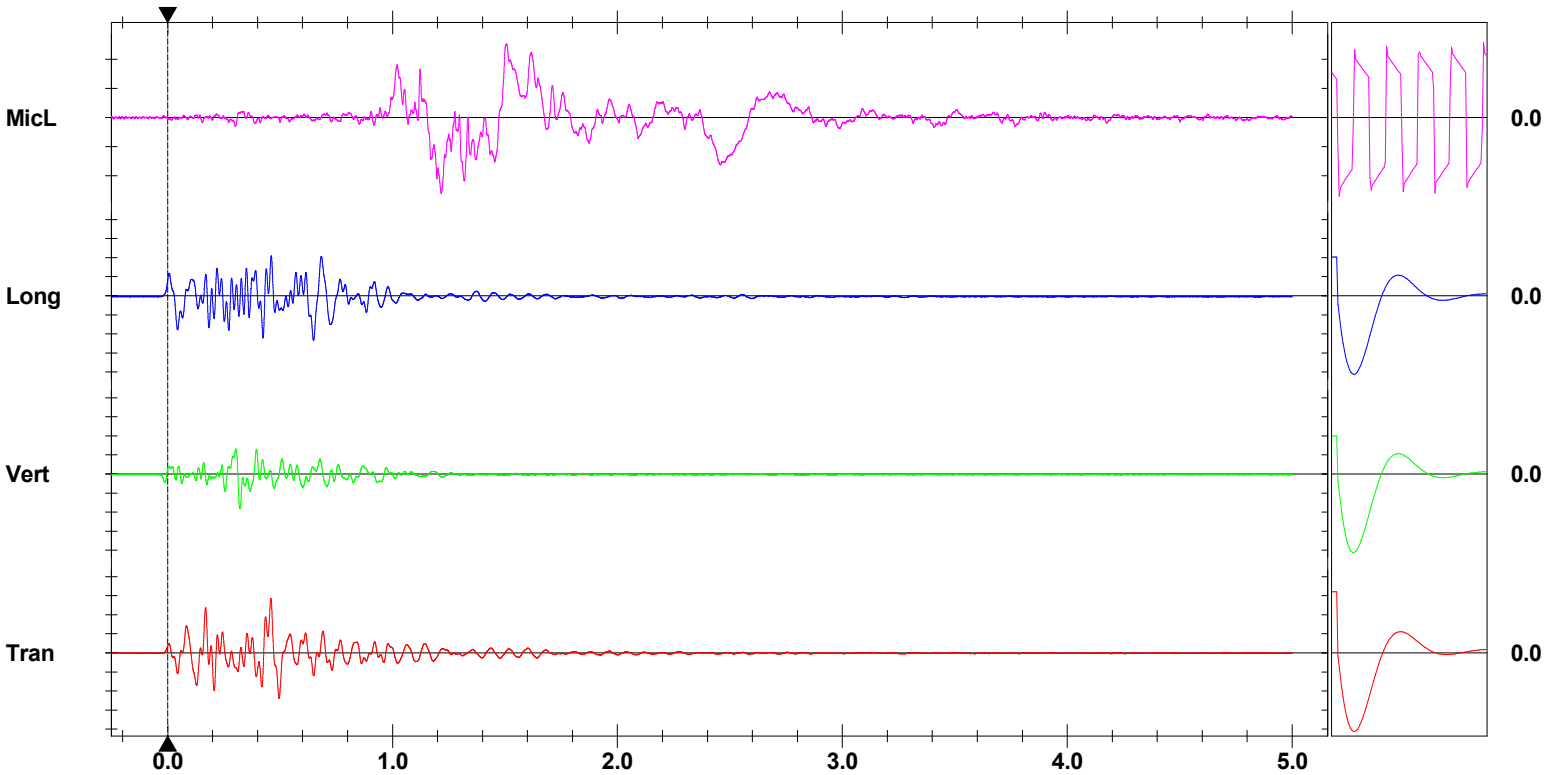
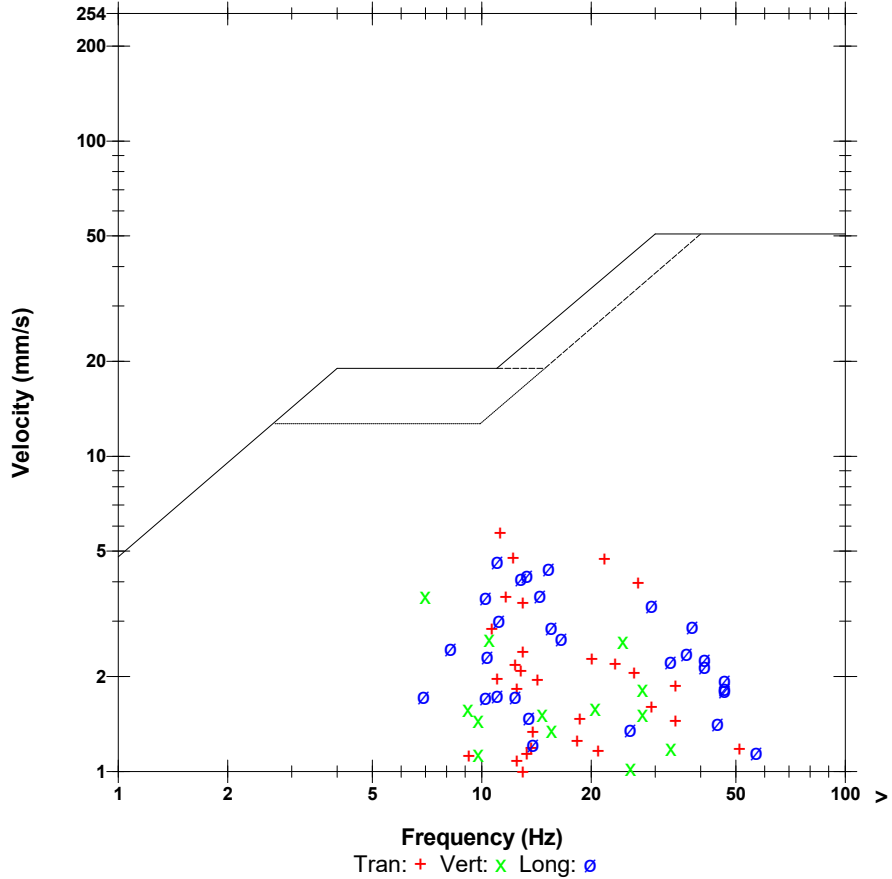
43.40245,-79.87814
 Sand Bagged

Microphone Linear Weighting
PSPL 116.3 dB(L) at 1.216 sec
ZC Freq 4.1 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1547 mv)

	Tran	Vert	Long	
PPV	5.714	3.618	4.658	mm/s
ZC Freq	11.3	7.0	11.0	Hz
Time (Rel. to Trig)	0.459	0.321	0.648	sec
Peak Acceleration	0.092	0.066	0.123	g
Peak Displacement	0.068	0.049	0.055	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.5	7.3	Hz
Overswing Ratio	3.7	3.8	3.8	

Peak Vector Sum 7.029 mm/s at 0.460 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 11:57:29 November 1, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.024 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Operator/Nelsons SW.mmb

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 22, 2017 by InstanTel
File Name UM6859_20181101115729.IDFW

Notes

Location: SouthWest Corner of Quarry
Client: Nelsons Burlington
User Name: Orica Canada Inc.
General: Monitoring Vibration and Airblast

Extended Notes

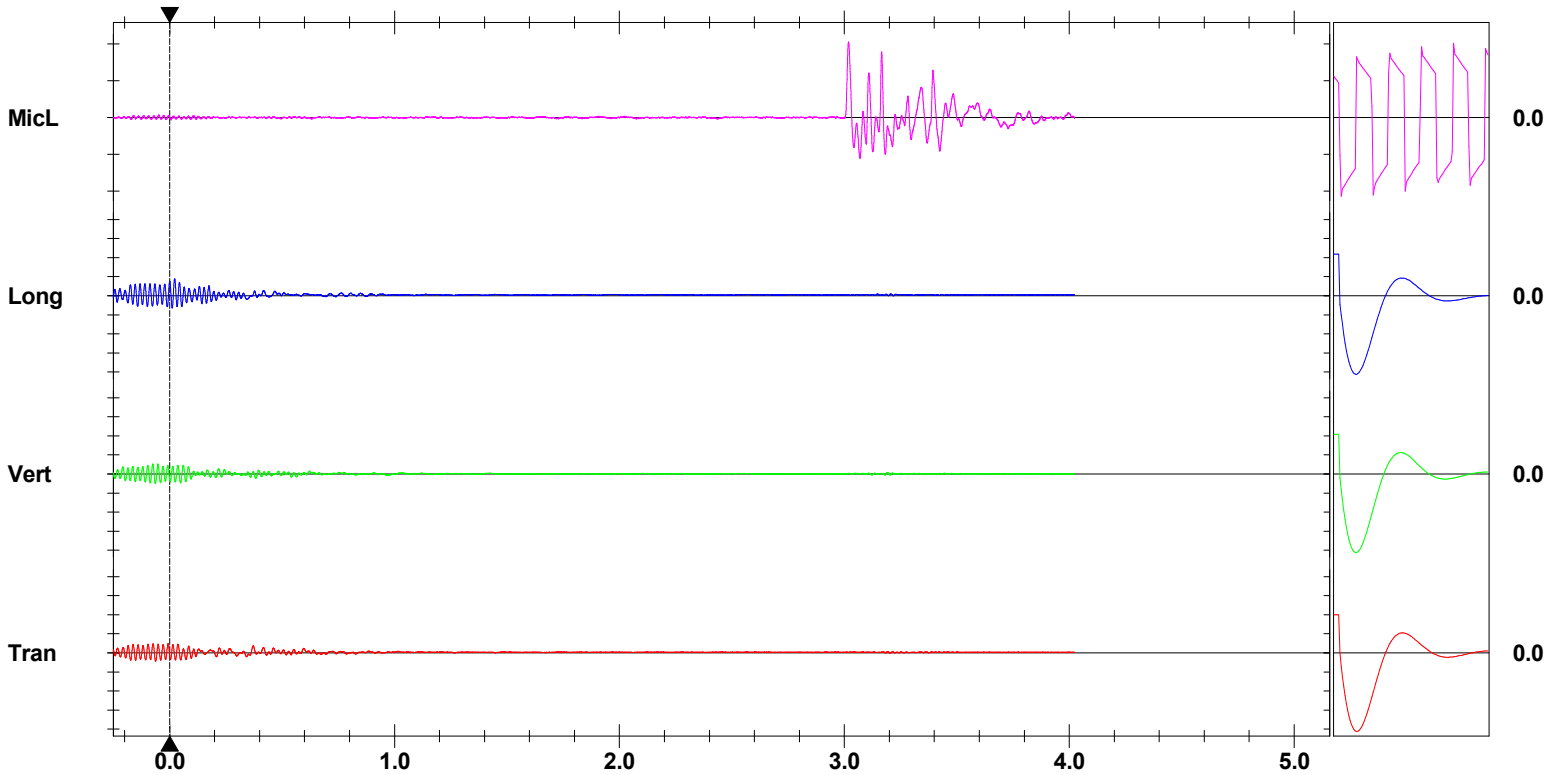
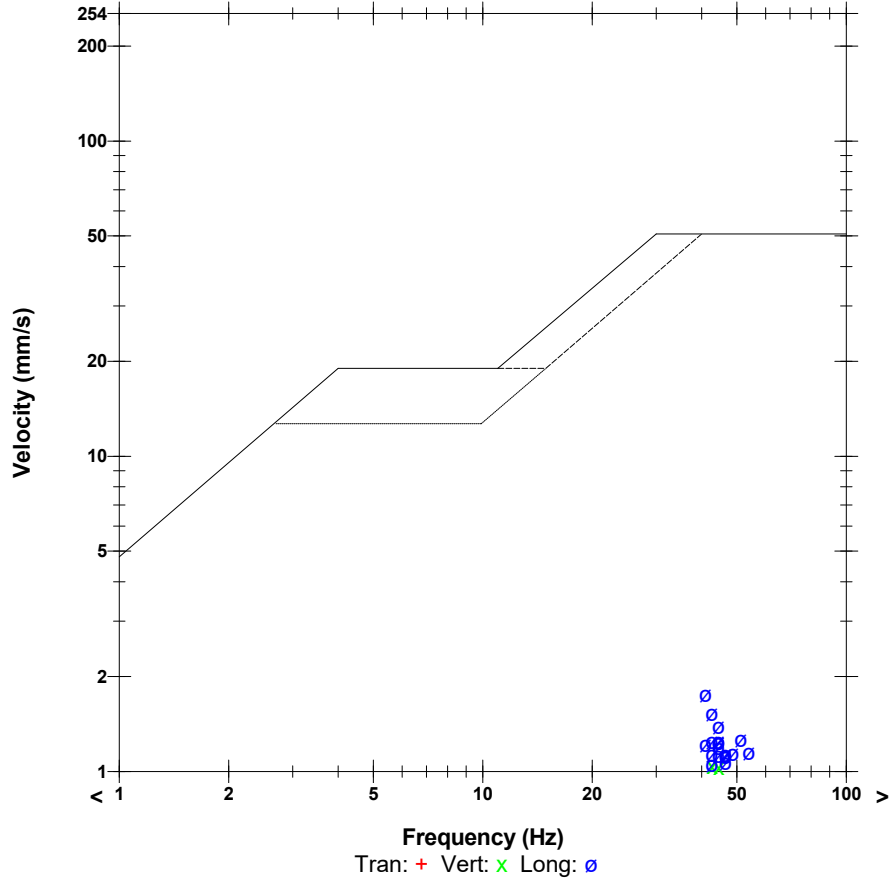
N 43.39339
 W 79.88880

Microphone Linear Weighting
PSPL 114.2 dB(L) at 3.019 sec
ZC Freq 17.1 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1525 mv)

	Tran	Vert	Long	
PPV	0.977	1.040	1.766	mm/s
ZC Freq	43	43	41	Hz
Time (Rel. to Trig)	-0.007	-0.052	0.022	sec
Peak Acceleration	0.031	0.038	0.048	g
Peak Displacement	0.060	0.004	0.105	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.6	4.4	

Peak Vector Sum 1.938 mm/s at 0.023 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 =

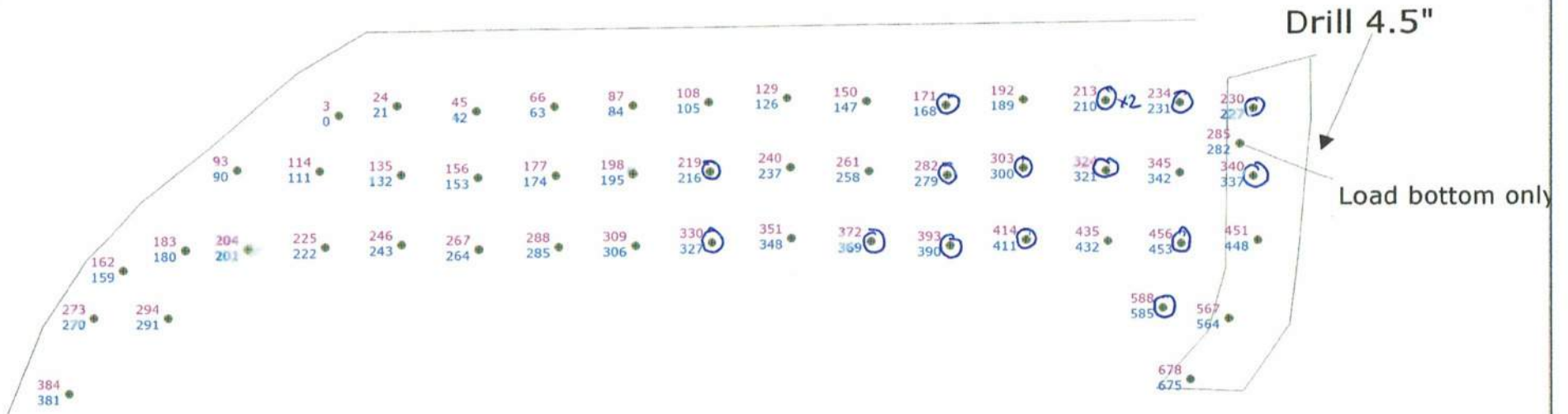
Sensor Check

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.3ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 50	Hole angle: 0.0°
Total drilled: 3772.9ft			

O = DECK



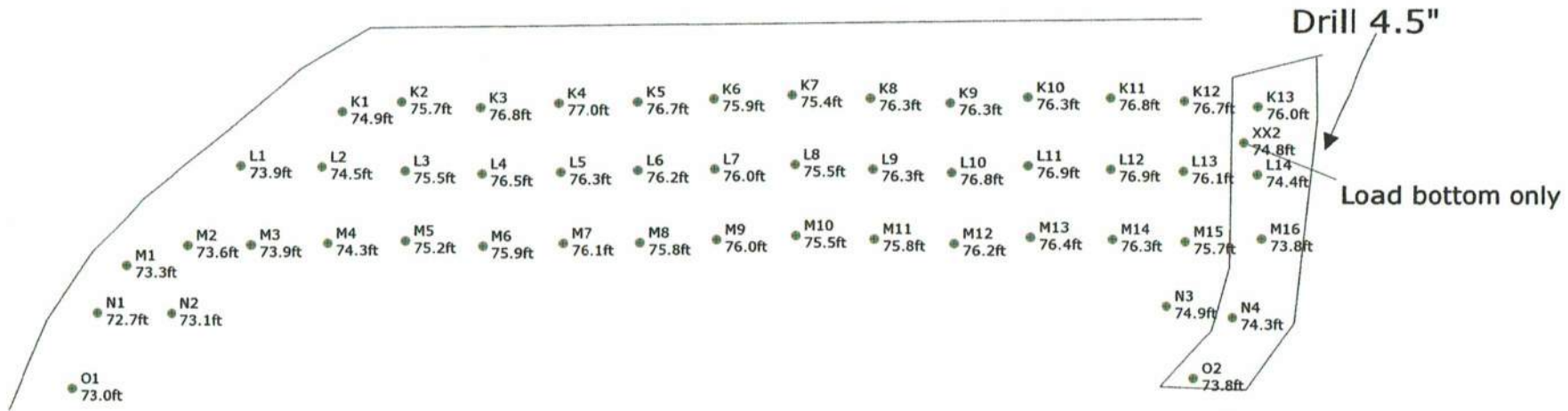
Not to scale

SHOTPlus™ Professional 5.7.3.0	10/31/2018
Mine	Burlington
Location	UPPER MIDDLE SOUTH FACE SCAN Design
Title/author	Design 18-019 UPPER MIDDLE Partial Fnl
Filename	2018-11-02 18-019 Revised Timing Upper Mid

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.3ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 50	Hole angle: 0.0°
Total drilled: 3772.9ft			



Not to scale

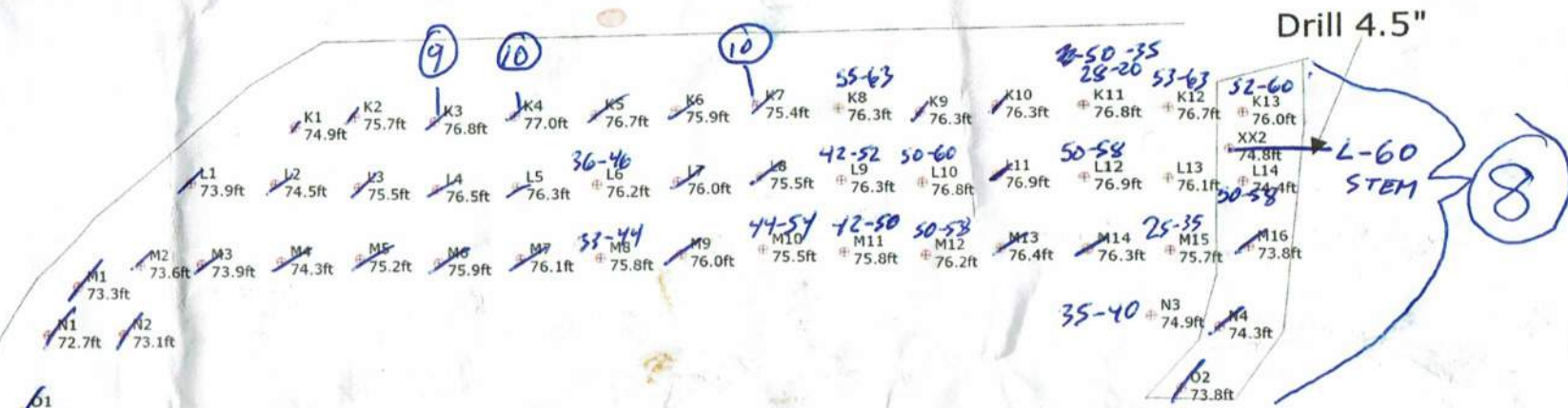
SHOTPlus™ Professional 5.7.3.0		11/1/2018
Mine	Burlington	
Location	UPPER MIDDLE SOUTH FACE SCAN Design	
Title/author	Design 18-019 UPPER MIDDLE Partial Fnl	
Filename	2018-11-02 18-019 Revised Timing Upper Mid	

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.3ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 50	Hole angle: 0.0°
Total drilled: 3772.9ft			

16 DECKS



Design 18-019 UPPER MIDDLE Partial Fnl - 4" Blast Hole 12x10 9x10 274 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Not to scale

SHOTPlus™ Professional 5.7.3.0	10/23/2018
Mine	Burlington
Location	UPPER MIDDLE SOUTH FACE SCAN Design
Title/author	Design 18-019 UPPER MIDDLE Partial Fnl
Filename	Dessign_18-019_Upper_Middle_Partial_Fnl.sp

1091137

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

GROSS / BRUT
TARE
NET
TIME IN HEURE D'ENTRÉE
TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE
B/L NUMBER N° DE CONNAISSEMENT

Bill of Lading / Connaissancement



CONSIGNOR EXPÉDITEUR
GRAND VALLEY
033411 SIDE ROAD 21-22
GRAND VALLEY ON
CA L9W 7G1

CONSIGNEE CONSIGNATAIRE
NELSON AGGREGATE COMPANY
BURLINGTON ON
CA L7R 4L8

REPRINT

PAGE 2

Table with 4 columns: DATE REQUIRED, TIME REQUIRED, INVOICE TO / BUYER, CUSTOMER REFERENCE NO. Includes handwritten notes like 'PT 15013'.

Main table with columns: QTY, UM, DG MD, QTY. RET'D, QTY. SOLD, DESCRIPTION, # OF / DE PKGS., AMOUNT MONTANT. Lists items like PENTEX BC 340, Harness Wire Duplex, etc.

24 HOUR NUMBER 1-613-996-6666
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE
EMERGENCY RESPONSE NO/24 HOUR NUMBER
PLACARDS OFFERED / PLACARDS OFFERT

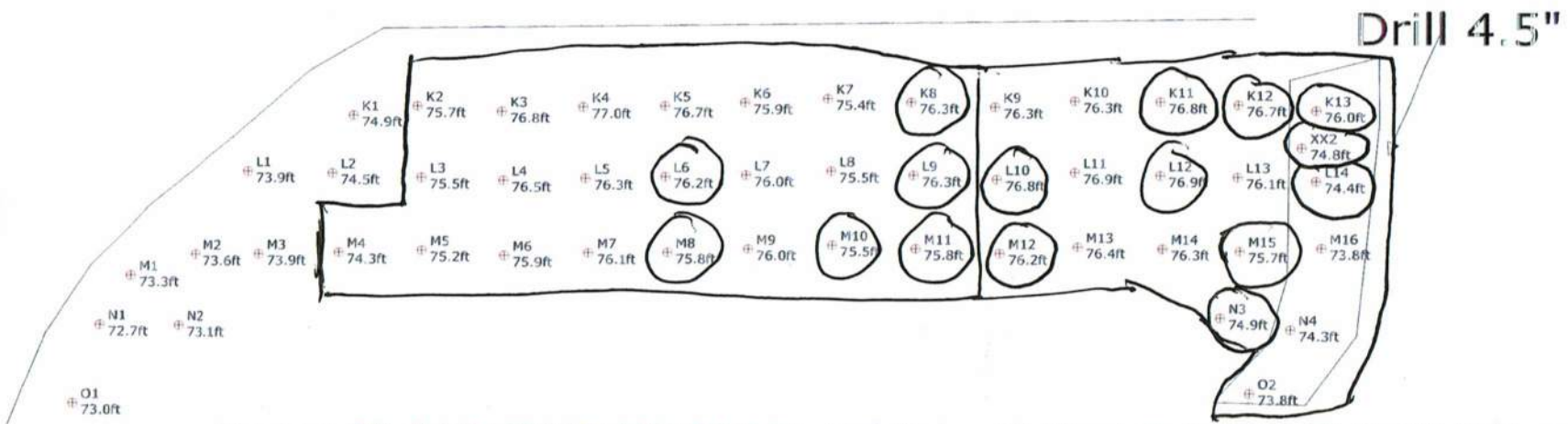
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED...
NETTE No. CONV PRESSAGE WT AGREEMENT NO.

CONSIGNOR / EXPÉDITEUR: GRAND VALLEY
CARRIER / TRANSPORTEUR: Orica Truck
CONSIGNEE / DESTINATAIRE: NELSON AGGREGATE COMPANY
SHIPPER'S NAME: Ryan Benham
DRIVER'S NAME: Ryan Benham
RECEIVER'S NAME: Nelson Aggregate Company

Blast Summary Data

Burden: 9.3ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.1ft	Hole Diameter: 4.0in	Number of holes: 50	Hole angle: 0.0°
Total drilled: 3772.9ft			

4" dia = 3326"
 4½" dia = 4471"



Design 18-019 UPPER MIDDLE Partial Fnl - 4" Blast Hole 12x10 9x10 274 and 250 +
 DRILLER NAME: _____



Not to scale

SHOTPlus™ Professional 5.7.4.19	11/10/2018
Mine	Burlington
Location	UPPER MIDDLE SOUTH FACE SCAN I
Title/author	Design 18-019 UPPER MIDDLE Partia
Filename	Dessign_18-019_Upper_Middle_Partia



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2018-11-08

Blast Number: 18-020

Orica Order #: 2410149

Blast Time: 11:57 AM

page 1

Blaster-in-charge: Mike derkinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40437 °N Latitude 79.88535 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 5 kph Temperature: 1 to 5 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: X Ceiling: 3,758 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 251 = 2,756.0 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	25,140	22,650	2,490

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	251	85.3

total explosives weight in Blast (kg): 2,575

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
EXEL HANDIDET 9m		25/500	251
CONNECTADET 9M		25 ms	18
CONNECTADET 9M		42 ms	23
UNITRONIC 600 6M			2

Cord & Accessories:

	U of M	# used
HARNESS WIRE DUPLEX (6 PACK) 400M	units	0

Resource Deployment:

# of Blasts today (this Quarry)		1
# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	3
# of MMU's (this Blast)		1

Services:

GPS LAYOUT	Enter hours	2.5
BULK TRUCK CHARGE	>=2,000kg <5,000kg	1
BLASTER HOURS	Enter Blaster hours	7.0
HELPER HOURS	Enter total Helper man-hours	18.0
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: 24,552 te 9,443 m³
Total tonnes per day: 24,552 te NF-14 Rate Code
Total Holes Loaded: 251 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 12 rows

- Pattern (Front Row) -

Burden: 11.0 ft avg
Spacing: 11.0 ft avg
Holes: 21 front row

- Pattern (Main Body) -

Burden: 11.0 ft avg
Spacing: 11.0 ft avg
Holes: 230 main body

Bench Height: 11.0 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 11.0 ft avg

- Stone Decking -

Front Row: ft avg
Main Body: ft avg
Decks: per blast

- Collar Stemming -

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg
Material used: .75" Stone

- Charge Length -

Front Row: 4.0 ft avg
Main Body: 4.0 ft avg

- Charge Weight -

Front Row: 11.6 kg/hole
Main Body: 11.6 kg/hole
Max. per delay: 21.0 kg/delay
SD () Equation: 429.0 kg/delay
Total kg Loaded: 2,575 kg
Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.105 kg/te (actual)
Front row: 0.119 kg/te (theoretical)
Main Body: 0.119 kg/te (theoretical)
"KPI" PF: 0.119 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:

1 Extra helper due to the number of holes

1 Advanced Blast design



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-11-08

Blast Number: 18-020
Orica Order #: 2410149
Blast Time: 11:57 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40442	79.88533	0.757550	1.394262
Front Row Corner	43.40454	79.88495	0.757552	1.394255
Back Row Corner	43.40417	79.88577	0.757546	1.394270
Average (Centre of Blast)	43.40437	79.88535	0.757549	1.394262

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	621.4	m		
Post Blast Data:	ppV: 2.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 43.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 110.4	dB	Trigger set at: 115	dB
2450 2nd Line (Beside cut tree stump in front yard)				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1254.2	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
South West Corner of Property				

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(621.4)^2}{30^2} \text{ kg}$$

$$= \frac{386,138}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.



Blast Design

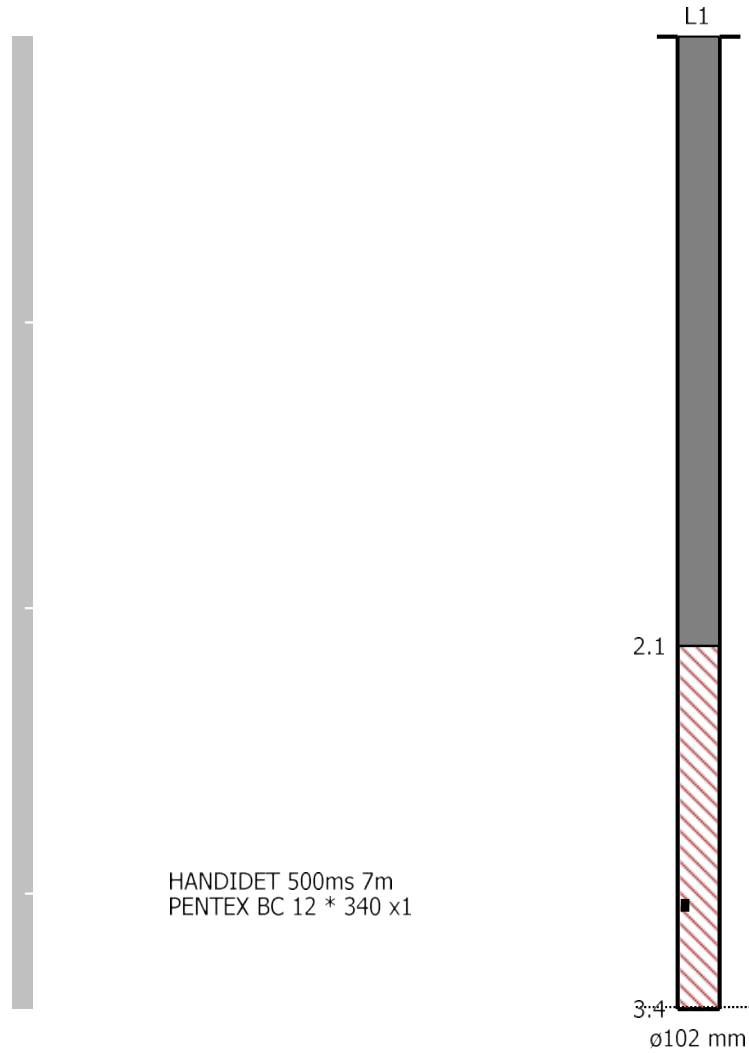
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 11/8/2018

Blast Number: 18-020
Orica Order #: 2410149

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 12:57:15 November 8, 2018
Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.0 sec at 2048 sps
Operator/Setup: ORICA CANADA/Nelson 2450 2nd.mmb

Serial Number UM9119 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 7, 2017 by InstanTEL
File Name UM9119_20181108125715.IDFW

Notes

Location: 2450 2nd Line
 Client: Nelson Aggregates
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

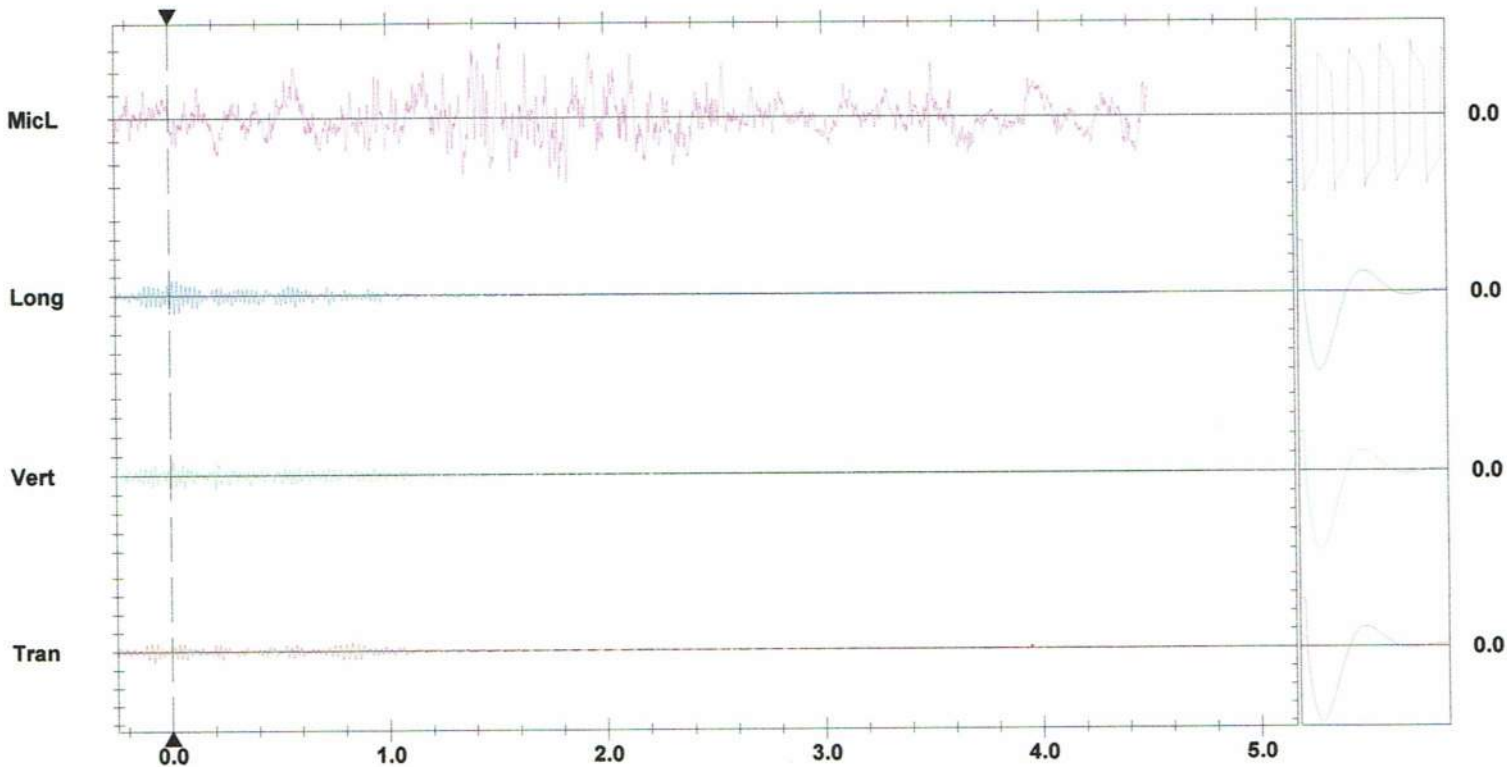
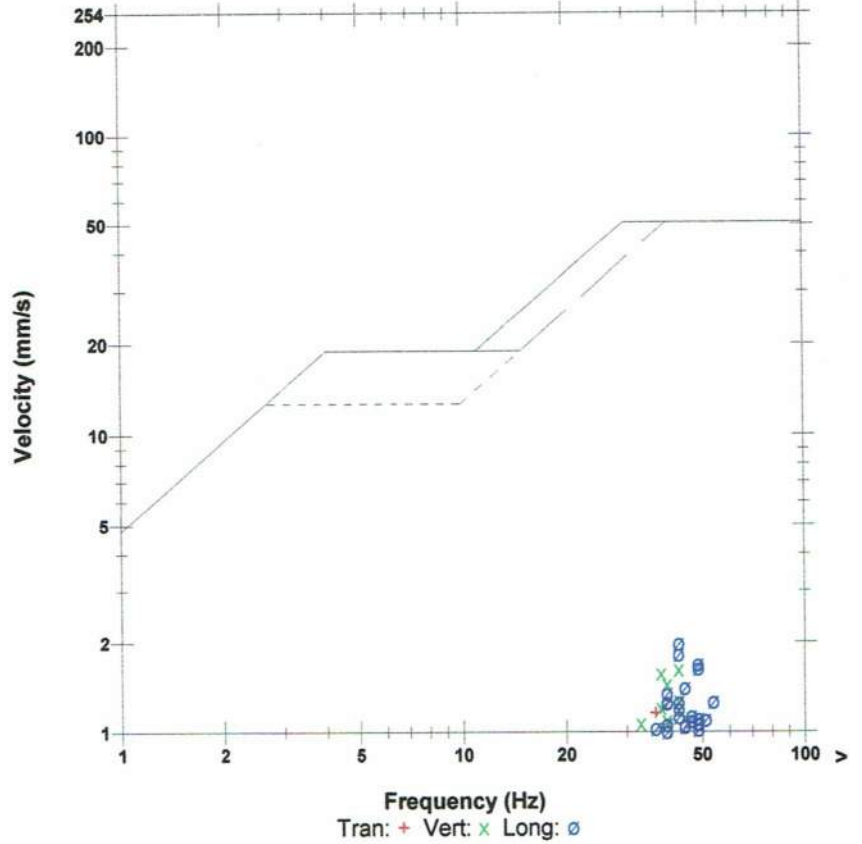
43.40245,-79.87814
 Sand Bagged

Microphone Linear Weighting
PSPL 110.4 dB(L) at 1.525 sec
ZC Freq 14.2 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1585 mv)

	Tran	Vert	Long	
PPV	1.151	1.616	1.978	mm/s
ZC Freq	37	43	43	Hz
Time (Rel. to Trig)	-0.081	0.013	0.022	sec
Peak Acceleration	0.031	0.046	0.089	g
Peak Displacement	0.005	0.008	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.3	Hz
Overswing Ratio	3.9	3.9	3.9	

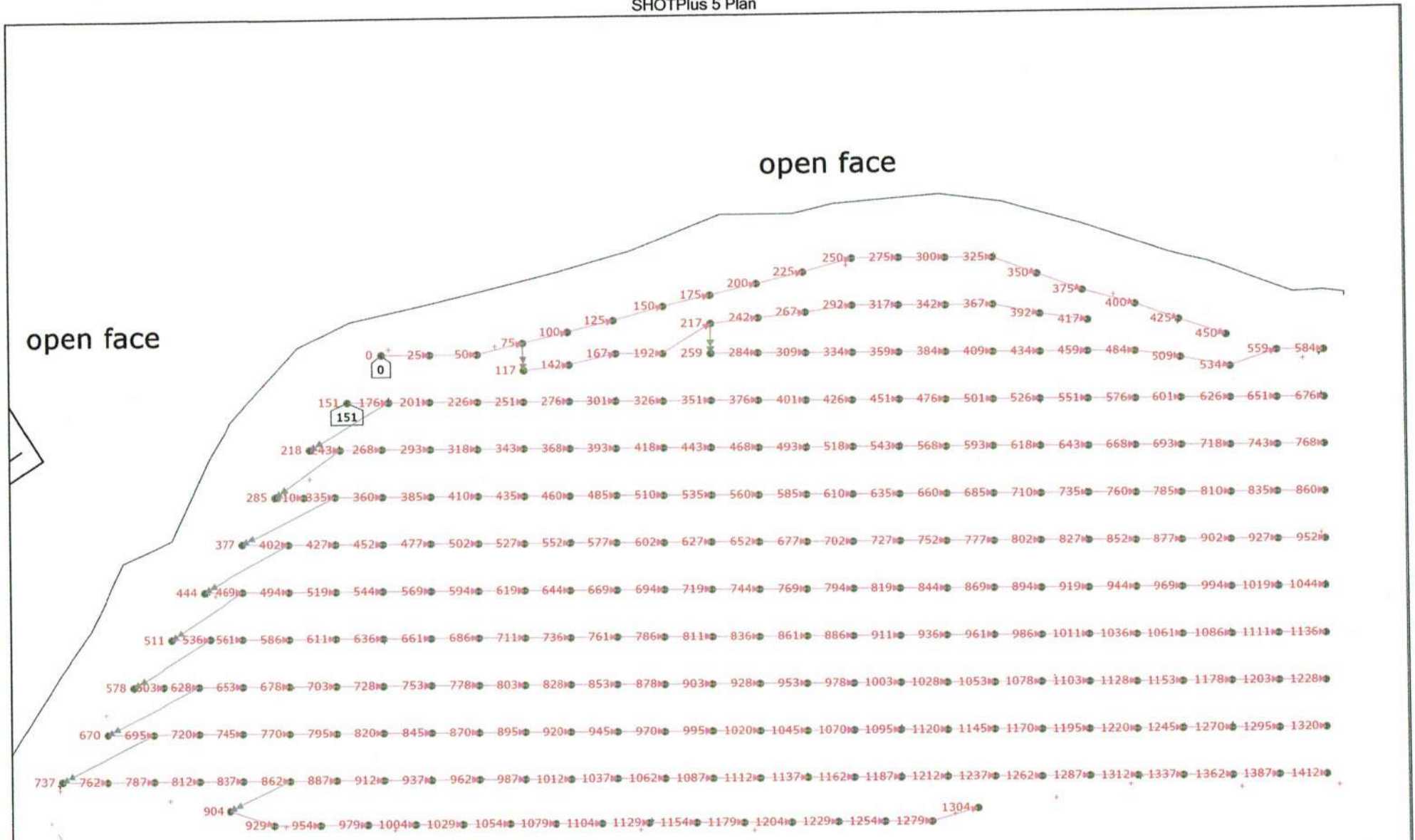
Peak Vector Sum 2.305 mm/s at 0.023 sec

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



ARMOUR STONE ROW

ARMOUR STONE ROW

ARMOUR STONE ROW

Design 18-020 FLOOR Fnl - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV

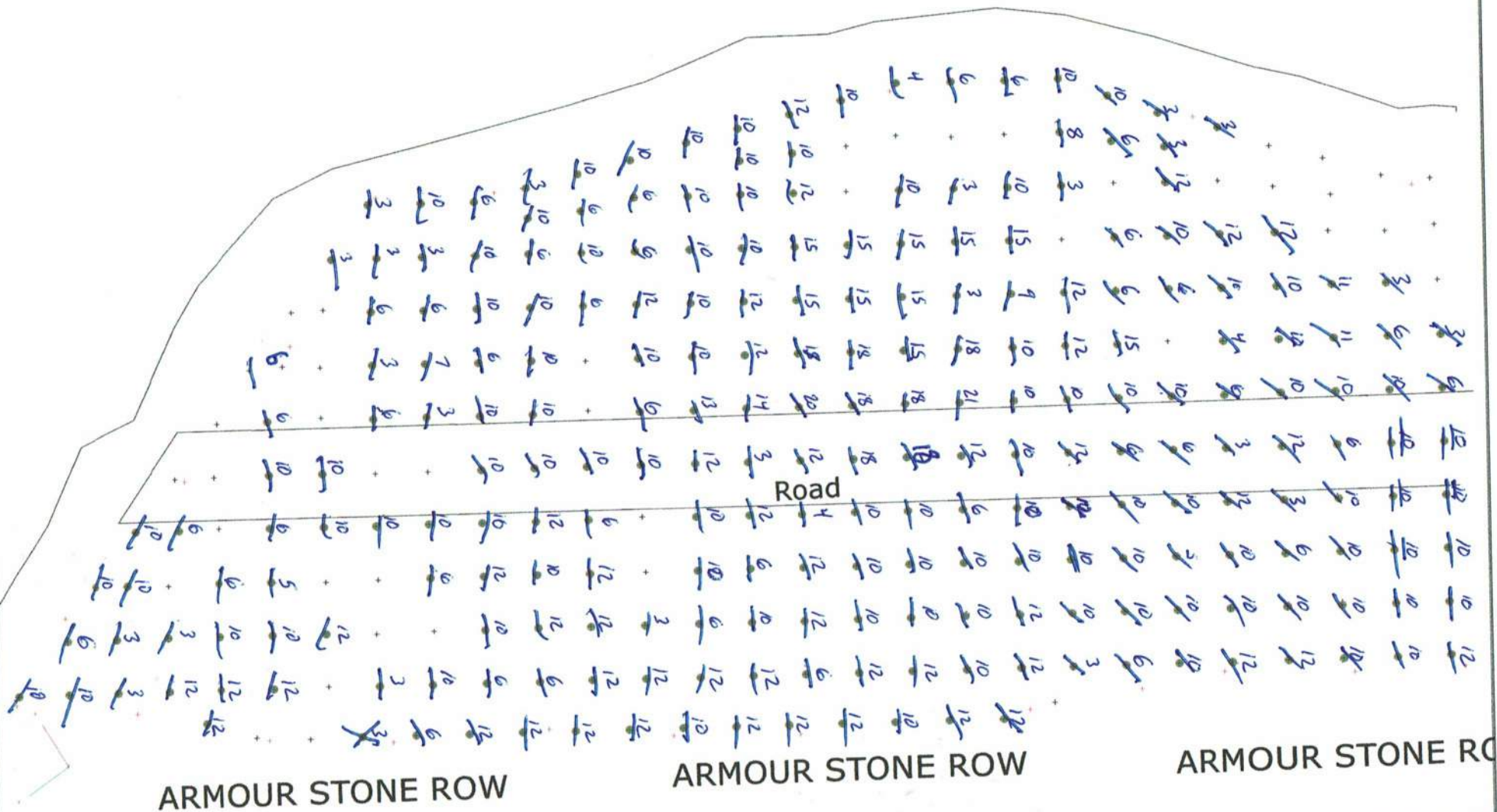


DRILL TO SHALE

Not to scale

SHOTPlus™ Professional 5.7.4.4		11/8/2018
Mine	Burlington	
Location	FLOOR	
Title/author	Design 18-020 FLOOR	
Filename	Design_18-020_FLOOR_Final R1.spf	

Load sheet
Max Load 21Kg



Not to scale

SHOTPlus™ Professional 5.7.4.4	11/7/2018
Mine	Burlington
Location	FLOOR
Title/author	Design 18-020 FLOOR
Filename	Design_18-020_FLOOR_Final.spf

SHOTPlus 5 Plan

Blast Summary Data

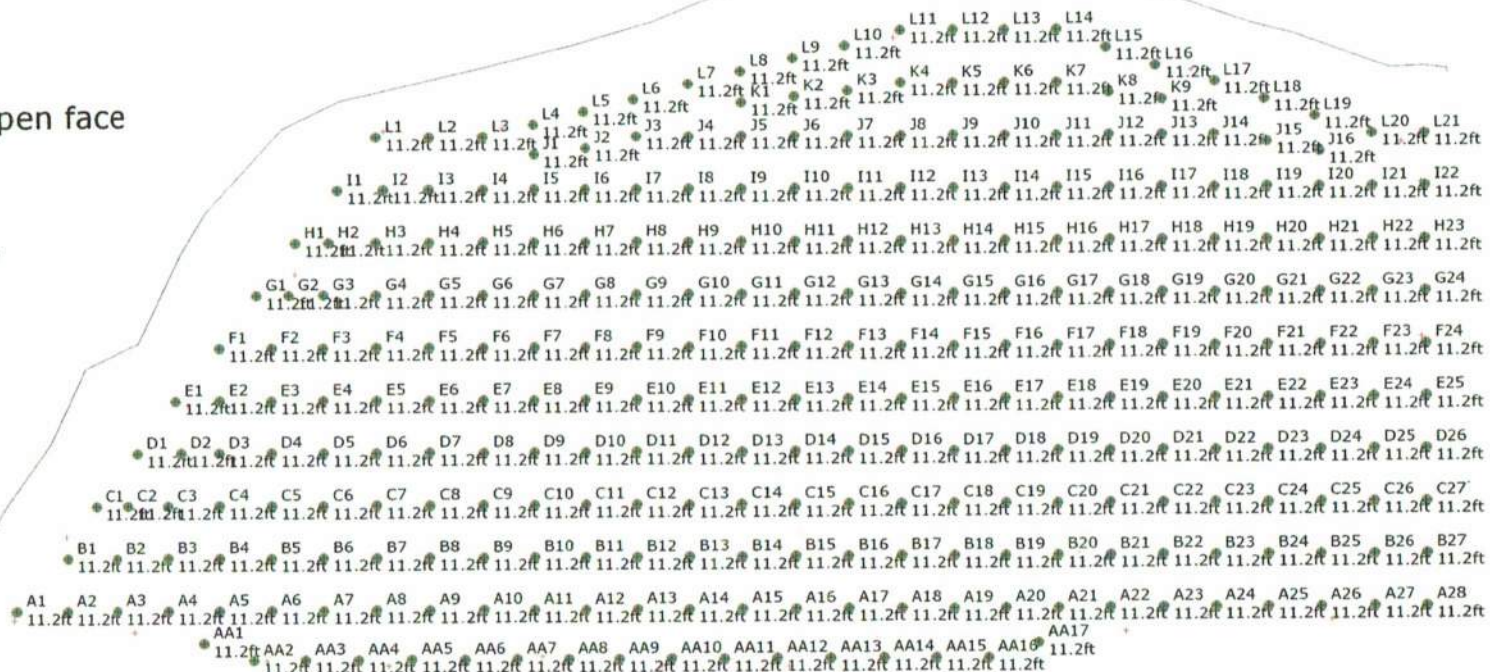
Burden: 11.8ft	Spacing: 11.8ft	Subdrill: 0.0ft	Stemming: 5.6ft
1st row burden: 11.8ft	Hole Diameter: 4.0in	Number of holes: 289	Hole angle: 0.0°
Total drilled: 3228.3ft			

open face

open face



= BILL'S
MARKI
STONES



ARMOUR STONE ROW ARMOUR STONE ROW ARMOUR STONE ROW

Design 18-020 FLOOR Fnl - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV



DRILL TO SHALE

Not to scale

SHOTPlus™ Professional 5.7.3.0	11/1/2018
Mine	Burlington
Location	FLOOR
Title/author	Design 18-020 FLOOR
Filename	Design_18-020_FLOOR_Final.spf

1091195

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
 FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISSEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES
 SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.



Orica Canada Inc.

GRAND VALLEY

CONSIGNOR
EXPÉDITEUR

033411 SIDE ROAD 21-22

GRAND VALLEY ON
CA L9W 7G1

Bill of Lading / Connaissance

GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2410149	86192440

CONSIGNEE
CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON
CA L7R 4L8

DATE REQUIRED DATE REQUISE	TIME REQUIRED HEURE REQUISE	INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT
08 Nov 2018	00:00:00	NELSON AGGREGATE COMPANY	n/a
DATE SHIPPED EXPÉDIÉ LE	FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE
08 Nov 2018	FOB Dest'n, Own Truck	F-73289	PT18230
SHIP VIA TRANSPORTEUR	ROUTING ITINÉRAIRE	MAG. LIC. NO. N° DE PERMIS	
Orica Truck	STANDARD		

QTY. QTÉ.	UM	DG MD	QTY. RET'D QTÉ. RET.	QTY. SOLD QTÉ. FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT
NET EXPLOSIVES QUANTITY:					117.137 KG		
343	PC	X	92	251	PENTEX BC 340 (49/CS)	7	125.195
1	PC		1	0	Harness Wire Duplex (6 pack) 400m	1	2.920
5	PC	X	3	2	*uni tronic 600-06.0M CU/ZC(20')80PC	1	0.365
100	PC		100	0	MINI STEM PLUGS - PART #74853		0.700
390	PC	X	139	251	EXEL HANDIDET 9M 25/500(30') 65/CS	6	39.390
65	PC	X	47	18	EXEL Connectadet 9M 25MS (30 FT) 65/CS	1	6.305
65	PC	X	42	23	EXEL Connectadet 9M 42MS (30 FT) 65/CS	1	6.370
1	PC				LICENSED BLASTER		
1.0	HR				LABOUR CHARGE		
1	PC				ROG (ROCK ON GROUND)		
TOTAL GROSS WEIGHT							181.245 KG
**** TOTAL PACKAGES ****						17	

24-HOUR NUMBER: 1-613-996-6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOURNÉES	BAGS USED / SACS UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFFERED / PLACARDS OFFERT
ERAP 2-1510	1-877-561-3636	YES / OUI NO / NON
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT. NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.		DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$
		NETTE No. CONV PRESSAGE WT AGREEMENT NO.
		FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À N° DE CONNAISSEMENT D'ORICA:
		301 rus hotel de ville Brownsburg-Chatham, QC J6G 3B5

CONSIGNOR / EXPÉDITEUR	CARRIER / TRANSPORTEUR	CONSIGNEE / DESTINATAIRE
GRAND VALLEY	Orica Truck	NELSON AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR
K. Platt	K. Platt	
SIGNATURE	SIGNATURE	SIGNATURE
DATE 8 11 18	DATE 8 11 18	DATE
D/J M/M Y/A	D/J M/M Y/A	D/J M/M Y/A

**2 SHIPPING ORDER
BON D'EXPÉDITION**

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
(L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNE LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK
SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRÉS AU VERSO
**** PAGE 2 OF 3 ****

SHOTPlus 5 Plan

Blast Summary Data

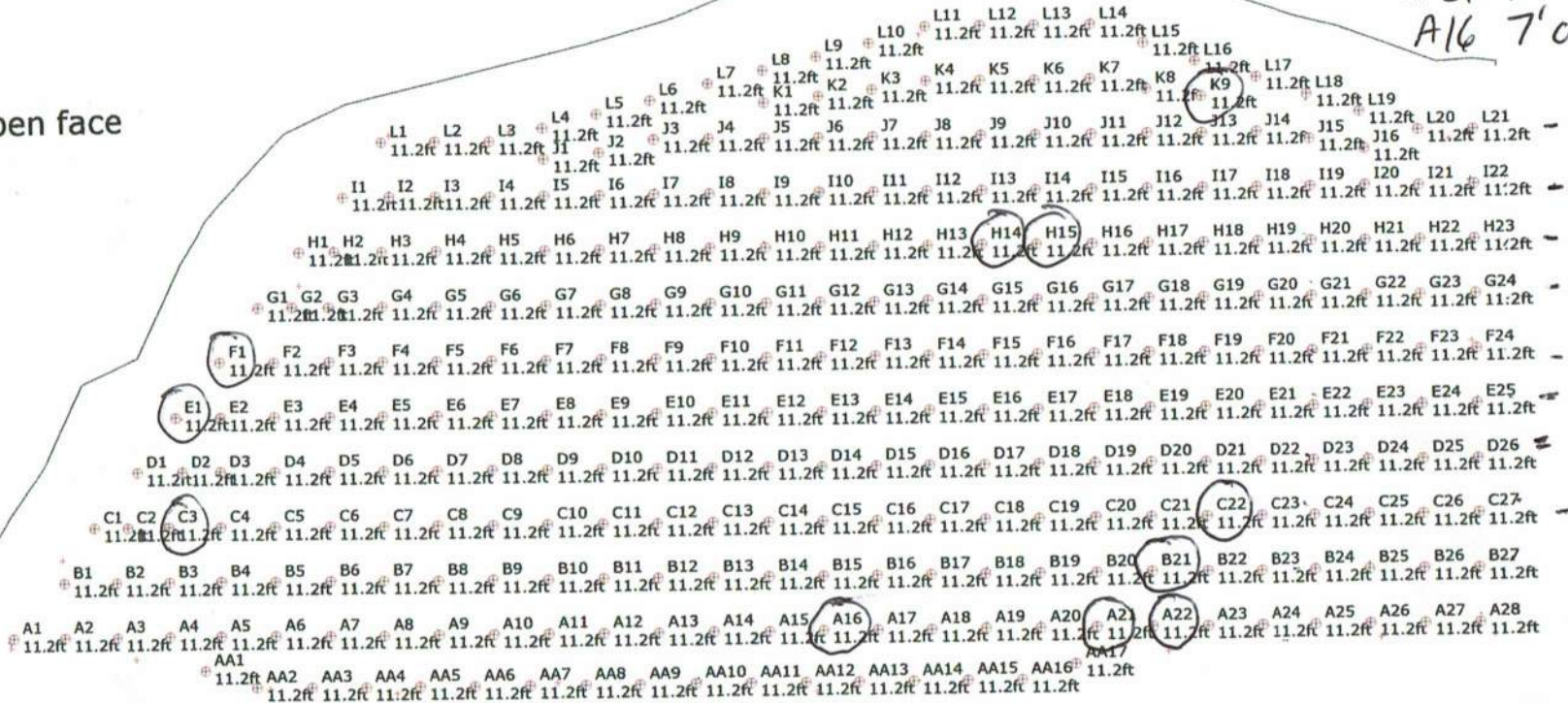
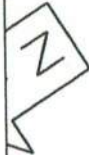
Burden: 11.8ft	Spacing: 11.8ft	Subdrill: 0.0ft	Stemming: 5.6ft
1st row burden: 11.8ft	Hole Diameter: 4.0in	Number of holes: 289	Hole angle: 0.0°
Total drilled: 3228.3ft			

4'-5' Broken material over all holes

H15 6'0B
 H14 6'0B
 K9 VOID 7-7.5'
 C22 VOID 7.5-8'
 C3 NO ROCK
 B21 VOID 7-7.5
 A22 VOID 7-7.5
 A21 NO ROCK
 A16 7'0B

open face

open face



= BILL'S
 MARKI
 STONE

F1 NO ROCK
 E1 NO ROCK

ARMOUR STONE ROW

ARMOUR STONE ROW

ARMOUR STONE ROW

Design 18-020 FLOOR Fnl - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV

DRILL TO SHALE



Not to scale

SHOTPlus™ Professional 5.7.3.0	11/1/2018
Mine	Burlington
Location	FLOOR
Title/author	Design 18-020 FLOOR
Filename	Design_18-020_FLOOR_Final.spf



SIEMIC REPORT SUMMARY

Shot #	Date	Time	Max Kg/Delay	Hole	Pattern	# Of Decks	# Of Rows	# Of Holes	Time Between (ms.)			Sub Drill	Ave. Water	Ave Hole Depth	Total Tons	Monitor 1		Monitor 2		Monitor 3		Monitor 4	
				Dia. (in.)	Spacing (ft.)				Burden (ft.)	Decks	Holes					Rows	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)
01-14	Mar. 5/14	11:21AM	130.80	4	11.5	11.5	1	8	117	0	25	67	0	N/A	17.00	21800.0	1.02	103.5	2.05	104.2	1.78	115.2	
02-14	Mar. 31/14	11:58AM	75.80	4	11.5	11.5	1	6	102	0	25	67	0	N/A	18.75	20609.0	N/R	N/R	2.52	103.5	1.78	115.2	
03-14	Apr. 9/14	12:42PM	54.0	4	12	12	1	6	186	0	25	134	0	N/A	13.00	28371.2	2.03	104.9	1.02	108.0	1.02	100.0	
04-14	Apr. 21/14	12:00PM	240.79	4	11	11	1	2	37	0	13	110	2	73.38	81.00	29548.2	2.79	126.7	N/R	N/R	N/R	N/R	
05-14	Apr. 30/14	11:57AM	107.02	4	11.5	11.5	1	9	138	0	25	67	0	N/A	18.00	26726.4	1.78	106.0	N/R	N/R	1.27	101.0	
06-14	May 7/14	11:59AM	44.59	4	11.5	11.5	1	7	162	0	25	67	0	N/A	11.00	19202.7	2.16	105.5	N/R	N/R	1.02	104.9	
07-14	May 16/14	12:01PM	80.06	4	11.5	11.5	1	9	125	0	25	67	0	N/A	15.50	23884.8	2.67	101.9	1.48	97.5	3.17	110.6	
08-14	May 27/14	01:08PM	234.84	4	11	11	1	2	40	0	13	58	2	71.56	82.25	32437.0	3.56	120.4	N/R	N/R	1.90	125.5	
09-14	Jun. 2/14	11:10AM	89.19	4	11.5	11.5	1	10	116	0	25	67	0	N/A	16.00	21379.4	N/R	N/R	N/R	N/R	N/R	N/R	
10-14	Jun. 11/14	12:00PM	89.18	4	11.5	11.5	1	8	155	0	25	67	0	N/A	13.50	26185.5	N/R	N/R	1.78	88.0	3.43	111.5	
11-14	Jun. 17/14	12:07PM	237.42	4	11	11	1	2	43	0	13	110	2	76.29	82.50	34975.7	3.05	114.9	2.16	118.6	N/R	N/R	
12-14	Jun. 24/14	11:11AM	65.25	4	11.5	11.5	1	14	164	0	25	67	0	N/A	13.50	24294.3	N/R	N/R	N/R	N/R	3.05	111.2	
13-14	Jul. 7/14	12:18PM	240.79	4	11	11	1	1	34	0	13	0	2	70.83	80.50	26984.8	2.92	116.9	N/R	N/R	1.78	124.1	
14-14	Jul. 15/14	11:57AM	55.74	4	11.5	11.5	1	8	210	0	25	67	0	N/A	11.25	25458.1	N/R	N/R	N/R	N/R	N/R	N/R	
15-14	Jul. 21/14	12:07PM	240.79	4	11	11	1	1	35	0	13	0	2	77.04	83.50	28813.7	4.57	123.4	1.02	124.2	N/R	N/R	
16-14	Aug. 1/14	12:02PM	240.79	4	11	11	1	1	29	0	13	0	2	78.28	82.75	23659.8	3.68	126.6	N/R	N/R	1.90	127.0	
17-14	Aug. 14/14	11:34AM	77.29	4	11.5	11.5	1	7	155	0	25	84	0	N/A	12.50	20878.4	1.78	106.0	1.27	104.2	1.02	100.0	
18-14	Aug. 20/14	11:55AM	49.05	4	11.5	11.5	1	9	166	0	25	67	0	N/A	11.50	23669.3	N/R	N/R	1.02	88.0	N/R	N/R	
19-14	Aug. 25/14	1:52PM	204.67	4	11	11	1	1	35	0	13	0	2	76.73	85.00	29331.3	3.30	129.4	2.16	132.2	N/R	N/R	
20-14	Aug. 28/14	12:15PM	77.29	4	11.5	11.5	1	9	190	0	25	84	0	N/A	12.50	25592.8	N/R	N/R	1.40	103.5	1.02	101.0	
21-14	Sept. 4/14	12:11PM	62.43	4	11.5	11.5	1	17	187	0	25	67	0	N/A	13.00	26336.4	N/R	N/R	N/R	N/R	5.08	111.8	
22-14	Sept. 10/14	12:47PM	176.58	4	11.5	11.5	1	14	186	0	25	67	0	N/A	12.75	25555.1	N/R	N/R	1.02	94.0	8.64	127.9	
23-14	Sept. 16/14	12:12PM	204.14	4	11.5	11.5	1	2	37	0	13	97	2	71.70	83.50	33292.2	5.21	128.4	1.40	133.4	1.40	134.6	
24-14	Sept. 24/14	11:59AM	40.13	4	11.5	11.5	1	9	141	0	25	84	0	N/A	12.75	19509.8	N/R	N/R	N/R	N/R	2.92	107.0	
25-14	Sept. 24/14	12:10PM	62.43	4	11.5	11.5	1	7	73	0	25	67	0	N/A	13.00	10226.3	N/R	N/R	N/R	N/R	10.70	113.3	
26-14	Oct. 2/14	1:40PM	240.79	4	11.5	11.5	1	2	60	0	13	97	2	74.93	85.25	55107.0	4.32	131.8	1.65	124.2	1.27	128.6	
27-14	Oct. 7/14	12:23PM	60.20	4	11.5	11.5	1	10	172	0	25	67	0	N/A	12.75	23631.6					6.86	116.4	
28-14	Oct. 22/14	11:54AM	255.65	4	11.5	11.5	1	2	31	0	13	97	2	73.73	87.75	29313.2	6.22	128.0	2.03	128.4	1.40	119.2	
29-14	Oct. 31/14	12:02PM	62.43	4	11.5	11.5	1	9	231	0	25	67	0	N/A	13.00	33340.7	N/R	N/R	3.17	104.9	3.68	112.3	
30-14	Nov. 5/14	12:02PM	246.74	4	11.5	11.5	1	2	35	0	13	97	2	74.69	87.00	32812.7	4.57	118.6	1.02	127.1	1.65	126.7	
31-14	Nov. 11/14	12:00PM	237.82	4	11.5	11.5	1	2	28	0	13	110	2	72.85	81.75	24666.1	3.56	130.6	N/R	N/R	N/R	N/R	
32-14	Nov. 24/14	12:08PM	246.74	4	11.5	11.5	1	2	26	0	13	97	2	74.88	88.75	24865.5	3.81	128.7	1.02	98.8	1.90	101.0	
33-14	Nov 27/14	11:55AM	71.34	4	11.5	11.5	1	7	232	0	24	84	0	N/A	14.00	35000.2	N/R	N/R	3.56	94.0	4.83	115.9	



SEISMIC REPORT SUMMARY

Shot #	Date	Time	Max Kg/Delay	Hole		Pattern			Time Between (ms.)			Sub Drill	Ave. Water	Ave Hole Depth	Total Tons	Monitor 1		Monitor 2		Monitor 3		Monitor 4	
				Dia. (in.)	Spacing (ft.)	Burden (ft.)	# Of Decks	# Of Rows	# Of Holes	Decks	Holes					Rows	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)
34-14	Dec. 2/14	11:57AM	246.74	4	11.5	11.5	1	2	59	0	13	97	2	71.46	83.75	52344.1	4.83	129.6	2.03	127.5	1.40	132.8	
35-14	Dec. 9/14	11:50AM	89.60	4	11.5	11.5	1	9	179	0	25	67,84	0	N/A	13.00	25215.7	1.14	104.9	2.16	88.0	4.83	116.7	



SIEMIC REPORT SUMMARY

Shot #	Date	Time	Max Kg/Delay	Hole		Pattern			Time Between (ms.)			Sub Drill	Ave. Water	Ave Hole Depth	Total Tons	Monitor 1		Monitor 2		Monitor 3		Monitor 4	
				Dia. (in.)	Spacing (ft.)	Burden (ft.)	# Of Decks	# Of Rows	# Of Holes	Decks	Holes					Rows	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)	(dbl.)	(mm/s)
01-15	Apr. 2/15	12:00PM	225.93	4	11.5	11.5	1	2	24	0	13	84	2	73.37	82.00	21207.0	2.41	115.6	1.52	94.0	2.29	125.6	
02-15	Apr. 9/15	11:57AM	35.67	4	11.5	11.5	1	19	121	0	25	84	0	N/A	12.00	17198.4	1.27	117.1	2.16	88.0	2.16	126.7	
03-15	Apr. 21/15	12:05PM	11.9	4	11.5	11.5	1	20	114	0	25	84	0	N/A	10.00	14763.0	11.78	104.2	1.02	98.8	N/R	N/R	
04-15	Apr. 23/15	12:03PM	225.93	4	11.5	11.5	1	2	23	0	13	123	2	75.04	81.00	20075.5	4.06	123.2	1.78	122.4	2.79	124.8	
07-15	May. 15/15	11:54AM	49.05	4	11.5	11.5	1	19	159	0	25	67	0	N/A	14.25	25644.0	1.78	103.5	1.4	103.5	N/R	N/R	
08-15	May. 22/15	11:51AM	120.39	4	11.5	11.5	1	12	153	0	25	67	0	N/A	19.50	32150.0	1.02	104.9	1.27	105.5	1.52	101.9	
09-15	May 28 2015	12:02PM	222.95	4	11.5	11.5	1	2	28	0	13	110	2	70.42	28.00	23534.6	3.81	116.6	N/R	N/R	1.02	122.3	
10-15	June 2 2015	12:01PM	246.74	4	11.5	11.5	1	1	15	0	13	0	2	80.27	92.75	14992.0	3.3	122.9	1.02	95.9	1.78	125	
11-15	June 10/15	11:50AM	225.92	4	11.5	11.5	1	2	30	0	13	110	2	70.86	77.25	24793.2	4.32	119.8	1.02	114.2	2.79	123.4	
12-15	June 12/15	12:18PM	98.1	4	11.5	11.5	1	13	254	0	25	67	0	N/A	17.00	47629.6	1.78	125.5	3.81	133.0	1.40	128.2	
13-15	June 17/15	12:03PM	255.65	4	11.5	11.5	1	2	35	0	13	130	2	83.00	92.00	34698.5	4.83	125.3	1.27	122	11.52	130.7	
14-15	July 8/15	12:02PM	214.04	4	11.5	11.5	1	2	29	0	13	123	2	71.64	77.00	24062.6	3.17	117.2	N/R	N/R	2.67	124.1	
15-15	July 13/15	12:02PM	275.20	4	11.5	11.5	1	2	38	0	13	38	2	77.87	88.50	36239.4	4.32	124.3	N/R	N/R	1.40	129.2	
16-15	July 30/15	12:00PM	214.04	4	11.5	11.5	1	6	29	0	13	29	2	75.38	77.75	24297.0	2.29	130.7	N/R	N/R	2.92	112.6	
17-15	Aug 19/15	12:02PM	246.74	4	11.5	11.5	1	2	44	0	13	182	2	75.75	86.25	39827.8	3.68	126.3	1.4	126.9	N/R	N/R	
18-15	Aug 26/15	12:01PM	120.49	4	11.5	11.5	1	9	242	0	25	84	0	N/A	19.50	51061.7	1.27	107	2.03	108.4	N/R	N/R	
19-15	Sept 1/15	12:01PM	217.01	4	11.5	11.5	1	3	34	0	13	68	2	70.87	78.50	28761.0	4.19	130.5	1.02	91.5	N/R	N/R	
20-15	Sept10/15	11:19AM	115.94	4	11.5	11.5	1	9	153	0	25	67	0	N/A	19.00	31325.6	N/R	N/R	1.40	106.0	N/R	N/R	
21-15	Oct 6/15	12:03PM	237.82	4	11.5	11.5	1	3	25	0	13	45	2	72.72	82.50	22225.4	5.08	121.1	1.78	88	1.02	123.0	
22-15	Oct 21/15	12:03PM	225.93	4	11.5	11.5	1	5	32	0	13	45	2	73.28	80.50	27758.7	6.6	134.3	1.78	91.5	3.94	130.9	



BLAST REPORT SUMMARY

Blast #	Date	Time	Blast		Wind From	Wind Velocity	Terrain	Hole Dia (in.)	# Of Rows	# Of Holes	Ave. Water	Ave Hole Depth	Total Tons	Monitor 1		Monitor 2		Monitor 3				
			Location	Weather										Location (mm/s) (dbl.)	Location (mm/s) (dbl.)	Location (mm/s) (dbl.)						
01-16	Apr. 8/16	1:01PM	Bulge #2 Side Rd				4	2	40	55.25	70.00	27605.9	2479 #2 Side R	N/R	N/R	SW Corner	N/R	N/R	2450 #2 Side R	2.29	113.5	
02-16	Apr. 19/16	12:28PM	NE Face				4	2	27	69.37	81.00	23567.0	2470 #2 Side R	N/R	N/R	SW Corner	1.65	97.5	Colling Rd	1.14	123.1	
03-16	May 4/16	12:00PM	Bulge #2 Side Rd				4	2	42	51.86	67.75	28054.0	2470 #2 Side R	1.40	112.0	SW Corner	12.80	118.1	Colling Rd	2.41	116.6	
04-16	May 9/16	12:00PM	NE Face	Partly Cloudy 14c	East	5 KPH	Rough	4,4.5	2	26,1	75.35	84.25	23604.7	2450 #2 Side R	3.43	118.8	SW Corner	1.65	91.5	Colling Rd	3.17	129.5
05-16	May 18/16	12:06PM	Pit Floor	Clear 15c	East	10 KPH	Flat	4	16	272	N/A	15.00	43965.8	2450 #2 Side R	N/R	N/R	SW Corner	2.92	105.5	Colling Rd	1.65	111.5
06-16	May 24/16	12:01PM	Pit Floor	Clear 27c	West	15 KPH	Flat	4	14	152	N/A	16.50	27026.0	2450 #2 Side R	1.02	109.5	SW Corner	2.41	95.9	Colling Rd	3.81	106.0
07-16	May 30/16	2:41PM	NE Face	Partly Cloudy 25c	West	10 KPH	Uneven	4,4.5	3	46,3	70.40	79.50	41977.6	2450 #2 Side R	3.94	124.9	SW Corner	1.14	125.0	Colling Rd	2.67	124.6
08-16	Jun 3/16	12:00PM	Bulge #2 Side Rd	Partly Cloudy 23c	East	10 KPH	Slope	4	2	43	50.39	63.75	27026.7	2450 #2 Side R	1.52	113.3	SW Corner	5.71	114.8	Colling Rd	1.90	115.9
16-09	Jul 5/16	12:00PM	N Face	Partly Cloudy 31	West	15KPH	Flat	4	3	20	74.74	83.00	17888.0	2450 #2 Side R	2.79	123.6	SW corner	N/R	N/R	Colling Rd	N/R	N/R
16-10	Jul 5/16	12:01PM	NE Face	Partly Cloudy 31	West	15kKPH	Flat	4	1	10	62.20	74.25	8001.1	2450 #2 Side R	4.06	122.1	SW Corner	N/R	N/R	Colling Rd	1.90	128.3
16-11	Jul 12/16	12:38PM	Pit Floor	Clear 32	Southwest	15KPH	Flat	4	14	248	N/A	19.00	50776.2	NOT USED			SW Corner	1.02	106	Colling Rd	4.06	105.5
16-12	Jul 15/16	12:00PM	Bulge#2 Side Rd	Partly Cloudy 27	West	25KPH	Flat	4	3	31	45.40	57.75	17650.5	2450 #2 Side R	1.14	88	SW Corner	4.44	117.4	Colling Rd	1.52	110.9
16-13	Jul 20/16	11:55PM	Pit Floor	Clear 29	West	10KPH	Flat	4.5	14	202	N/A	17.50	39035.8	2450 #2 Side R	N/R	N/R	SW Corner	2.54	103.5	Colling Rd	2.41	106
16-14	Jul 22/16	12:00PM	N Face	Partly Cloudy 33	Northwest	25KPH	Flat	4	3	21	61.50	73.50	16632.6	2450 #2 Side R	2.92	118.1	SW Corner	N/R	N/R	Colling Rd	1.40	124.5
16-15	Aug 4/16	12:00PM	Bulge#2 Side Rd	Clear 31	Southwest	10KPH	Flat	4	3	35	43.85	58.00	20014.3	2450 #2 Side R	1.40	108.8	SW Corner	3.05	117.9	Colling Rd	1.02	113.8
16-16	Aug 9/16	12:00PM	N Face	Partly Cloudy 31	South	15KPH	Uneven	4,4.5	3	45	66.05	77.50	37581.0	2450 #2 Side R	2.29	115.7	SW Corner	1.4	118.8	Colling Rd	2.16	127.5
16-17	Aug 30/16	12:00PM	N Face	Clear	West	15KPH	Uneven	4	3	41	64.95	80.00	35345.0	2450 #2 Side R	3.05	120.0	SW Corner	N/R	N/R	Colling Rd	1.78	128.8
16-18	Sep 20/16	12:01PM	NE Face	Clear	Northwest	10KPH	Flat	4,4.5	3	47	41.90	47.50	24057.3	2450 #2 Side R	2.52	127.2	SW Corner	N/R	N/R	Colling Rd	1.78	117.4
16-19	Oct 6/16	11:55AM	N Face	Clear	South	10KPH	Flat	4,4.5	2	41	38.78	45.75	20212.9	2450 #2 Side R	2.67	124.3	SW Corner	2.29	91.5	Colling Rd	1.65	114.4
16-20	Oct 12/16	11:47AM	NE Face	Clear	South	20KPH	Downslope	4,4.5	6	27	60.00	71.75	20872.3	2450 #2 Side R	4.57	122.1	SW Corner	1.52	88	Colling Rd	2.03	122.9
16-21	Oct 24/16	11:59AM	Bulge#2 Side Rd	Partly Cloudy 11	Northwest	25KPH	Uneven	4	4	29	45.68	59.25	16940.7	2450 #2 Side R	3.05	111.2	SW Corner	4.06	123.4	Colling Rd	2.41	109.9
17-01	Apr 11/17	11:56AM	Bulge#2 Side Rd	Partly Cloudy 20	Southwest	20KPH	Uneven	4	5	26	50.33	58.25	26417.9	2450 #2 Side R	2.55	111.5	SW Corner	N/R	N/R	Colling Rd	N/R	N/R
17-02	Apr 18/17	11:53AM	N Face	Clear	East	15KPH	Flat	4	3	13	72.82	80.50	21384.4	2450 #2 Side R	3.56	125.0	SW Corner	0.18	124.1	Colling Rd	N/R	N/R
17-03	April 21/17	11:53AM	Low Bench	Rain	West	22KPH	Flat	4,4.5	3	50	39.38	44.75	21133.9	2450 #2 Side R	3.56	122.9	SW Corner	1.02	116.7	Colling Rd	N/R	N/R
17-04	May 1/17	11:52AM	Bulge#2 Side Rd	Rain	East	15KPH	Downslope	4	3	32	N/A	69.70	17585.0	2450 #2 Side R	3.05	108.0	SW Corner	2.03	88	Colling Rd	N/R	N/R
17-05	May 15/17	12:35PM	Bulge#2 Side Rd	Clear	Northwest	10KPH	Downslope	4	3	34	N/A	74.00	21062.0	2450 #2 Side R	3.82	111.5	SW Corner	3.30	95.9	Colling Rd	0.13	88.0
17-06	May 17/17	11:53AM	Low Bench	Cloudy26	Southwest	40KPH	Flat	4,4.5	2	42	N/A	41.20	15010.0	2450 #2 Side R	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	1.14	111.8
17-07	May 29/17	12:00PM	Bulge#2 Side Rd	Cloudy23	West	10KPH	Flat	4	3	32	N/A	72.00	21440.0	2450 #2 Side R	1.42	98.8	SW Corner	1.52	88	Colling Rd	6.10	91.5
17-08	Jun 1/17	2:30PM	Low Bench	Clear	Southwest	25KPH	Flat	4	4	86	N/A	37.30	29085	2450 #2 Side R	5.84	101.0	SW Corner	N/R	N/R	Colling Rd	3.81	91.5
17-09	June 8/17	11:55PM	Bulge#2 Side Rd	Clear	Southeast	5KPH	Flat	4	3	30	N/A	79.40	20898	2450 #2 Side R	3.30	94.0	SW Corner	2.41	88	Colling Rd	N/R	N/R



BLAST REPORT SUMMARY

Blast #	Date	Time	Blast		Wind From	Wind Velocity	Terrain	Hole Dia	# Of	# Of	Ave.	Ave Hole	Total	Monitor 1		Monitor 2		Monitor 3					
			Location	Weather				(in.)	Rows	Holes	Water	Depth	Tons	Location	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)	
17-01	April 11/17	11:56AM	Bulge#2 Side Rd	Part Cloudy	20	Southwest	20KPH	Uneven	4	5	26	50.33	58.25	26417.9	2450#2 Side R	2.55	111.5	SW Corner	N/R	N/R	Colling Rd	N/R	N/R
17-02	April 18/17	11:53AM	North Face	Clear		East	15KPH	Flat	4	3	13	72.82	80.50	21384.4	2450#2 Side R	3.56	125	SW Corner	0.18	124.1	Colling Rd	N/R	N/R
17-03	April 21/17	11:53AM	Low bench	Rain		West	22KPH	Flat	4,4.5	3	50	39.38	44.75	21133.9	2450#2 Side R	3.56	122.9	SW Corner	1.02	116.7	Colling Rd	N/R	N/R
17-04	May 1/17	11:52AM	Bulge#2 Side Rd	Rain		East	15KPH	Downslope	4	3	32	N/A	69.70	17585.0	2450 #2 Side R	3.05	108	SW Corner	2.03	88	Colling Rd	N/R	N/R
17-05	May 15/17	12:35PM	Bulge#2 Side Rd	Clear		Northwest	10KPH	Downslope	4	3	34	N/A	74.00	21062.0	2450#2 Side R	3.82	111.5	SW Corner	3.3	95.9	Colling Rd	0.13	88.0
17-06	May 17/17	11:53AM	Low bench	Cloudy	26	Southwest	40KPH	Flat	4,4.5	2	42	N/A	41.20	15010.0	2450#2 Side R	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	1.14	111.8
17-07	May 29/17	12:00PM	Bulge#2 Side Rd	Cloudy	23	West	10KPH	Flat	4	3	32	N/A	72.00	21440.0	2450#2 Side R	1.42	98.8	SW Corner	1.52	88.0	Colling Rd	6.10	91.5
17-08	June 1/17	2:30PM	Low bench	Clear		Southwest	25KPH	Flat	4	4	86	N/A	37.30	29085.0	2450#2 Side R	5.84	101	SW Corner	N/R	N/R	Colling Rd	3.81	91.5
17-09	June 8/17	11:55AM	Bulge#2 Side Rd	Clear		Southeast	5KPH	Flat	4	3	30	N/A	79.40	20898.0	2450#2 Side R	3.3	94	SW Corner	2.41	88	Colling Rd	N/R	N/R
17-11	June 20/17	12:02PM	Bulge#2 Side Rd	Part Cloudy	22	Southwest	10KPH	Flat	4	3	36	N/A	84.10	23583.0	2450#2 Side R	2.03	108.4	SW Corner	2.41	101.9	Colling Rd	N/R	N/R
17-10	June 21/17	12:35PM	Low bench	Part Cloudy	21	West	10KPH	Flat	4,4.5	3	84	N/A	40.80	25680.0	2450#2 Side R	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	did not	use
17-12	June 26/17	1:00PM	Floor	Part Cloudy		Southwest	15KPH	Flat	4	12	252	N/A	16.00	40014.0	2450#2 Side R	6.22	91.5	SW Corner	1.78	88	Colling Rd	N/R	N/R
17-14	July 4/17	12:46PM	North Face	Part Cloudy		Southeast	10KPH	Flat	4,4.5	3	36	N/A	57.95	33601.0	2450#2 Side R	12.20	95.9	SW Corner	4.19	88.0	Colling Rd	1.27	88
17-13	July 10/17	1:40PM	Floor	Part Cloudy		Southwest	10KPH	Flat	4	11	295	N/A	16.70	48920.0	2450#2 Side R	2.16	91.5	SW Corner	4.22	88.0	Colling Rd	1.02	104.2
17-15	July 25/17	11:57AM	Low Bench	Part Cloudy		NorthEast	5KPH	Flat	4	4	52	N/A	42.00	15057.0	2450#2 Side R	3.56	91.5	SW Corner	2.16	88	Colling Rd	1.14	112.8
17-17	August 3/17	12:41PM	North Face	Part Cloudy		North	0.00	Flat	4,5	4	23	N/A	77.10	11832.0	2450#2 Side R	2.92	88	SW Corner	1.27	88	Colling Rd	N/R	N/R
17-18	August 28/17	12:32PM	Floor	Partly Cloudy		West	5KPH	Flat	4	8	188	N/A	17.70	26351.0	2450 #2 Side R	4.70	104.9	SW Corner	3.3	88	Colling Rd	1.14	107.5
17-16	August 30/17	12:01PM	Bulge#2 Side Rd	Partly Cloudy		Southwest	5KPH	Flat	4	3	28	N/A	84.30	16211.0	2450 #2 Side R	1.52	91.5	SW Corner	1.52	92.0	Colling Rd	N/R	N/R
17-19	September 12/17	11:49AM	Low bench	Partly Cloudy		Southeast	10KPH	Flat	4	3	37	N/A	38.90	21101.0	2450 #2 Side R	2.92	88.0	SW Corner	1.90	94	Colling Rd	1.02	114.6
17-22	September 26/17	11:56AM	Low bench	Partly Cloudy		South	5KPH	Flat	4	5	62	N/A	38.80	19349.0	2450 #2 Side R	1.65	88.0	SW Corner	1.65	88	Colling Rd	1.14	115.6
17-20	September 27/17	12:01PM	Bulge#2 Side Rd	Partly Cloudy		West	10KPH	Flat	4,4.5	3	40	N/A	81.90	27877.0	2450 #2 Side R	2.54	103.5	SW Corner	3.17	88	Colling Rd	N/R	N/R
17-23	October 6/17	11:53AM	Upper Middle	Partly Cloudy		North	10KPH	Flat	4,4.5	3	34	N/A	77.20	21365.0	2450 #2 Side R	3.43	95.9	SW Corner	3.05	94	Colling Rd	1.27	88.0
17-24	October 11/17	12:41PM	Bulge#2 Side Rd	Rain		East	20KPH	Flat	4,4.5	3	45	N/A	81.70	30695.0	2450 #2 Side R	0.38	91.5	SW Corner	4.95	122.4	Colling Rd	N/R	N/R
17-25	October 30/17	11:55AM	Low bench	Partly Cloudy		West	35KPH	Flat	4	9	41	N/A	39.10	11407.0	2450#2 Side R	1.14	122.8	SW Corner	N/R	N/R	Colling Rd	N/R	N/R



BLAST REPORT SUMMARY

Blast#	Date	Time	Blast		Wind From	Wind Velocity	Terrain	Hole Dia	# Of	# Of	Ave.	Ave Hole	Total	Monitor 1		Monitor 2		Monitor 3				
			Location	Weather				(in.)	Rows	Holes	Water	Depth	Tons	Location	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)
18-001	Apr 9/18	11:56 AM	Upper Middle	Part Cloudy	Southeast	5KPH	Flat	4	3	49	N/A	75.50	27194.0	2450#2 Side R	3.60	115.3	SW Corner	1.2	119.7	Colling Rd	0.4	121.9
18-002	Apr 11/18	11:16AM	Floor	Overcast	Southwest	10KPH	Flat	4	9	180	N/A	10.00	19279.0	2450#2 Side R	DNT	DNT	SW Corner	2	88.4	Colling Rd	N/A	N/A
18-003	Apr 18/18	10:54	Lower middle	Overcast	West	10KPH	Flat	4	4	39	N/A	40.10	11087.0	2450#2 Side R	2.70	119.7	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-004	May 22/18	12:02PM	Upper Middle	Overcast	SouthEast	5KPH	Flat	4,4.5	3	49	N/A	75.50	26332.0	2450#2 Side R	3.3	124.3	SW Corner	0.3	39.1	Colling Rd	0.30	123.1
18-005	June 4/18	11:50AM	Lower middle	Overcast	West	15KPH	Flat	4	8	67	N/A	44.20	20811.0	2450#2 Side R	N/R	N/R	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-006	June 6/18	12:10PM	Lower middle	Overcast	West	5KPH	Flat	4	11	61	N/A	41.70	17948.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-007	June 11/18	11:56AM	Upper Middle	Part Cloudy	East	15KPH	Flat	4,4.5	4	55	N/A	73.10	28467.0	2450#2 Side R	2.70	116.9	SW Corner	0.10	119.6	Colling Rd	0.20	120.2
18-008	June 13/18	11:52AM	Lower middle	Part Cloudy	West	10KPH	Sloped	4	7	89	N/A	50.00	28929.0	2450#2 Side R	1	120.6	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-009	June 25/18	12:01PM	Lower middle	Clear	Southeast	10KPH	Flat	4	13	99	N/A	35.30	25983.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-010	July 5/18	11:51AM	Upper Middle	Clear	Southwest	5KPH	Flat	4	3	53	N/A	76.00	30963.0	2450#2 Side R	2.30	115.9	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-011	20-Jul	11:59AM	Lower middle	Part Cloudy	East	5KPH	Flat	4	15	125	N/A	26.00	24173.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-012	Aug 3/18	11:52AM	Upper Middle	Part Cloudy	none	0	Flat	4,5	3	46	N/A	76.40	27176.0	2450#2 Side R	2.4	115	SW Corner	0.01	117.1	Colling Rd	0.01	116.4
18-013	Aug 14/18	10:54AM	Floor	Part Cloudy	South	5.00	Flat	4	11	182	N/A	10.00	17069.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-014	Aug 30/18	11:55AM	Upper Middle	Part Cloudy	NorthEast	5KPH	Flat	4,5	3	58	N/A	75.20	31778.0	2450#2 Side R	3.7	113.3	SW Corner	2.00	93.2	Colling Rd	DNT	DNT
18-015	Sept 10/18	11:49AM	Floor	Rain	East	15KPH	Flat	4	9	204	N/A	11.50	22269.0	2450#2 Side R	DNT	DNT	SW Corner	NSU	NSU	Colling Rd	0.1	118
18-018	Sept 21/18	12:34PM	Floor	Part Cloudy	Southwest	15KPH	Flat	4	21	345	N/A	11.20	38483.0	2450#2 Side R	DNT	DNT	SW Corner	NSU	NSU	Colling Rd	DNT	DNT
18-017	Oct 2/18	12:02PM	Upper Middle	Rain	Sourhwest	5KPH	Flat	4	3	48	N/A	76.40	26868.0	2450#2 Side R	5.30	114.2	SW Corner	0.5	123.5	Colling Rd	0.20	121.6
18-016	Oct 10/18	12:24PM	Lower middle	Part Cloudy	East	5KPH	Flat	4	5	100	N/A	61.80	44223.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-019	Nov 1/18	11:57AM	Upper Middle	Rain	None	0.00	Flat	4,4.5	5	50	N/A	73.40	27342.0	2450#2 Side R	5.70	116.3	SW Corner	1.80	114.2	Colling Rd	0.30	118.8
18-020	Nov11/18	11:57AM	Floor	Cloudy	West	5KPH	Flat	4	12	251	N/A	11.00	24552.0	2450#2 Side R	2.00	110.4	SW Corner	DNT	DNT	Colling Rd	0.00	0.0



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-05-28

Blast Number: 19-006
Orica Order #: 2487394
Blast Time: 11:09 AM

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Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Upper Middle North East (Bench / Face)

GPS Coordinates: 43.40506 °N Latitude 79.88187 °W Longitude
Centre of Blast Centre of Blast

Wind from the: NE at 10 kph Temperature: 6 to 10 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: Ceiling 591 ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
Primary Bit diam: 101.6 mm 0 # Holes: 43 = 2,739.9 ft (4 " diam)
Secondary Bit diam: 92.1 mm 0 # Holes: 4 = 254.9 ft (3 5/8 " diam)
Tertiary Bit diam: mm 0 # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,740	25,080	8,660

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	47	10.7
PENTEX 12 (OR EQUIVALENT)	0.34	47	16.0

total explosives weight in Blast (kg): 8,712

Pkgd Prod (25 kg) % of Total kg: 0.3%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			47
UNITRONIC 600 25M			47

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	2

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: 18,760 te 7,215 m³
Total tonnes per day: 18,760 te NB60-08 Rate Code
Total Holes Loaded: 47 holes
... including: 5 Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 4 rows

- Pattern (Front Row)-

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 13 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 34 main body

Bench Height: 61.7 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 63.7 ft avg

- Stone Decking -

Front Row: 0.0 ft avg
Main Body: 0.0 ft avg
Decks: 0 per blast

- Collar Stemming -

Front Row: 8.0 ft avg
Main Body: 8.0 ft avg
Material used: 3/4" Clear

- Charge Length -

Front Row: 55.7 ft avg
Main Body: 55.7 ft avg

- Charge Weight -

Front Row: 162.5 kg/hole
Main Body: 162.5 kg/hole
Max. per delay: 197.0 kg/delay
SD () Equation: 195.0 kg/delay
Total kg Loaded: 8,712 kg
Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.464 kg/te (actual)
Front row: 0.298 kg/te (theoretical)
Main Body: 0.397 kg/te (theoretical)
"KPI" PF: 0.372 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Hole D7 Recived packaged product to load though small seam from 15'-9'
We were unable to locate the drill log.
After speaking with the driller we felt confidant to continue and load the blast



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-05-28

Blast Number: 19-006
 Orica Order #: 2487394
 Blast Time: 11:09 AM

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Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40510	79.88190	0.757562	1.394202
Front Row Corner	43.40488	79.88179	0.757558	1.394200
Back Row Corner	43.40519	79.88193	0.757563	1.394203
Average (Centre of Blast)	43.40506	79.88187	0.757561	1.394202

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	418.9	m		
Post Blast Data:	ppV: 4.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 10.7	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.6	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	987.1	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 8.8	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 118.9	dB	Trigger set at: 115	dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1414.7	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

SouthWest Corner of Property

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

Nelson Aggregate

Quarry: Burlington

P.O. #:

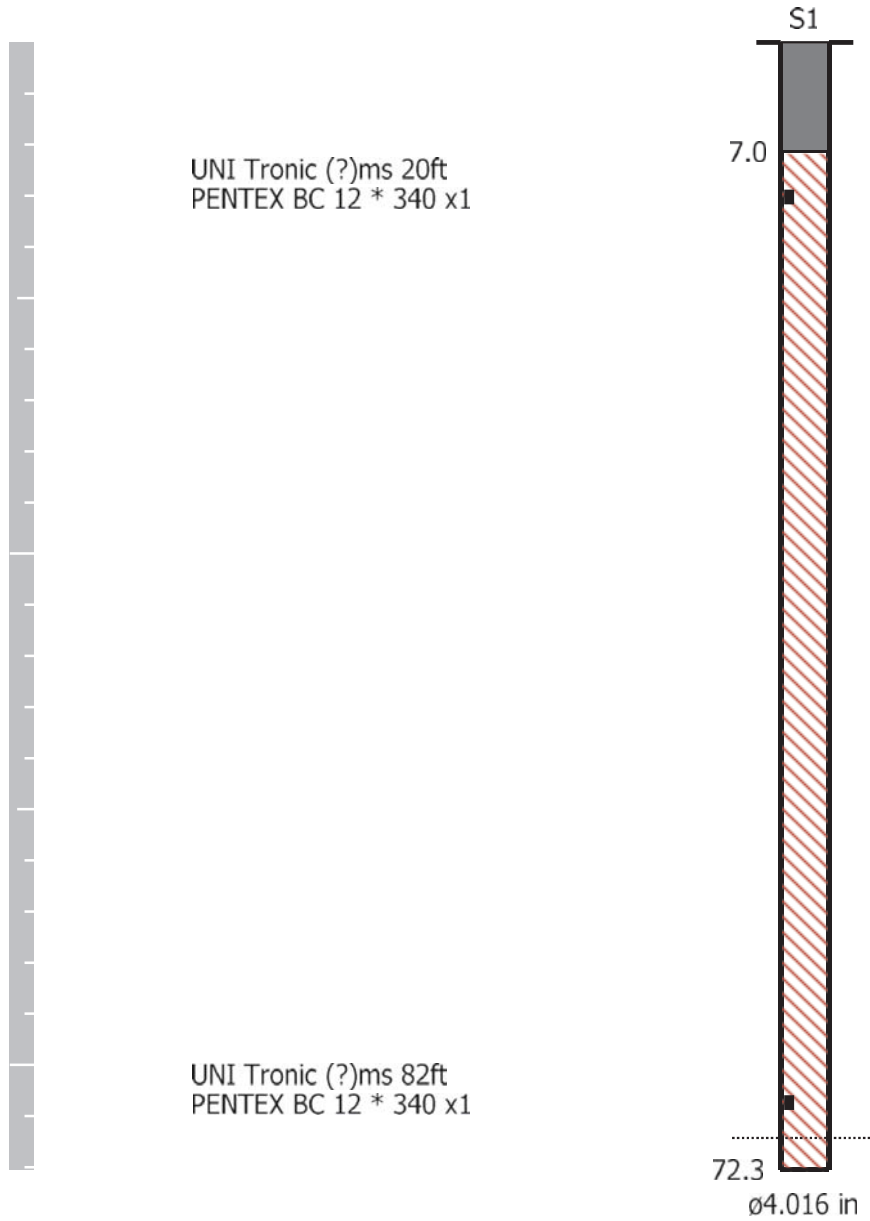
Blast Date: 5/28/2019

Blast Number: 19-006

Orica Order #: 2487394

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nick Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:09:14 May 28, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 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: 2450 Line 2
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

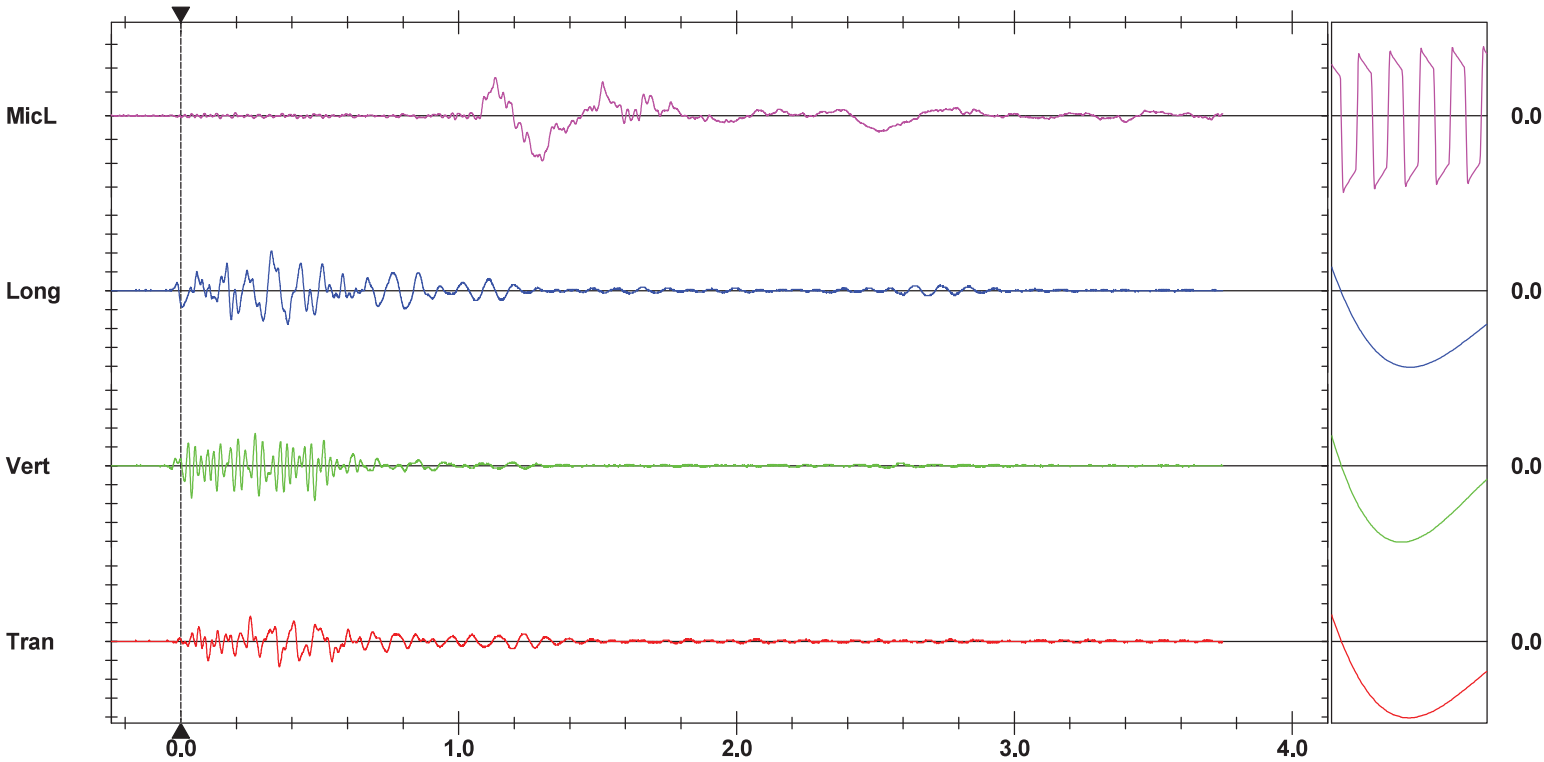
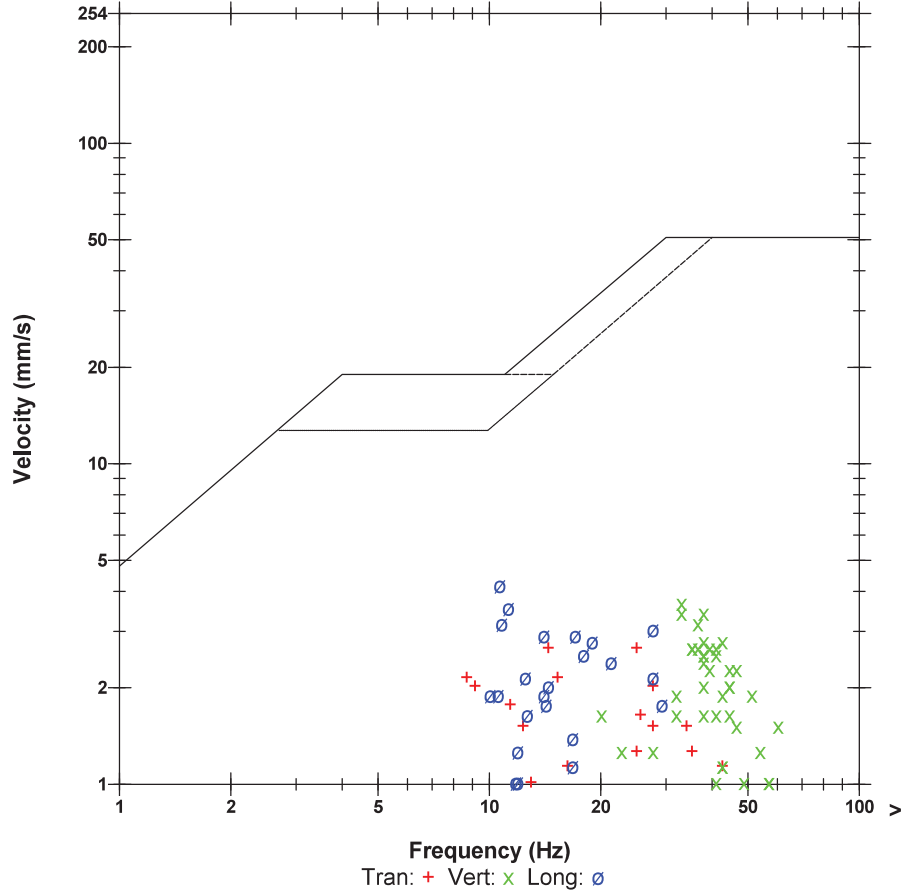
In front Yard by tree stump
 N-43.40245, W-79.87814

Microphone Linear Weighting
PSPL 119.6 dB(L) at 1.301 sec
ZC Freq 2.0 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 562 mv)

	Tran	Vert	Long	
PPV	2.667	3.683	4.191	mm/s
ZC Freq	25	33	10.7	Hz
Time (Rel. to Trig)	0.250	0.482	0.325	sec
Peak Acceleration	0.053	0.106	0.106	g
Peak Displacement	0.030	0.018	0.057	mm
Sensor Check	Check	Check	Check	
Frequency	2.2	2.2	2.2	Hz
Overswing Ratio	226.0	174.0	247.0	

Peak Vector Sum 4.814 mm/s at 0.482 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 MicL at 11:09:17 May 28, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.117 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL,MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190528110917.IDFW

Notes

Location: COLLING RD & BLINDLINE
Client: NELSON AGGREGATES
User Name: ORICA CANADA
General:

Extended Notes

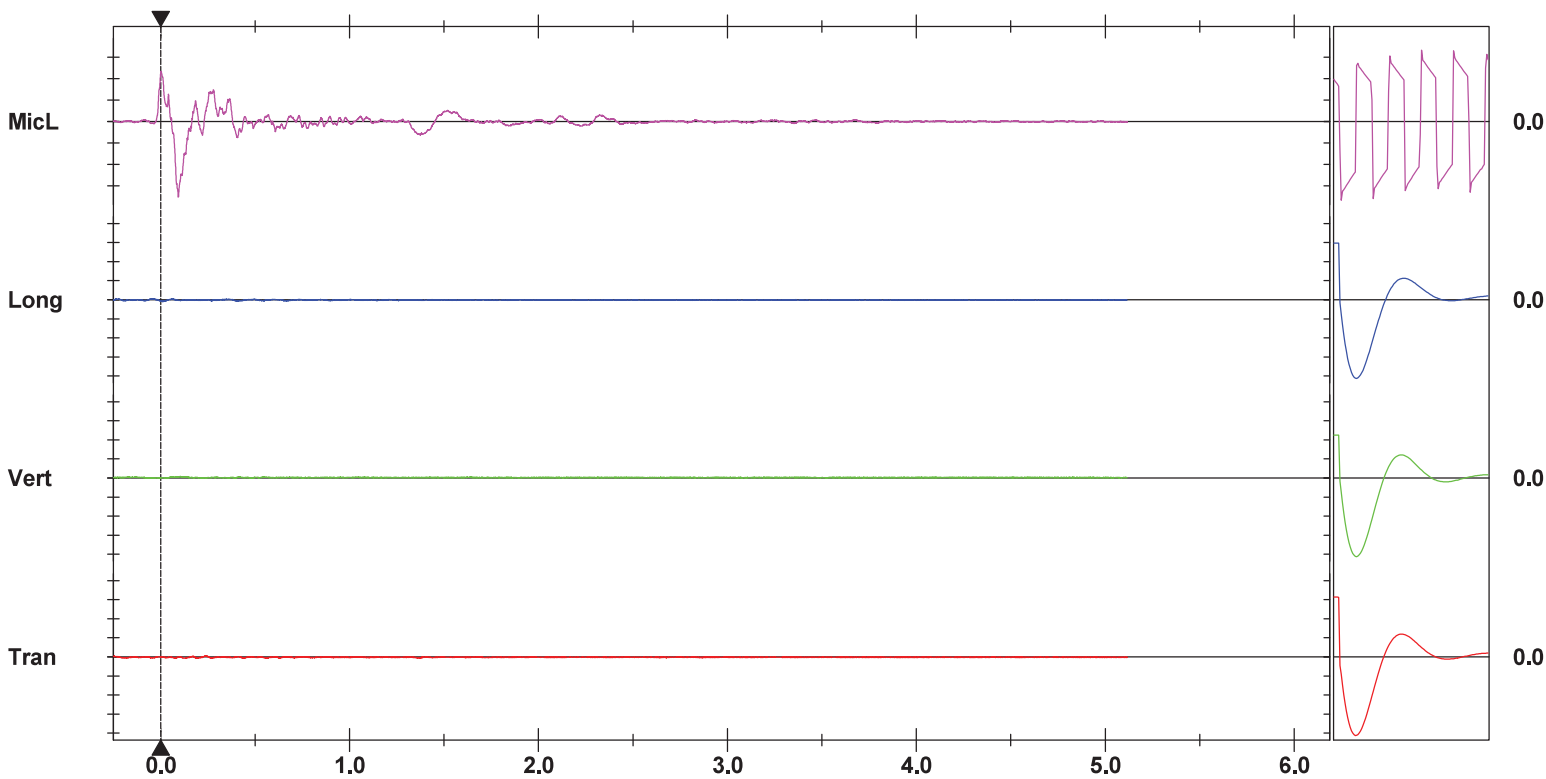
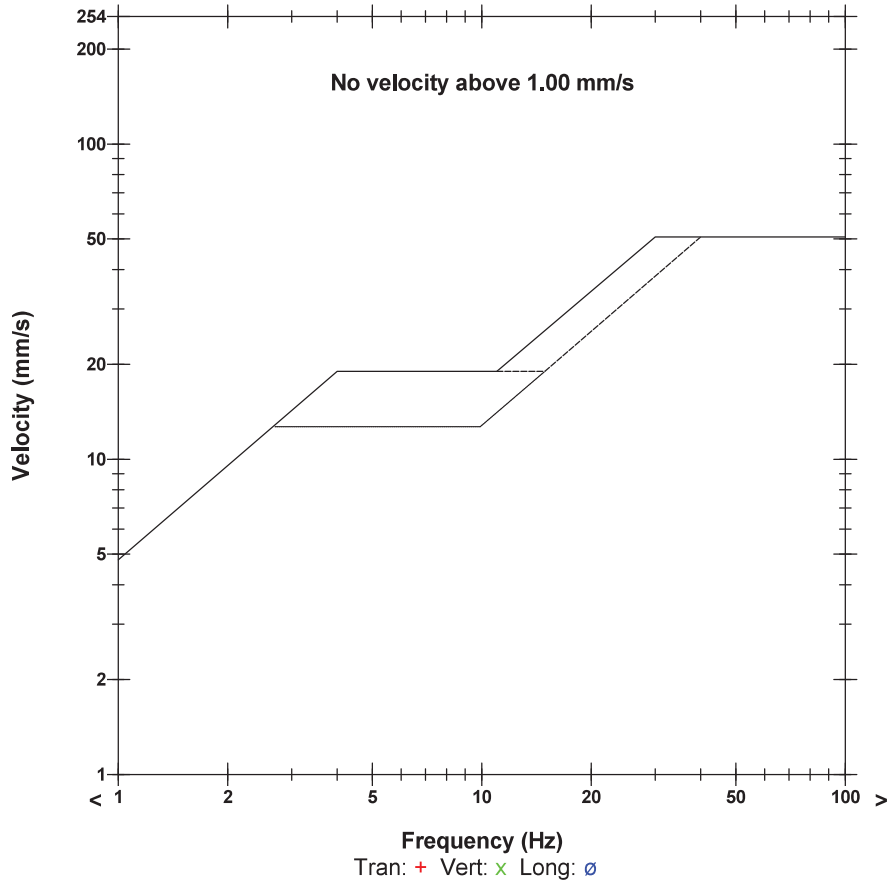
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 118.9 dB(L) at 0.093 sec
ZC Freq 4.7 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1541 mv)

	Tran	Vert	Long	
PPV	0.142	0.166	0.197	mm/s
ZC Freq	9.6	3.0	8.8	Hz
Time (Rel. to Trig)	0.124	0.103	0.008	sec
Peak Acceleration	0.012	0.010	0.015	g
Peak Displacement	0.026	0.034	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.6	

Peak Vector Sum 0.202 mm/s at 0.008 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

**Nelson Aggregate
Across rod from 2102 Road 2
Burlington 2019-05-28 Blast 19-005**

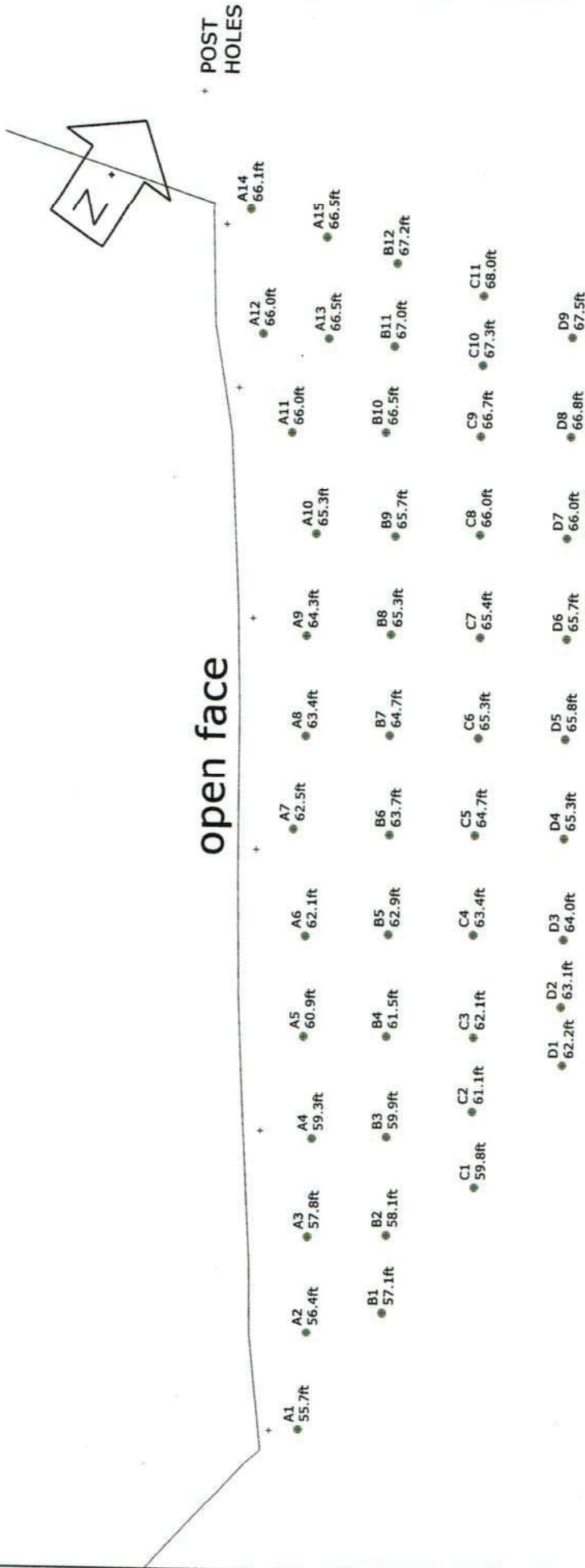
Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
May 28 /19 05:53:15		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
May 28 /19 05:53:15	May 28 /19 11:40:31	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 47 Hole angle: 0.0°
 Total drilled: 2994.8ft



9NECRNR005 Design Fnl -3.625 and 4" Blast Holes 12x10 9x10 270.25 a
 DRILLER NAME:

GREEN MARKER STONES 3.625" Blast Holes



Not to scale

SHOTPlus™ Professional 5.7.4.4	5/27/2019
Mine	Burlington
Location	N E CRNR NEXT TO UPPER MIDDLE
Title/author	9NECRNR005 Design Partial
Filename	Burlington 2019-05-28 Blast 19-005 Upper Mic

SHOTPlus 5 Plan

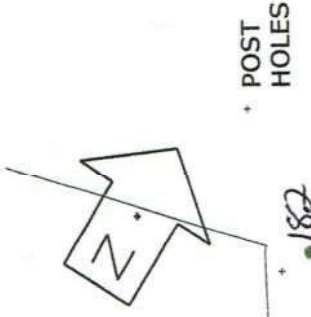
Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 2994.8ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Stemming: 7.0ft
 Hole angle: 0.0°
 Subdrill: 2.0ft
 Number of holes: 47

Load Sheet 215Kg Max

open face

Ø = 3 5/8"



POST HOLES

- 159 • 173 • 181 • 156 • 161 • 180 • 184 • 185 • 190 • 197 • 195 • 190 • 182
- 176 • 160 • 163 • 179 • 184 • 191 • 196 • 194 • 192 • 191 • 192 • 189 • 152 • 144
- 168 • 187 • 186 • 190 • 197 • 187 • 190 • 192 • 146 • 193 • 185
- 181 • 140 • 184 • 194 • 179 • 193 • 193



Not to scale

SHOTPlus™ Professional 5.7.4.4	5/27/2019
Mine	Burlington
Location	N E CRNR NEXT TO UPPER MIDDLE
Title/author	9NECRNR005 Design Partial
Filename	Burlington 2019-05-28 Blast 19-005 Upper Mic



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-05-10

Blast Number: 19-007

Orica Order #: 2480529

Blast Time: 12:55 PM

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Blaster-in-charge: Kevin Toplis (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40368 °N Latitude 79.88238 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 30 kph Temperature: 11 to 15 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: X
Ceiling: 2,434 ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
Primary Bit diam: 101.6 mm 0 # Holes: 283 = 4,188.4 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	34,110	27,740	6,370

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	5	5	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	280	95.2

total explosives weight in Blast (kg): 6,465

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 9m		25/500	280
CONNECTADET 9M		25 ms	1
CONNECTADET 9M		42 ms	26

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	7.5
HELPER HOURS	Enter total Helper man-hours	13.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	1.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 40,349 te 15,519 m³
Total tonnes per day: 40,349 te NF-02 Rate Code
Total Holes Loaded: 280 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 13 rows

- Pattern (Front Row) -

Burden: 11.5 ft avg

Spacing: 11.5 ft avg

Holes: 4 front row

- Pattern (Main Body) -

Burden: 11.5 ft avg

Spacing: 11.5 ft avg

Holes: 276 main body

Bench Height: 14.8 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 14.8 ft avg

- Stone Decking -

Front Row: ft avg

Main Body: 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: 7.8 ft avg

Main Body: 7.8 ft avg

- Charge Weight -

Front Row: 22.7 kg/hole

Main Body: 22.7 kg/hole

Max. per delay: 42.0 kg/delay

SD () Equation: 151.3 kg/delay

Total kg Loaded: 6,465 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.160 kg/te (actual)

Front row: 0.158 kg/te (theoretical)

Main Body: 0.158 kg/te (theoretical)

"KPI" PF: 0.158 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Holes B7, B8, B9, where taken out of the shot due to being caved in before loading.

helper hours: 6.5 hours x 2



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-05-10

Blast Number: 19-007
 Orica Order #: 2480529
 Blast Time: 12:55 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40368	79.88241	0.757537	1.394211
Front Row Corner	43.40387	79.88250	0.757540	1.394213
Back Row Corner	43.40348	79.88223	0.757534	1.394208
Average (Centre of Blast)	43.40368	79.88238	0.757537	1.394211

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	369.0	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
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	976.5	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
Colling Rd & Blind Line Bruce Trail				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(369)^2}{30^2} \text{ kg} \\
 &= \frac{136,161}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

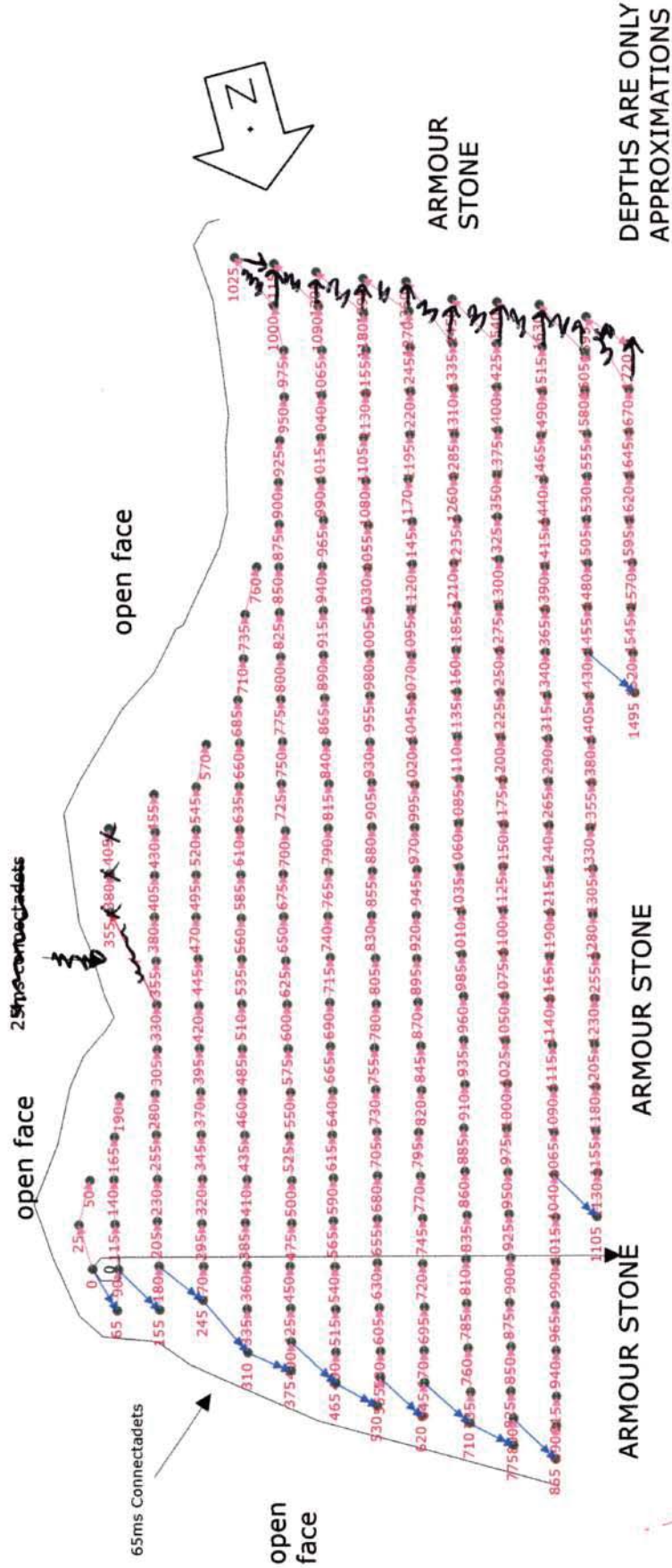
Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Subdrill: 0.0ft Stemming: 5.5ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Number of holes: 283 Hole angle: 0.0°
 Total drilled: 4211.9ft



ARMOUR STONE
 9FLR007 Design Partial Fnl - 4" Blast Hole 11.5 x 11.5 253 and 248.6 ELEV
 DRILLER NAME:

DRILL TO SHALE



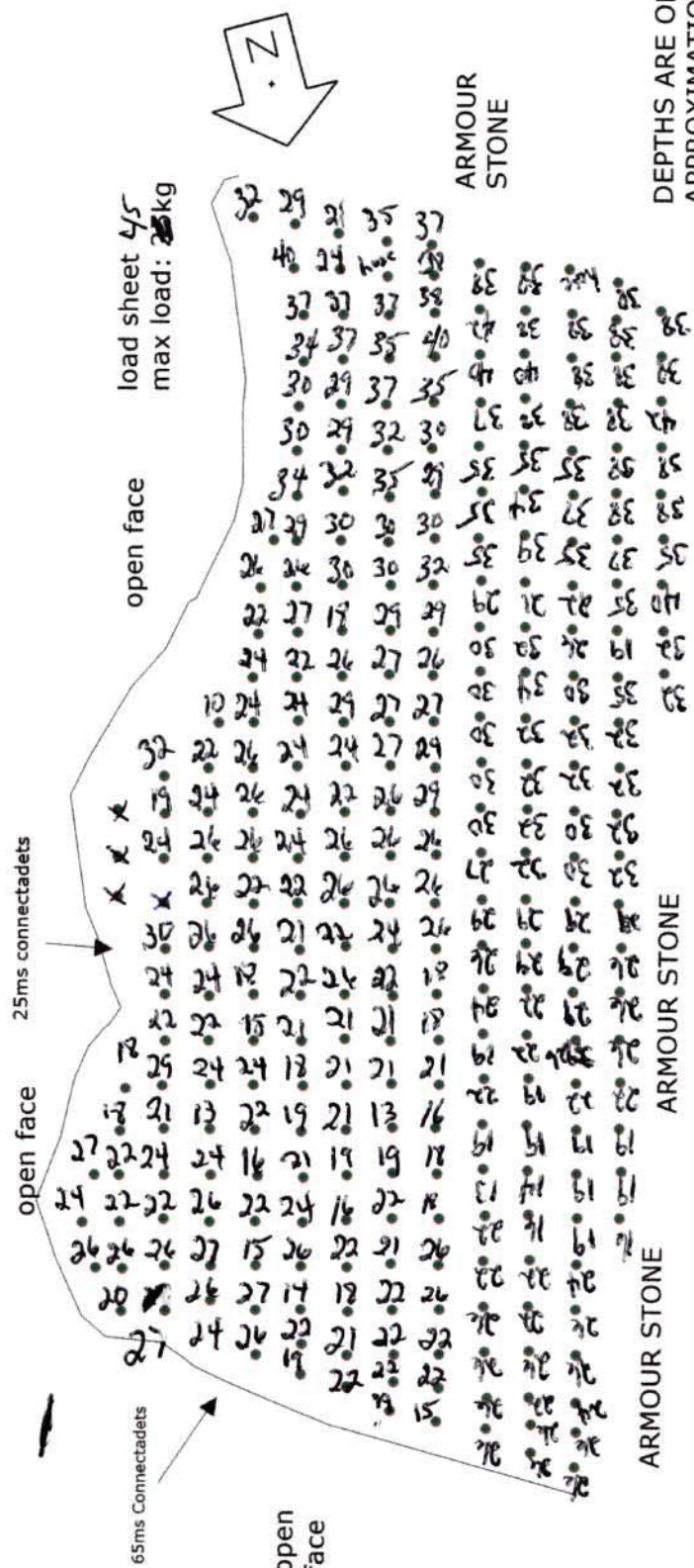
Not to scale

SHOTPlus™ Professional 5.7.6.1	5/9/2019
Mine	Burlington
Location	FLOOR SHOT NEXT TO 9FLR004
Title/author	9FLR007 Partial Design Fnl
Filename	Burlington 2019-05-10 Blast 19-007 Floor.spf

SHOTPlus Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Stemming: 5.5ft
 1st row burden: 11.5ft Subdrill: 0.0ft Hole angle: 0.0°
 Hole Diameter: 4.0in Number of holes: 283
 Total drilled: 4211.9ft



9FLR007 Design Partial Fnl - 4" Blast Hole 11.5 x 11.5 253 and 248.6 ELEV
 DRILLER NAME:
 DEPTHS ARE ONLY APPROXIMATIONS

DRILL TO SHALE



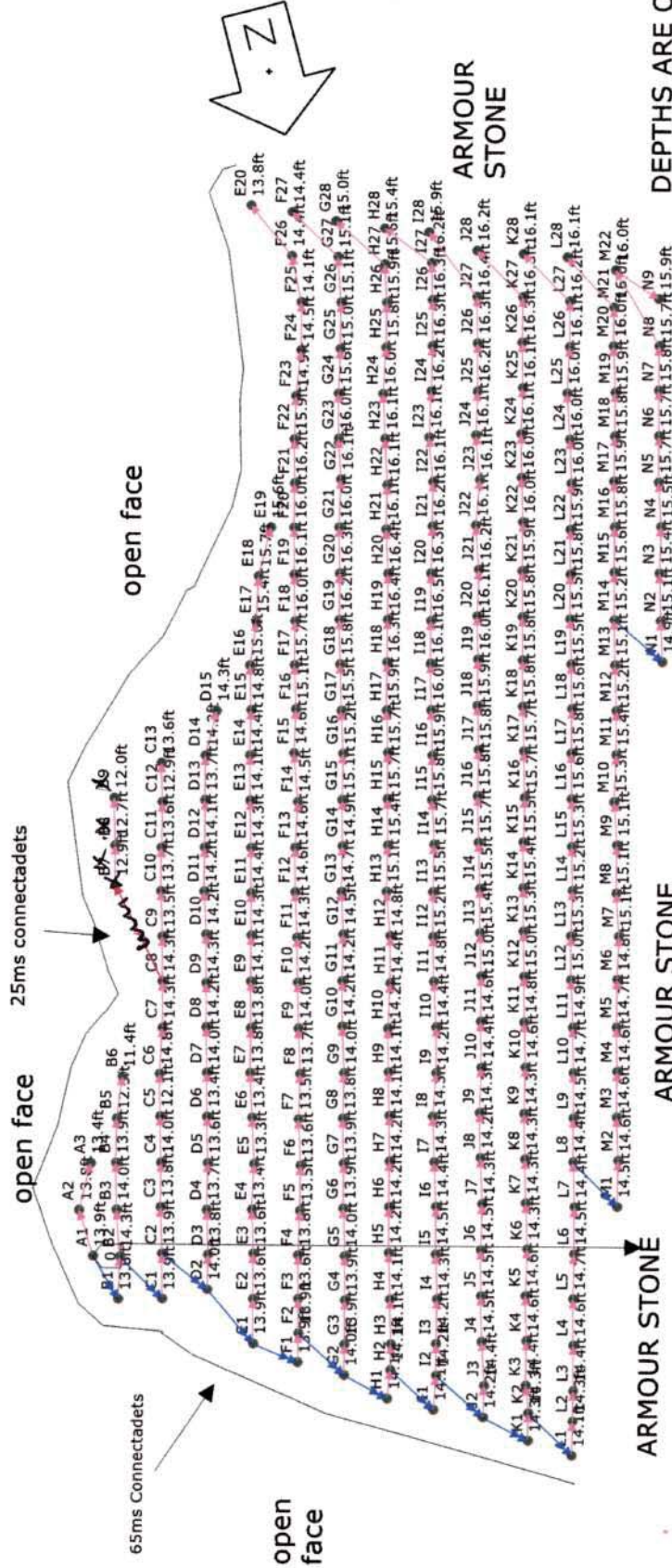
Not to scale

SHOTPlus™ Professional 5.7.6.1	5/9/2019
Mine	Burlington
Location	FLOOR SHOT NEXT TO 9FLR004
Title/author	9FLR007 Partial Design Fnl
Filename	Burlington 2019-05-10 Blast 19-007 Floor.spf

SHOTPlus Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Subdrill: 0.0ft Stemming: 5.5ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Number of holes: 283 Hole angle: 0.0°
 Total drilled: 4211.9ft



ARMOUR STONE

ARMOUR STONE

ARMOUR STONE

ARMOUR STONE

9FLR007 Design Partial Fnl - 4" Blast Hole 11.5 x 11.5 253 and 248.6 ELEV
 DRILLER NAME:

DRILL TO SHALE

DEPTHS ARE ONLY APPROXIMATIONS



SHOTPlus™ Professional 5.7.6.1	5/9/2019
Mine	Burlington
Location	FLOOR SHOT NEXT TO 9FLR004
Title/author	9FLR007 Partial Design Fnl
Filename	Burlington 2019-05-10 Blast 19-007 Floor.spf

Not to scale



Blast Design

Nelson Aggregate

Quarry: **Burlington**
 P.O. #:
 Design Date: **2019-05-10**

Blast Number: **19-007**
 Orica Order #:

page 1

Blaster-in-charge: **Kevin Toplis** (Print Name)

Blast Location: **Floor** (Bench / Face)

GPS Coordinates: **43.40368** °N Latitude **79.88238** °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: **35,821** te
 Total Holes Loaded: **283** holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: **13** rows

- Drilling Information -

Angle from Vertical
 Primary Bit diam: **101.6** mm **0**° # Holes: **283** = 4,245.0 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: **11.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: **7** front row

- Design Pattern (Main Body) -

Burden: **11.5** ft avg
 Spacing: **11.5** ft avg
 # Holes: 276 main body
 Bench Height: **13.0** ft avg
 Sub-drill: **2.0** ft avg
 Hole Depth: **15.0** ft avg

- Design Stone Decking -

Front Row: ft avg
 Main Body: ft avg

- Design Collar Stemming -

Front Row: **7.0** ft avg
 Main Body: **7.0** ft avg

Material used: **3/4" Clear**

- Design Charge Length -

Front Row: **8.0** ft avg
 Main Body: **8.0** ft avg

- Design Charge Weight -

Front Row: **23.3** kg/hole
 Main Body: **23.3** kg/hole
 Max Chge Wt / delay: **25.0** kg/delay

Required kg Loaded: **8,096** kg
 Rock Density: **2.60** g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: **0.226** kg/te (actual)
 Front row: **0.184** kg/te (theoretical)
 Main Body: **0.184** kg/te (theoretical)
 "KPI" PF: **0.184** kg/te (theoretical)

0.808 lb/yd³
 0.808 lb/yd³
 0.808 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required: kg
CENTRA GOLD 70 **8,000**

Pkgd Expl. Required: kg

Boosters Required: kg/u # used kg
PENTEX 12 (OR EQUIVALENT) **0.34** **283** **96.2**

total explosives weight in Blast (kg): **8,096**
 Pkgd Prod (0 kg) % of Total kg: **0.0%**

Detonators Required: ms # req'd
EXEL HANDIDET 9m **283**
UNITRONIC 600 6M **1**
CONNECTADET 9M **65 ms** **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	1.0
BORETRACK	Enter hours	0.0



Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 5/10/2019

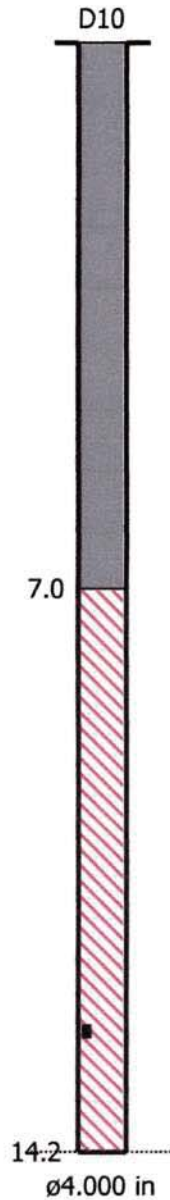
Blast Number: 19-007
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



HANDIDET 500ms 23ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Kevin Toplis

Quarry Manager:

Nick Heap

Signature required, indicating
sign off on Blast Design.



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-05-30

Blast Number: 19-008

Orica Order #: 2488743

Blast Time: 11:55 AM

page 1

Blaster-in-charge: Mike der Kinderen (Print Name)

Blast Location: Floor (Bench / Face)

GPS Coordinates: 43.40286 °N Latitude 79.88663 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 10 kph Temperature: 16 to 20 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 23,061 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 229 = 4,243.8 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	26,810	19,270	7,540

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	227	77.2

total explosives weight in Blast (kg): 7,617

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 9m		25/500	227
CONNECTADET 9M		65 ms	18

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	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

Tonnes Blasted: 40,960 te 15,754 m³
Total tonnes per day: 40,960 te NF-02 Rate Code
Total Holes Loaded: 227 holes
... including: 0 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 18 rows

- Pattern (Front Row) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 20 front row

- Pattern (Main Body) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 207 main body

Bench Height: 18.5 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 18.5 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: 10.5 ft avg
Main Body: 10.5 ft avg

- Charge Weight -

Front Row: 30.7 kg/hole
Main Body: 30.7 kg/hole
Max. per delay: 45.0 kg/delay
SD () Equation: 526.2 kg/delay
Total kg Loaded: 7,617 kg
Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.186 kg/te (actual)
Front row: 0.170 kg/te (theoretical)
Main Body: 0.170 kg/te (theoretical)
"KPI" PF: 0.170 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-05-30

Blast Number: 19-008
 Orica Order #: 2488743
 Blast Time: 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40292	79.88668	0.757524	1.394286
Front Row Corner	43.40298	79.88617	0.757525	1.394277
Back Row Corner	43.40269	79.88704	0.757520	1.394292
Average (Centre of Blast)	43.40286	79.88663	0.757523	1.394285

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	688.2	m		
Post Blast Data:	ppV: 1.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 35.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 104.2	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1068.8	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(688.2)^2}{30^2} \text{ kg} \\
 &= \frac{473,619}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

jim bray

Orica
 Blaster-in-charge:

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

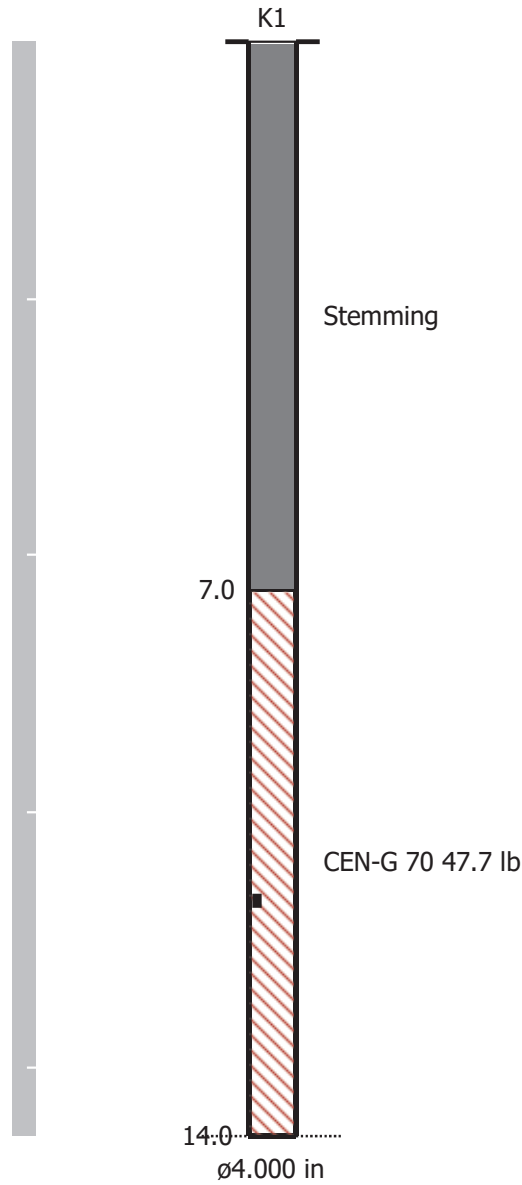
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 5/30/2019

Blast Number: 19-008
Orica Order #: 2488743

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nick Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:55:15 May 30, 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: 2450 Line 2
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

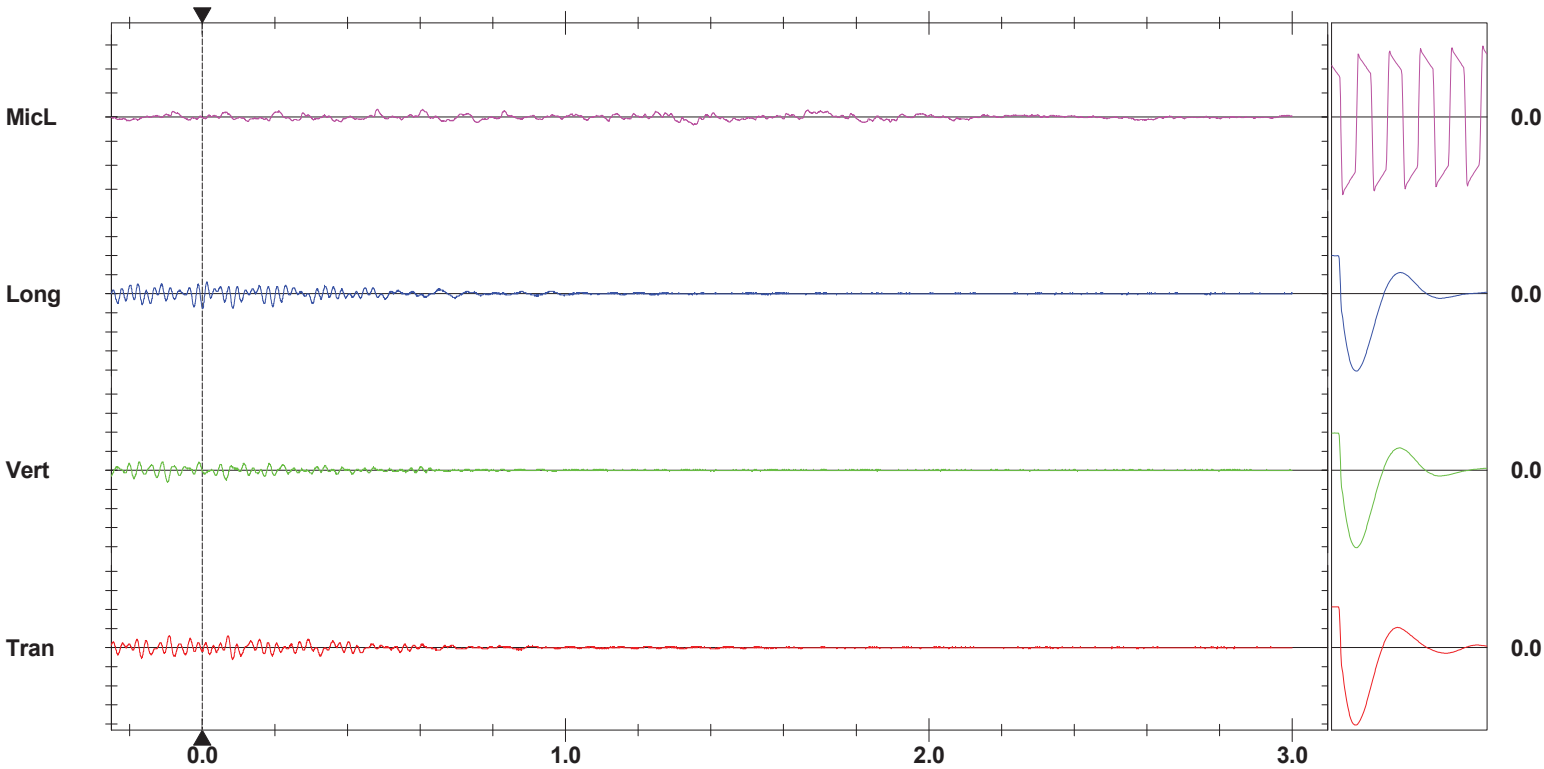
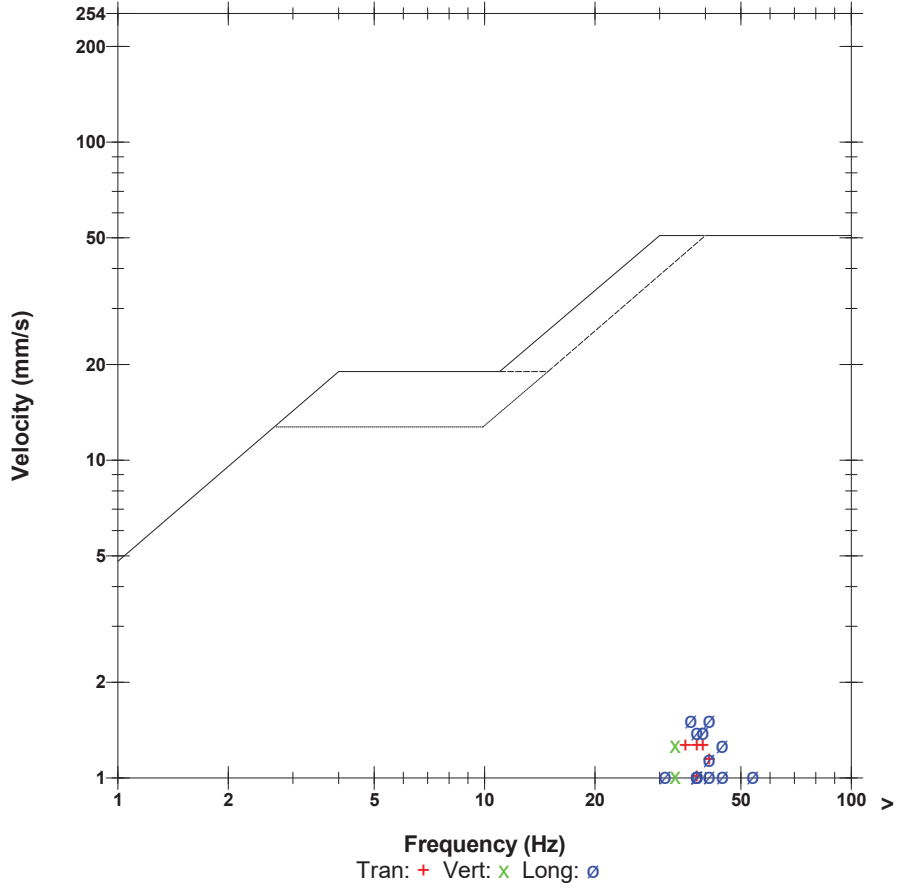
In front Yard by tree stump
 N-43.40245, W-79.87814

Microphone Linear Weighting
PSPL 104.2 dB(L) at 0.481 sec
ZC Freq 20 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 566 mv)

	Tran	Vert	Long	
PPV	1.270	1.270	1.524	mm/s
ZC Freq	35	33	41	Hz
Time (Rel. to Trig)	-0.092	-0.096	0.000	sec
Peak Acceleration	0.053	0.053	0.053	g
Peak Displacement	0.006	0.006	0.007	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.9	3.5	3.7	

Peak Vector Sum 2.020 mm/s at 0.083 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

**Nelson Aggregate
Across rod from 2102 Road 2
Burlington 2019-05-30 Blast 19-008 Floor**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
----- May 30 /19 05:22:36	----- May 30 /19 12:21:22	SERIAL NUMBER: UM6859 Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:

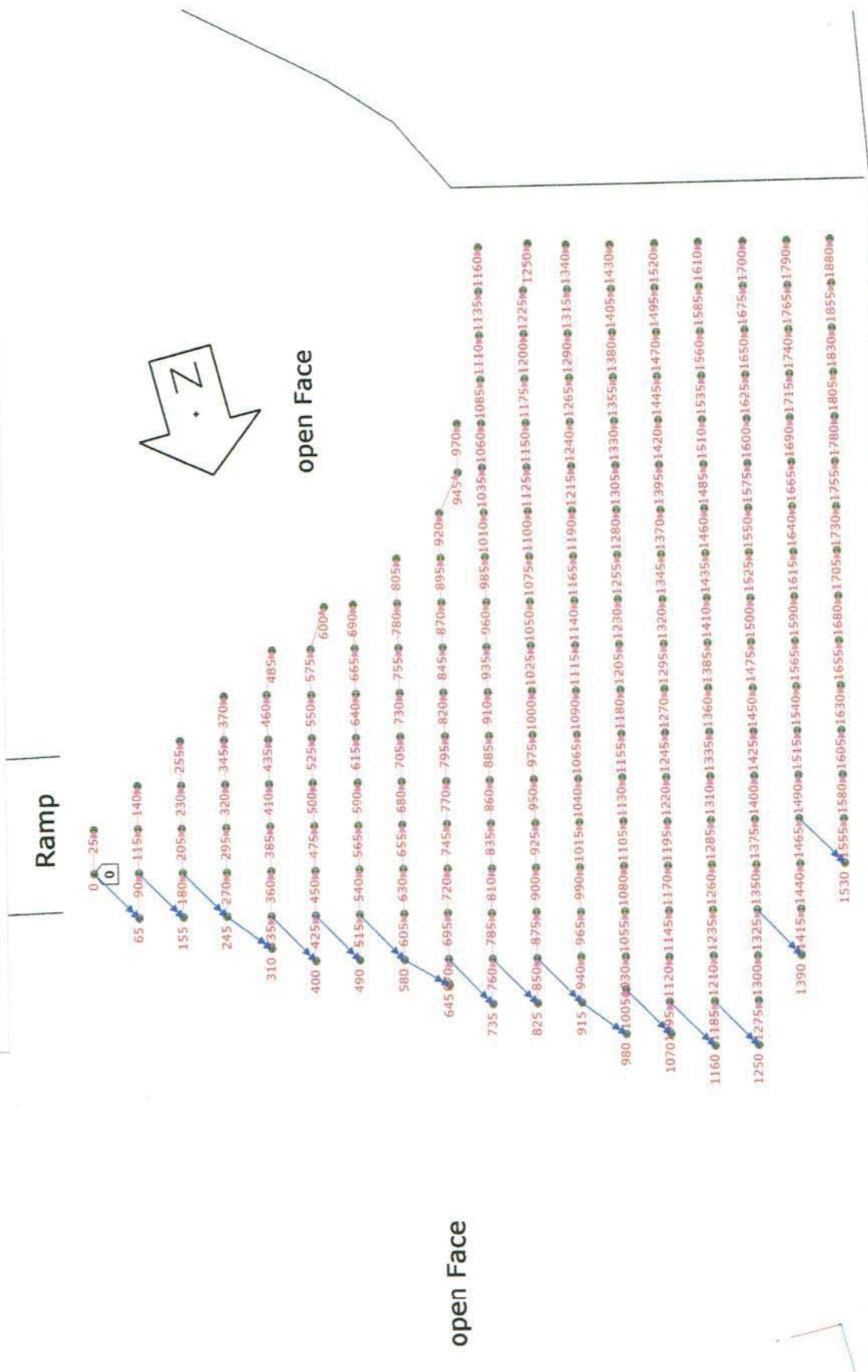
SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.5ft
 1st row burden: 11.5ft
 Total drilled: 3206.0ft

Spacing: 11.5ft
 Hole Diameter: 4.0in
 Number of holes: 229

Stemming: 5.5ft
 Subdrill: 0.0ft
 Hole angle: 0.0°



Road

SHOTPlus™ Professional 5.7.4.4	5/29/2019
Mine	Burlington
Location	
Title/author	9FLR008 Final
Filename	Burlington 2019-05-30 Blast 19-008 Floor.spf



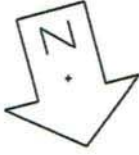
Not to scale

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Stemming: 5.5ft
 1st row burden: 11.5ft Subdrill: 0.0ft Hole angle: 0.0°
 Hole Diameter: 4.0in Number of holes: 229
 Total drilled: 3206.0ft

Ramp

- R1 R2 14.0ft 14.0ft
- Q1 Q2 Q3 Q4 14.0ft 14.0ft 14.0ft 14.0ft
- P1 P2 P3 P4 P5 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- O1 O2 O3 O4 O5 O6 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- N1 N2 N3 N4 N5 N6 N7 N8 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- M1 M2 M3 M4 M5 M6 M7 M8 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- L1 L2 L3 L4 L5 L6 L7 L8 L9 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- J1 J2 J3 J4 J5 J6 J7 J8 J9 J10 J11 J12 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- I1 I2 I3 I4 I5 I6 I7 I8 I9 I10 I11 I12 I13 I14 I15 I16 I17 I18 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 E19 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft
- A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft 14.0ft



9FLR008 Final
 4" Blasthole
 11.5 X 11.5' Pattern

DRILL TO SHALE

- J14 14.0ft 14.0ft
- I15 14.0ft 14.0ft
- H18 14.0ft 14.0ft
- G18 14.0ft 14.0ft
- F19 14.0ft 14.0ft
- E19 14.0ft 14.0ft
- D19 14.0ft 14.0ft
- C19 14.0ft 14.0ft
- B17 14.0ft 14.0ft
- A15 14.0ft 14.0ft

Road



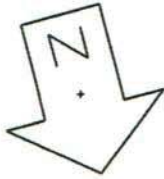
Not to scale

SHOTPlus™ Professional 5.7.4.4		5/29/2019
Mine	Burlington	
Location		
Title/author	9FLR008 Final	
Filename	Burlington 2019-05-30 Blast 19-008 Floor.spf	

SHOTPlus 5 Plan

Blast Summary Data
 Burden: 11.5ft Spacing: 11.5ft Stemming: 5.5ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Subdrill: 0.0ft Hole angle: 0.0°
 Total drilled: 3206.0ft Number of holes: 229

Ramp



Load Sheet
 Max 40 Kg

74/6 - P.C.

Qm7

31	33	28	31	34	33	26	29	29	35	48	41	41	43	41	41	44
31	31	28	31	34	38	29	28	33	35	36	38	41	41	41	41	41
4	38	31	31	33	28	26	29	33	33	35	38	38	38	41	41	38
25	30		27	32	28	28	28	32	32	34	36	38	39	40	41	41
28	30	32	32	32	32	32	32	34	35	37	37	34	40	44	41	
10	10	12	36								10	10	24	38		
19	19	13	26	33	33	31	34	37	40	42	42	45	45	42	39	
19	31	33	33	27	26	27	28	29	39	42	45	45	45	45	42	
26	33	37	29	28	28	28	39	40	43	45	45	45	45	45	45	
19	26	34	33	31	34	37	40	42	45	45	42	39				
12	34	34	29	33	33	39	41	39	42	42	42	36				
12	26	35	28	33	33	39	41	39	42	42	42	36				
6	29	33	35	35	35	42	33	33	35	36	36	36				
25	25	25	22	24	25	25	25	24	22	27	33	27	28	22		
25	26	25	22	27	33	27	28	22	25	25	25	24				

Road

SHOTPlus™ Professional 5.7.4.4	5/29/2019
Mine	Burlington
Location	
Title/author	9FLR008 Final
Filename	Burlington 2019-05-30 Blast 19-008 Floor.spf



Not to scale



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-06-06

Blast Number: 19-009

Orica Order #: 2491485

Blast Time: 12:07 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40361 °N Latitude 79.88191 °W Longitude
Centre of Blast Centre of Blast

Wind from the: S at kph Temperature: 16 to 20 °C

Clear: Partly Cloudy: X Rain: Snow: Inversion: Ceiling 3,169 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 52 = 3,754.9 ft (4 " diam)
Secondary Bit diam: 92.1 mm	0	# Holes: 1 = 72.2 ft (3 5/8 " diam)
Tertiary Bit diam: mm	0	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,970	22,050	11,920

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	55	12.5
PENTEX 12 (OR EQUIVALENT)	0.34	55	18.7

total explosives weight in Blast (kg): 11,951
Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			53
UNITRONIC 600 20M			2
UNITRONIC 600 25M			55

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	5

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	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:	27,603 te	10,616 m ³
Total tonnes per day:	27,603 te	NB80-01 Rate Code
Total Holes Loaded:	53 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:	10.0 ft avg
# Holes:	19 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	34 main body

Bench Height: 70.2 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 72.2 ft avg

- Stone Decking -

Front Row:	8.0 ft avg
Main Body:	0.0 ft avg
# Decks:	2 per blast

- Collar Stemming -

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4" Clear

- Charge Length -

Front Row:	57.2 ft avg
Main Body:	65.2 ft avg

- Charge Weight -

Front Row:	166.8 kg/hole
Main Body:	190.1 kg/hole
Max. per delay:	230.0 kg/delay
SD () Equation:	122.0 kg/delay
Total kg Loaded:	11,951 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.433 kg/te (actual)
Front row:	0.269 kg/te (theoretical)
Main Body:	0.409 kg/te (theoretical)
"KPI" PF:	0.362 kg/te (theoretical)

NOTES (ANY VARIATION FROM STANDARD):

2 Stone decks were added due to voids identified on drill log



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-06-06

Blast Number: 19-009
Orica Order #: 2491485
Blast Time: 12:07 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40362	79.88191	0.757536	1.394202
Front Row Corner	43.40341	79.88199	0.757532	1.394204
Back Row Corner	43.40381	79.88183	0.757539	1.394201
Average (Centre of Blast)	43.40361	79.88191	0.757536	1.394202

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	331.4	m		
Post Blast Data:	ppV: 9.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 11.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.9	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	1014.8	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 15.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 121.7	dB	Trigger set at: 115	dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1267.4	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

SouthWest Corner of Property

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

$$W = \frac{D^2}{30^2}$$

$$= \frac{(331.4)^2}{30^2} \text{ kg}$$

$$= \frac{109,826}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

Date/Time Long at 12:07:12 June 6, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 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: 2450 #2 Sideroad
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

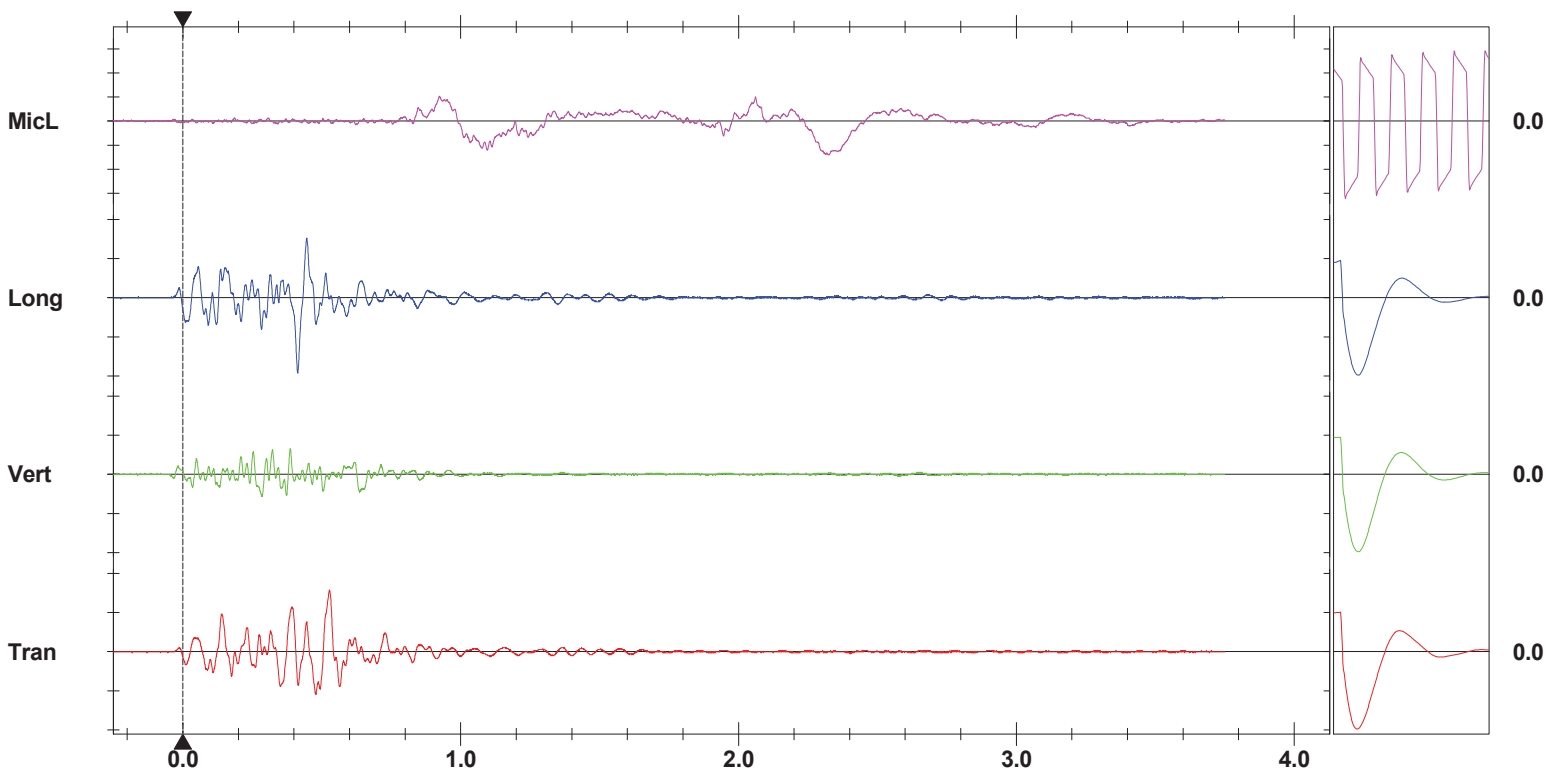
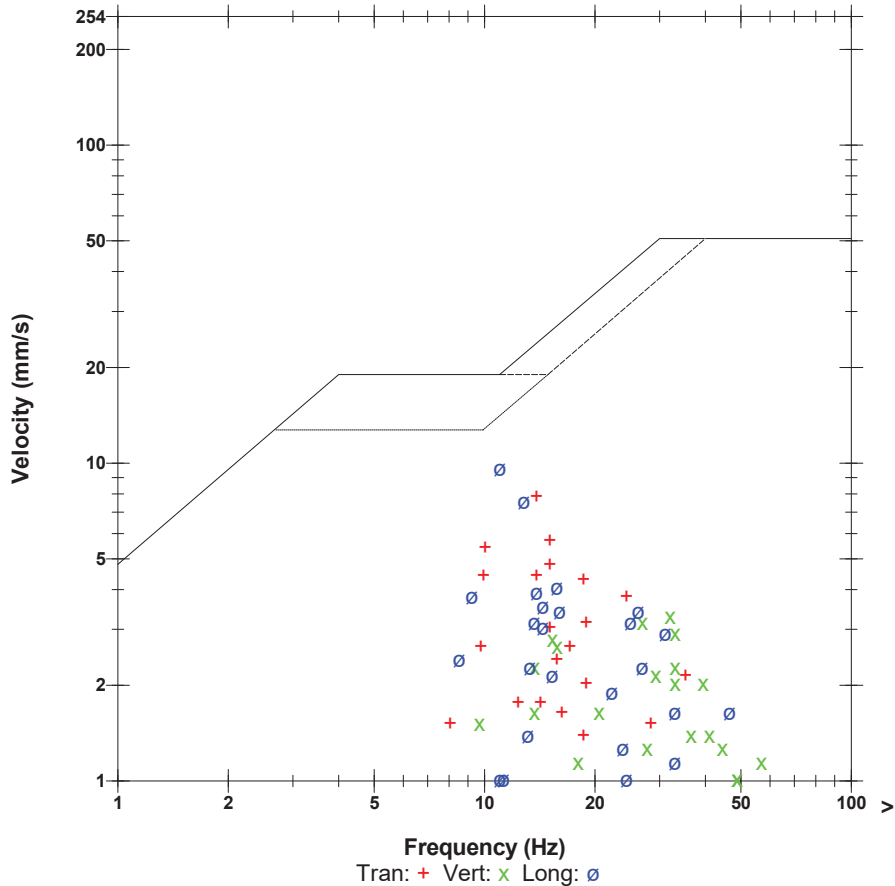
43.40245 -79.87814
 Beside tree stump in front yard

Microphone Linear Weighting
PSPL 116.9 dB(L) at 2.322 sec
ZC Freq 2.3 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 571 mv)

	Tran	Vert	Long	
PPV	7.874	3.302	9.652	mm/s
ZC Freq	13.8	32	11.0	Hz
Time (Rel. to Trig)	0.527	0.386	0.413	sec
Peak Acceleration	0.106	0.080	0.106	g
Peak Displacement	0.089	0.029	0.089	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

Peak Vector Sum 10.53 mm/s at 0.414 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 MicL at 12:07:14 June 6, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.353 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190606120714.IDFW

Notes

Location: COLLING RD & BLINDLINE
Client: NELSON AGGREGATES
User Name: ORICA CANADA
General:

Extended Notes

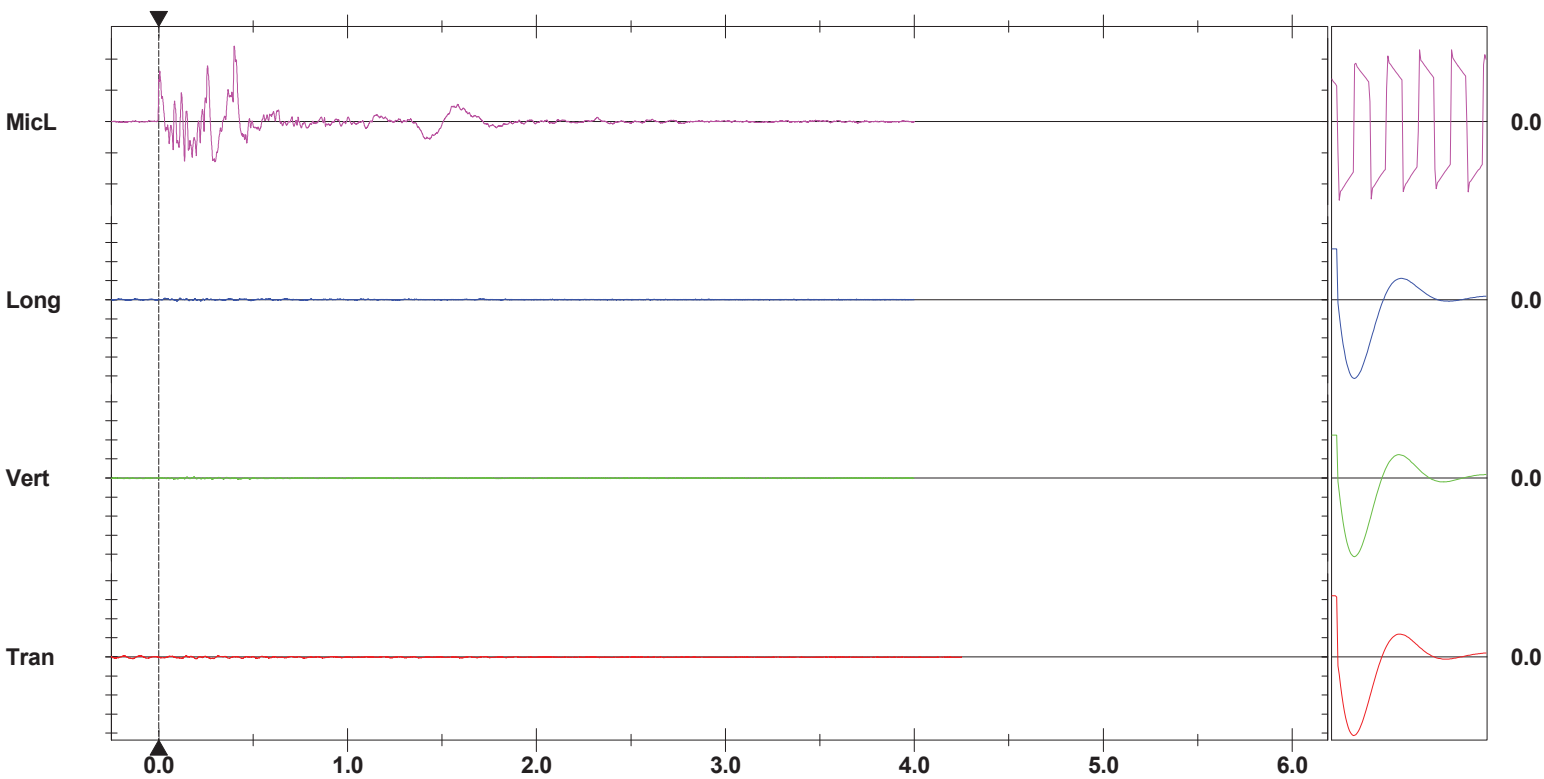
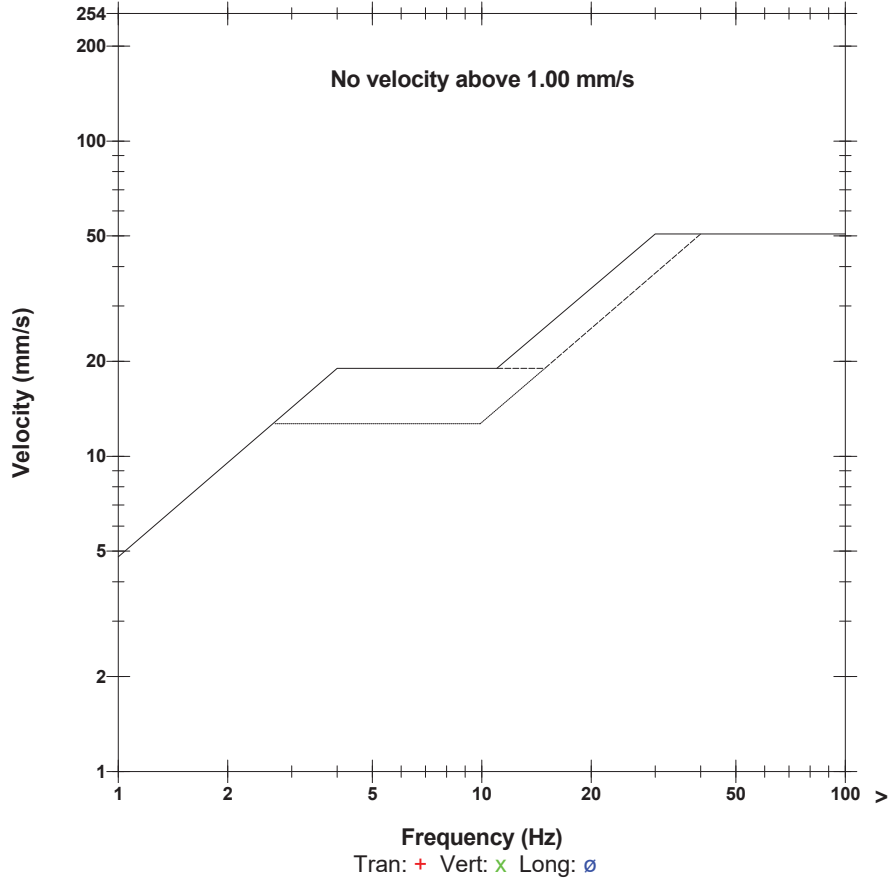
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 121.7 dB(L) at 0.400 sec
ZC Freq 5.6 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1345 mv)

	Tran	Vert	Long	
PPV	0.213	0.126	0.173	mm/s
ZC Freq	15.5	14.4	25	Hz
Time (Rel. to Trig)	0.200	0.081	0.114	sec
Peak Acceleration	0.010	0.012	0.016	g
Peak Displacement	0.009	0.002	0.002	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 0.232 mm/s at 0.200 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

**Nelson Aggregate
SW Corner of Property
Burlington 2019-06-06 Blast 19-009 Upper Middle**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Jun 6 /19 05:55:30		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jun 6 /19 12:29:39	Jun 6 /19 12:29:41	Event recorded. Trigger Level Long: 1.50 mm/s
Jun 6 /19 12:29:41	Jun 6 /19 12:29:49	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0 dB

SHOTPlus 5 Plan

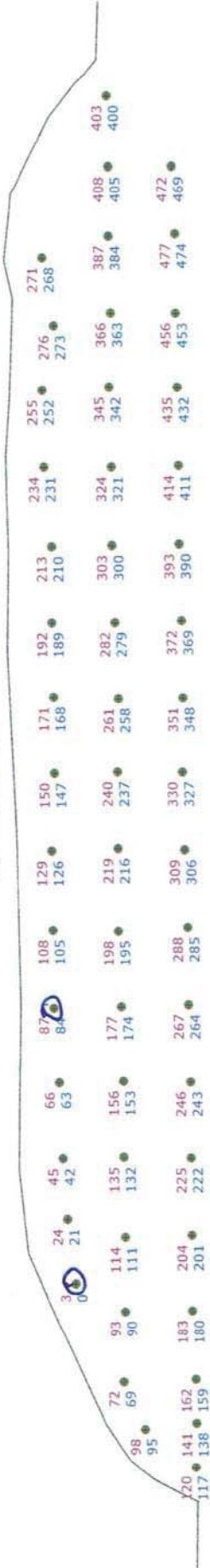
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3827.1ft Hole Diameter: 4.0in Number of holes: 53

Ø = Deck



open face



C2 3.625" DIA HOLE



Not to scale

SHOTPlus™ Professional 5.7.4.4	6/5/2019
Mine	Burlington
Location	UPPER MIDDLE
Title/author	9UPMD009 Design Fnl
Filename	Burlington 2019-06-06 Blast 19-009 Upper Mig

SHOTPlus 5 Plan

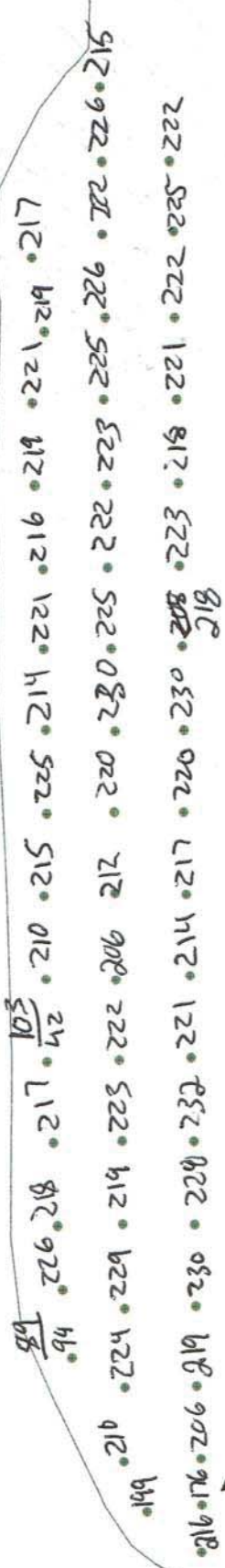
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3827.1ft Hole Diameter: 4.0in Number of holes: 53

Load Sheet
Max 230 Kg



open face



C2 3.625" DIA HOLE



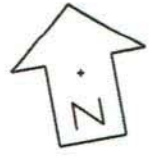
Not to scale

SHOTPlus™ Professional 5.7.4.4	6/5/2019
Mine	Burlington
Location	UPPER MIDDLE
Title/author	9UPMD009 Design Fnl
Filename	Burlington 2019-06-06 Blast 19-009 Upper Mic

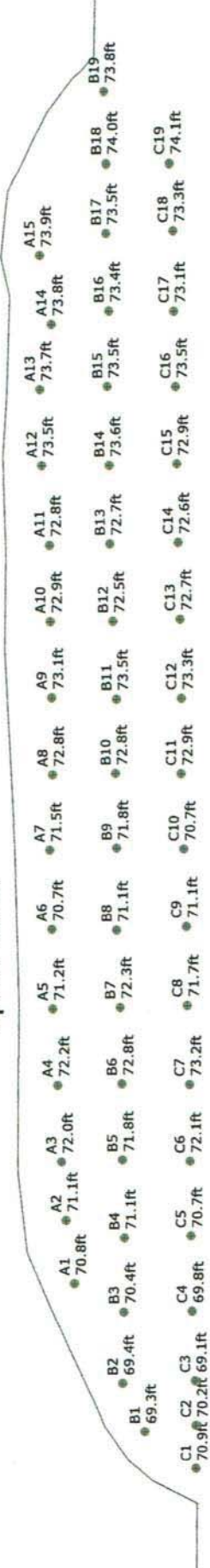
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 53
 Total drilled: 3827.1ft



open face



9UPMD009 Design Fnl - 3.625" and 4" Blast Holes 12x10 9x10 272 and 250 + .6 S
 DRILLER NAME: _____

C2 3.625" DIA HOLE



Not to scale

SHOTPlus™ Professional 5.7.4.4	6/5/2019
Mine	Burlington
Location	UPPER MIDDLE
Title/author	9UPMD009 Design Fnl
Filename	Burlington 2019-06-06 Blast 19-009 Upper Mid



Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Design Date: 2019-06-06

Blast Number: 19-009
 Orica Order #:

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)
 GPS Coordinates: 43.40361 °N Latitude 79.88191 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 27,603 te
 Total Holes Loaded: 53 holes
 ... including: Dead Holes
 ... and: Helper Holes
 Helper Hole Collar: ft avg
 # Rows Blasted: 3 rows

- Drilling Information -

	Angle from Vertical		Nominal Bit Diameter:
Primary Bit diam:	<u>101.6</u> mm <u>0</u> °	# Holes: <u>52</u> =	3,754.9 ft (<u>4</u> " diam)
Secondary Bit diam:	<u>92.1</u> mm <u>0</u> °	# Holes: <u>1</u> =	72.2 ft (<u>3 5/8</u> " diam)
Tertiary Bit diam:	<u> </u> mm <u>0</u> °	# Holes: <u> </u> =	0.0 ft (<u> </u> " diam)

- Design Pattern (Front Row) -

Burden: 12.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 19 front row

- Design Pattern (Main Body) -

Burden: 9.0 ft avg
 Spacing: 10.0 ft avg
 # Holes: 34 main body
 Bench Height: 70.2 ft avg
 Sub-drill: 2.0 ft avg
 Hole Depth: 72.2 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" Clear

- Design Charge Length -

Front Row: 65.2 ft avg
 Main Body: 65.2 ft avg

- Design Charge Weight -

Front Row: 190.1 kg/hole
 Main Body: 190.1 kg/hole
 Max Chge Wt / delay: 230.0 kg/delay

Required kg Loaded: 12,550 kg
 Rock Density: 2.60 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.455 kg/te (actual)
 Front row: 0.307 kg/te (theoretical)
 Main Body: 0.409 kg/te (theoretical)
 "KPI" PF: 0.375 kg/te (theoretical)

1.343 lb/yd³
 1.791 lb/yd³
 1.642 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Bulk Expl. Required:	kg
CENTRA GOLD 70	<u>12,500</u>

Pkgd Expl. Required:	kg
FORTEL PRO 75X400	<u>2</u> 50

Boosters Required:	kg/u	# used	kg
PENTEX 8 (OR EQUIVALENT)	<u>0.23</u>		
PENTEX 12 (OR EQUIVALENT)	<u>0.34</u>		

total explosives weight in Blast (kg): 12,550
 Pkgd Prod (50 kg) % of Total kg: 0.4%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		
UNITRONIC 600 25M		

Cord & Access. Req'd:	U of M	# req'd
WIRE DUPLEX (6 PACK) 400M	<u>units</u>	<u>1</u>

Resource Deployment:	
# of Blasts today (this Quarry)	<u>1</u>
# of Blasters (this Blast)	<u>1</u>
# of Helpers (this Blast)	<u>1</u>
# of MMU's (this Blast)	<u>1</u>

Services Req'd:		
BULK TRUCK CHARGE		<u>1.0</u>
BLASTER HOURS	Enter Blaster hours	<u>0.0</u>
HELPER HOURS	Enter total Helper man-hours	<u>0.0</u>
SHOT LAYOUT FEE	Enter # trips extra beyond 1	<u>0.0</u>
ADVANCED BLAST DESIGN	Enter hours	<u>0.0</u>
BORETRACK	Enter hours	<u>0.0</u>



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-06-20

Blast Number: 19-010

Orica Order #: 2496865

Blast Time: 12:11 PM

page 1

Blaster-in-charge: Kevin Toplis (Print Name)

Blast Location: Floor 011 (Bench / Face)

GPS Coordinates: 43.40226 °N Latitude 79.88668 °W Longitude
Centre of Blast Centre of Blast

Wind from the: N at 5 kph Temperature: 16 to 20 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: X
Ceiling: 30,000 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0	# Holes: 272 = 4,678.4 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	35,630	29,410	6,220

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	272	92.5

total explosives weight in Blast (kg): 6,312

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
EXEL HANDIDET 12m		25/500	24
CONNECTADET 9M		25 ms	11
CONNECTADET 9M		33 ms	2
CONNECTADET 9M		65 ms	36
EXEL HANDIDET 9m		25/500	248

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	6.5
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:	45,552 te	17,520 m ³
Total tonnes per day:	45,552 te	NF-02 Rate Code
Total Holes Loaded:	272 holes	
... including:	0 Dead Holes	
... and:	0 Helper Holes	
Helper Hole Collar:	ft avg	
# Rows Blasted:	17 rows	

- Pattern (Front Row)-

Burden:	11.5 ft avg
Spacing:	11.5 ft avg
# Holes:	40 front row

- Pattern (Main Body) -

Burden:	11.5 ft avg
Spacing:	11.5 ft avg
# Holes:	232 main body

Bench Height: 17.2 ft avg

Sub-drill: 0.0 ft avg

Hole Depth: 17.2 ft avg

- Stone Decking -

Front Row: ft avg

Main Body: ft avg

Decks: 0 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 1/2" Clear

- Charge Length -

Front Row: 10.2 ft avg

Main Body: 10.2 ft avg

- Charge Weight -

Front Row: 29.7 kg/hole

Main Body: 29.7 kg/hole

Max. per delay: 32.0 kg/delay

SD () Equation: 530.4 kg/delay

Total kg Loaded: 6,312 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.139 kg/te (actual)

Front row: 0.178 kg/te (theoretical)

Main Body: 0.178 kg/te (theoretical)

"KPI" PF: 0.178 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

helper hours 2x6=12hrs



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-06-20

Blast Number: 19-010
 Orica Order #: 2496865
 Blast Time: 12:11 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40226	79.88684	0.757512	1.394288
Front Row Corner	43.40197	79.88588	0.757507	1.394272
Back Row Corner	43.40255	79.88732	0.757517	1.394297
Average (Centre of Blast)	43.40226	79.88668	0.757512	1.394286

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	690.9	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

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1002.0	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(690.9)^2}{30^2} \text{ kg} \\
 &= \frac{477,343}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

jim bray

Kevin Toplis

Signature required, indicating that
 Blast Report is Complete & Accurate.

SHOTPlus Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Stemming: 5.5ft
 1st row burden: 11.5ft Hole Diameter: 4.0in Subdrill: 0.0ft Hole angle: 0.0°
 Total drilled: 4368.0ft Number of holes: 273



9FLR11 Design
 4" Blasthole
 11.5' X 11.5' Pattern
 DRILL TO SHALE

SHOTPlus™ Professional 5.7.7.8	6/19/2019
Mine	Burlington
Location	
Title/author	9FLR11 Design
Filename	Burlington 2019-06-20 Blast 19-010 Floor.spf

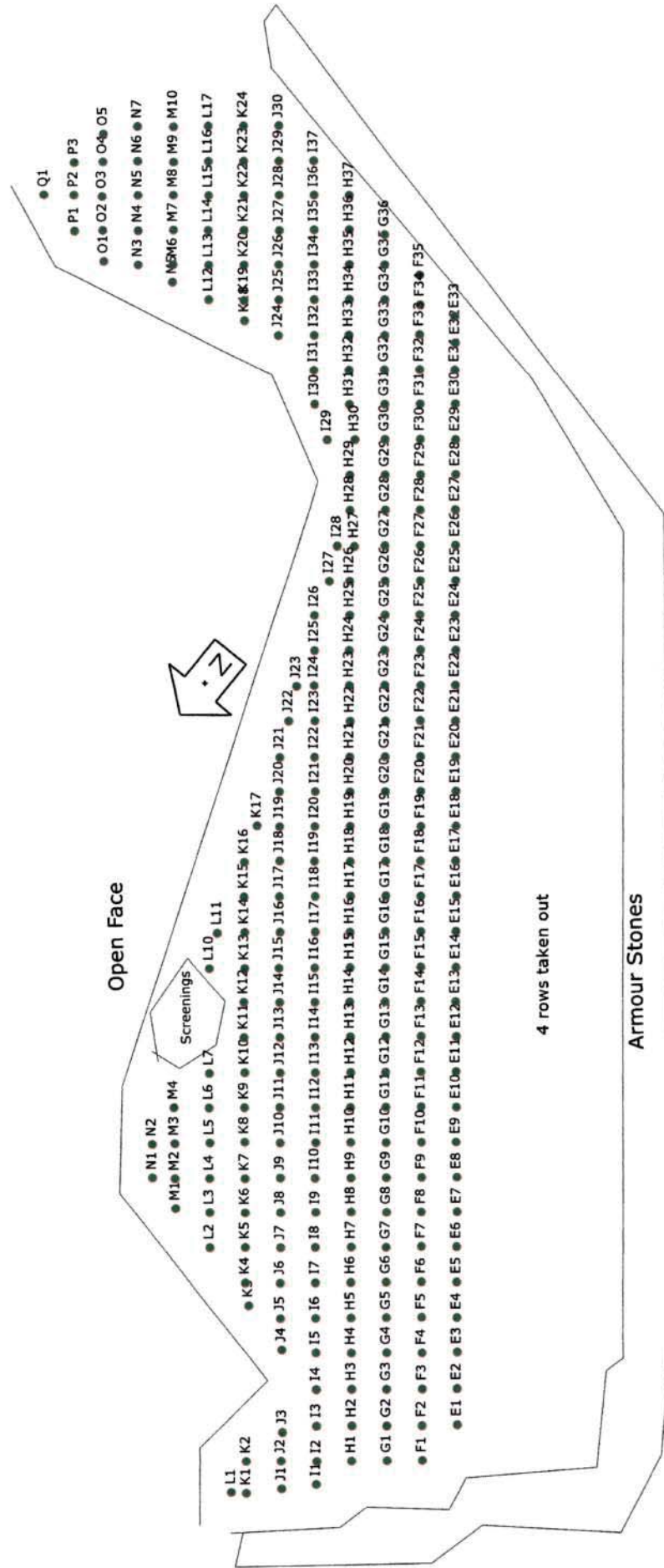


Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 11.5ft Spacing: 11.5ft Stemming: 5.5ft
 1st row burden: 11.5ft Subdrill: 0.0ft Hole angle: 0.0°
 Hole Diameter: 4.0in Number of holes: 273
 Total drilled: 4368.0ft



9FLR11 Design
 4" Blasthole
 11.5' X 11.5' Pattern
 DRILL TO SHALE

SHOTPlus™ Professional 5.7.7.8		6/19/2019
Mine	Burlington	
Location		
Title/author	9FLR11 Design	
Filename	Burlington 2019-06-20 Blast 19-010 Floor.spf	



Not to scale



Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Design Date: 2019-06-20

Blast Number: 19-010
Orica Order #:

page 1

Blaster-in-charge: Kevin Toplis (Print Name)

Blast Location: Floor 011 (Bench / Face)
GPS Coordinates: 43.40226 °N Latitude 79.88668 °W Longitude
Centre of Blast Centre of Blast

Design to Blasted: 61,536 te
Total Holes Loaded: 395 holes
... including: Dead Holes
... and: Helper Holes
Helper Hole Collar: ft avg
Rows Blasted: 17 rows

- Drilling Information -

Primary Bit diam: 101.6 mm 0° Angle from Vertical # Holes: 395 = 6,320.0 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: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 40 front row

- Design Pattern (Main Body) -

Burden: 11.5 ft avg
Spacing: 11.5 ft avg
Holes: 355 main body
Bench Height: 16.0 ft avg
Sub-drill: 0.0 ft avg
Hole Depth: 16.0 ft avg

- Design Stone Decking -

Front Row: ft avg
Main Body: ft avg

- Design Collar Stemming -

Front Row: 7.0 ft avg
Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Design Charge Length -

Front Row: 9.0 ft avg
Main Body: 9.0 ft avg

- Design Charge Weight -

Front Row: 26.2 kg/hole
Main Body: 26.2 kg/hole
Max Chge Wt / delay: 45.0 kg/delay

Required kg Loaded: 184 kg
Rock Density: 2.60 g/cc = te/m³

- Design Powder Factor -

Expected Yield PF: 0.003 kg/te (actual)
Front row: 0.168 kg/te (theoretical)
Main Body: 0.168 kg/te (theoretical)
"KPI" PF: 0.168 kg/te (theoretical)

0.738 lb/yd³
0.738 lb/yd³
0.738 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Drilling to shale, final depths to be determined once shot has been measured

Bulk Expl. Required:	kg
CENTRA GOLD 70	

Pkgd Expl. Required:	kg
FORTELE PRO 75X400	2 50

Boosters Required:	kg/u	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	395	134.3

total explosives weight in Blast (kg): 184
Pkgd Prod (50 kg) % of Total kg: 27.1%

Detonators Required:	ms	# req'd
UNITRONIC 600 6M		2
EXEL HANDIDET 12m	25/500	395
CONNECTADET 9M	25 ms	3
CONNECTADET 9M	33 ms	1
CONNECTADET 9M	65 ms	24

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)		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 Design

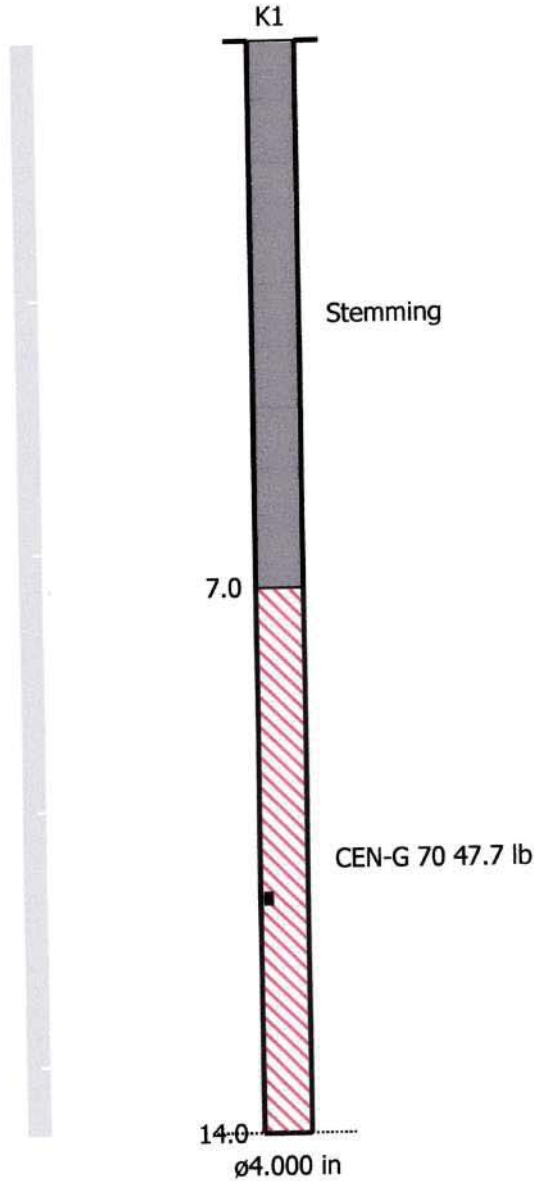
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 6/20/2019

Blast Number: 19-010
Orica Order #:

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Kevin Toplis

Quarry Manager:

Nick Heap

Signature required, indicating
sign off on Blast Design.



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-07-04

Blast Number: 19-011

Orica Order #: 2503180

Blast Time: 11:04 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle North (Bench / Face)

GPS Coordinates: 43.40499 °N Latitude 79.88175 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SE 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: 53 = 3,205.4 ft (4 " diam)
Secondary Bit diam: 92.1 mm	0°	# Holes: 4 = 241.9 ft (3 5/8 " diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	27,440	19,700	7,740
CENTRA GOLD 70	34,450	32,820	1,630

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	57	12.9
PENTEX 12 (OR EQUIVALENT)	0.34	57	19.4

total explosives weight in Blast (kg): 9,402

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			57
UNITRONIC 600 20M			25
UNITRONIC 600 25M			32

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	5

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	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	23,372 te	8,989 m ³
Total tonnes per day:	23,372 te	NB60-07 Rate Code
Total Holes Loaded:	57 holes	
... including:	3 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:	10.0 ft avg
# Holes:	20 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	37 main body

Bench Height: 58.5 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 60.5 ft avg

- Stone Decking -

Front Row: 0.0 ft avg

Main Body: 0.0 ft avg

Decks: 0 per blast

- Collar Stemming -

Front Row: 8.0 ft avg

Main Body: 8.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 52.5 ft avg

Main Body: 52.5 ft avg

- Charge Weight -

Front Row: 153.0 kg/hole

Main Body: 153.0 kg/hole

Max. per delay: 187.0 kg/delay

SD () Equation: 183.3 kg/delay

Total kg Loaded: 9,402 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.402 kg/te (actual)

Front row: 0.296 kg/te (theoretical)

Main Body: 0.395 kg/te (theoretical)

"KPI" PF: 0.362 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.763 lb/yd³
1.298 lb/yd³
1.731 lb/yd³
1.586 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

F-16 Was measured at 61' the morning of the blast and brought to Nick Heap's attention

8' Collars were used due to excessive over burden



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-07-04

Blast Number: 19-011
 Orica Order #: 2503180
 Blast Time: 11:04 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40505	79.88168	0.757561	1.394198
Front Row Corner	43.40470	79.88175	0.757555	1.394200
Back Row Corner	43.40521	79.88182	0.757564	1.394201
Average (Centre of Blast)	43.40499	79.88175	0.757560	1.394199

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	406.2	m		
Post Blast Data:	ppV: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 20.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 113.5	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	998.1	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 9.1	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 115.3	dB	Trigger set at: 115	dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1411.7	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(406.2)^2}{30^2} \text{ kg} \\
 &= \frac{164,998}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
Blast Date:	7/4/2019

Blast Number:	19-011
Orica Order #:	2503180

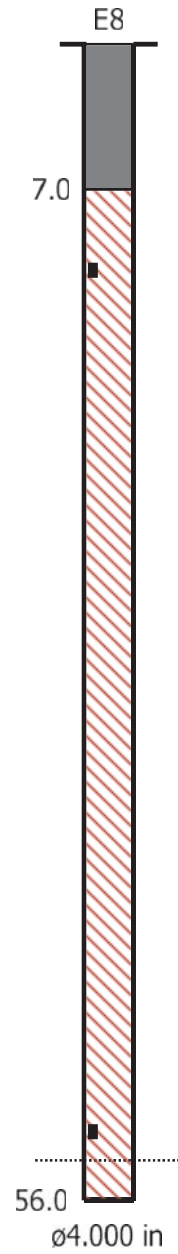
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
PENTEX BC 7 * 200 x1

UNI Tronic (?)ms 66ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike derkinderen

Quarry Manager:

Nick Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:04:45 July 4, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 2048 sps
Job Number: 1

Serial Number BE12877 V 10.72-1.1 Minimate Blaster
Battery Level 6.4 Volts
Unit Calibration December 4, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: 2450 #2 Road
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

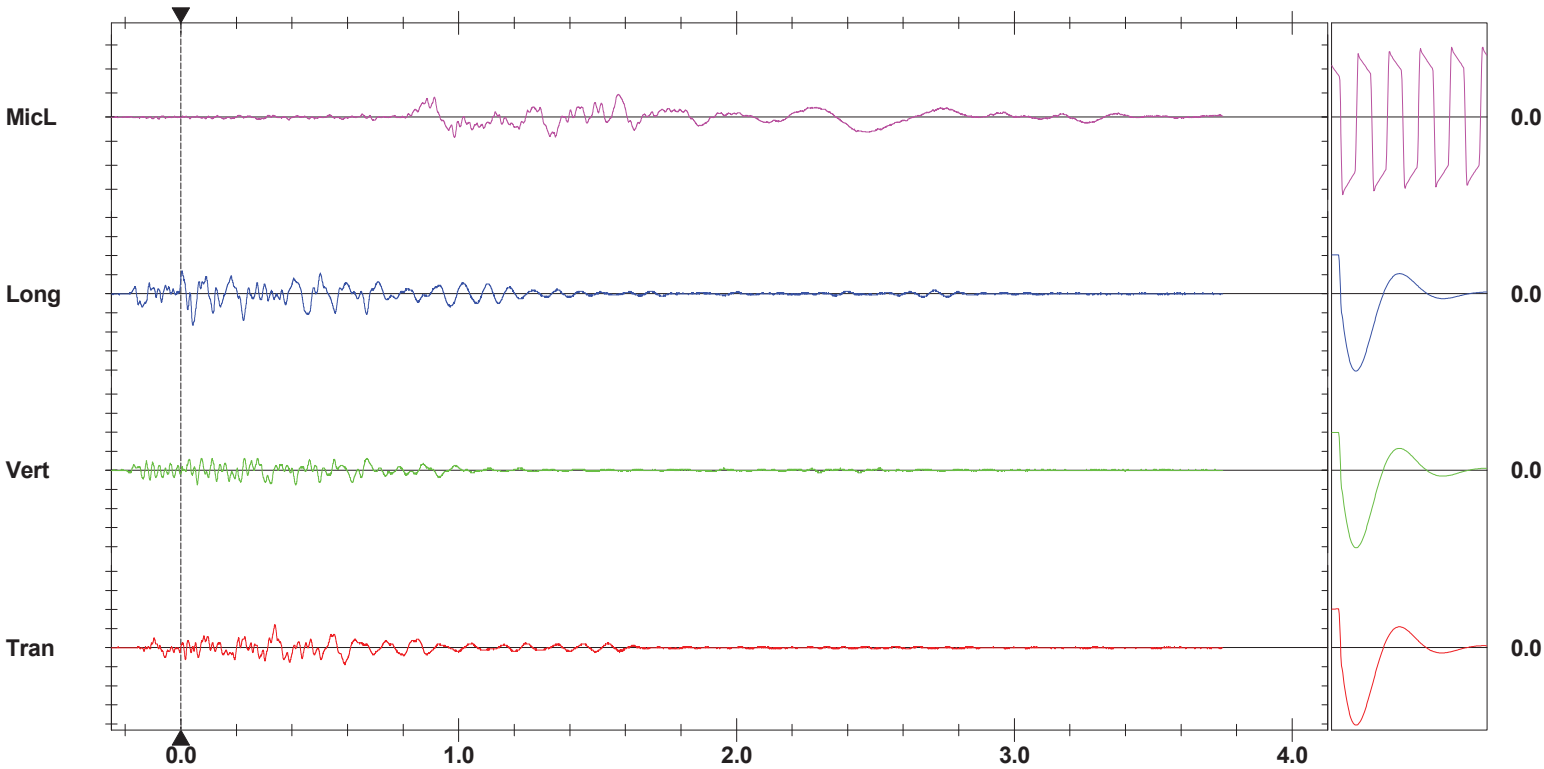
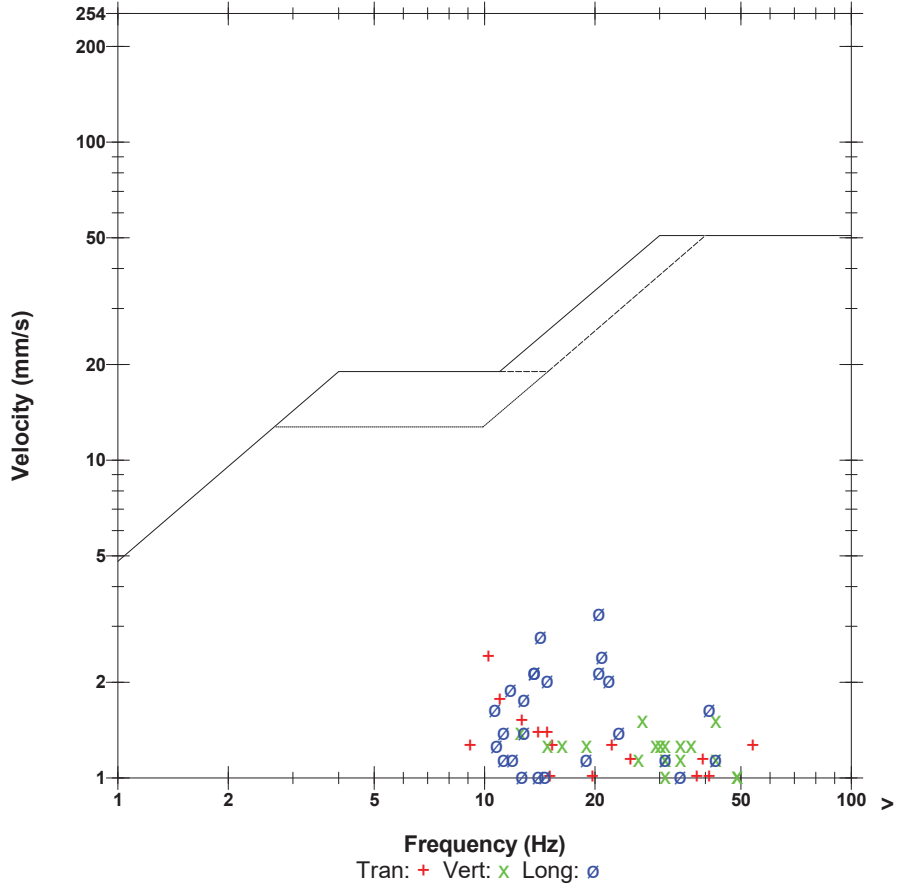
N43.40245;W-79.87814

Microphone Linear Weighting
PSPL 113.5 dB(L) at 1.575 sec
ZC Freq 9.1 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 514 mv)

	Tran	Vert	Long	
PPV	2.413	1.524	3.302	mm/s
ZC Freq	10.2	43	20	Hz
Time (Rel. to Trig)	0.338	0.059	0.042	sec
Peak Acceleration	0.053	0.053	0.080	g
Peak Displacement	0.026	0.019	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.4	Hz
Overswing Ratio	3.8	3.6	3.9	

Peak Vector Sum 3.326 mm/s at 0.042 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 MicL at 11:04:45 July 4, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.009 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190704110445.IDFW

Notes

Location: COLLING RD & BLINDLINE
Client: NELSON AGGREGATES
User Name: ORICA CANADA
General:

Extended Notes

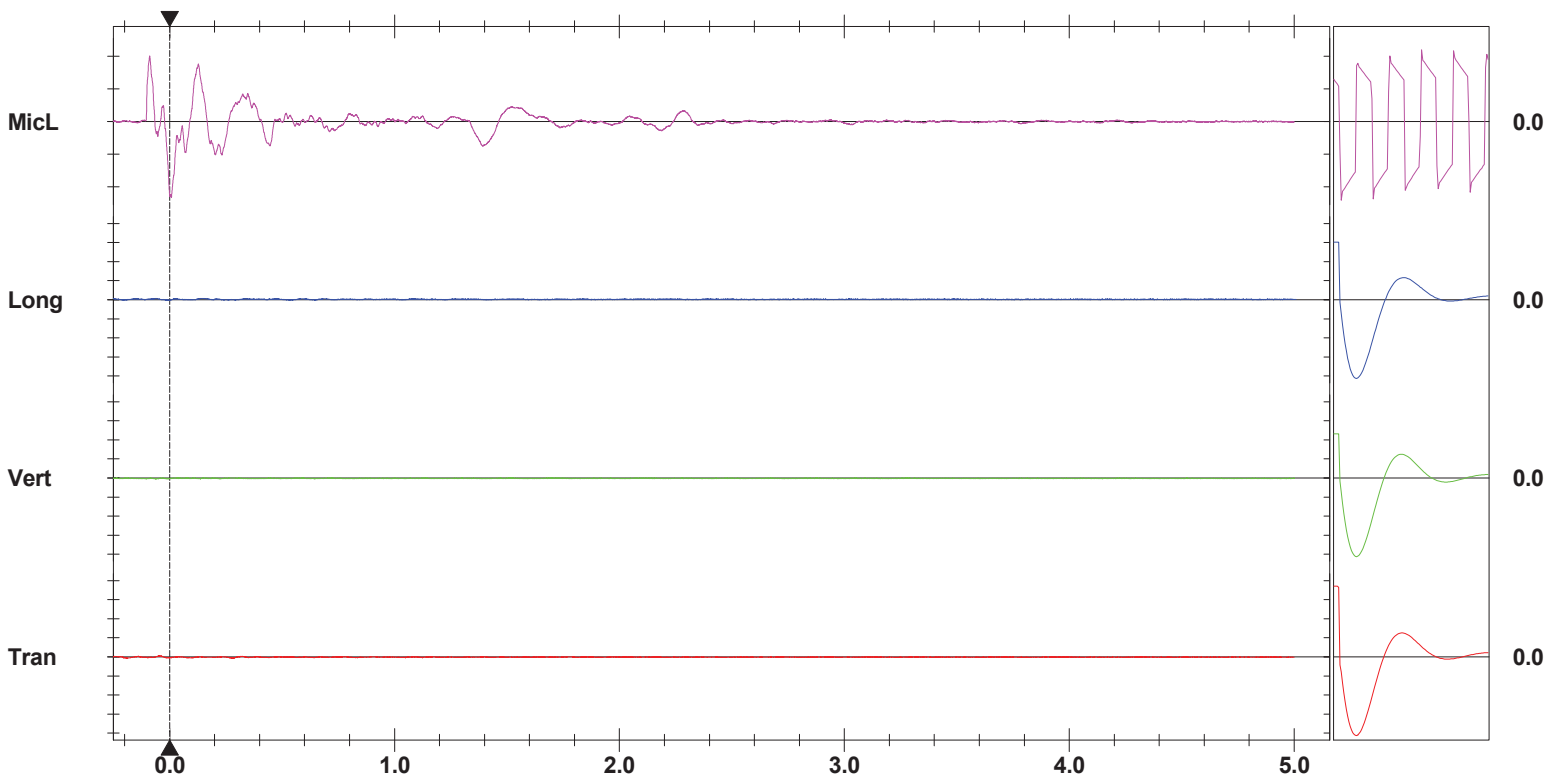
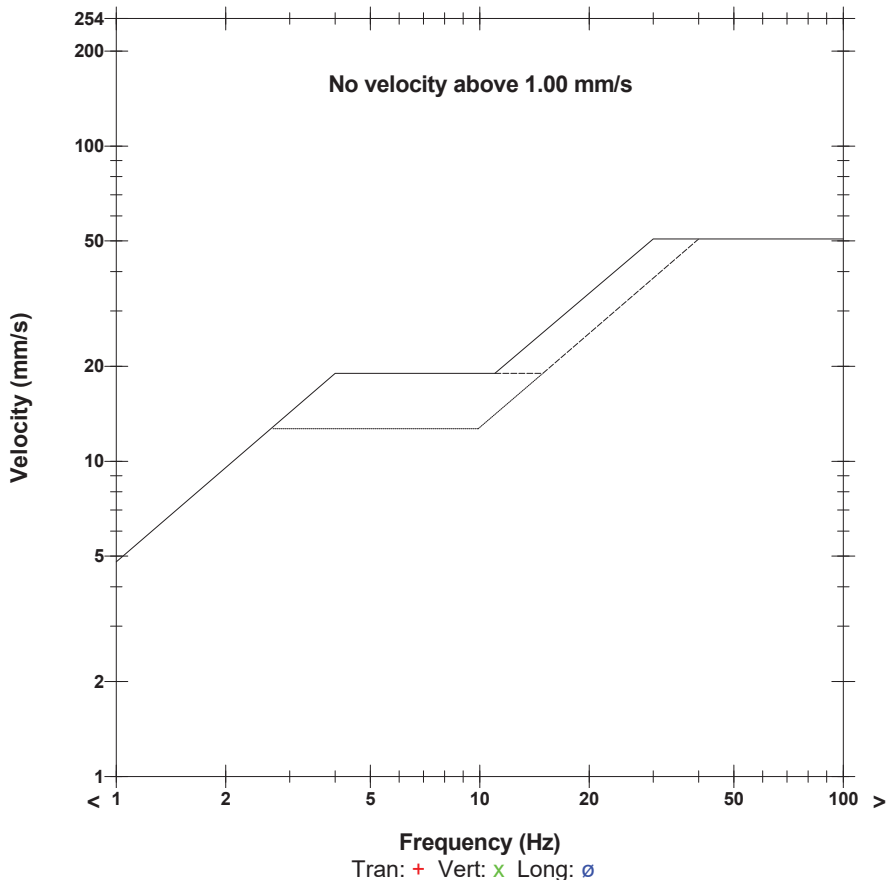
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 115.3 dB(L) at 0.007 sec
ZC Freq 4.5 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1273 mv)

	Tran	Vert	Long	
PPV	0.150	0.102	0.150	mm/s
ZC Freq	9.1	4.9	7.2	Hz
Time (Rel. to Trig)	-0.188	-0.104	0.141	sec
Peak Acceleration	0.010	0.012	0.012	g
Peak Displacement	0.003	0.016	0.012	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 0.166 mm/s at -0.060 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 =

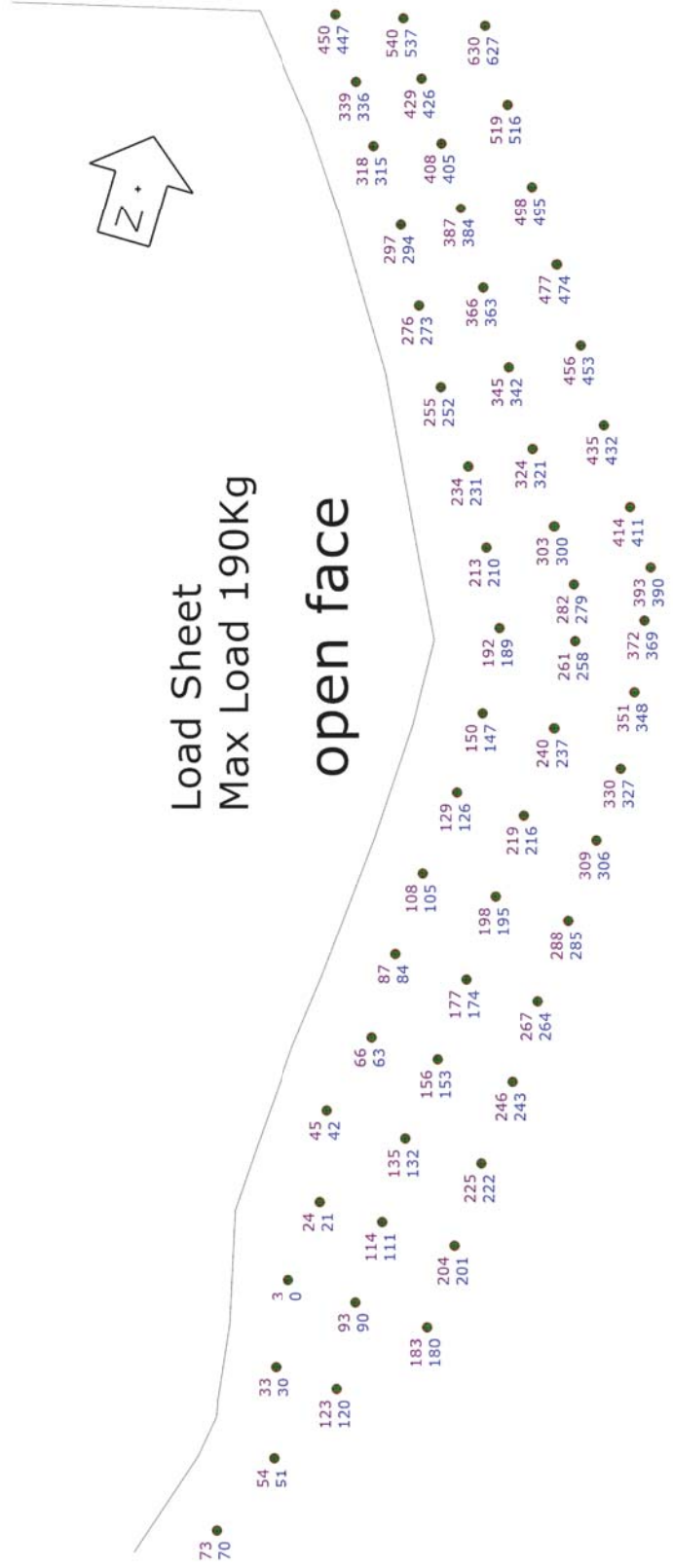
Sensor Check

**Southwest Corner of property
Nelson Aggregate
Burlington 2019-07-04 Blast 19-011 Upper Middle**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Jul 4 /19 10:13:22		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jul 4 /19 10:13:22	Jul 4 /19 11:37:50	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0 dB

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 57	Hole angle: 0.0°
Total drilled: 3447.4ft			



9NECRNR010 Design FnI- 3.625" and 4" Blast Holes 12x10 9x10 266 and 2
E19 F11 F18 G10 G11 are 3.625" DIA HOLES
PAINTED PINK MARKER STONES

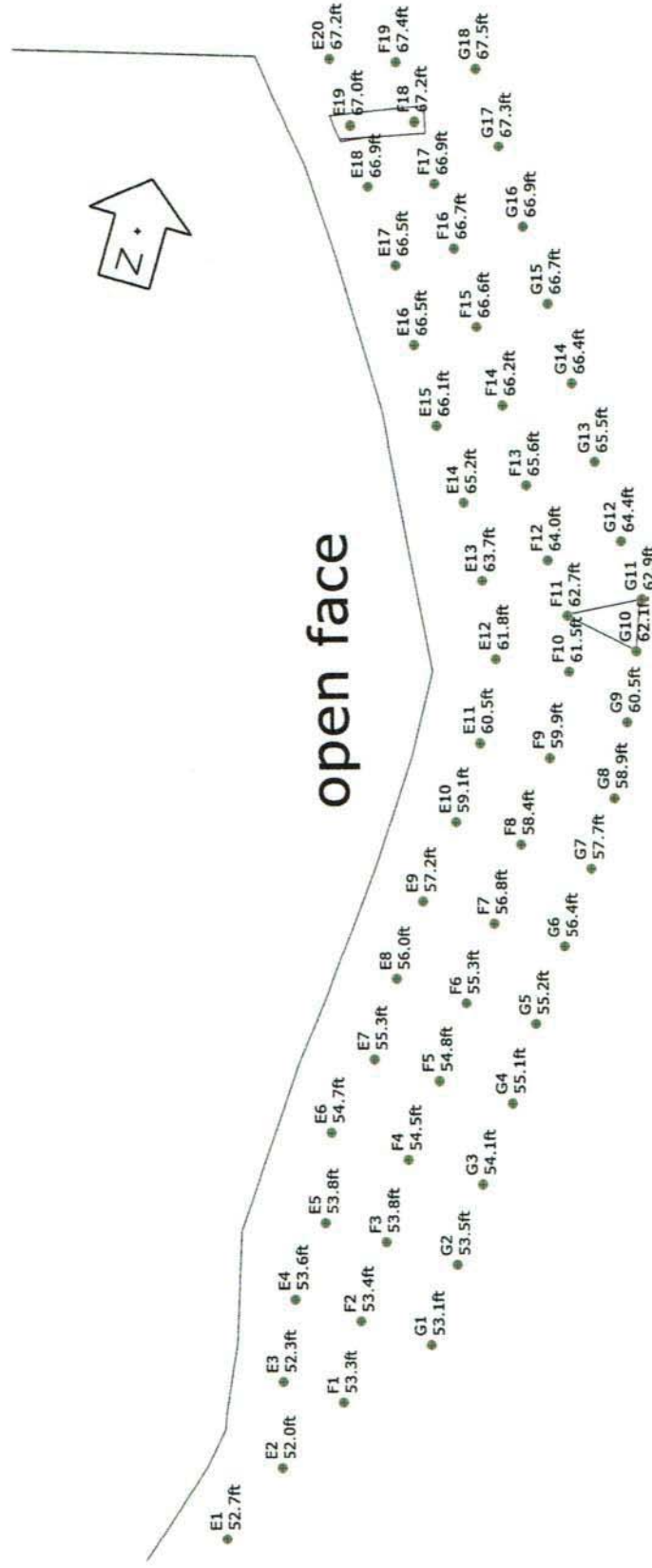


Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 57 Hole angle: 0.0°
 Total drilled: 3447.4ft



**E19 F11 F18 G10 G11 are 3.625" DIA HOLES
PAINTED PINK MARKER STONES**

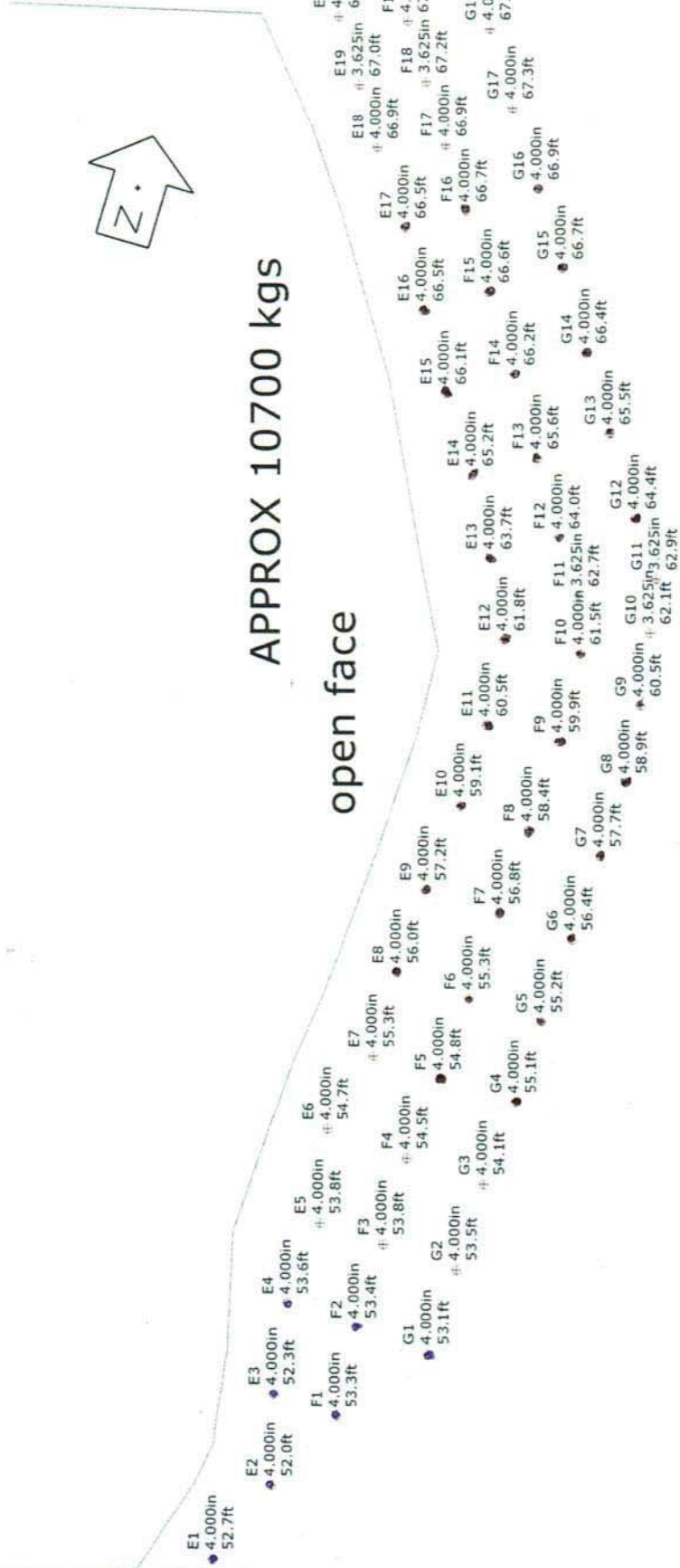


Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3447.4ft Hole Diameter: 4.0in Number of holes: 57



APPROX 10700 kgs
 open face

9NECRNR010 Design Fnl- 3.625" and 4" Blast Holes 12x10 9x10 266 and 250 + .6 SUB ELEV
**E19 F11 F18 G10 G11 are 3.625" DIA HOLES
 PAINTED PINK MARKER STONES**

SHOTPlus™ Professional 5.7.4.4		6/12/2019
Mine	Burlington	
Location	N E Corner along haul road	
Title/author	9NECRNR010 Design Fnl	
Filename		



Scale 1:250



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-07-11

Blast Number: 19-012

Orica Order #: 2505549

Blast Time: 11:01 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40358 °N Latitude 79.88181 °W Longitude
Centre of Blast Centre of Blast

Wind from the: SW at 5 kph Temperature: 26 to 30 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 29,209 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 51 = 3,662.6 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	33,890	22,660	11,230

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	52	11.8
PENTEX 12 (OR EQUIVALENT)	0.34	53	18.0

total explosives weight in Blast (kg): 11,260

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			48
UNITRONIC 600 15M			4
UNITRONIC 600 25M			53

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	5

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	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	24,817 te	9,545 m ³ Rate Code
Total tonnes per day:	24,817 te	NB80-02
Total Holes Loaded:	51 holes	
... including:	3 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:	10.0 ft avg
# Holes:	18 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	33 main body

Bench Height: 69.8 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 71.8 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Main Body: 4.0 ft avg

Decks: 3 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 60.8 ft avg

Main Body: 60.8 ft avg

- Charge Weight -

Front Row: 177.3 kg/hole

Main Body: 177.3 kg/hole

Max. per delay: 242.0 kg/delay

SD () Equation: 115.2 kg/delay

Total kg Loaded: 11,260 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.454 kg/te (actual)

Front row: 0.287 kg/te (theoretical)

Main Body: 0.383 kg/te (theoretical)

"KPI" PF: 0.351 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.988 lb/yd³

1.260 lb/yd³

1.680 lb/yd³

1.540 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Hole E18's top detonator showed an error at blast time (NCO) All holes are double primed so we continued to fire the blast.



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-07-11

Blast Number: 19-012
 Orica Order #: 2505549
 Blast Time: 11:01 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40361	79.88180	0.757536	1.394200
Front Row Corner	43.40336	79.88190	0.757532	1.394202
Back Row Corner	43.40377	79.88172	0.757539	1.394199
Average (Centre of Blast)	43.40358	79.88181	0.757535	1.394201

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	322.0	m		
Post Blast Data:	ppV: 7.9	mm/s	Trigger set at: 2.0	mm/s
	frequency: 13.1	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.7	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	1024.0	m		
Post Blast Data:	ppV: 0.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 10.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 120.3	dB	Trigger set at: 115	dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1267.6	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(322)^2}{30^2} \text{ kg} \\
 &= \frac{103,684}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica

Blaster-in-charge:

Signature required, indicating that
 Blast Report is Complete & Accurate.

jim bray



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date:

Blast Number: 19-012

Orica Order #: 2505549

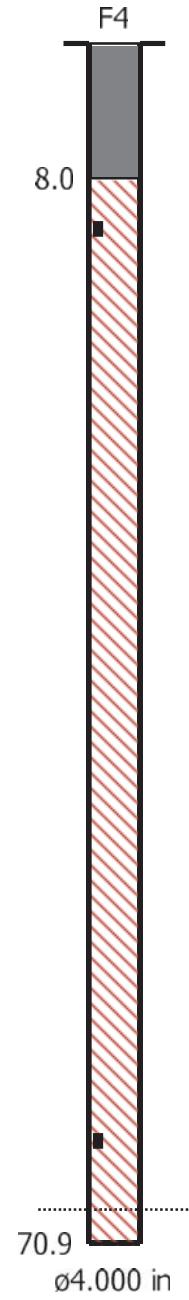
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
PENTEX BC 7 * 200 x1

UNI Tronic (?)ms 82ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:01:03 July 11, 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: 2450 #2 Road
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

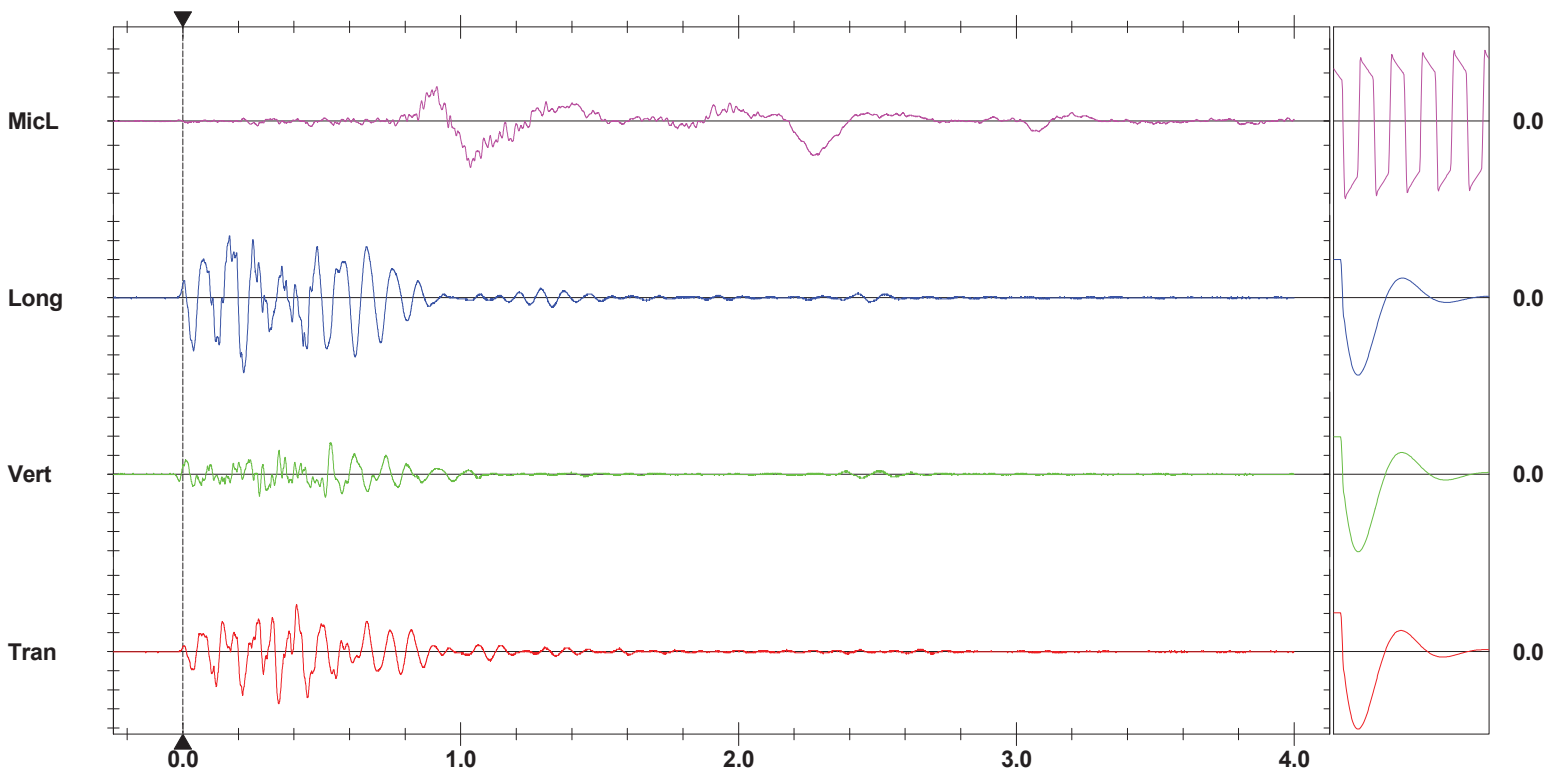
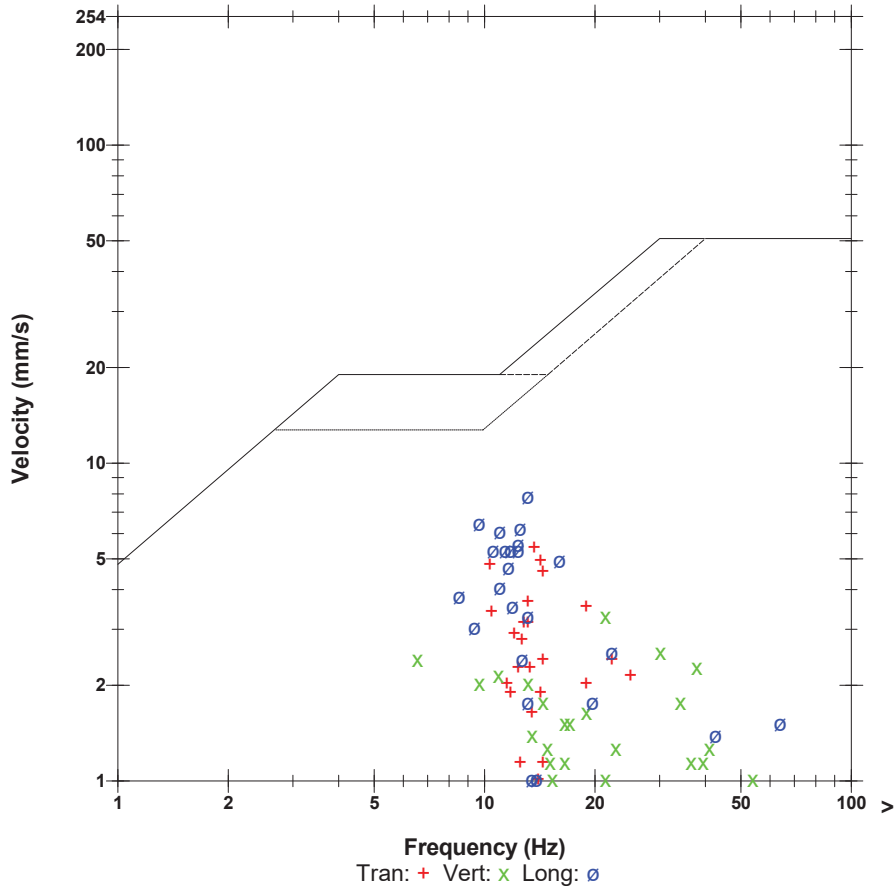
N43.40245;W-79.87814

Microphone Linear Weighting
PSPL 119.7 dB(L) at 1.034 sec
ZC Freq 1.9 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 543 mv)

	Tran	Vert	Long	
PPV	5.461	3.302	7.874	mm/s
ZC Freq	13.7	21	13.1	Hz
Time (Rel. to Trig)	0.344	0.530	0.218	sec
Peak Acceleration	0.080	0.080	0.133	g
Peak Displacement	0.063	0.037	0.111	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.7	3.6	4.0	

Peak Vector Sum 8.807 mm/s at 0.218 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 MicL at 11:01:04 July 11, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.133 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190711110104.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

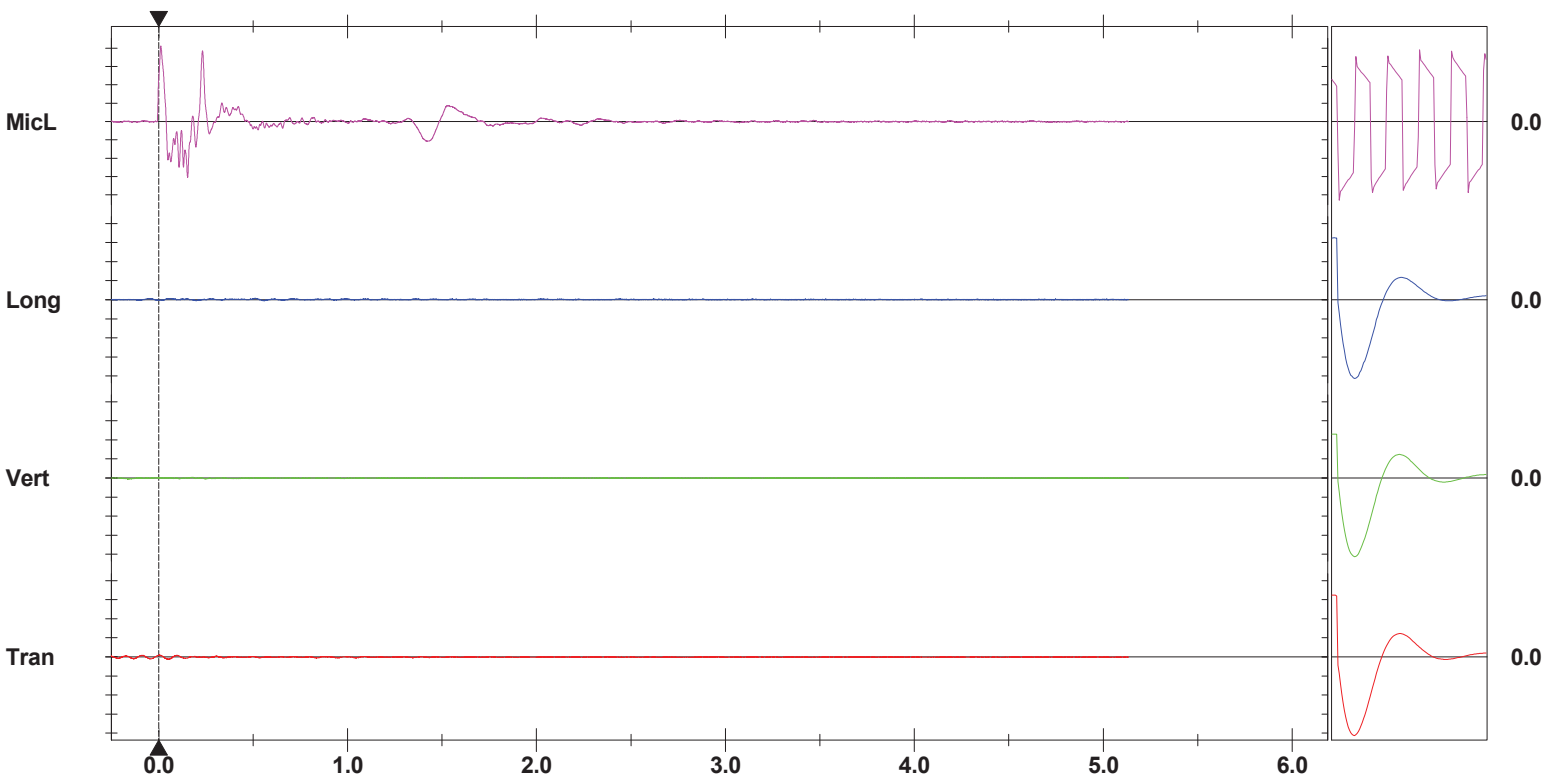
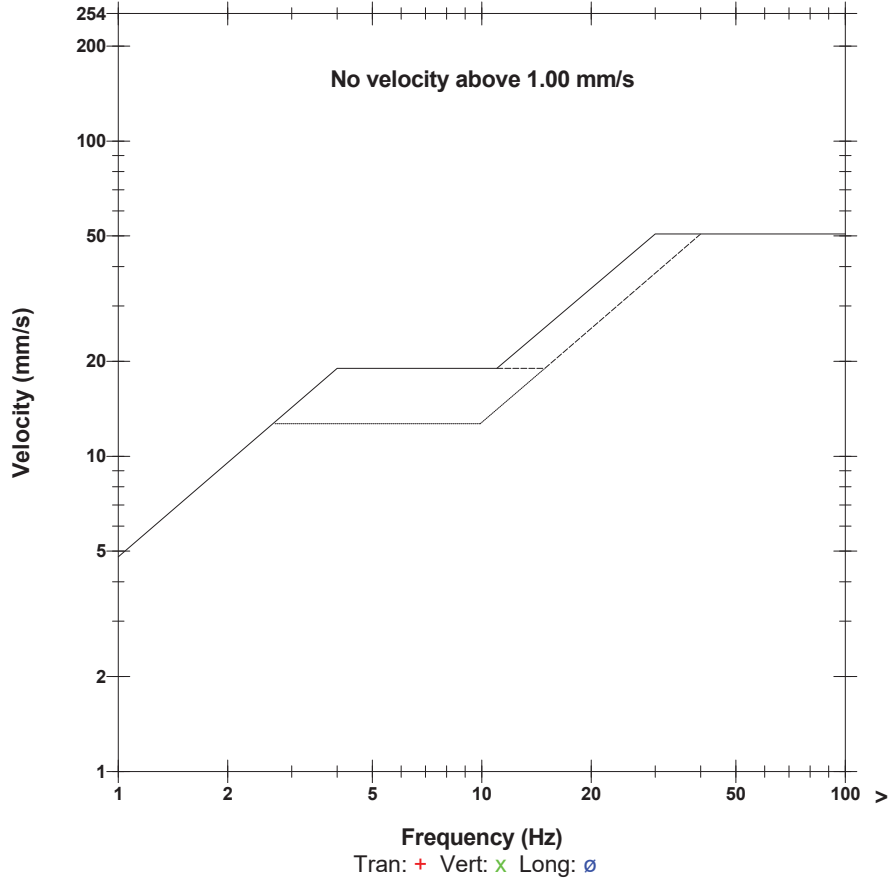
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 120.3 dB(L) at 0.011 sec
ZC Freq 10.6 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1329 mv)

	Tran	Vert	Long	
PPV	0.252	0.102	0.158	mm/s
ZC Freq	10.0	6.4	9.0	Hz
Time (Rel. to Trig)	0.046	-0.164	0.511	sec
Peak Acceleration	0.010	0.010	0.012	g
Peak Displacement	0.004	0.002	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.3	3.5	

Peak Vector Sum 0.275 mm/s at 0.053 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

**Southwest Corner of property
Nelson Aggregate
Burlington 2019-07-11 Blast 19-12 Upper Middle**

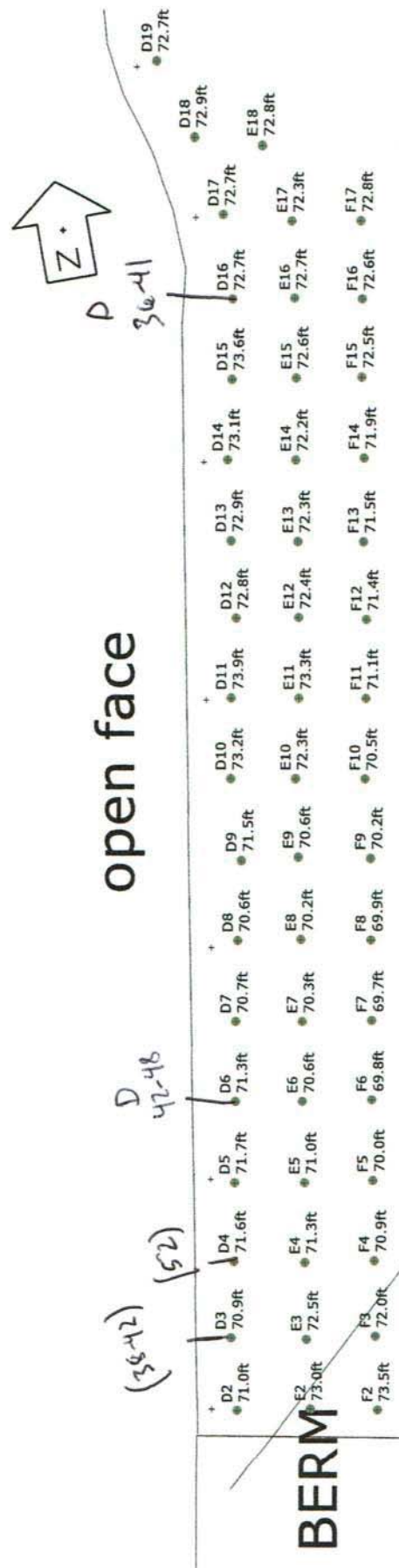
Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Jul 11 /19 06:21:03		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jul 11 /19 06:21:02	Jul 11 /19 11:33:15	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0 dB

SHOTPLUS 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3662.6ft Hole Diameter: 4.0in Number of holes: 51



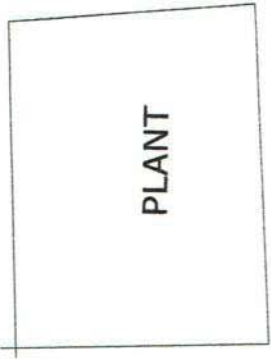
Not to scale

SHOTPlus 5 Plan

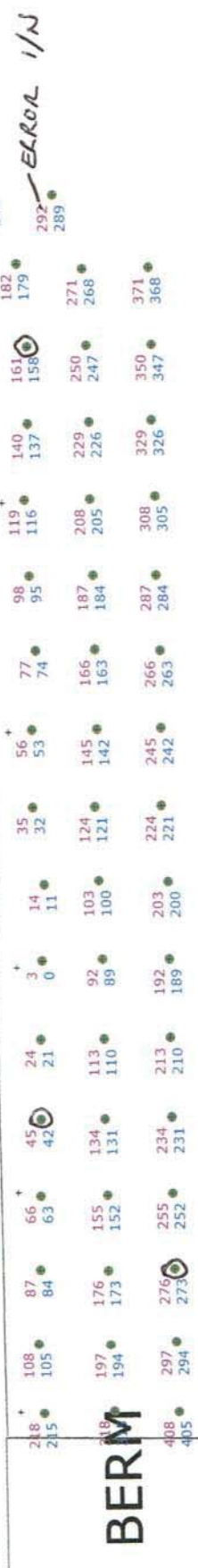
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3662.6ft Hole Diameter: 4.0in Number of holes: 51

O = Deck



open face



Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3662.6ft Hole Diameter: 4.0in Number of holes: 51

Load Sheet 245
 Max Load 230Kg
 open face



118
 230 230 235 229 227 229 222 226 229 229 220 223 225 100 150
 227 230 228 224 232 221 222 226 222 232 227 226 222 219 221 222 228
 230 225 219 217 219 223 220 216 217 211 211 230 225 216 220
 242 225 222 221 222 226 222 232 227 226 222 219 221 222 228
 222 225 222 221 222 226 222 232 227 226 222 219 221 222 228

BERM



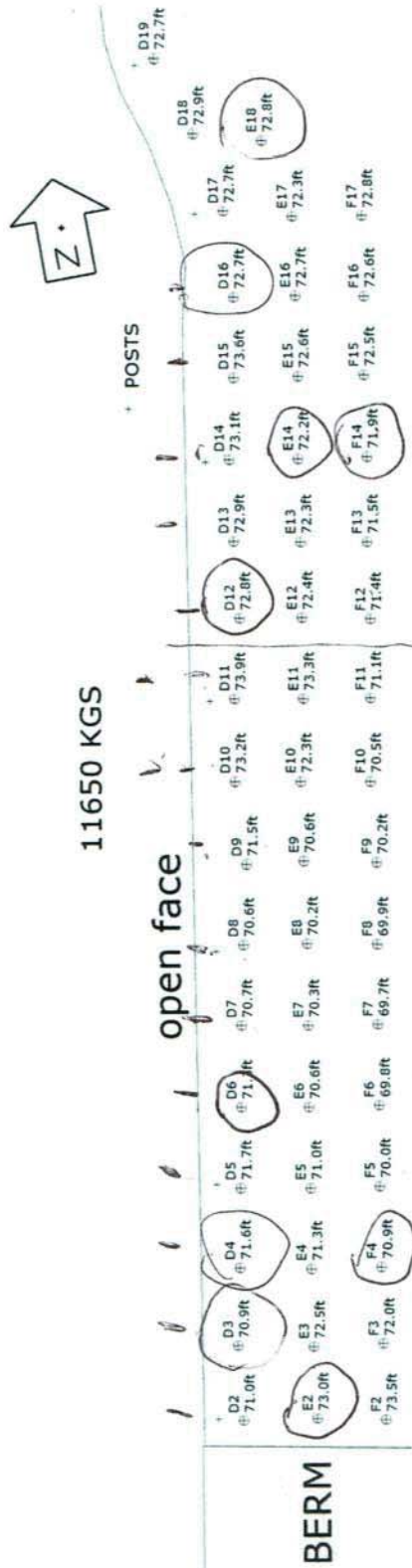
Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3662.6ft Hole Diameter: 4.0in Number of holes: 51

11650 KGS



9UPMD012 Design Fnl - 4" Blast Hole 12x10 9x10 271.5 and 250 + .6 SUB ELEV
 DRILLER NAME:



Scale 1:300

SHOTPlus™ Professional 5.7.4.4	7/5/2019
Mine	Burlington
Location	UPPER MIDDLE NEXT TO OLD WHEEL WASH
Title/author	9UPMD012 Design Fnl
Filename	



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-07-30

Blast Number: 19-014

Orica Order #: 2512320

Blast Time: 12:20 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40355 °N Latitude 79.88169 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 5 kph Temperature: 26 to 30 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 2,552 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 45 = 3,113.3 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	36,290	26,610	9,680

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	46	10.4
PENTEX 12 (OR EQUIVALENT)	0.34	46	15.6

total explosives weight in Blast (kg): 9,731

Pkgd Prod (25 kg) % of Total kg: 0.3%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			45
UNITRONIC 600 15M			2
UNITRONIC 600 25M			45

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	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	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 21,052 te 8,097 m³
Total tonnes per day: 21,052 te NB60-07 Rate Code
Total Holes Loaded: 45 holes
... including: 3 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: 10.0 ft avg
Holes: 17 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 28 main body

Bench Height: 67.2 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 69.2 ft avg

- Stone Decking -

Front Row: 0.0 ft avg

Main Body: 5.0 ft avg

Decks: 1 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 62.2 ft avg

Main Body: 57.2 ft avg

- Charge Weight -

Front Row: 181.3 kg/hole

Main Body: 166.7 kg/hole

Max. per delay: 209.0 kg/delay

SD () Equation: 108.4 kg/delay

Total kg Loaded: 9,731 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.462 kg/te (actual)

Front row: 0.305 kg/te (theoretical)

Main Body: 0.375 kg/te (theoretical)

"KPI" PF: 0.352 kg/te (theoretical)

2.026 lb/yd³

1.339 lb/yd³

1.641 lb/yd³

1.541 lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Hole I5 received a 5' stone deck due to void identified while loading



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-07-30

Blast Number: 19-014
 Orica Order #: 2512320
 Blast Time: 12:20 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40354	79.88170	0.757535	1.394199
Front Row Corner	43.40376	79.88168	0.757539	1.394198
Back Row Corner	43.40336	79.88170	0.757532	1.394199
Average (Centre of Blast)	43.40355	79.88169	0.757535	1.394199

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	312.4	m		
Post Blast Data:	ppV: 7.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.8	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 120.7	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	1033.6	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 8.9	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 120.5	dB	Trigger set at: 115	dB

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (3rd Seis. From Centre of Blast)	1269.2	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(312.4)^2}{30^2} \text{ kg} \\
 &= \frac{97,594}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 7/30/2019

Blast Number: 19-014

Orica Order #: 2512320

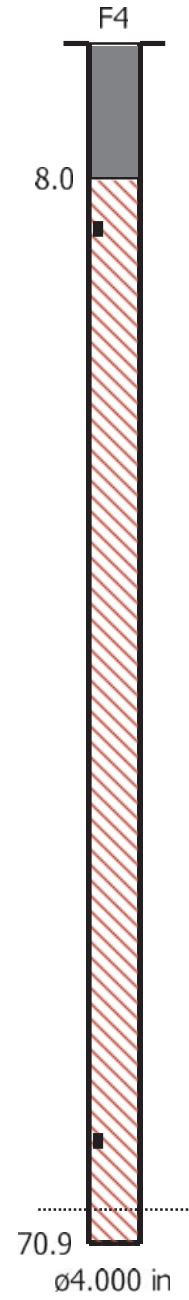
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
PENTEX BC 7 * 200 x1

UNI Tronic (?)ms 82ft
PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:20:36 July 30, 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: 2450 #2 Sideroad
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

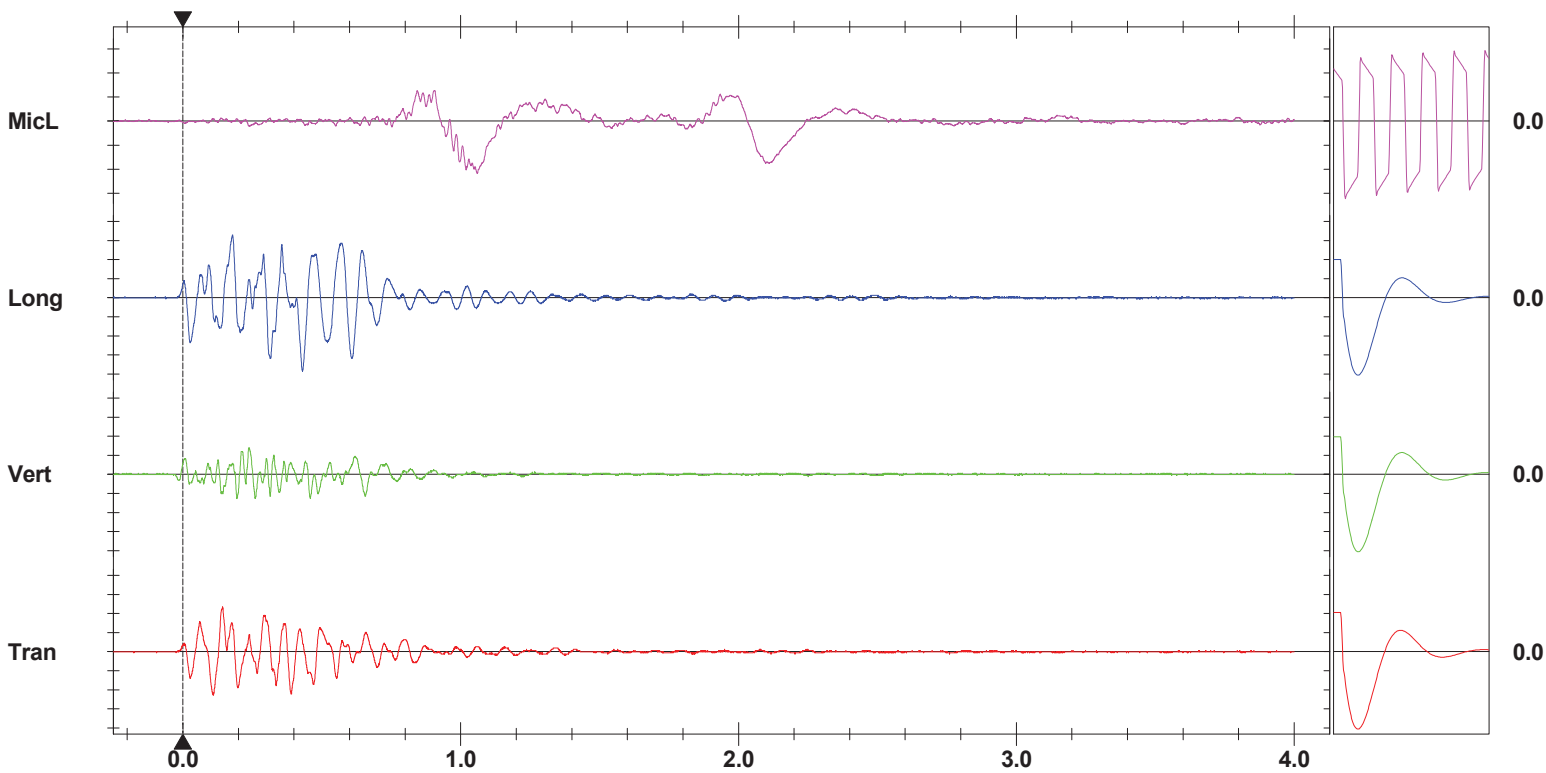
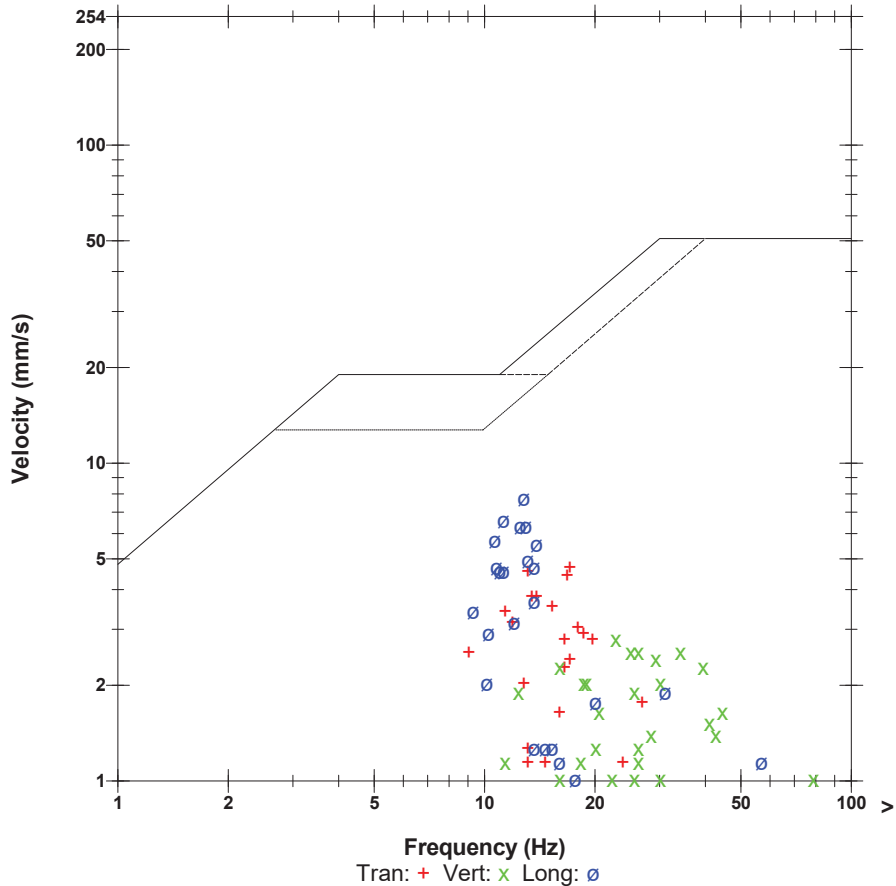
Sand Bagged
 N43.40245W-79.87814

Microphone Linear Weighting
PSPL 120.7 dB(L) at 1.059 sec
ZC Freq 2.7 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 556 mv)

	Tran	Vert	Long	
PPV	4.699	2.794	7.747	mm/s
ZC Freq	17.1	23	12.8	Hz
Time (Rel. to Trig)	0.143	0.237	0.430	sec
Peak Acceleration	0.080	0.080	0.106	g
Peak Displacement	0.049	0.023	0.091	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.7	3.6	4.0	

Peak Vector Sum 7.832 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: 10.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time MicL at 12:20:37 July 30, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.147 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190730122037.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

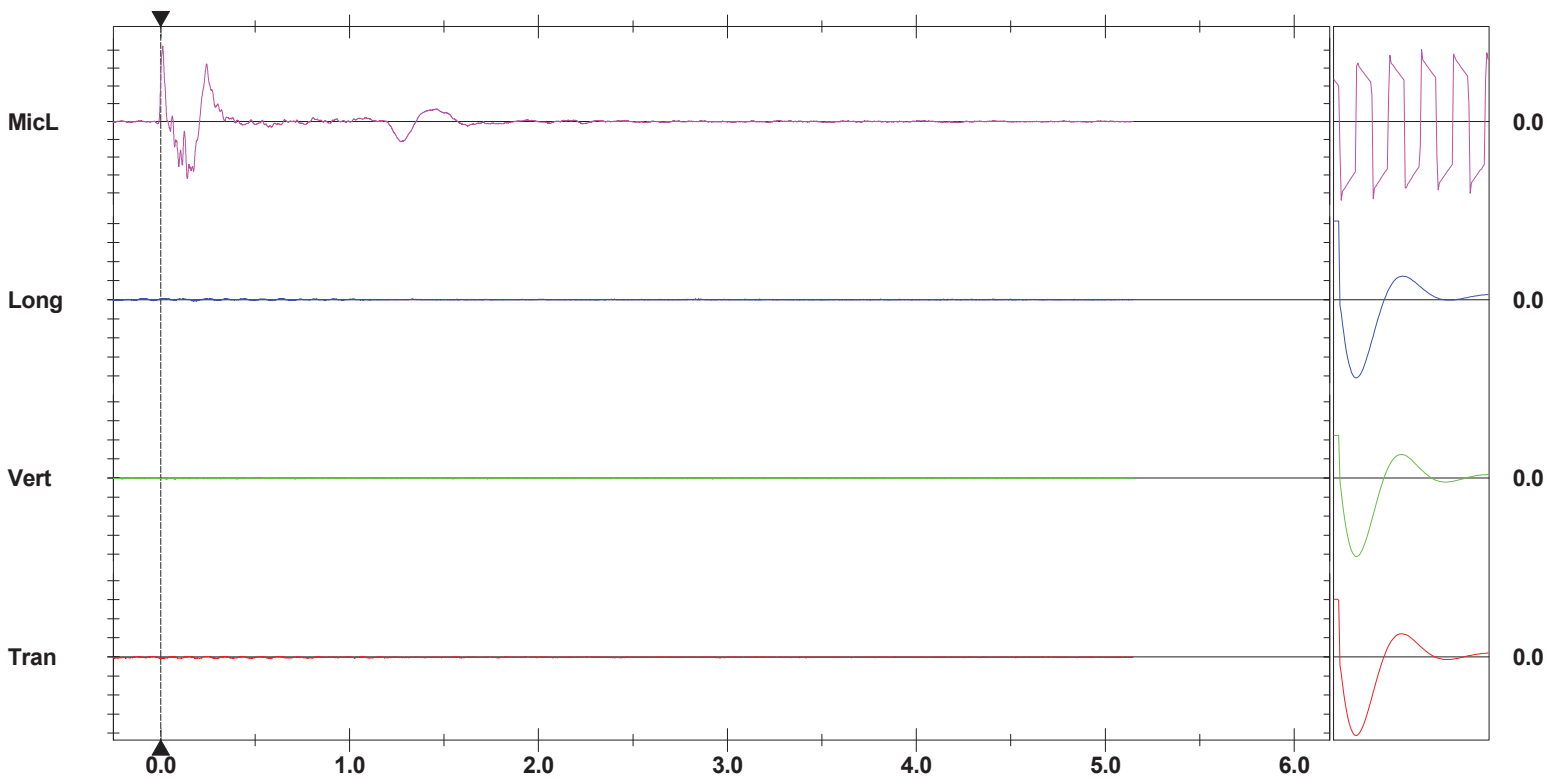
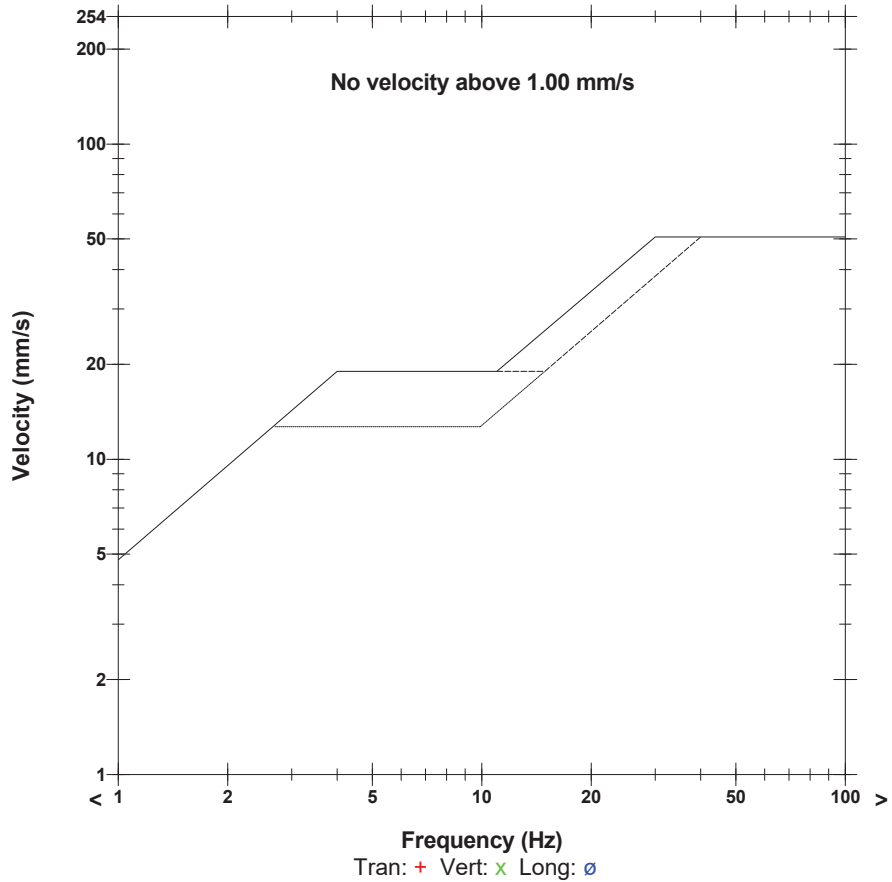
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 120.5 dB(L) at 0.011 sec
ZC Freq 11.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1301 mv)

	Tran	Vert	Long	
PPV	0.166	0.102	0.150	mm/s
ZC Freq	8.9	5.4	8.1	Hz
Time (Rel. to Trig)	0.185	-0.232	0.012	sec
Peak Acceleration	0.010	0.010	0.013	g
Peak Displacement	0.018	0.044	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.4	3.3	3.3	

Peak Vector Sum 0.209 mm/s at 0.185 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

**South west corner of property(N43.39339W-79.88880)
Nelson Aggregate
Burlington 2019-07-30 Blast 19-014**

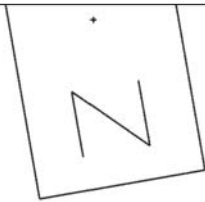
Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6859
Jul 30 /19 05:43:58		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jul 30 /19 11:20:23	Jul 30 /19 11:20:26	Event recorded. Trigger Level Long: 1.50 mm/s
Jul 30 /19 12:43:42	Jul 30 /19 12:43:46	Event recorded. Trigger Level Tran: 1.50 mm/s
Jul 30 /19 12:43:46	Jul 30 /19 12:43:53	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0

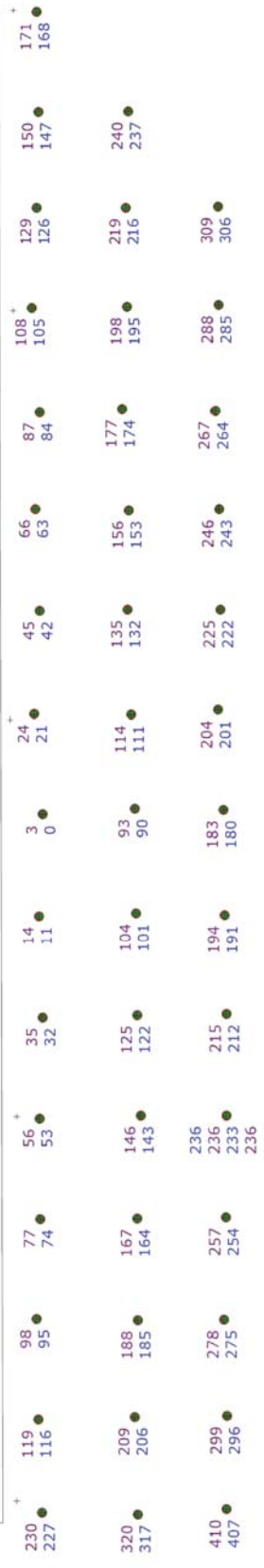
SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 45	Hole angle: 0.0°
Total drilled: 3113.3ft			



open face



Not to scale

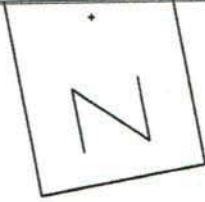
SHOTPlus Plan

Blast Summary Data

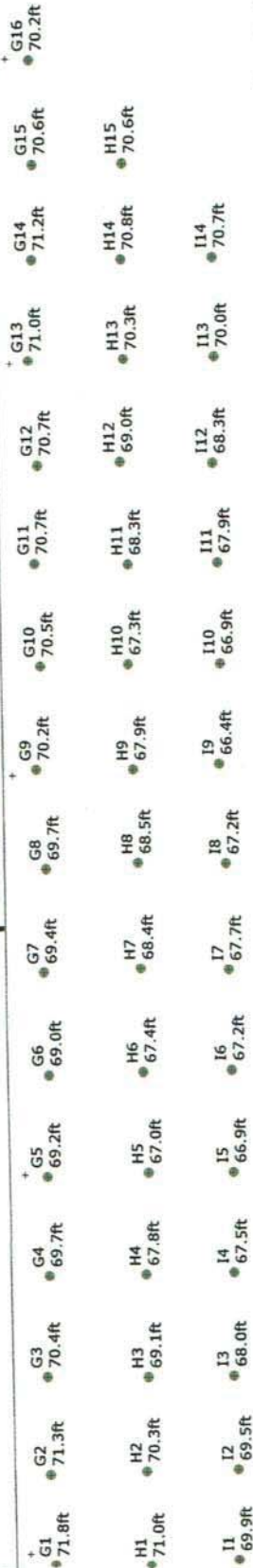
Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 3113.3ft

Spacing: 10.0ft
 Hole Diameter: 4.0in
 Number of holes: 45

Stemming: 7.0ft
 Hole angle: 0.0°



open face



9UPMD015 Design Fnl - 4" Blast Hole 12x10 9x10 270 and

DRILLER NAME:

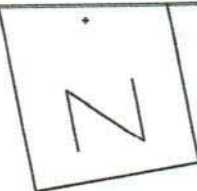


Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 3113.3ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Subdrill: 2.0ft
 Number of holes: 45
 Stemming: 7.0ft
 Hole angle: 0.0°



Load Sheet 230Kg Max open face

214	203	211	207	197	197	307	244	203	196	203	197	181	202	198
210	206	212	180	184	203	196	192	196	197	198	203	207	203	
204	180	200	198	198	196	205	196	187	187	198	211	175	+	Blow

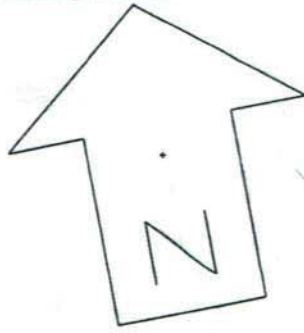


Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3113.3ft Hole Diameter: 4.0in Number of holes: 45



APPROX 10000 KGS

POSTS

open face

G1 # 71.8ft	G2 # 71.3ft	G3 # 70.4ft	G4 # 69.7ft	G5 # 69.2ft	G6 # 69.0ft	G7 # 69.4ft	G8 # 69.7ft	G9 # 70.2ft	G10 # 70.5ft	G11 # 70.7ft	G12 # 70.7ft	G13 # 71.0ft	G14 # 71.2ft	G15 # 70.6ft	G16 # 70.2ft
H1 # 71.0ft	H2 # 70.3ft	H3 # 69.1ft	H4 # 67.8ft	H5 # 67.0ft	H6 # 67.4ft	H7 # 68.4ft	H8 # 68.5ft	H9 # 67.9ft	H10 # 67.3ft	H11 # 68.3ft	H12 # 69.0ft	H13 # 70.3ft	H14 # 70.8ft	H15 # 70.6ft	
I1 # 69.9ft	I2 # 69.5ft	I3 # 68.0ft	I4 # 67.5ft	I5 # 66.9ft	I6 # 67.2ft	I7 # 67.7ft	I8 # 67.2ft	I9 # 66.4ft	I10 # 66.9ft	I11 # 67.9ft	I12 # 68.3ft	I13 # 70.0ft	I14 # 70.7ft		

9UPMD015 Design Fnl - 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV

DRILLER NAME: *Mike Keller*

Start July 25/19

Finish July 29/19



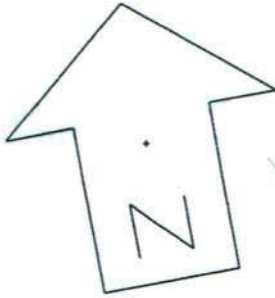
Scale 1:250

SHOTPlus™ Professional 5.7.4.4	7/29/2019
Mine	Burlington
Location	
Title/author	9UPMD015 Design Partial
Filename	9UPMD015 Design Fnl.spf

SHOTPlus 5 Plan

Blast Summary Data

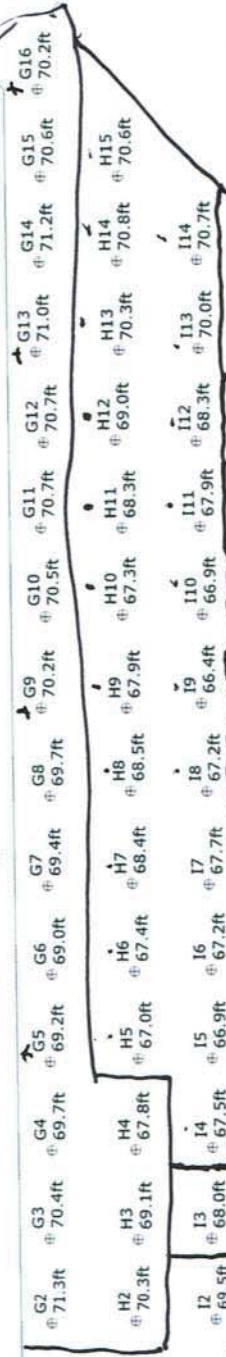
Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 42
 Total drilled: 2900.7ft



APPROX 10000 KGS

+ Posts

open face



9UPMD015 Design Partial - 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV

DRILLER NAME:

NOT MARKED

BERM STRIPPING
 REQ'D BEFORE
 LAYING OUT
 G1 H1 I1 I2

SHOTPlus™ Professional 5.7.4.4	7/26/2019
Mine	Burlington
Location	
Title/author	9UPMD015 Design Partial
Filename	9UPMD015 Design Partial Fnl.spf

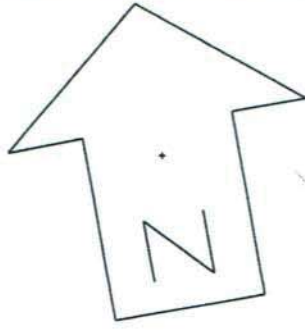


Scale 1:275

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 29 Hole angle: 0.0°
 Total drilled: 2016.5ft



*G1 to be used for power
 G11 after exam*

open face

G2	70.3ft	G3	70.4ft	G4	69.7ft	G5	69.2ft	G6	69.0ft	G7	69.4ft	G8	69.7ft	G9	70.2ft	G10	70.5ft	G11	70.7ft	G12	70.7ft	G13	71.0ft	G14	71.2ft	G15	70.6ft	G16	70.2ft
H2	70.3ft	H3	69.1ft	H4	67.8ft	H5	67.0ft	H6	67.4ft	H7	68.4ft	H8	68.5ft	H9	67.9ft	H10	67.3ft	H11	68.3ft	H12	69.0ft	H13	70.3ft	H14	70.8ft	H15	70.6ft		

9UPMD015 Design Partial - 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV
 DRILLER NAME: Michael Keller

Start July 25/19



SHOTPlus™ Professional 5.7.4.4	7/25/2019
Mine	Burlington
Location	
Title/author	9UPMD015 Design Partial
Filename	

Scale 1:250



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-08-12

Blast Number: 19-015

Orica Order #: 2517100

Blast Time: 12:10 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40432 °N Latitude 79.88176 °W Longitude
Centre of Blast Centre of Blast

Wind from the: N at 0 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: 64 = 3,799.9 ft (4 " diam)
Secondary Bit diam: 92.1 mm	0°	# Holes: 2 = 118.7 ft (3 5/8 " diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,850	22,690	11,160

Packaged Explosives:

	cs shipped	cs returned	kg

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	69	15.7
PENTEX 12 (OR EQUIVALENT)	0.34	69	23.5

total explosives weight in Blast (kg): 11,199

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			65
UNITRONIC 600 20M			43
UNITRONIC 600 25M			30

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	units	2

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	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	28,893 te	11,113 m ³
Total tonnes per day:	28,893 te	NB60-06 Rate Code
Total Holes Loaded:	66 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:	10.0 ft avg
# Holes:	30 front row

- Pattern (Main Body) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	36 main body

Bench Height: 57.4 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 59.4 ft avg

- Stone Decking -

Front Row:	8.0 ft avg
Main Body:	0.0 ft avg
# Decks:	3 per blast

- Collar Stemming -

Front Row:	8.0 ft avg
Main Body:	7.0 ft avg
Material used:	3/4" Clear

- Charge Length -

Front Row:	43.4 ft avg
Main Body:	52.4 ft avg

- Charge Weight -

Front Row:	126.5 kg/hole
Main Body:	152.7 kg/hole
Max. per delay:	238.0 kg/delay
SD () Equation:	143.8 kg/delay
Total kg Loaded:	11,199 kg
Rock Density:	2.60 g/cc = te/m ³

- Powder Factor -

Yield PF:	0.388 kg/te (actual)
Front row:	0.250 kg/te (theoretical)
Main Body:	0.402 kg/te (theoretical)
"KPI" PF:	0.351 kg/te (theoretical)

1.699 lb/yd³
1.093 lb/yd³
1.760 lb/yd³
1.538 lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

3 Stone decks were added due to voids identified by driller on the drill log.



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-08-12

Blast Number: 19-015
 Orica Order #: 2517100
 Blast Time: 12:10 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40437	79.88178	0.757549	1.394200
Front Row Corner	43.40390	79.88181	0.757541	1.394201
Back Row Corner	43.40470	79.88170	0.757555	1.394199
Average (Centre of Blast)	43.40432	79.88176	0.757548	1.394200

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	359.7	m		
Post Blast Data:	ppV: 3.9	mm/s	Trigger set at: 2.0	mm/s
	frequency: 11.6	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 112.8	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40605	79.89400	0.757578	1.394413
2nd Reading				
Average	43.40605	79.89400	0.757578	1.394413
Distance (2nd Seis. From Centre of Blast)	1008.2	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

Colling Rd & Blind Line Bruce Trail

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39329	79.88868	0.757356	1.394321
2nd Reading				
Average	43.39329	79.88868	0.757356	1.394321
Distance (3rd Seis. From Centre of Blast)	1349.6	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

SouthWest Corner of Property

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(359.7)^2}{30^2} \text{ kg} \\
 &= \frac{129,384}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica

Blaster-in-charge:

Signature required, indicating that
 Blast Report is Complete & Accurate.

jim bray



Blast Design

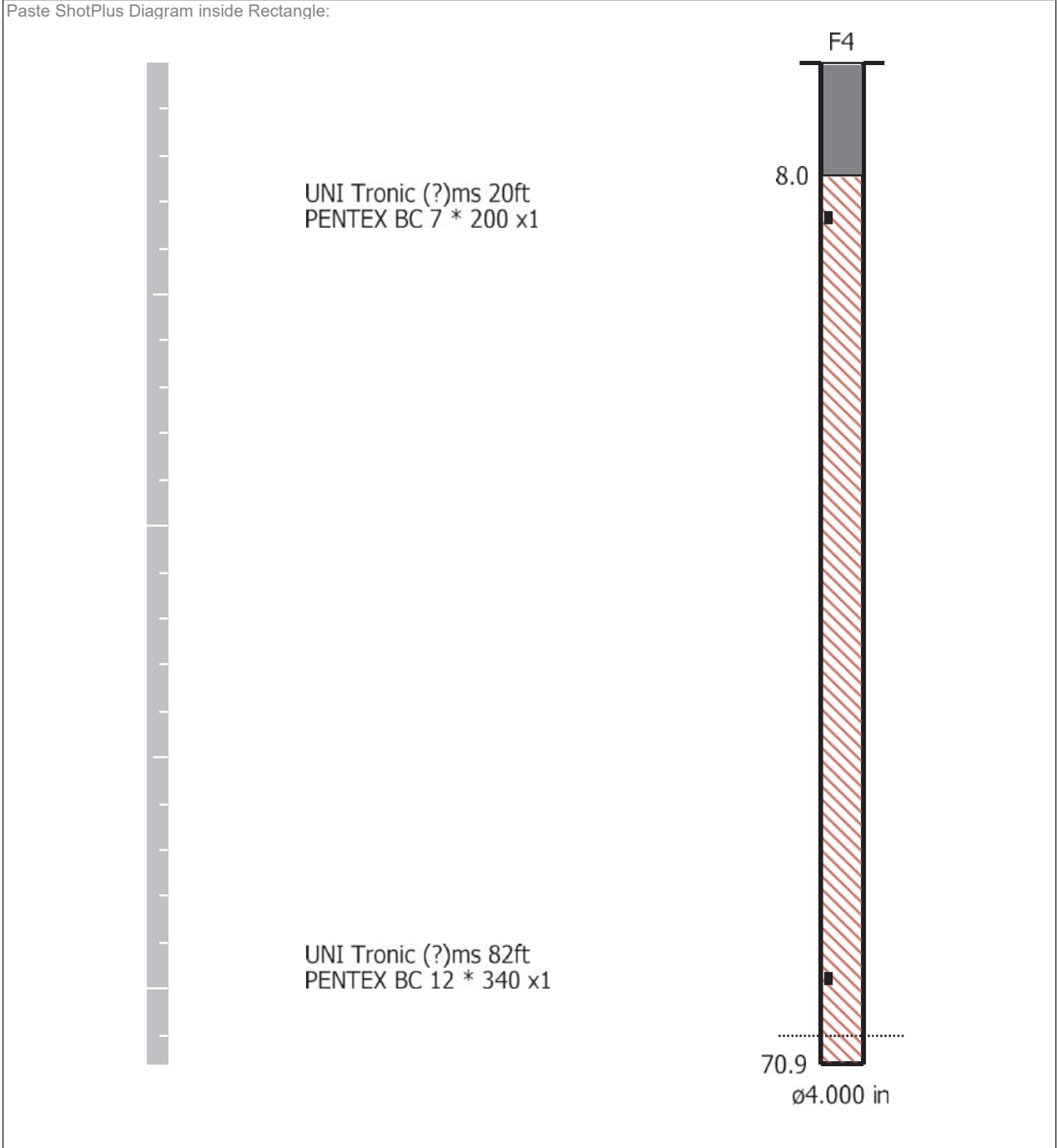
Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 8/12/2019

Blast Number: 19-015
 Orica Order #: 2517100

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:10:05 August 12, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.25 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: 2450 2nd Line, Burlington, On
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

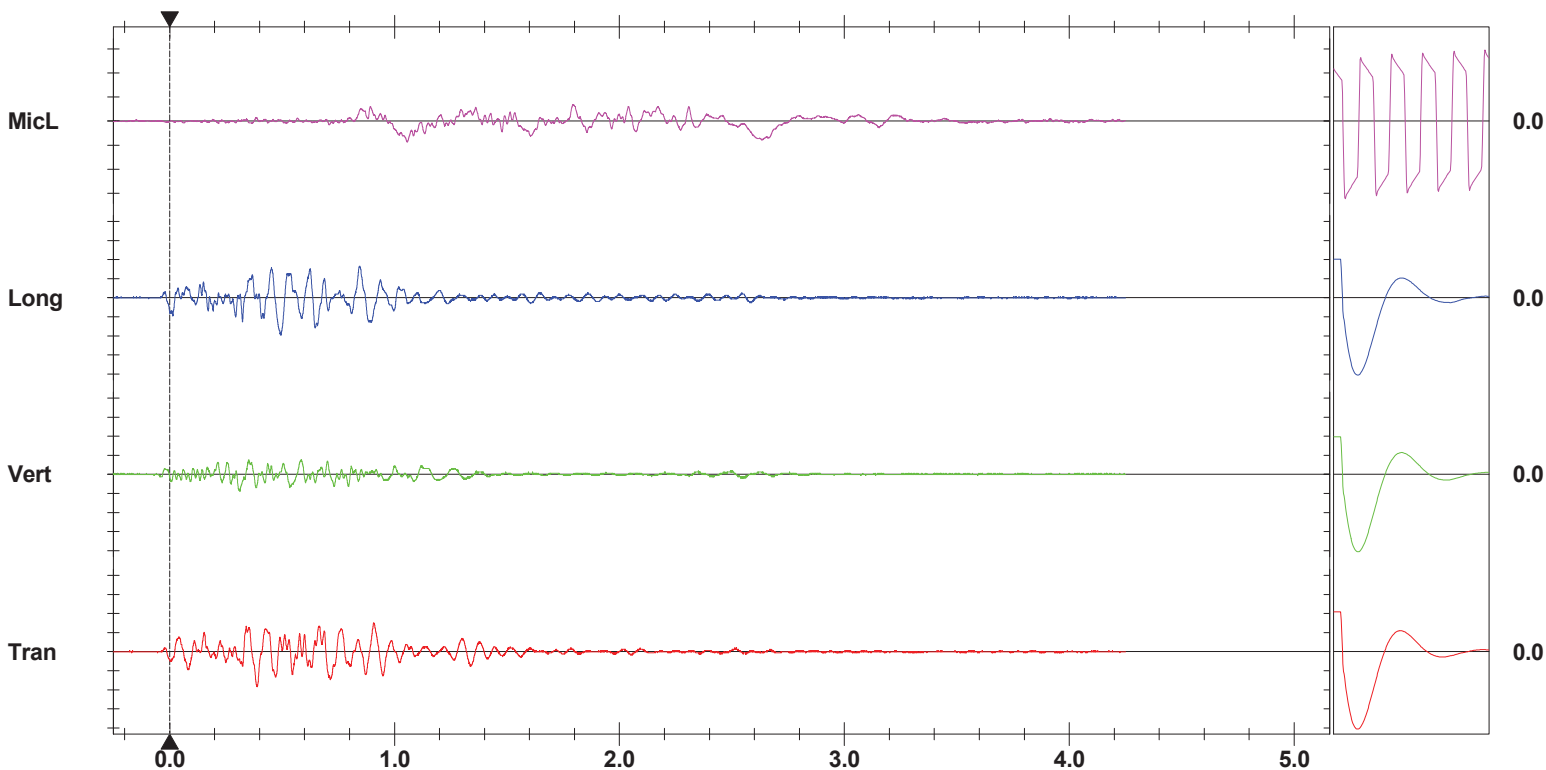
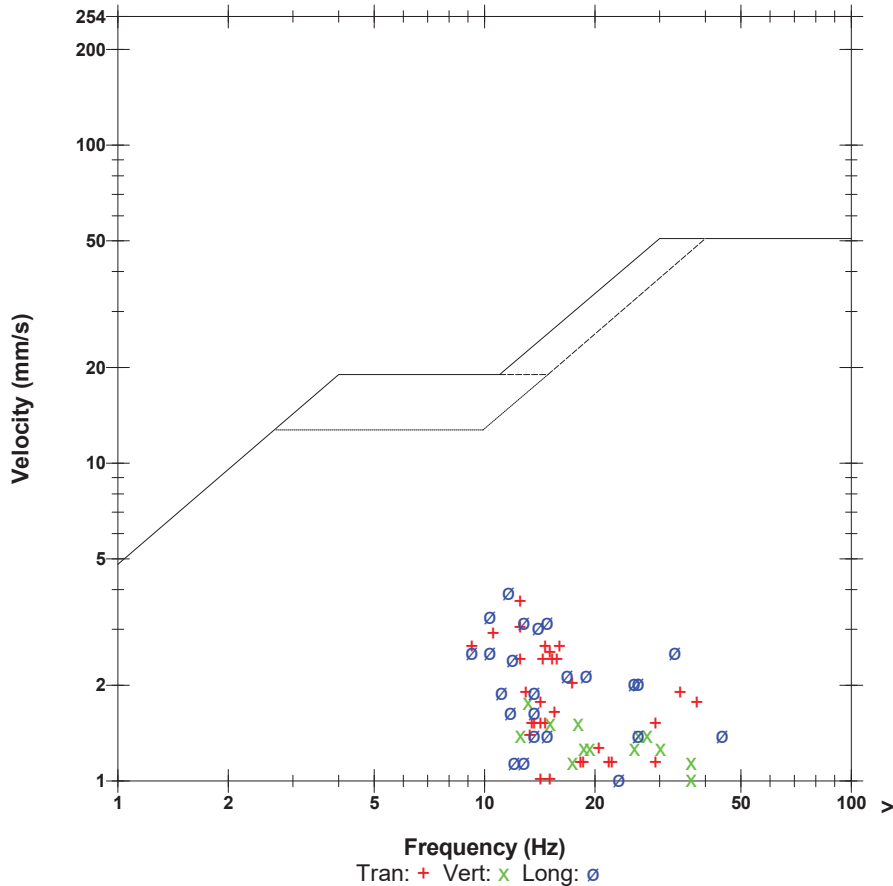
Sand Bagged
 N43.40245:W-79.87814

Microphone Linear Weighting
PSPL 112.8 dB(L) at 1.056 sec
ZC Freq 2.4 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 533 mv)

	Tran	Vert	Long	
PPV	3.683	1.778	3.937	mm/s
ZC Freq	12.5	13.1	11.6	Hz
Time (Rel. to Trig)	0.388	0.312	0.494	sec
Peak Acceleration	0.053	0.053	0.080	g
Peak Displacement	0.044	0.018	0.052	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.4	Hz
Overswing Ratio	3.8	3.6	4.0	

Peak Vector Sum 4.111 mm/s at 0.491 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

**Coling rd & Blind Line (Bruce Trail)
Nelson Aggregate
Burlington 2019-08-12 Blast 19-015 Upper Middle**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Aug 12 /19 06:04:45		Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
Aug 12 /19 06:04:45	Aug 12 /19 12:42:41	No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:

**SW Corner of Property
Nelson Aggregate
Burlington 2019-08-12 Blast 19-015 Upper Middle**

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
----- Aug 12 /19 06:09:14	----- Aug 12 /19 12:38:37	SERIAL NUMBER: UM6859 Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:

SHOTPlus Plan

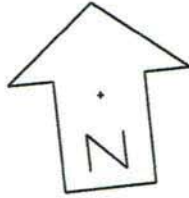
Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 3918.7ft

Spacing: 10.0ft
 Hole Diameter: 4.0in
 Number of holes: 66

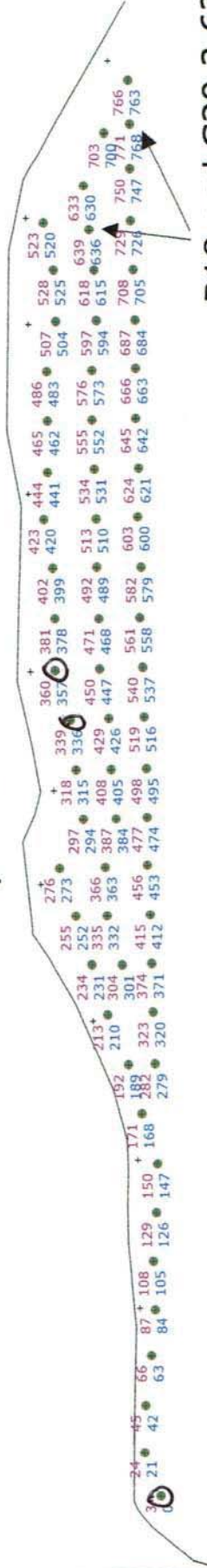
Stemming: 7.0ft
 Hole angle: 0.0°

D = Deck



Load Sheet
 Max 75 Kg

open face



B18 and C29 3.625" DIA



Not to scale

SHOTPLUS Plan

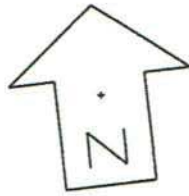
Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 3918.7ft

Spacing: 10.0ft
 Hole Diameter: 4.0in
 Number of holes: 66

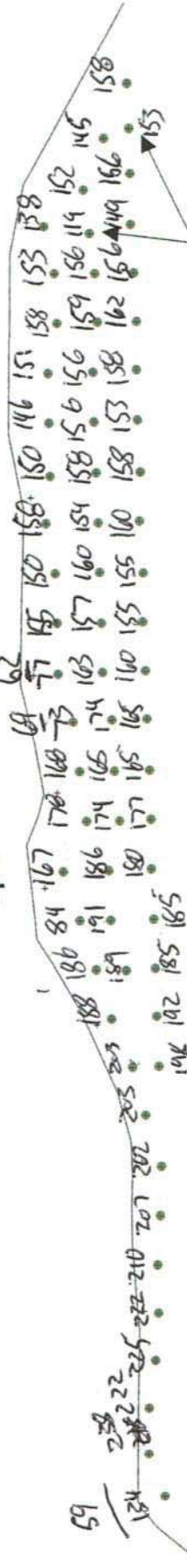
Stemming: 7.0ft
 Hole angle: 0.0°

240
 150
 2
 60



Load Sheet
 Max 75-Kg

open face



B18 and C29 3.625" DIA.

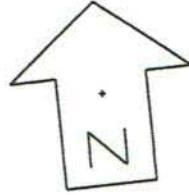


Not to scale

SHOTPlus Plan

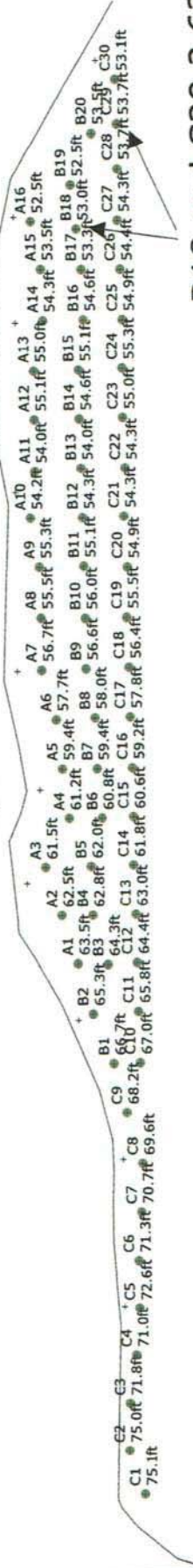
Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 66	Hole angle: 0.0°
Total drilled: 3918.7ft			



+ POSTS

open face



B18 and C29 3.625" DIA.



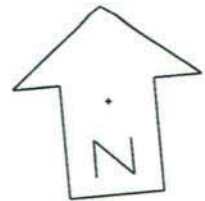
Not to scale

SHOTPlus 5 Plan

Blast Summary Data

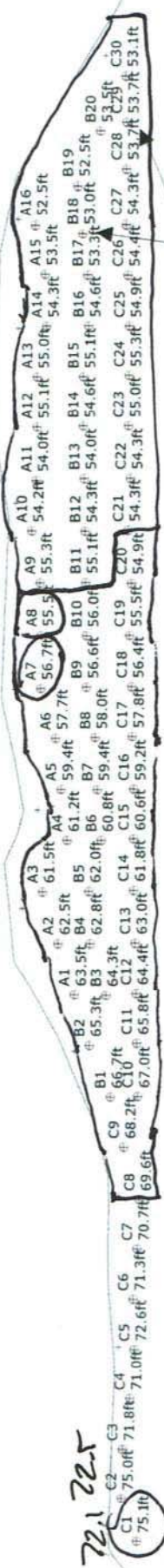
Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3918.7ft Hole Diameter: 4.0in Number of holes: 66

- 5.5'
 3918.2'



12165 KGS

open face POSTS



B18 and C29 3.625" DIA.

9MID014 Design Partial - 3.625 and 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV
 DRILLER NAME: Michael Kelle

Start July 29/19

Finish July 31/19

O = void
 see log



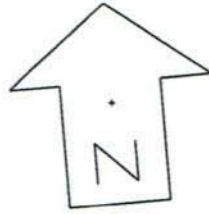
Scale 1:400

SHOTPlus™ Professional 5.7.4.4	7/29/2019
Mine	Burlington
Location	MID BETWEEN NECRNR AND UPMD
Title/author	9MID014 Partial Design Fnl
Filename	9MID014 Partial Design Fnl.spf

SHOTPlus 5 Plan

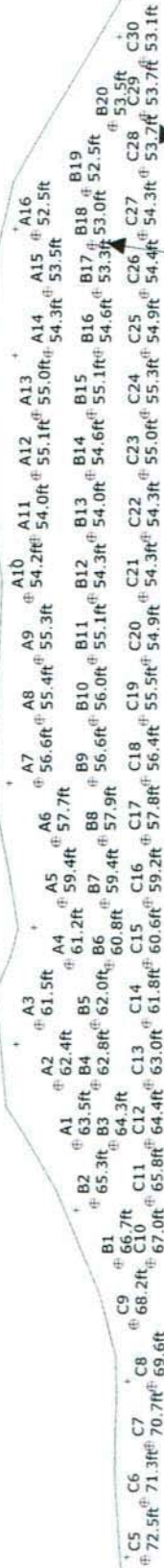
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Subdrill: 2.0ft Hole angle: 0.0°
 Total drilled: 3624.7ft Hole Diameter: 4.0in Number of holes: 62



POSTS

open face



cleanup
requ'd

B18 and C29 3.625" DIA.

9MID014 Design Partial - 3.625 and 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV
 DRILLER NAME:



Scale 1:375

SHOTPlus™ Professional 5.7.4.4	7/29/2019
Mine	Burlington
Location	MID BETWEEN NECRNR AND UPMD
Title/author	9MID014 Partial Design Fnl
Filename	



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-08-22

Blast Number: 19-016

Orica Order #: 2521575

Blast Time: 12:04 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40434 °N Latitude 79.88168 °W Longitude
Centre of Blast Centre of Blast

Wind from the: NW at 15 kph Temperature: 21 to 25 °C

Clear: Rain: Overcast: Partly Cloudy: Snow: Inversion: Ceiling: 9,144 ft

- Drilling Information -

	Angle from Vertical	Nominal Bit Diameter:
Primary Bit diam: 101.6 mm	0°	# Holes: 66 = 3,937.6 ft (4 " diam)
Secondary Bit diam: 114.3 mm	0°	# Holes: 4 = 238.6 ft (4 1/2 " diam)
Tertiary Bit diam: mm	0°	# Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,930	22,980	10,950

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	68	23.1
PENTEX DUO (OR EQUIVALENT)	0.45	70	31.8

total explosives weight in Blast (kg): 11,030

Pkgd Prod (25 kg) % of Total kg: 0.2%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			23
UNITRONIC 600 15M			45
UNITRONIC 600 20M			18
UNITRONIC 600 25M			52
EXEL MS 18m		25 ms	25
EXEL MS 25m		25 ms	45

Cord & Accessories:

	U of M	# used
HARNES WIRE DUPLEX (6 PACK) 400M	units	1
MINI STEM PLUGS - 6015 (4")	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	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted:	30,187 te	11,610 m ³	Rate Code
Total tonnes per day:	30,187 te	TBD	
Total Holes Loaded:	70 holes		
... including:	0 Dead Holes		
... and:	2 Helper Holes		
Helper Hole Collar:	35.0 ft avg		
# Rows Blasted:	2 rows		

- Pattern (Front Row) -

Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	34 front row

- Pattern (Back Row) -

Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# Holes:	36 back row

Bench Height: 57.7 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 59.7 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Back Row: 4.0 ft avg

Decks: 68 per blast

- Collar Stemming -

Front Row: 8.0 ft avg

Back Row: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 47.7 ft avg

Back Row: 48.7 ft avg

- Charge Weight -

Front Row: 139.0 kg/hole

Back Row: 141.9 kg/hole

Max. per delay: 130.0 kg/delay

SD () Equation: 5.0 kg/delay

Total kg Loaded: 11,030 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.365 kg/te (actual)

Front row: 0.273 kg/te (theoretical)

Main Body: 0.371 kg/te (theoretical)

"KPI" PF: 0.322 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 to bring up collars

Rate code to be determined by sale rep.



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-08-22

Blast Number: 19-016
 Orica Order #: 2521575
 Blast Time: 12:04 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40439	79.88167	0.757549	1.394198
Front Row Corner	43.40387	79.88176	0.757540	1.394200
Back Row Corner	43.40478	79.88161	0.757556	1.394197
Average (Centre of Blast)	43.40434	79.88168	0.757549	1.394198

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	355.8	m		
Post Blast Data:	ppV: 7.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.7	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1348.6	m		
Post Blast Data:	ppV: 1.5	mm/s	Trigger set at: 2.0	mm/s
	frequency: 41.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 111.3	dB	Trigger set at: 115	dB

South West Corner of property

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	67.1	m		
Post Blast Data:	ppV: 48.64	mm/s	Trigger set at: 2.0	mm/s
	frequency: 30	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 128.3	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(67.1)^2}{30^2} \text{ kg} \\
 &= \frac{4,502}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date:

Blast Number: 19-016

Orica Order #: 2521575

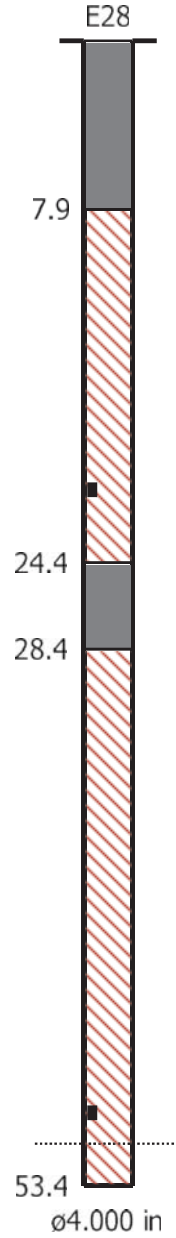
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 33ft
PENTEX BC 12 * 340 x1

UNI Tronic (?)ms 66ft
Pentex DUO 16 * 454 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:05:01 August 22, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.25 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: 2450 2nd Line
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

Sand Bagged
 N43.40245,W-79.87814

Microphone Linear Weighting

PSPL 116.7 dB(L) at 2.612 sec

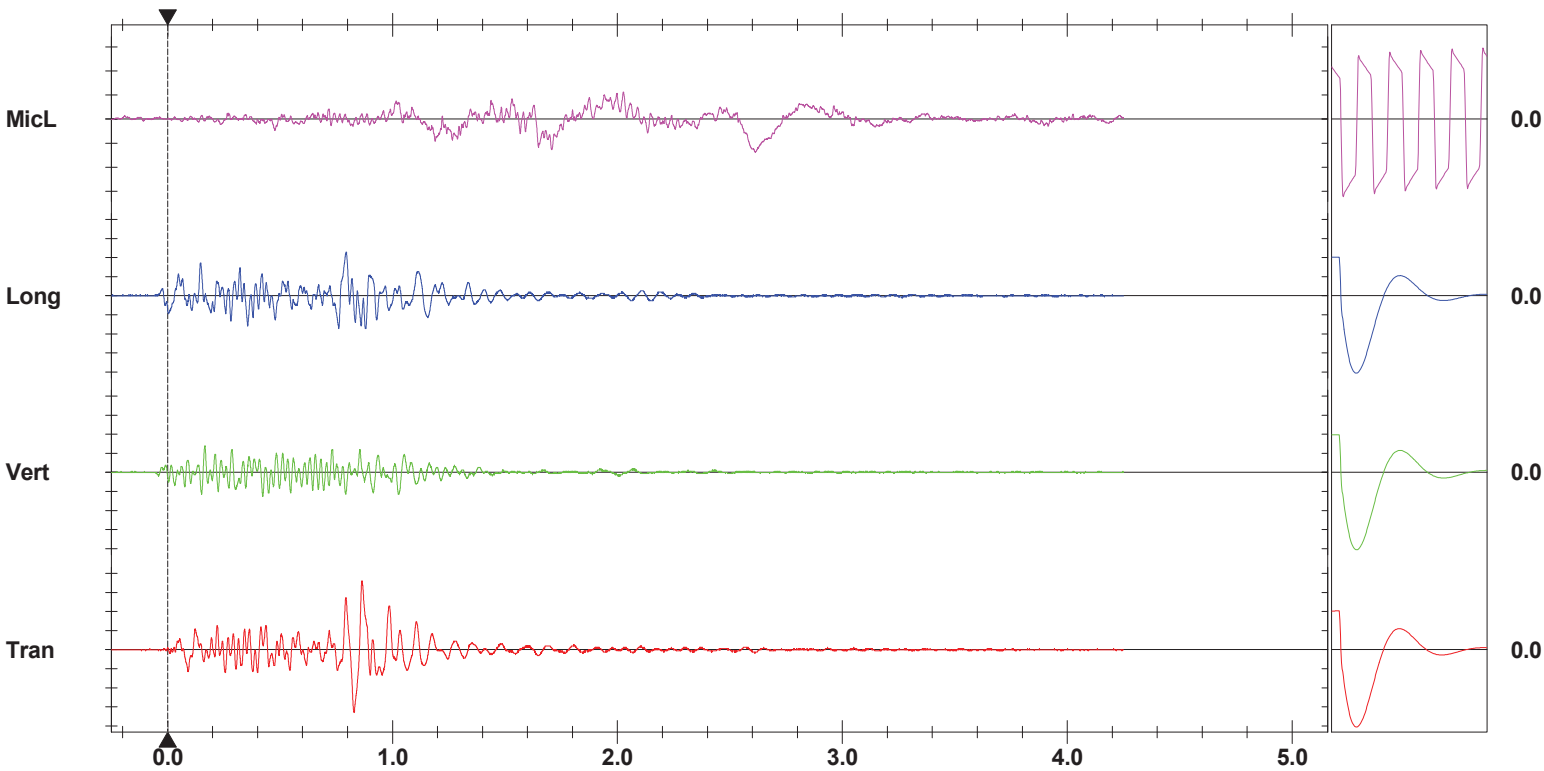
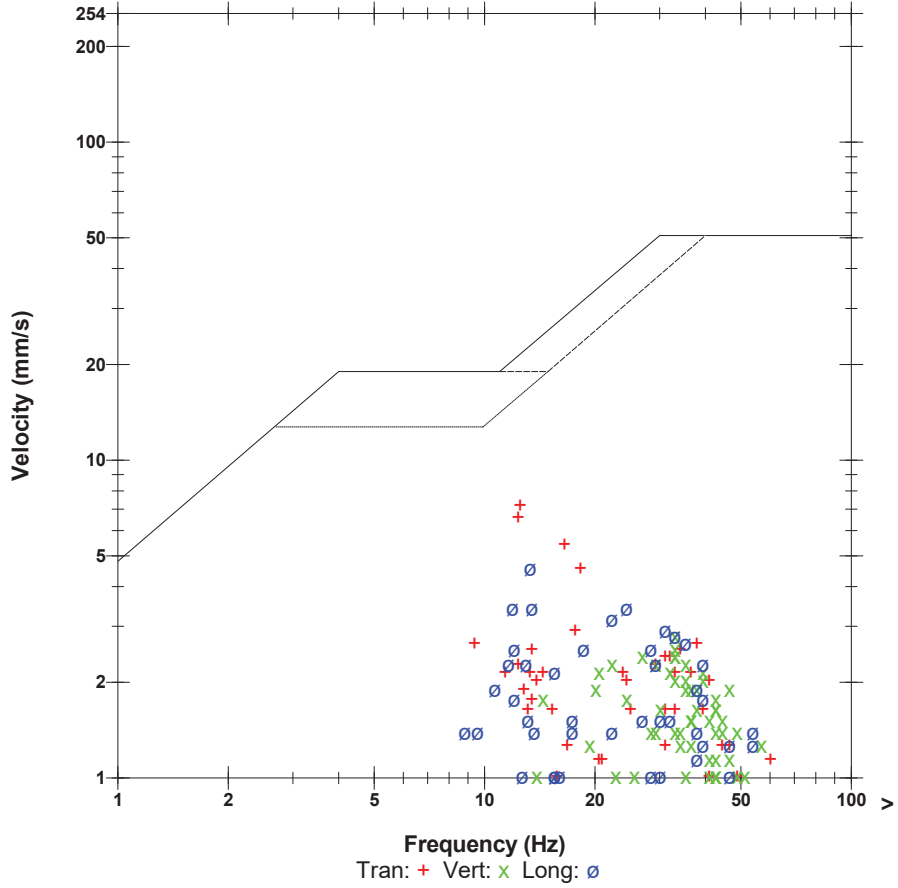
ZC Freq 2.6 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 530 mv)

	Tran	Vert	Long	
PPV	7.239	2.794	4.572	mm/s
ZC Freq	12.5	33	13.3	Hz
Time (Rel. to Trig)	0.864	0.165	0.793	sec
Peak Acceleration	0.106	0.080	0.080	g
Peak Displacement	0.079	0.019	0.050	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	3.9	

Peak Vector Sum 7.523 mm/s at 0.864 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 12:04:56 August 22, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 121.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.0 sec (Auto=4Sec) at 2048 sps
Operator/Setup: Mike der Kinderen/Burlington SW.MMB

Serial Number UM6859 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration December 24, 2018 by InstanTel
File Name UM6859_20190822120456.IDFW

Notes

Location: SouthWest Corner of Quarry
Client: Nelsons Burlington
User Name: Orica Canada Inc.
General: Monitoring Vibration and Airblast

Extended Notes

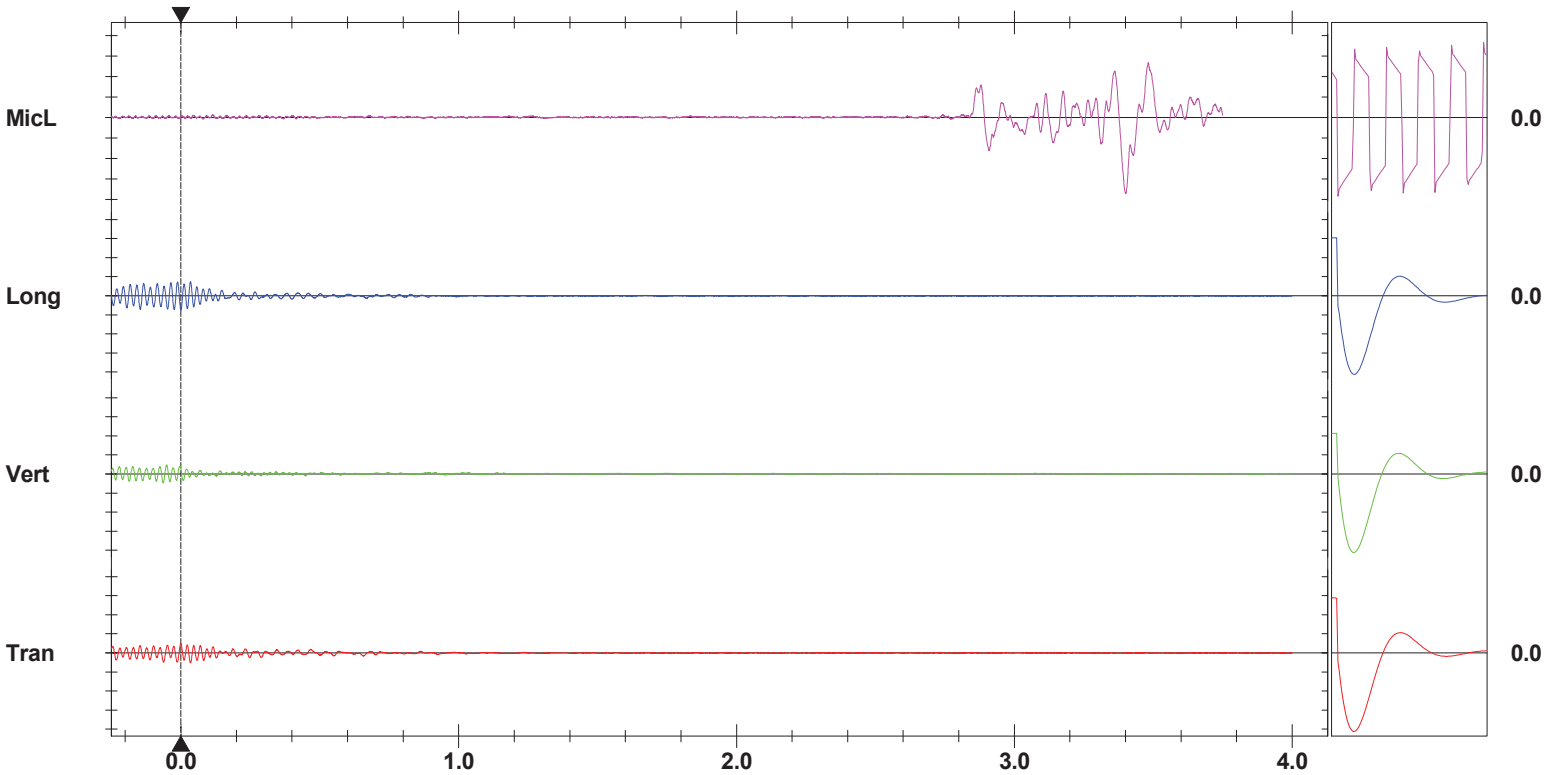
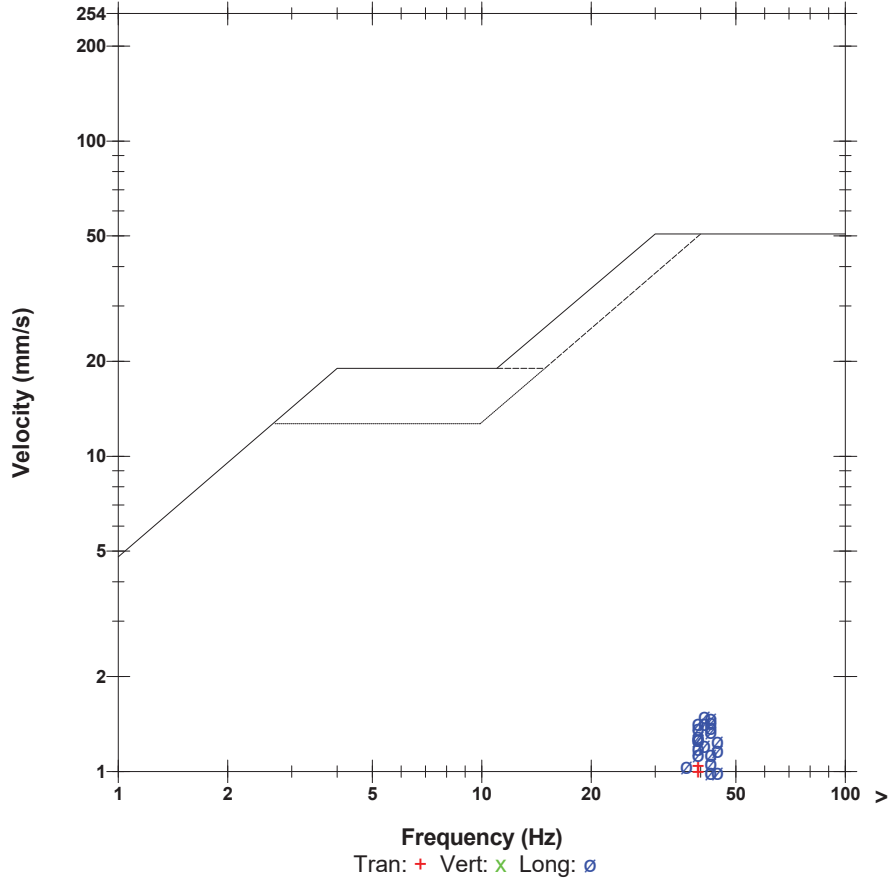
N 43.39339
 W 79.88880

Microphone Linear Weighting
PSPL 111.3 dB(L) at 3.400 sec
ZC Freq 7.7 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 1355 mv)

	Tran	Vert	Long	
PPV	1.040	0.938	1.498	mm/s
ZC Freq	39	43	41	Hz
Time (Rel. to Trig)	0.035	-0.063	0.000	sec
Peak Acceleration	0.028	0.033	0.064	g
Peak Displacement	0.004	0.004	0.006	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.8	4.0	

Peak Vector Sum 1.884 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: 2.000 pa.(L)/div
Trigger =

Sensor Check

Date/Time Vert at 12:05:00 August 22, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name _TEMP.EVT

Notes

Location: Gas Line 52 Meters Behind Blast
Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

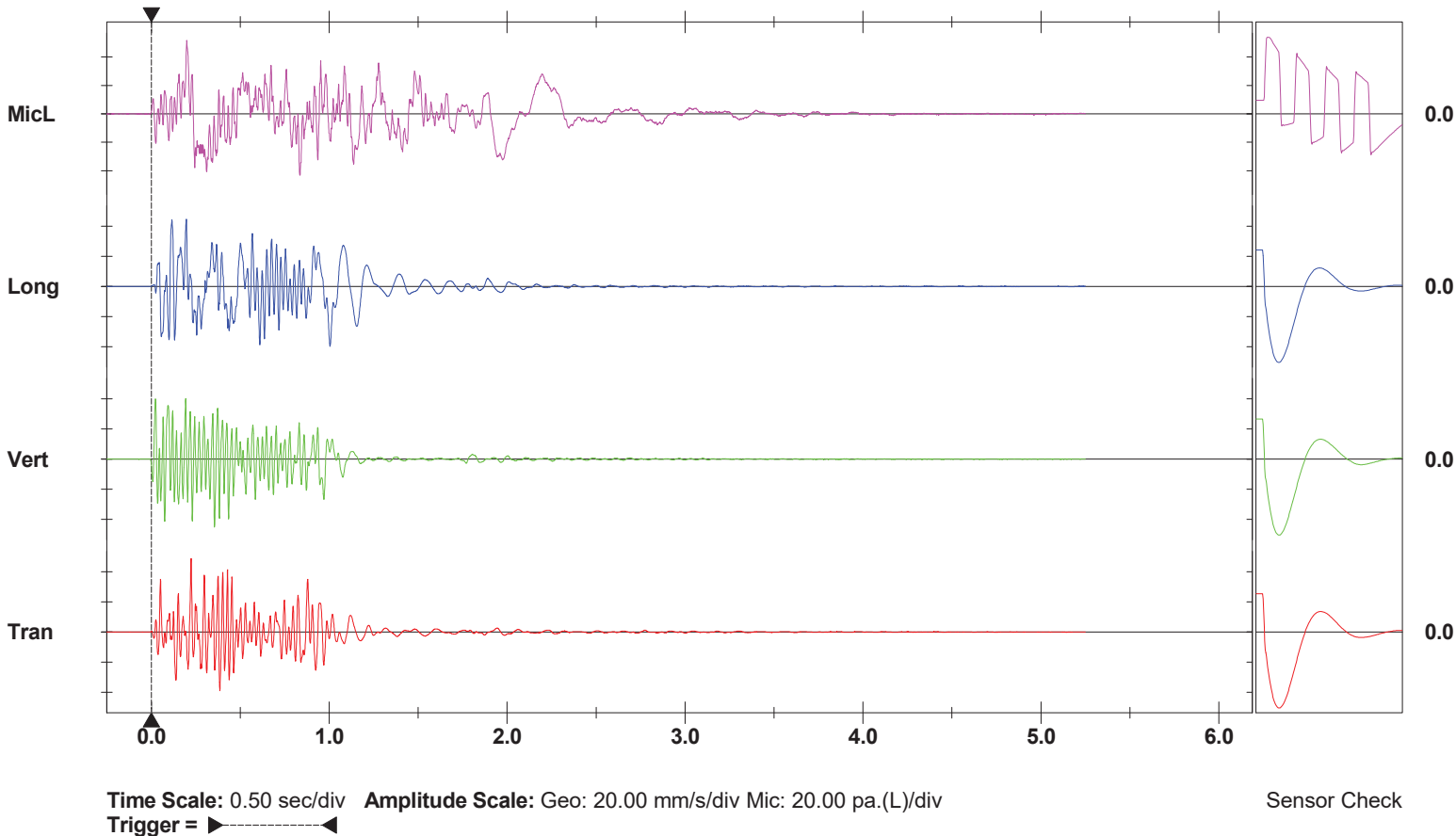
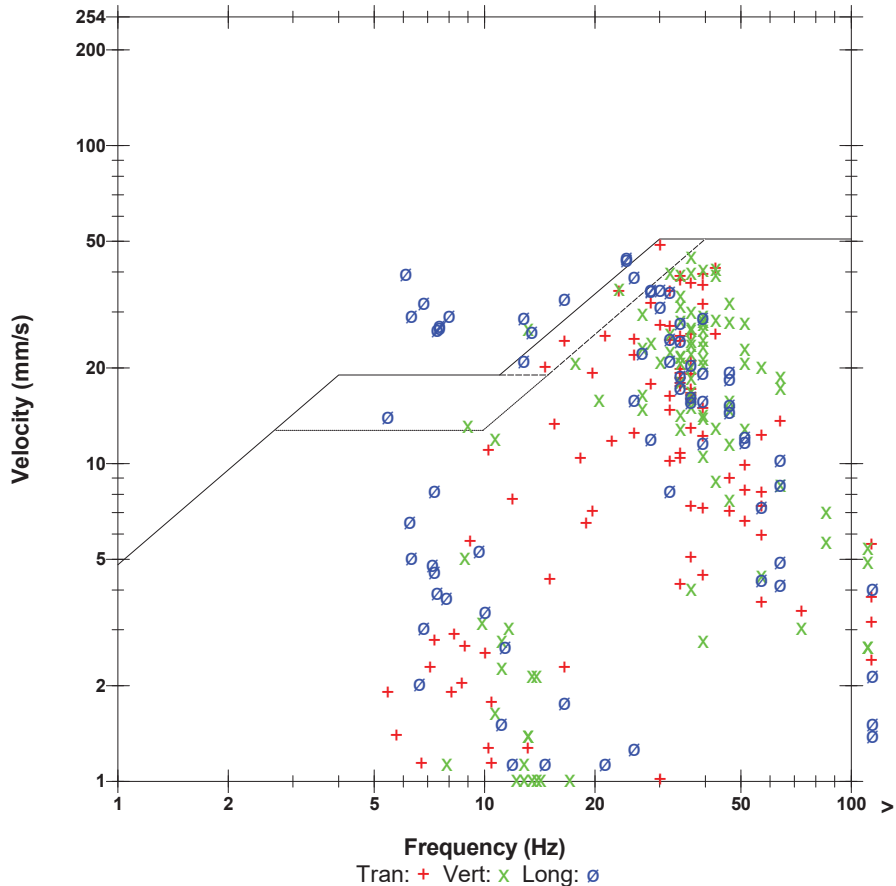
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 128.3 dB(L) at 0.199 sec
ZC Freq 10 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 683 mv)

	Tran	Vert	Long	
PPV	48.64	45.08	44.58	mm/s
ZC Freq	30	37	24	Hz
Time (Rel. to Trig)	0.224	0.355	0.196	sec
Peak Acceleration	1.644	1.591	1.259	g
Peak Displacement	0.227	0.301	0.675	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.4	Hz
Overswing Ratio	3.7	3.9	4.1	

Peak Vector Sum 56.13 mm/s at 0.194 sec

USBM RI8507 And OSMRE



Sensor Check

**Blind line & Colling rd
Nelson Aggregate
Burlington 2019-08-22 Blast 19-016Middle**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
----- Aug 22 /19 11:20:47	----- Aug 22 /19 12:41:21	SERIAL NUMBER: UM6857 Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 70	Hole angle: 0.0°
Total drilled: 4176.3ft			

Open Face

130 Kg Bottom
103Kg Top
D1, D3, D4, D5
4.5" Painted Green

110 Kg Bottom
82 Kg Top
Top deck to be loaded to collar

80 Kg Bottom
54 Kg Top
Top deck to be loaded to collar



9MID017 Final
4" Blasthole
12' X 10' Front Row
9' X 10' Body
250.0 + 0.6m Subdrill

Holes D1, D3, D4, D5 are 4.5" Painted Green



Not to scale

SHOTPLUS Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 4069.7ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Subdrill: 2.0ft
 Number of holes: 68
 Stemming: 8.0ft
 Hole angle: 0.0°

Open Face

D1, D3, D4, D5
 4.5" Painted Green

HEZ ADZ
 XYZ
 PT.



- 9MID017 Final
- 4" Blasthole
- 12' X 10' Front Row
- 9' X 10' Body
- 250.0 + 0.6m Subdrill

Holes D1, D3, D4, D5 are 4.5" Painted Green



Not to scale



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-08-28

Blast Number: 19-017

Orica Order #: 2523993

Blast Time: 10:59 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40346 °N Latitude 79.88160 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 5 kph Temperature: 21 to 25 °C

Clear: Partly Cloudy: X Rain: Snow: Inversion: Ceiling: 30,000 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 36 = 2,383.1 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	34,180	27,010	7,170

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	2	0

Boosters:

	kg / unit	# used	kg
PENTEX 8 (OR EQUIVALENT)	0.23	35	7.9
PENTEX 12 (OR EQUIVALENT)	0.34	36	12.2

total explosives weight in Blast (kg): 7,190

Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			35
UNITRONIC 600 25M			36

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	5.5
HELPER HOURS	Enter total Helper man-hours	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 15,727 te 6,049 m3
Total tonnes per day: 15,727 te NB60-08 Rate Code
Total Holes Loaded: 36 holes
... including: 3 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 2 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 13 front row

- Pattern (Back Row) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 23 back row

Bench Height: 64.2 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 66.2 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: 3/4" Clear

- Charge Length -

Front Row: 59.2 ft avg

Back Row: 59.2 ft avg

- Charge Weight -

Front Row: 172.6 kg/hole

Back Row: 172.6 kg/hole

Max. per delay: 237.0 kg/delay

SD () Equation: 22.5 kg/delay

Total kg Loaded: 7,190 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.457 kg/te (actual)

Front row: 0.304 kg/te (theoretical)

Main Body: 0.406 kg/te (theoretical)

"KPI" PF: 0.355 kg/te (theoretical)

2.004 lb/yd³

1.334 lb/yd³

1.778 lb/yd³

1.556 lb/yd³

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

J-9 Only received a bottom primer due to hole bridging while retracting the hose



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-08-28

Blast Number: 19-017
 Orica Order #: 2523993
 Blast Time: 10:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40346	79.88160	0.757533	1.394197
Front Row Corner	43.40333	79.88167	0.757531	1.394198
Back Row Corner	43.40360	79.88153	0.757536	1.394196
Average (Centre of Blast)	43.40346	79.88160	0.757533	1.394197

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	301.5	m		
Post Blast Data:	ppV: 7.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 12.3	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 119.1	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1263.8	m		
Post Blast Data:	ppV: 0.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 10.1	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 117.4	dB	Trigger set at: 115	dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	142.4	m		
Post Blast Data:	ppV: 34.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: 30.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 131.6	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(142.4)^2}{30^2} \text{ kg} \\
 &= \frac{20,278}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 8/28/2019

Blast Number: 19-017
 Orica Order #: 2523993

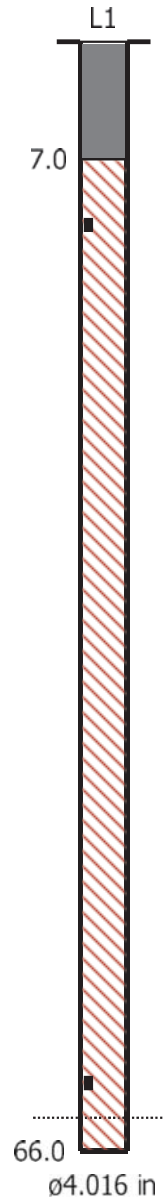
page 2

Paste ShotPlus Diagram inside Rectangle:



UNI Tronic (?)ms 20ft
 PENTEX CD 8 * 227 x1

UNI Tronic (?)ms 82ft
 PENTEX BC 12 * 340 x1



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 10:59:42 August 28, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 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: 2450 2nd Line
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

Sand Bagged
 N43.40245,W-79.87814

Microphone Linear Weighting

PSPL 119.1 dB(L) at 0.987 sec

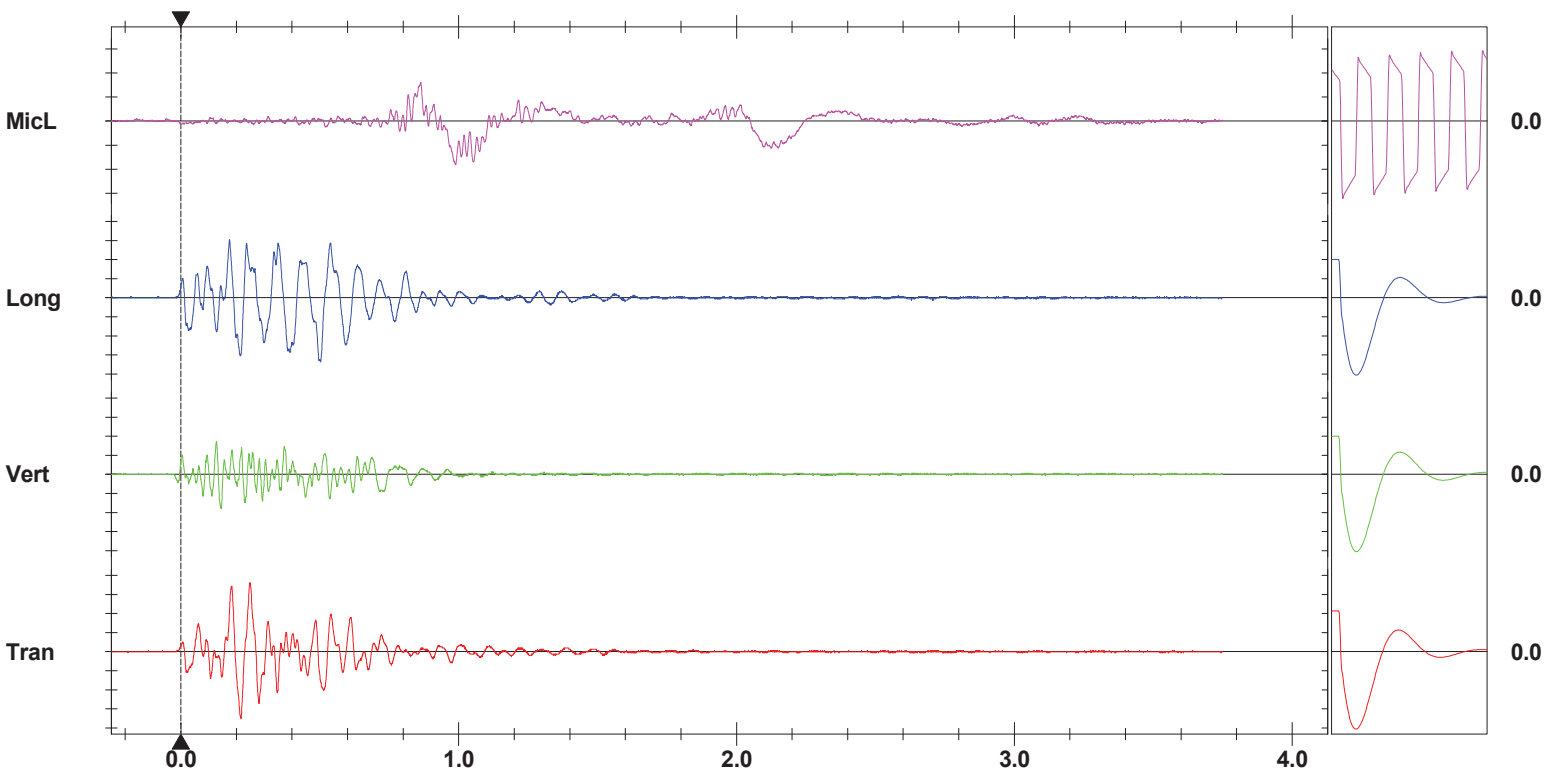
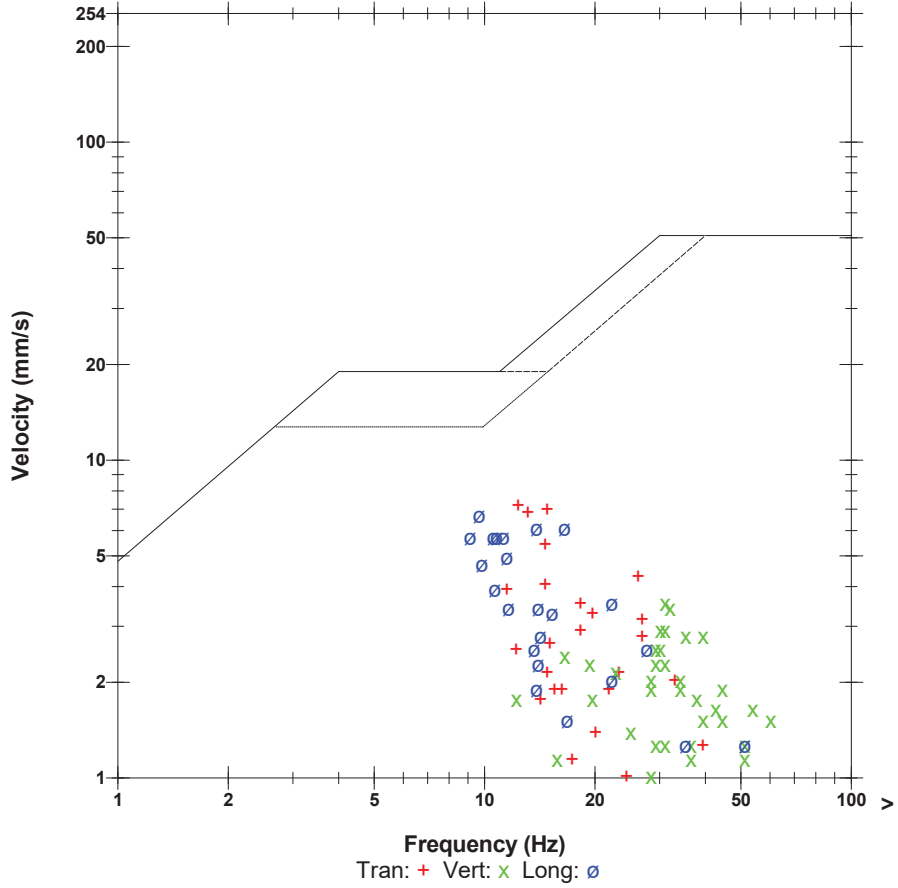
ZC Freq 3.0 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 520 mv)

	Tran	Vert	Long	
PPV	7.239	3.556	6.731	mm/s
ZC Freq	12.3	31	9.7	Hz
Time (Rel. to Trig)	0.248	0.144	0.502	sec
Peak Acceleration	0.106	0.106	0.106	g
Peak Displacement	0.073	0.027	0.094	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.6	3.5	3.9	

Peak Vector Sum 9.410 mm/s at 0.216 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 MicL at 10:59:42 August 28, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.088 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.5 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20190828105942.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

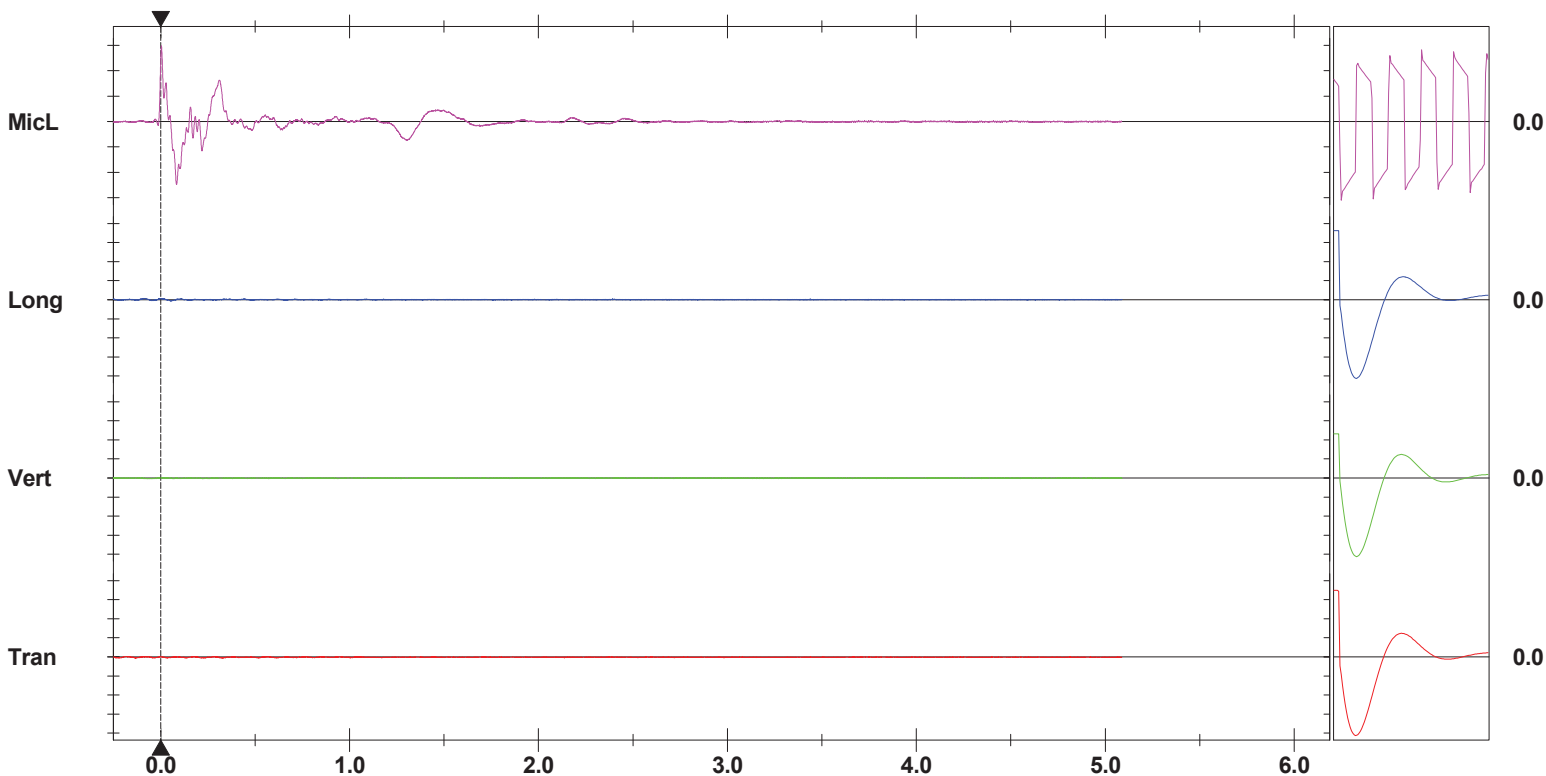
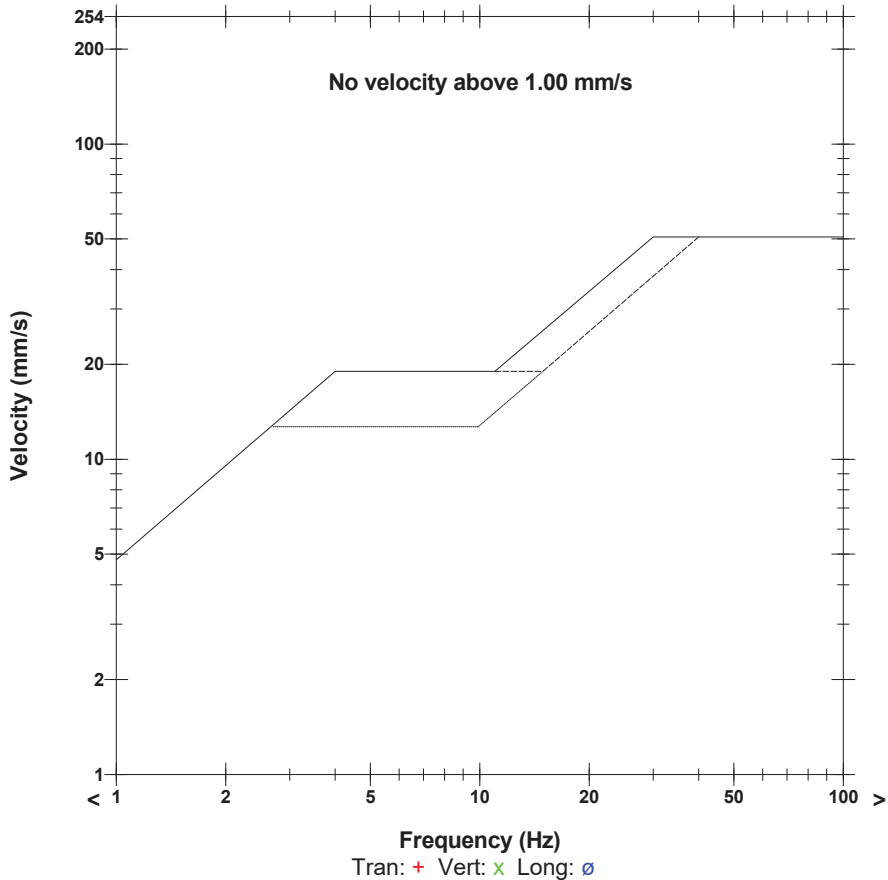
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 117.4 dB(L) at 0.004 sec
ZC Freq 8.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1338 mv)

	Tran	Vert	Long	
PPV	0.126	0.079	0.134	mm/s
ZC Freq	9.5	6.6	10.1	Hz
Time (Rel. to Trig)	-0.219	-0.071	-0.093	sec
Peak Acceleration	0.008	0.010	0.010	g
Peak Displacement	0.017	0.002	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.3	3.3	3.4	

Peak Vector Sum 0.146 mm/s at -0.088 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

Date/Time Vert at 10:59:42 August 28, 2019
Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: Gas Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 131.6 dB(L) at 0.717 sec

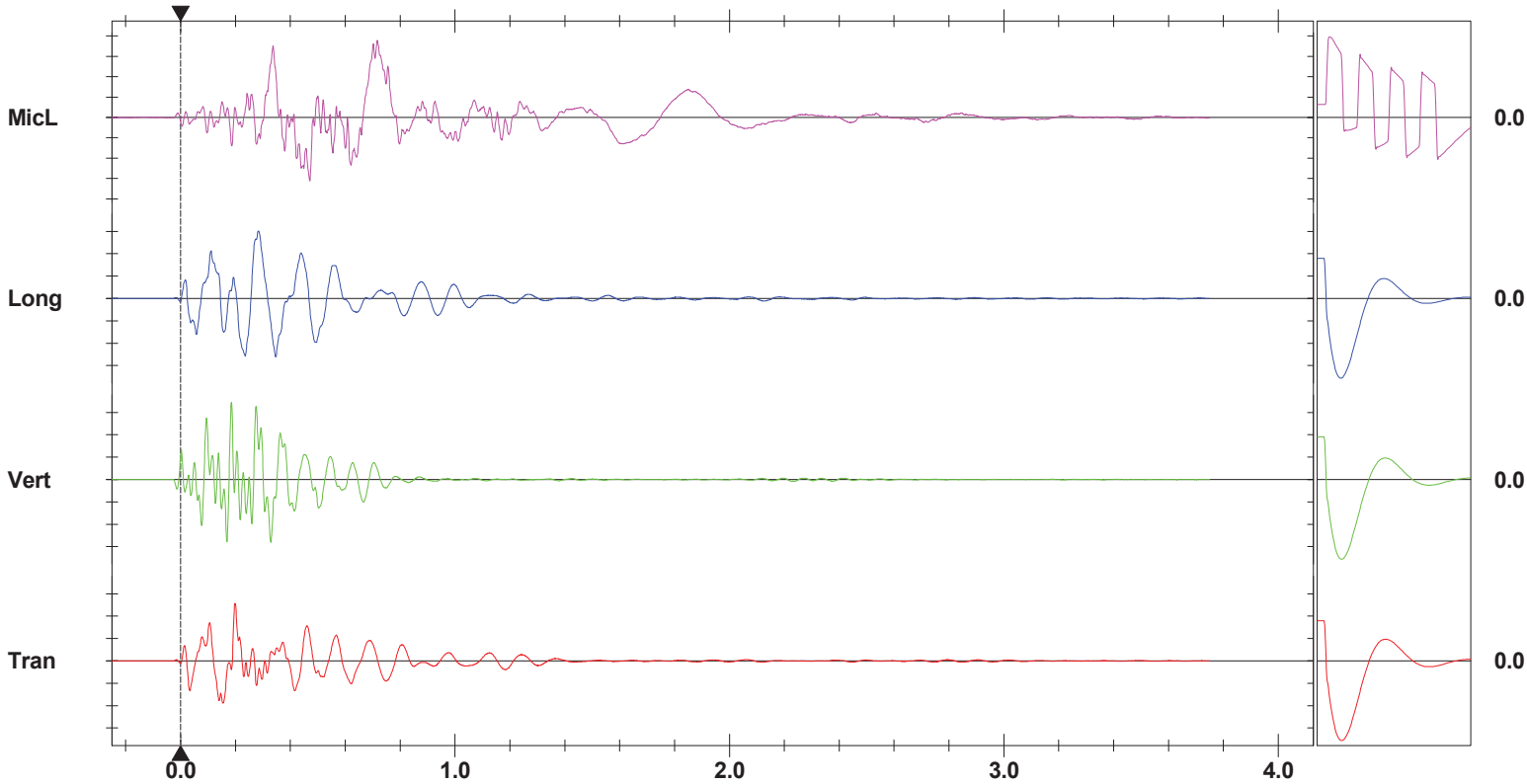
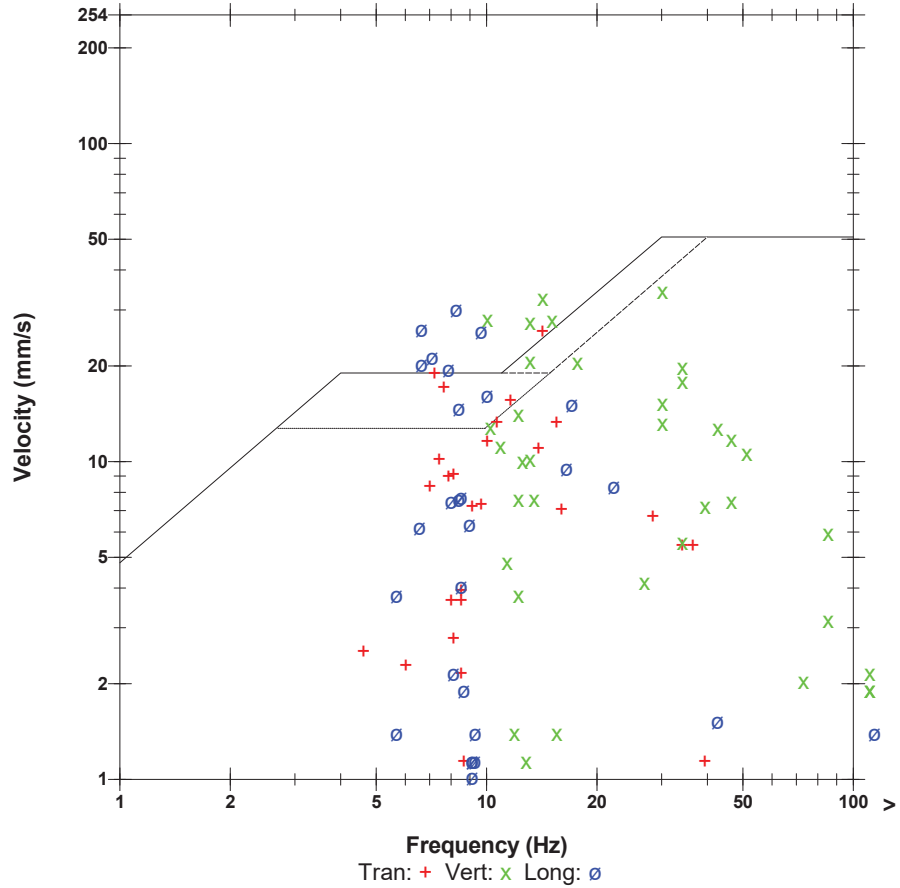
ZC Freq 4.1 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 695 mv)

	Tran	Vert	Long	
PPV	25.65	34.42	30.10	mm/s
ZC Freq	14	30	8.3	Hz
Time (Rel. to Trig)	0.198	0.186	0.282	sec
Peak Acceleration	0.424	0.663	0.278	g
Peak Displacement	0.333	0.340	0.556	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.2	7.3	7.5	Hz
Overswing Ratio	3.7	3.7	4.0	

Peak Vector Sum 43.35 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: 20.00 pa.(L)/div
Trigger =

Sensor Check

SHOTPlus Plan

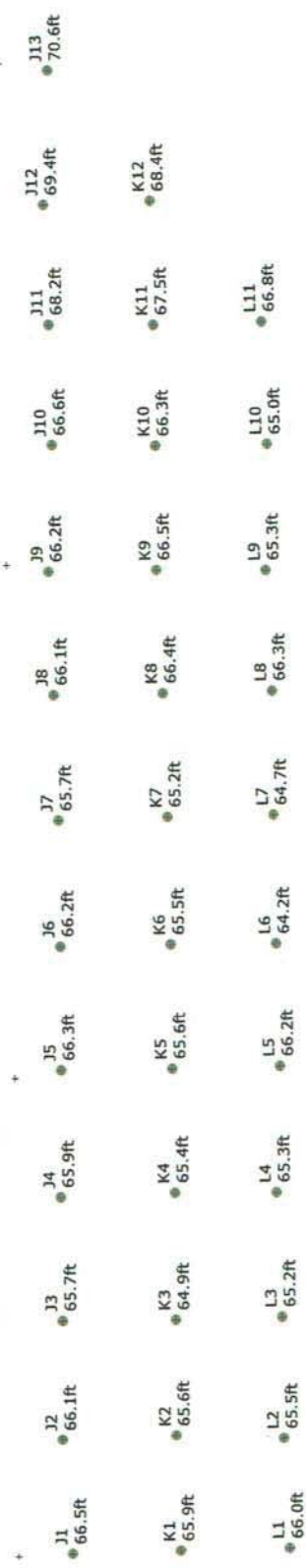
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 36 Hole angle: 0.0°
 Total drilled: 2383.1ft



POSTS

open face



9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 +
 DRILLER NAME: _____



Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 36 Hole angle: 0.0°
 Total drilled: 2383.1ft



open face



9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 +
 DRILLER NAME: _____



Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft
1st row burden: 12.0ft
Total drilled: 2383.1ft

Spacing: 10.0ft
Hole Diameter: 4.0in
Number of holes: 36

Stemming: 7.0ft
Hole angle: 0.0°

Load Sheet
Max 225 Kg
open face



Not to scale

SHOTPlus 5 Plan

Blast Summary Data

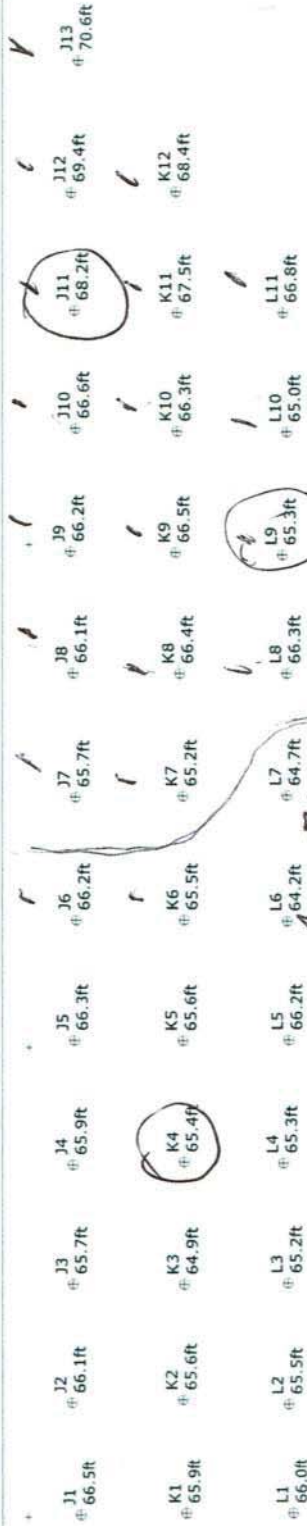
Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 36 Hole angle: 0.0°
 Total drilled: 2383.1ft



POSTS

7500 KGS

open face



9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 + .6 SUB ELEV
 DRILLER NAME:

SHOTPlus™ Professional 5.7.4.4	8/19/2019
Mine	Burlington
Location	UPPER MIDDLE SLOT NEXT TO OLD WHLWAS
Title/author	9UPMD016 Design Fnl
Filename	



Scale 1:200



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-09-09

Blast Number: 19-018

Orica Order #: 2528633

Blast Time: 12:37 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Middle (Bench / Face)

GPS Coordinates: 43.40434 °N Latitude 79.88160 °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: 2,400 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 78 = 4,680.9 ft (4 " diam)
Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,710	22,210	11,500

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	79	26.9
PENTEX DUO (OR EQUIVALENT)	0.45	97	44.0

total explosives weight in Blast (kg): 11,596

Pkgd Prod (25 kg) % of Total kg: 0.2%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 9M			20
UNITRONIC 600 15M			78
UNITRONIC 600 20M			39
UNITRONIC 600 25M			54
EXEL MS 15m			19
EXEL MS 18m			39

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	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	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 35,108 te 13,503 m³
Total tonnes per day: 35,108 te NB60-16 Rate Code
Total Holes Loaded: 78 holes
... including: 0 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 2 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 40 front row

- Pattern (Back Row) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 38 back row

Bench Height: 58.0 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 60.0 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Back Row: 4.0 ft avg

Decks: 97 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Back Row: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 49.0 ft avg

Back Row: 49.0 ft avg

- Charge Weight -

Front Row: 142.9 kg/hole

Back Row: 142.9 kg/hole

Max. per delay: 110.0 kg/delay

SD () Equation: 4.2 kg/delay

Total kg Loaded: 11,596 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.330 kg/te (actual)

Front row: 0.279 kg/te (theoretical)

Main Body: 0.372 kg/te (theoretical)

"KPI" PF: 0.325 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.447 lb/yd³

1.222 lb/yd³

1.629 lb/yd³

1.426 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

The first 19 Holes at the north end of the blast received 3 emulsion decks, the rest of the blast received 2 emulsion decks to control vibrations at the gas line and the near by shop.

Rate Code NB60-16 (19 decks in addition to the 78 built into the rate code)

Excel MS 25M 25ms---24 Used

15 additional 25M Unitronics were used instead of 25M ms because of limited stock

No additional charge should be added



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-09-09

Blast Number: 19-018
 Orica Order #: 2528633
 Blast Time: 12:37 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40436	79.88159	0.757549	1.394197
Front Row Corner	43.40381	79.88168	0.757539	1.394198
Back Row Corner	43.40486	79.88152	0.757558	1.394196
Average (Centre of Blast)	43.40434	79.88160	0.757549	1.394197

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	349.9	m		
Post Blast Data:	ppV: 4.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 10.9	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 117.4	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1351.1	m		
Post Blast Data:	ppV: 0.1	mm/s	Trigger set at: 2.0	mm/s
	frequency: 14.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.4	dB	Trigger set at: 115	dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	61.5	m		
Post Blast Data:	ppV: 29.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 20.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 128.2	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(61.5)^2}{30^2} \text{ kg} \\
 &= \frac{3,782}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

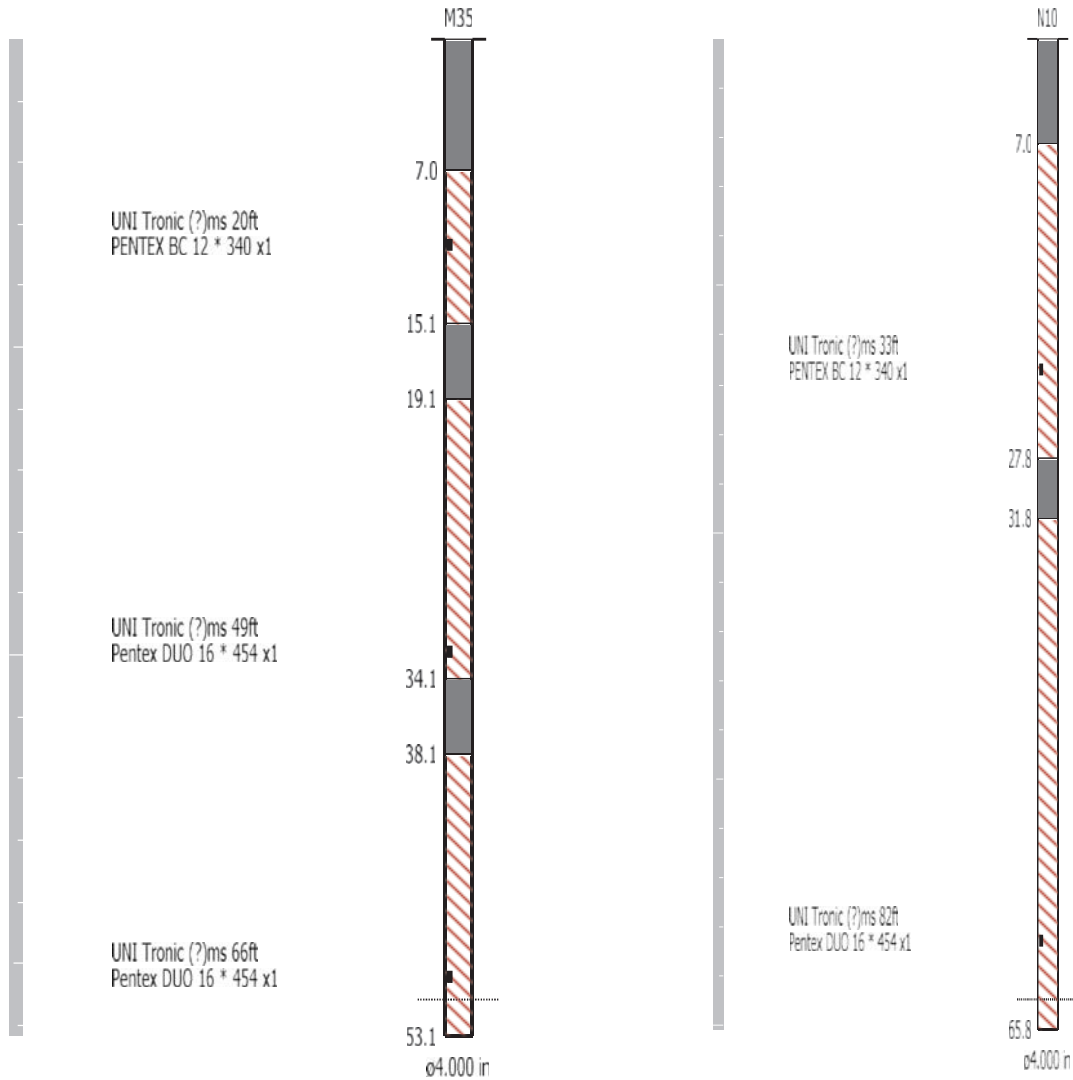
Blast Date: 9/9/2019

Blast Number: 19-018

Orica Order #: 2528633

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:37:13 September 9, 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 6.2 Volts
Unit Calibration December 4, 2018 by InstanTEL
File Name __TEMP.EVT

Notes

Location: 2450 #2 Road Burlington
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

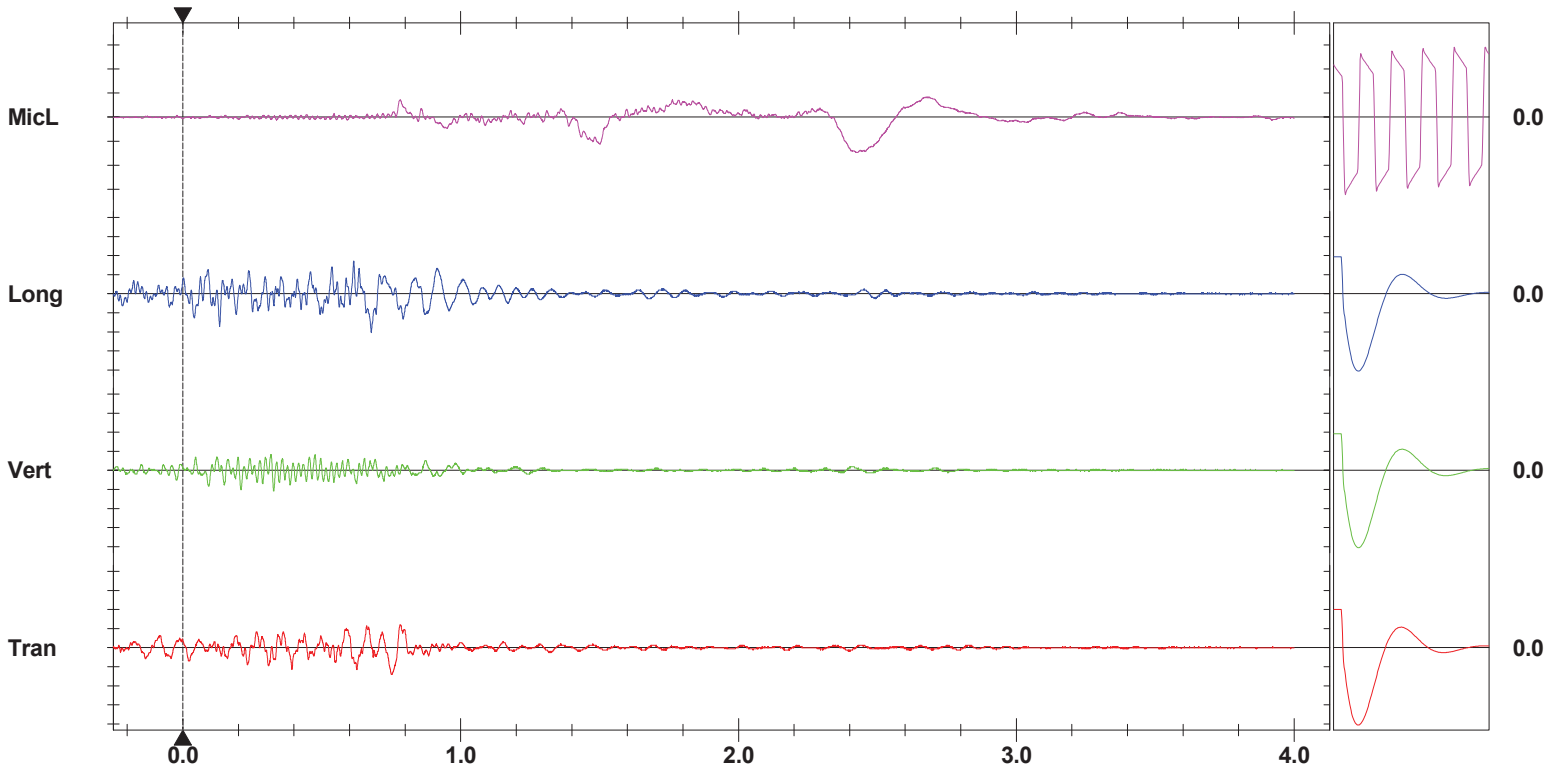
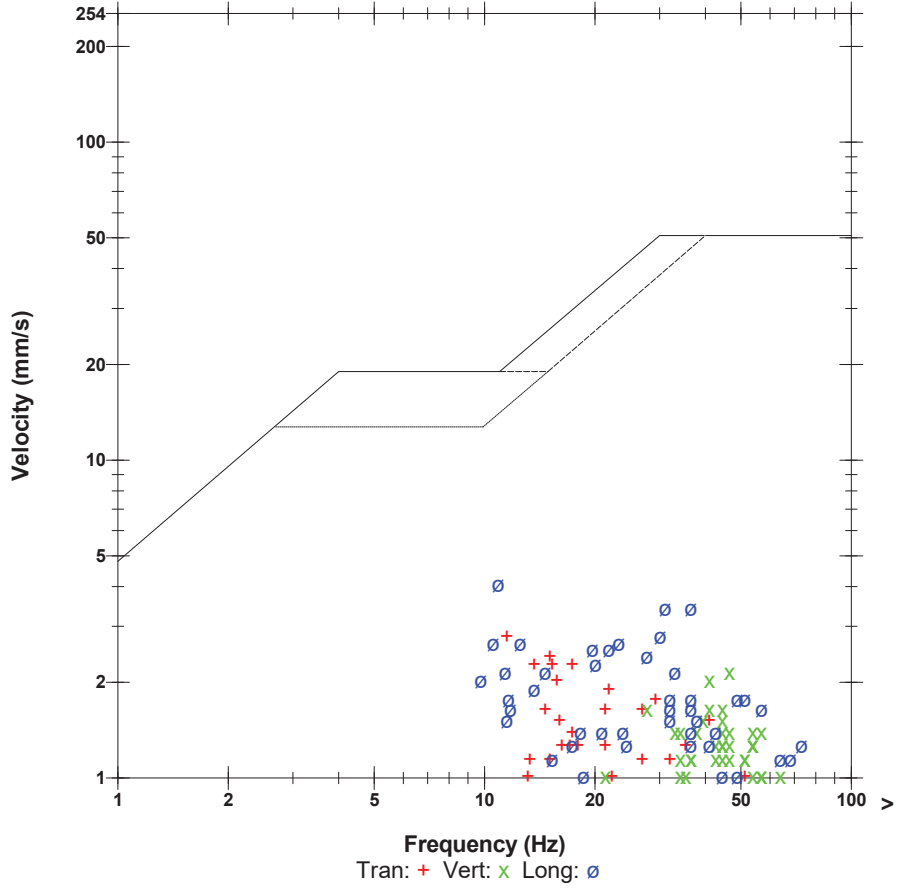
Sand Bagged

Microphone Linear Weighting
PSPL 117.4 dB(L) at 2.425 sec
ZC Freq 2.3 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 599 mv)

	Tran	Vert	Long	
PPV	2.794	2.159	4.064	mm/s
ZC Freq	11.5	47	10.9	Hz
Time (Rel. to Trig)	0.750	0.326	0.678	sec
Peak Acceleration	0.053	0.080	0.106	g
Peak Displacement	0.036	0.010	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.2	Hz
Overswing Ratio	3.8	3.7	4.1	

Peak Vector Sum 4.098 mm/s at 0.678 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 MicL at 12:37:15 September 9, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.012 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.7 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20190909123715.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

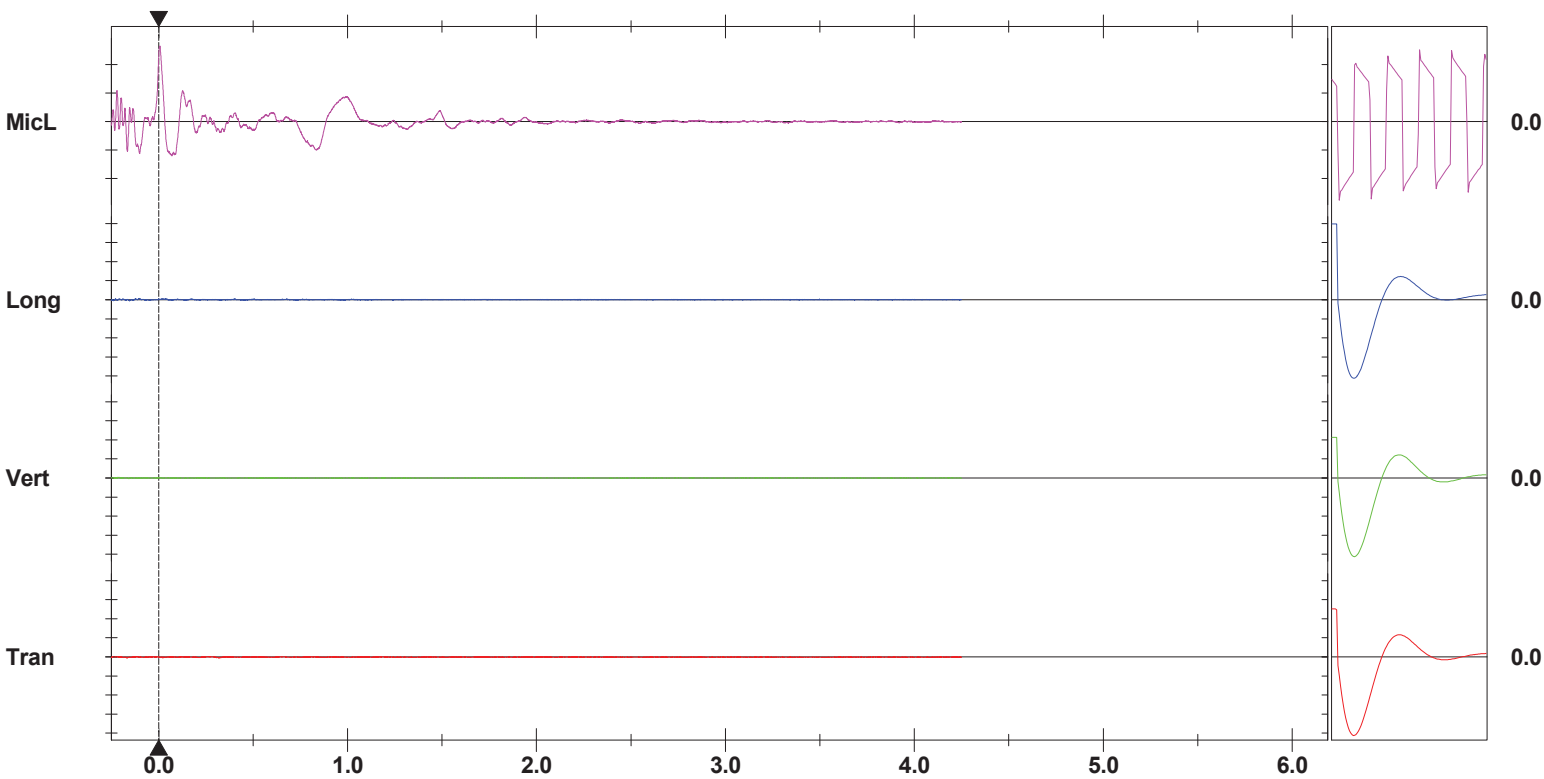
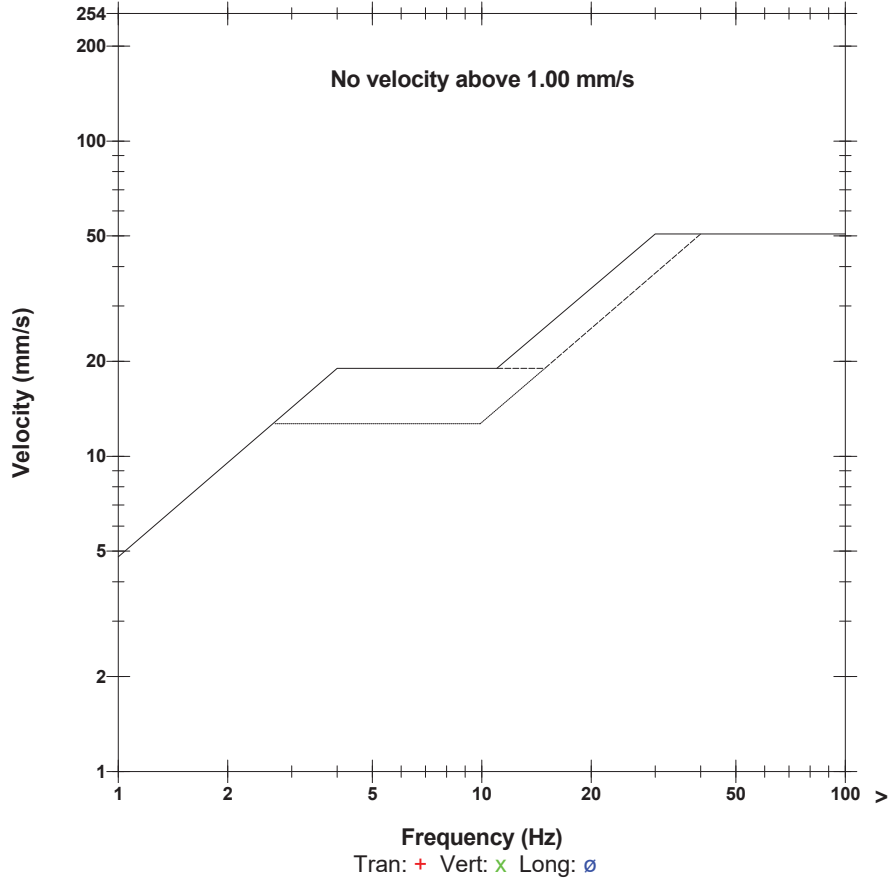
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 116.4 dB(L) at 0.007 sec
ZC Freq 7.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1392 mv)

	Tran	Vert	Long	
PPV	0.102	0.071	0.142	mm/s
ZC Freq	9.1	20	14.0	Hz
Time (Rel. to Trig)	-0.167	-0.214	-0.104	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.003	0.000	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.6	3.4	3.4	

Peak Vector Sum 0.151 mm/s at -0.104 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

Date/Time Vert at 12:35:20 September 9, 2019
Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.4 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: Gas Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: 43.40466,-79.88098

Extended Notes

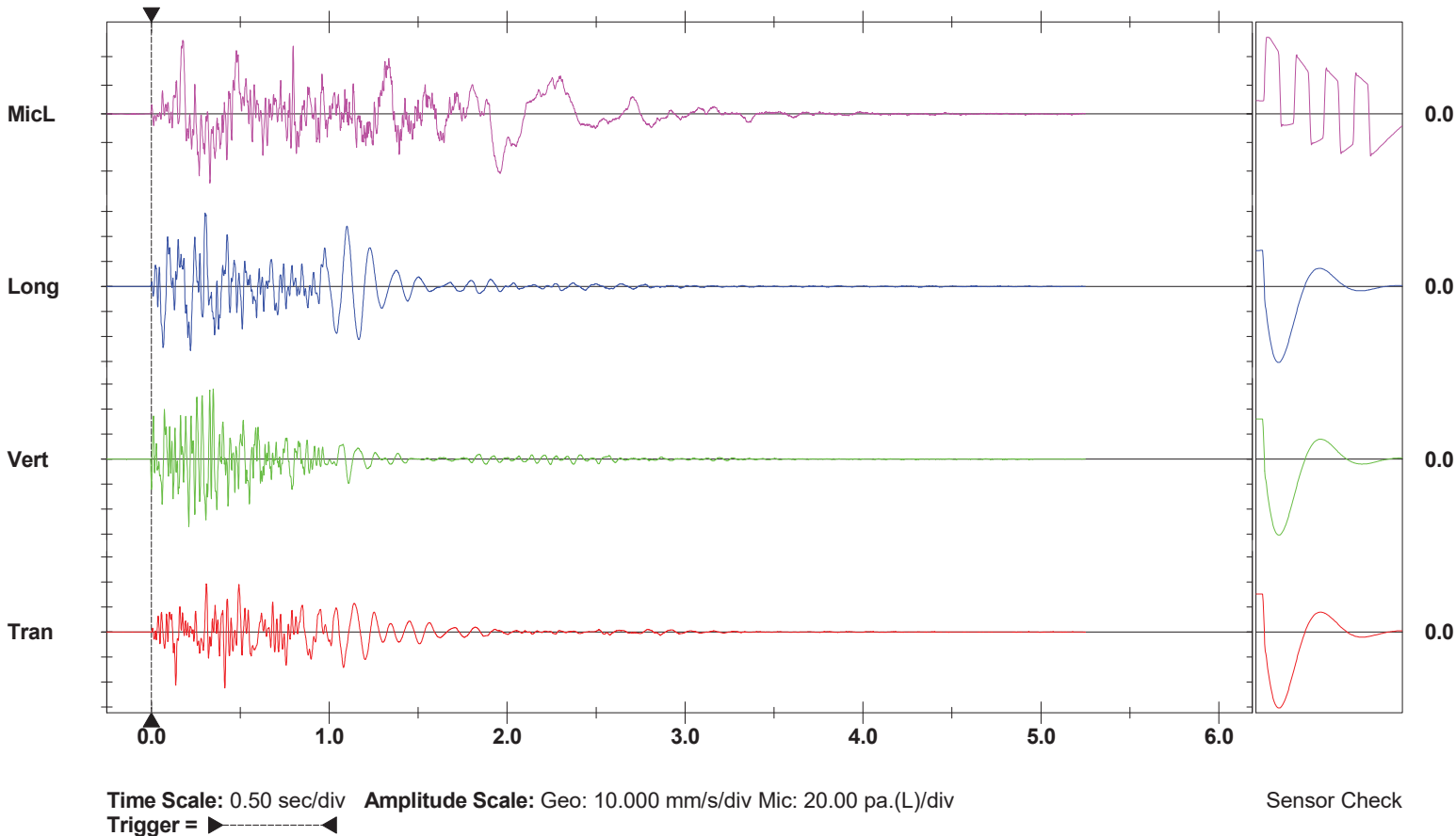
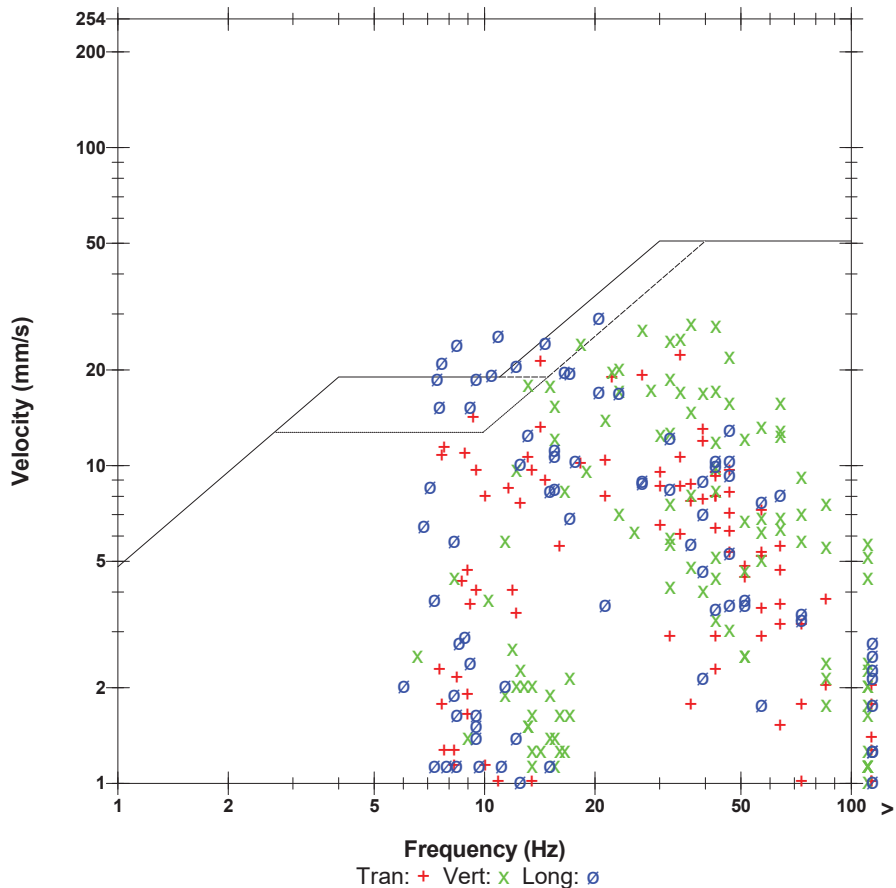
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 128.2 dB(L) at 0.177 sec
ZC Freq 16 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 624 mv)

	Tran	Vert	Long	
PPV	22.35	28.07	29.34	mm/s
ZC Freq	34	37	20	Hz
Time (Rel. to Trig)	0.414	0.349	0.303	sec
Peak Acceleration	0.464	0.862	0.583	g
Peak Displacement	0.224	0.195	0.444	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.4	Hz
Overswing Ratio	3.9	3.9	4.2	

Peak Vector Sum 41.10 mm/s at 0.308 sec

USBM RI8507 And OSMRE



SHOTPlus Plan

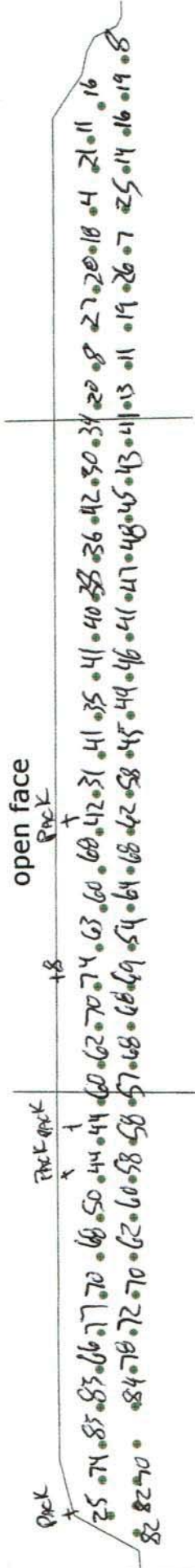
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 8.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Hole angle: 0.0°
 Total drilled: 4681.0ft Subdrill: 2.0ft Number of holes: 78

2 decks
 78Kg
 110kg

2 decks
 68Kg
 85kg

3 decks
 32Kg
 48Kg
 48Kg



9MID018 Design Fnl -
 4" Blast Hole
 12x10 9x10 271.25 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 4681.0ft

Spacing: 10.0ft
 Hole Diameter: 4.0in
 Number of holes: 78

Stemming: 8.0ft
 Hole angle: 0.0°

2 decks
 78Kg
 110kg

3 decks
 32Kg
 48Kg
 48Kg

2 decks
 68Kg
 85kg

open face



9MID018 Design Fnl -
 4" Blast Hole
 12x10 9x10 271.25 and 250 + .6 SUB ELEV
 DRILLER NAME:



Not to scale

SHOTPLUS Plan

Blast Summary Data

Burden: 9.0ft
 Spacing: 10.0ft
 Stemming: 8.0ft
 1st row burden: 12.0ft
 Hole Diameter: 4.0in
 Number of holes: 78
 Hole angle: 0.0°
 Total drilled: 4681.0ft

2 decks
 78Kg
 110kg

2 decks
 68Kg
 85kg

3 decks
 32Kg
 48Kg
 48Kg

open face



9MID018 Design Fnl -
 4" Blast Hole
 12x10 9x10 271.25 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



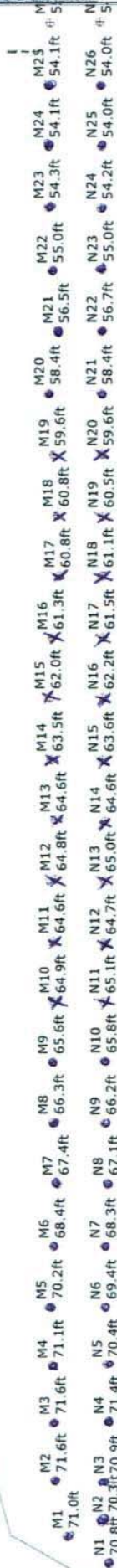
Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 8.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Hole angle: 0.0°
 Total drilled: 4681.0ft Number of holes: 78 Subdrill: 2.0ft

open face



9MID018 Design Fnl - 4" Blast Hole 12x10 9x10 271.25 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Scale 1:325

SHOTPlus™ Professional 5.7.4.4	8/29/2019
Mine	Burlington
Location	2 ROW MID WALL
Title/author	9MID018 Design Fnl
Filename	



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-09-24

Blast Number: 19-019

Orica Order #: 2534945

Blast Time: 12:05 PM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Middle (Bench / Face)

GPS Coordinates: 43.40405 °N Latitude 79.88154 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 10 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: 72 = 4,700.4 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	36,500	23,730	12,770

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	74	25.2
PENTEX DUO (OR EQUIVALENT)	0.45	72	32.7

total explosives weight in Blast (kg): 12,853
Pkgd Prod (25 kg) % of Total kg: 0.2%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			2
UNITRONIC 600 15M			72
UNITRONIC 600 20M			54
UNITRONIC 600 25M			90

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	7.0
HELPER HOURS	Enter total Helper man-hours	13.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 32,416 te 12,468 m³
Total tonnes per day: 32,416 te NB60-16 Rate Code
Total Holes Loaded: 72 holes
... including: 3 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: 10.0 ft avg
Holes: 26 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 46 main body

Bench Height: 63.3 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 65.3 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Main Body: 4.0 ft avg

Decks: 72 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 54.3 ft avg

Main Body: 54.3 ft avg

- Charge Weight -

Front Row: 158.3 kg/hole

Main Body: 158.3 kg/hole

Max. per delay: 110.0 kg/delay

SD () Equation: 7.5 kg/delay

Total kg Loaded: 12,853 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.396 kg/te (actual)

Front row: 0.283 kg/te (theoretical)

Main Body: 0.377 kg/te (theoretical)

"KPI" PF: 0.346 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.738 lb/yd³
1.241 lb/yd³
1.654 lb/yd³
1.516 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

We had to use 2 unitronics per dou booster due to shortage of 25M Excel ms 25ms



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-09-24

Blast Number: 19-019
 Orica Order #: 2534945
 Blast Time: 12:05 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40407	79.88154	0.757544	1.394196
Front Row Corner	43.40376	79.88161	0.757538	1.394197
Back Row Corner	43.40432	79.88148	0.757548	1.394195
Average (Centre of Blast)	43.40405	79.88154	0.757544	1.394196

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	327.9	m		
Post Blast Data:	ppV: 6.7	mm/s	Trigger set at: 2.0	mm/s
	frequency: 16.5	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 116.7	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1324.1	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

Blind Line and Colling Road (Bruce Trail Entrance)

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	81.9	m		
Post Blast Data:	ppV: 37.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 30.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 131.9	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(81.9)^2}{30^2} \text{ kg} \\
 &= \frac{6,708}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



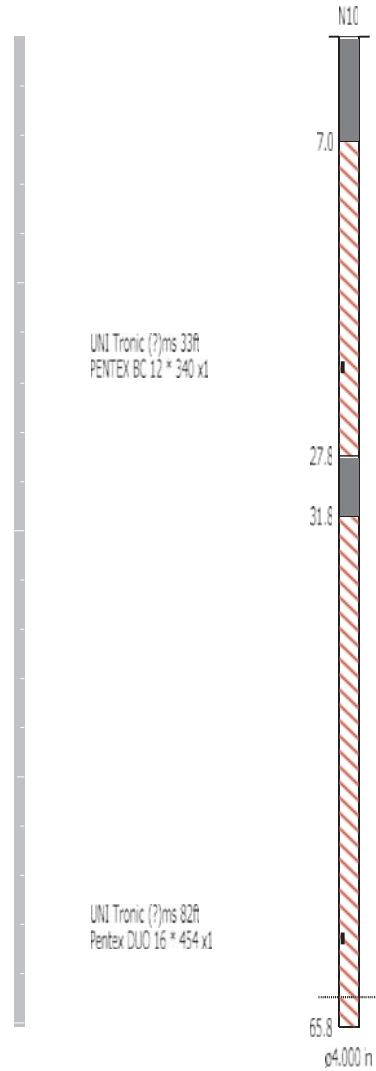
Blast Design
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/9/2019

Blast Number: 19-019
Orica Order #: 2534945

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 12:06:02 September 24, 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: 2450 #2 road, Burlington
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

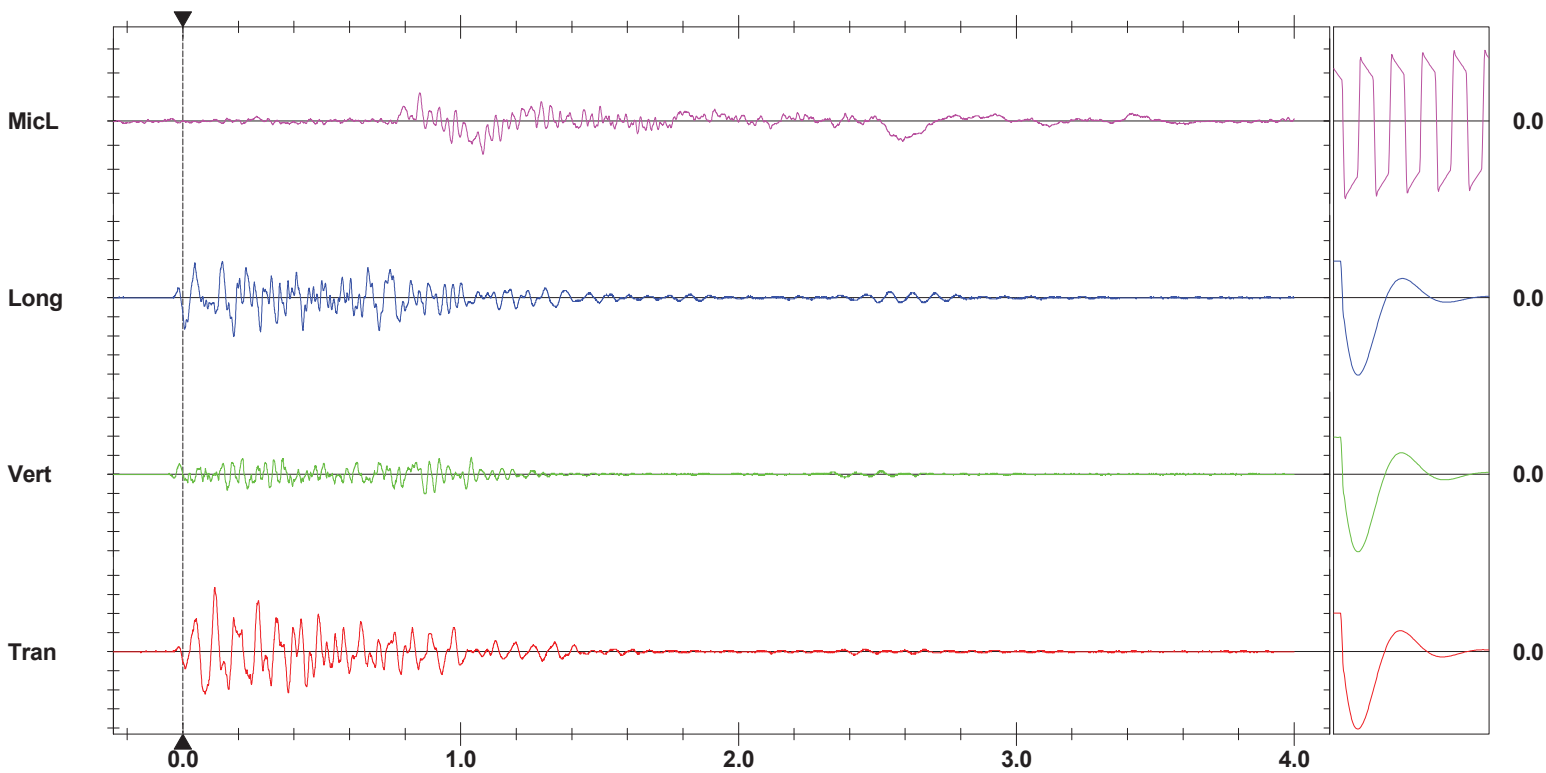
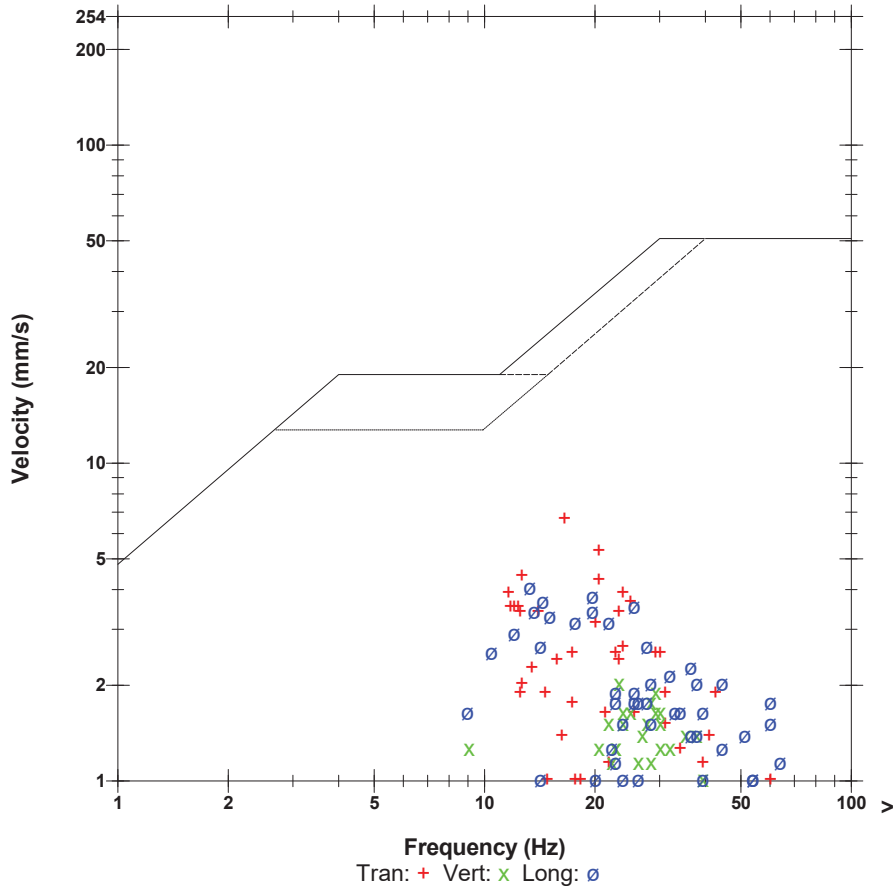
Sand Bagged
 N43.40245 W-79.87814

Microphone Linear Weighting
PSPL 116.7 dB(L) at 1.080 sec
ZC Freq 3.8 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 570 mv)

	Tran	Vert	Long	
PPV	6.731	2.032	4.064	mm/s
ZC Freq	16.5	23	13.3	Hz
Time (Rel. to Trig)	0.114	0.869	0.184	sec
Peak Acceleration	0.106	0.080	0.106	g
Peak Displacement	0.063	0.018	0.039	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.2	Hz
Overswing Ratio	3.8	3.7	4.1	

Peak Vector Sum 6.901 mm/s at 0.116 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

**Blind Line & Colling rd
Nelson Aggregate
Burlington 2019-09-24 Blast 19-019 Middle**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
----- Sep 24 /19 06:03:57	----- Sep 24 /19 13:17:31	SERIAL NUMBER: UM6857 Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:

Date/Time Long at 12:06:01 September 24, 2019
Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: Gas Line
Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

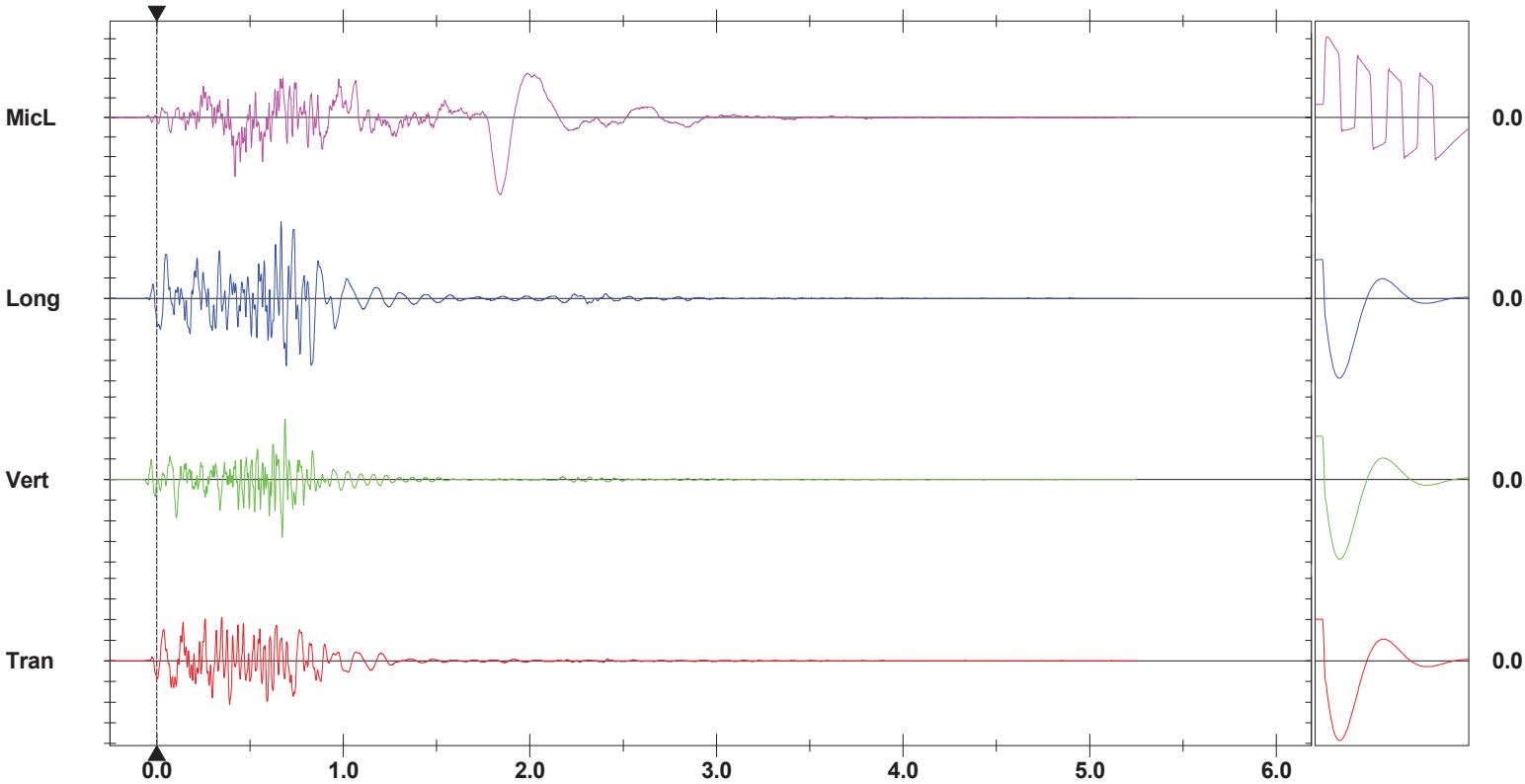
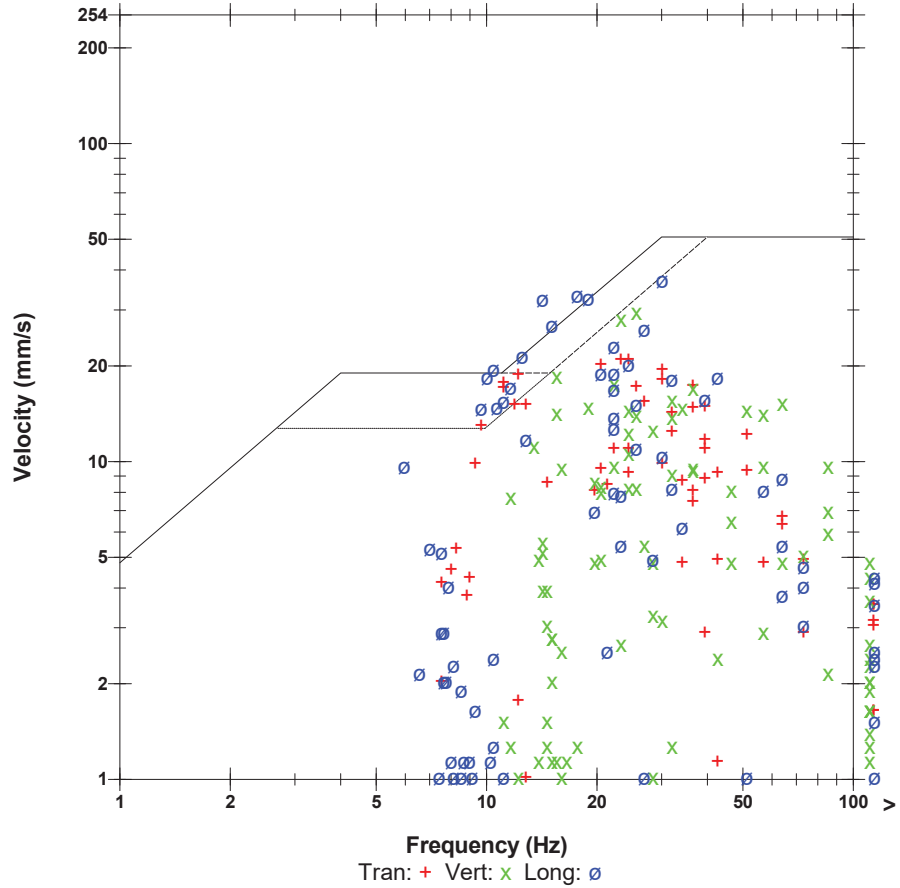
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 131.9 dB(L) at 1.840 sec
ZC Freq 3.5 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 611 mv)

	Tran	Vert	Long	
PPV	21.08	29.46	37.34	mm/s
ZC Freq	24	26	30	Hz
Time (Rel. to Trig)	0.349	0.688	0.667	sec
Peak Acceleration	0.490	0.742	0.623	g
Peak Displacement	0.235	0.167	0.378	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.7	3.7	4.1	

Peak Vector Sum 42.02 mm/s at 0.667 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 10.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger =

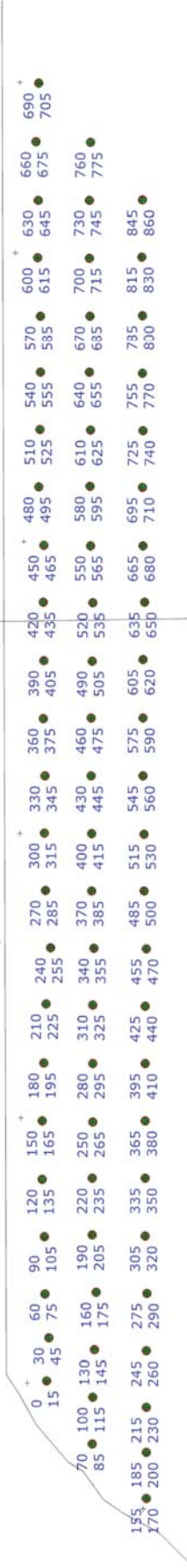
Sensor Check

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 72	Hole angle: 0.0°
Total drilled: 4700.5ft			

82Kg/delay 25M/25M 20M/18M,ms
 110Kg/delay 15M/15M,ms 15M/15M,ms
 open face



9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Not to scale

SHOTPlus Plan

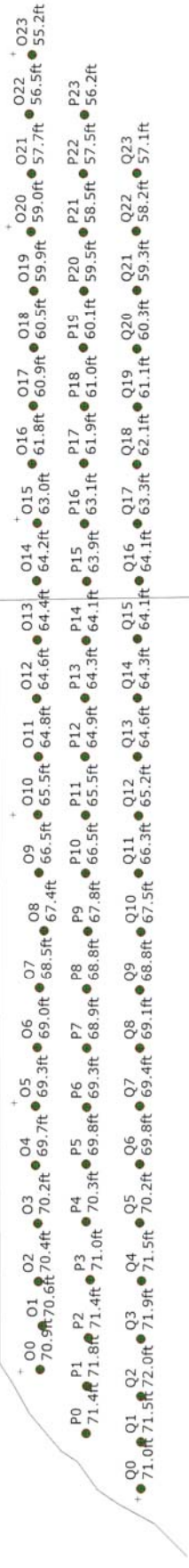
Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 72	Hole angle: 0.0°
Total drilled: 4700.5ft			

82Kg/delay
110Kg/delay

25M/25M
15M/15M,ms
open face

85Kg/Delay
85Kg/Delay

20M/18M,ms
15M/15M,ms



9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV
DRILLER NAME: _____



Not to scale



Not to scale



Blast Summary Data			
Burden:	9.0ft	Spacing:	10.0ft
1st row burden:	12.0ft	Hole Diameter:	4.0in
Total drilled:	4700.5ft	Subdrill:	2.0ft
		Number of holes:	72
		Stemming:	8.0ft
		Hole angle:	0.0°

SHOTPlus Plan

SHOTPlus 5 Plan

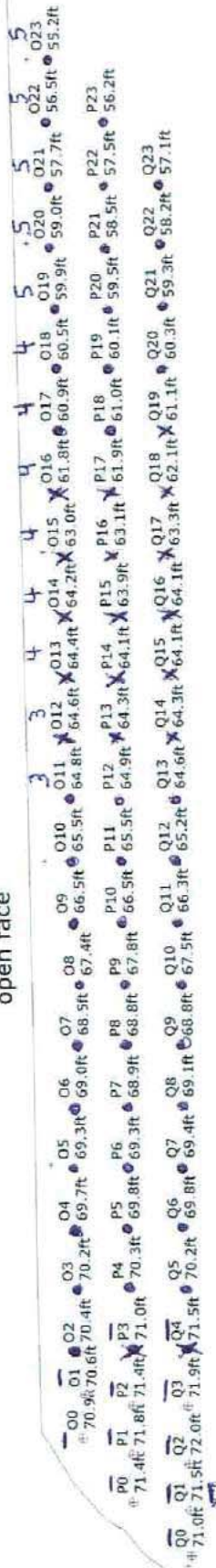
Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 4700.5ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Stemming: 8.0ft
 Hole angle: 0.0°
 Subdrill: 2.0ft
 Number of holes: 72



POSTS

open face



9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV
 DRILLER NAME:

11-785'
 28-1904'
 16-1014.3'
 17-997.4'



Scale 1:350

SHOTPlus™ Professional 5.7.4.4		9/11/2019
Mine	Burlington	
Location	SOUTH OPEN END	
Title/author	9MID019 Design Fnl	
Filename		



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-09-30

Blast Number: 19-020
Orica Order #: 2537318
Blast Time: 11:56 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Middle (Bench / Face)

GPS Coordinates: 43.40469 °N Latitude 79.88146 °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: 30,000 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 64 = 3,370.0 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	27,320	20,030	7,290

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	0	50

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	65	22.1
PENTEX DUO (OR EQUIVALENT)	0.45	64	29.1

total explosives weight in Blast (kg): 7,391
Pkgd Prod (50 kg) % of Total kg: 0.7%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 6M			1
UNITRONIC 600 9M			64
UNITRONIC 600 15M			64
UNITRONIC 600 20M			64
EXEL MS 15m			64
EXEL MS 18m			64

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	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: 24,167 te 9,295 m³
Total tonnes per day: 24,167 te NB60-17 Rate Code
Total Holes Loaded: 64 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: 10.0 ft avg
Holes: 24 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 40 main body

Bench Height: 50.7 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 52.7 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Main Body: 4.0 ft avg

Decks: 128 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 41.7 ft avg

Main Body: 41.7 ft avg

- Charge Weight -

Front Row: 121.5 kg/hole

Main Body: 121.5 kg/hole

Max. per delay: 40.0 kg/delay

SD () Equation: 1.7 kg/delay

Total kg Loaded: 7,391 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.306 kg/te (actual)

Front row: 0.271 kg/te (theoretical)

Main Body: 0.362 kg/te (theoretical)

"KPI" PF: 0.332 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.340 lb/yd³

1.189 lb/yd³

1.586 lb/yd³

1.454 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

64 Addition decks on top of rate code



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-09-30

Blast Number: 19-020
 Orica Order #: 2537318
 Blast Time: 11:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40469	79.88146	0.757555	1.394195
Front Row Corner	43.40444	79.88153	0.757550	1.394196
Back Row Corner	43.40493	79.88140	0.757559	1.394193
Average (Centre of Blast)	43.40469	79.88146	0.757555	1.394195

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	366.2	m		
Post Blast Data:	ppV: 2.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 26.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 111.8	dB	Trigger set at: 115	dB
2450 2nd Line				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1390.6	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
Blind Line and Colling Road (Bruce Trail Entrance)				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	39.3	m		
Post Blast Data:	ppV: 30.4	mm/s	Trigger set at: 2.0	mm/s
	frequency: 20.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 129.9	dB	Trigger set at: 115	dB
Gas Line				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(39.3)^2}{30^2} \text{ kg} \\
 &= \frac{1,544}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

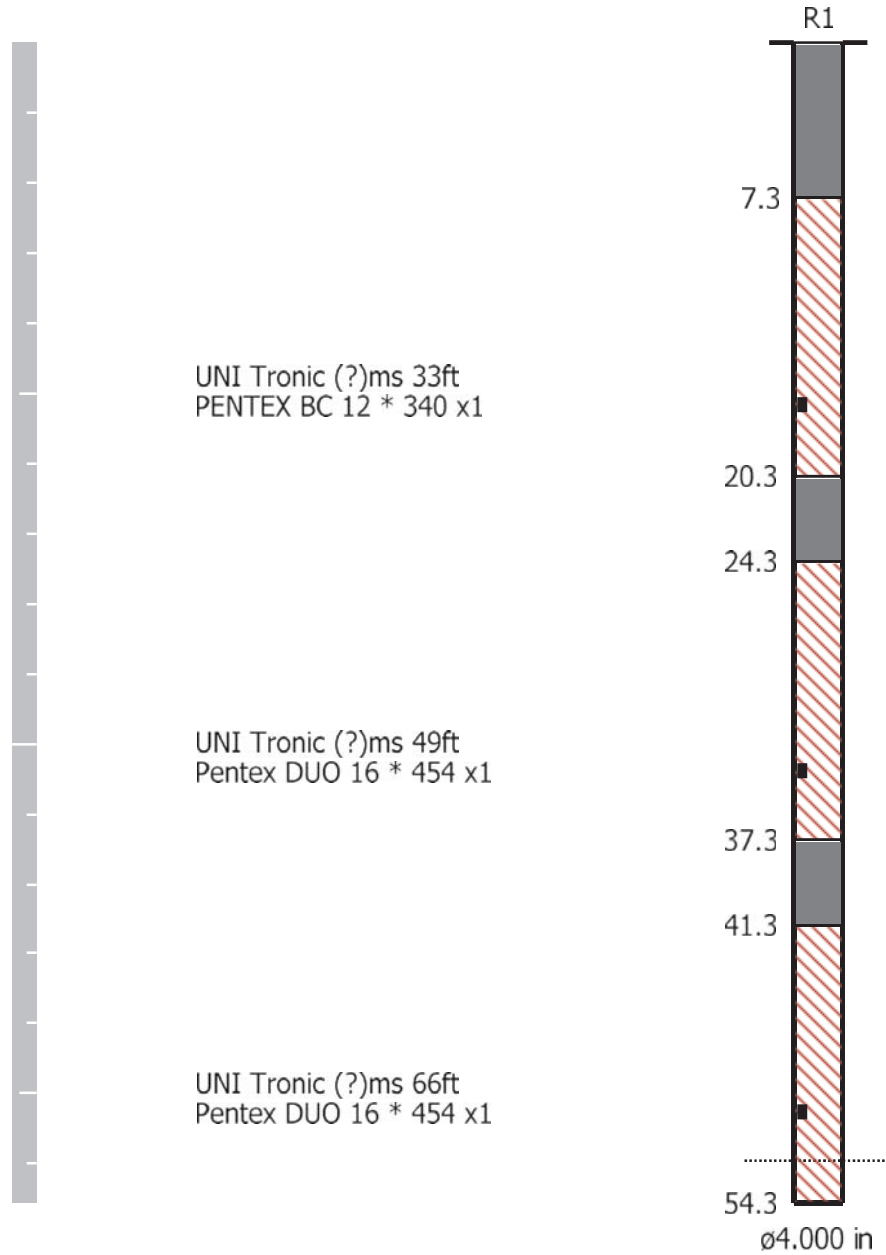
Blast Date: 9/30/2019

Blast Number: 19-020

Orica Order #: 2537318

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 11:56:54 September 30, 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 6.2 Volts
Unit Calibration December 4, 2018 by InstanTel
File Name __TEMP.EVT

Notes

Location: 2450 #2 road, Burlington
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington

Extended Notes

Sand Bagged
 N43.40245 W-79.87814

Microphone Linear Weighting

PSPL 111.8 dB(L) at 0.757 sec

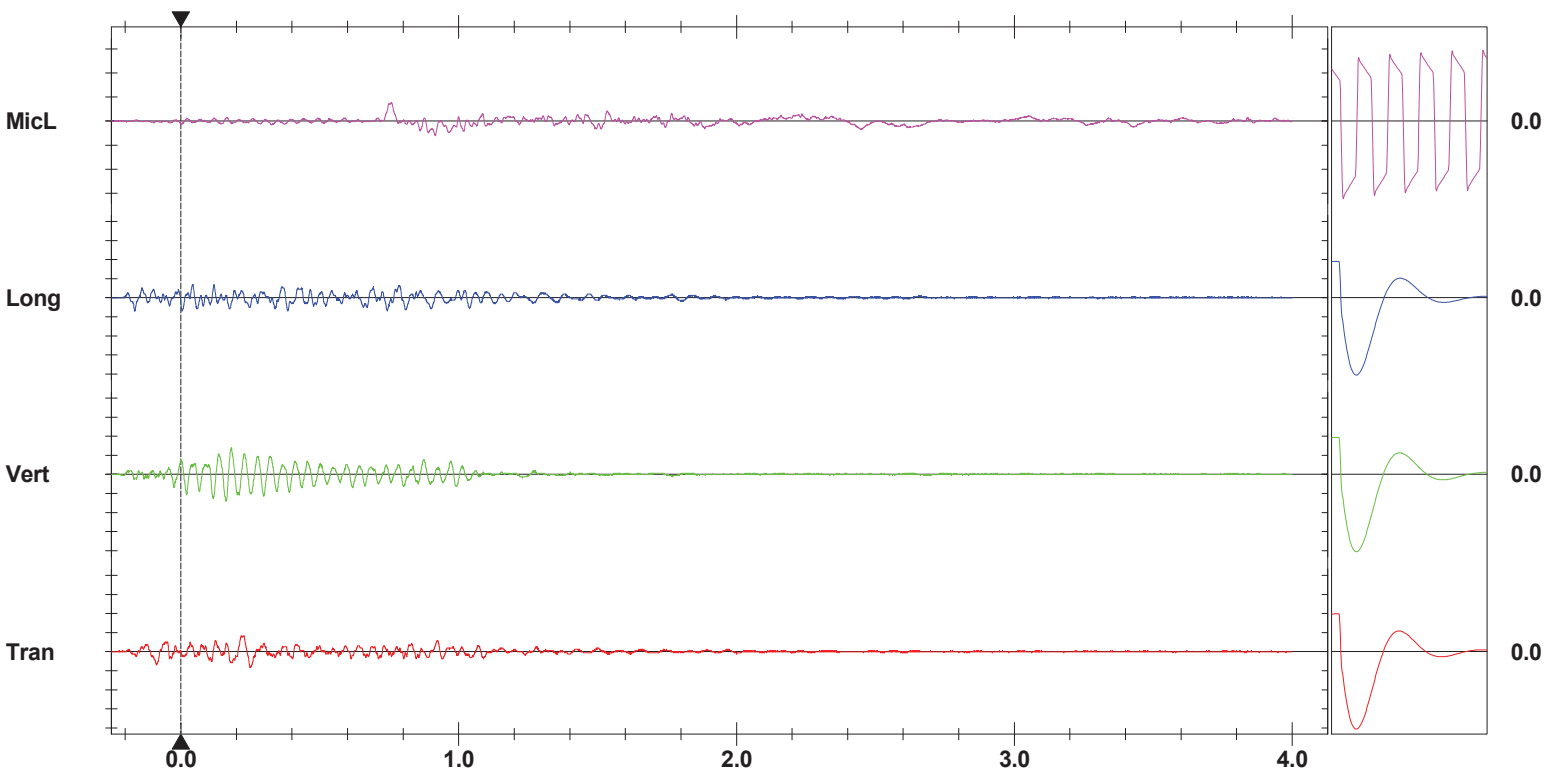
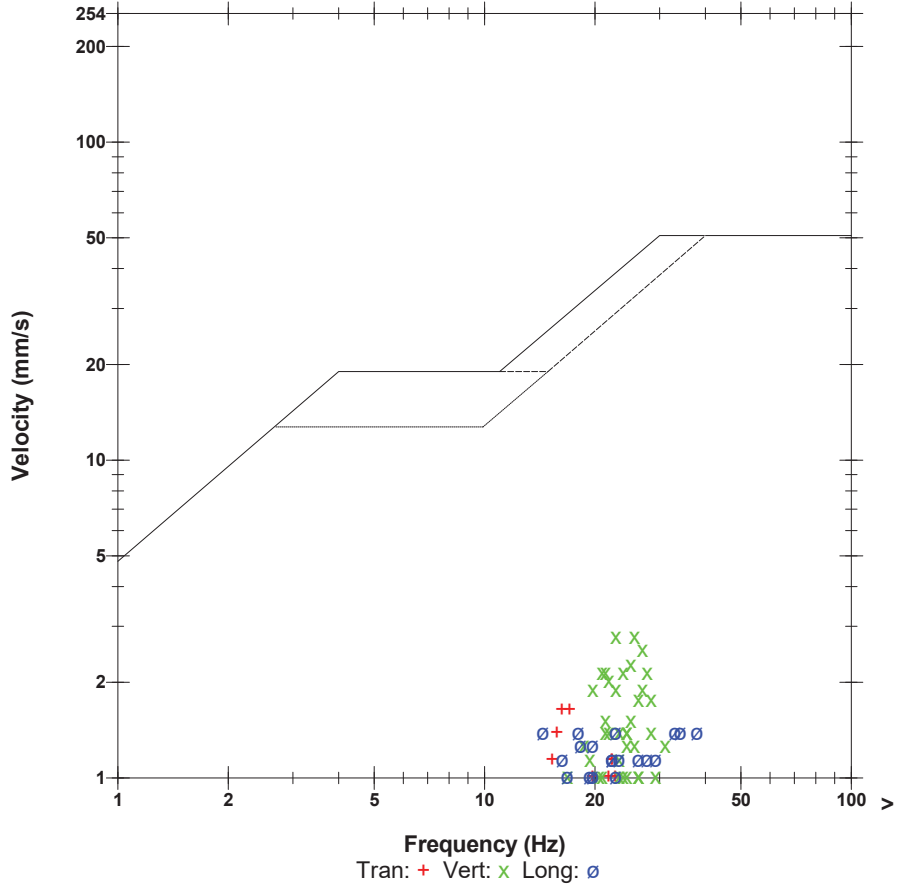
ZC Freq 10.8 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 574 mv)

	Tran	Vert	Long	
PPV	1.651	2.794	1.397	mm/s
ZC Freq	16.3	26	18.0	Hz
Time (Rel. to Trig)	0.216	0.161	-0.167	sec
Peak Acceleration	0.053	0.080	0.053	g
Peak Displacement	0.018	0.019	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.7	4.0	

Peak Vector Sum 3.113 mm/s at 0.181 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

**Blind Line & Colling road
Burlington
Burlington 2019-09-30 Blast 19-020 Middle**

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
-----	-----	SERIAL NUMBER: UM6857
Sep 30 /19 06:17:01		Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
Sep 30 /19 10:16:29	Sep 30 /19 10:16:34	Event recorded. Trigger Level MicL: 115.0 dB
Sep 30 /19 10:16:34	Sep 30 /19 12:25:24	Event recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic: 115.

Date/Time Vert at 11:56:52 September 30, 2019
Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name _TEMP.EVT

Notes

Location: Gas Line
Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

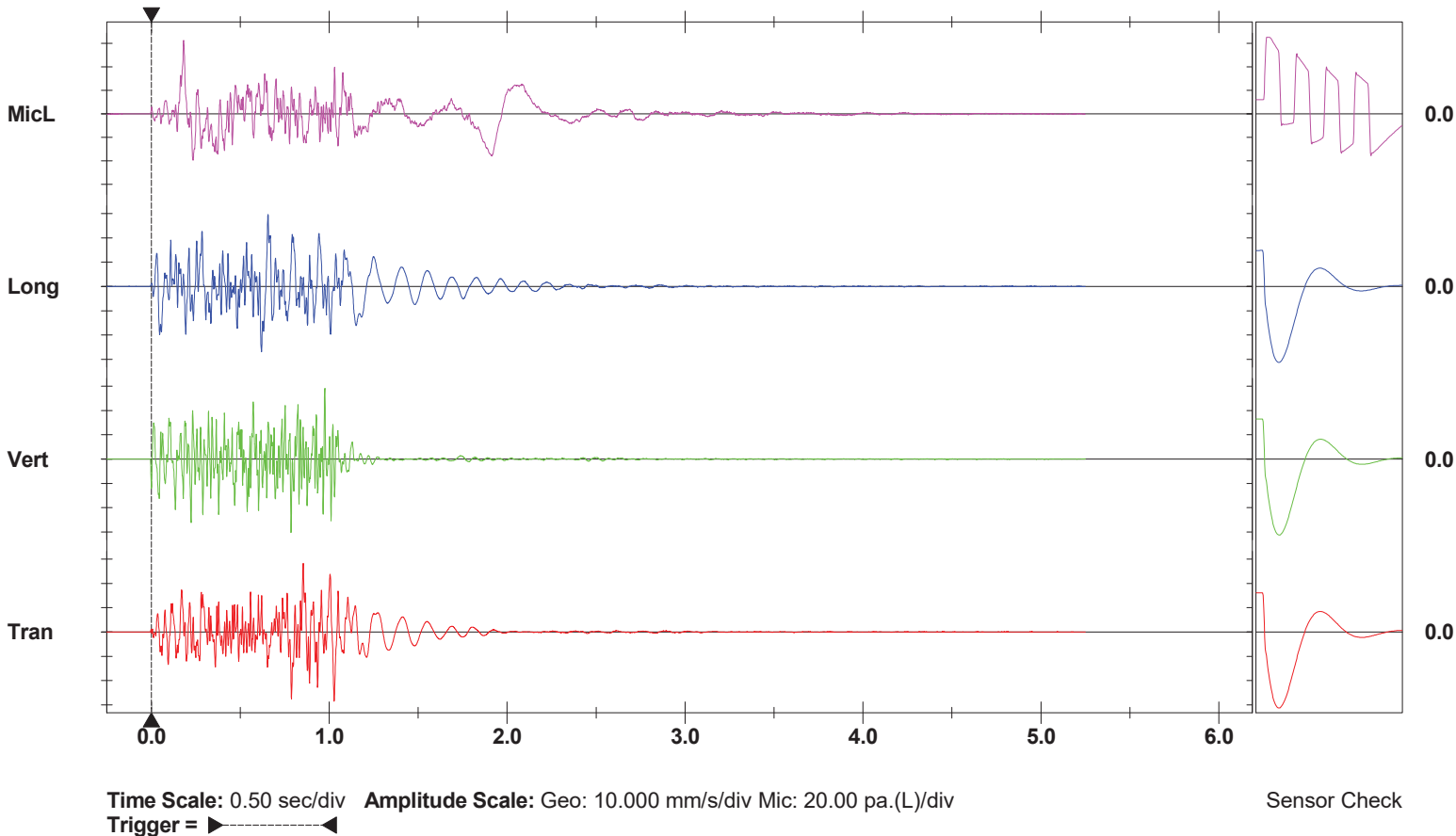
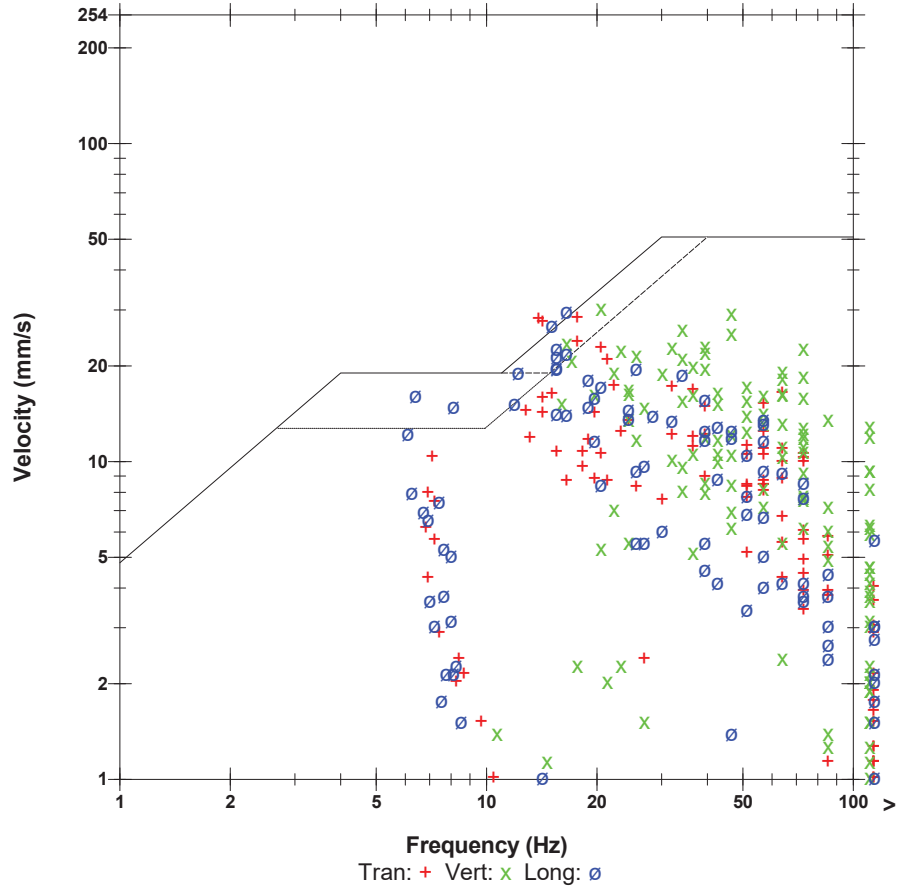
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 129.9 dB(L) at 0.182 sec
ZC Freq 10 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 644 mv)

	Tran	Vert	Long	
PPV	28.57	30.35	29.72	mm/s
ZC Freq	18	20	17	Hz
Time (Rel. to Trig)	1.027	0.785	0.656	sec
Peak Acceleration	0.610	1.418	0.663	g
Peak Displacement	0.246	0.144	0.403	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.3	Hz
Overswing Ratio	3.7	3.9	4.2	

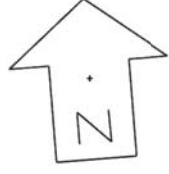
Peak Vector Sum 40.18 mm/s at 0.787 sec

USBM RI8507 And OSMRE



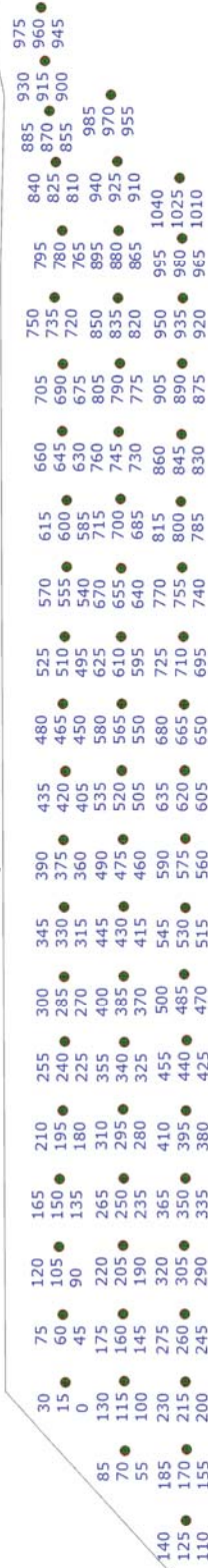
SHOTPLUS Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 73	Hole angle: 0.0°
Total drilled: 4105.8ft			



POSTS

open face



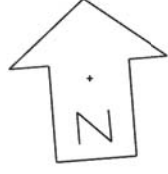
9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Not to scale

SHOTPLUS Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 73	Hole angle: 0.0°
Total drilled: 4105.8ft			

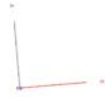


open face

POSTS

- R1 ● 52.3ft ● R2 ● 52.3ft ● R3 ● 52.1ft ● R4 ● 52.1ft ● R5 ● 51.7ft ● R6 ● 51.7ft ● R7 ● 51.6ft ● R8 ● 51.8ft ● R9 ● 51.8ft ● R10 ● 51.8ft ● R11 ● 51.7ft ● R12 ● 52.1ft ● R13 ● 52.2ft ● R14 ● 52.5ft ● R15 ● 52.5ft ● R16 ● 53.2ft ● R17 ● 53.2ft ● R18 ● 53.3ft ● R19 ● 53.5ft ● R20 ● 54.0ft ● R21 ● 54.9ft ● R22 ● 54.7ft
- S1 ● 52.7ft ● S2 ● 52.3ft ● S3 ● 51.9ft ● S4 ● 51.5ft ● S5 ● 51.4ft ● S6 ● 51.7ft ● S7 ● 52.3ft ● S8 ● 52.6ft ● S9 ● 52.3ft ● S10 ● 51.8ft ● S11 ● 51.8ft ● S12 ● 52.0ft ● S13 ● 52.2ft ● S14 ● 52.4ft ● S15 ● 52.5ft ● S16 ● 52.6ft ● S17 ● 53.0ft ● S18 ● 53.6ft ● S19 ● 53.8ft ● S20 ● 55.1ft ● S21 ● 55.1ft
- T1 ● 53.5ft ● T2 ● 52.6ft ● T3 ● 52.2ft ● T4 ● 51.9ft ● T5 ● 51.3ft ● T6 ● 51.7ft ● T7 ● 52.1ft ● T8 ● 52.8ft ● T9 ● 52.6ft ● T10 ● 52.2ft ● T11 ● 51.7ft ● T12 ● 51.6ft ● T13 ● 52.0ft ● T14 ● 52.2ft ● T15 ● 52.3ft ● T16 ● 52.2ft ● T17 ● 52.5ft ● T18 ● 53.3ft ● T19 ● 54.0ft ● T20 ● 53.6ft ● T21 ● 53.3ft

9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV
 DRILLER NAME: _____



Not to scale

SHOTPlus Plan

Blast Summary Data

Stemming: 8.0ft
Hole angle: 0.0°

Subdrill: 2.0ft

Spacing: 10.0ft

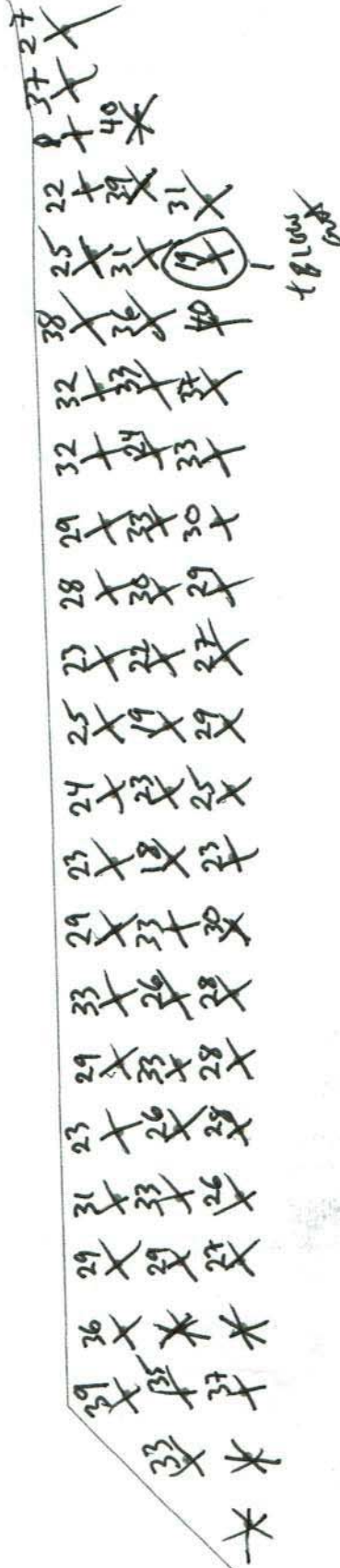
Number of holes: 73

Hole Diameter: 4.0in

Burden: 9.0ft
1st row burden: 12.0ft
Total drilled: 4105.8ft



Load Sheet
3 Decks
40 Kg/ Delay



25



Not to scale

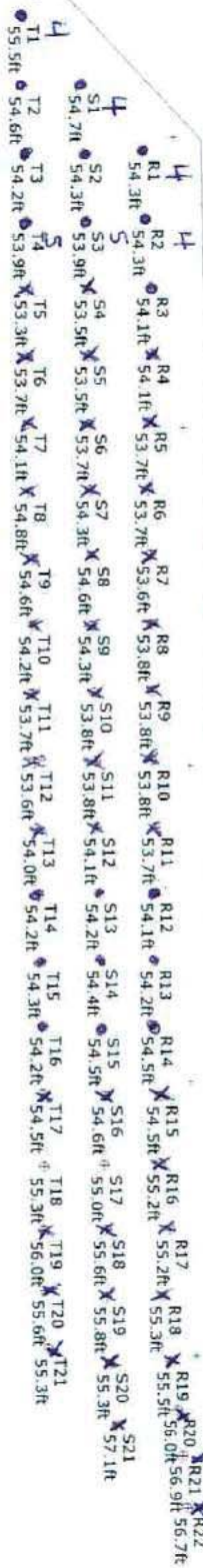
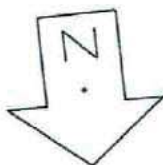
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 8.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 64 Hole angle: 0.0°
 Total drilled: 3489.7ft

open face

POSTS



9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV
 DRILLER NAME: _____

10-543,8



Scale 1:350

SHOTPlus™ Professional 5.7.4.4	9/11/2019
Mine	Burlington
Location	NORTH CLOSED END
Title/author	9MID020 Design Fnl
Filename	



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-10-15

Blast Number: 19-021

Orica Order #: 2543361

Blast Time: 11:55 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40362 °N Latitude 79.88148 °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: 30,000 ft

- Drilling Information -

Angle from Vertical Nominal Bit Diameter:
Primary Bit diam: 101.6 mm 0° # Holes: 56 = 3,832.6 ft (4 " diam)
Secondary Bit diam: 92.1 mm 0° # Holes: 3 = 205.3 ft (3 5/8 " diam)
Tertiary Bit diam: mm 0° # Holes: = 0.0 ft (" diam)

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,740	24,140	9,600

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	1	25

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	56	19.0
PENTEX DUO (OR EQUIVALENT)	0.45	54	24.5

total explosives weight in Blast (kg): 9,669

Pkgd Prod (25 kg) % of Total kg: 0.3%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 15M			54
UNITRONIC 600 25M			54
EXEL MS 25m			54
UNITRONIC 600 6M			2

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	6.5
HELPER HOURS	Enter total Helper man-hours	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 26,561 te 10,216 m³
Total tonnes per day: 26,561 te NB60-17 Rate Code
Total Holes Loaded: 53 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: 10.0 ft avg
Holes: 22 front row

- Pattern (Main Body) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 31 main body

Bench Height: 66.4 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 68.4 ft avg

- Stone Decking -

Front Row: 8.0 ft avg

Main Body: 0.0 ft avg

Decks: 2 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Main Body: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 53.4 ft avg

Main Body: 61.4 ft avg

- Charge Weight -

Front Row: 155.8 kg/hole

Main Body: 179.2 kg/hole

Max. per delay: 107.0 kg/delay

SD () Equation: 16.7 kg/delay

Total kg Loaded: 9,669 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.364 kg/te (actual)

Front row: 0.265 kg/te (theoretical)

Main Body: 0.407 kg/te (theoretical)

"KPI" PF: 0.360 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.595 lb/yd³
1.163 lb/yd³
1.783 lb/yd³
1.577 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Nick Heap and I decided it was best to cut 6 holes off to the south due to a hole that was 20' short in depth.

Package was use to load through lean burden



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-10-15

Blast Number: 19-021
 Orica Order #: 2543361
 Blast Time: 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40365	79.88148	0.757537	1.394195
Front Row Corner	43.40332	79.88155	0.757531	1.394196
Back Row Corner	43.40390	79.88141	0.757541	1.394194
Average (Centre of Blast)	43.40362	79.88148	0.757536	1.394195

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	300.1	m		
Post Blast Data:	ppV: 6.0	mm/s	Trigger set at: 2.0	mm/s
	frequency: 14.6	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 112.8	dB	Trigger set at: 115	dB

2450 2nd Line

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.39339	79.88880	0.757358	1.394323
2nd Reading				
Average	43.39339	79.88880	0.757358	1.394323
Distance (2nd Seis. From Centre of Blast)	1283.8	m		
Post Blast Data:	ppV: 0.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 9.1	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 117.0	dB	Trigger set at: 115	dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	122.6	m		
Post Blast Data:	ppV: 18.8	mm/s	Trigger set at: 2.0	mm/s
	frequency: 15.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 129.7	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(122.6)^2}{30^2} \text{ kg} \\
 &= \frac{15,031}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

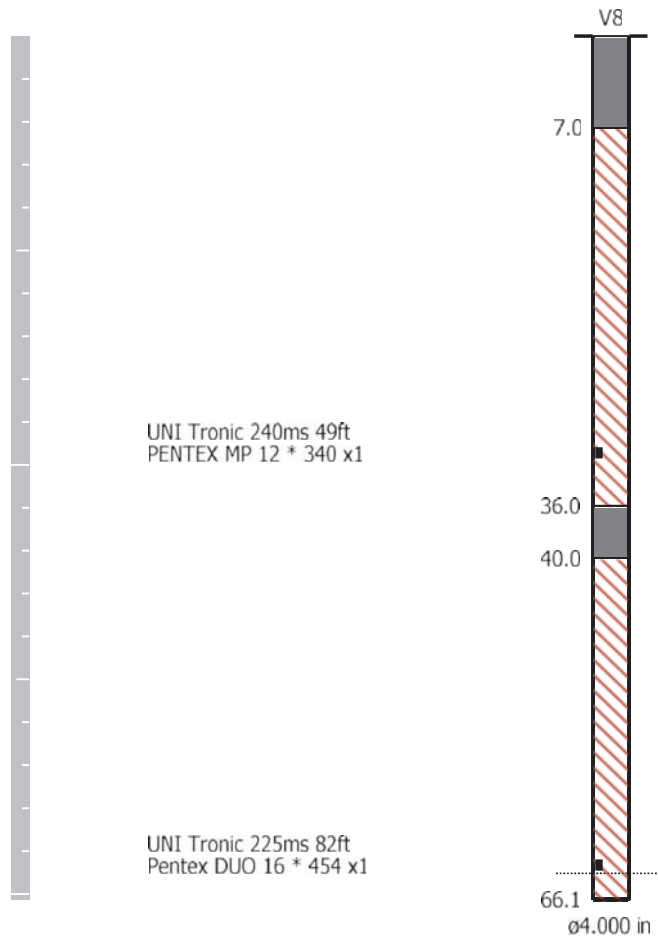
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 10/15/2019

Blast Number: 19-021
Orica Order #: 2543361

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 11:55:04 October 15, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.25 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: 2450 #2 road, Burlington
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Burlington, On

Extended Notes

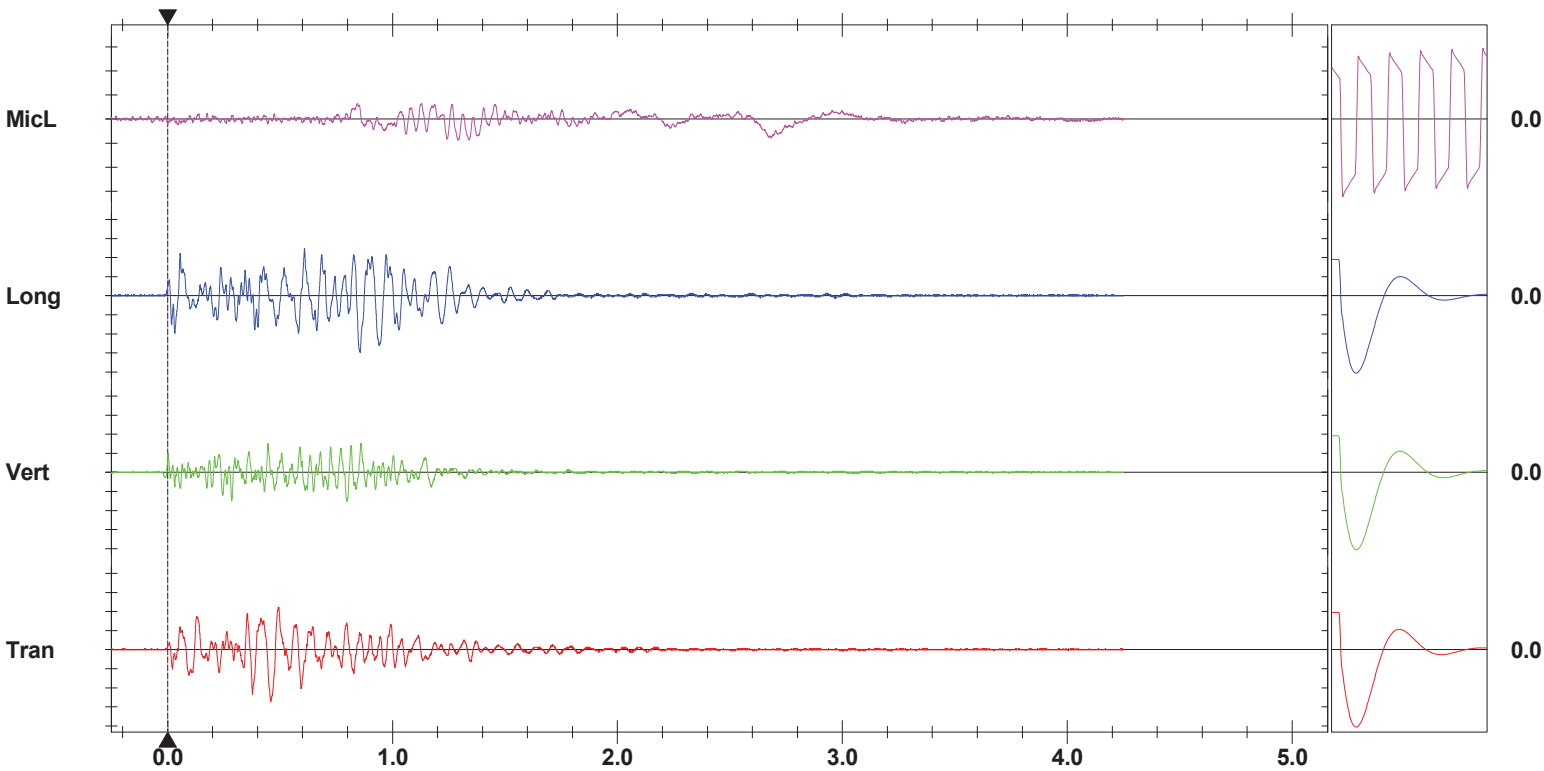
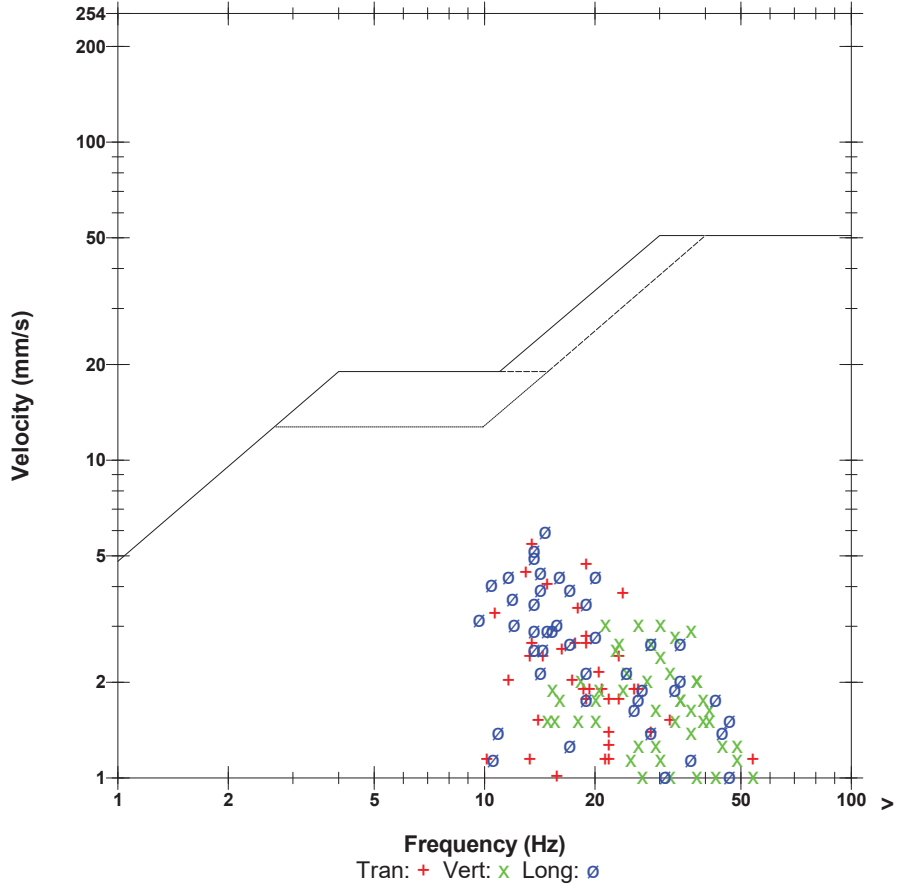
Sand Bagged
 43.40245 -79.87814

Microphone Linear Weighting
PSPL 112.8 dB(L) at 1.290 sec
ZC Freq 15.3 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 627 mv)

	Tran	Vert	Long	
PPV	5.461	3.048	5.969	mm/s
ZC Freq	13.5	30	14.6	Hz
Time (Rel. to Trig)	0.458	0.446	0.855	sec
Peak Acceleration	0.080	0.080	0.106	g
Peak Displacement	0.064	0.019	0.065	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.2	Hz
Overswing Ratio	3.9	3.7	4.1	

Peak Vector Sum 6.571 mm/s at 0.856 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 MicL at 11:55:03 October 15, 2019
Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.054 sec (Auto=5Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.6 Volts
Unit Calibration January 15, 2019 by InstanTEL
File Name UM6857_20191015115503.IDFW

Notes

Location: COLLING RD & BLINDLINE
 Client: NELSON AGGREGATES
 User Name: ORICA CANADA
 General:

Extended Notes

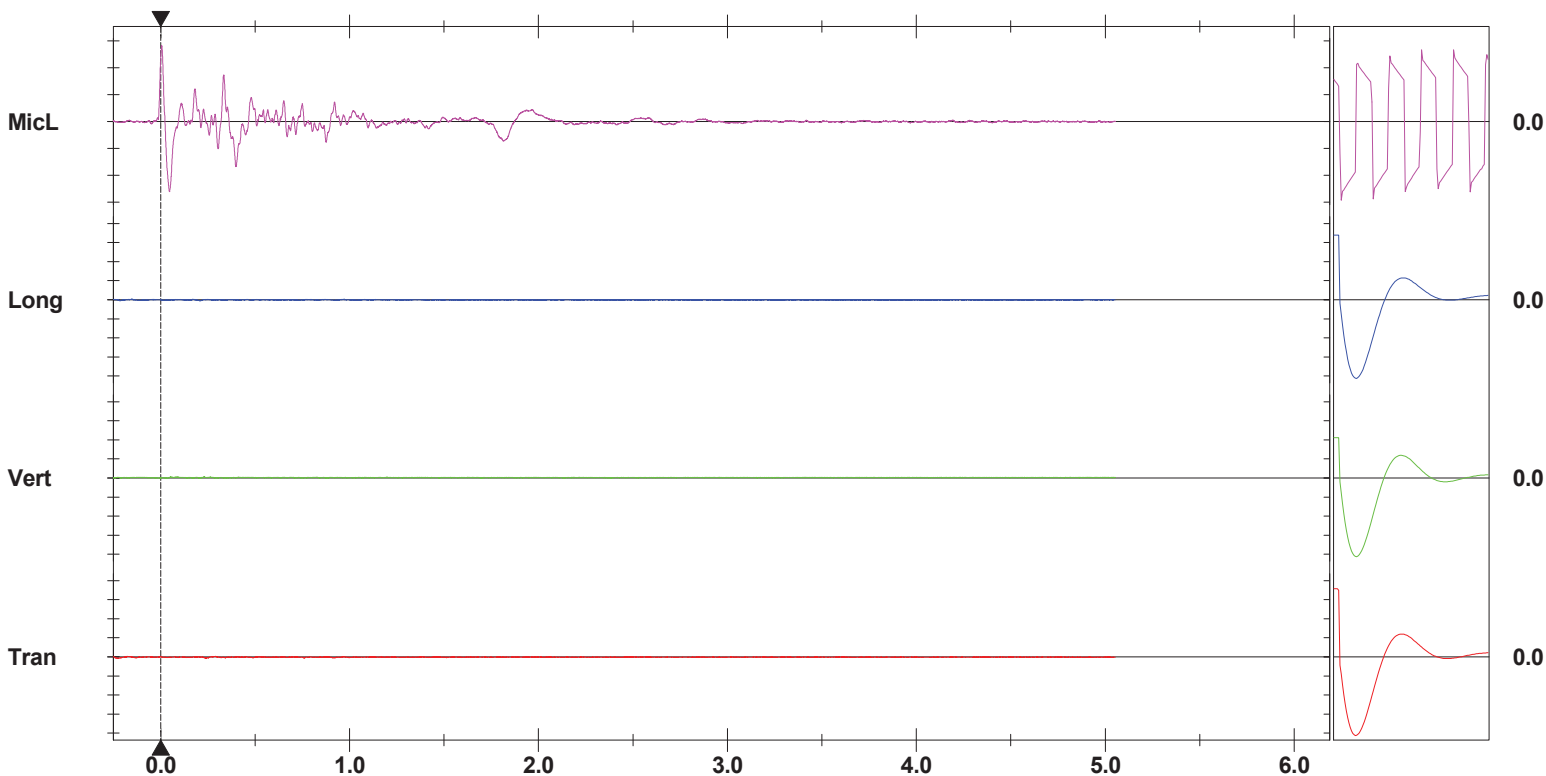
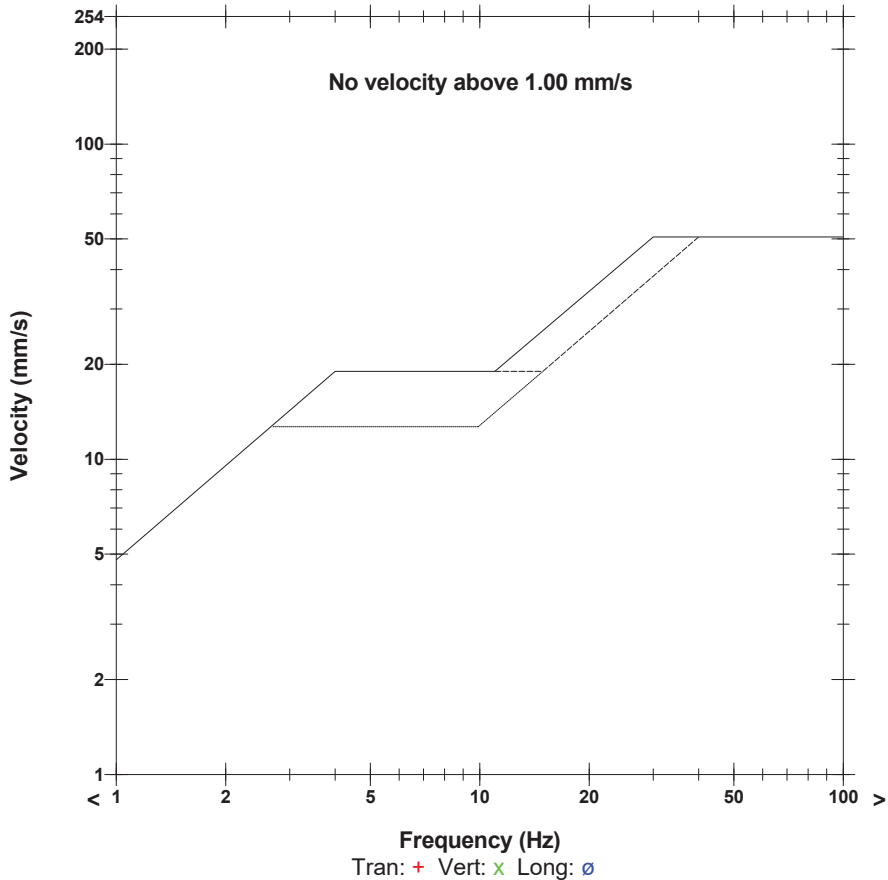
N 43.31617
 W 80.02664

Microphone Linear Weighting
PSPL 117.0 dB(L) at 0.006 sec
ZC Freq 10.0 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1474 mv)

	Tran	Vert	Long	
PPV	0.166	0.110	0.102	mm/s
ZC Freq	9.1	4.0	13.7	Hz
Time (Rel. to Trig)	-0.229	0.056	0.206	sec
Peak Acceleration	0.008	0.010	0.012	g
Peak Displacement	0.005	0.013	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.6	

Peak Vector Sum 0.177 mm/s at -0.229 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

Date/Time Tran at 11:52:41 October 15, 2019
Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name _TEMP.EVT

Notes

Location: Gas Line
 Client: Nelson Aggregates
 User Name: Orica Canada
 General: 43.40466,-79.88098

Extended Notes

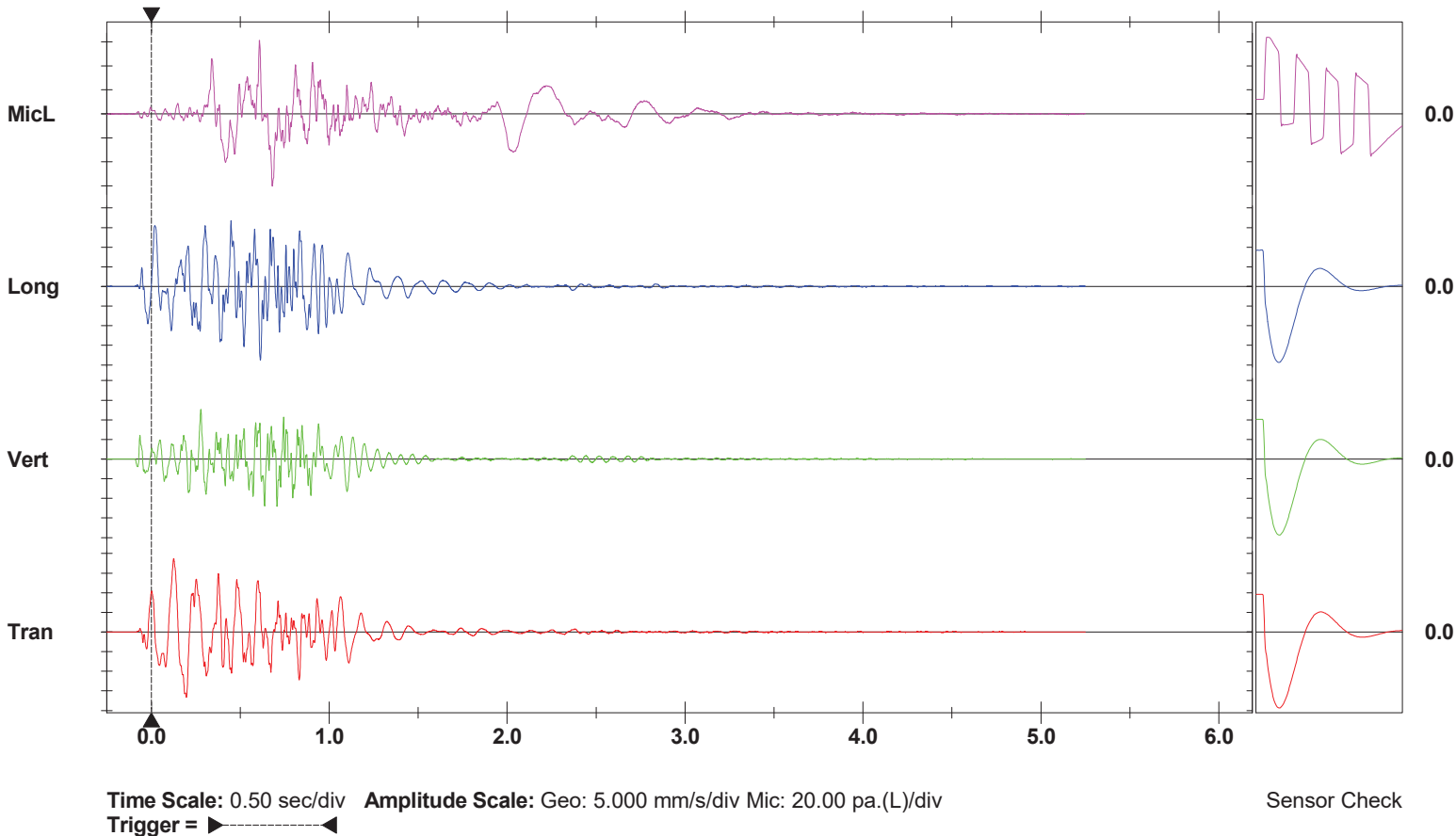
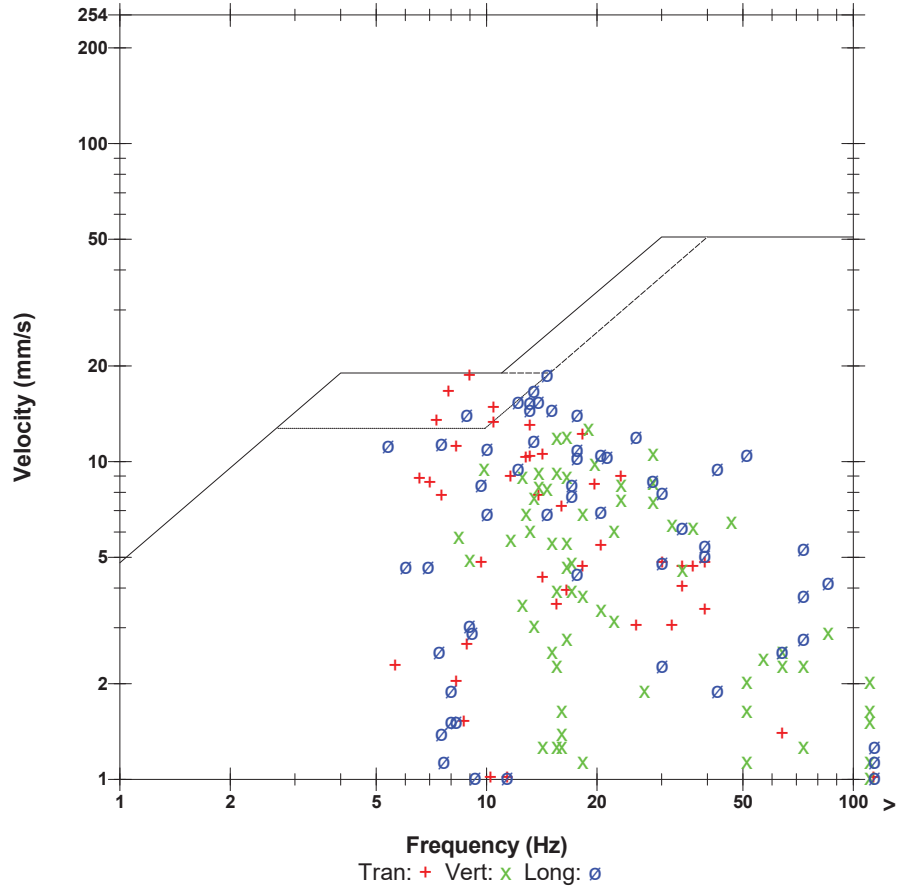
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 129.7 dB(L) at 0.607 sec
ZC Freq 16 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 627 mv)

	Tran	Vert	Long	
PPV	18.67	12.70	18.80	mm/s
ZC Freq	9.0	19	15	Hz
Time (Rel. to Trig)	0.125	0.278	0.613	sec
Peak Acceleration	0.199	0.318	0.318	g
Peak Displacement	0.323	0.112	0.234	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.4	Hz
Overswing Ratio	3.8	3.9	4.2	

Peak Vector Sum 22.37 mm/s at 0.610 sec

USBM RI8507 And OSMRE

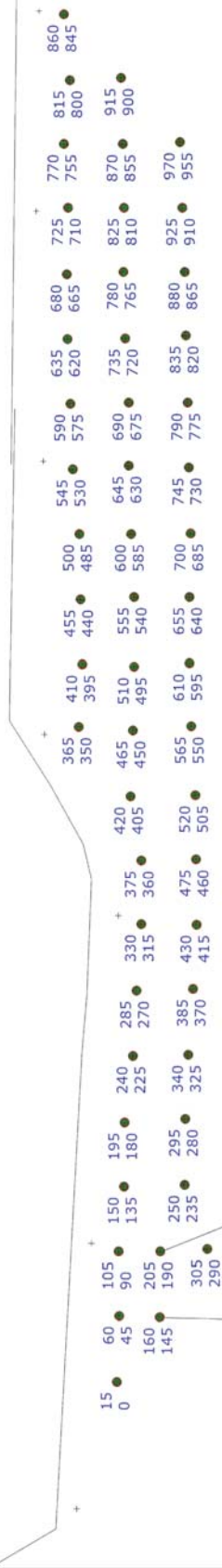


SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 53 Hole angle: 0.0°
 Total drilled: 3634.7ft

open face



W2 W3 W4 3.625" DIA

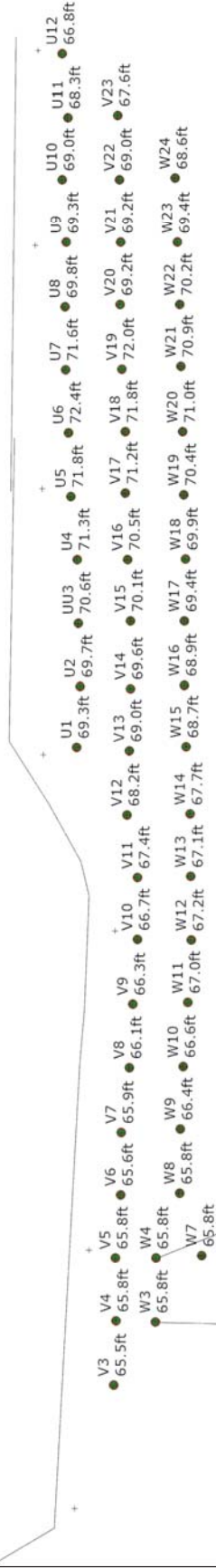


Not to scale

SHOTPlus Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 53	Hole angle: 0.0°
Total drilled: 3634.7ft			

open face
 Load Sheet
 100 Kg Max
 95Kg Bottom Deck



W2 W3 W4 3.625" DIA



Not to scale

SHOTPLUS Plan

Blast Summary Data

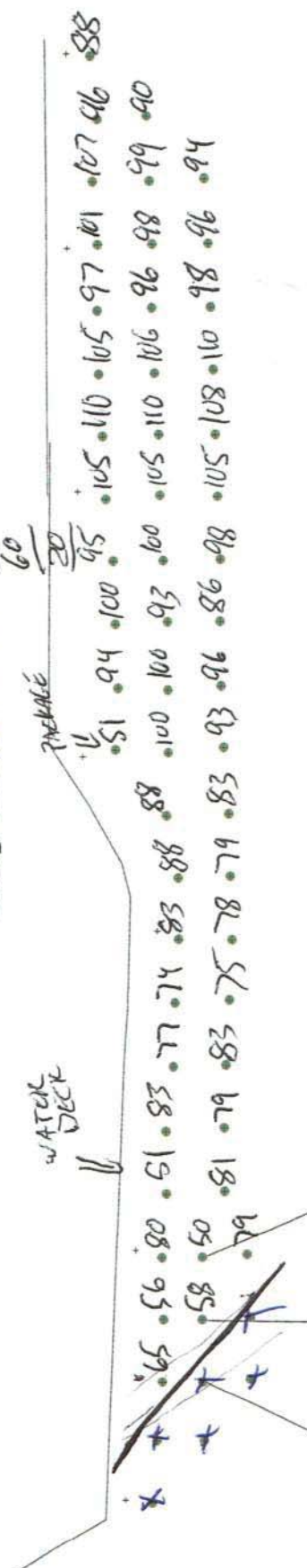
Burden: 9.0ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Number of holes: 59
 Stemming: 7.0ft
 Hole angle: 0.0°
 1st row burden: 12.0ft
 Subdrill: 2.0ft
 95Kg Bottom Deck
 Total drilled: 4029.6ft

open face

Load Sheet

100 Kg Max

95Kg Bottom Deck



W2 W3 W4 3.625" DIA



Not to scale

SHOTPlus 5 Plan

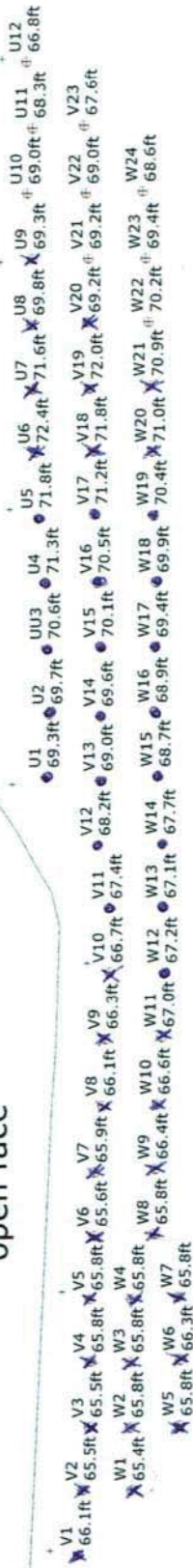
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 59 Hole angle: 0.0°
 Total drilled: 4029.6ft

APPROX 12300 KGS WITH NO DECKS

POSTS

open face



W2 W3 W4 3.625" DIA

9MID021 Design Fnl - 3.625 and 4" Blast Holes 12x10 9x10 271 and 250 + .6 SUB ELEV

DRILL TO DEPTH OR SHALE + 2 FEET



Scale 1:350

SHOTPlus™ Professional 5.7.4.4	9/25/2019
Mine	Burlington
Location	SOUTH WALL TO MID NEXT TO OLD WHL WS
Title/author	9MID021 Design Partial Fnl
Filename	9MID021 Design Partial Fnl.spf



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-10-23

Blast Number: 19-022
Orica Order #: 2547256
Blast Time: 11:59 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Middle (Bench / Face)
GPS Coordinates: 43.40443 °N Latitude 79.88139 °W Longitude
Centre of Blast Centre of Blast

Wind from the: W at 15 kph Temperature: 11 to 15 °C

Clear: Partly Cloudy: X
Rain: Snow: Inversion: Ceiling: 30,000 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 64 = 3,527.0 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	33,760	24,820	8,940

Packaged Explosives:	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	0	50

Boosters:	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	66	22.4
PENTEX DUO (OR EQUIVALENT)	0.45	64	29.1

total explosives weight in Blast (kg): 9,041
Pkgd Prod (50 kg) % of Total kg: 0.6%

Detonators:	case #'s	ms	# used
UNITRONIC 600 6M			1
UNITRONIC 600 15M			64
UNITRONIC 600 20M			36
UNITRONIC 600 25M			29
EXEL MS 18m		25 ms	36
EXEL MS 25m		25 ms	28

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: 26,393 te 10,151 m³
Total tonnes per day: 26,393 te NB60-17 Rate Code
Total Holes Loaded: 64 holes
... including: 0 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 2 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 33 front row

- Pattern (Back Row) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 31 back row

Bench Height: 53.1 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 55.1 ft avg

- Stone Decking -

Front Row: 4.0 ft avg
Back Row: ft avg
Decks: 64 per blast

- Collar Stemming -

Front Row: 7.0 ft avg
Back Row: 7.0 ft avg
Material used: 3/4" Clear

- Charge Length -

Front Row: 44.1 ft avg
Back Row: 48.1 ft avg

- Charge Weight -

Front Row: 128.6 kg/hole
Back Row: 140.3 kg/hole
Max. per delay: 85.0 kg/delay
SD () Equation: 2.0 kg/delay
Total kg Loaded: 9,041 kg
Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.343 kg/te (actual)
Front row: 0.274 kg/te (theoretical)
Main Body: 0.399 kg/te (theoretical)
"KPI" PF: 0.336 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

NOTES (ANY VARIATION FROM STANDARD):

Drilled to dept od shale + 2'
2 Cases of package were used for X1 due to lean burden from 30' to collar



Blast Report

Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 2019-10-23

Blast Number: 19-022
 Orica Order #: 2547256
 Blast Time: 11:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40443	79.88138	0.757550	1.394193
Front Row Corner	43.40401	79.88147	0.757543	1.394195
Back Row Corner	43.40485	79.88133	0.757557	1.394192
Average (Centre of Blast)	43.40443	79.88139	0.757550	1.394193

1st

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	343.1	m		
Post Blast Data:	ppV: Memory	mm/s	Trigger set at: 2.0	mm/s
	frequency: was full	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: from high wind	dB	Trigger set at: 115	dB

2450 #2 Sideroad, Burlington, On

2nd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40614	79.87455	0.757580	1.394074
2nd Reading				
Average	43.40614	79.87455	0.757580	1.394074
Distance (2nd Seis. From Centre of Blast)	585.1	m		
Post Blast Data:	ppV: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 43.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 104.6	dB	Trigger set at: 115	dB

2582 #2 Sideroad, Burlington, On

3rd

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	42.2	m		
Post Blast Data:	ppV: Memory	mm/s	Trigger set at: 2.0	mm/s
	frequency: was full	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: from high wind	dB	Trigger set at: 115	dB

Gas Line

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(42.2)^2}{30^2} \text{ kg} \\
 &= \frac{1,781}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
 Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
 Blast Report is Complete & Accurate.



Blast Design

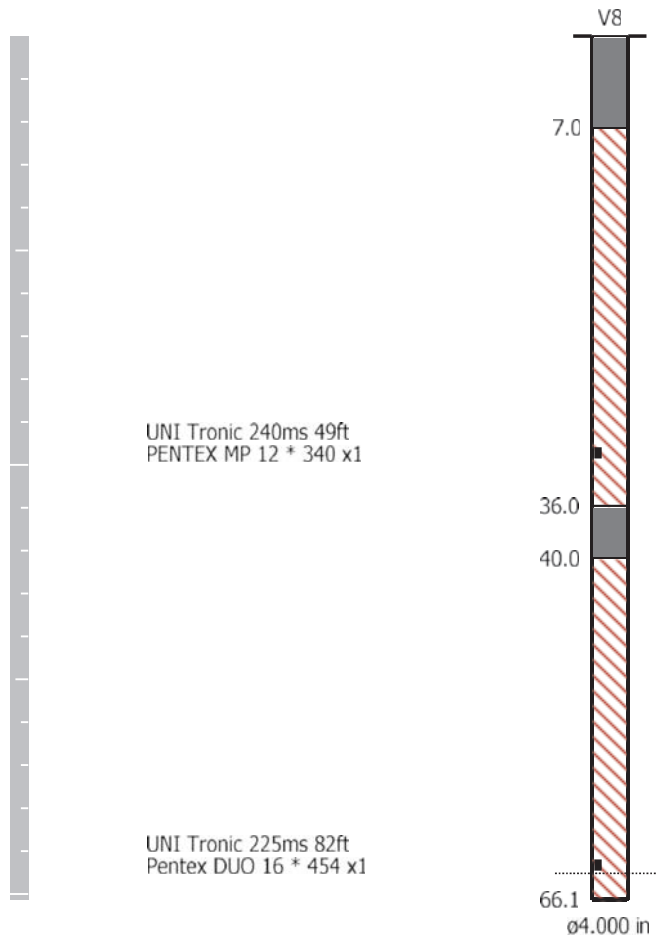
Nelson Aggregate

Quarry: Burlington
 P.O. #:
 Blast Date: 10/23/2019

Blast Number: 19-022
 Orica Order #: 2547256

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Long at 11:59:19 October 23, 2019
Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 4.875 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington 2582.mmb

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20191023115919.IDFW

Notes

Location: 2582 #2 Sideroad, Mount Nemo, On
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Monitoring Vibration and Airblast

Extended Notes

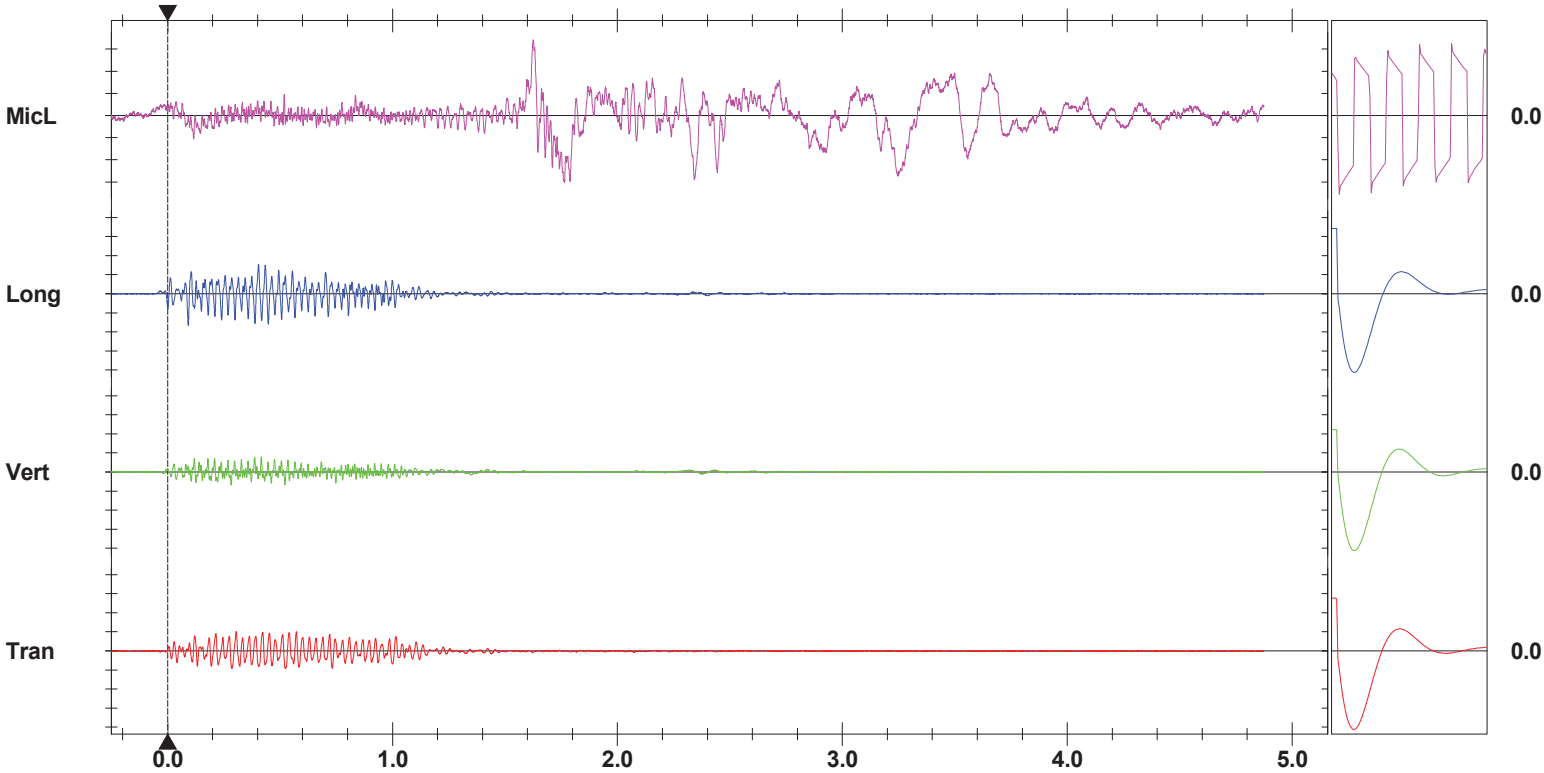
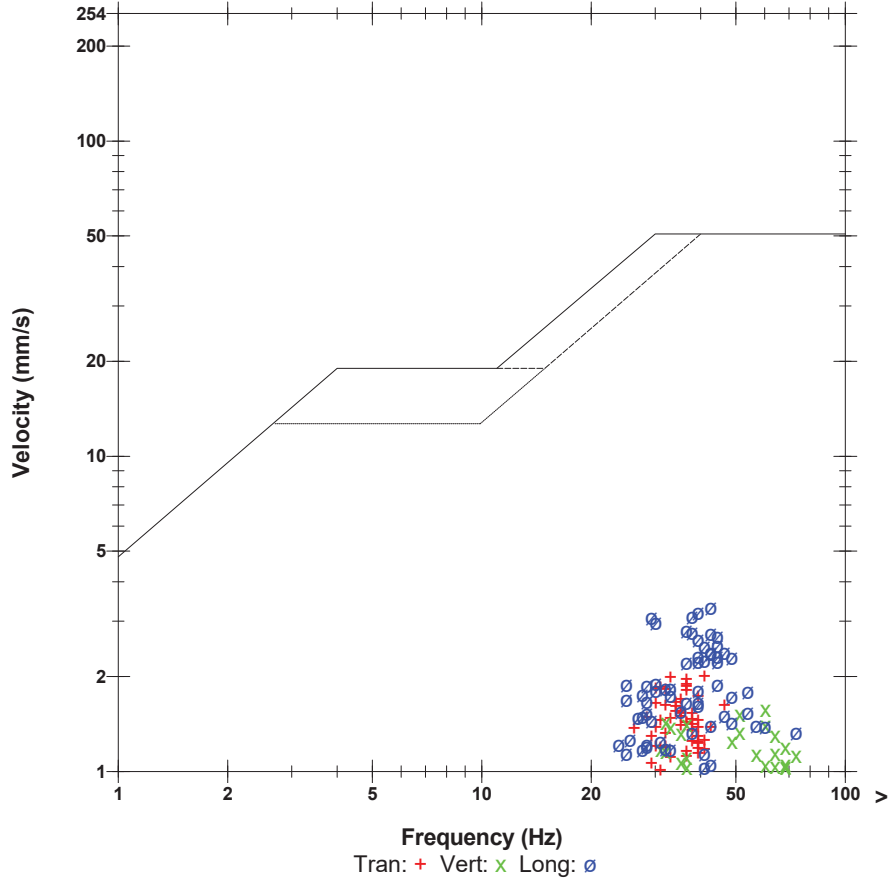
Sand Bagged
 N43.40614,W-79.87455

Microphone Linear Weighting
PSPL 104.6 dB(L) at 1.625 sec
ZC Freq 5.9 Hz
Channel Test Passed (Freq = 19.7 Hz Amp = 1484 mv)

	Tran	Vert	Long	
PPV	2.018	1.576	3.334	mm/s
ZC Freq	41	60	43	Hz
Time (Rel. to Trig)	0.572	0.417	0.091	sec
Peak Acceleration	0.064	0.077	0.145	g
Peak Displacement	0.011	0.005	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.4	3.6	

Peak Vector Sum 3.595 mm/s at 0.388 sec

USBM RI8507 And OSMRE

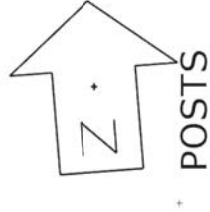


Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div
Trigger =

Sensor Check

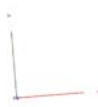
SHOTPLUS Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 63	Hole angle: 0.0°
Total drilled: 3628.0ft			



open face

- X1 64.3ft
- X2 63.9ft
- X3 64.1ft
- X4 64.2ft
- X5 64.1ft
- X6 63.3ft
- X7 61.9ft
- X8 60.8ft
- X9 59.6ft
- X10 58.6ft
- X11 57.3ft
- X12 57.0ft
- X13 56.4ft
- X14 55.3ft
- X15 54.6ft
- X16 54.0ft
- X17 53.6ft
- X18 53.2ft
- X19 53.3ft
- X20 53.9ft
- X21 54.6ft
- X22 55.6ft
- X23 54.8ft
- X24 54.2ft
- X25 54.1ft
- X26 54.7ft
- X27 55.1ft
- X28 55.2ft
- X29 55.7ft
- X30 56.4ft
- X31 56.4ft
- Y1 64.7ft
- Y2 63.8ft
- Y3 63.7ft
- Y4 64.0ft
- Y5 64.1ft
- Y6 63.2ft
- Y7 61.9ft
- Y8 60.7ft
- Y9 59.5ft
- Y10 59.0ft
- Y11 57.9ft
- Y12 57.2ft
- Y13 56.2ft
- Y14 55.5ft
- Y15 54.8ft
- Y16 54.1ft
- Y17 53.7ft
- Y18 53.5ft
- Y19 53.4ft
- Y20 53.9ft
- Y21 54.8ft
- Y22 56.1ft
- Y23 54.8ft
- Y24 54.4ft
- Y25 55.4ft
- Y26 55.5ft
- Y27 55.4ft
- Y28 55.4ft
- Y29 55.7ft
- Y30 56.5ft
- Y31 56.2ft
- Y32 56.2ft



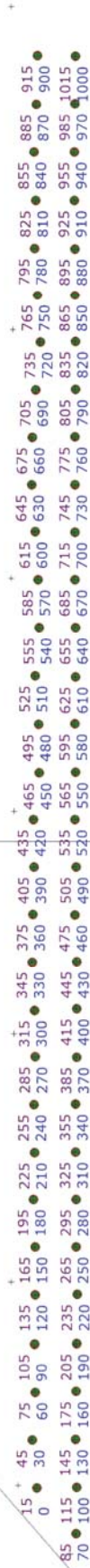
Not to scale

SHOTPLUS Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Stemming: 7.0ft	
1st row burden: 12.0ft	Hole Diameter: 4.0in	Hole angle: 0.0°	
Total drilled: 3628.0ft	Subdrill: 2.0ft	Number of holes: 63	



open face



Not to scale

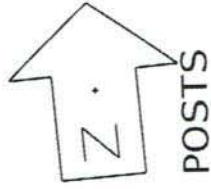
SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 63 Hole angle: 0.0°
 Total drilled: 3628.0ft

Load Sheet
 85 Kg / Top Deck
 75 Kg / Bottom Deck

open face



85 85 82 73 75 64 76 45 58 56 61 75 51 47 64 48 52 53 59 57 69 55 75 70 62 53 67 59 53 57
 85 83 83 75 67 66 63 62 75 68 52 38 36 43 48 41 35 40 51 61 61 18 46 54 69 51 56 50 53 60
 46 54 69 51 56 50 53 60



Not to scale

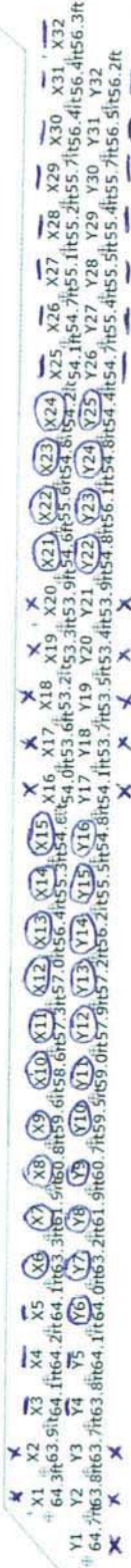
SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Stemming: 7.0ft
 1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 64 Hole angle: 0.0°
 Total drilled: 3684.3ft



open face



9MID022 Design Fnl - 4" Blast Hole 12x10 9x10 268 266.5 and 250 + .6 SUB ELEV
 DRILLER NAME:



Scale 1:500

SHOTPlus™ Professional 5.7.4.4		10/1/2019
Mine	Burlington	
Location	MID TO NORTH WALL DESIGN	
Title/author	9MID022 Design Fnl	
Filename		



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #:

Blast Date: 2019-10-31

Blast Number: 19-023

Orica Order #: 2550103

Blast Time: 10:56 AM

page 1

Blaster-in-charge: Mike Derkinderen (Print Name)

Blast Location: Upper Middle (Bench / Face)

GPS Coordinates: 43.40370 °N Latitude 79.88137 °W Longitude
Centre of Blast Centre of Blast

Wind from the: E at 5 kph Temperature: 6 to 10 °C

Clear: Rain: Overcast: X
Partly Cloudy: Snow: Inversion: Ceiling: 18,000 ft

- Drilling Information -

Primary Bit diam: 101.6 mm Angle from Vertical: 0° # Holes: 41 = 2,753.0 ft (4 " diam)
Secondary Bit diam: mm # Holes: = 0.0 ft (" diam)
Tertiary Bit diam: mm # Holes: = 0.0 ft (" diam)
Nominal Bit Diameter:

Bulk Explosives:

	in (kg)	out (kg)	kg
CENTRA GOLD 70	33,440	25,960	7,480

Packaged Explosives:

	cs shipped	cs returned	kg
FORTEL PRO 75X400	2	0	50

Boosters:

	kg / unit	# used	kg
PENTEX 12 (OR EQUIVALENT)	0.34	41	13.9
PENTEX DUO (OR EQUIVALENT)	0.45	41	18.6

total explosives weight in Blast (kg): 7,563

Pkgd Prod (50 kg) % of Total kg: 0.7%

Detonators:

	case #'s	ms	# used
UNITRONIC 600 15M			41
UNITRONIC 600 25M			82

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	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	0.0
BORETRACK	Enter hours	0.0

Tonnes Blasted: 19,709 te 7,580 m³
Total tonnes per day: 19,709 te NB60-18 Rate Code
Total Holes Loaded: 41 holes
... including: 2 Dead Holes
... and: 0 Helper Holes
Helper Hole Collar: 0.0 ft avg
Rows Blasted: 2 rows

- Pattern (Front Row) -

Burden: 12.0 ft avg
Spacing: 10.0 ft avg
Holes: 21 front row

- Pattern (Back Row) -

Burden: 9.0 ft avg
Spacing: 10.0 ft avg
Holes: 20 back row

Bench Height: 65.1 ft avg

Sub-drill: 2.0 ft avg

Hole Depth: 67.1 ft avg

- Stone Decking -

Front Row: 4.0 ft avg

Back Row: ft avg

Decks: 41 per blast

- Collar Stemming -

Front Row: 7.0 ft avg

Back Row: 7.0 ft avg

Material used: 3/4" Clear

- Charge Length -

Front Row: 56.1 ft avg

Back Row: 60.1 ft avg

- Charge Weight -

Front Row: 163.7 kg/hole

Back Row: 175.4 kg/hole

Max. per delay: kg/delay

SD () Equation: 13.9 kg/delay

Total kg Loaded: 7,563 kg

Rock Density: 2.60 g/cc = te/m³

- Powder Factor -

Yield PF: 0.384 kg/te (actual)

Front row: 0.284 kg/te (theoretical)

Main Body: 0.406 kg/te (theoretical)

"KPI" PF: 0.345 kg/te (theoretical)

Theoretical PF (Based on a single hole)

Yield Powder Factor (kg Loaded / te Blastec

1.682 lb/yd³

1.247 lb/yd³

1.781 lb/yd³

1.514 lb/yd³

NOTES (ANY VARIATION FROM STANDARD):

Unitronics were used instead of 25ms Excel MS in bottom deck due to an error on Orica.



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-10-31

Blast Number: 19-023
Orica Order #: 2550103
Blast Time: 10:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
Mid Blast	43.40370	79.88136	0.757537	1.394193
Front Row Corner	43.40345	79.88143	0.757533	1.394194
Back Row Corner	43.40395	79.88133	0.757542	1.394192
Average (Centre of Blast)	43.40370	79.88137	0.757537	1.394193

1st Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40245	79.87814	0.757516	1.394137
2nd Reading				
Average	43.40245	79.87814	0.757516	1.394137
Distance (1st Seis. From Centre of Blast)	296.0	m		
Post Blast Data:	ppV: 8.6	mm/s	Trigger set at: 2.0	mm/s
	frequency: 20.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 115.7	dB	Trigger set at: 115	dB
2450 #2 Sideroad, Burlington, On				

2nd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40614	79.87455	0.757580	1.394074
2nd Reading				
Average	43.40614	79.87455	0.757580	1.394074
Distance (2nd Seis. From Centre of Blast)	615.0	m		
Post Blast Data:	ppV: 3.3	mm/s	Trigger set at: 2.0	mm/s
	frequency: 28.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: Set to not trigger	dB	Trigger set at: n/a	dB
2582 #2 Sideroad, Burlington, On				

3rd Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading	43.40466	79.88098	0.757554	1.394186
2nd Reading				
Average	43.40466	79.88098	0.757554	1.394186
Distance (3rd Seis. From Centre of Blast)	111.8	m		
Post Blast Data:	ppV: 36.2	mm/s	Trigger set at: 2.0	mm/s
	frequency: 26.0	Hz	V / T / L : ?	(Vertical, Transverse or Longitudinal)
	air overpressure: 130.5	dB	Trigger set at: 115	dB
Gas Line				

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

$$\begin{aligned}
 W &= \frac{D^2}{30^2} \\
 &= \frac{(111.8)^2}{30^2} \text{ kg} \\
 &= \frac{12,499}{900} \text{ kg}
 \end{aligned}$$

Maximum Indicated Charge Weight per Delay = kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that
Blast Report is Complete & Accurate.



Blast Design

Nelson Aggregate

Quarry: Burlington

P.O. #:

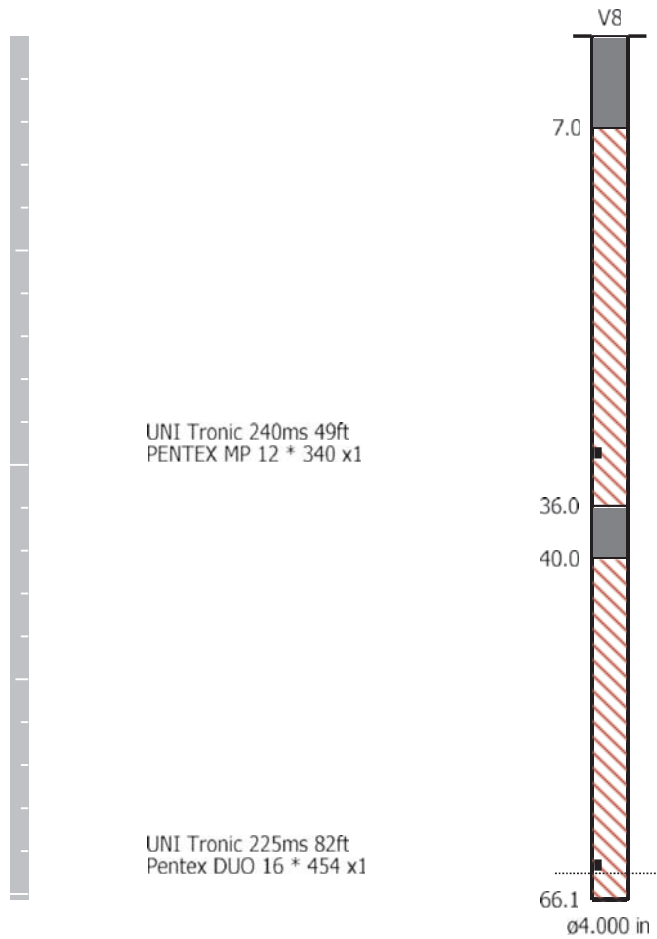
Blast Date: 10/31/2019

Blast Number: 19-023

Orica Order #: 2550103

page 2

Paste ShotPlus Diagram inside Rectangle:



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.

Date/Time Vert at 10:56:06 October 30, 2019
Trigger Source Geo: 1.500 mm/s
Range Geo: 254.0 mm/s
Record Time 1.0 sec 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: 2450 #2 Road, Burlington, On
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

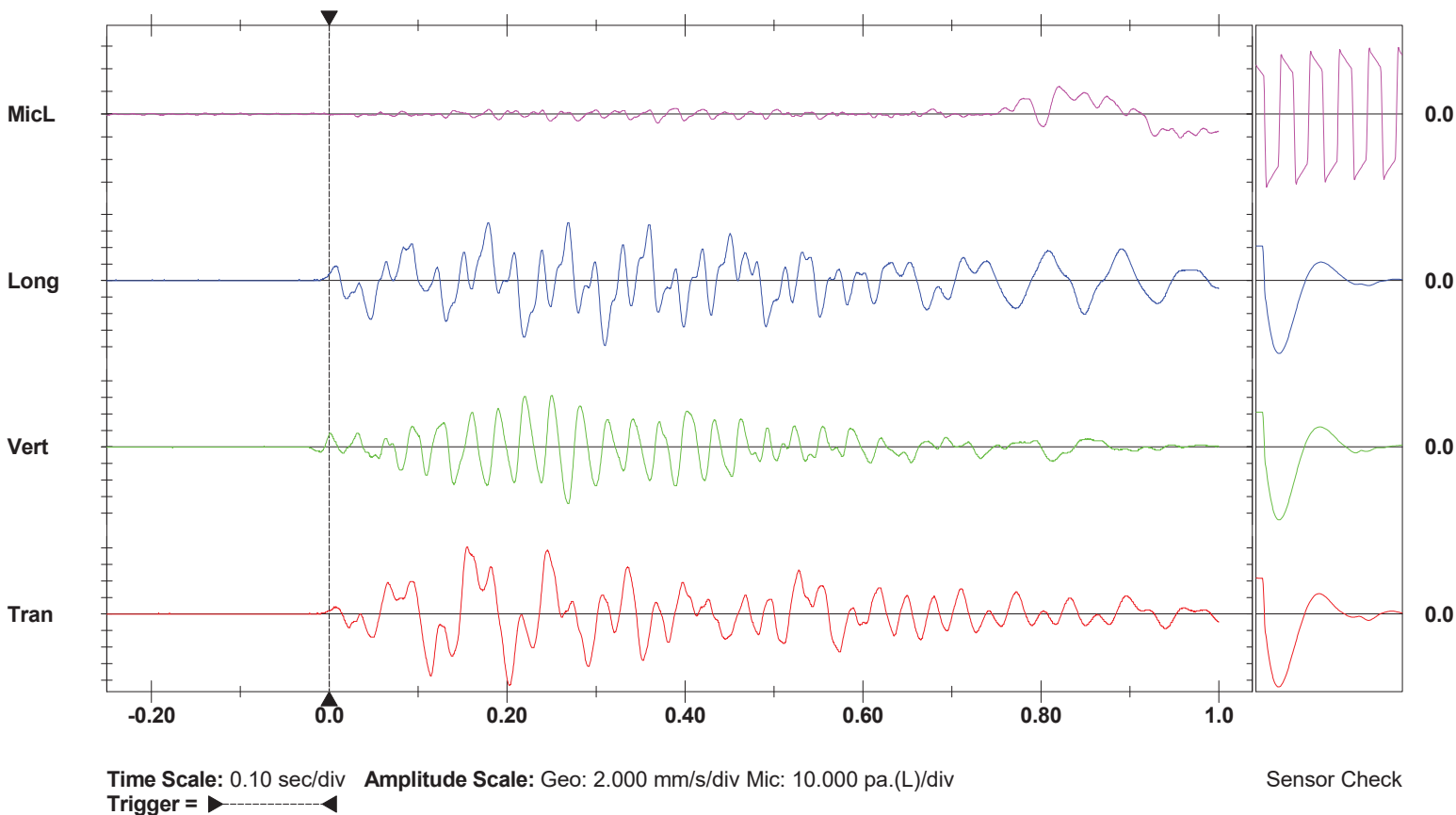
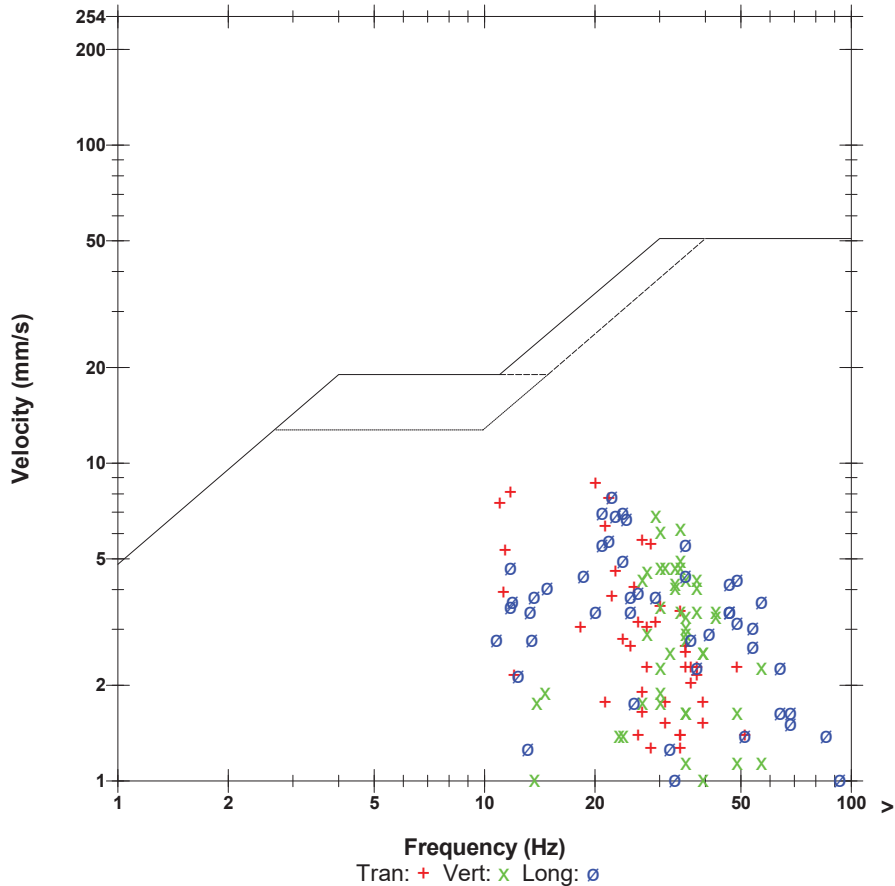
Sand Bagged

Microphone Linear Weighting
PSPL 115.7 dB(L) at 0.821 sec
ZC Freq 6.0 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 612 mv)

	Tran	Vert	Long	
PPV	8.636	6.858	7.874	mm/s
ZC Freq	20	29	22	Hz
Time (Rel. to Trig)	0.202	0.268	0.310	sec
Peak Acceleration	0.159	0.159	0.186	g
Peak Displacement	0.102	0.037	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.2	Hz
Overswing Ratio	3.7	3.7	4.0	

Peak Vector Sum 9.809 mm/s at 0.269 sec

USBM RI8507 And OSMRE



Date/Time Long at 10:56:07 October 30, 2019
Trigger Source Geo: 1.500 mm/s
Range Geo: 254.0 mm/s
Record Time 4.756 sec (Auto=4Sec) at 2048 sps
Operator/Setup: MIKE DERKNDEREN/Burlington 2582.MMB

Serial Number UM6857 V 10-89 Micromate ISEE
Battery Level 3.8 Volts
Unit Calibration January 15, 2019 by InstanTel
File Name UM6857_20191030105607.IDFW

Notes

Location: 2582 #2 Sideroad, Mount Nemo, On
 Client: Nelson Aggregate
 User Name: Orica Canada Inc.
 General: Monitoring Vibration and Airblast

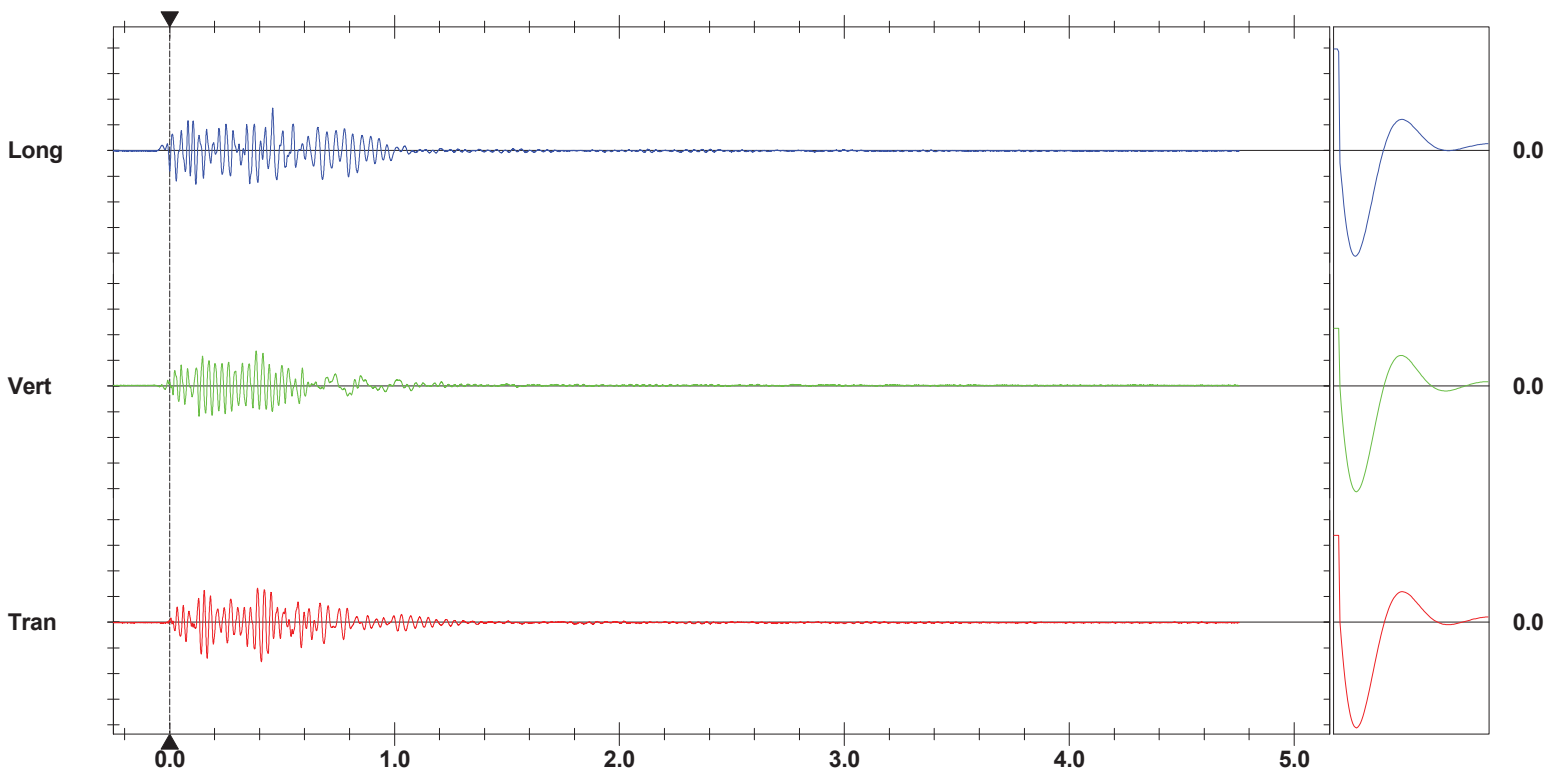
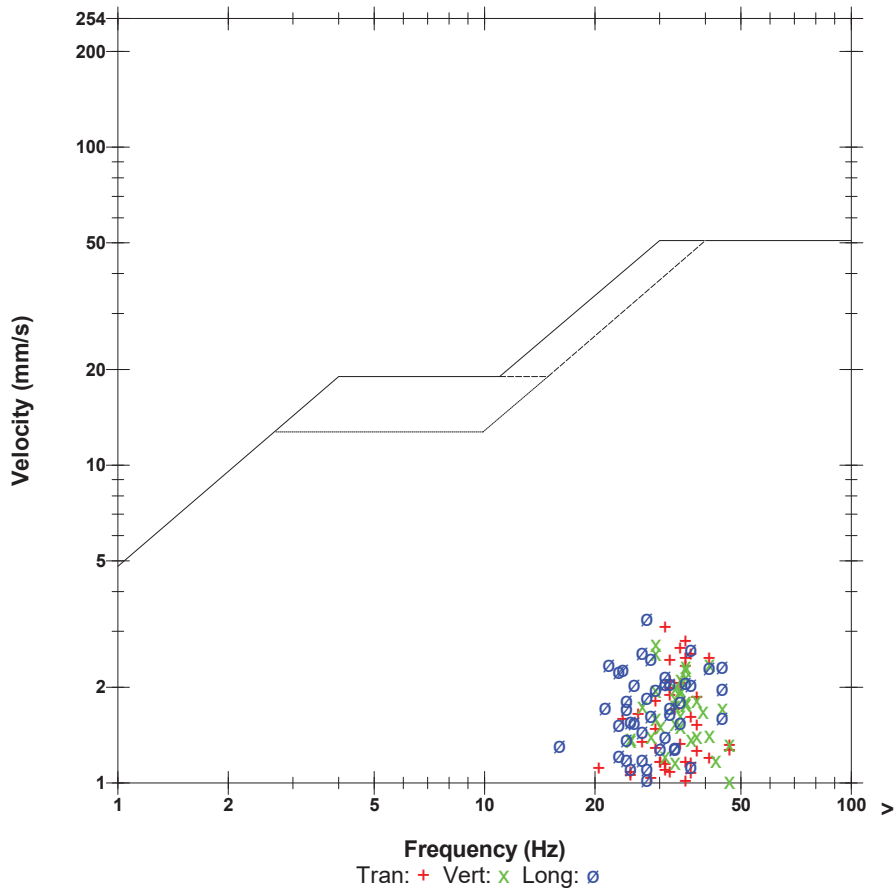
Extended Notes

Sand Bagged
 N43.40614,W-79.87455

	Tran	Vert	Long	
PPV	3.090	2.743	3.302	mm/s
ZC Freq	31	29	28	Hz
Time (Rel. to Trig)	0.408	0.384	0.458	sec
Peak Acceleration	0.081	0.114	0.102	g
Peak Displacement	0.016	0.017	0.016	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	3.5	3.4	3.4	

Peak Vector Sum 3.783 mm/s at 0.458 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div
Trigger =

Sensor Check

Date/Time Tran at 10:56:05 October 30, 2019
Trigger Source Geo: 10.000 mm/s
Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Serial Number BE19461 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration August 31, 2018 by InstanTel
File Name _TEMP.EVT

Notes

Location: Gas Line
Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

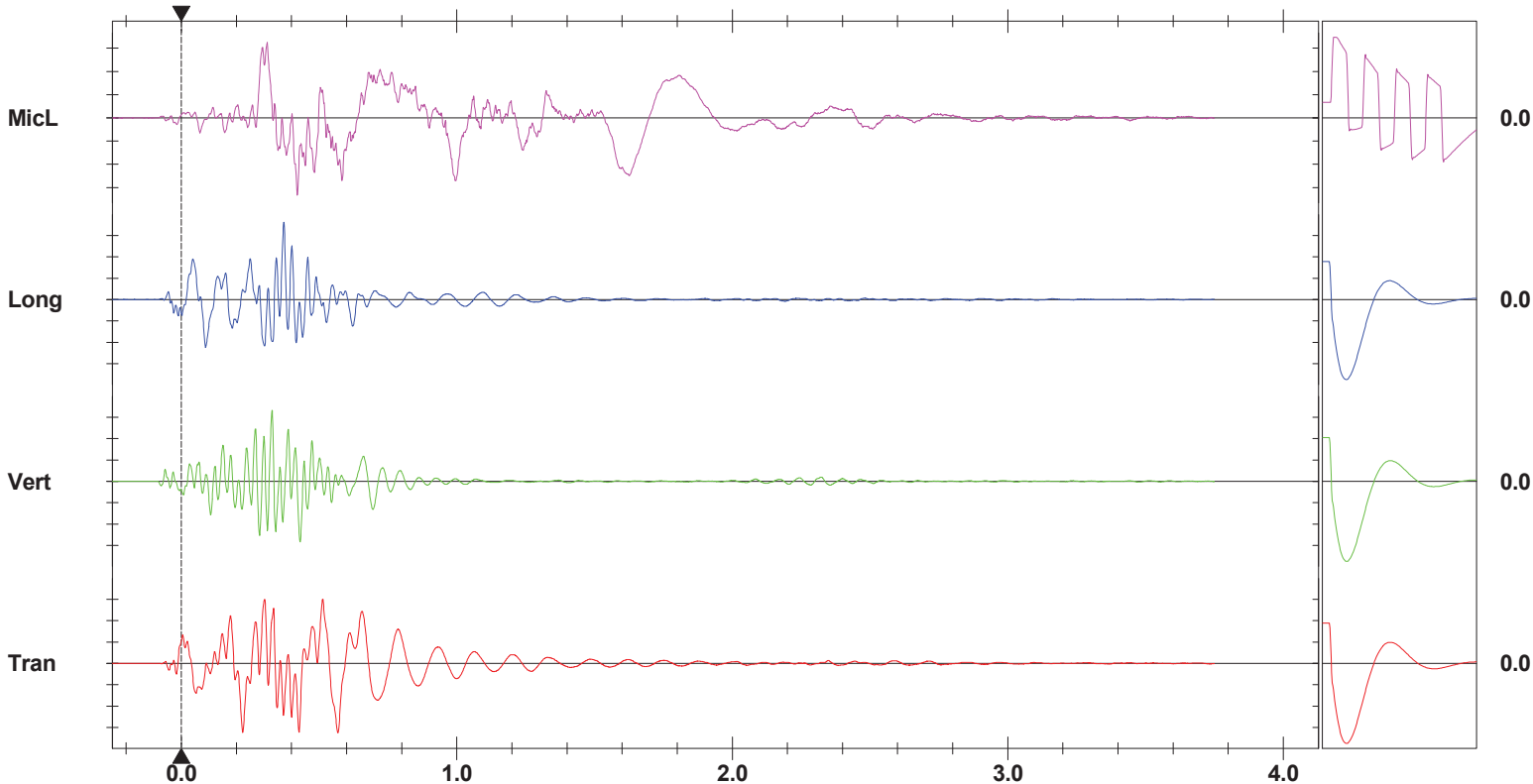
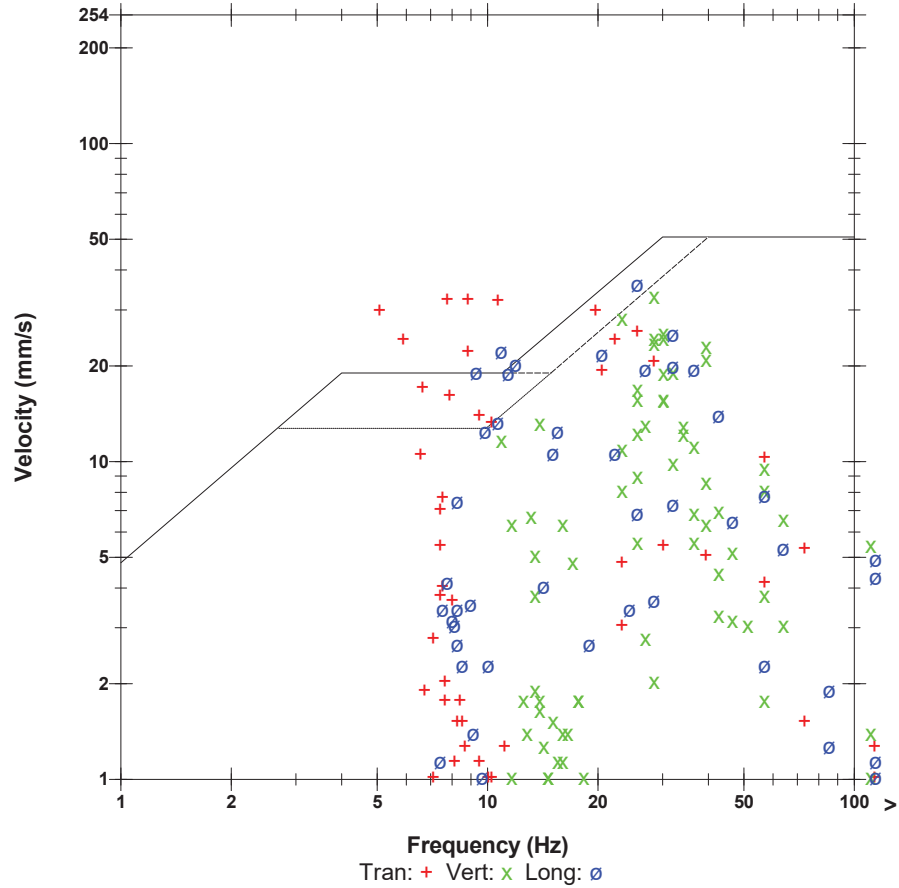
Sand Bagged at gas line

Microphone Linear Weighting
PSPL 130.5 dB(L) at 0.421 sec
ZC Freq 9.0 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 658 mv)

	Tran	Vert	Long	
PPV	32.51	33.27	36.19	mm/s
ZC Freq	8.8	28	26	Hz
Time (Rel. to Trig)	0.568	0.329	0.372	sec
Peak Acceleration	0.610	0.848	0.623	g
Peak Displacement	0.579	0.182	0.257	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.4	Hz
Overswing Ratio	3.8	3.9	4.3	

Peak Vector Sum 45.51 mm/s at 0.371 sec

USBM RI8507 And OSMRE



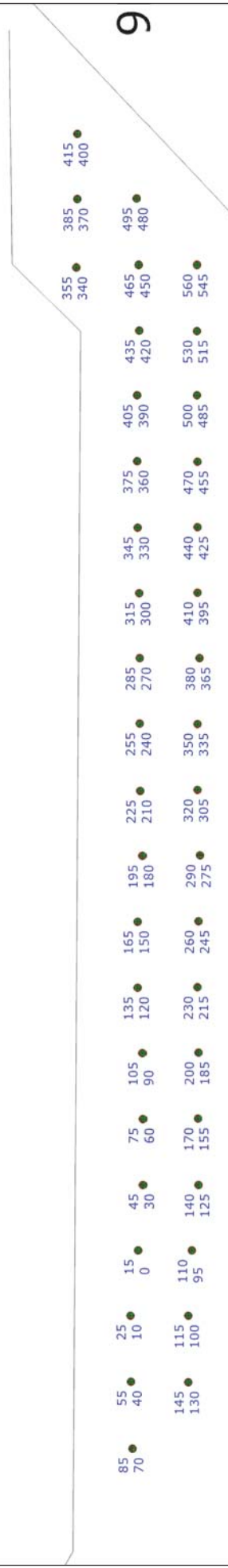
Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 10.000 mm/s/div Mic: 20.00 pa.(L)/div
Trigger =

Sensor Check

Blast Summary Data

Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 41	Hole angle: 0.0°
Total drilled: 2774.7ft			

Open Face



9MID023 Final
 4" Blasthole
 12 X 10, 9 X 10 Pattern
 250 + 0.6m Subdrill
DRILL TO DEPTH OR SHALE + 2 FEET

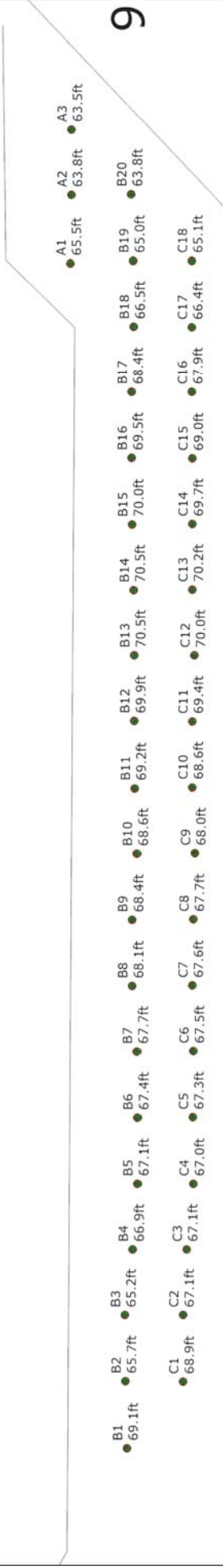


Not to scale

SHOTPlus Plan

Blast Summary Data			
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 8.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 41	Hole angle: 0.0°
Total drilled: 2774.7ft			

Open Face



9MID023 Final
 4" Blasthole
 12 X 10, 9 X 10 Pattern
 250 + 0.6m Subdrill
DRILL TO DEPTH OR SHALE + 2 FEET



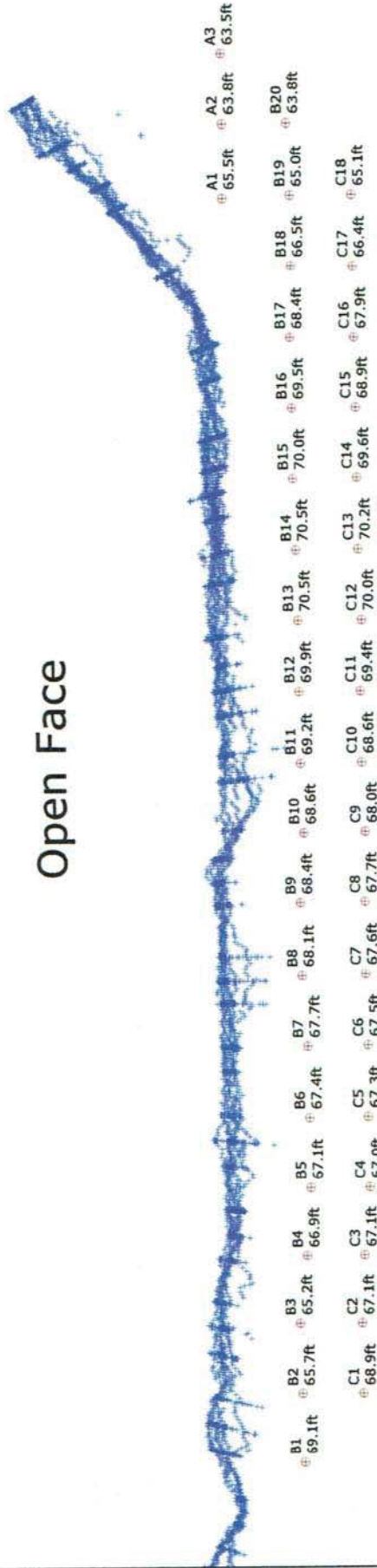
Not to scale

SHOTPlus Plan

Blast Summary Data

Burden: 9.0ft
 1st row burden: 12.0ft
 Total drilled: 2774.6ft
 Spacing: 10.0ft
 Hole Diameter: 4.0in
 Subdrill: 2.0ft
 Number of holes: 41
 Stemming: 8.0ft
 Hole angle: 0.0°

Open Face



9MID023 Final
 4" Blasthole
 12 X 10, 9 X 10 Pattern
 250.0 + 0.6m Subdrill

DRILL TO DEPTH OR SHALE + 2 FEET



Not to scale

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.

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 Senior Engineer and Project Organizer 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 Organizer, Mitch is responsible for operational strategies, scheduling and contract procurement. As a Senior Engineer, the technical responsibilities include detailed blast designs, blast investigations and reviews, implementation of vibration monitoring programs, development of monitoring Equipment/ technologies and building structural assessments for the drilling and blasting portions of mining, quarrying and construction projects across Canada.

PROFESSIONAL RECORD

2008 – Present - Engineer / Project Manager, 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



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Michael Tobin, B.A.Sc.

Explotech Engineering Ltd.

EDUCATION

Bachelor of Applied Science,
Geological Engineering, Queen's University

PROFESSIONAL AFFILIATIONS

International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

A technician 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 equipment maintenance and repair.

PROFESSIONAL RECORD

2017 – Present - Technician, Explotech Engineering Ltd.

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,

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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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