

**Whitewater**  
Hydrogeology Ltd.



**2019 ADAPTIVE MANAGEMENT  
PLAN COMPLIANCE MONITORING  
REPORT**

**KEPPEL QUARRY**

Prepared for:



A Walker Company

Date: April 2020

Whitewater Hydrogeology Ltd  
Phone: 705.888.7064  
Email: [tecia@white-water.ca](mailto:tecia@white-water.ca)

April 27, 2020

Harold Sutherland Construction  
323545 East Linton Road, R.R #2  
Kemble, Ontario, Canada N0H 1S0

Attention: Mr. Dave Munro

**Re: Keppel Quarry: 2019 Adaptive Management Plan Compliance Monitoring Report**

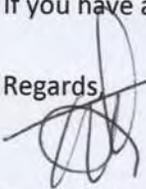
Dear Sir:

Whitewater Hydrogeology Ltd. (Whitewater) is pleased to present the 2019 Adaptive Management Plan (AMP) Compliance Monitoring Report. Based on the monitoring data, Whitewater concludes that extraction did not cause any negative impacts on groundwater resources in 2019.

Based on the findings of the monitoring data collected to date, a revised groundwater and surface water monitoring program is recommended. In response, a revised AMP has been prepared under a separate cover for agency approval and includes a detailed description of the recommended impact assessment methodologies. Until approval is granted, the existing monitoring program shall continue.

If you have any questions, please do not hesitate to call anytime.

Regards

  
Tecia White, M.Sc., P.Geo (licence 0701)  
Senior Hydrogeologist / President  
Whitewater Hydrogeology Ltd.



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## 1.0 INTRODUCTION

Harold Sutherland Construction Ltd. (HSCL), a Walker Company, owns and operates the Keppel Quarry located on Part Lot 28, Concession 10, in the Township of Georgian Bluffs, Grey County (Figure 1). The Keppel Quarry operates under two Aggregate Resources Act (ARA) licenses:

1. License Number 4881 (Original License: East Quarry)
2. License Number 609501 (New License: West Quarry)

Through the ARA licensing process and Ontario Municipal Board proceedings for the New West Quarry, there were extensive technical studies completed to establish baseline data and to assess the potential for adverse impacts to the natural environment because of the quarry operations. This information was used to develop an Adaptive Management Plan (AMP), which includes monitoring, mitigation, and contingency measures that will be relied upon to prevent, minimize, or, if necessary, mitigate environmental impacts. The AMP is a condition of the East Quarry license and approved ARA Site Plans.

### 1.1 Keppel Quarry: Extraction/Operations Plan

A detailed description of the extraction plan is provided on page 3 of the Site Plans (Bradshaw, May 2012). The sequence of operations describes the extraction from the four areas of the quarry (Area 1A, Area 1B, Area 2, and Area 3). Area 1A was a small expansion of the East Quarry and has been fully extracted to a depth of approximately 234 masl. In 2019, operations (blasting) occurred in Area 1B of the West Quarry. Aggregate was extracted to an elevation of roughly 238 masl (lift one of two). Material is currently hauled to the East Quarry for processing.

### 1.2 Keppel Quarry: Water Management Plan

To maintain dry operating conditions, the East Quarry relies on a water management plan. An Ontario Water Resources Act Section 34 Permit to Take Water (PTTW, No.: 4028-8RCKTY) and Section 54 Environmental Compliance Approval (ECA, Number 3515-8M4PWM) have been issued to allow for the management of groundwater and surface water entering the East Quarry. The PTTW permits the pumping of 2,160,000 L/day at an instantaneous rate of 3,000 L/min for 12 hours a day.

On August 29, 2017, the Ministry of the Environment, Conservation, and Parks (MECP) issued ECA No.:1624-ANJQ4P, which permitted the modifications to the existing sewage works for the collection, transmission, treatment, and disposal of the groundwater and surface water collected in the West Quarry footprint. On June 14, 2018, the MECP issued PTTW No.: 5843-AZ4QLJ, which permits the pumping of the West Quarry at a maximum rate of 6,000 L/min to the sewage works regulated under ECA No.:1624-ANJQ4P.

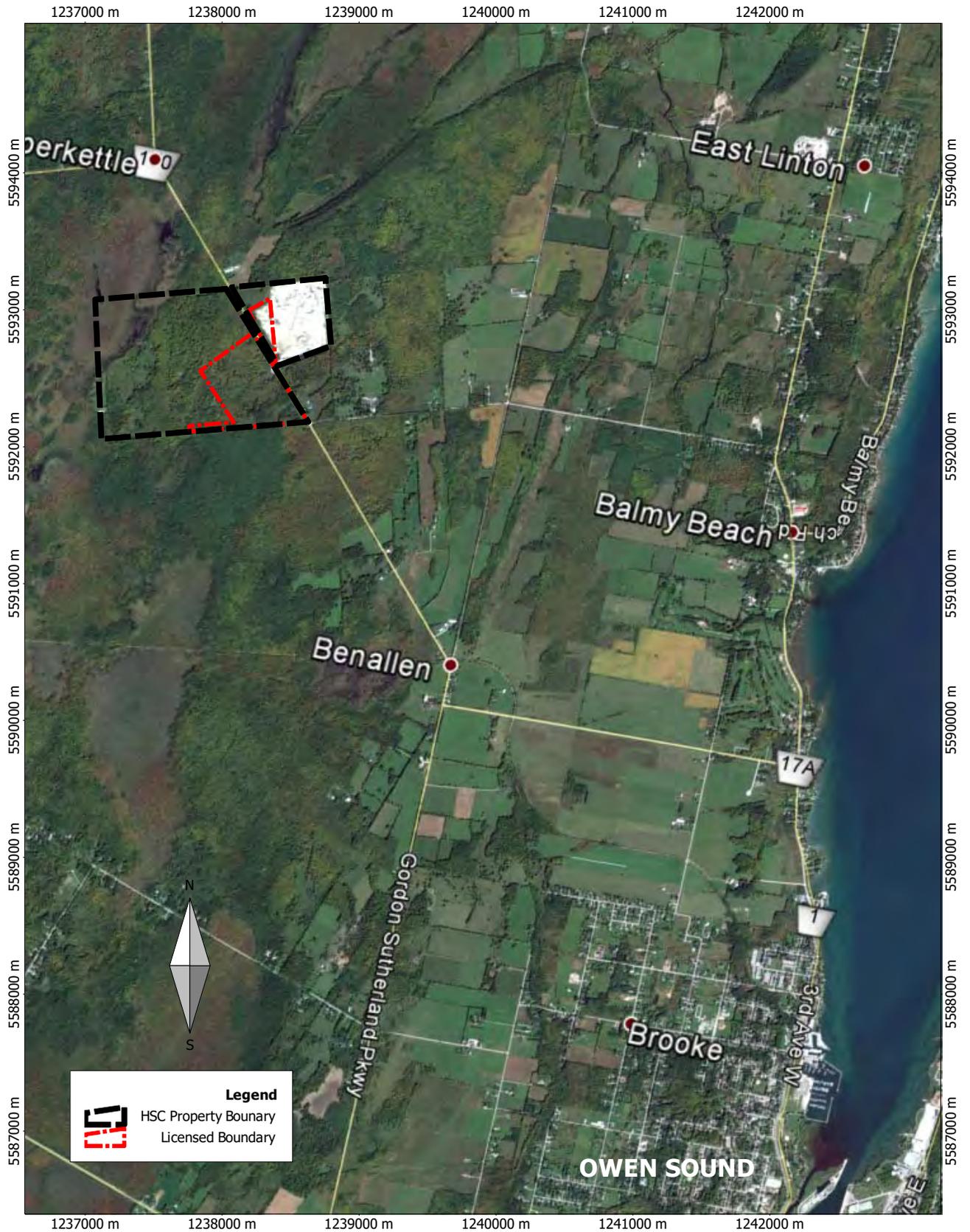


FIGURE 1: SITE LOCATION MAP

## 2.0 GROUNDWATER AND SURFACE WATER MONITORING RESULTS

The monitoring program outlined in the AMP is intended to minimize potential impacts on water resources and monitor the effects of blasting to ensure that proposed mitigation measures are sufficient. There are three components to the monitoring program:

- Water Resources Monitoring (including Private Well Monitoring) (Main Report and Appendix A); and
- Blast Monitoring (Appendix B).

The Water Resources Monitoring Program is designed to track the performance of the West Quarry and the potential impacts on water resources. The Water Resources Monitoring Program tracks changes in each of the following environmental receptors:

- The bedrock groundwater flow system;
- The Shouldice Wetland; and
- The Glen Management Area.

The annual reporting for the West Quarry involves the data compilation, presentation, and evaluation of the performance monitoring data, including the trend analysis. The annual AMP monitoring reports are to be stand-alone documents that provide the reviewers/agencies with interpretations of the data collected and make recommendations to modify the monitoring programs and/or the ARA Site Plan.

The comprehensive monitoring program required under the AMP has resulted in an extensive database of water level and water quality data. Therefore, to ensure that the report provides a clear and concise interpretation of the 2019 monitoring activities relative to the historical and background data, the data is provided in graphical format only. Data in raw format (in the form of extensive tables) have not been included in the report but will be made available upon request.

The AMP for the Keppel Quarry currently relies on seasonal site-specific trigger water level elevations at selected sentry monitoring wells and surface water monitoring stations. These seasonal triggers are set for four quarterly periods (highlighted in Figure 2):

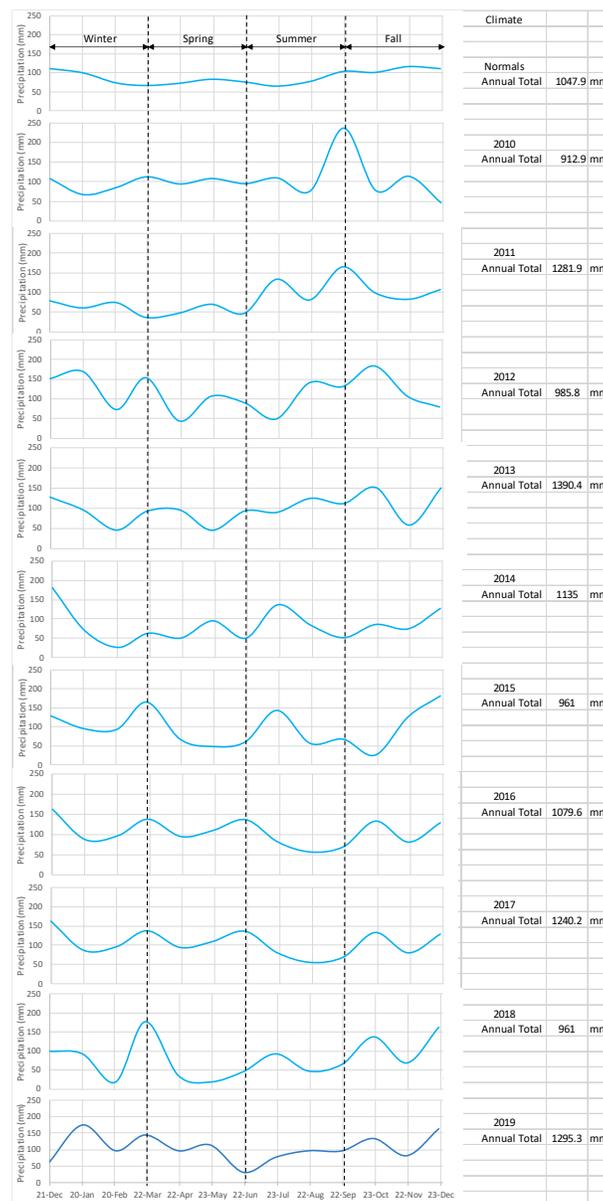
- Winter: December 21<sup>st</sup> to March 21<sup>st</sup>
- Spring: March 21<sup>st</sup> to June 21<sup>st</sup>
- Summer: June 21<sup>st</sup> to September 21<sup>st</sup>
- Fall: Sept 21<sup>st</sup> to Dec 21<sup>st</sup>

Ontario experiences significant seasonal climatic variability and season creep, which needs to be taken into consideration during the hydrogeological impact assessment for the Keppel Quarry. An approach to assessing how changes in climate (both temperature and precipitation) affect the hydrogeological response in groundwater and surface water regimes coupled with potential impacts from the aggregate operation is required. As a result, an assessment of the local climatic conditions has been included. Additional information on the trigger conditions is provided in Section 2.3.3.

## 2.1 Climatic Conditions

A key component of the groundwater and surface water assessment is understanding the climatic conditions over the monitoring period. Variability outside of the normal conditions will have a strong influence on the seasonal groundwater and surface water levels, and trends, which will impact the hydrogeological assessment. Therefore, to ensure that the database is complete, the local precipitation data that has been relied upon was collected from the Wiarton Airport Environment Canada (EC) Weather Station (located approximately 15.5 km from the site).

As shown in Figure 2, seasonal variability is evident when comparing the climatic normal to actual precipitation data collected between 2010 and 2019. This will have an influence on the seasonal variability in both groundwater levels and surface water flows.

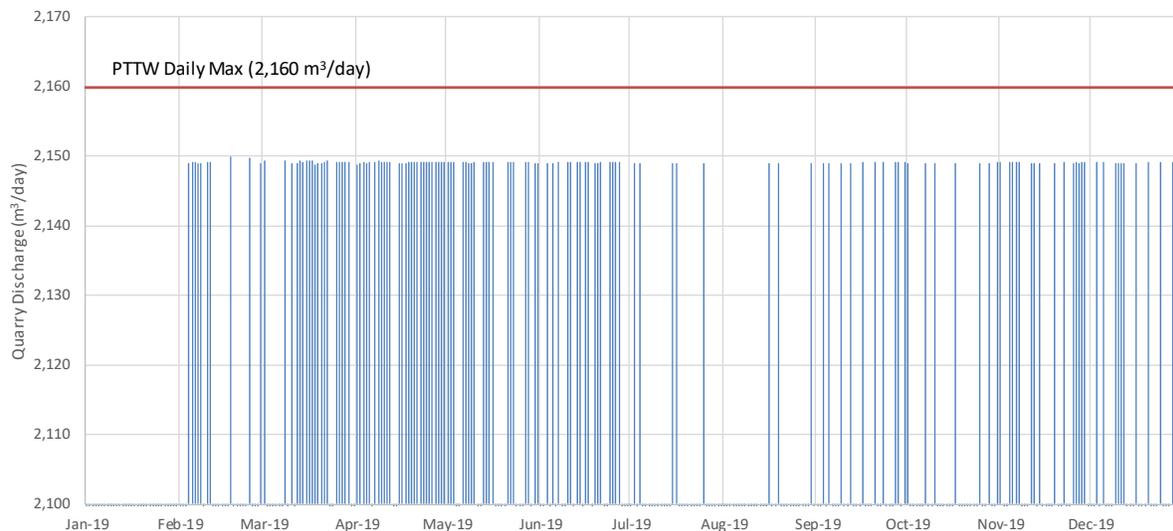


**FIGURE 2: SEASONAL PRECIPITATION TRENDS**

## 2.2 New Keppel Quarry Activities

### 2.2.1 Pumping Records

Quarry dewatering in 2019 continued from the East Quarry under PTTW No.: 4028-8RCKTY. The pump that is used for dewatering the East Quarry is rated at 3,000 L/min and enables the quarry to be dewatered at the maximum permitted rate. In 2019, 305,171 m<sup>3</sup> of water was pumped over 142 days (Figure 3). The maximum daily taking was reported to be 2,150,000 L. HSCL remains in compliance with PTTW No.: 4028-8RCKTY. No dewatering was conducted in the West Quarry under PTTW No.: 5843-AZ4QLJ in 2019.



**FIGURE 3: 2019 DAILY PUMPING VOLUMES**

### 2.2.2 Water Bearing Fractures

The AMP requires visual inspections along the active quarry face after each blast for water-bearing fractures. The intent is to ensure that the quarry does not interfere with potential epi-karst pathways that might otherwise deliver water to surface water features such as springs found in the Shouldice Wetland. Visual inspections were made by HSCL staff after each blast in 2019.



There were 14 blasts in total, which took place on:

- April 10 at 1:00 pm
- May 1 at 2:43 pm
- May 17 at 12:45 pm
- June 24 at 5:28 pm
- August 6 at 1:47 pm
- August 21, 1:25 pm
- September 3, 1:14 pm
- September 20 at 3:40 pm
- October 7 at 2:29 pm
- October 21 at 1:54 pm
- November 4 at 4:01 pm
- November 18 at 2:26 pm
- November 22 at 3:38 pm
- December 11 at 3:06 pm

No concerns related to water (i.e., high flows observed in new and/or existing fractures) were reported after any of the blasts.

## 2.3 Groundwater Monitoring

The bedrock groundwater system includes three distinct components:

1. Epi-karst.
2. Shallow bedrock.
3. Deeper bedrock.

The groundwater elevation monitoring program, which has been designed to characterize all three groundwater flow zones over time, has been divided into two areas: the groundwater monitoring locations within the predicted area of influence (Groundwater Monitoring Wells); and the groundwater monitoring of locations outside the predicted area of influence (Sentry Groundwater Monitoring Wells). The water monitoring network is shown in Figure 4.

### 2.3.1 Changes to the Groundwater Monitoring Program

Several changes to the groundwater monitoring program have occurred over the years. Specifically, several wells have been destroyed because of the on-going extraction of aggregate. These wells include:

- OW11s and OW11d
- OW16s and OW16d
- OW34
- OW35
- OW36
- OW40
- OW65d

In 2019, several manual water levels were not obtained. Water levels were not measured in January due to severe weather conditions. In the spring (March/April), access roads and trails to some wells were being used by a logging company and could not be used by HSCL employees due to safety concerns around their equipment. Finally, water levels measured in July were lost in a vehicle fire prior to being entered into the Keppel database.

The AMP had proposed additional observation wells that have not yet been constructed. For example:

- OW61 - HSCL has committed to installing this observation well after logging, and grading is completed in Area 1B (MTE, 2015).
- OW66, OW67, OW68 – These observation wells are in a part of the ANSI that is too sensitive for the installation of monitoring points without causing significant disturbance to the Natural Environment (Hearts-tongue Fern habitat<sup>6</sup>). MTE recommended that these locations be removed from the AMP (MTE, 2015).
- OW69 and OW70 - Given the presence of existing observation wells in proximity to their proposed locations, MTE recommended that their installation is deferred until such time that the AMP indicates the extra water level data is required (MTE, 2015).

### 2.3.2 Groundwater Elevations

Monthly groundwater levels are collected at 46 monitoring well locations (Figure 4). Nested groundwater wells (multi-level) are found at 30 of the 46 monitoring locations. Water level data collected from multi-level groundwater wells allow for the assessment of the horizontal flow direction within the bedrock aquifer systems as well as the vertical movement of groundwater over time.

The epi-karst (designated by the letter 'k') is discontinuous across the site but where present is contained within the upper 5 m. Shallow wells (designated by the letter 's') extend five to 10 metres below ground surface (mbgs), while deep wells (designated by the letter 'd') are between 10 and 22 mbgs. Deep wells are

screened at an elevation close to the current quarry floor elevation (234 masl), while shallow screens are placed about halfway between the natural grade and the finished quarry floor elevation.

Monthly water levels are measured at the following groundwater monitoring wells:

- OW3d
- OW4d<sup>1</sup>
- OW7s and OW7d<sup>1</sup>
- OW10s and OW10d
- OW14s and OW14d
- OW15s and OW15d
- OW24d<sup>2</sup>
- OW25s<sup>2</sup> and OW25d<sup>2</sup>
- OW26d<sup>2</sup>
- OW27s<sup>2</sup> and OW27d<sup>2</sup>
- OW28s and OW28d
- OW29s and OW29d
- OW30s and OW30d<sup>1</sup>
- OW31s and OW31d
- OW32s and OW32d
- OW37d<sup>1</sup>
- OW38d
- OW39d<sup>1</sup>
- OW41s and OW41d
- OW42s and OW42d
- OW43s and OW43d
- OW44s and OW44d
- OW46k, OW46s, and OW46d
- OW48d
- OW49d<sup>3</sup>
- OW50d<sup>3</sup>
- OW52d<sup>3</sup>
- OW53d<sup>1</sup>
- OW58s<sup>2</sup> and OW58d<sup>2</sup>
- OW59s<sup>2</sup> and OW59d<sup>2</sup>
- OW60s<sup>2</sup> and OW60d<sup>2</sup>
- OW62k, OW62s, and OW62d
- OW63s and OW63d
- OW64s and OW64d
- OW65s and OW65d
- OW72s (OW11 replacement)

**Note:**

1. Monitoring wells that have reported a drawdown / decreasing water level trend since 2009.
2. Monitoring wells that were installed to monitor groundwater levels under the Shouldice Wetland.
3. Monitoring wells that were installed to monitor groundwater levels under the Glen Management Area.

Groundwater levels have been monitored in the shallow and deep bedrock since 2003. Historical baseline groundwater levels are presented in Appendix A-1a. Trend analysis has been completed on groundwater elevation data. While linear trend (least squares regression) analysis can be a useful tool, it can also provide misleading results and must be used with caution. For example, water levels were not measured routinely in the winter and spring between 2005 and 2008, where water levels tend to be the highest. Data collected prior to 2009 would be biased toward seasonally low water levels during the summer and fall (resulting in increasing water levels with time) and would not reflect average climate conditions or potential impacts from quarry dewatering.

It wasn't until 2009 that routine monthly water level monitoring was completed and captured the true seasonal fluctuations. Water level hydrographs (with trend lines) have been generated for the period between 2009 and 2019 (Appendix A-1a). The hydrographs have a constant vertical scale that spans between 234 masl (base of the quarry floor) and 250 masl, which allows for a comparison between the water level elevations, seasonal fluctuations, and trends.

Water levels across the site remain within the historical seasonal ranges, except for the observed drawdown trends measured at monitoring wells located near the recently extracted quarry faces. These wells include:

- OW4d
- OW7d
- OW30d
- OW37d
- OW39d
- OW42s and OW42d
- OW53d

The water level decline at these locations (except for OW4d, OW42s, and OW42d) is minor with less than a 1 m over the 9-year evaluation period. A 2 m drop is observed at OW4d, OW42s, and OW42d, which are located immediately adjacent to the quarry face. Although a downward trend observed at OW53d based on the data back to 2009, the recent data (last four years) suggests that a new equilibrium has been reached since the completion of extraction in the East Quarry.

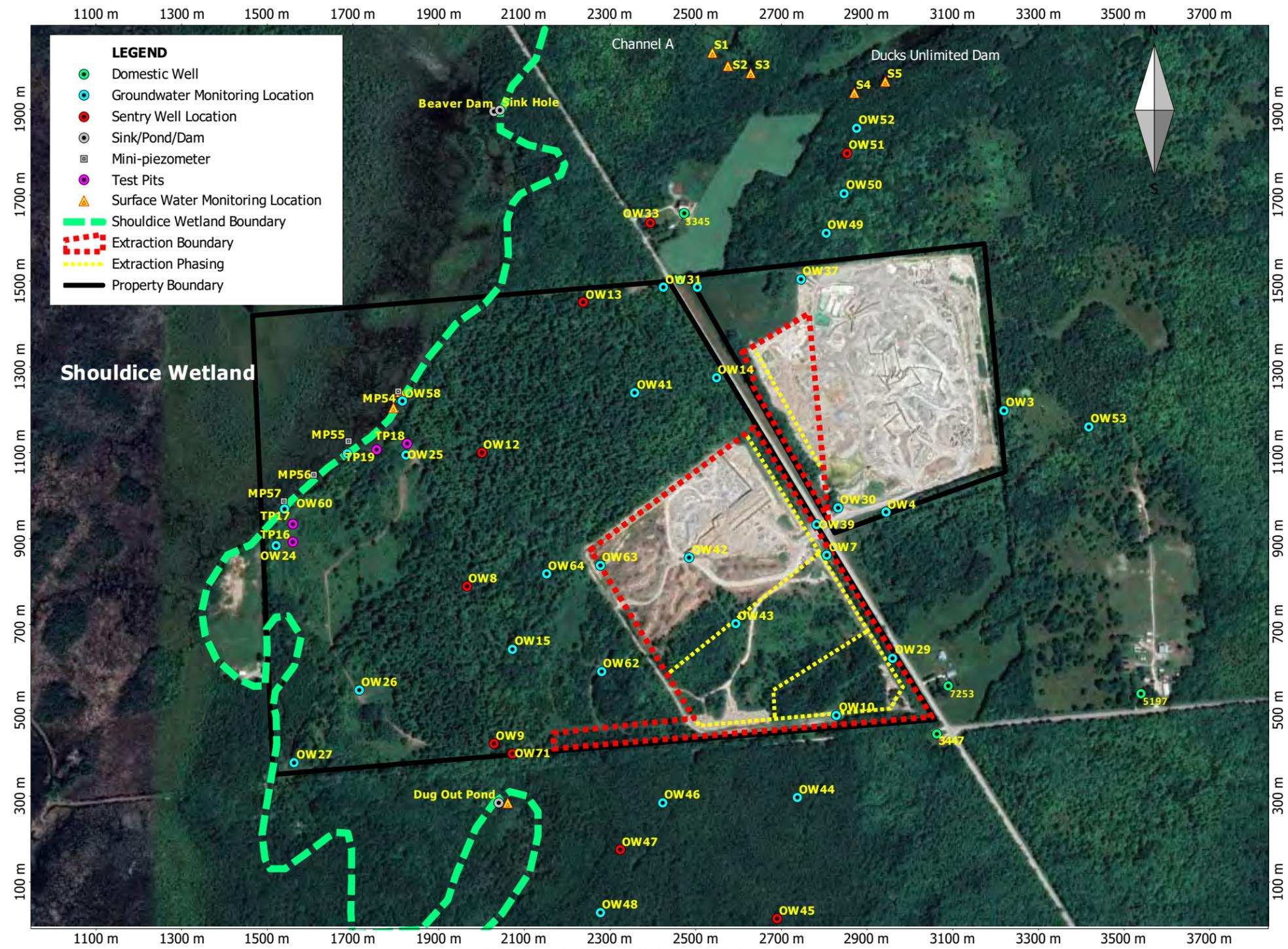


FIGURE 4: MONITORING LOCATION MAP

Bedrock groundwater levels between the Keppel Quarry and the Glen Management Area are measured at OW49, OW50, OW51, and OW52. Monitoring results indicate that water levels remain within background conditions.

Water level monitoring that is completed to assess the potential impacts to the Shouldice Wetland is completed for the overburden sediments (test pits and mini-piezometers) as well as within the groundwater beneath the wetland. In 2019, water levels in the overburden remained within the historical ranges. It should be noted that in 2018, there was a drop in water levels at MP 55. Based on recent water level data, it appears that the readings in 2018 may be anomalous. The groundwater elevations within the deep bedrock aquifer show a slight downward trend at OW25 and OW27. This trend is believed to be attributed to the seasonal fluctuations and timing of water level responses. Hydrographs for the water levels in the vicinity of the are presented in Appendix A-1b.

In order to confirm that these slight trends are a result of the 2019 quarry operations, a more detailed assessment was completed. This assessment incorporated the findings of the vertical gradient and area of influenced evaluations and are presented in Section 2.3.5 and 2.3.6.

### 2.3.3 Sentry Groundwater Monitoring Wells

Nine (9) of the 46 monitoring locations have been equipped with automatic dataloggers to supplement the manual groundwater monitoring. These wells are located outside the predicted zone of influence from the quarry operations and are therefore referred to as sentry well locations. As a contingency measure, the AMP identifies trigger values for the sentry wells that, if exceeded, will trigger action by HSCL so that mitigation can occur before any negative effects to the natural environment can occur.

For each of the sentry wells, there are three standard categories of trigger values (green, yellow, and red). Each trigger value is accompanied by a set of actions that are implemented if these values are exceeded. Data loggers were not installed until the spring of 2017. The assessment has been completed based on spot measurements, and extrapolation between these data points on the hydrograph is interpretative (as a result of the erroneous barometric data in 2019).

Green trigger values were set at 15 cm above observed seasonal lows (spring, summer, autumn, and winter) reported from the monthly water level data collected between 2009 and 2014 for each of the Sentry Wells. Exceedance of a green trigger value indicates no significant negative impacts have been observed, and water levels are still within the normal historical range. This will trigger a Green Action as an early response action (i.e., increase monitoring frequency and investigate). Yellow trigger values are equal to observed seasonal lows for each location. Exceedance of a yellow trigger value indicates water levels are slightly below seasonal lows, but no significant negative impacts have been observed. This is used to trigger a Yellow Action or a precautionary mitigation measure. Red trigger values were set at 15 cm below observed seasonal lows. Exceedance of a red trigger value is used to trigger Red Actions or immediate responses if the yellow actions fail to correct or reverse the impact.

Monthly and continuous water levels (collected via datalogger) are measured at the following sentry groundwater monitoring well locations:

- OW8s and OW8d
- OW9s and OW9d
- OW12s and OW12d
- OW13s and OW13d
- OW33s and OW33d
- OW45d
- OW47s and OW47d
- OW51d
- OW71k, OW71s, and OW71d<sup>1</sup>

**Note:**

1. Monitoring wells were installed to monitor groundwater levels under the Shouldice Wetland.

Water level hydrographs (in comparison to the associated trigger values) have been generated for the period between 2015 and 2019 (Appendix A-1c). A review of the data indicates that generally, water levels remain within historical levels. In fact, water level trends are either constant or increasing.

Although the water levels at the Sentry Wells show no drawdown because of the quarry operations, a comparison to the seasonal trigger levels has been completed with the understanding that there is climatic variability (Appendix A-1c). A summary of this assessment is provided in Table 1. Overall, 24 yellow and 30 red triggers were exceeded since 2015. Green triggers (water levels above seasonal low) were not included in the summary.

**TABLE 1: SUMMARY OF TRIGGER EXCEEDANCES**

Trigger Type	Winter	Spring	Summer	Fall	Total
Yellow	1	6	7	10	24
Red	7	0	4	19	30

Seasonal trigger levels were set at 15 cm above, 0 cm, and 15 cm below low water levels. Although there were no drawdown trends attributed to the operation of the Keppel Quarry, triggers were frequently exceeded. It is apparent from the assessment of the water level data collected since the AMP and Site Plans took effect that the application of the seasonal trigger response system as a means in providing an early warning system for potential groundwater impacts from quarry operations is ineffective. A detailed discussion of the application of triggers is provided in Section 3.0.

#### *2.3.4 Overburden Water Levels and Groundwater Recharge*

Four test pits with standpipes have been installed in the overburden within 100 m of the Shouldice Wetland boundary. These test pits (TP16, TP17, TP18, and TP19) are monitored to assess water level conditions in the overburden aquifer, which are believed to be a potential source of groundwater recharge for the wetland springs. Water levels in the overburden remain within historical ranges (Appendix A-1d).

#### *2.3.5 Groundwater Flow*

##### Vertical Hydraulic Gradients

The vertical movement of groundwater in the overburden sediments and the bedrock aquifer can be determined by measuring the hydraulic head difference between the units by installing a mini-piezometer (MP). A mini-piezometer is a portable drive probe that provides a comparison between the stage of a surface water body and the hydraulic head beneath the surface water body at the depth to which the screen at the end of the probe is driven. Because the MP is driven manually into the sediments, obtaining a good seal between the MP and the sediments is difficult, and data should be interpreted with caution.

At the Keppel Quarry, groundwater levels in the overburden are monitored at four mini-piezometers (MP), which are constructed in the ponded water of the Shouldice Wetland (MP54, MP55, MP56, MP57) and are monitored monthly during unfrozen conditions (Appendix A1-e). These overburden water levels were used to estimate the vertical direction of groundwater flow beneath the wetland when wet. In 2019, the wetland was dry most of the time. As a result, the vertical hydraulic gradients could not be calculated during these periods. The 2019 hydraulic gradients are like the historical averages.

Groundwater vertical hydraulic gradients were also calculated using observation wells installed in the bedrock underlying the Shouldice Wetland, including observation well nests OW58, OW59, OW60, and OW71. The

calculated values for OW58, OW59, and OW60 showed neutral to slightly upward gradients on average (0.01 to 0.03 m/m) in 2019. The average vertical gradient for the karst bedrock to the shallow bedrock at OW71 was slightly upward (0.04 m/m), while the average vertical gradient for the shallow bedrock to deep bedrock at OW71 was neutral (0 to 0.01 m/m). These gradients were consistent with historical data at these locations. This information, coupled with the gradients calculated from the mini-piezometers, indicates that the groundwater vertical hydraulic gradients in the Shouldice Wetland or the bedrock underneath the wetland were not affected by extraction in 2019.

**TABLE 2: VERTICAL HYDRAULIC GRADIENTS BENEATH THE SHOULDICE WETLAND**

Date	Overburden				Bedrock				
	MP54	MP55	MP56	MP57	OW58	OW59	OW60	OW71 S&K	OW71 S&D
24-Apr	0.03	0.02	-0.01	0.04	0.02	-0.03	-0.07	-0.04	-0.02
7-May	0.03	0.03	-0.04	0.03	0.01	0.01	-0.04	-0.01	0.01
25-Jun	0.00	0.02	-0.06	0.03	0.01	-0.01	Dry	-0.05	0.00
31-Aug	0.04	0.03	0.00	0.05	-0.01	Dry	Dry	Dry	Dry
25-Sep-19	0.05	0.02	0.00	0.05	0.00	0.00	Dry	Dry	-0.01
31-Oct-19	0.03	0.01	-0.02	0.01	0.00	-0.01	Dry	-0.04	0.00
5-Nov-19	0.04	0.02	-0.01	0.02	0.00	0.00	Dry	-0.02	-0.01
AVERAGE	0.03	0.02	-0.02	0.03	0.00	-0.01	-0.05	-0.03	-0.01

#### Horizontal Groundwater Flow.

The shallow and deep groundwater flow maps have been prepared based on water levels collected on August 31, 2019, to assess the dry conditions. The potentiometric surface for the shallow bedrock aquifer is presented in Figure 5. The influence of the extraction has become evident in the shallow groundwater elevation data. As discussed in Section 2.3.2, a 2 m drawdown was reported at OW42, which is immediately adjacent to the quarry extraction face. The data is showing the early stages of a cone of influence developing in the shallow aquifer system. Groundwater flow under natural conditions flowed directly west toward the Shouldice Wetland. As anticipated, local changes in the groundwater flow have resulted from the extraction and dewatering, and a portion of the shallow groundwater now flows toward the West Quarry footprint.

The potentiometric surface for the deep bedrock aquifer is presented in Figure 6. The deep groundwater flows from a high of approximately 245-246 masl in the central portion of the West Quarry. Groundwater flows radially from this groundwater mound towards the Shouldice Wetland in the west and toward the East Quarry. The extraction of Area 1B appears to have had only a minor no influence on the deep groundwater flow pattern. The extraction in the East Quarry has resulted in an area of influence that extends between 300-500 m from the quarry face.

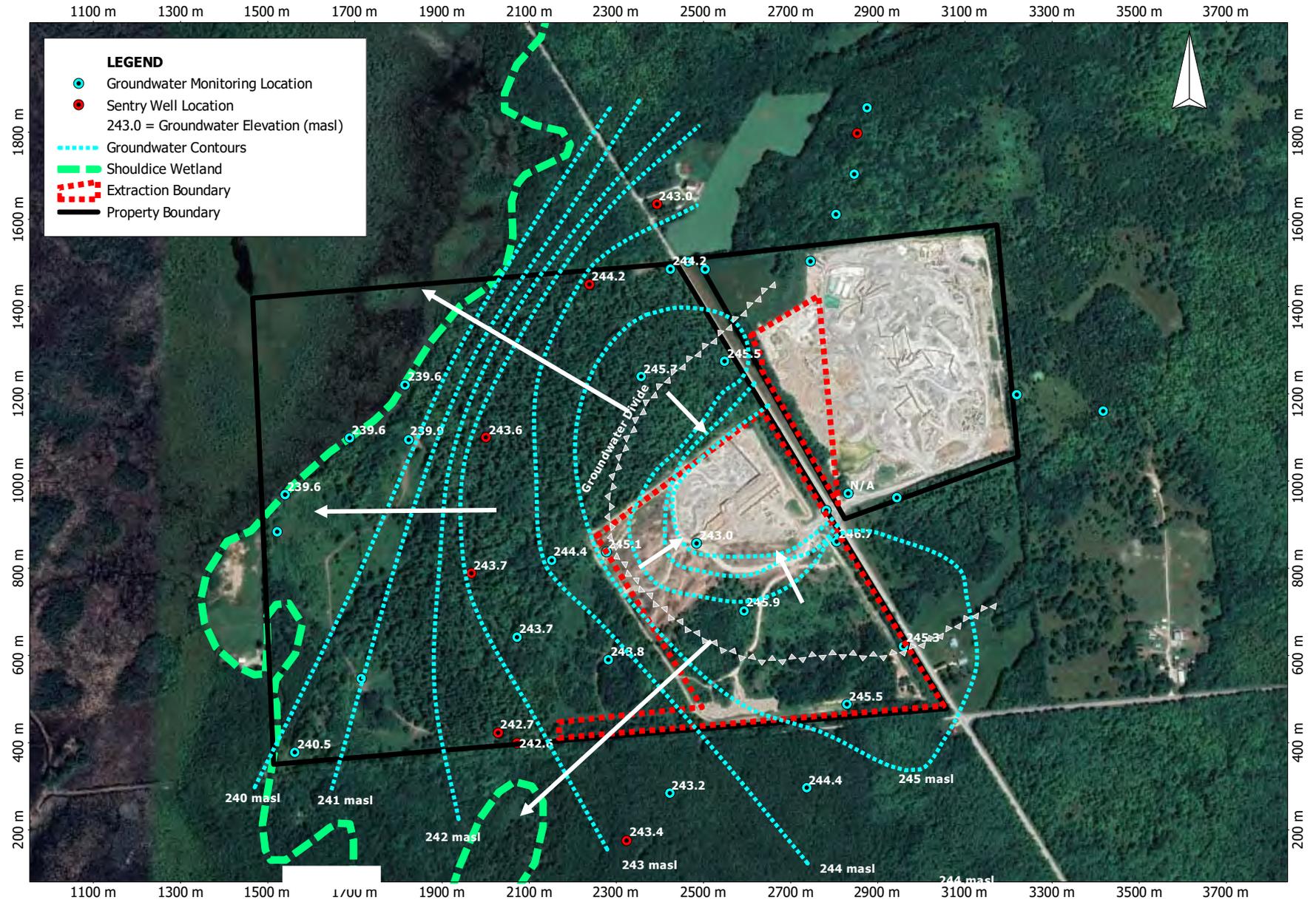
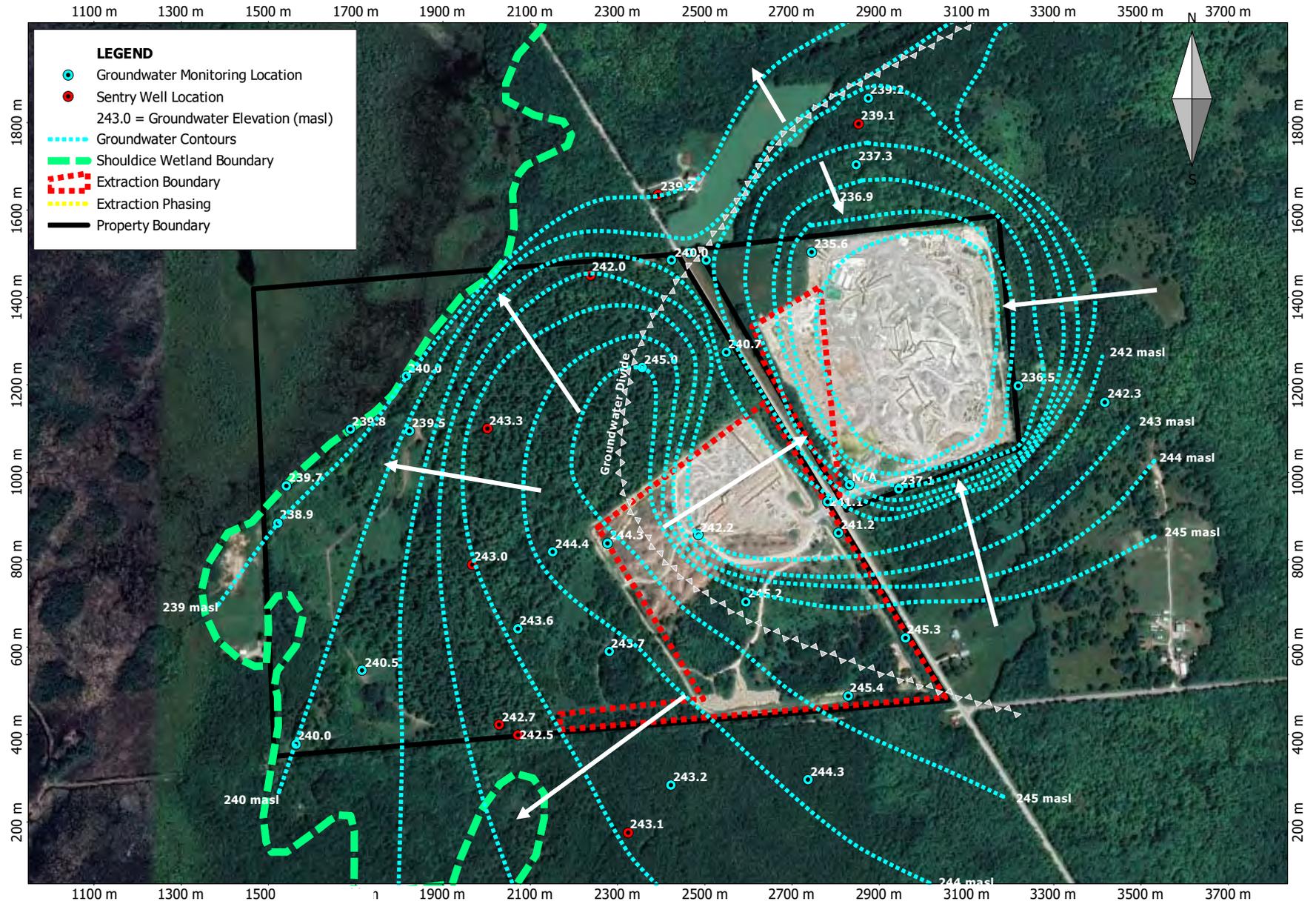


FIGURE 5: GROUNDWATER FLOW PATTERN – SHALLOW AQUIFER



**FIGURE 6: GROUNDWATER FLOW PATTERN - DEEP AQUIFER**

### 2.3.6 Groundwater Area of Influence Assessment

The zone of influence within the bedrock aquifer has been defined by mapping the water table contours based on the seasonal low water levels (Section 2.3.5). To supplement this plan view delineation of the zone of influence and to track the changes within this area over time, distance-water level plots have been generated (Appendix A2). These distance-water elevation plots are to be generated along nine monitoring lines outlined in the AMP and subsequently modified by MTE (2016).

Figure A2-1 shows the transect lines used to generate the distance – water level plots. Transect Line 1 shows an inflection point at OW50 for most of the year. Between September and December, this inflection point moves to OW52. Therefore, the area of influence that has resulted from the extraction of aggregate at the Keppel Quarry extends between 200 and 350 m in a northerly direction.

Transect Lines 2, 3, and 4 all run from the east towards the Shouldice Wetland in the west. Transect Line 2 is within the area of influence, and no inflection point is noted. Transect Line 3 and 4 extend to the Shouldice Wetland and show inflection points 300 m at OW41 (Line 3) and 380 m (at OW42). Transect Lines 5 and 6 runs from the quarry face south. Inflection points are noted at distances of 380 m (OW43) and 495 m (at OW10).

## 2.4 Domestic Water Well Monitoring

A Private Domestic Water Well Monitoring Program has been developed to monitor water supplies of residents within one kilometer of the Keppel Quarry (Figure 4). Private wells have been separated into two categories:

1. Category A wells – includes those wells within or just outside the predicted zone of influence for the deep bedrock aquifer when the Keppel Quarry is at its full extent. These wells include:
  - well no. 3345 (the Ritchie well);
  - well no. 3447 (owned by HSCL);
  - well no. 5197 (the Ruthven well); and
  - well no. 7253 (the Cramp well)
2. Category B wells - includes those wells within 1 km of the Keppel Quarry license boundaries but outside the predicted zone of influence. Category B Private Wells include:
  - well no. PW1 (the Jenks well);
  - well no. PW2 (the Thompson well); and
  - well no. PW3 (the Porter well).

### 2.4.1 Category “A” Domestic Water Wells

#### 1. Private well no. 3345 (the Ritchie well)

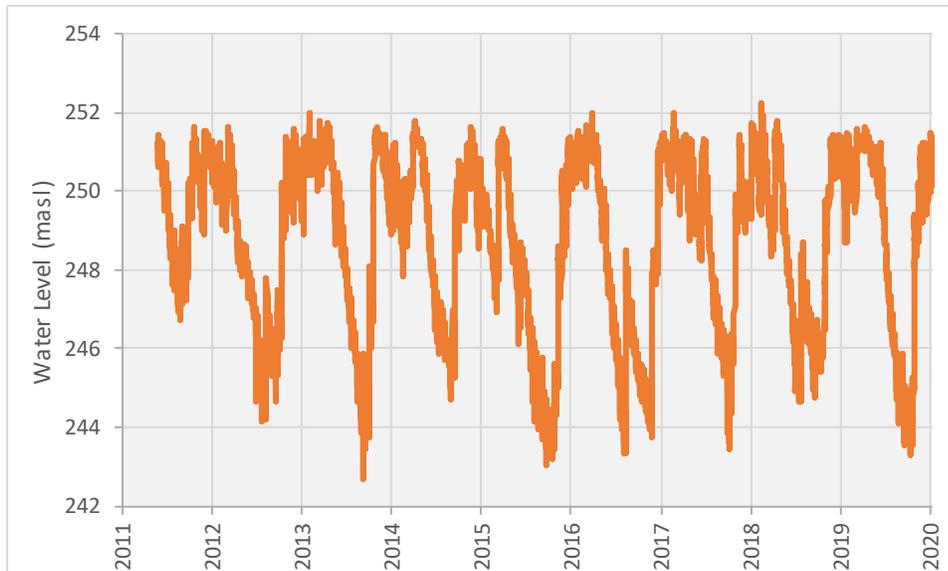
As stated in the 2015 and 2016 AMP Compliance Assessment Report (MTE, 2016, and 2017), the resident declined to be a part of the monitoring program. This remains unchanged, and therefore no water level data was collected at this location in 2019.

#### 2. Private well no. 3447 (owned by HSCL)

Access to the well is limited as it is in a locked shed occupied by the tenant’s scrap material and garbage. HSCL has requested the shed be cleaned up for safer access. Water levels cannot be collected until access to the well has been re-established.

3. *Private well no. 5197 (the Ruthven well)*

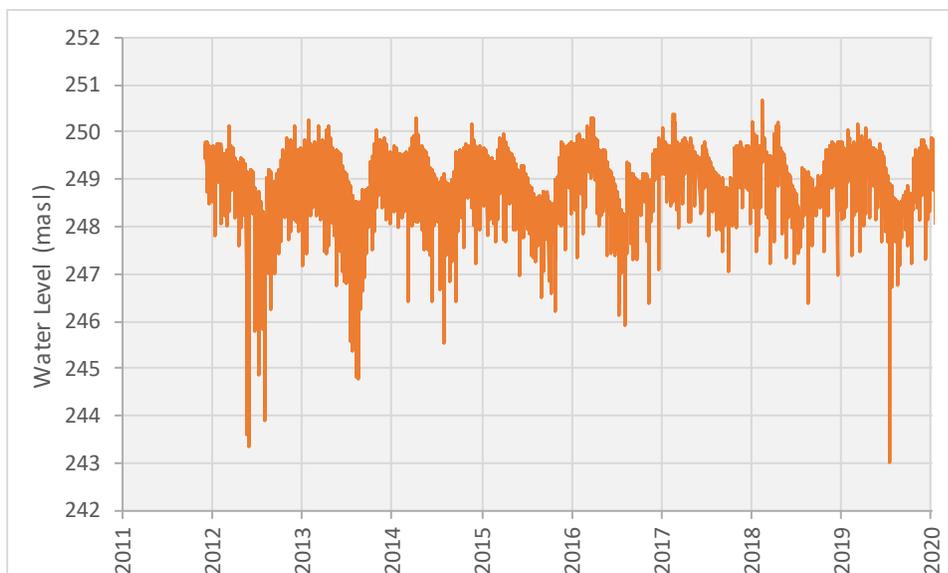
Water levels in Private Well No. 5197 were measured using a data logger. Water levels were like historical values fluctuating around 248 masl on average. At least 4.75 m of water column remained in this well while extraction occurred in 2019, which is like previous years. This information indicates that the water supply has not been affected by extraction.



**FIGURE 7: WATER LEVEL HYDROGRAPH - WELL NO.: 5197**

4. *Private well no. 7253 (the Cramp well)*

Water levels in Private Well No. 7253 were measured using a data logger. Water levels measured in 2019 were like historical values fluctuating around 248 masl (Figure 8). At least 14 m of water column remained in this well while extraction occurred in 2019. This information indicates that the water has not been affected by extraction.



**FIGURE 8: WATER LEVEL HYDROGRAPH – WELL NO.: 7253**

2.4.2 Category “B” Domestic Water Wells

Water levels are to be measured manually from each of the participating Category B private wells on a seasonal basis (3 times per year). PW1, PW2, and PW3 fluctuated seasonally in 2019, with the highest water levels being measured in the spring, the lowest water level in the summer, and then a small amount of recharge in the fall. Water levels measured at the Category B wells in 2019 were comparable to previous years.

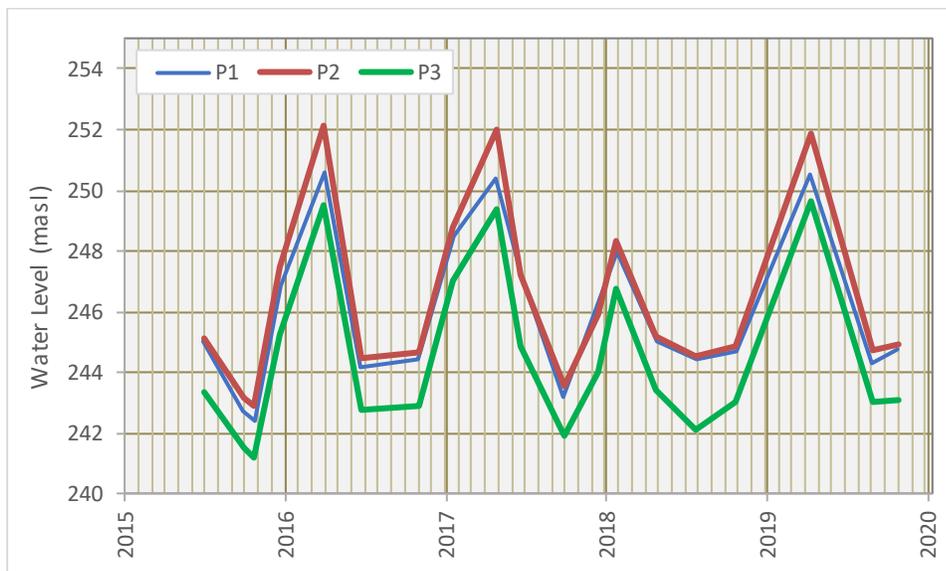


FIGURE 9: CATEGORY B - DOMESTIC WELL WATER LEVELS

2.4.3 Domestic Water Well Interference Complaints

There were no well interference complaints received by HSCL from any of the private wells in 2019

## 2.5 Surface Water Monitoring

### 2.5.1 Shouldice Wetland

The Shouldice Wetland is a Provincially Significant Wetland (PSW). The wetland has been identified as an environmental receptor due to its ecological importance and its unique hydraulic and hydrogeologic characteristics (MTE, 2009). Key indicators used to monitor the Shouldice Wetland include:

- Bedrock Groundwater levels (refer to Section 2.3.2);
- Groundwater recharge (refer to Section 2.3.4);
- Groundwater vertical hydraulic gradients using mini-piezometers (refer to Section 2.3.4);
- Springs (s8, s9, and s13) and the dugout pond;
- Shouldice Wetland culverts; and
- Beaver dam and sinkhole.

As discussed in Sections 2.3, the groundwater conditions indicate that the vertical hydraulic gradients between the Shouldice Wetland and both the overburden and bedrock aquifers were not affected by extraction in 2019. To supplement this information and provide multi-lines of evidence to effectively assess the impacts of aggregate extraction from the Keppel Quarry on the wetland, the following surface water program was conducted in 2019 to comply with the requirements of the AMP:

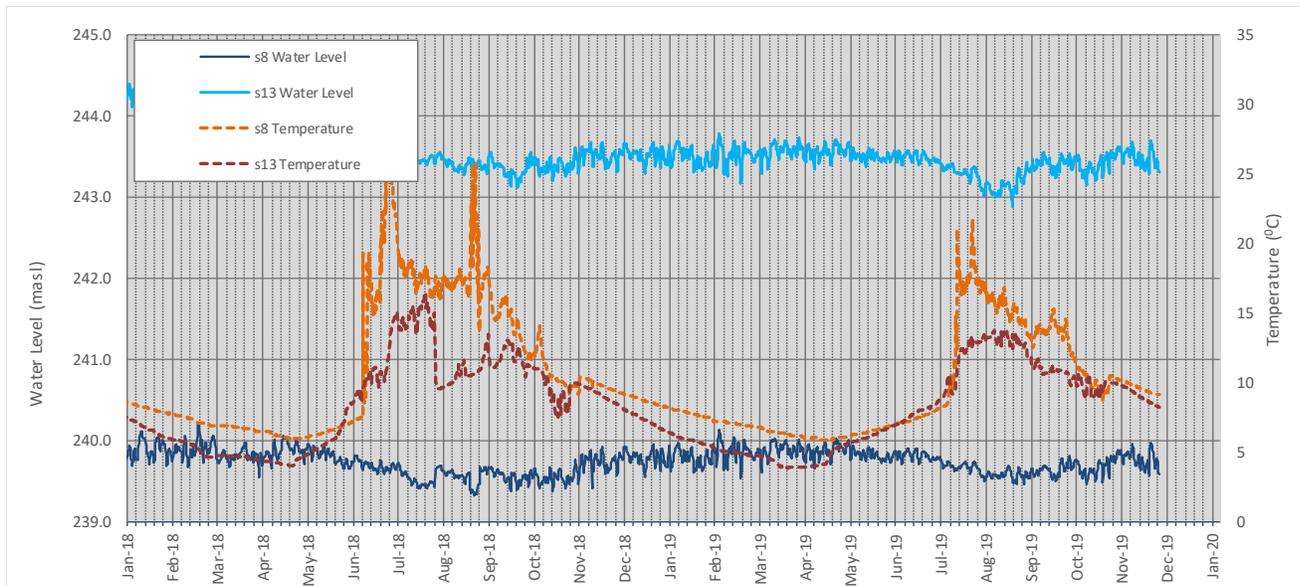
- Continuous and monthly surface water levels, conductivity and temperature measurements (datalogger) at Spring s8, s13 and dugout pond (SG1 and outflow) to characterize the hydroperiod, trends, and to determine the water source (groundwater or surface water);
- Monthly surface water levels and flows at Spring s9;
- Flow conditions at the Shouldice Wetland culverts to confirm the length of hydroperiod and trends; and
- Monthly surface water flows measurements at the beaver dam sinkhole to characterize the hydroperiod and trends. Continuous water level, temperature, and conductivity monitoring to determine the water source (groundwater or surface water).

#### A: Surface Water Stations s8 and s13 and the Dugout Pond

Spring s8 is located along the edge of the Shouldice Wetland, approximately 850m west of Area 1a. Spring s13 is located approximately one kilometer southwest of Area 1A and adjacent to the dugout pond (SG1). The spring locations are identified in Figure 4. The monthly monitoring data are provided in Table 3. Continuous water level and temperature data are presented in Figure 10.

**TABLE 3: SURFACE WATER FIELD MEASUREMENTS**

Date	Surface Water Springs						Dug Pond				
	s8			s13			SG1		Pond Outflow		
	Conductivity µS	Temperature °C	Flow L/s	Conductivity µS	Temperature °C	Flow L/s	Conductivity µS	Temperature °C	Conductivity µS	Temperature °C	Flow L/s
31-Jan-19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26-Feb-19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27-Mar-19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24-Apr-19	556	6.5	F	678	6.9	F	699	7.1	615	7	F
6-May-19	602	8.3	F	702	9	NF	701	9.3	721	9.2	F
25-Jun-19	D	D	D	778	15.5	NF	D	D	D	D	D
1-Jul-19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31-Aug-19	599	19.7	F	1102	21.7	NF	1157	19.9	1005	22.2	NF
26-Sep-19	623	14.2	F	998	18	NF	1146	18.6	848	16.4	F
31-Oct-19	584	9.7	F	1097	9.1	NF	1069	10	994	9.5	F
4-Nov-19	494	6	NF	795	5.4	NF	NA	NA	NA	NA	NA
5-Dec-19	460	2.6	NF	796	3.1	NF	681	2.4	NF	NF	NF
Notes:	F = Flowing										
	NF = No Apparent Flow										
	D = Dry										
	NA = Frozen/No Data										
	ND = No Data										



**FIGURE 10: S8 AND S13 WATER LEVELS AND TEMPERATURE**

The surface water monitoring in 2019 shows that there was flow at s8 between April and November, with a minor period where the system went dry in June. At s13, the flow was only reported during the spring freshet in April. Water levels measured in 2019 at s8 and s13 were comparable to historical values. Flow out of the Pond was reported in the spring (April and May) and again in the fall (September and October). Monitoring results indicate that extraction has not caused any not measurable influence on the surface water regime at these locations.

Historical conductivity values ranged from 447  $\mu\text{S}$  to 623  $\mu\text{S}$  at spring s8, 26  $\mu\text{S}$  to 1,102  $\mu\text{S}$  at spring s13 and 662  $\mu\text{S}$  to 1228  $\mu\text{S}$  at the dugout pond. The 2019 values are comparable to historical data collected at these locations.

#### B: Surface Water Station s9

Spring s9 is either dry, ponded, or frozen, and no flow was observed in 2019.

#### C: Shouldice Wetland culverts

There are several culverts (Culverts 4 through 7) that allow water to cross under a snowmobile trail constructed at the end of Gun Club Road, which through the Shouldice Wetland (Figure 2). Monthly monitoring of surface water flows (observed as 'flowing,' 'no apparent flow,' 'dry' 'frozen or blocked), conductivity, and water temperature is collected to assist in evaluating the hydro-period of the Shouldice Wetland. The monitoring results from 2019 are summarized in Table 4.

Culvert 7 is blocked, and therefore, no monitoring was completed at this location in 2019. The remaining stations were frozen in January, February, and March 2019. Furthermore, the culverts were generally dry between August and September (except Culver 5 and 6a).

The conductivity values collected in 2019 at the culverts ranged from 404 to 712 at the culverts. These values are comparable to historical data collected at these locations. Water temperature values collected in 2019 at the culverts ranged from 4 to 23°C. Historically, temperatures have risen as high as 30°C.

**TABLE 4: CULVERT FIELD MEASUREMENTS**

Location	Parameter	Unit	Monitoring Results							
			24-Apr-19	6-May-19	25-Jun-19	30-Aug-19	26-Sep-19	31-Oct-19	6-Nov-19	4-Dec-19
Culvert 4	Conductivity	mS	659	661	712	D	D	556	541	501
	Temperature	°C	6.1	9.9	15.6	D	D	9.4	4.5	4.1
	Flow	L/s	F	NF	NF	D	D	F	NF	NF
Culvert 5	Conductivity	mS	553	490	587	404	452	497	529	481
	Temperature	°C	5.9	9.5	16.3	22	15.8	8.6	5.1	4
	Flow	L/s	F	F	F	F	F	F	F	F
Culvert 5a	Conductivity	mS	687	562	699	D	D	564	497	426
	Temperature	°C	6	10	15.7	D	D	9.5	5.8	4.4
	Flow	L/s	NA	NA	NA	D	D	F	F	NF
Culvert 6	Conductivity	mS	429	485	501	D	D	625	422	439
	Temperature	°C	5.9	11.6	16	D	D	9.5	5.4	4.7
	Flow	L/s	F	F	F	D	D	F	F	F
Culvert 6a	Conductivity	mS	416	450	522	505	480	446	427	500
	Temperature	°C	6.3	11	17.6	23	18	9.2	5.1	4.1
	Flow	L/s	F	F	NF	NF	F	F	F	NF
Culvert 7	Conductivity	mS	NA	NA	NA	D	D	NA	NA	NA
	Temperature	°C	NA	NA	NA	D	D	NA	NA	NA
	Flow	L/s	NA	NA	NA	D	D	NA	NA	NA
Notes:	F = Flowing									
	NF = No Apparent Flow									
	D = Dry									
	NA = Frozen or Blocked									

#### D: Beaver Dam and Sinkhole

The beaver dam and sinkhole are located approximately 850 m north of the Keppel Quarry (Figure 4) in the Shouldice Wetland. The beaver dam maintains surface water levels in the north portion of the Shouldice Wetland, which would otherwise recharge the shallow groundwater regime by the sinkhole located at the edge of the wetland. During high water levels, surface water drains over the dam and recharges the bedrock along a prominent joint in the limestone bedrock. This sinkhole is a discrete karst feature that is connected to springs s1-s3 in the Glen Management Area.

Monthly monitoring of surface water flows (observed as ‘flowing,’ ‘no apparent flow,’ ‘dry,’ ‘frozen’), conductivity, and water temperature is collected to assist in evaluating the hydro-period of the Shouldice Wetland. The monitoring results from 2019 are summarized in Table 5.

**TABLE 5: BEAVER DAM AND SINK HOLE FIELD MEASUREMENTS**

Date	Beaver Dam					
	Sinkhole			Dam		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	µS	°C	L/s	µS	°C	L/s
30-Jan-19	NA	NA	NA	NA	NA	NA
27-Feb-19	NF	NF	NF	NF	NF	NF
27-Mar-19	519	6.1	F	555	4.7	F
24-Apr-19	654	6.9	F	700	6.8	F
7-May-19	680	11.8	F	712	12.1	F
26-Jun-19	D	D	D	596	19.4	NF
1-Jul-19	ND	ND	ND	ND	ND	ND
31-Aug-19	D	D	D	532	22.3	F
26-Sep-19	721	13.1	F	498	14.5	F
30-Oct-19	637	8.5	F	601	8.7	F
4-Nov-19	NF	NF	NF	592	4.1	F
4-Dec-19	NF	NF	NF	613	2.3	NF
Notes:	F = Flowing					
	NF = No Apparent Flow					
	D = Dry					
	NA = Frozen/No Data					
	ND = No Data					

Based on the flow data collected at the beaver dam, water was observed flowing through and into the cove all year except for dry periods in June and likely July. Flow observations at the sinkhole are made at the eastern extent of the cove, and flow ended in June with minor flow occurring again during the month of October. Even though flows at the sinkhole ended in June, the hydroperiod for the sinkhole is tied to the flow through the beaver dam because the bedrock joint extends through the entire cove and water sinks along its entire length (Cowell, 2008).

Conductivity values collected in 2019 at the dam and sinkhole ranged from 498 and 712  $\mu\text{s}/\text{cm}$  and 519  $\mu\text{s}/\text{cm}$  to 721  $\mu\text{s}/\text{cm}$ , respectively. The conductivity ranges fall within the historical conductivity values for these locations. Water temperature values collected in 2019 at the beaver dam and sinkhole range from 2.3 to 22.3  $^{\circ}\text{C}$  and 6.1 and 13.1 $^{\circ}\text{C}$ , respectively. These values are comparable to historical data collected at these locations.

### Summary

The monitoring results indicate that there has been no measurable impact on the Shouldice Wetland. This monitoring shall continue as extraction in Phase 1B and 2 proceed. The continued monitoring will provide the information required to assess the potential impact of extraction on the wetland's form and function. This assessment is needed to allow for the holding provision on Area 3 to be lifted by the MNRF and MECP to allow for the extraction of this area.

If the monitoring results indicate a potential impact, an infiltration pond is to be constructed to augment flow to spring s13 and the Dugout Pond. If required, then the infiltration pond shall be constructed in the headwater recharge area for spring s13. As presented, the monitoring data collected in 2019 did not trigger the construction of the infiltration pond.

### *2.5.2 Glen Management Area*

The north portion of the Glen Management Area located approximately 500 m north of the Area 1a is monitored as part of the AMP. The key indicators that are used to monitor this feature include:

- Bedrock Groundwater Levels at OW49-OW52 (refer to Section 2.3.2);
- Beaver Dam and Sink Hole (refer to Section 2.5.1);
- Glen Management Area Springs (s1, s2, and s3);
- Mud Creek (Channel A and Channel B);
- Glen Management Area Springs (s4 (a-c), s5);
- Ducks Unlimited Dam; and
- Ephemeral Pond.

As discussed in Sections 2.3.2, the groundwater conditions near the Glen Management Area have continued to fluctuate within the historical ranges. To support this conclusion and to provide multiple lines of evidence to effectively assess the impacts of aggregate extraction from the Keppel Quarry on the Glen Management Area, monthly surface water flows, conductivity and temperature are measured at the groundwater spring (s1, s2, and s3), Mud Creek (Channel A and B), and the Ducks Unlimited Dam (outflow weir).

### A: Glen Management Area Springs (s1, s2, and s3)

The field measurements collected at the Glen Management Area springs (s1-s3) are provided in Table 6. The surface water flow data continues to show that the hydro-period for these springs extended from January through to December in 2019. This information is consistent with the historical data.

**TABLE 6: GLEN MANAGEMENT SPRINGS FIELD MEASUREMENTS (S1, S2, AND S3)**

Date	Surface Water Springs								
	s1			s2			s3		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	$\mu\text{S}$	$^{\circ}\text{C}$		$\mu\text{S}$	$^{\circ}\text{C}$		$\mu\text{S}$	$^{\circ}\text{C}$	
31-Jan-19	475	2.2	F	428	1.8	F	444	2	F
28-Feb-19	459	4	F	433	4.1	F	490	4.1	F
27-Mar-19	522	4.2	F	576	4.4	F	554	4.6	F
25-Apr-19	515	7	F	522	6.9	F	537	6.6	F
7-May-19	601	13.2	F	597	14	F	606	14.5	F
25-Jun-19	555	19	F	541	18.6	F	622	18.8	F
24-Jul-19	NA	NA	F	NA	NA	D	NA	NA	F
31-Aug-19	517	17.7	F	489	18.2	F	617	20	F
27-Sep-19	590	15.3	F	566	15	F	577	14.9	F
31-Oct-19	508	8.9	F	616	8.4	F	650	9	F
4-Nov-19	622	5.4	F	609	5.6	F	663	5.4	F
6-Dec-19	499	4	F	500	4.4	F	580	4.3	F
Notes:	F = Flow								
	NF = No Apparent Flow								
	D = Dry								
	NA = Frozen/No Data								

Conductivity values collected in 2019 range between 428  $\mu\text{S}/\text{cm}$  and 663  $\mu\text{S}/\text{c}$ , which is comparable to historical data. Conductivity values in this range indicate that there is a mix of groundwater and surface water flowing from these features (Cowell, 2009). Water temperature values collected in 2019 at the springs range between  $2^{\circ}\text{C}$  and  $20^{\circ}\text{C}$ . Due to inputs from groundwater at these springs, their temperatures historically have not exceeded  $22^{\circ}\text{C}$ . The water temperatures recorded at these springs in 2019 were comparable to historical data collected at these locations.

#### B: Mud Creek Channel A and Channel B

The headwaters for Mud Creek include springs s1-s3. There are two channels that flow from these springs into Mud Creek. These are referred to as:

- Channel A, the main channel; and
- Channel B, a secondary channel that flows intermittently.

Field measurements collected in 2019 at Mud Creek (Channel A and B) are found in Table 7.

**TABLE 7: MUD CREEK FIELD MEASUREMENTS**

Date	Mud Creek					
	Channel A			Channel B		
	Conductivity	Temperature	Flow	Conductivity	Temperature	Flow
	$\mu\text{S}$	$^{\circ}\text{C}$		$\mu\text{S}$	$^{\circ}\text{C}$	
31-Jan-19	456	2	F	NA	NA	NA
28-Feb-19	509	4	F	NF	NF	NF
27-Mar-19	552	6.2	F	NF	NF	NF
25-Apr-19	512	6.7	F	NF	NF	NF
7-May-19	445	12.1	F	NF	NF	NF
25-Jun-19	436	15.9	F	NF	NF	NF
24-Jul-19	NA	NA	NA	NA	NA	NA
31-Aug-19	478	17.9	F	D	D	D
27-Sep-19	499	13.8	F	D	D	D
31-Oct-19	516	10	F	D	D	D
4-Nov-19	447	6.6	F	NF	NF	NF
6-Dec-19	412	4.9	F	D	D	D
Notes:	F = Flow					
	NF = No Apparent Flow					
	D = Dry					
	NA = Frozen					

Based on the 2019 flow data collected, the hydroperiod for Channel A extended from December through to January. The existence (and therefore, significance) of Channel B remains unclear. Generally, there is only

ponded water in the area of the channel. This information is consistent with historical data, which has Channel B as either ponded or dry throughout the year, whereas Channel A flows almost all year.

Conductivity values ranged from 455  $\mu\text{S}/\text{cm}$  to 645  $\mu\text{S}/\text{cm}$  for Channel A in 2019. Water temperature in Channel A ranged from 2°C to about 18°C. The conductivity and temperature values all fall within the historical ranges.

**C: Glen Management Area Springs (s4a, s4b, s4c, and s5)**

The field measurements collected at the Glen Management Area springs (s4a, s4b, s4c, and s5) are provided in Table 8. The surface water flow data continues to show that the hydro-period for these springs extended from January through to June in 2019. This information is consistent with the historical data.

**TABLE 8: GLEN MANAGEMENT SPRINGS FIELD MEASUREMENTS (S4 AND S5)**

Date	Surface Water Springs											
	s4a			s4b			s4c			s5		
	Conductivity $\mu\text{S}$	Temperature $^{\circ}\text{C}$	Flow									
31-Jan-19	NA	NA	NA									
28-Feb-19	NA	NA	NA									
27-Mar-19	690	5.1	F	606	4.9	F	NA	NA	NA	NA	NA	NA
25-Apr-19	652	6.8	F	712	7	F	696	5.9	F	668	6.1	F
7-May-19	688	11	F	680	12.1	F	655	13.3	F	D	D	D
25-Jun-19	554	14.5	D	D	D	D	D	D	D	D	D	D
1-Jul-19	NA	NA	D									
31-Aug-19	D	D	D	D	D	D	D	D	D	D	D	D
27-Sep-19	D	D	D	D	D	D	D	D	D	D	D	D
31-Oct-19	D	D	D	D	D	D	D	D	D	D	D	D
4-Nov-19	700	6	D	635	5.8	F	690	5.5	F	D	D	D
6-Dec-19	666	4.2	F	687	4.1	F	674	4.1	F	D	D	D

Notes:  
 F = Flow  
 NF = No Apparent Flow  
 D = Dry  
 NA = Frozen

**D: Ducks Unlimited Dam**

The field measurements collected at the Ducks Unlimited Dam outflow weir are provided in Table 9. The surface water flow data continues to show that the hydro-period for these springs extended year-round. This information is consistent with the historical data.

**TABLE 9: DUCKS UNLIMITED DAM FIELD MEASUREMENTS**

Date	Ducks Unlimited Dam		
	Conductivity	Temperature	Flow
	$\mu\text{S}$	$^{\circ}\text{C}$	
31-Jan-19	No data	No data	F
28-Feb-19	No data	No data	F
27-Mar-19	522	5.9	F
25-Apr-19	509	6.2	F
7-May-19	493	12.5	F
25-Jun-19	427	21.1	F
24-Jul-19	No data	No data	F
31-Aug-19	577	23.5	F
27-Sep-19	608	19.9	F
31-Oct-19	555	9.8	F
4-Nov-19	457	6.6	F
6-Dec-19	411	5.7	F

Notes:  
 F = Flow  
 NF = No Apparent Flow  
 D = Dry  
 NA = Frozen

**E: Ephemeral Pond**

There was an ephemeral pond on Lot 26 Concession 10. The AMP requires that three years of baseline water levels be measured using a staff gauge in this feature prior to extraction occurring within Area 1B. Water levels shall be measured during the amphibian breeding season, which extends from April 1 to June 30. The results from 2019 are provided in Table 10.

**TABLE 10: EPHEMERAL POND**

Date	Ephemeral Pond water depth	Date	Ephemeral Pond water depth	Date	Ephemeral Pond water depth
3-Apr-19	0.62	2-May-19	0.59	5-Jun-19	0.45
10-Apr-19	0.62	8-May-19	0.54	12-Jun-19	0.39
17-Apr-19	0.6	16-May-19	0.5	20-Jun-19	0.38
25-Apr-19	0.59	23-May-19	0.5	25-Jun-19	0.36
		30-May-19	0.47		

### 3.0 ASSESSMENT OF TRIGGER VALUES

The AMP for the Keppel Quarry currently relies on seasonal site-specific trigger water level elevations at selected sentry monitoring wells and surface water monitoring locations. Trigger values were determined based on the evaluation of baseline water level data and based these levels on the predicted the maximum extent of the cone of influence once the New Keppel Quarry is fully extracted. By defining the maximum extent of the cone of influence, suitable trigger values were set that would activate mitigation measures if the observed values collected through the Water Resources Monitoring Program are lower than predicted.

The approved trigger values were set for four quarterly seasonal periods (spring, summer, fall, and winter). For selected monitoring locations, there are three standard categories of trigger values; green, yellow, and red. Green trigger values were set at 15 cm above observed seasonal lows. Yellow trigger values are equal to observed seasonal lows for each location. Red trigger values were set at 15 cm below observed seasonal lows.

Since the AMP has been implemented, there have been numerous false-positive trigger exceedances. The reasons for these exceedances include:

1. Seasonal conditions were assessed based on monthly spot measurements, which may not have captured actual seasonal low water level conditions;
2. The oversimplification of the approach to setting the triggers (broadly apply a 15 cm drawdown to all sentry monitoring locations); and
3. The neglect to account for the full impact of climate change during the development of the AMP.

Limiting drawdown to 15 cm during a set period, which defines a season at a selected sentry location, is a strict criterion to ensure minimal impact from quarry dewatering (as this is a relatively small change in the water level). However, the approach has one significant drawback, which is the lack of consideration in the variability in the seasonal variation in water levels. For example, for OW51, the water level fluctuates 5 m. If the water level drops an additional 15 cm, that change only represents 3% of the variability. At OW12s, the water level fluctuates only 1.38 m seasonally. If the water level drops an additional 15 cm, that change increase to 11% of the variability. Therefore, the use of seasonal trends should be considered. Furthermore, the development of a single site-specific trigger value for each sentry monitoring location would result in a more appropriate drawdown trigger value.

In addition, the full impact of climate change must be incorporated into the development of revised trigger values. Climate change has resulted in an increase in the frequency and intensity of some types of extreme weather events. For example, warming is causing more rain to fall in heavy isolated downpours. There are also longer dry periods between rainfalls. This, coupled with more evaporation due to higher temperatures, intensifies drought conditions. In addition, season creep, which refers to observed changes in the timing of the seasons, has been widely observed in Ontario (refer to Section 2.1).

Since 2015, the yellow and red triggers set for the Keppel Quarry have been exceeded numerous times. Therefore, it is recommended that the trigger mechanism for both the surface water and groundwater be re-

evaluated. As per Condition 10.3 of the AMP, a Site Plan Amendment application must be submitted to the MNRF so that any revisions to the trigger values can be considered.

#### **4.0 CONCLUSION**

Based on the monitoring data, Whitewater concludes that extraction did not cause any negative impacts on groundwater resources in 2019.

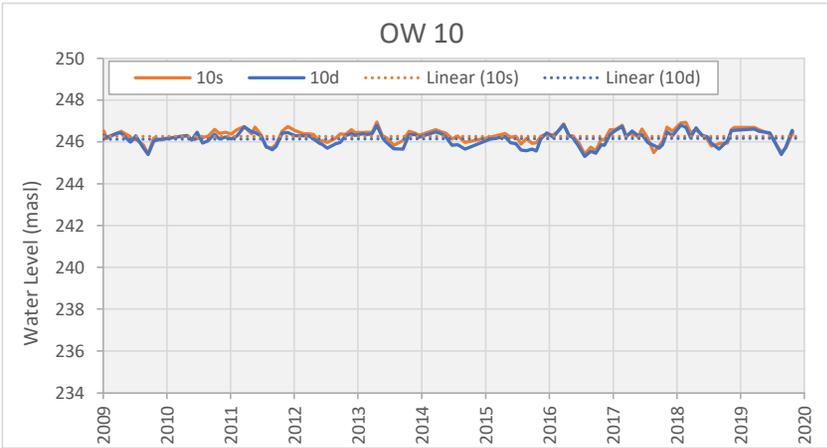
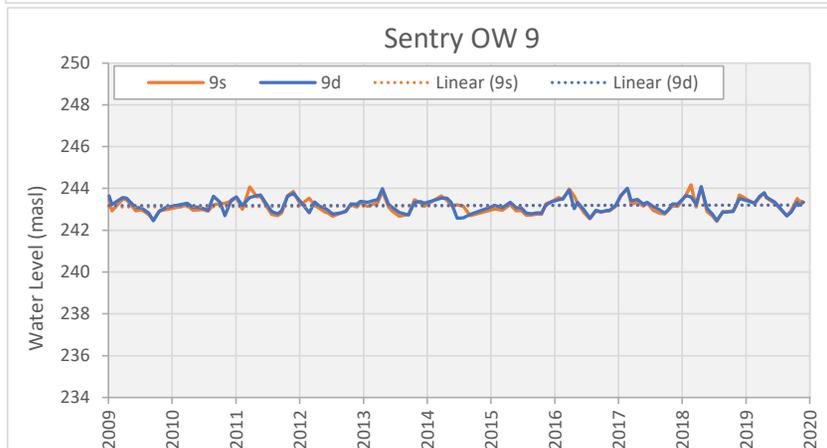
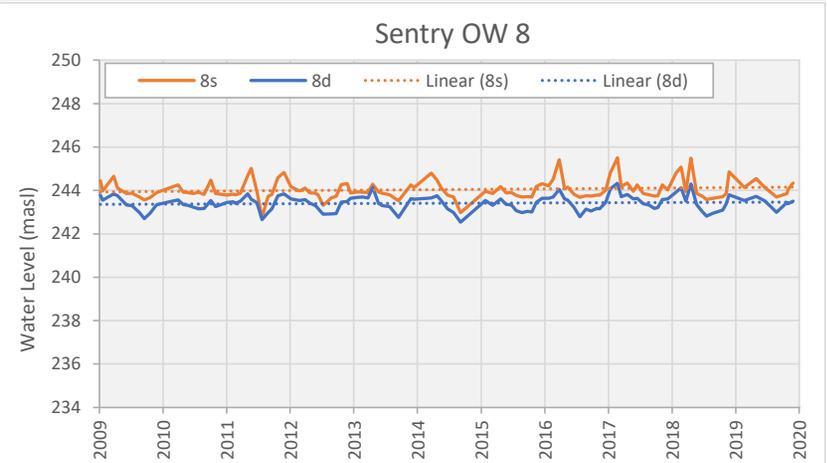
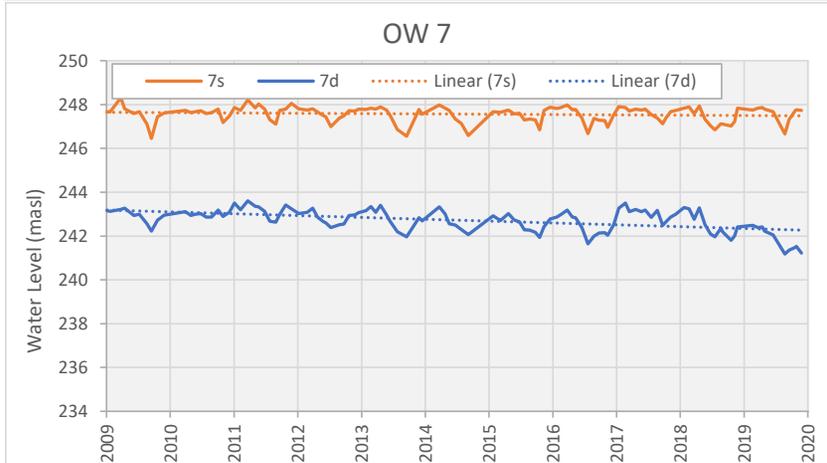
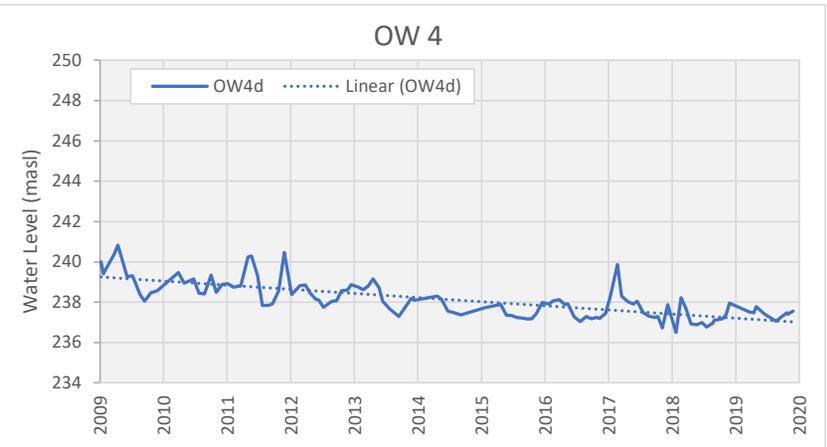
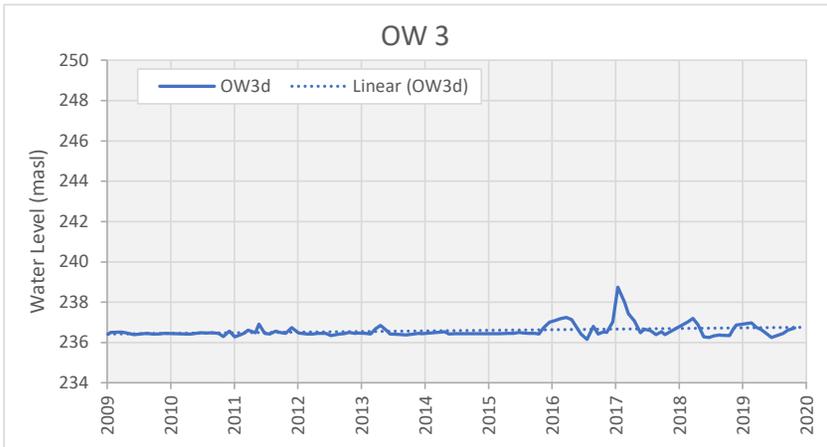
#### **5.0 RECOMMENDATIONS**

Subject to approval from MNRF, the AMP shall be updated to include any recommended changes to the groundwater and surface water monitoring program, including threshold methodologies and threshold values.

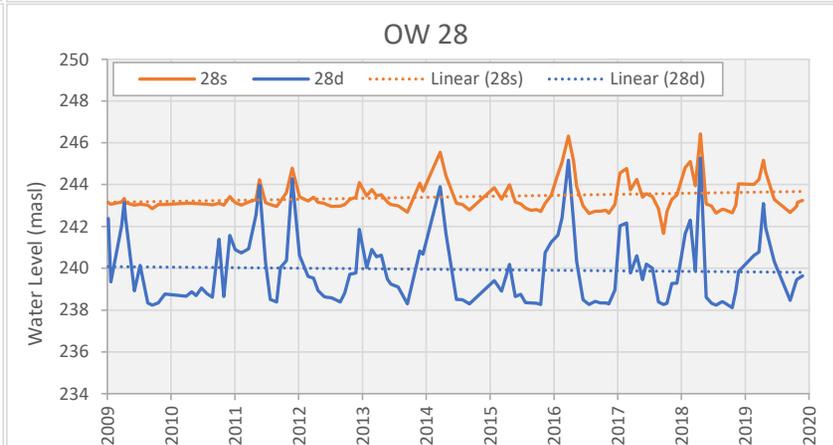
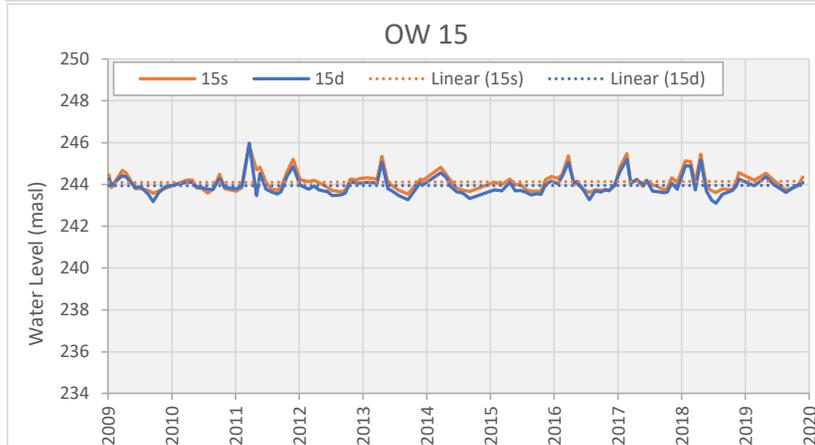
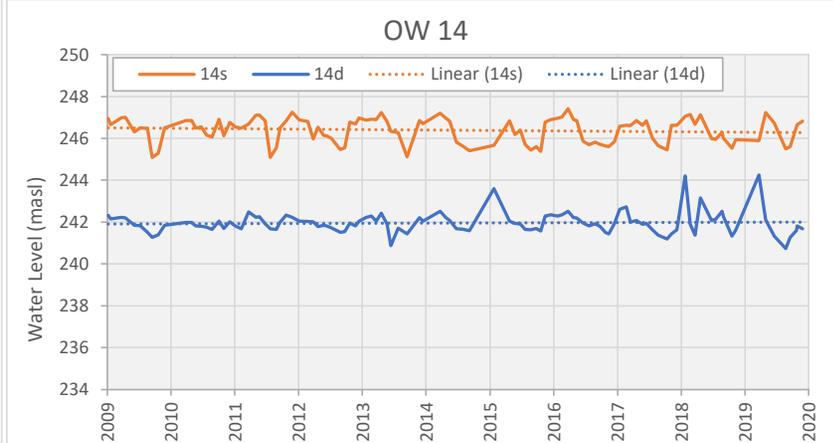
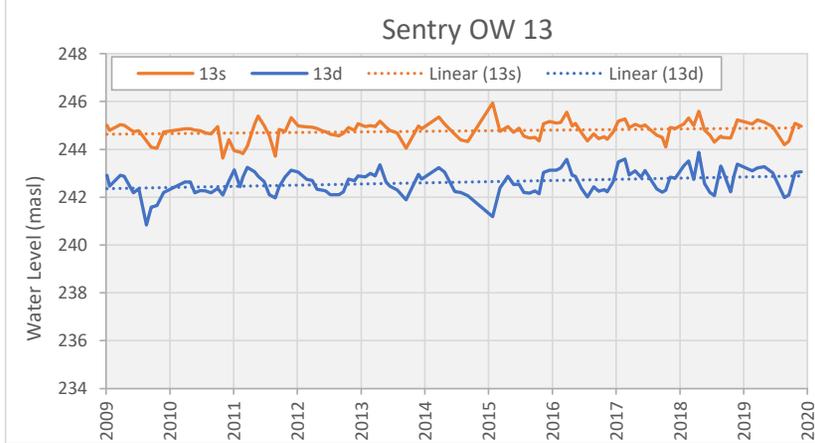
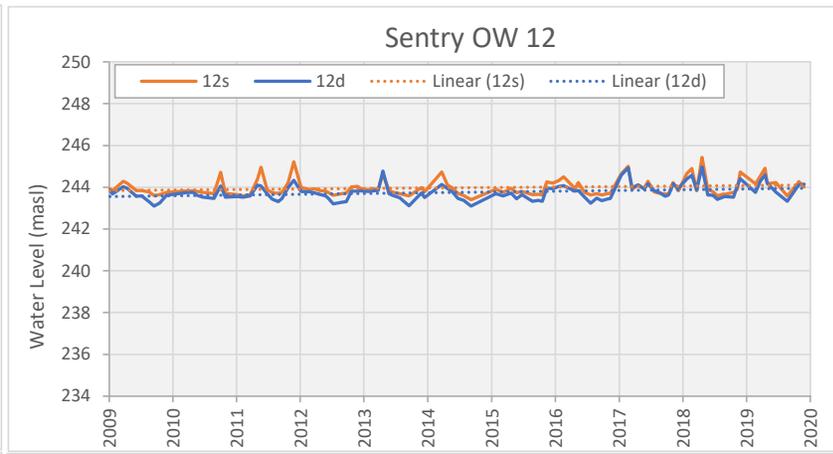
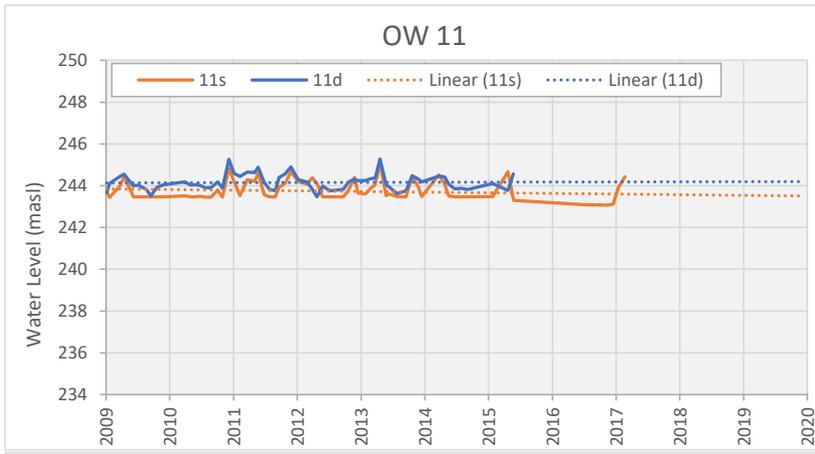
**APPENDIX A1**  
**GROUNDWATER HYDROGRAPHS**

**APPENDIX A1-a**  
**GROUNDWATER MONITORING WELLS**

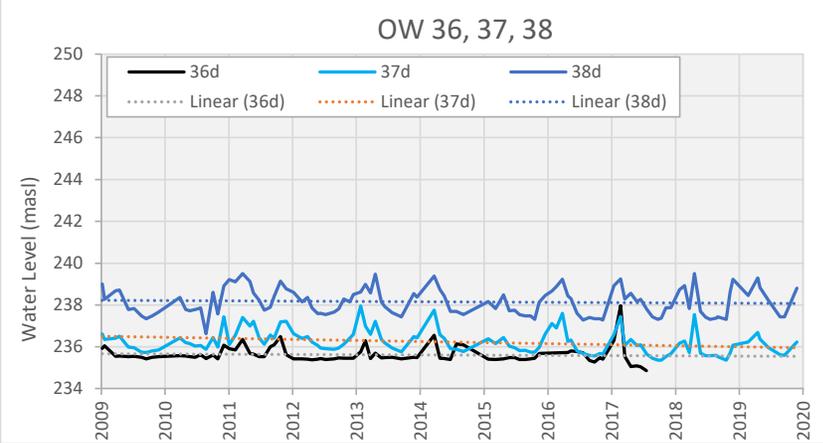
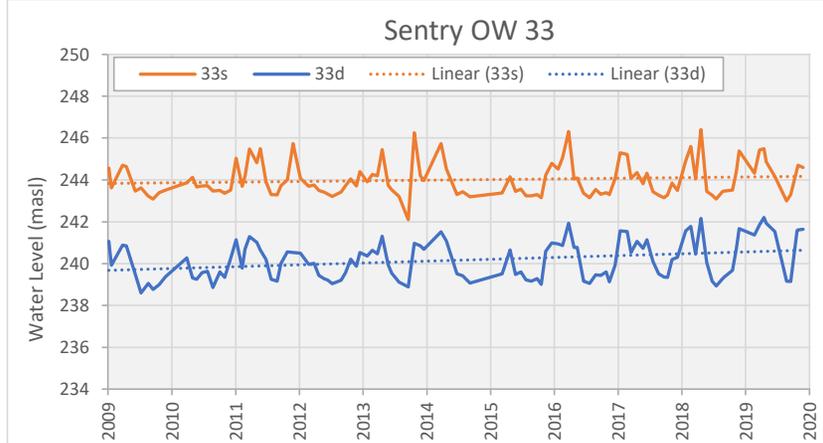
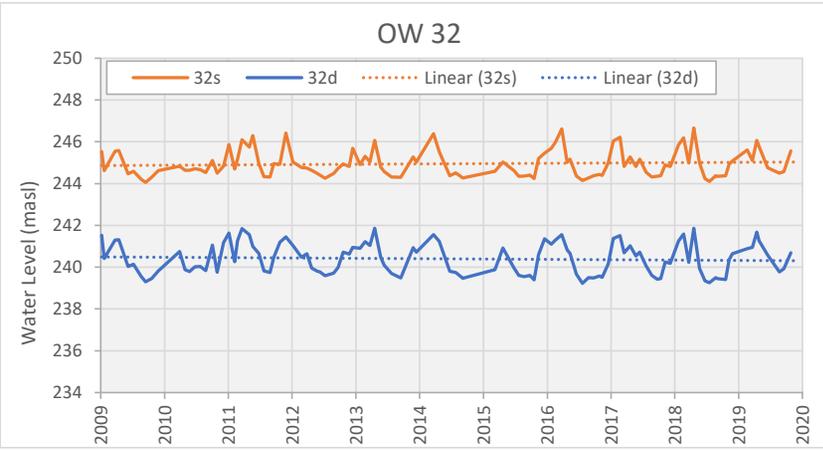
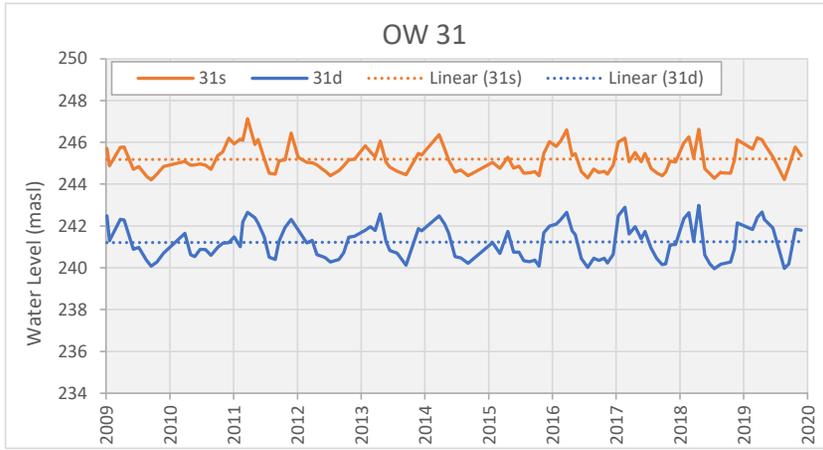
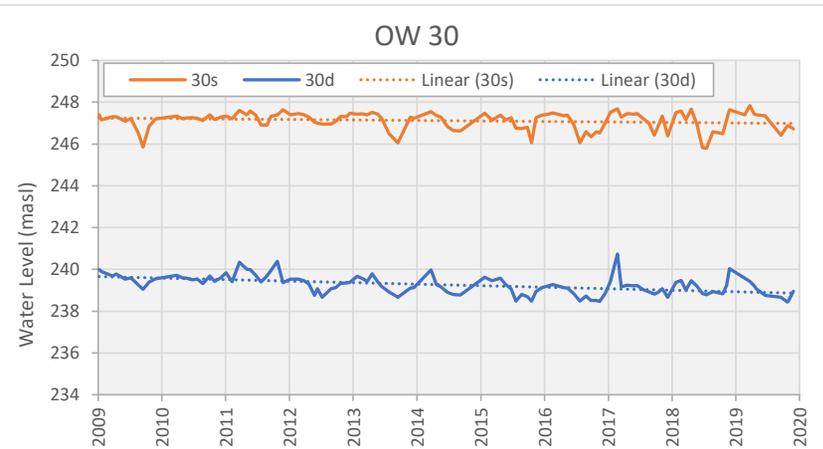
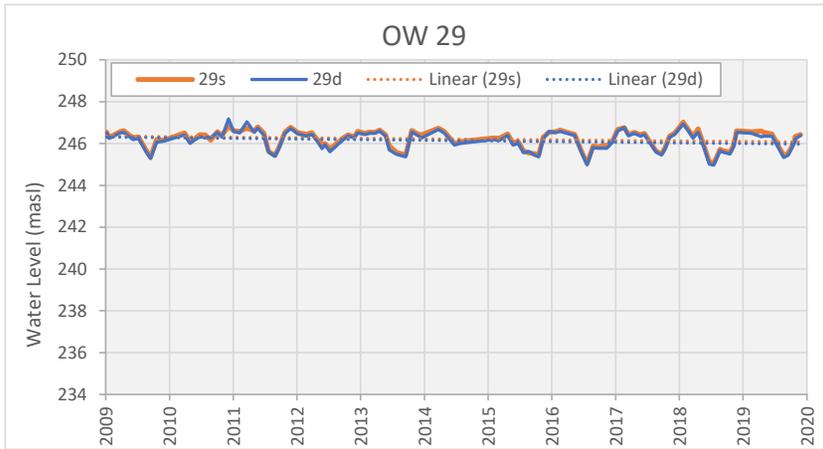
Keppel Quarry: Appendix A-1a  
Groundwater Hydrographs



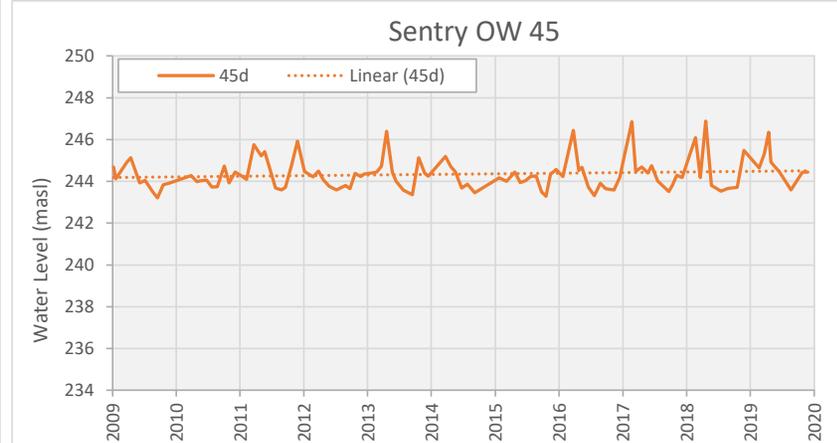
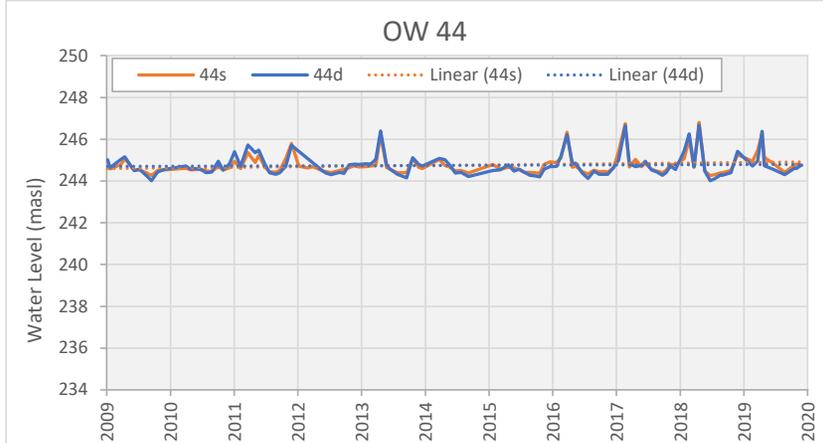
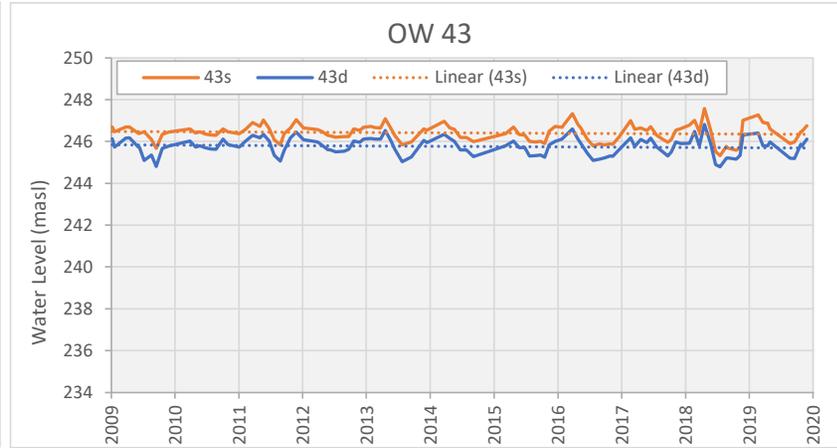
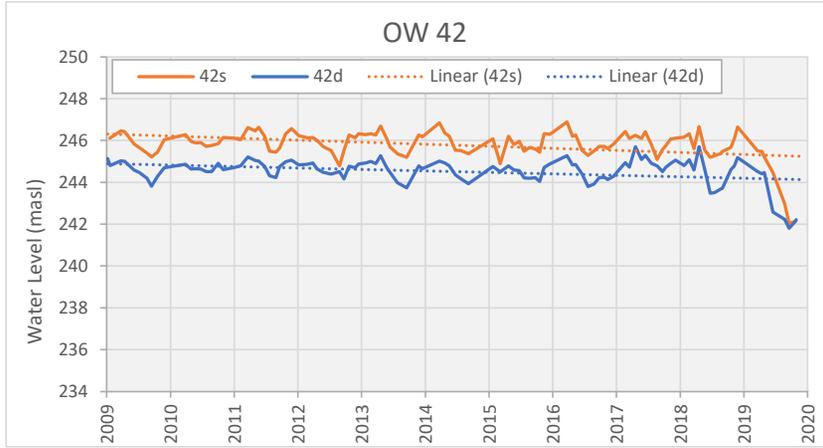
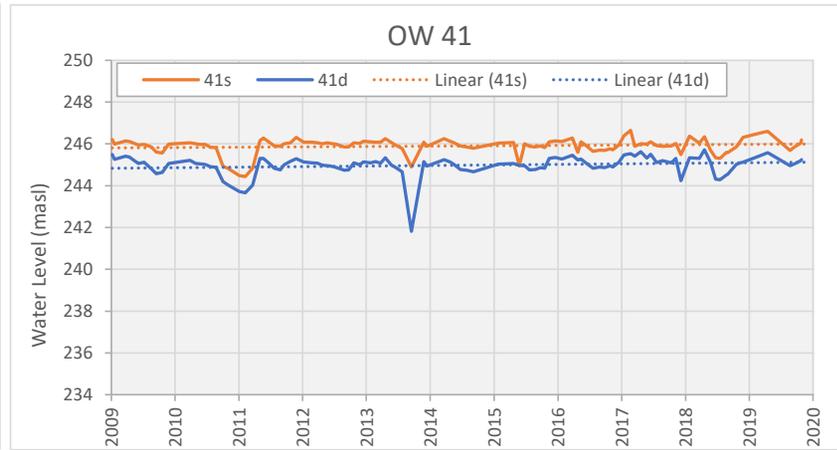
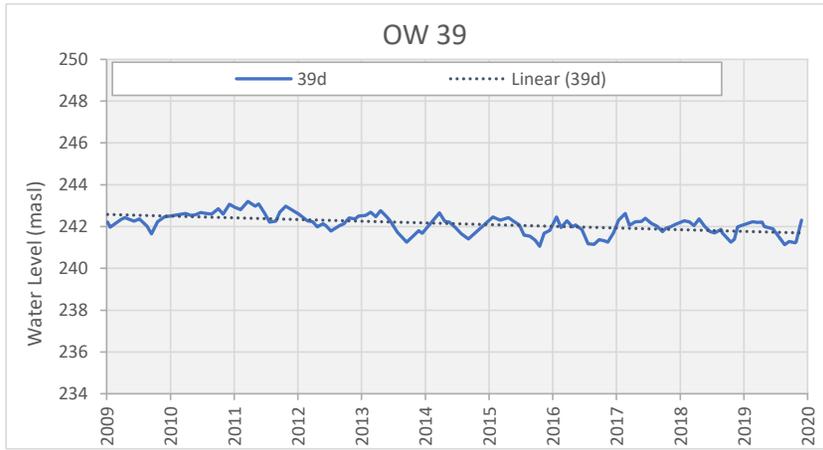
Keppel Quarry: Appendix A-1a  
Groundwater Hydrographs



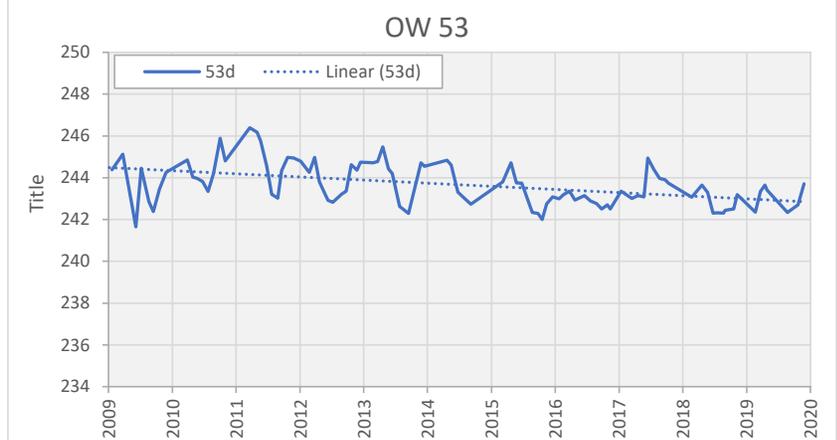
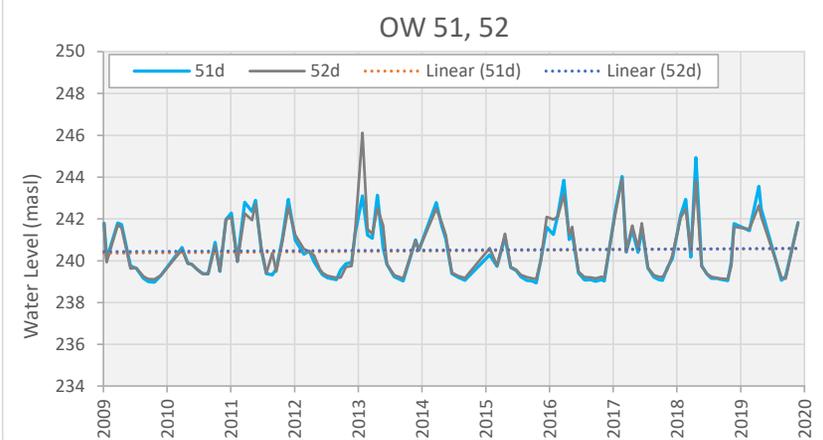
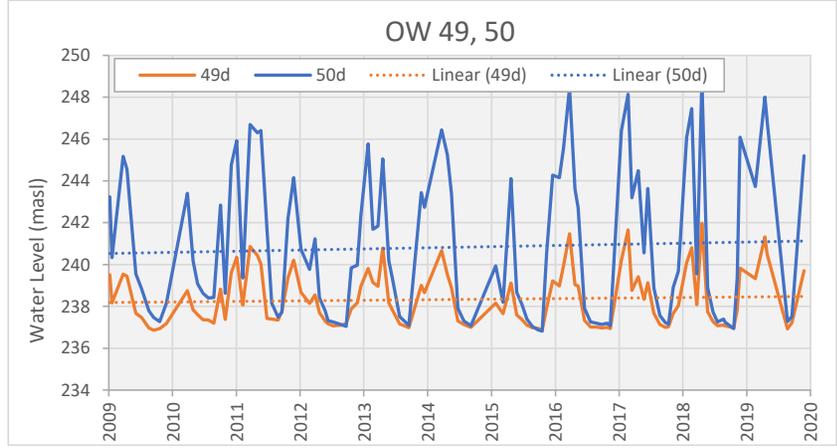
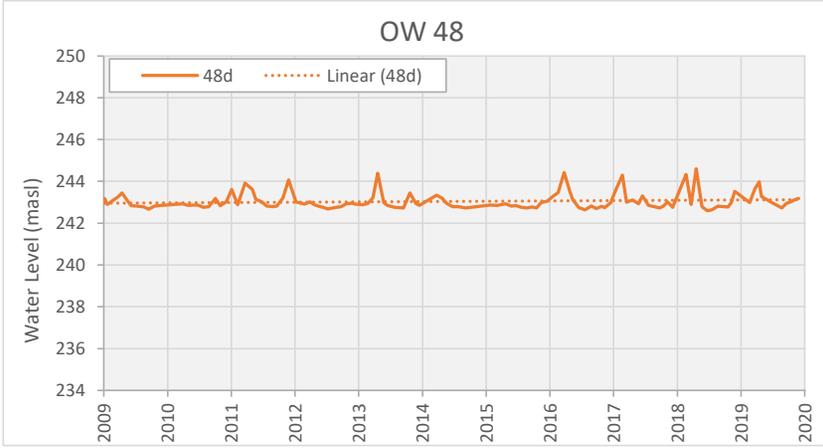
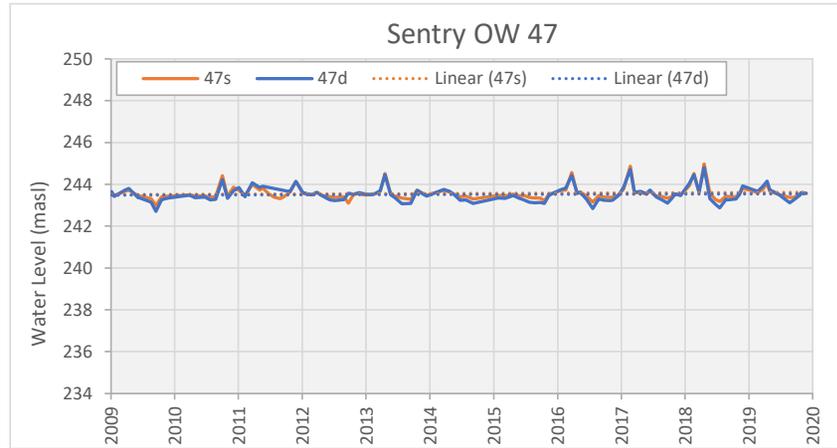
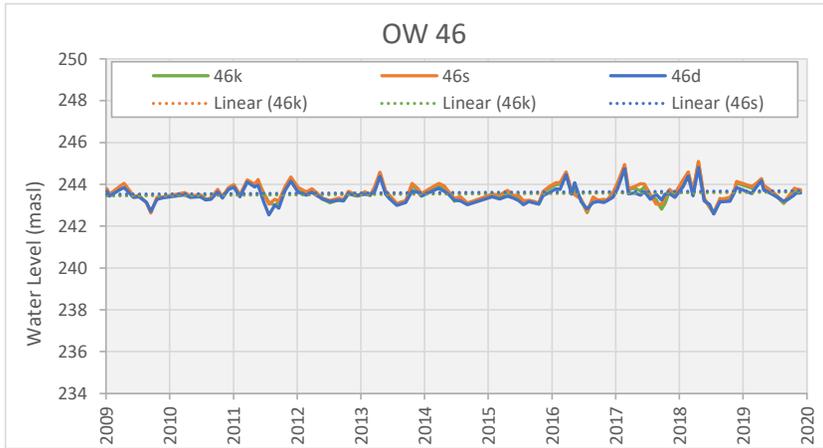
### Keppel Quarry: Appendix A-1a Groundwater Hydrographs



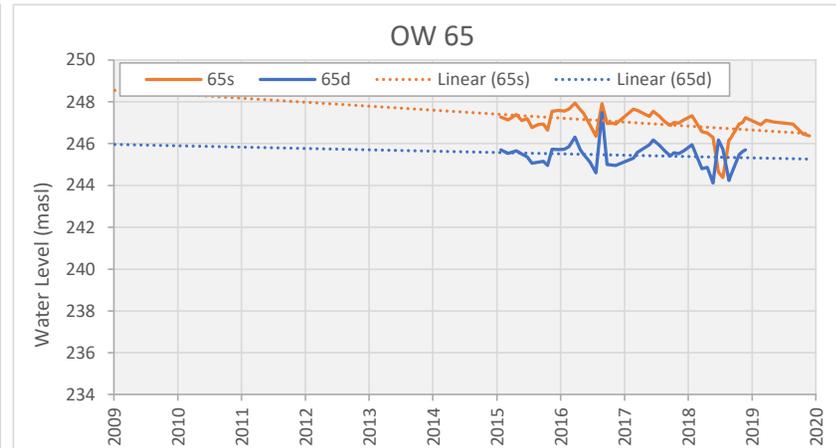
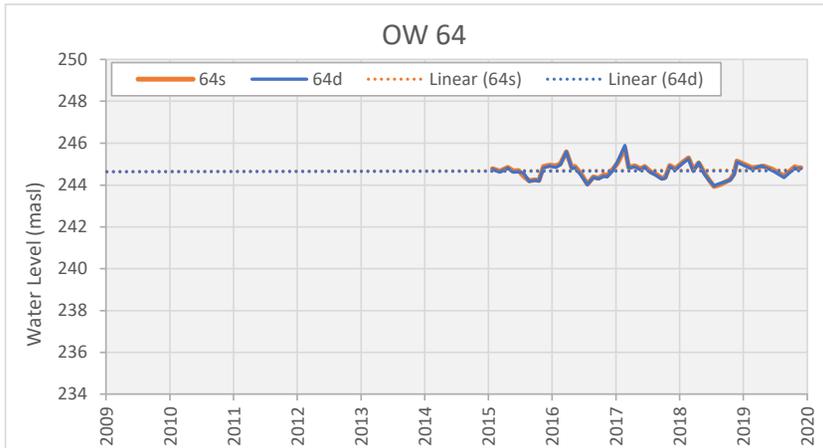
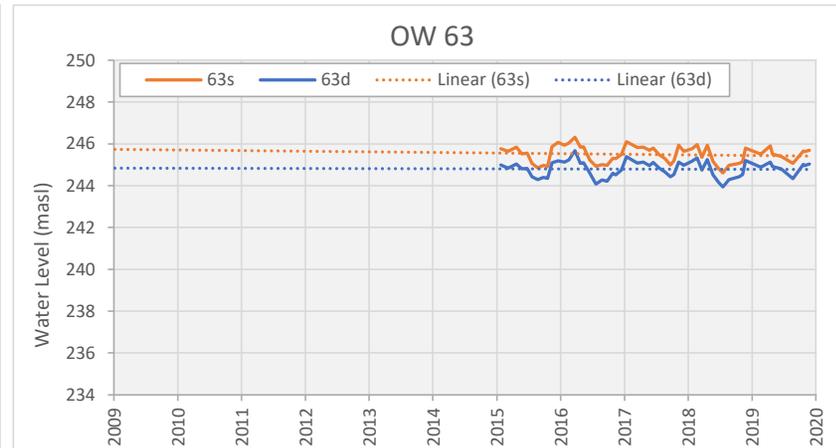
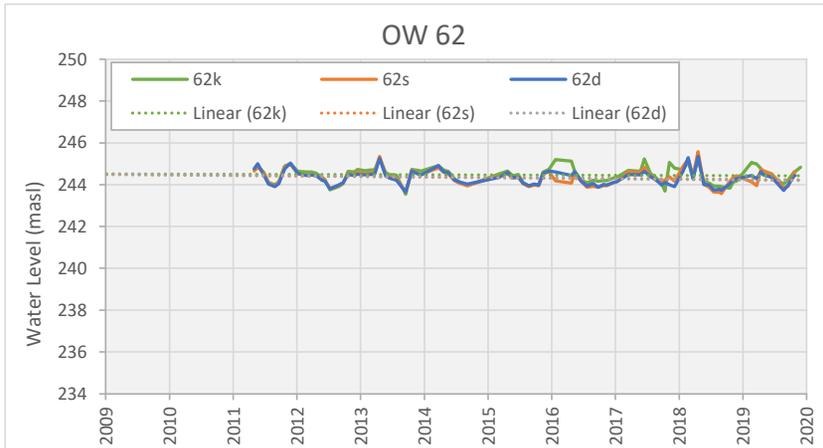
Keppel Quarry: Appendix A-1a  
Groundwater Hydrographs



**Keppel Quarry: Appendix A-1a  
Groundwater Hydrographs**



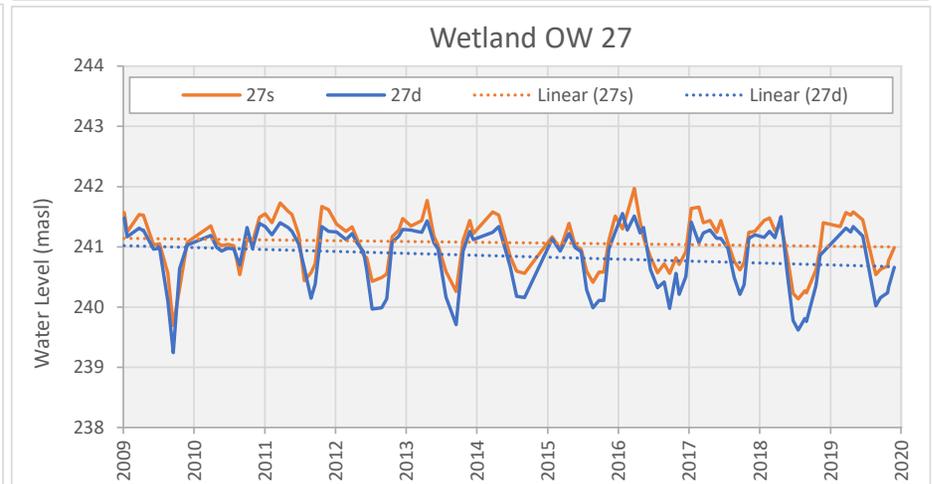
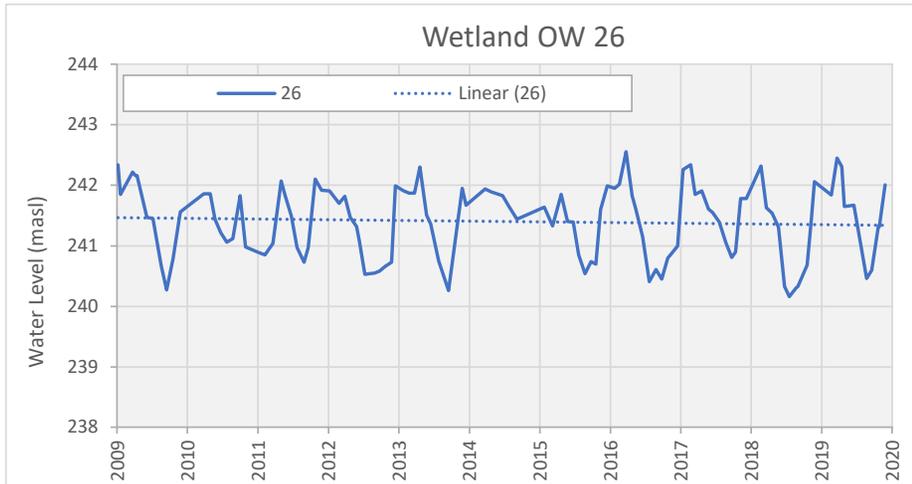
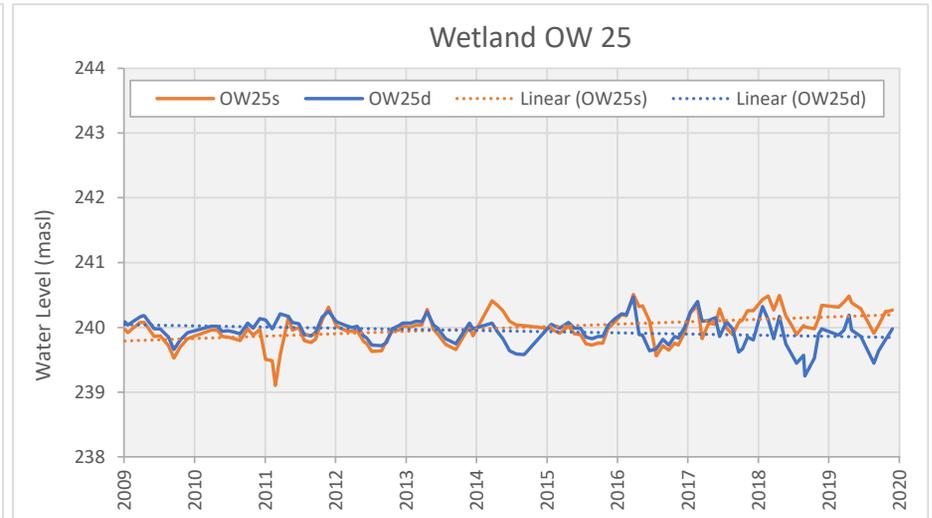
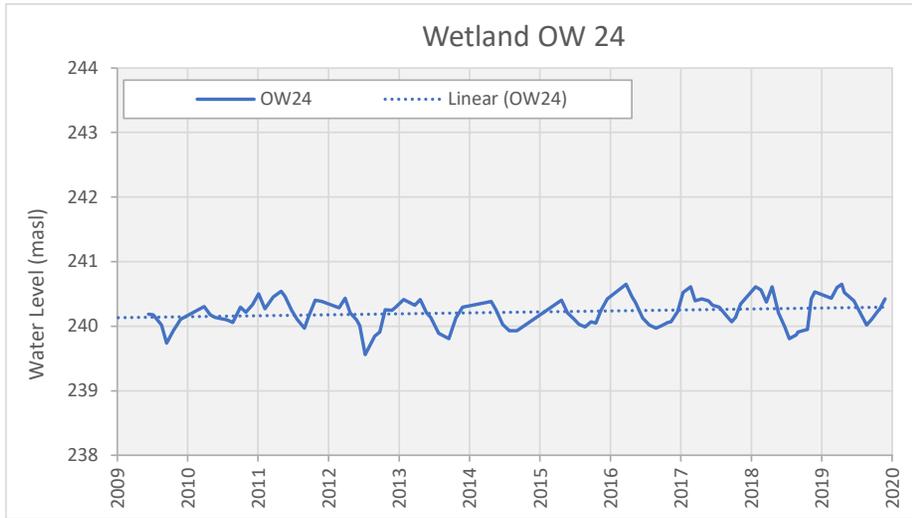
**Keppel Quarry: Appendix A-1a  
Groundwater Hydrographs**



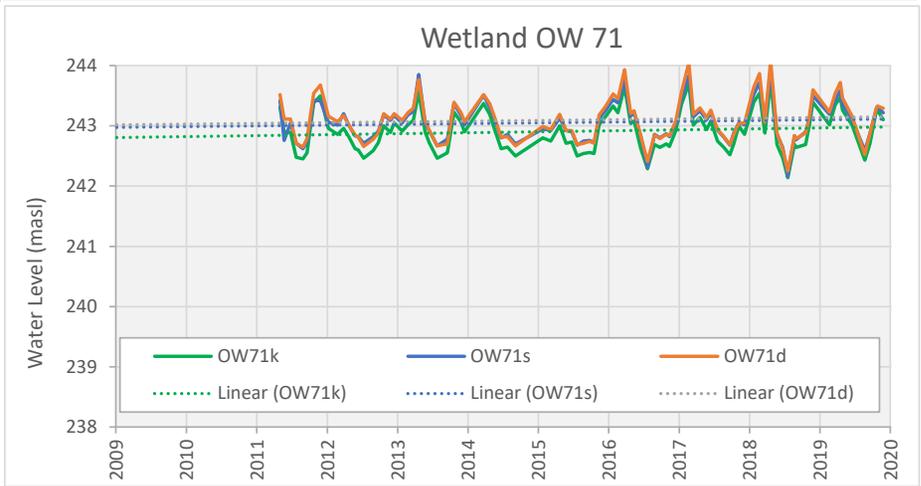
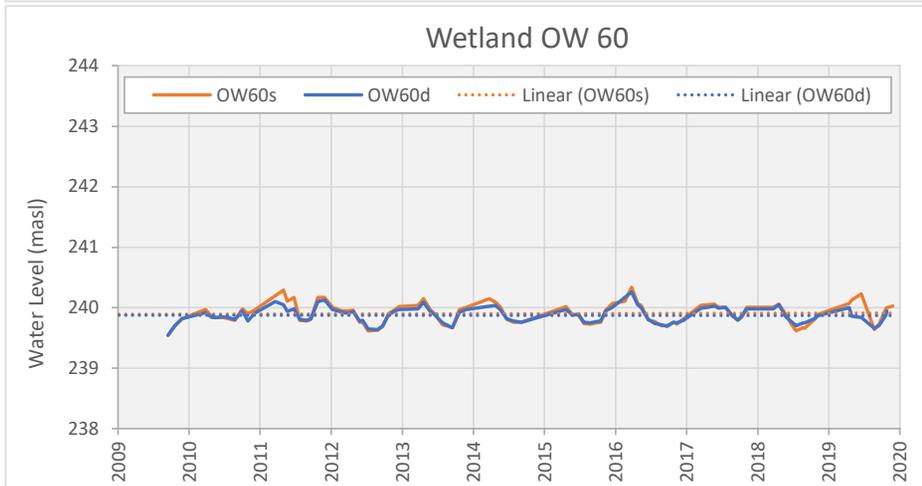
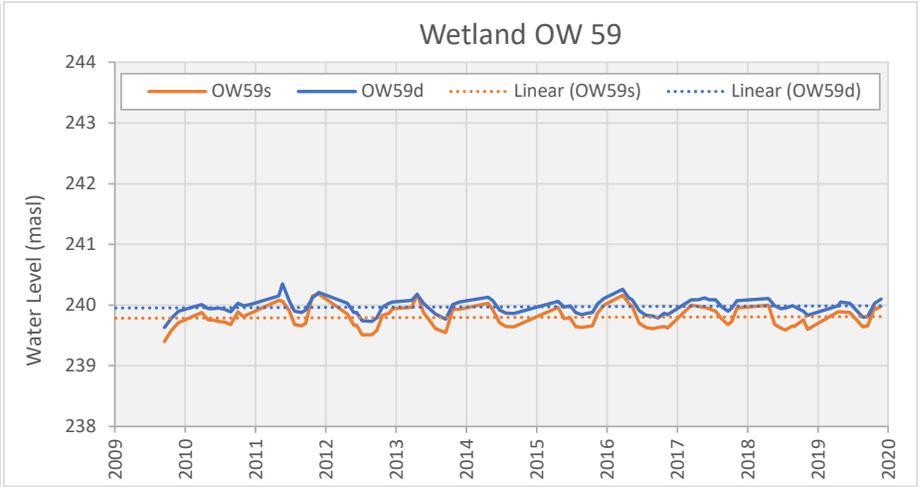
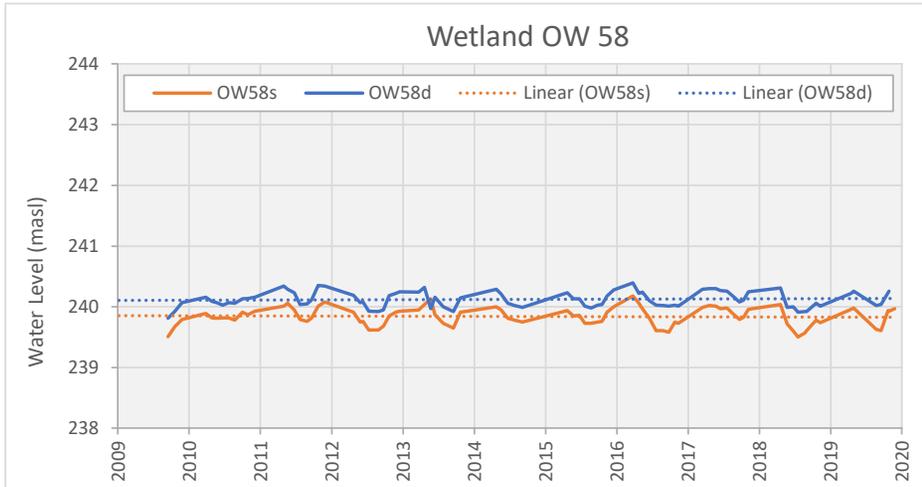
**APPENDIX A1-b**

**GROUNDWATER MONITORING WELLS: WETLAND AREAS**

Keppel Quarry: Appendix A-1b  
Groundwater Hydrographs (Wetland Area)

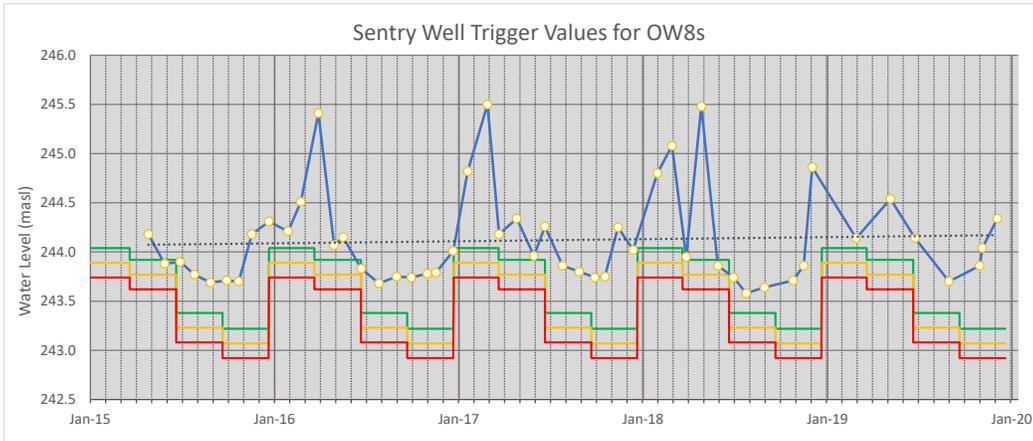


Keppel Quarry: Appendix A-1b  
Groundwater Hydrographs (Wetland Area)



**APPENDIX A1-c**  
**SENTRY MONITORING WELLS**

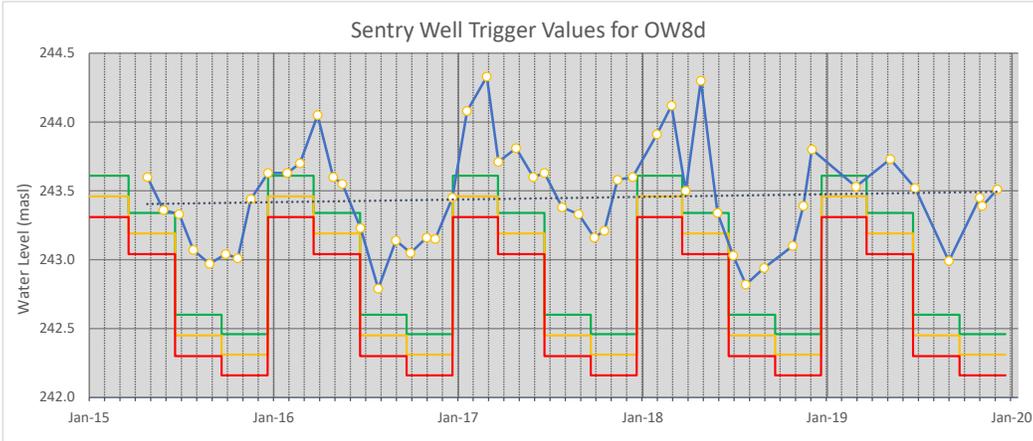
**Keppel Quarry: Appendix A-1c  
Sentry Well Hydrographs and Trigger Values**



**Trigger Exceedences (OW8s)**

Date	Season	Trigger Type

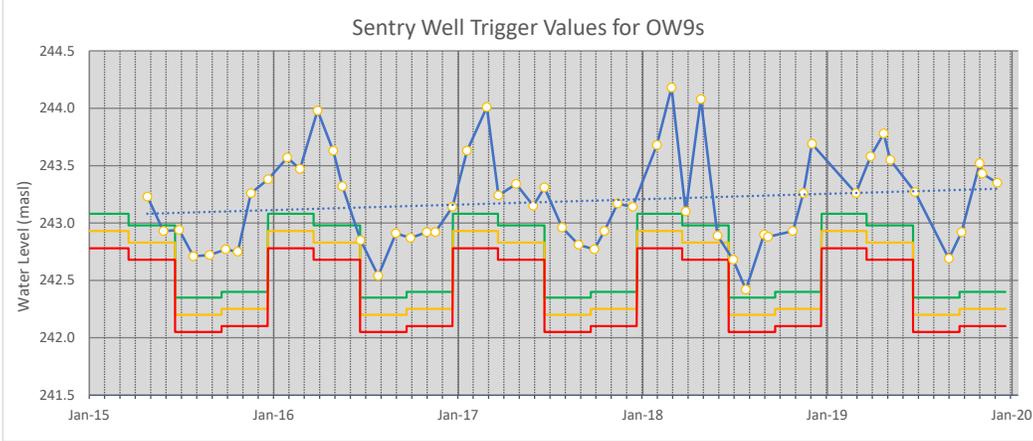
green triggers not included



**Trigger Exceedences (OW8d)**

Date	Season	Trigger Type

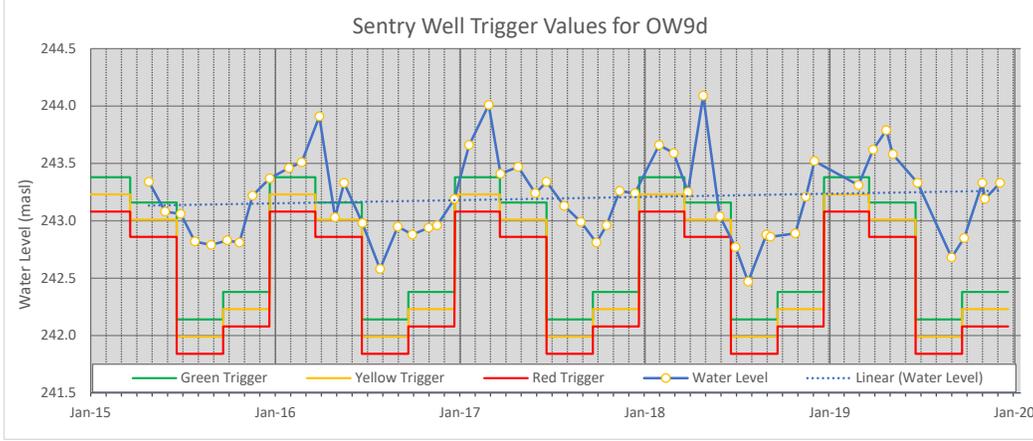
green triggers not included



**Trigger Exceedences (OW9s)**

Date	Season	Trigger Type

green triggers not included

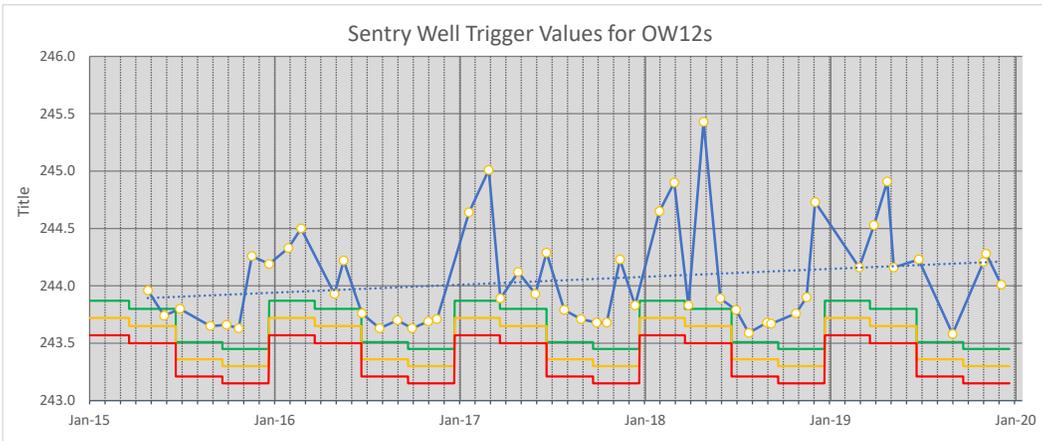


**Trigger Exceedences (OW9d)**

Date	Season	Trigger Type

green triggers not included

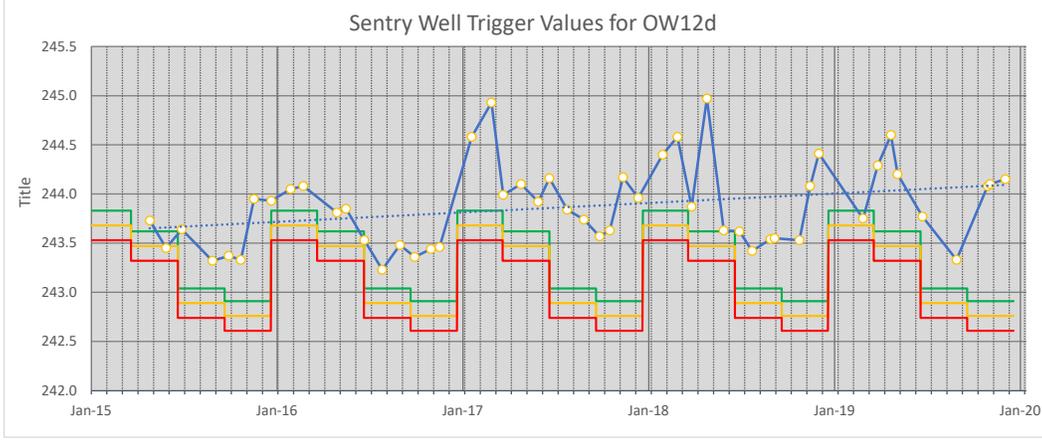
**Keppel Quarry: Appendix A-1c**  
**Sentry Well Hydrographs and Trigger Values**



**Trigger Exceedences (OW12s)**

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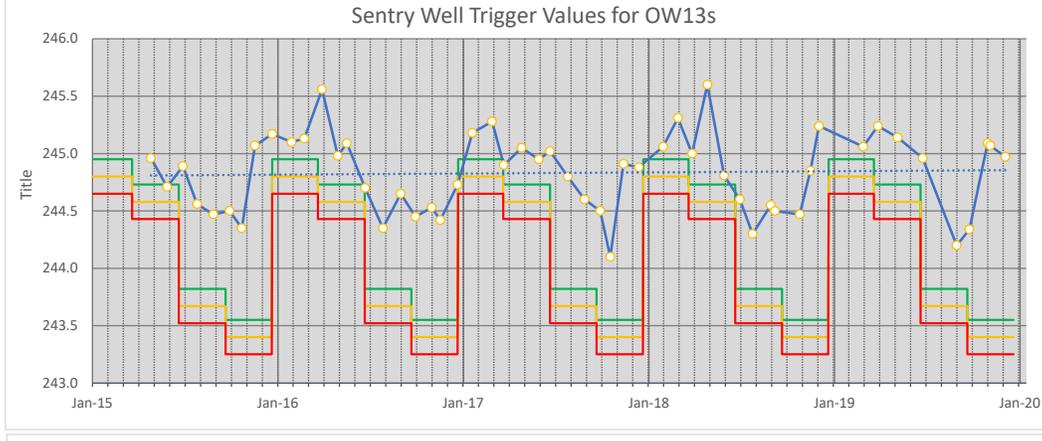
green triggers not included



**Trigger Exceedences (OW12d)**

Date	Season	Trigger Type
29-May-15	Spring	Yellow

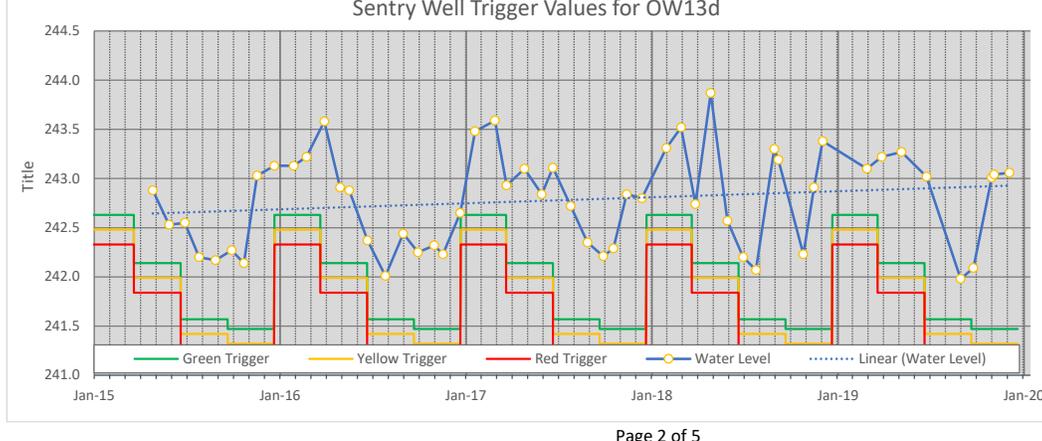
green triggers not included



**Trigger Exceedences (OW13s)**

Date	Season	Trigger Type

green triggers not included

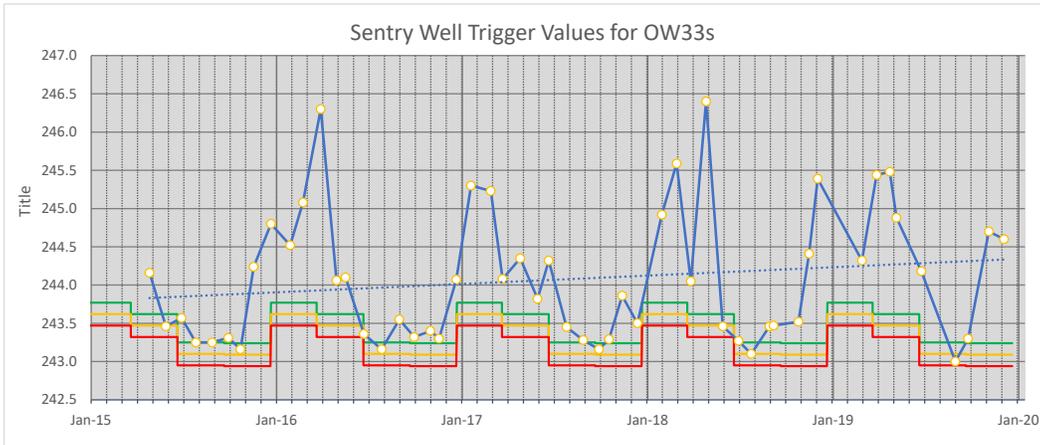


**Trigger Exceedences (OW13d)**

Date	Season	Trigger Type

green triggers not included

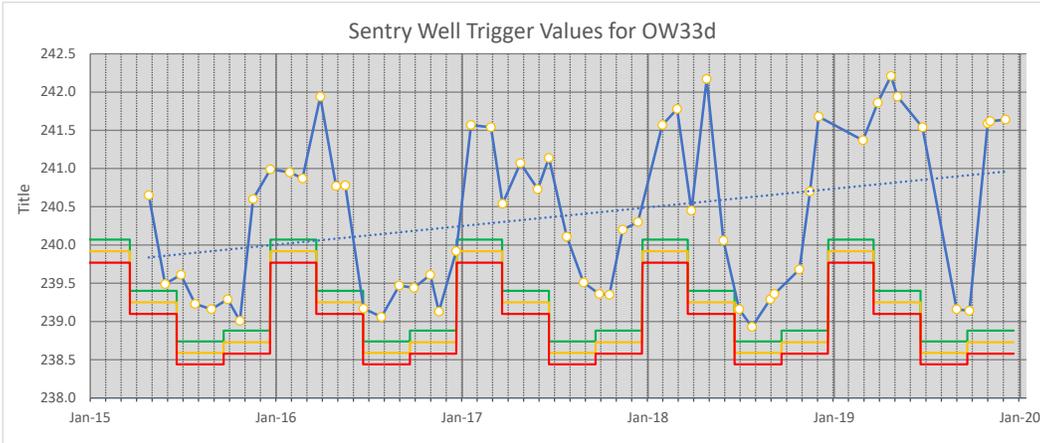
**Keppel Quarry: Appendix A-1c  
Sentry Well Hydrographs and Trigger Values**



**Trigger Exceedences (OW33s)**

Date	Season	Trigger Type
30-May-18	Spring	Yellow
31-Aug-19	Summer	Yellow

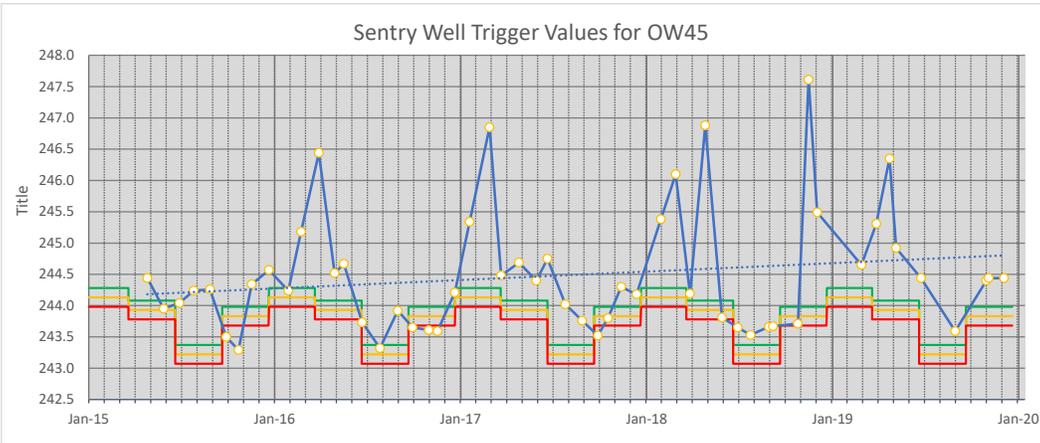
green triggers not included



**Trigger Exceedences (OW33d)**

Date	Season	Trigger Type

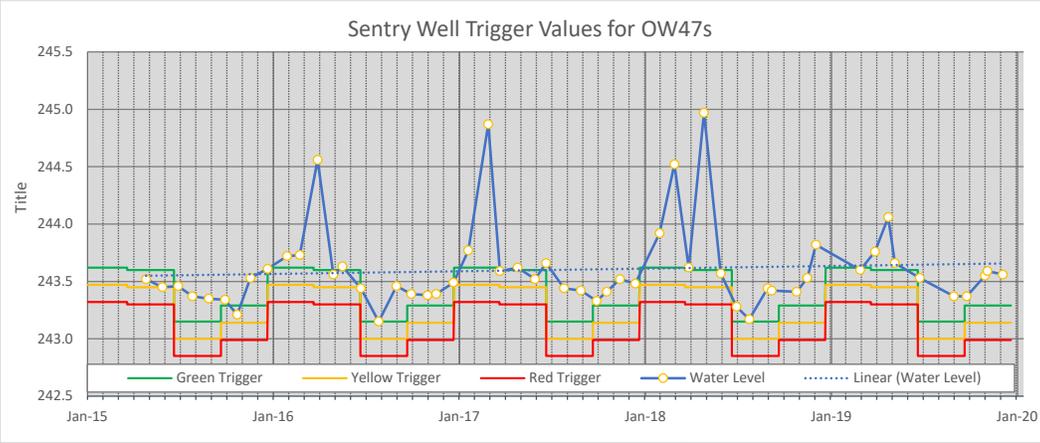
green triggers not included



**Trigger Exceedences (OW45)**

Date	Season	Trigger Type
29-Sep-15	Fall	Red
23-Oct-15	Fall	Red
29-Sep-16	Fall	Red
31-Oct-16	Fall	Red
17-Nov-16	Fall	Red
28-Sep-17	Fall	Red
30-May-18	Spring	Yellow
25-Oct-18	Spring	Yellow

green triggers not included

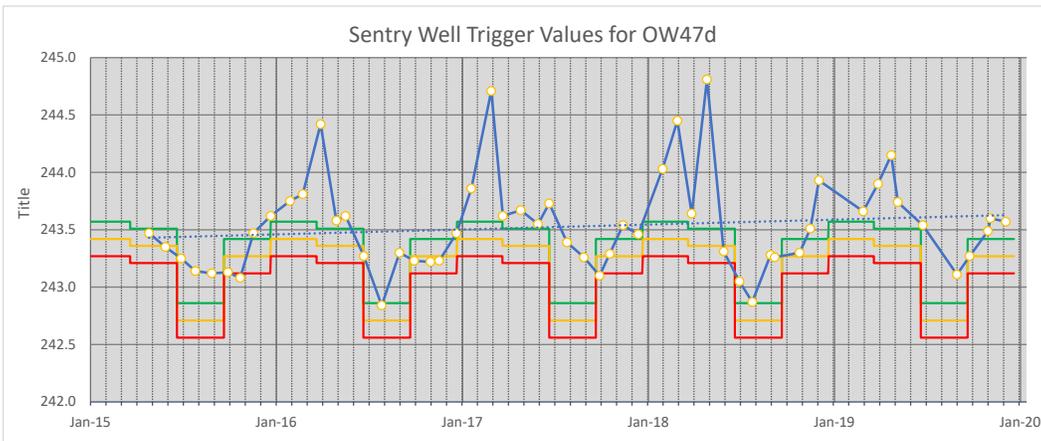


**Trigger Exceedences (OW47s)**

Date	Season	Trigger Type

green triggers not included

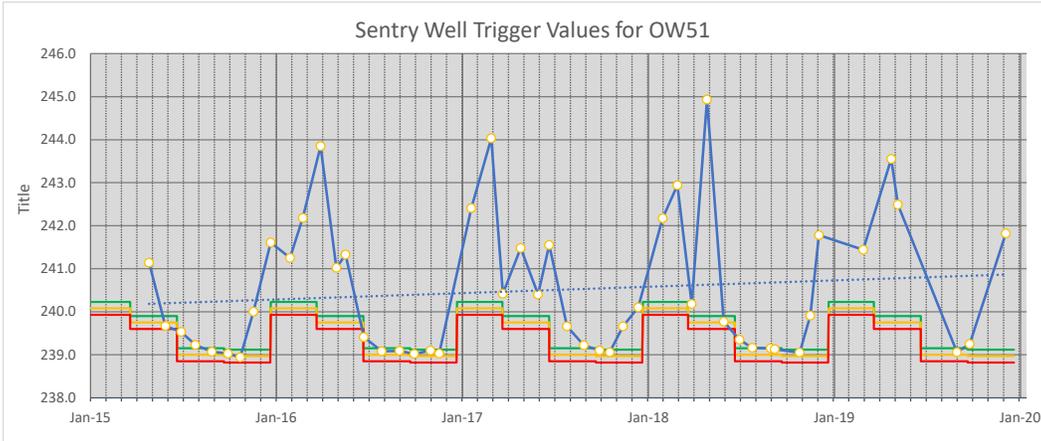
**Keppel Quarry: Appendix A-1c**  
**Sentry Well Hydrographs and Trigger Values**



**Trigger Exceedences (OW47d)**

Date	Season	Trigger Type
29-May-15	Spring	Yellow
29-Sep-15	Fall	Yellow
23-Oct-15	Fall	Red
29-Sep-16	Fall	Yellow
31-Oct-16	Fall	Yellow
17-Nov-16	Fall	Yellow
28-Sep-17	Fall	Red
30-May-18	Spring	Yellow

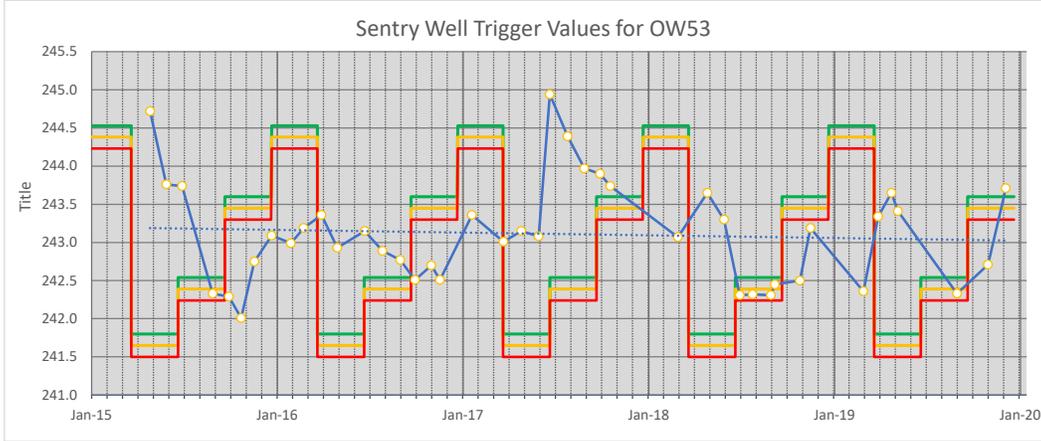
green triggers not included



**Trigger Exceedences (OW51d)**

Date	Season	Trigger Type
23-Oct-15	Fall	Yellow

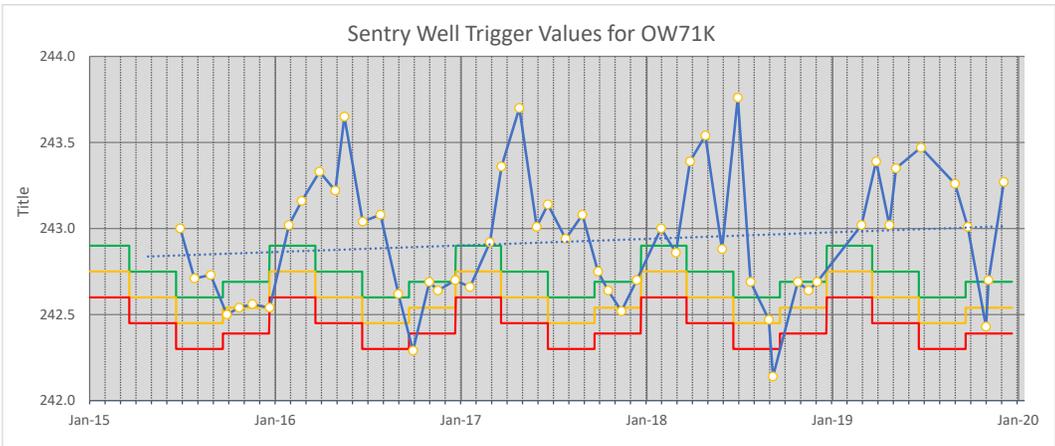
green triggers not included



**Trigger Exceedences (OW53d)**

Date	Season	Trigger Type
28-Aug-15	Summer	Yellow
29-Sep-15	Fall	Red
23-Oct-15	Fall	Red
18-Nov-15	Fall	Red
22-Dec-15	Winter	Red
29-Jan-16	Winter	Red
23-Feb-16	Winter	Red
29-Sep-16	Fall	Red
31-Oct-16	Fall	Red
17-Nov-16	Fall	Red
19-Jan-17	Winter	Red
28-Feb-18	Winter	Red
25-Jul-18	Summer	Yellow
30-Aug-18	Summer	Yellow
26-Oct-18	Fall	Red
16-Nov-18	Fall	Red

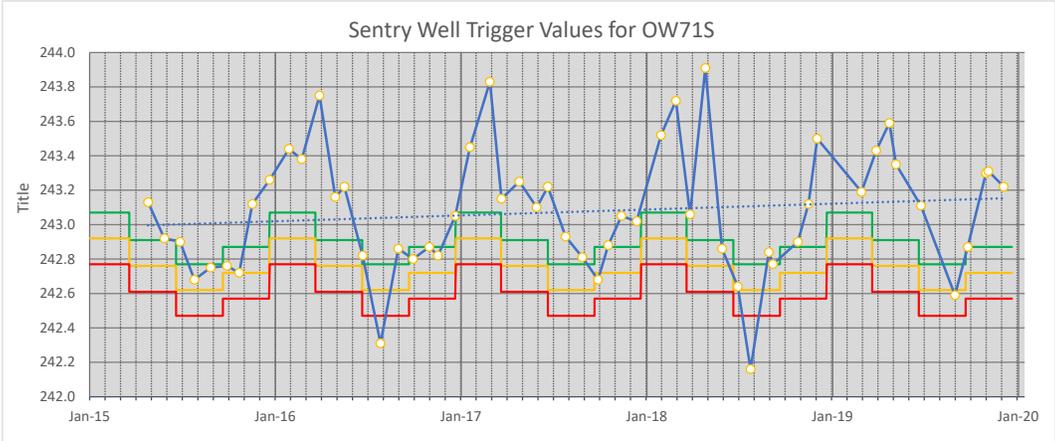
**Keppel Quarry: Appendix A-1c  
Sentry Well Hydrographs and Trigger Values**



**Trigger Exceedences (OW71K)**

Date	Season	Trigger Type
29-Sep-15	Fall	Yellow
23-Oct-15	Fall	Yellow
22-Dec-16	Winter	Red
29-Sep-16	Fall	Red
19-Jan-17	Winter	Yellow
13-Nov-17	Fall	Yellow
26-Oct-18	Fall	Red
31-Aug-19	Summer	Yellow

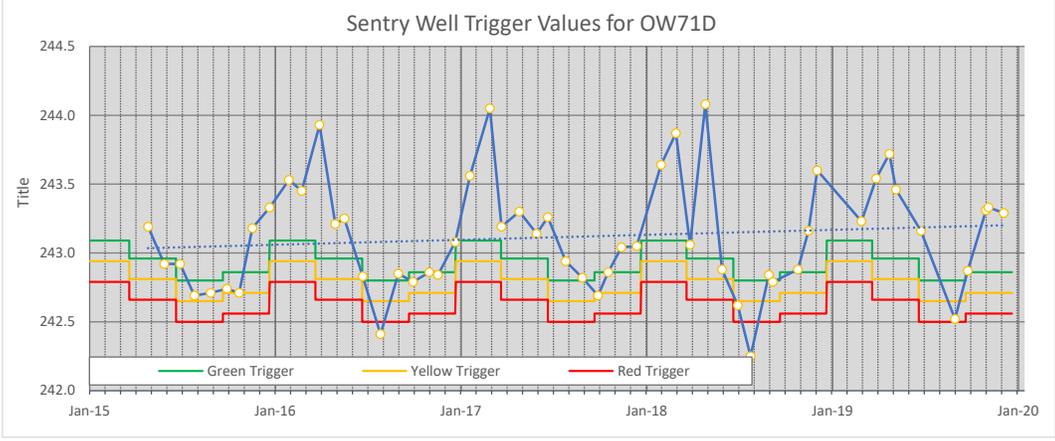
green triggers not included



**Trigger Exceedences (OW71S)**

Date	Season	Trigger Type
27-Jul-16	Summer	Red
28-Sep-17	Fall	Yellow
25-Jul-18	Summer	Red
31-Aug-19	Summer	Yellow

green triggers not included



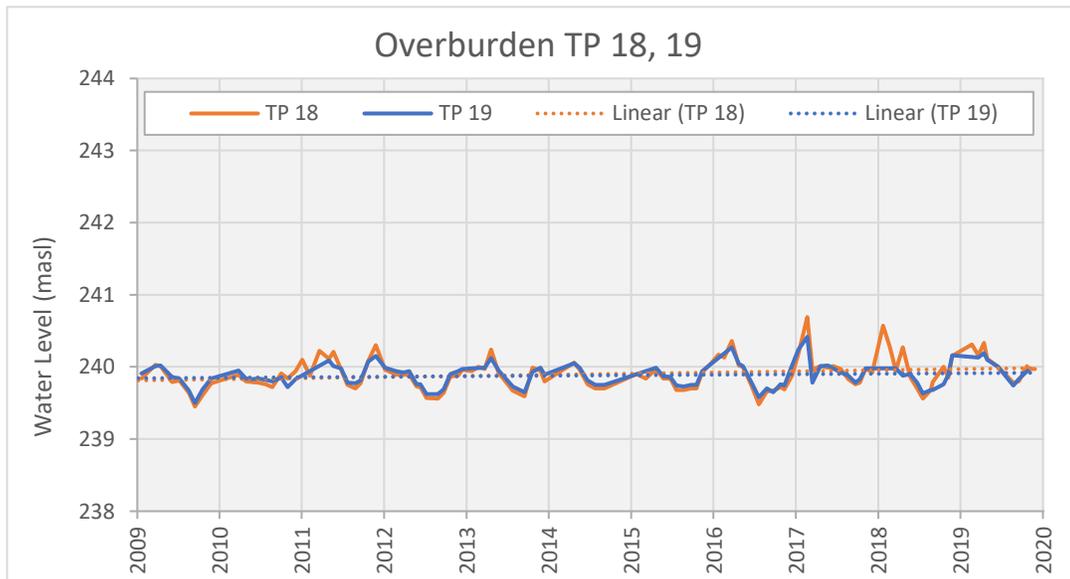
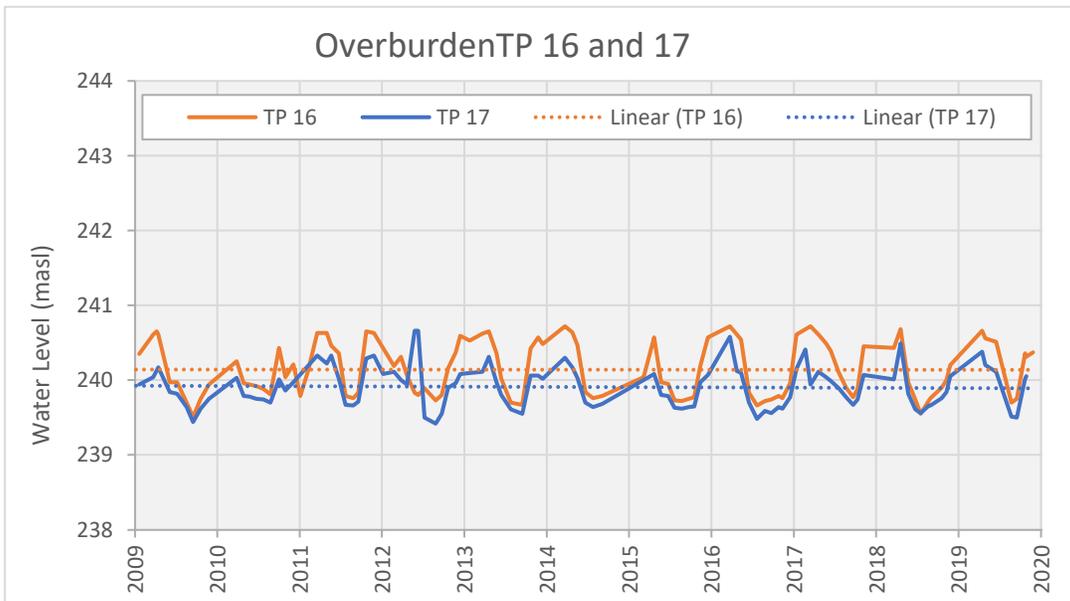
**Trigger Exceedences (OW71D)**

Date	Season	Trigger Type
27-Jul-16	Summer	Red
28-Sep-17	Fall	Yellow
25-Jul-18	Summer	Red
31-Aug-19	Summer	Yellow

green triggers not included

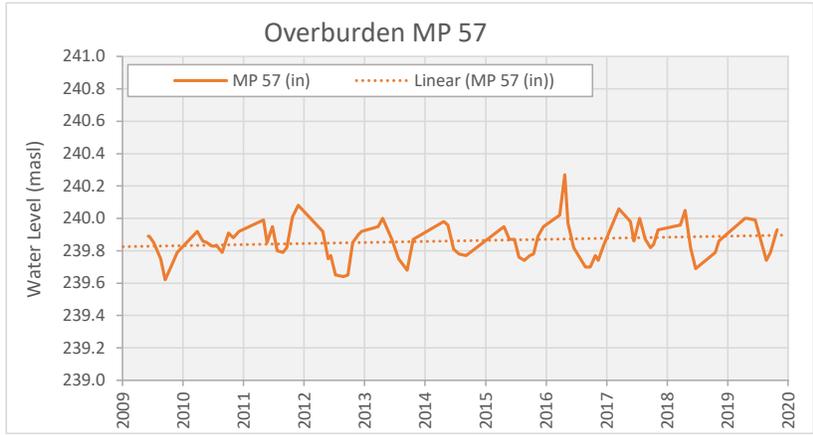
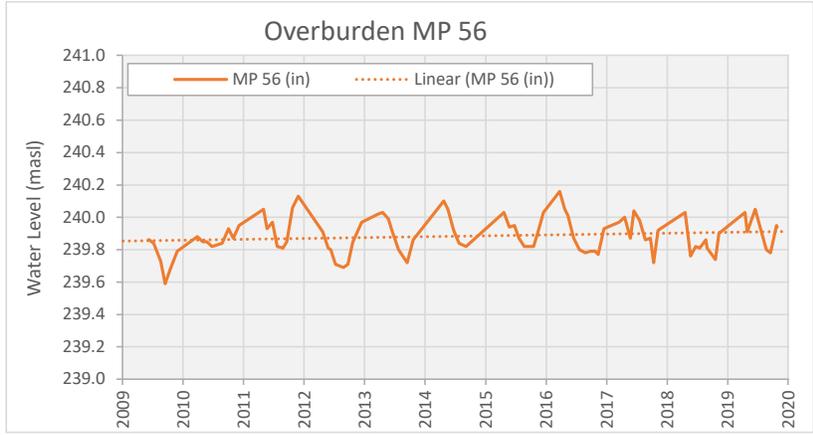
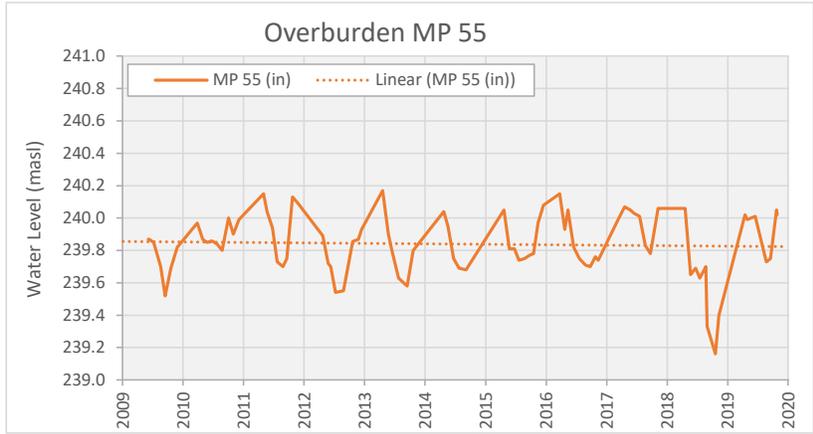
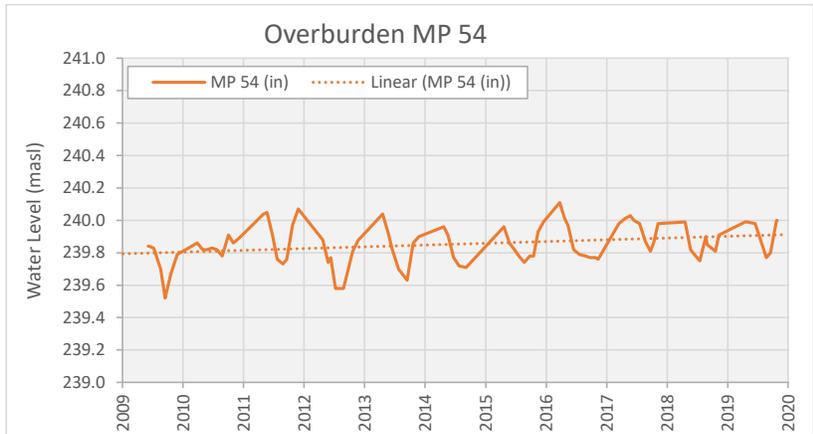
**APPENDIX A1-d**  
**OVERBURDEN TEST PITS**

Keppel Quarry: Appendix A-1d  
Overburden Test Pits



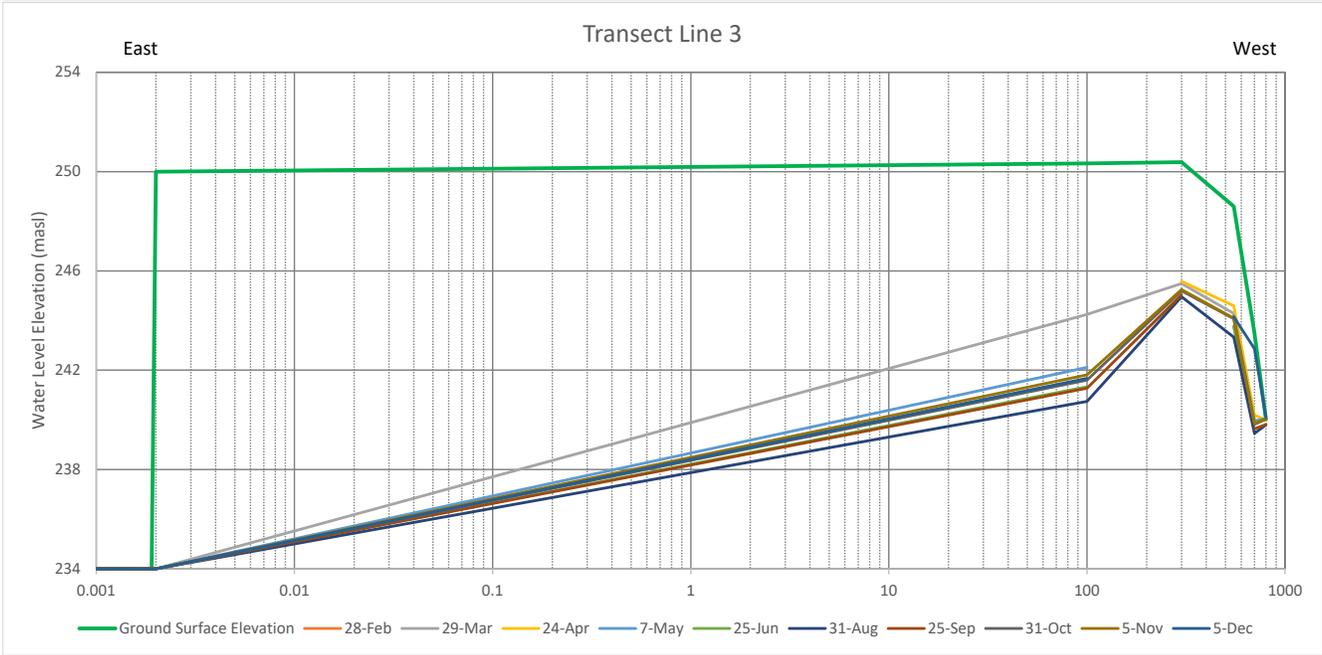
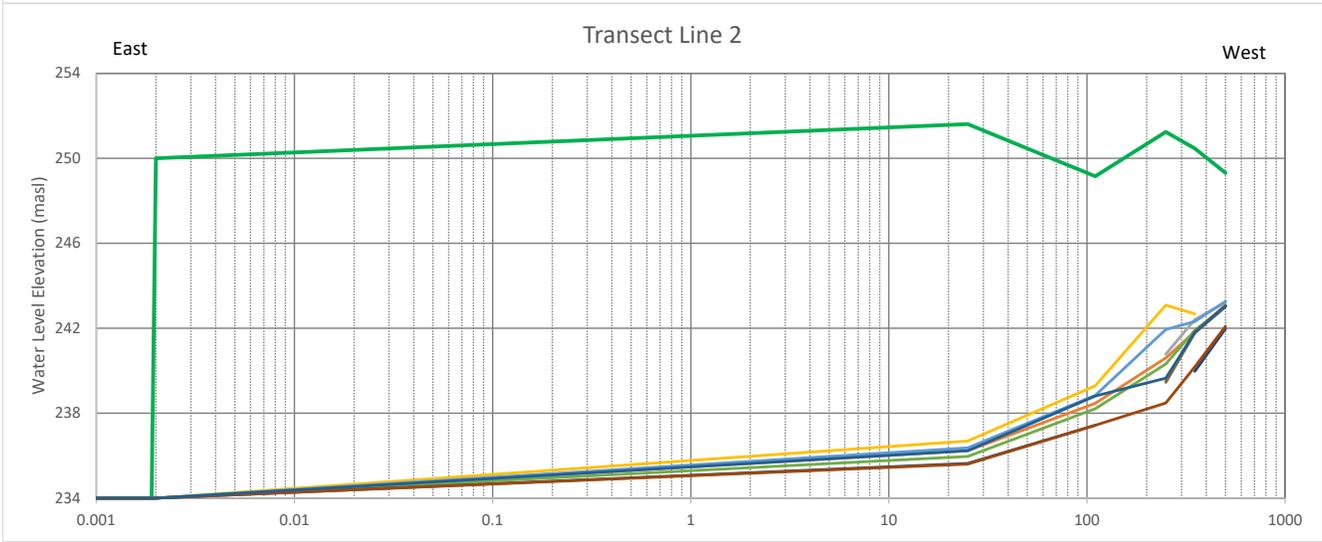
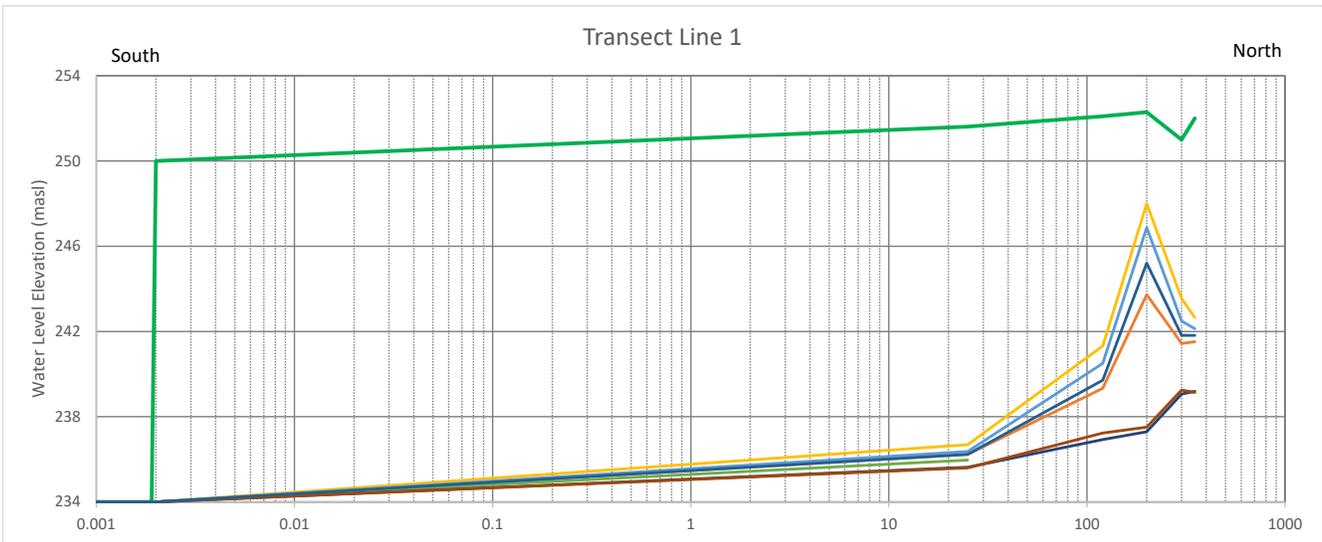
**APPENDIX A1-e**  
**OVERBURDEN MINI-PIEZOMETERS**

Keppel Quarry: Appendix A1-e  
Groundwater Hydrographs

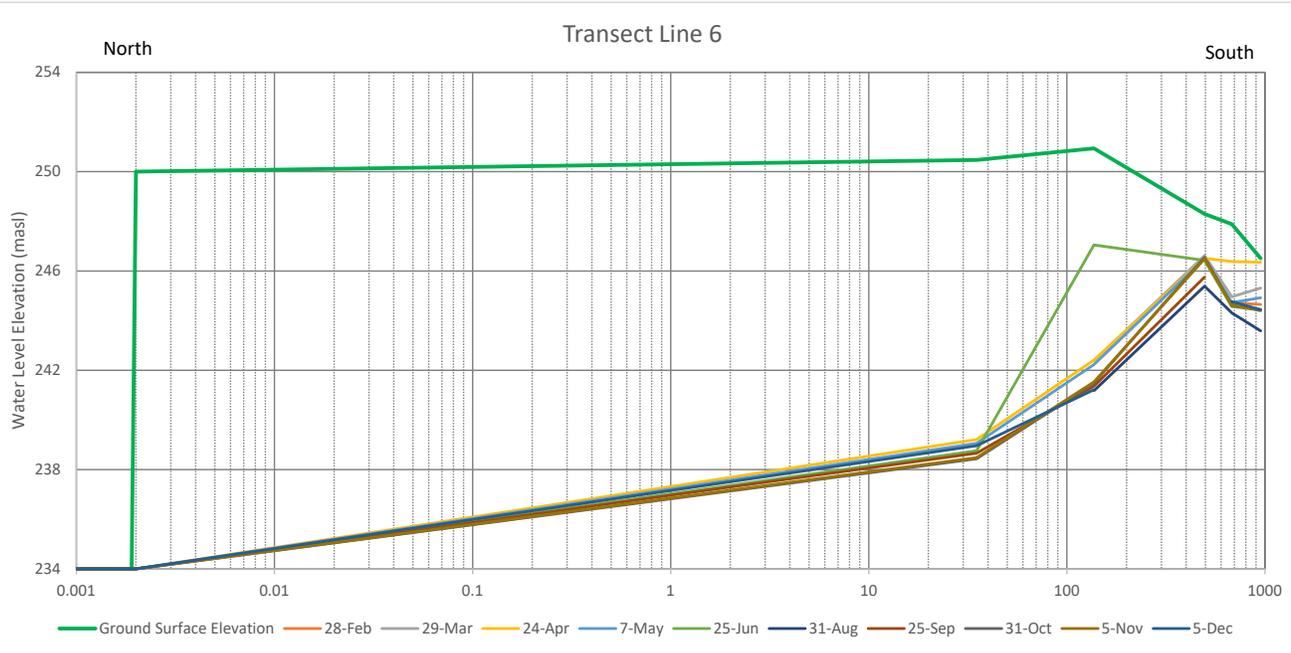
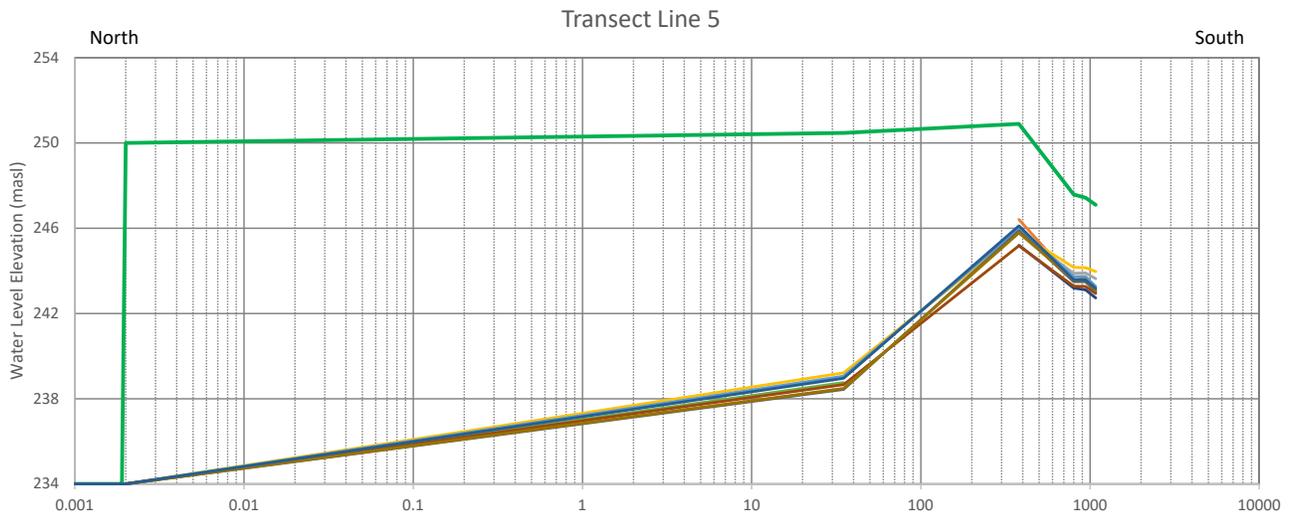
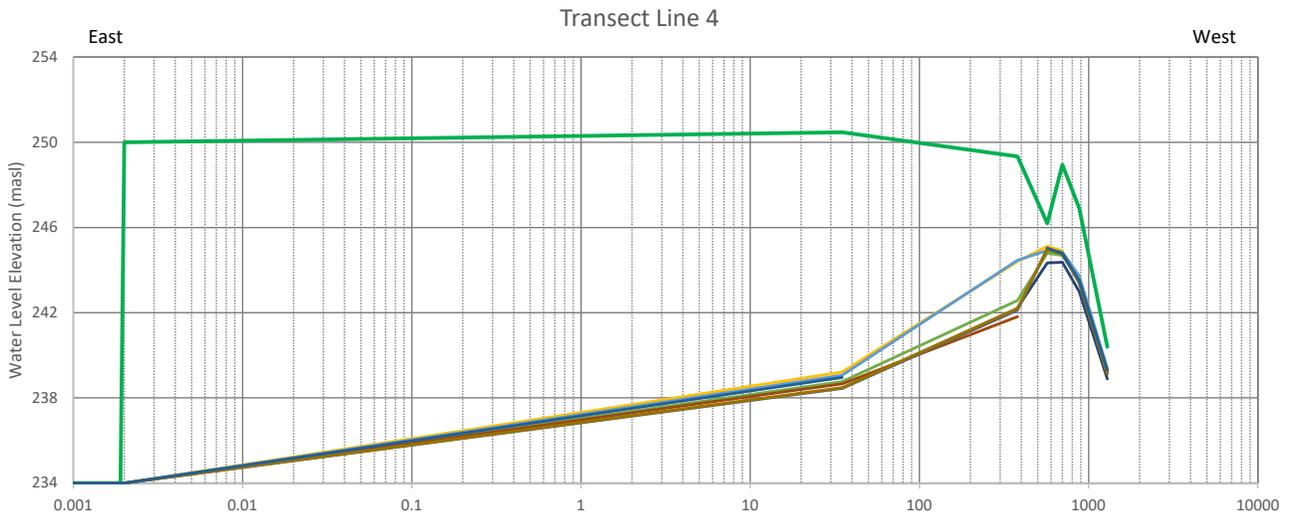


**APPENDIX A2**  
**DISTANCE – DRAWDOWN PLOTS**

Keppel Quarry: Appendix A2  
Distance-Water Level Graphs



Keppel Quarry: Appendix A2  
Distance-Water Level Graphs



**APPENDIX B**  
**BLAST REPORTING**

April 24, 2020

Harold Sutherland Construction  
323545 East Linton Road, R.R #2  
Kemble, Ontario, Canada N0H 1S0

Attention: Mr. Dave Munro

**Re: Keppel Quarry: 2019 Blast Reporting**

Dear Sir:

Whitewater Hydrogeology Ltd. (Whitewater) is pleased to present a summary of the 2019 Blasting Monitoring Program, which is a condition of the Aggregate Resource Act license for the Keppel Quarry. The Blasting Monitoring Program was developed to ensure that blasting operations are carried out in a safe and productive manner and to ensure no damage to any buildings, structures or residences surrounding the Keppel Quarry.

Blasts were designed by Austin Powder Ltd. so that the seismic activity (vibrations) and noise induced by blasting operations remain within the guidelines set by the Ministry of the Environment and Climate Change. Austin Powder Ltd. set up the primary monitors and HSCL we set up any additional monitors as required.

The Adaptive Management Plan (AMP) stipulates that all blasts be monitored for vibration and overpressure using digital seismographs. There were 14 blasts in total, which took place on:

- April 10 at 1:00 pm
- May 1 at 2:43 pm
- May 17 at 12:45 pm
- June 24 at 5:28 pm
- August 6 at 1:47 pm
- August 21, 1:25 pm
- September 3, 1:14 pm
- September 20 at 3:40 pm
- October 7 at 2:29 pm
- October 21 at 1:54 pm
- November 4 at 4:01 pm
- November 18 at 2:26 pm
- November 22 at 3:38 pm
- December 11 at 3:06 pm

The recommended limit set by the MECP for vibration and overpressure (noise) are as follows:

- • Vibration - 12.5 mm/sec; and
- • Overpressure (Noise) - 128 dB.

Event Reports showing noise and vibration readings measured in 2019 during each blast are appended and the results are summarized in Table 1. Seismograph readings showed that vibrations levels ranged from not registered 4.147 mm/sec. Overpressure readings ranged from not registered to 130 dB average. All measured vibration levels were below the recommended MECP limits in 2019, except for a single exceedance on June 24, 2019 at 178841 Grey Rd 17, where the overpressure was measured at 130 dB.

TABLE 1: 2019 BLAST SUMMARY RESULTS

Receptor	Date	Blast Distance (m)	Overpressure (dB)	Vibration (mm/s)	Weather
178841 Grey Rd 17	April 10, 2019	NA	NA	NA	clear
	May 1, 2019	568.45	108	2.03	heavy rain
	May 17, 2019	655.32	NR	NR	partly cloudy
	June 24, 2019	703.78	130	1.566	overcast/low clouds
	August 6, 2019	688.85	117	0.197	high clouds
	August 21, 2019	703.78	117	1.147	clear
	September 3, 2019	NR	NR	NR	heavy rain
	September 20, 2019	616.92	117	2.245	overcast/low clouds
	October 7, 2019	640.38	119	0.325	high clouds
	October 21, 2019	655.02	NR	NR	clear
	November 4, 2019	693.12	NR	NR	heavy rain
	November 18, 2019	691.59	91	2.075	overcast/low clouds
	November 22, 2019	655.62	124	2.643	light snow
December 11, 2019	NA	NA	NA	heavy snow	
283197 Conc Rd 10	April 10, 2019	1,032.36	116	NR	clear
	May 1, 2019	1,015.90	102	1.823	heavy rain
	May 17, 2019	1,076.25	117	0.22	partly cloudy
	June 24, 2019	1,048.21	114	1.67	overcast/low clouds
	August 6, 2019	1,011.33	118	0.254	high clouds
	August 21, 2019	1,015.29	113	1.888	clear
	September 3, 2019	NR	NR	NR	heavy rain
	September 20, 2019	NR	NR	NR	overcast/low clouds
	October 7, 2019	976.27	110	2.087	high clouds
	October 21, 2019	973.23	100	1.845c	clear
	November 4, 2019	996.09	NR	NR	heavy rain
	November 18, 2019	NA	NA	NA	overcast/low clouds
	November 22, 2019	NA	NA	NA	light snow
December 11, 2019	NA	NA	NA	heavy snow	
178717 Grey Rd 17	April 10, 2019	NA	NA	NA	clear
	May 1, 2019	615.70	107	2.78	heavy rain
	May 17, 2019	635.81	118	1.616	partly cloudy
	June 24, 2019	601.07	118	4.147	overcast/low clouds
	August 6, 2019	571.50	117	0.146	high clouds
	August 21, 2019	571.80	116	1.731	clear
	September 3, 2019	NR	NR	NR	heavy rain
	September 20, 2019	677.27	123	1.785	overcast/low clouds
	October 7, 2019	559.31	110	2.246	high clouds
	October 21, 2019	551.69	118	0.13	clear
	November 4, 2019	557.78	110	NR	heavy rain
	November 18, 2019	NA	NA	NA	overcast/low clouds
	November 22, 2019	531.88	121	1.818	light snow
December 11, 2019	516.33	111	3.43	heavy snow	

Notes: NR = Not Registered  
NA = Not Monitored

No flyrock was generated beyond the blast area in any of the blasts in 2019.

If you have any questions, please do not hesitate to call any time.

Regards,



Tecia White, M.Sc., P.Geo (licence 0701)  
Senior Hydrogeologist / President  
Whitewater Hydrogeology Ltd.





# AUSTIN POWDER LTD.

## BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 04/10/2019 13:00

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: East Bench

### ENVIRONMENT

Method Used: Lat./Long.

Weather: Clear

Wind From: WSW

Temperature: 3 °C

Terrain: Flat

Wind Velocity: 4-10 km/h

Blast Lat./Long.: 44° 38' 8.100" N 80° 59' 48.500" W

### NEAREST PROTECTED STRUCTURE

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 344 °

Distance: 560 m

Structure Lat./Long.: 44° 38' 25.580" N 80° 59' 55.233" W

### LAYOUT

Hole Depth: 9.45 m    Material Blasted: Limestone    Total Meters Drilled: 935.4 m

No. of Holes: 99    Subdrilling: 0.30 m    Burden: 3.05 m    Water Depth: 3.05 m

No. of V.P.† Holes: 99    Face Height: 9.14 m    Spacing: 3.35 m    Stem Length: 1.83 m

No. of Rows: 3    Drilling Angle: °    Back Fill Depth: 0.00 m    Area Type: Center Start/Breakout

Diameter: 114.3 mm    Mats Used: No    Stem Type: Clear stone    Method: Specified

† V.P. = Volume Producing

(H = 9.14 m)

### WEIGHTS

Max. Wt. of Expl. in Overlapped Decks: 352.5 kg    Volume Produced: 8,970.8 m<sup>3</sup>

Initiation: Electronic    Max. Wt. of Expl. Per 8 ms Interval: 352.5 kg    Weight Produced: 21,533.4 t

Firing Device: E\*Star Blasting Machine (WRFD)    Max. No. of Holes Per 8 ms Interval: 4    Powder Factor 1: 2.468 t/kg

Other Method:    Max. Wt. of Explosive Per Hole: 88.1 kg    Powder Factor 2: 0.972 kg/m<sup>3</sup>

Mfg and Model: DBM1600-2-RC    Scaled Distance Factor (max charge): 59.61    Rock Density: 2.400 t/m<sup>3</sup>

Initiation Settings:    Scaled Distance Factor (per delay): 29.81

Series Resistance (ohms):

### SEISMOGRAPHS

See seismographs on separate page

### CREW

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: loader bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
REED	ADAM, G	* ON - N/A		Yes	Yes	Yes	No	Yes
BRAGAN	COREY, T			No	No	No	No	No
FRALICK	CRAIG, A			No	No	No	No	No
KOUYOUMJIAN	MACKENZI E, H			No	Yes	Yes	No	No
MOUNTENAY	AUSTIN, B			No	No	No	No	No
NEWTON	JOHN, D			No	No	Yes	No	No
O'DONOHUE	LIAM, J			No	No	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 04/10/2019 13:00

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: East Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	198.00 ea	198.00
15001	24' E*STAR Detonator - QM	99.00 ea	0.00
15003	40' E*STAR Detonator - QM	99.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	8,526.00 kg	8,526.00
12981	Mini Stem Plug - 6015	99.00 ea	0.00
Total Weight of Explosives (Include Primers) ( kg ):			8,724.00

**COMMENTS / EXPLANATIONS**

General Comments: Imported on 4/11/2019 6:50:19 AM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-01

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 04/10/2019 13:00

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: East Bench

**SEISMOGRAPH 1 - 178841 GREY RD. 17**

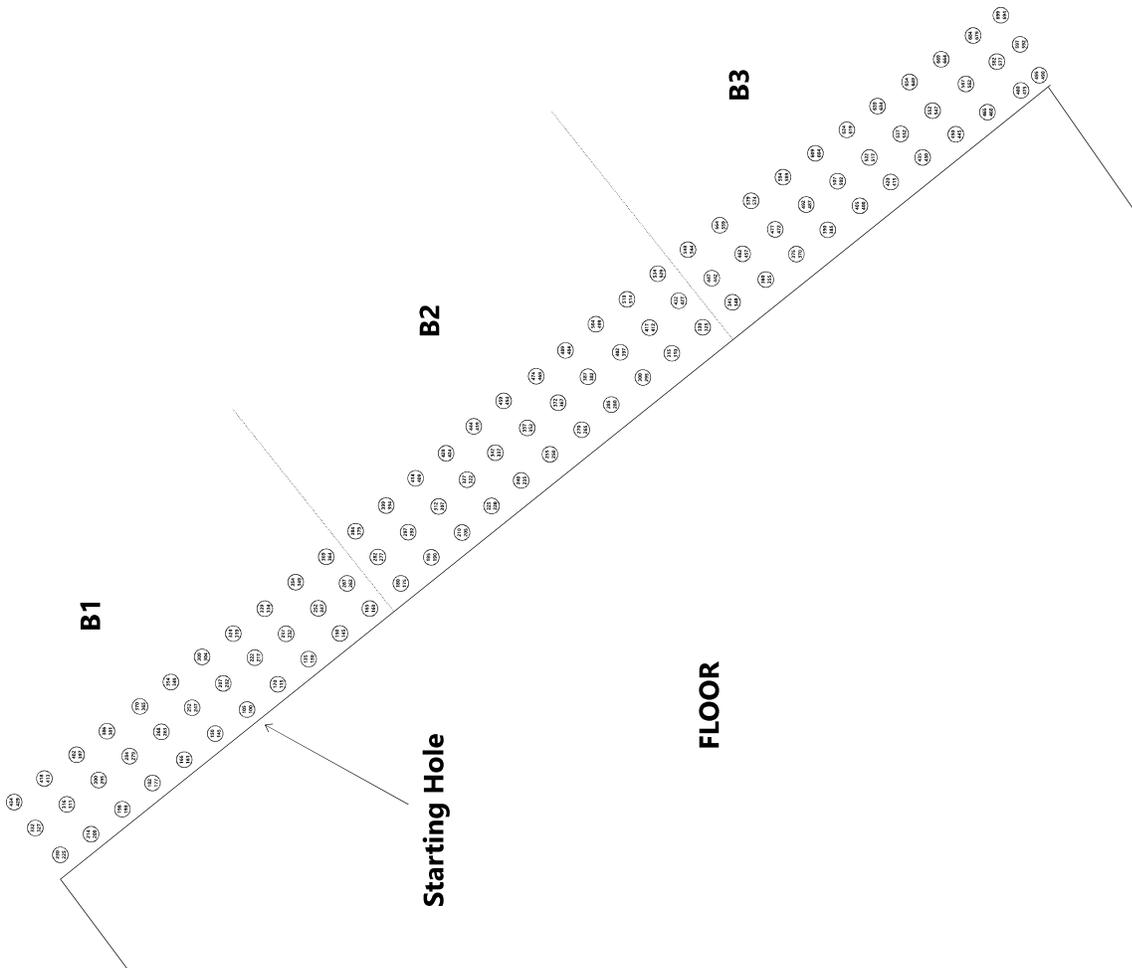
Data Type: No Trigger      Seismograph Type: Instantel Minimate II  
Date: 04/10/19              Trigger Level: 1.00 mm/s      --- dB  
Time: 13:00                  Calibration Date: 01/22/19  
Distance From Blast: 562.66 m      Calibration Signal:  
Direction From Blast: NNW      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz  
Location: Bolted to bedrock in front of property.  
Lat./Long.: 44° 38' 25.645" N      80° 59' 55.415" W  
Reader and Firm: Adam Reed, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Adam Reed Austin Powder

**SEISMOGRAPH 2 - 178706 GREY RD. 17**

Data Type: Seismic Record      Seismograph Type: Instantel Mini-Mate II  
Date: 04/10/19              Trigger Level: 1.50 mm/s      115.00 dB      Transverse: 0.127 mm/s      --- Hz  
Time: 13:00                  Calibration Date: 01/22/19      Vertical: 0.254 mm/s      --- Hz  
Distance From Blast: 628.19 m      Calibration Signal:      Longitudinal: 0.127 mm/s      --- Hz  
Direction From Blast: SE      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz      Acoustic: 122 dB      --- Hz  
Location: Buried at the front of the property.      Vector Sum: --- mm/s  
Lat./Long.: 44° 37' 52.587" N      80° 59' 30.045" W  
Reader and Firm: Adam Reed, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Adam Reed Austin Powder

**SEISMOGRAPH 3 - 283197 10TH CONC.**

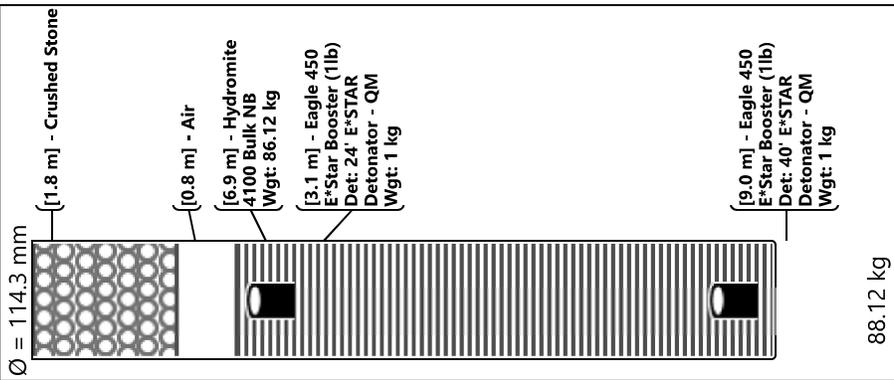
Data Type: Seismic Record      Seismograph Type: Instantel Mini-Mate II  
Date: 04/10/19              Trigger Level: 1.50 mm/s      115.00 dB      Transverse: 0.127 mm/s      --- Hz  
Time: 13:00                  Calibration Date: 01/22/19      Vertical: 0.127 mm/s      --- Hz  
Distance From Blast: 1,032.36 m      Calibration Signal:      Longitudinal: 0.127 mm/s      --- Hz  
Direction From Blast: ESE      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz      Acoustic: 116 dB      --- Hz  
Location: Behind the mail box.      Vector Sum: --- mm/s  
Lat./Long.: 44° 37' 49.797" N      80° 59' 9.304" W  
Reader and Firm: Adam Reed, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Adam Reed Austin Powder



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ77	Typical hole	0	529/534	ZZ67	Typical hole	0	370/375
ZZ75	Typical hole	0	490/495	ZZ62	Typical hole	0	412/417
ZZ94	Typical hole	0	664/669	ZZ72	Typical hole	0	445/450
ZZ90	Typical hole	0	634/639	ZZ35	Typical hole	0	277/282
ZZ15	Typical hole	0	365/370	ZZ70	Typical hole	0	415/420
ZZ9	Typical hole	0	397/402	ZZ41	Typical hole	0	307/312
ZZ17	Typical hole	0	247/252	ZZ52	Typical hole	0	469/474
ZZ29	Typical hole	0	247/252	ZZ31	Typical hole	0	160/165
ZZ63	Typical hole	0	514/519	ZZ92	Typical hole	0	547/552
ZZ97	Typical hole	0	679/684	ZZ74	Typical hole	0	475/480
ZZ8	Typical hole	0	295/300	ZZ66	Typical hole	0	355/360
ZZ39	Typical hole	0	394/399	ZZ55	Typical hole	0	280/285
ZZ47	Typical hole	0	235/240	ZZ57	Typical hole	0	484/489
ZZ89	Typical hole	0	619/624	ZZ64	Typical hole	0	325/330
ZZ14	Typical hole	0	263/268	ZZ16	Typical hole	0	349/354
ZZ83	Typical hole	0	472/477	ZZ88	Typical hole	0	517/522
ZZ53	Typical hole	0	367/372	ZZ81	Typical hole	0	559/564
ZZ38	Typical hole	0	292/297	ZZ20	Typical hole	0	202/207
ZZ36	Typical hole	0	175/180	ZZ59	Typical hole	0	397/402
ZZ61	Typical hole	0	310/315	ZZ26	Typical hole	0	232/237
ZZ19	Typical hole	0	100/105	ZZ85	Typical hole	0	589/594
ZZ7	Typical hole	0	193/198	ZZ27	Typical hole	0	334/339
ZZ49	Typical hole	0	352/357	ZZ24	Typical hole	0	115/120
ZZ84	Typical hole	0	487/492	ZZ3	Typical hole	0	429/434
ZZ58	Typical hole	0	499/504	ZZ4	Typical hole	0	413/418
ZZ18	Typical hole	0	145/150	ZZ56	Typical hole	0	382/387
ZZ87	Typical hole	0	502/507	ZZ23	Typical hole	0	217/222
ZZ2	Typical hole	0	327/332	ZZ44	Typical hole	0	322/327
ZZ10	Typical hole	0	381/386	ZZ32	Typical hole	0	262/267
ZZ51	Typical hole	0	439/444	ZZ33	Typical hole	0	364/369
ZZ40	Typical hole	0	409/414	ZZ98	Typical hole	0	694/699
ZZ54	Typical hole	0	265/270	ZZ6	Typical hole	0	209/214
ZZ22	Typical hole	0	319/324	ZZ78	Typical hole	0	544/549
ZZ30	Typical hole	0	145/150	ZZ80	Typical hole	0	457/462
ZZ21	Typical hole	0	304/309	ZZ60	Typical hole	0	295/300
ZZ65	Typical hole	0	340/345	ZZ45	Typical hole	0	424/429
ZZ71	Typical hole	0	430/435	ZZ93	Typical hole	0	649/654
ZZ73	Typical hole	0	460/465	ZZ79	Typical hole	0	442/447
ZZ25	Typical hole	0	130/135	ZZ46	Typical hole	0	337/342
ZZ34	Typical hole	0	379/384	ZZ95	Typical hole	0	562/567
ZZ1	Typical hole	0	225/230	ZZ99	Typical hole	0	592/597
ZZ43	Typical hole	0	220/225	ZZ96	Typical hole	0	577/582
ZZ11	Typical hole	0	279/284	ZZ12	Typical hole	0	177/182
ZZ50	Typical hole	0	454/459	ZZ91	Typical hole	0	532/537
ZZ42	Typical hole	0	205/210	ZZ13	Typical hole	0	161/166
ZZ5	Typical hole	0	311/316	ZZ76	Typical hole	0	427/432

Hole	Load	Surface Delay	Deck 1 Delay
ZZ68	Typical hole	0	385/390
ZZ69	Typical hole	0	400/405
ZZ86	Typical hole	0	604/609
ZZ28	Typical hole	0	349/354
ZZ82	Typical hole	0	574/579
ZZ37	Typical hole	0	190/195
ZZ48	Typical hole	0	250/255

# Typical hole





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/01/2019 14:43

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Heavy Rain

Wind From: W

Temperature: 8 °C

Terrain: Flat

Wind Velocity: 5-6 km/h

Blast U.T.M.: 17N 500272 mE 4942469 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd #17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 342 °

Structure U.T.M.: 17N 500101 mE 4943011 mN

Distance: 568 m

**LAYOUT**

Hole Depth:	9.45 m	Material Blasted:	Limestone	Total Meters Drilled:	935.4 m
No. of Holes:	99	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	99	Face Height:	8.84 m	Spacing:	3.35 m
No. of Rows:	3	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone
				Method:	Specified
					(H = 8.84 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation:	Electronic	Max. Wt. of Expl. in Overlapped Decks:	276.0 kg	Volume Produced:	8,671.7 m <sup>3</sup>
Firing Device:	E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	276.0 kg	Weight Produced:	20,815.6 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.308 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	93.0 kg	Powder Factor 2:	1.041 kg/m <sup>3</sup>
Initiation Settings:		Scaled Distance Factor (max charge):	58.95	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):		Scaled Distance Factor (per delay):	34.22		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	No
BELTRAME	ALEXANDE R, A			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
O'DONOHUE	LIAM, J			No	Yes	Yes	No	Yes



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/01/2019 14:43

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	212.00 ea	212.00
15001	24' E*STAR Detonator - QM	97.00 ea	0.00
15003	40' E*STAR Detonator - QM	115.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	8,810.00 kg	8,810.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	4.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			9,022.00

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-02

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/01/2019 14:43

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**SEISMOGRAPH 1 - 178841 GREY ROAD #17**

Data Type: Seismic Record Seismograph Type: GeoSonics Inc.

Date: 05/01/19 Trigger Level: 1.52 mm/s 115.00 dB Transverse: 1.52 mm/s 29.4 Hz

Time: 14:43 Calibration Date: 07/16/18 Vertical: 1.02 mm/s 18.5 Hz

Distance From Blast: 568.45 m Calibration Signal: OK Longitudinal: 1.84 mm/s 27.8 Hz

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

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 108 dB --- Hz

Location: Bolted to Bedrock. Vector Sum: 2.03 mm/s

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Liam O'Donohoe, Austin Powder Ltd.

**SEISMOGRAPH 2 - 178717 GREY RD #17**

Data Type: Seismic Record Seismograph Type: GeoSonic Inc.

Date: 05/01/19 Trigger Level: 1.52 mm/s 115.00 dB Transverse: 1.33 mm/s 27.8 Hz

Time: 14:43 Calibration Date: 07/16/18 Vertical: 1.84 mm/s 27.8 Hz

Distance From Blast: 615.70 m Calibration Signal: OK Longitudinal: 2.67 mm/s 27.8 Hz

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

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 107 dB --- Hz

Location: Spiked and buried. Vector Sum: 2.79 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Liam O'Donohoe, Austin Powder Ltd.

**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type: Seismic Record Seismograph Type: InstanTel - Minimate Blaster

Date: 05/01/19 Trigger Level: 1.50 mm/s 115.00 dB Transverse: 1.651 mm/s 28.0 Hz

Time: 14:43 Calibration Date: 02/05/19 Vertical: 0.762 mm/s 43.0 Hz

Distance From Blast: 1,015.90 m Calibration Signal: OK Longitudinal: 0.762 mm/s 34.0 Hz

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

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 102 dB --- Hz

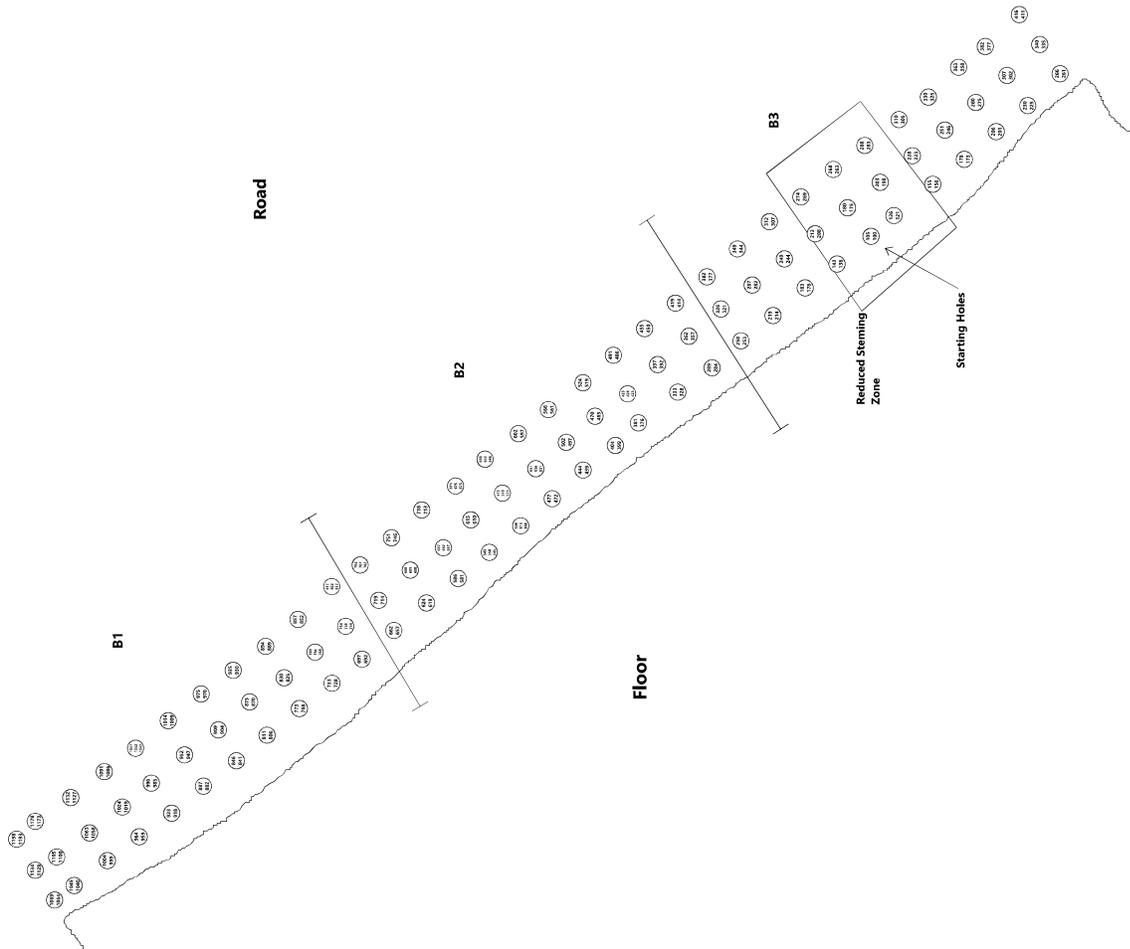
Location: Spiked and weight bagged beside the mail box. Vector Sum: 1.823 mm/s

U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

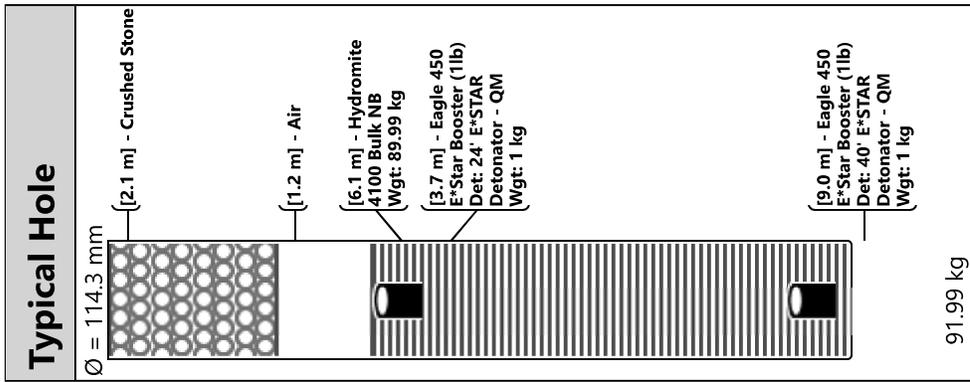
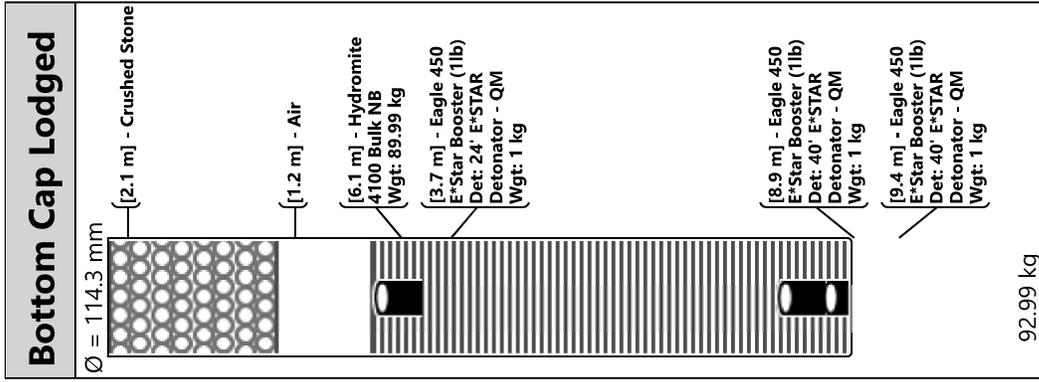
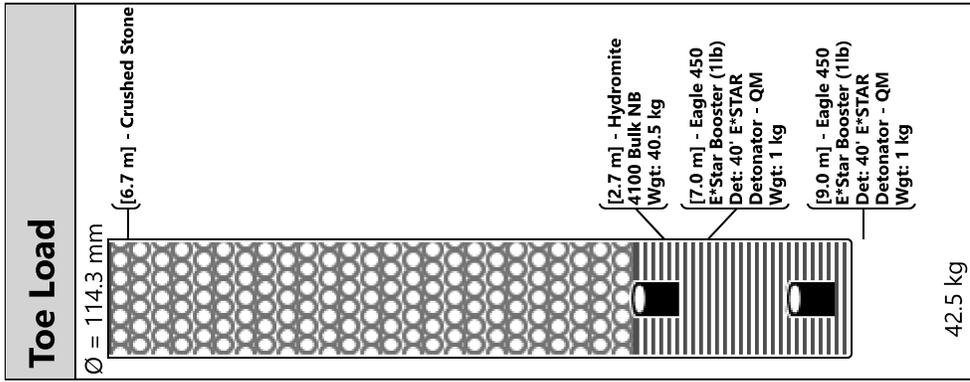
Installer and Firm: Liam O'Donohoe, Austin Powder Ltd.



Hole	Load	Surface Delay	Deck 1 Delay
ZZ94	Typical Hole	0	261/266
ZZ91	Typical Hole	0	377/382
ZZ37	Typical Hole	0	619/624
ZZ62	Typical Hole	0	392/397
ZZ70	Typical Hole	0	344/349
ZZ39	Typical Hole	0	746/751
ZZ56	Typical Hole	0	465/470
ZZ30	Typical Hole	0	728/733
ZZ9	Typical Hole	0	1127/1132
ZZ40	Typical Hole	0	713/718
ZZ55	Typical Hole	0	399/404
ZZ79	Typical Hole	0	100/105
ZZ87	Typical Hole	0	173/178
ZZ68	Typical Hole	0	321/326
ZZ18	Typical Hole	0	882/887
ZZ98	Typical Hole	0	121/126
ZZ86	Typical Hole	0	246/251
ZZ85	Typical Hole	0	325/330
ZZ48	Bottom Cap Lodged	0	508/508/513
ZZ41	Bottom Cap Lodged	0	637/637/642
ZZ31	Typical Hole	0	692/697
ZZ60	Typical Hole	0	376/381
ZZ92	Typical Hole	0	302/307
ZZ44	Typical Hole	0	610/615
ZZ43	Bottom Cap Lodged	0	545/545/550
ZZ72	Typical Hole	0	214/219
ZZ28	Typical Hole	0	852/857
ZZ25	Toe Load	0	768/773
ZZ96	Typical Hole	0	411/416
ZZ47	Bottom Cap Lodged	0	573/573/578
ZZ8	Typical Hole	0	1058/1063
ZZ1	Typical Hole	0	1064/1069
ZZ89	Typical Hole	0	275/280
ZZ22	Typical Hole	0	930/935
ZZ24	Typical Hole	0	806/811
ZZ11	Typical Hole	0	1019/1024
ZZ90	Typical Hole	0	358/363
ZZ67	Typical Hole	0	253/258
ZZ52	Typical Hole	0	561/566
ZZ26	Typical Hole	0	825/830
ZZ4	Typical Hole	0	1173/1178
ZZ71	Typical Hole	0	282/287
ZZ15	Bottom Cap Lodged	0	1047/1047/1052
ZZ33	Bottom Cap Lodged	0	817/817/822
ZZ83	Typical Hole	0	223/228
ZZ29	Bottom Cap Lodged	0	789/789/794

Hole	Load	Surface Delay	Deck 1 Delay
ZZ97	Typical Hole	0	175/180
ZZ73	Typical Hole	0	178/183
ZZ6	Typical Hole	0	1040/1045
ZZ23	Typical Hole	0	870/875
ZZ19	Typical Hole	0	841/846
ZZ45	Bottom Cap Lodged	0	670/670/675
ZZ7	Typical Hole	0	999/1004
ZZ10	Typical Hole	0	1086/1091
ZZ35	Typical Hole	0	714/719
ZZ82	Typical Hole	0	150/155
ZZ57	Typical Hole	0	519/524
ZZ59	Bottom Cap Lodged	0	423/423/428
ZZ63	Typical Hole	0	450/455
ZZ74	Typical Hole	0	244/249
ZZ64	Typical Hole	0	414/419
ZZ17	Typical Hole	0	947/952
ZZ49	Toe Load	0	472/477
ZZ32	Bottom Cap Lodged	0	754/754/759
ZZ20	Typical Hole	0	904/909
ZZ54	Typical Hole	0	439/444
ZZ50	Bottom Cap Lodged	0	531/531/536
ZZ66	Typical Hole	0	284/289
ZZ69	Typical Hole	0	377/382
ZZ34	Bottom Cap Lodged	0	782/782/787
ZZ58	Typical Hole	0	486/491
ZZ80	Typical Hole	0	263/268
ZZ88	Typical Hole	0	201/206
ZZ93	Typical Hole	0	225/230
ZZ36	Typical Hole	0	657/662
ZZ78	Typical Hole	0	138/143
ZZ42	Typical Hole	0	581/586
ZZ99	Typical Hole	0	283/288
ZZ81	Typical Hole	0	198/203
ZZ75	Typical Hole	0	307/312
ZZ27	Typical Hole	0	889/894
ZZ38	Bottom Cap Lodged	0	680/680/685
ZZ53	Typical Hole	0	497/502
ZZ65	Typical Hole	0	357/362
ZZ51	Typical Hole	0	597/602
ZZ21	Typical Hole	0	970/975
ZZ13	Typical Hole	0	918/923
ZZ16	Typical Hole	0	1009/1014
ZZ5	Typical Hole	0	1100/1105
ZZ2	Typical Hole	0	1129/1134
ZZ95	Typical Hole	0	335/340
ZZ76	Typical Hole	0	269/274

Hole	Load	Surface Delay	Deck 1 Delay
ZZ61	Typical Hole	0	328/333
ZZ46	Bottom Cap Lodged	0	638/638/643
ZZ77	Typical Hole	0	208/213
ZZ12	Typical Hole	0	959/964
ZZ14	Typical Hole	0	985/990
ZZ84	Typical Hole	0	305/310
ZZ3	Typical Hole	0	1193/1198





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/17/2019 12:45

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Partly Cloudy

Wind From: WNW

Temperature: 12 °C

Terrain: Flat

Wind Velocity: 3-10 km/h

Blast U.T.M.: 17N 500140 mE 4942357 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd #17

Compass Point: N

Direction/Bearing: 357 °

Structure Type: Dwelling

Distance: 655 m

Structure U.T.M.: 17N 500101 mE 4943011 mN

**LAYOUT**

Hole Depth:	9.75 m	Material Blasted:	Limestone	Total Meters Drilled:	1,043.6 m
No. of Holes:	107	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	107	Face Height:	9.14 m	Spacing:	3.66 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone
				Method:	Specified
					(H = 9.14 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation:	Electronic	Max. Wt. of Expl. in Overlapped Decks:	391.6 kg	Volume Produced:	10,397.9 m <sup>3</sup>
Firing Device:	E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	391.6 kg	Weight Produced:	24,959.2 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.382 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	97.9 kg	Powder Factor 2:	1.007 kg/m <sup>3</sup>
Initiation Settings:		Scaled Distance Factor (max charge):	66.24	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):		Scaled Distance Factor (per delay):	33.12		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	No	No	No	No
O'DONOHUE	LIAM, J			No	Yes	No	No	Yes
PETRY	BRANDON			No	Yes	No	No	No
	, R							



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/17/2019 12:45

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	214.00 ea	214.00
15003	40' E*STAR Detonator - QM	107.00 ea	0.00
15030	60' E*STAR Detonator - QM/HD	107.00 ea	0.00
15128	Hydromite 4100 Bulk NB	10,260.00 kg	10,260.00
12981	Mini Stem Plug - 6015	107.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	5.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			10,474.00

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 05/17/2019 12:45

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**SEISMOGRAPH 1 - 178717 GREYRD #17**

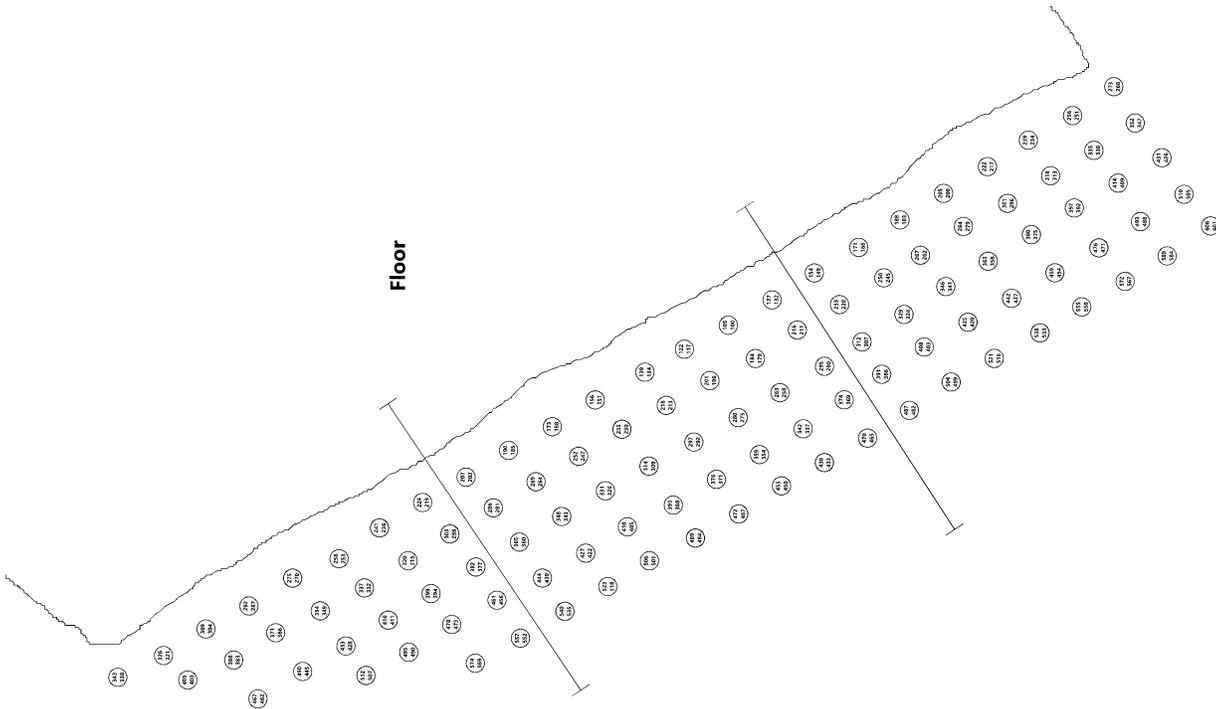
Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster			
Date:	05/17/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	1.143 mm/s	37.0 Hz
Time:	12:45	Calibration Date:	07/16/18	Vertical:	1.524 mm/s	17.0 Hz
Distance From Blast:	635.81 m	Calibration Signal:	OK	Longitudinal:	1.27 mm/s	34.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz			
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	118 dB	--- Hz
Location:	Spiked and buried.			Vector Sum:	1.616 mm/s	
U.T.M.:	17N 500660 mE 4941991 mN					
Reader and Firm:	Evan Smart, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Evan Smart, Austin Powder Ltd.					

**SEISMOGRAPH 2 - 178841 GREY ROAD #17**

Data Type:	No Trigger	Seismograph Type:	GeoSonics Inc.
Date:	05/17/19	Trigger Level:	1.52 mm/s 115.00 dB
Time:	12:45	Calibration Date:	07/16/18
Distance From Blast:	655.32 m	Calibration Signal:	OK
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz
Readout:		Mic. Min. Freq.:	--- Hz
Location:	Bolted to Bedrock.		
U.T.M.:	17N 500101 mE 4943011 mN		
Reader and Firm:	Evan Smart, AUSTIN POWDER		
Analyst and Firm:			
Installer and Firm:	Evan Smart, Austin Powder Ltd.		

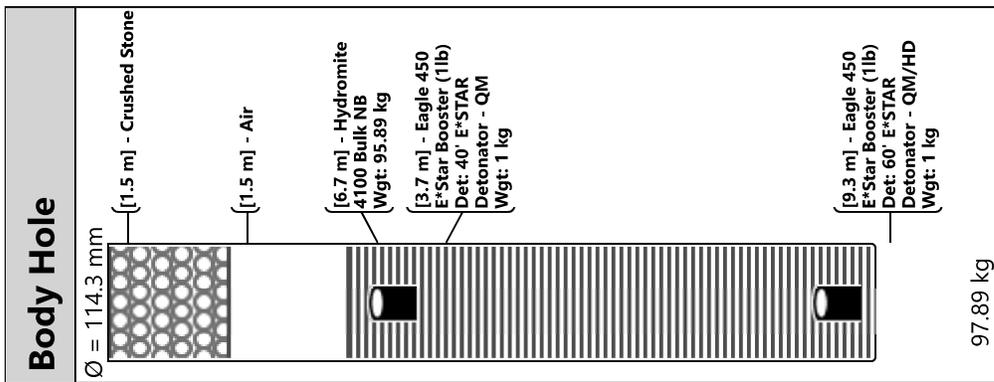
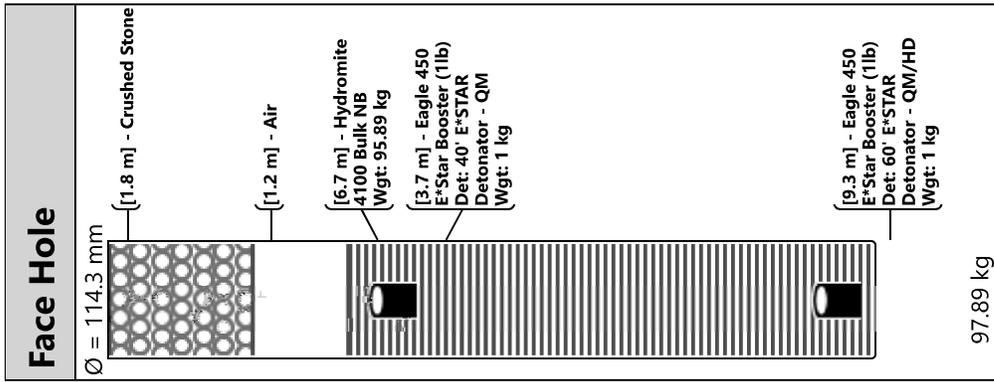
**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster			
Date:	05/17/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	0.127 mm/s	0.0 Hz
Time:	12:45	Calibration Date:	02/05/19	Vertical:	0.127 mm/s	0.0 Hz
Distance From Blast:	1,076.25 m	Calibration Signal:	OK	Longitudinal:	0.127 mm/s	0.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz			
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	117 dB	--- Hz
Location:	Spiked and weight bagged beside the mail box.			Vector Sum:	0.22 mm/s	
U.T.M.:	17N 501117 mE 4941905 mN					
Reader and Firm:	Evan Smart, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Evan Smart, Austin Powder Ltd.					



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ86	Body Hole	0	454/459	ZZ59	Body Hole	0	292/297
ZZ90	Body Hole	0	601/606	ZZ44	Body Hole	0	296/301
ZZ84	Body Hole	0	420/425	ZZ106	Body Hole	0	552/557
ZZ61	Body Hole	0	326/331	ZZ88	Body Hole	0	488/493
ZZ4	Face Hole	0	217/222	ZZ36	Body Hole	0	213/218
ZZ63	Body Hole	0	360/365	ZZ99	Body Hole	0	433/438
ZZ25	Body Hole	0	400/405	ZZ104	Body Hole	0	518/523
ZZ18	Face Hole	0	236/241	ZZ97	Body Hole	0	482/487
ZZ64	Body Hole	0	377/382	ZZ96	Body Hole	0	499/504
ZZ70	Body Hole	0	507/512	ZZ35	Body Hole	0	230/235
ZZ81	Body Hole	0	369/374	ZZ37	Body Hole	0	196/201
ZZ62	Body Hole	0	343/348	ZZ105	Body Hole	0	535/540
ZZ85	Body Hole	0	437/442	ZZ32	Body Hole	0	281/286
ZZ74	Body Hole	0	439/444	ZZ14	Face Hole	0	168/173
ZZ51	Body Hole	0	375/380	ZZ102	Body Hole	0	484/489
ZZ42	Body Hole	0	262/267	ZZ103	Body Hole	0	501/506
ZZ29	Body Hole	0	332/337	ZZ83	Body Hole	0	403/408
ZZ100	Body Hole	0	450/455	ZZ89	Body Hole	0	505/510
ZZ2	Face Hole	0	251/256	ZZ98	Body Hole	0	465/470
ZZ26	Body Hole	0	383/388	ZZ1	Face Hole	0	268/273
ZZ27	Body Hole	0	366/371	ZZ65	Body Hole	0	394/399
ZZ28	Body Hole	0	349/354	ZZ77	Body Hole	0	388/393
ZZ76	Body Hole	0	405/410	ZZ55	Body Hole	0	307/312
ZZ101	Body Hole	0	467/472	ZZ21	Face Hole	0	287/292
ZZ107	Body Hole	0	569/574	ZZ56	Body Hole	0	290/295
ZZ13	Face Hole	0	151/156	ZZ22	Face Hole	0	304/309
ZZ24	Face Hole	0	338/343	ZZ30	Body Hole	0	315/320
ZZ72	Body Hole	0	473/478	ZZ79	Body Hole	0	354/359
ZZ11	Face Hole	0	117/122	ZZ49	Body Hole	0	409/414
ZZ33	Body Hole	0	264/269	ZZ5	Face Hole	0	200/205
ZZ52	Body Hole	0	358/363	ZZ43	Body Hole	0	279/284
ZZ45	Body Hole	0	313/318	ZZ53	Body Hole	0	341/346
ZZ78	Body Hole	0	371/376	ZZ10	Face Hole	0	100/105
ZZ38	Body Hole	0	179/184	ZZ66	Body Hole	0	411/416
ZZ47	Body Hole	0	347/352	ZZ31	Body Hole	0	298/303
ZZ23	Face Hole	0	321/326	ZZ91	Body Hole	0	584/589
ZZ41	Body Hole	0	245/250	ZZ68	Body Hole	0	445/450
ZZ87	Body Hole	0	471/476	ZZ34	Body Hole	0	247/252
ZZ12	Face Hole	0	134/139	ZZ9	Face Hole	0	132/137
ZZ39	Body Hole	0	211/216	ZZ75	Body Hole	0	422/427
ZZ6	Face Hole	0	183/188	ZZ40	Body Hole	0	228/233
ZZ58	Body Hole	0	275/280	ZZ71	Body Hole	0	490/495
ZZ93	Body Hole	0	550/555	ZZ16	Face Hole	0	202/207
ZZ82	Body Hole	0	386/391	ZZ95	Body Hole	0	516/521
ZZ67	Body Hole	0	428/433	ZZ69	Body Hole	0	462/467
ZZ60	Body Hole	0	309/314	ZZ17	Face Hole	0	219/224

Hole	Load	Surface Delay	Deck 1 Delay
ZZ46	Body Hole	0	330/335
ZZ7	Face Hole	0	166/171
ZZ73	Body Hole	0	456/461
ZZ92	Body Hole	0	567/572
ZZ15	Face Hole	0	185/190
ZZ80	Body Hole	0	337/342
ZZ57	Body Hole	0	258/263
ZZ19	Face Hole	0	253/258
ZZ8	Face Hole	0	149/154
ZZ94	Body Hole	0	533/538
ZZ20	Face Hole	0	270/275
ZZ50	Body Hole	0	392/397
ZZ54	Body Hole	0	324/329
ZZ48	Body Hole	0	426/431
ZZ3	Face Hole	0	234/239





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 06/24/2019 17:28

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 33' Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Overcast /  
Low Clouds

Wind From: ENE

Temperature: 27 °C

Terrain: Flat

Wind Velocity: 1-15 km/h

Blast U.T.M.: 17N 500150 mE 4942309 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Road #17

Compass Point: N  
Direction/Bearing: 356 °  
Distance: 704 m

Structure Type: Dwelling

Structure U.T.M.: 17N 500101 mE 4943011 mN

**LAYOUT**

Hole Depth:	10.06 m	Material Blasted:	Limestone	Total Meters Drilled:	2,202.8 m
No. of Holes:	219	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	213	Face Height:	9.45 m	Spacing:	3.66 m
No. of Rows:	7	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone
				Method:	Specified
					(H = 9.45 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	941.6 kg	Volume Produced:	22,329.3 m <sup>3</sup>
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	941.6 kg	Weight Produced:	53,598.6 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	9	Powder Factor 1:	2.294 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	105.3 kg	Powder Factor 2:	1.047 kg/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (max charge):	68.57	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):	Scaled Distance Factor (per delay):	22.94		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDE R, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
KICKSEE	WAYNE, R			No	No	No	No	No
KOUYOUJIAN	MACKENZI E, H			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
O'DONOHUE	LIAM, J			No	Yes	Yes	No	No
PETRY	BRANDON , R			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 06/24/2019 17:28

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 33' Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	441.00 ea	441.00
15003	40' E*STAR Detonator - QM	222.00 ea	0.00
15030	60' E*STAR Detonator - QM/HD	219.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	22,260.00 kg	22,260.00
20334	Hydromite 880 76x400 (3x16)	12.00 st	27.24
12981	Mini Stem Plug - 6015	219.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	2.00 ea	0.00
AB013	Labour Charge	13.00 hr	0.00

Total Weight of Explosives (Include Primers) ( kg ): 22,728.24

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 06/24/2019 17:28

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 33' Bench

**SEISMOGRAPH 1 - 178717 GREY RD #17**

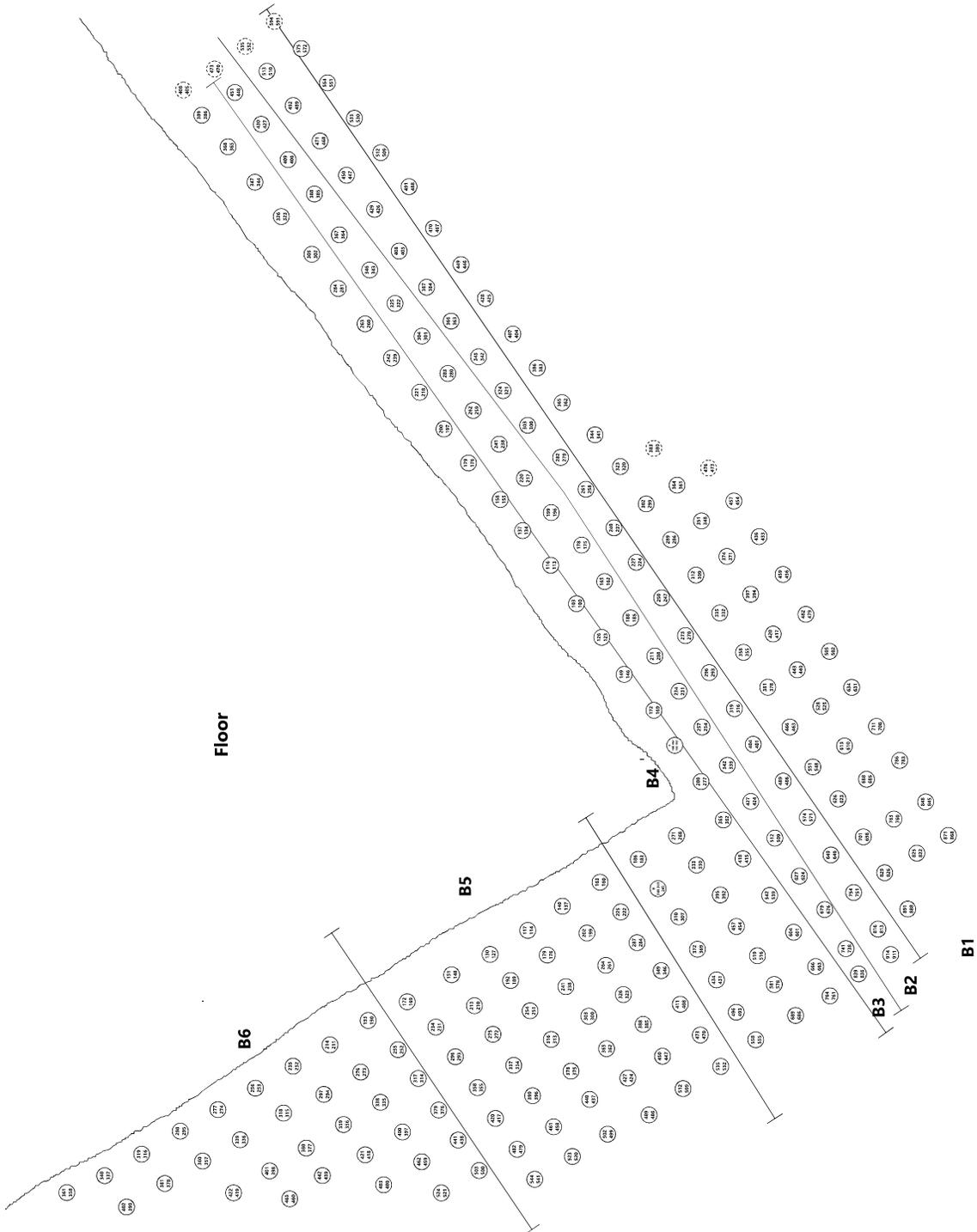
Data Type:	Seismic Record	Seismograph Type:	InstanTEL - Minimate Blaster		
Date:	06/24/19	Trigger Level:	1.50 mm/s	115.00 dB	Transverse: 3.683 mm/s 47.0 Hz
Time:	17:28	Calibration Date:	01/22/19		Vertical: 2.032 mm/s 34.0 Hz
Distance From Blast:	601.07 m	Calibration Signal:	OK		Longitudinal: 2.921 mm/s 39.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz		
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic: 118 dB --- Hz
Location:	Spiked and buried.				Vector Sum: 4.147 mm/s
U.T.M.:	17N 500660 mE 4941991 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Mac Kouyoumjian, Austin Powder Ltd.				

**SEISMOGRAPH 2 - 178841 GREY ROAD #17**

Data Type:	Seismic Record	Seismograph Type:	InstanTEL - Minimate Blaster		
Date:	06/24/19	Trigger Level:	1.50 mm/s	115.00 dB	Transverse: 0.762 mm/s 0.0 Hz
Time:	17:28	Calibration Date:	01/22/19		Vertical: 1.27 mm/s 18.0 Hz
Distance From Blast:	703.78 m	Calibration Signal:			Longitudinal: 1.524 mm/s 27.0 Hz
Direction From Blast:	N	Geophone Min. Freq.:	--- Hz		
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic: 130 dB --- Hz
Location:	Bolted to bedrock at the front of the property. Unit #233.				Vector Sum: 1.566 mm/s
U.T.M.:	17N 500101 mE 4943011 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Mac Kouyoumjian, Austin Powder Ltd.				

**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type:	Seismic Record	Seismograph Type:	InstanTEL - Minimate Blaster		
Date:	06/24/19	Trigger Level:	1.50 mm/s	115.00 dB	Transverse: 1.397 mm/s 32.0 Hz
Time:	17:28	Calibration Date:	02/05/19		Vertical: 0.762 mm/s 26.0 Hz
Distance From Blast:	1,048.21 m	Calibration Signal:	OK		Longitudinal: 1.524 mm/s 39.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz		
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz		Acoustic: 114 dB --- Hz
Location:	Spiked and weight bagged beside the mail box.				Vector Sum: 1.67 mm/s
U.T.M.:	17N 501117 mE 4941905 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Mac Kouyoumjian, Austin Powder Ltd.				

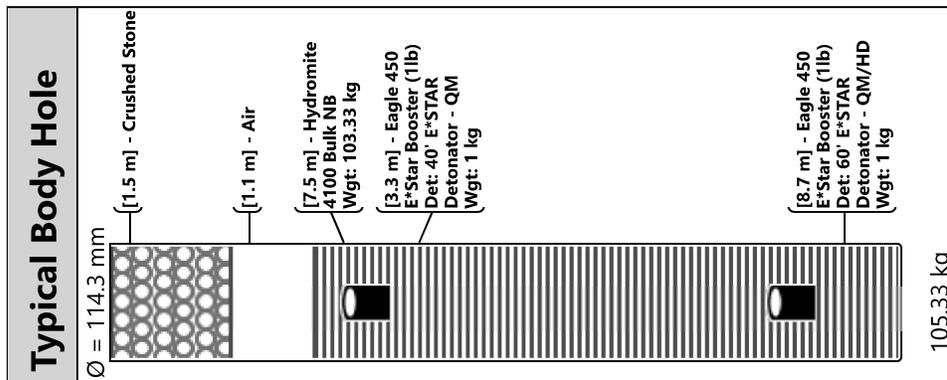
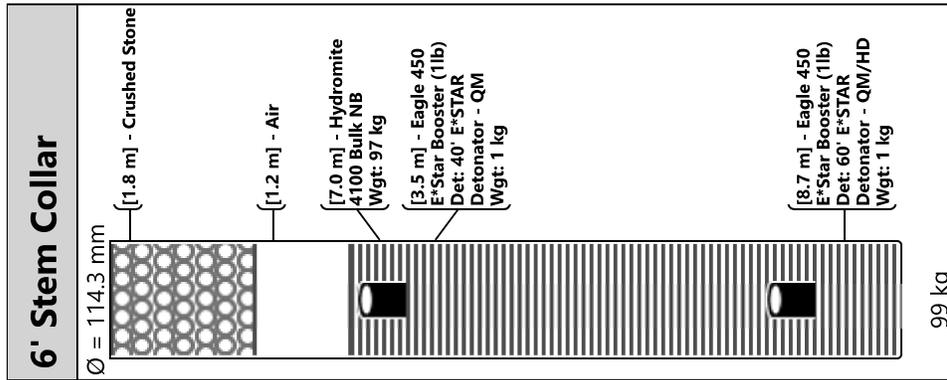
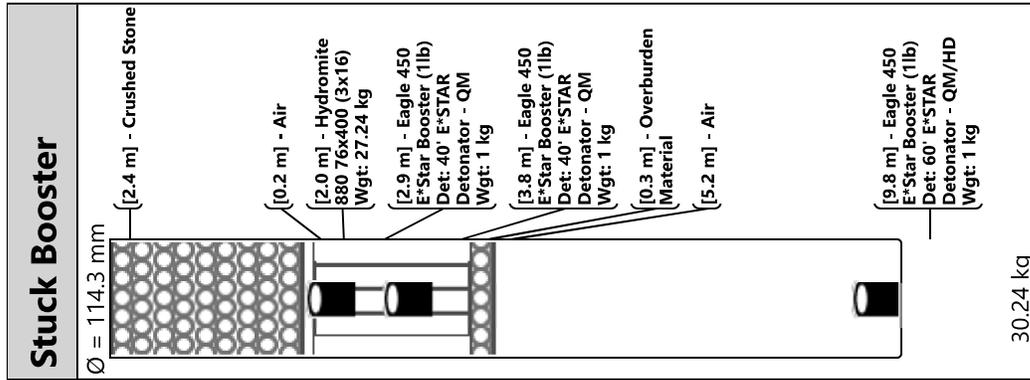
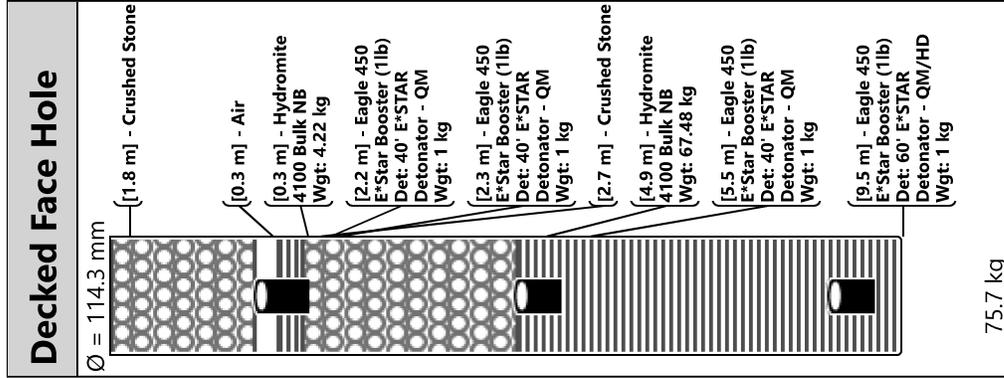


Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ15	6' Stem Collar	0	160/163	ZZ91	Typical Body Hole	0	371/374
ZZ6	6' Stem Collar	0	253/256	ZZ106	6' Stem Collar	0	134/137
ZZ122	Typical Body Hole	0	426/429	ZZ158	Typical Body Hole	0	578/581
ZZ88	Typical Body Hole	0	456/459	ZZ189	Typical Body Hole	0	760/763
ZZ100	Typical Body Hole	0	454/457	ZZ45	Typical Body Hole	0	369/372
ZZ125	Typical Body Hole	0	342/345	ZZ119	Typical Body Hole	0	259/262
ZZ142	Typical Body Hole	0	446/449	ZZ55	Typical Body Hole	0	439/442
ZZ29	Typical Body Hole	0	357/360	ZZ34	Typical Body Hole	0	377/380
ZZ210	Typical Body Hole	0	293/296	ZZ31	Typical Body Hole	0	399/402
ZZ68	Typical Body Hole	0	470/473	ZZ20	Typical Body Hole	0	176/179
ZZ70	Typical Body Hole	0	424/427	ZZ109	Typical Body Hole	0	320/323
ZZ193	Typical Body Hole	0	783/786	ZZ8	6' Stem Collar	0	211/214
ZZ75	Typical Body Hole	0	521/524	ZZ25	Typical Body Hole	0	273/276
ZZ87	Typical Body Hole	0	394/397	ZZ80	Typical Body Hole	0	509/512
ZZ39	Typical Body Hole	0	272/275	ZZ186	Typical Body Hole	0	548/551
ZZ121	6' Stem Collar	0	218/221	ZZ192	Typical Body Hole	0	845/848
ZZ175	Typical Body Hole	0	424/427	ZZ42	Typical Body Hole	0	261/264
ZZ27	Typical Body Hole	0	315/318	ZZ139	Typical Body Hole	0	530/533
ZZ213	6' Stem Collar	0	155/158	ZZ14	6' Stem Collar	0	137/140
ZZ93	Typical Body Hole	0	185/188	ZZ134	Typical Body Hole	0	509/512
ZZ83	6' Stem Collar	0	146/149	ZZ185	Typical Body Hole	0	623/626
ZZ30	Typical Body Hole	0	378/381	ZZ1	6' Stem Collar	0	358/361
ZZ53	Typical Body Hole	0	397/400	ZZ54	Typical Body Hole	0	418/421
ZZ190	Typical Body Hole	0	822/825	ZZ102	Typical Body Hole	0	237/240
ZZ203	Typical Body Hole	0	316/319	ZZ111	Typical Body Hole	0	279/282
ZZ181	Typical Body Hole	0	911/914	ZZ179	Typical Body Hole	0	751/754
ZZ69	Typical Body Hole	0	447/450	ZZ97	Typical Body Hole	0	224/227
ZZ58	Typical Body Hole	0	459/462	ZZ199	Typical Body Hole	0	339/342
ZZ50	Typical Body Hole	0	334/337	ZZ194	Typical Body Hole	0	708/711
ZZ160	Typical Body Hole	0	454/457	ZZ9	6' Stem Collar	0	190/193
ZZ40	Typical Body Hole	0	251/254	ZZ107	Typical Body Hole	0	196/199
ZZ112	Typical Body Hole	0	341/344	ZZ82	Typical Body Hole	0	555/558
ZZ141	Typical Body Hole	0	384/387	ZZ191	Typical Body Hole	0	868/871
ZZ36	Typical Body Hole	0	335/338	ZZ126	Typical Body Hole	0	404/407
ZZ37	Typical Body Hole	0	314/317	ZZ154	Typical Body Hole	0	510/513
ZZ41	Typical Body Hole	0	238/241	ZZ60	Typical Body Hole	0	417/420
ZZ2	6' Stem Collar	0	337/340	ZZ48	Typical Body Hole	0	300/303
ZZ184	Typical Body Hole	0	698/701	ZZ145	Typical Body Hole	0	343/346
ZZ33	Typical Body Hole	0	398/401	ZZ92	Typical Body Hole	0	433/436
ZZ195	Typical Body Hole	0	525/528	ZZ152	6' Stem Collar	0	386/389
ZZ178	Typical Body Hole	0	646/649	ZZ72	Typical Body Hole	0	458/461
ZZ52	Typical Body Hole	0	376/379	ZZ180	Typical Body Hole	0	813/816
ZZ204	Typical Body Hole	0	378/381	ZZ26	Typical Body Hole	0	294/297
ZZ76	Typical Body Hole	0	541/544	ZZ51	Typical Body Hole	0	355/358
ZZ44	Typical Body Hole	0	307/310	ZZ21	Typical Body Hole	0	189/192
ZZ108	Typical Body Hole	0	258/261	ZZ157	Typical Body Hole	0	686/689

Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ13	6' Stem Collar	0	114/117	
ZZ138	Typical Body Hole	0	468/471	
ZZ114	Typical Body Hole	0	238/241	
ZZ208	Typical Body Hole	0	417/420	
ZZ117	Typical Body Hole	0	321/324	
ZZ79	Typical Body Hole	0	486/489	
ZZ35	Typical Body Hole	0	356/359	
ZZ182	Typical Body Hole	0	888/891	
ZZ32	Typical Body Hole	0	419/422	
ZZ128	Typical Body Hole	0	425/428	
ZZ12	6' Stem Collar	0	127/130	
ZZ187	Typical Body Hole	0	610/613	
ZZ202	Typical Body Hole	0	254/257	
ZZ207	Typical Body Hole	0	479/482	
ZZ116	Typical Body Hole	0	362/365	
ZZ171	Typical Body Hole	0	738/741	
ZZ77	Typical Body Hole	0	520/523	
ZZ85	Typical Body Hole	0	270/273	
ZZ137	Typical Body Hole	0	406/409	
ZZ86	Typical Body Hole	0	332/335	
ZZ99	Typical Body Hole	0	348/351	
ZZ163	6' Stem Collar	0	268/271	
ZZ172	Typical Body Hole	0	676/679	
ZZ200	6' Stem Collar	0	277/280	
ZZ127	Typical Body Hole	0	363/366	
ZZ17	Stuck Booster	0	245/245/248	0
ZZ149	Typical Body Hole	0	489/492	
ZZ133	Typical Body Hole	0	447/450	
ZZ136	6' Stem Collar	0	344/347	
ZZ151	6' Stem Collar	0	302/305	
ZZ101	Typical Body Hole	0	175/178	
ZZ156	Typical Body Hole	0	364/367	
ZZ165	Typical Body Hole	0	415/418	
ZZ66	Typical Body Hole	0	431/434	
ZZ153	Typical Body Hole	0	448/451	
ZZ129	Typical Body Hole	0	301/304	
ZZ61	Typical Body Hole	0	396/399	
ZZ18	Typical Body Hole	0	222/225	
ZZ123	Typical Body Hole	0	488/491	
ZZ130	6' Stem Collar	0	239/242	
ZZ110	Typical Body Hole	0	217/220	
ZZ3	6' Stem Collar	0	316/319	
ZZ143	Typical Body Hole	0	405/408	
ZZ211	Typical Body Hole	0	231/234	
ZZ198	Typical Body Hole	0	401/404	
ZZ170	Typical Body Hole	0	836/839	

Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ173	Typical Body Hole	0	624/627	
ZZ62	Typical Body Hole	0	375/378	
ZZ5	6' Stem Collar	0	274/277	
ZZ113	6' Stem Collar	0	176/179	
ZZ201	Decked Face Hole	0	192/192/192/195	0
ZZ146	6' Stem Collar	0	281/284	
ZZ71	Typical Body Hole	0	437/440	
ZZ135	6' Stem Collar	0	260/263	
ZZ94	6' Stem Collar	0	123/126	
ZZ81	Typical Body Hole	0	532/535	
ZZ212	6' Stem Collar	0	169/172	
ZZ24	Typical Body Hole	0	252/255	
ZZ43	Typical Body Hole	0	284/287	
ZZ56	Typical Body Hole	0	460/463	
ZZ159	Typical Body Hole	0	516/519	
ZZ144	Typical Body Hole	0	467/470	
ZZ155	Typical Body Hole	0	572/575	
ZZ63	Typical Body Hole	0	362/365	
ZZ148	Typical Body Hole	0	427/430	
ZZ59	Typical Body Hole	0	438/441	
ZZ67	Typical Body Hole	0	493/496	
ZZ166	Typical Body Hole	0	539/542	
ZZ177	Typical Body Hole	0	571/574	
ZZ11	6' Stem Collar	0	148/151	
ZZ105	6' Stem Collar	0	113/116	
ZZ124	Typical Body Hole	0	280/283	
ZZ22	Typical Body Hole	0	210/213	
ZZ209	Typical Body Hole	0	355/358	
ZZ183	Typical Body Hole	0	826/829	
ZZ188	Typical Body Hole	0	685/688	
ZZ74	Typical Body Hole	0	500/503	
ZZ90	Typical Body Hole	0	309/312	
ZZ150	Typical Body Hole	0	551/554	
ZZ84	Typical Body Hole	0	208/211	
ZZ38	Typical Body Hole	0	293/296	
ZZ104	Typical Body Hole	0	361/364	
ZZ65	Typical Body Hole	0	408/411	
ZZ167	Typical Body Hole	0	601/604	
ZZ205	Typical Body Hole	0	440/443	
ZZ140	Typical Body Hole	0	322/325	
ZZ115	Typical Body Hole	0	300/303	
ZZ4	6' Stem Collar	0	295/298	
ZZ206	Typical Body Hole	0	502/505	
ZZ64	Typical Body Hole	0	385/388	
ZZ78	Typical Body Hole	0	499/502	
ZZ176	Typical Body Hole	0	486/489	

Hole	Load	Surface Delay	Deck 1 Delay
ZZ196	Typical Body Hole	0	631/634
ZZ132	Typical Body Hole	0	385/388
ZZ73	Typical Body Hole	0	479/482
ZZ28	Typical Body Hole	0	336/339
ZZ19	Typical Body Hole	0	199/202
ZZ16	6' Stem Collar	0	183/186
ZZ147	6' Stem Collar	0	365/368
ZZ10	6' Stem Collar	0	169/172
ZZ46	Typical Body Hole	0	346/349
ZZ131	6' Stem Collar	0	323/326
ZZ49	Typical Body Hole	0	313/316
ZZ89	Typical Body Hole	0	247/250
ZZ161	Typical Body Hole	0	392/395
ZZ96	Typical Body Hole	0	162/165
ZZ168	Typical Body Hole	0	663/666
ZZ174	Typical Body Hole	0	509/512
ZZ162	Typical Body Hole	0	330/333
ZZ103	Typical Body Hole	0	299/302
ZZ98	Typical Body Hole	0	286/289
ZZ197	Typical Body Hole	0	463/466
ZZ169	Typical Body Hole	0	761/764
ZZ47	Typical Body Hole	0	323/326
ZZ95	6' Stem Collar	0	100/103
ZZ118	Typical Body Hole	0	383/386
ZZ57	Typical Body Hole	0	480/483
ZZ7	6' Stem Collar	0	232/235
ZZ164	Typical Body Hole	0	362/365
ZZ120	6' Stem Collar	0	197/200
ZZ23	Typical Body Hole	0	231/234
ZZ214	6' Stem Collar	0	405/408
ZZ218	Typical Body Hole	0	473/476
ZZ215	Typical Body Hole	0	470/473
ZZ216	Typical Body Hole	0	532/535
ZZ217	Typical Body Hole	0	591/594
ZZ219	Typical Body Hole	0	380/383





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/06/2019 13:47

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 32' Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Cloudy / High  
Clouds

Wind From: ENE

Temperature: 25 °C

Terrain: Flat

Wind Velocity: 3-7 km/h

Blast U.T.M.: 17N 500199 mE 4942329 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 352 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 686 m

**LAYOUT**

Hole Depth:	9.75 m	Material Blasted:	Limestone	Total Meters Drilled:	1,102.2 m
No. of Holes:	113	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	113	Face Height:	9.14 m	Spacing:	3.35 m
No. of Rows:	2	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear stone
				Method:	Specified
					(H = 9.14 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	536.6 kg	Volume Produced:	10,372.5 m <sup>3</sup>
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	536.6 kg	Weight Produced:	24,898.1 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	6	Powder Factor 1:	2.488 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	90.1 kg	Powder Factor 2:	0.965 kg/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (max charge):	72.33	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):	Scaled Distance Factor (per delay):	29.63		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

Blast occurred other than scheduled time: No      Misfire Occurred: No      Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BRAGAN	COREY, T			No	Yes	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
O'DONOHUE	LIAM, J			No	Yes	Yes	No	No
PETRY	BRANDON , R			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/06/2019 13:47

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 32' Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	228.00 ea	228.00
15003	40' E*STAR Detonator - QM	122.00 ea	0.00
15030	60' E*STAR Detonator - QM/HD	106.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	9,760.00 kg	9,760.00
20334	Hydromite 880 76x400 (3x16)	8.00 st	18.16
12981	Mini Stem Plug - 6015	114.00 ea	0.00
Total Weight of Explosives (Include Primers) ( kg ):			<b>10,006.16</b>

**COMMENTS / EXPLANATIONS**

General Comments: Imported on 8/7/2019 6:21:53 AM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/06/2019 13:47

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: 32' Bench

**SEISMOGRAPH 1 - 178717 GREYRD 17**

Data Type: Seismic Record Seismograph Type: instancel

Date: 08/06/19 Trigger Level: 1.50 mm/s 115.00 dB Transverse: 0.127 mm/s --- Hz

Time: 13:47 Calibration Date: 01/01/19 Vertical: 0.142 mm/s --- Hz

Distance From Blast: 571.50 m Calibration Signal: ok Longitudinal: 0.127 mm/s --- Hz

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

Readout: Mic. Min. Freq.: --- Hz Acoustic: 117 dB --- Hz

Location: Vector Sum: 0.146 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 2 - 178841 GREYRD. 17**

Data Type: Seismic Record Seismograph Type: Instancel Minimate II

Date: 08/06/19 Trigger Level: 1.00 mm/s --- dB Transverse: 0.127 mm/s --- Hz

Time: 13:47 Calibration Date: 01/22/19 Vertical: 0.158 mm/s --- Hz

Distance From Blast: 688.85 m Calibration Signal: Longitudinal: 0.166 mm/s --- Hz

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

Readout: Mic. Min. Freq.: --- Hz Acoustic: 117 dB --- Hz

Location: Bolted to bedrock in front of property. Vector Sum: 0.197 mm/s

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 3 - 283197 10TH CONC.**

Data Type: Seismic Record Seismograph Type: Instancel Mini-Mate II

Date: 08/06/19 Trigger Level: 1.50 mm/s 115.00 dB Transverse: 0.127 mm/s --- Hz

Time: 13:47 Calibration Date: 01/22/19 Vertical: 0.127 mm/s --- Hz

Distance From Blast: 1,011.33 m Calibration Signal: Longitudinal: 0.254 mm/s --- Hz

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

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

Location: Behind the mail box. Vector Sum: 0.254 mm/s

U.T.M.: 17N 501117 mE 4941905 mN

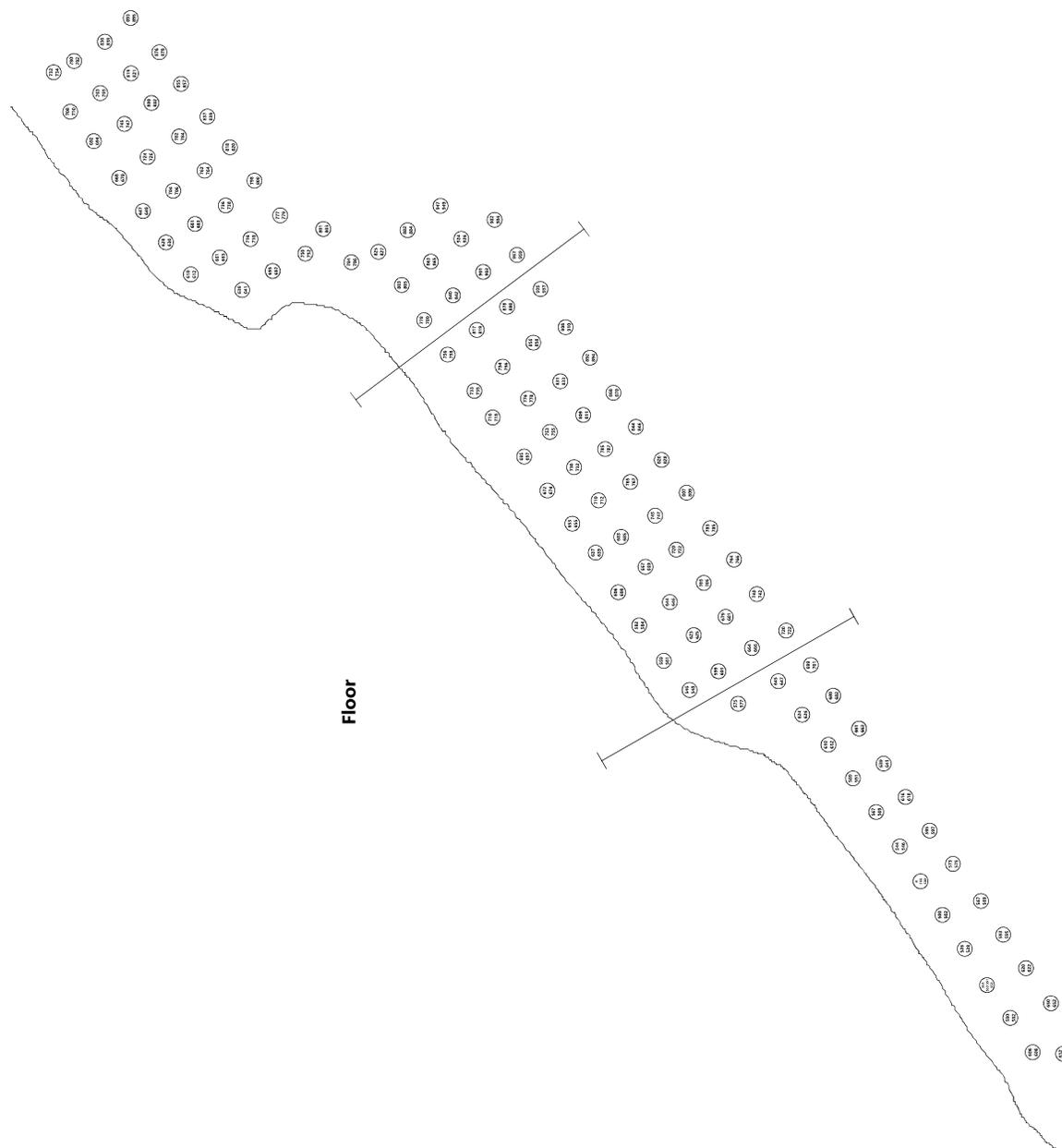
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

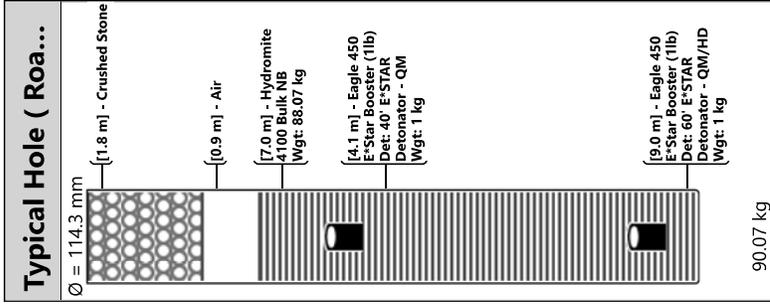
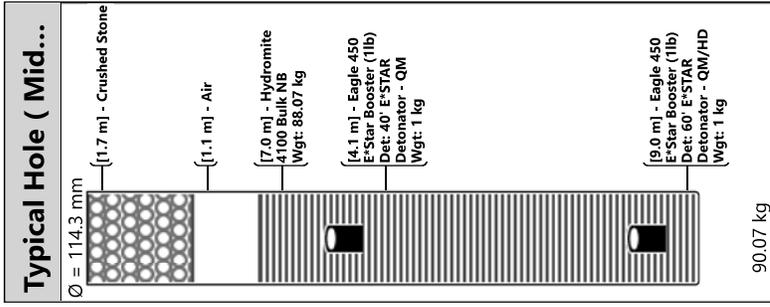
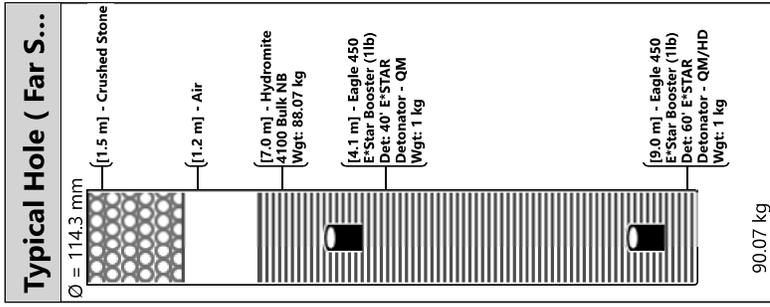
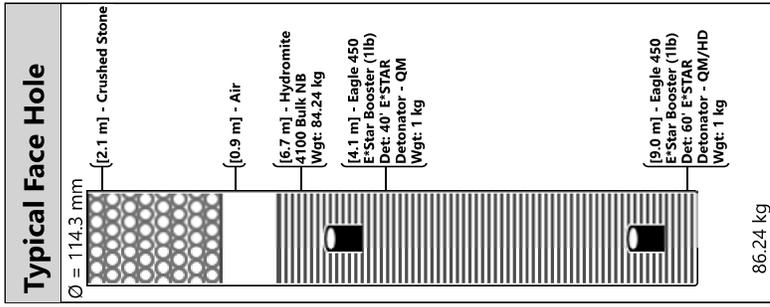
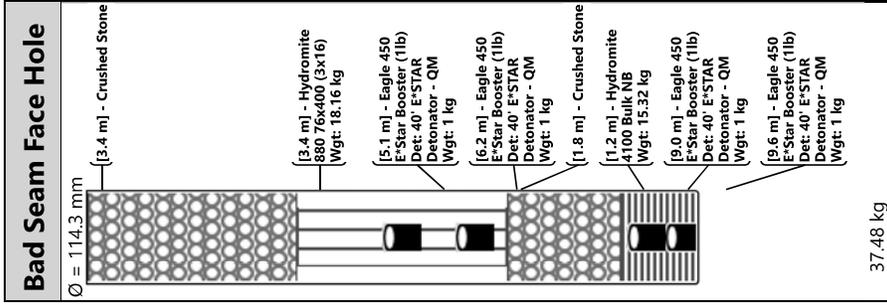
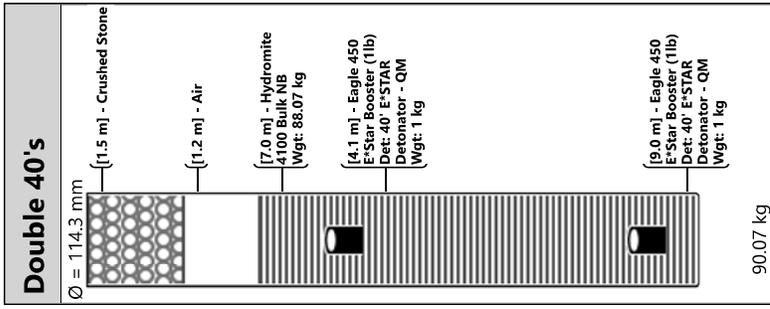


Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ36	Typical Face Hole	0	624/626		ZZ25	Double 40's	0	632/634
ZZ100	Typical Face Hole	0	692/694		ZZ26	Double 40's	0	606/608
ZZ5	Typical Hole ( Mid Shot )	0	892/894		ZZ62	Typical Hole ( Mid Shot )	0	667/669
ZZ38	Typical Hole ( Far Side )	0	664/666		ZZ55	Typical Hole ( Mid Shot )	0	817/819
ZZ4	Typical Hole ( Mid Shot )	0	908/910		ZZ98	Typical Hole ( Road Side )	0	800/802
ZZ111	Typical Face Hole	0	628/630		ZZ29	Typical Face Hole	0	526/528
ZZ103	Typical Hole ( Road Side )	0	782/784		ZZ106	Typical Hole ( Road Side )	0	716/718
ZZ43	Typical Hole ( Mid Shot )	0	765/767		ZZ16	Typical Hole ( Far Side )	0	661/663
ZZ88	Typical Hole ( Road Side )	0	837/839		ZZ83	Typical Face Hole	0	784/786
ZZ6	Typical Hole ( Mid Shot )	0	868/870		ZZ37	Typical Face Hole	0	645/647
ZZ27	Double 40's	0	580/582		ZZ95	Typical Face Hole	0	708/710
ZZ80	Typical Hole ( Road Side )	0	825/827		ZZ18	Typical Hole ( Far Side )	0	616/618
ZZ74	Typical Face Hole	0	695/697		ZZ48	Typical Hole ( Mid Shot )	0	878/880
ZZ72	Typical Face Hole	0	653/655		ZZ1	Typical Hole ( Road Side )	0	982/984
ZZ99	Typical Hole ( Road Side )	0	745/747		ZZ9	Typical Hole ( Mid Shot )	0	807/809
ZZ91	Typical Hole ( Road Side )	0	893/895		ZZ77	Typical Face Hole	0	756/758
ZZ110	Typical Face Hole	0	647/649		ZZ12	Typical Hole ( Mid Shot )	0	740/742
ZZ30	Typical Face Hole	0	500/502		ZZ101	Typical Face Hole	0	668/670
ZZ42	Typical Hole ( Mid Shot )	0	745/747		ZZ75	Typical Face Hole	0	716/718
ZZ64	Typical Hole ( Mid Shot )	0	623/625		ZZ23	Double 40's	0	620/622
ZZ31	Bad Seam Face Hole	0	518/520	0	ZZ10	Typical Hole ( Mid Shot )	0	783/785
ZZ82	Typical Hole ( Road Side )	0	801/803		ZZ58	Typical Hole ( Mid Shot )	0	753/755
ZZ46	Typical Hole ( Mid Shot )	0	831/833		ZZ112	Typical Face Hole	0	610/612
ZZ76	Typical Face Hole	0	733/735		ZZ44	Typical Hole ( Mid Shot )	0	785/787
ZZ107	Typical Face Hole	0	639/641		ZZ65	Typical Hole ( Far Side )	0	599/601
ZZ61	Typical Hole ( Mid Shot )	0	683/685		ZZ68	Typical Face Hole	0	559/561
ZZ56	Typical Hole ( Mid Shot )	0	794/796		ZZ33	Typical Face Hole	0	567/569
ZZ60	Typical Hole ( Mid Shot )	0	710/712		ZZ93	Typical Hole ( Road Side )	0	780/782
ZZ63	Typical Hole ( Mid Shot )	0	644/646		ZZ32	Typical Face Hole	0	544/546
ZZ92	Typical Hole ( Road Side )	0	836/838		ZZ34	Typical Face Hole	0	589/591
ZZ108	Typical Hole ( Road Side )	0	661/663		ZZ114	Typical Hole ( Road Side )	0	704/706
ZZ87	Typical Hole ( Road Side )	0	818/820		ZZ85	Typical Hole ( Road Side )	0	777/779
ZZ41	Typical Hole ( Mid Shot )	0	720/722		ZZ20	Typical Hole ( Far Side )	0	573/575
ZZ70	Typical Face Hole	0	606/608		ZZ78	Typical Face Hole	0	778/780
ZZ49	Typical Hole ( Road Side )	0	901/903		ZZ22	Typical Hole ( Far Side )	0	593/595
ZZ69	Typical Face Hole	0	582/584		ZZ67	Typical Face Hole	0	546/548
ZZ50	Typical Hole ( Road Side )	0	924/926		ZZ52	Typical Hole ( Road Side )	0	882/884
ZZ104	Typical Hole ( Road Side )	0	762/764		ZZ73	Typical Face Hole	0	672/674
ZZ90	Typical Hole ( Road Side )	0	876/878		ZZ24	Double 40's	0	650/652
ZZ109	Typical Hole ( Road Side )	0	681/683		ZZ19	Typical Hole ( Far Side )	0	595/597
ZZ57	Typical Hole ( Mid Shot )	0	776/778		ZZ84	Typical Hole ( Road Side )	0	750/752
ZZ2	Typical Hole ( Road Side )	0	957/959		ZZ71	Typical Face Hole	0	637/639
ZZ47	Typical Hole ( Mid Shot )	0	856/858		ZZ53	Typical Hole ( Road Side )	0	863/865
ZZ3	Typical Hole ( Mid Shot )	0	935/937		ZZ17	Typical Hole ( Far Side )	0	639/641
ZZ40	Typical Hole ( Mid Shot )	0	703/705		ZZ105	Typical Hole ( Road Side )	0	695/697
ZZ11	Typical Hole ( Mid Shot )	0	764/766		ZZ35	Typical Face Hole	0	610/612

Hole	Load	Surface Delay	Deck 1 Delay
ZZ8	Typical Hole ( Mid Shot )	0	826/828
ZZ89	Typical Hole ( Road Side )	0	855/857
ZZ7	Typical Hole ( Mid Shot )	0	844/846
ZZ28	Double 40's	0	551/551/553/553
ZZ14	Typical Hole ( Far Side )	0	699/701
ZZ13	Typical Hole ( Far Side )	0	720/722
ZZ102	Typical Hole ( Road Side )	0	724/726
ZZ66	Typical Face Hole	0	575/577
ZZ59	Typical Hole ( Mid Shot )	0	730/732
ZZ86	Typical Hole ( Road Side )	0	798/800
ZZ79	Typical Face Hole	0	803/805
ZZ51	Typical Hole ( Road Side )	0	947/949
ZZ15	Typical Hole ( Far Side )	0	680/682
ZZ94	Typical Face Hole	0	732/734
ZZ21	Typical Hole ( Far Side )	0	567/569
ZZ39	Typical Hole ( Mid Shot )	0	679/681
ZZ54	Typical Hole ( Road Side )	0	840/842
ZZ97	Typical Hole ( Road Side )	0	819/821
ZZ113	Typical Hole ( Road Side )	0	736/738
ZZ45	Typical Hole ( Mid Shot )	0	809/811
ZZ96	Typical Hole ( Road Side )	0	763/765





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/21/2019 13:25

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Clear

Wind From: SSE

Temperature: 27 °C

Terrain: Flat

Wind Velocity: 3-6 km/h

Blast U.T.M.: 17N 500187 mE 4942313 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Road #17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 353 °

Structure U.T.M.: 17N 500101 mE 4943011 mN

Distance: 704 m

**LAYOUT**

	Hole Depth:	9.75-13.11 m	Material Blasted:	Limestone	Total Meters Drilled:	896.7 m	
No. of Holes:	83	Subdrilling:	0.61 m	Burden:	3.05 m	Water Depth:	3.05 m
No. of V.P. † Holes:	83	Face Height:	9.14-12.50 m	Spacing:	3.35 m	Stem Length:	min 1.52 m
No. of Rows:	6	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Center Start/ Breakout
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone	Method:	Specified
							(H = 10.06 m)

† V.P. = Volume Producing

**WEIGHTS**

	Max. Wt. of Expl. in Overlapped Decks:	266.9 kg	Volume Produced:	7,914.8 m <sup>3</sup>
Initiation: Electronic	Max. Wt. of Expl. Per 8 ms Interval:	266.9 kg	Weight Produced:	18,998.7 t
Firing Device: E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	114.452 t/kg
Other Method:	Max. Wt. of Explosive Per Hole:	133.4 kg	Powder Factor 2:	0.021 kg/m <sup>3</sup>
Mfg and Model: DBM1600-2-RC	Scaled Distance Factor (max charge):	60.92	Rock Density:	2.400 t/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (per delay):	43.08		
Series Resistance (ohms):				

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
FRALICK	CRAIG, A			No	No	No	No	No
KOUYOU MJIAN	MACKENZI E, H			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
PETRY	BRANDON , R			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/21/2019 13:25

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	166.00 ea	166.00
15003	40' E*STAR Detonator - QM	140.00 ea	0.00
15031	80' E*STAR Detonator - QM/HD	26.00 ea	0.00
15128	Hydromite 4100 Bulk NB	8,580.00 kg	8,580.00
12981	Mini Stem Plug - 6015	83.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	6.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			8,746.00

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 08/21/2019 13:25

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**SEISMOGRAPH 1 - 178717 GREY RD #17**

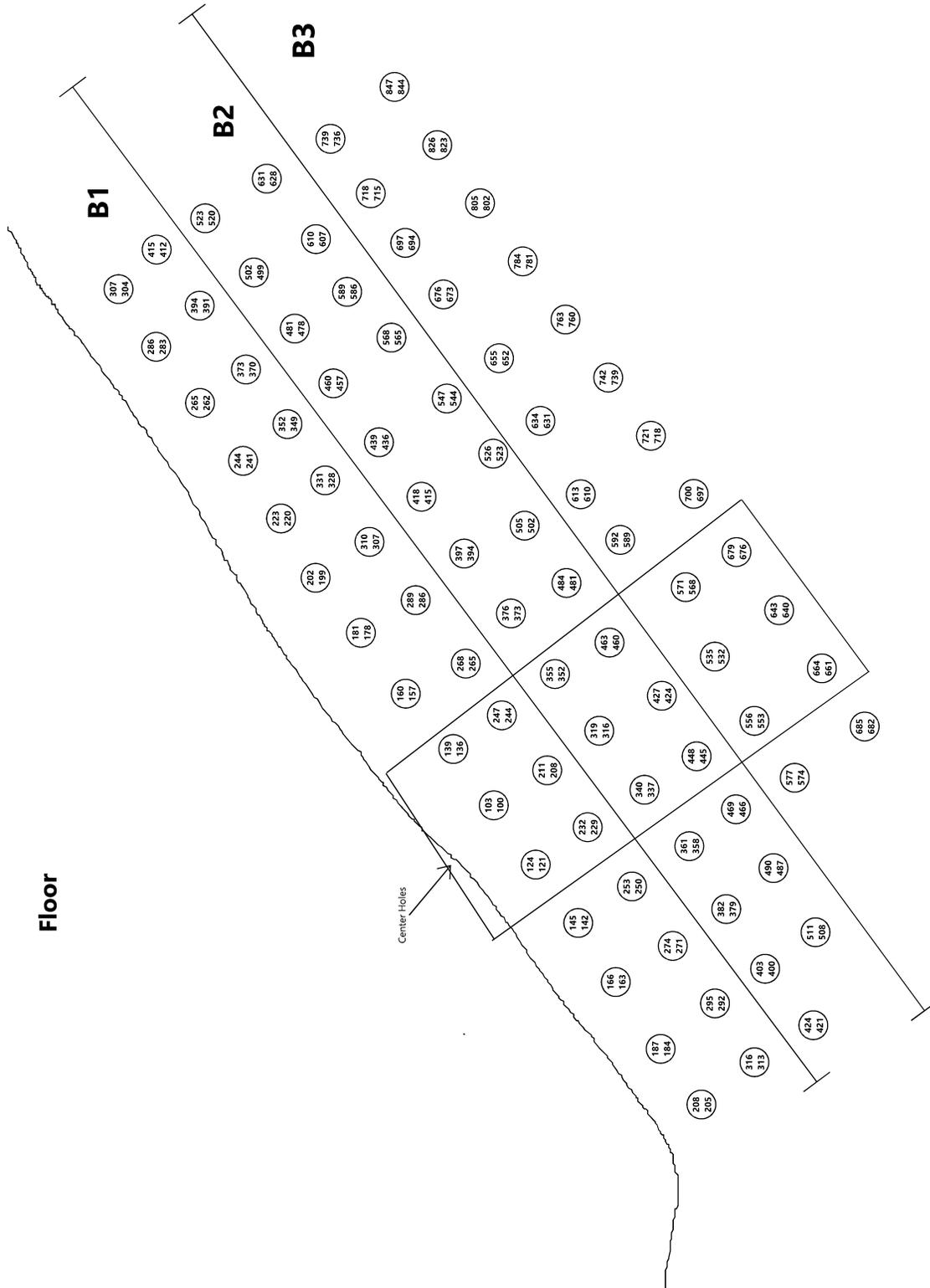
Data Type:	Seismic Record	Seismograph Type:	Instantel - Micromate			
Date:	08/21/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	0.954 mm/s	42.7 Hz
Time:	13:25	Calibration Date:	05/30/19	Vertical:	1.214 mm/s	30.1 Hz
Distance From Blast:	571.80 m	Calibration Signal:	OK	Longitudinal:	1.695 mm/s	36.6 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz			
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	116 dB	--- Hz
Location:	Spiked and buried.			Vector Sum:	1.731 mm/s	
U.T.M.:	17N 500660 mE 4941991 mN					
Reader and Firm:	Evan Smart, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Evan Smart, Austin Powder Ltd.					

**SEISMOGRAPH 2 - 178841 GREY ROAD #17**

Data Type:	Seismic Record	Seismograph Type:	Instantel - Micromate			
Date:	08/21/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	0.607 mm/s	36.6 Hz
Time:	13:25	Calibration Date:	05/30/19	Vertical:	0.741 mm/s	18.3 Hz
Distance From Blast:	703.78 m	Calibration Signal:	OK	Longitudinal:	1.135 mm/s	15.1 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz			
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	117 dB	--- Hz
Location:	Bolted to bedrock at the front of the property.			Vector Sum:	1.147 mm/s	
U.T.M.:	17N 500101 mE 4943011 mN					
Reader and Firm:	Evan Smart, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Evan Smart, Austin Powder Ltd.					

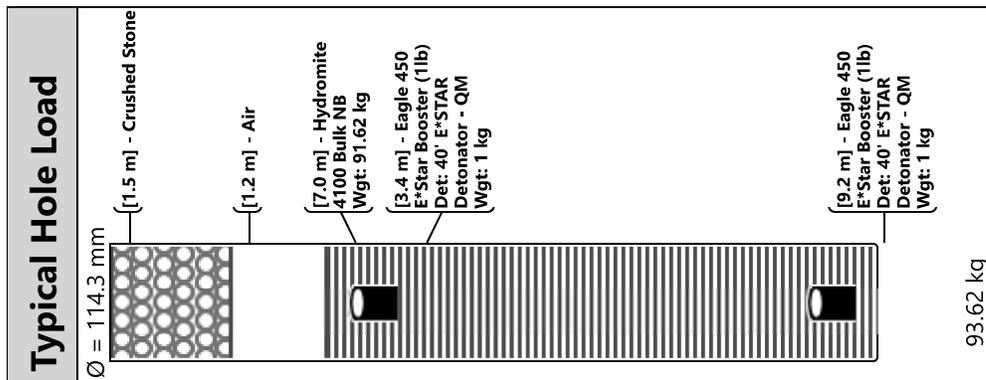
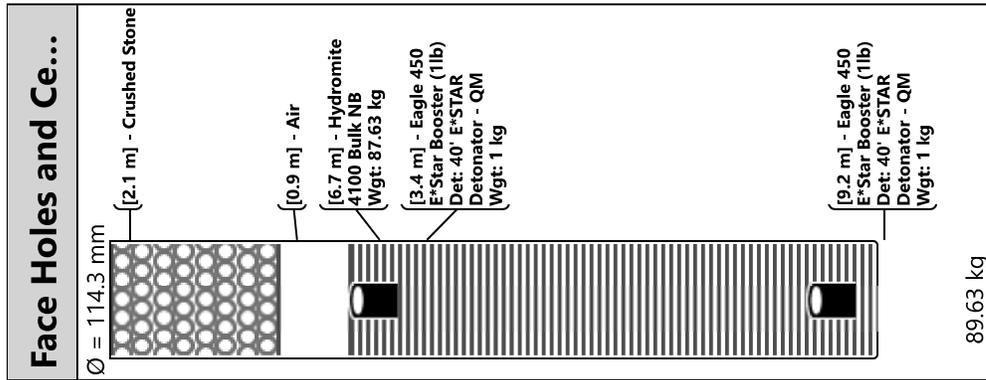
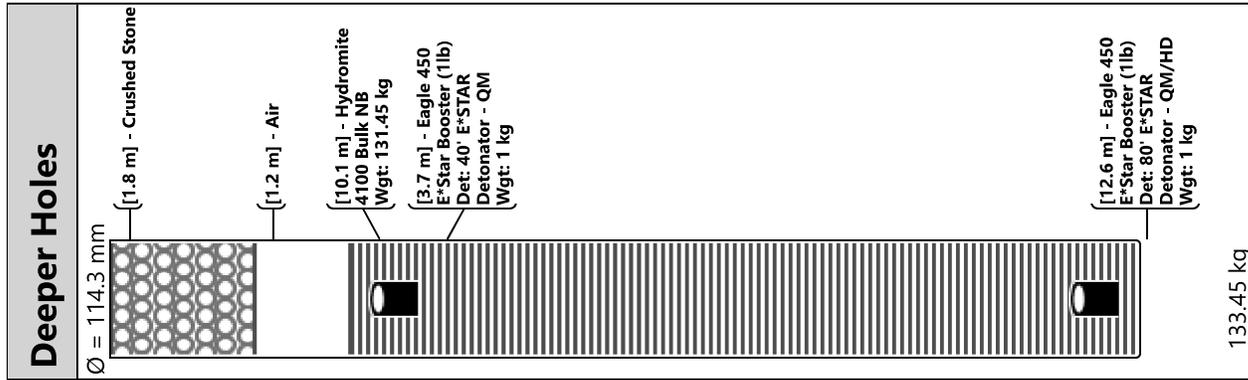
**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster			
Date:	08/21/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	1.016 mm/s	47.0 Hz
Time:	13:25	Calibration Date:	01/22/19	Vertical:	1.397 mm/s	47.0 Hz
Distance From Blast:	1,015.29 m	Calibration Signal:	OK	Longitudinal:	1.651 mm/s	47.0 Hz
Direction From Blast:	ESE	Geophone Min. Freq.:	--- Hz			
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	113 dB	--- Hz
Location:	Spiked and weight bagged beside the mail box.			Vector Sum:	1.888 mm/s	
U.T.M.:	17N 501117 mE 4941905 mN					
Reader and Firm:	Evan Smart, AUSTIN POWDER					
Analyst and Firm:						
Installer and Firm:	Evan Smart, Austin Powder Ltd.					



Hole	Load	Surface Delay	Deck 1 Delay
ZZ2	Face Holes and Center Holes	0	283/286
ZZ23	Typical Hole Load	0	265/268
ZZ36	Typical Hole Load	0	415/418
ZZ17	Typical Hole Load	0	292/295
ZZ79	Deeper Holes	0	682/685
ZZ80	Deeper Holes	0	661/664
ZZ81	Deeper Holes	0	640/643
ZZ82	Deeper Holes	0	676/679
ZZ83	Deeper Holes	0	697/700
ZZ84	Deeper Holes	0	718/721
ZZ85	Deeper Holes	0	739/742
ZZ86	Deeper Holes	0	760/763
ZZ87	Deeper Holes	0	781/784
ZZ88	Deeper Holes	0	802/805
ZZ89	Deeper Holes	0	823/826
ZZ90	Deeper Holes	0	844/847
ZZ75	Deeper Holes	0	736/739
ZZ73	Deeper Holes	0	715/718
ZZ72	Deeper Holes	0	694/697
ZZ71	Deeper Holes	0	673/676
ZZ70	Deeper Holes	0	652/655
ZZ69	Deeper Holes	0	631/634
ZZ63	Deeper Holes	0	589/592
ZZ59	Deeper Holes	0	568/571
ZZ60	Deeper Holes	0	532/535
ZZ61	Deeper Holes	0	553/556
ZZ62	Deeper Holes	0	574/577
ZZ74	Deeper Holes	0	628/631
ZZ54	Deeper Holes	0	607/610
ZZ64	Deeper Holes	0	610/613
ZZ37	Typical Hole Load	0	394/397
ZZ35	Typical Hole Load	0	436/439
ZZ11	Face Holes and Center Holes	0	121/124
ZZ57	Typical Hole Load	0	523/526
ZZ18	Typical Hole Load	0	271/274
ZZ29	Typical Hole Load	0	391/394
ZZ19	Typical Hole Load	0	250/253
ZZ55	Typical Hole Load	0	586/589
ZZ6	Face Holes and Center Holes	0	199/202
ZZ9	Face Holes and Center Holes	0	136/139
ZZ48	Typical Hole Load	0	466/469
ZZ49	Typical Hole Load	0	445/448
ZZ25	Typical Hole Load	0	307/310
ZZ3	Face Holes and Center Holes	0	262/265
ZZ24	Typical Hole Load	0	286/289
ZZ33	Typical Hole Load	0	478/481

Hole	Load	Surface Delay	Deck 1 Delay
ZZ1	Face Holes and Center Holes	0	304/307
ZZ26	Typical Hole Load	0	328/331
ZZ40	Typical Hole Load	0	316/319
ZZ12	Face Holes and Center Holes	0	142/145
ZZ58	Typical Hole Load	0	544/547
ZZ7	Face Holes and Center Holes	0	178/181
ZZ8	Face Holes and Center Holes	0	157/160
ZZ42	Typical Hole Load	0	358/361
ZZ39	Typical Hole Load	0	352/355
ZZ43	Typical Hole Load	0	379/382
ZZ53	Typical Hole Load	0	502/505
ZZ28	Typical Hole Load	0	370/373
ZZ31	Typical Hole Load	0	520/523
ZZ16	Typical Hole Load	0	313/316
ZZ20	Typical Hole Load	0	229/232
ZZ27	Typical Hole Load	0	349/352
ZZ30	Typical Hole Load	0	412/415
ZZ46	Typical Hole Load	0	508/511
ZZ47	Typical Hole Load	0	487/490
ZZ13	Face Holes and Center Holes	0	163/166
ZZ45	Typical Hole Load	0	421/424
ZZ41	Typical Hole Load	0	337/340
ZZ38	Typical Hole Load	0	373/376
ZZ15	Face Holes and Center Holes	0	205/208
ZZ32	Typical Hole Load	0	499/502
ZZ51	Typical Hole Load	0	460/463
ZZ4	Face Holes and Center Holes	0	241/244
ZZ21	Typical Hole Load	0	208/211
ZZ50	Typical Hole Load	0	424/427
ZZ14	Face Holes and Center Holes	0	184/187
ZZ52	Typical Hole Load	0	481/484
ZZ22	Typical Hole Load	0	244/247
ZZ34	Typical Hole Load	0	457/460
ZZ44	Typical Hole Load	0	400/403
ZZ5	Face Holes and Center Holes	0	220/223
ZZ56	Typical Hole Load	0	565/568
ZZ10	Face Holes and Center Holes	0	100/103





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/03/2019 13:14

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Heavy Rain

Wind From: WSW

Temperature: 18 °C

Terrain: Flat

Wind Velocity: 5-7 km/h

Blast U.T.M.: 17N 500280 mE 4942472 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 342 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 565 m

**LAYOUT**

Hole Depth:	9.75 m	Material Blasted:	Limestone	Total Meters Drilled:	936.3 m
No. of Holes:	96	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P.† Holes:	96	Face Height:	9.14 m	Spacing:	3.35 m
No. of Rows:	3	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear stone
				Method:	Specified
					(H = 9.14 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation:	Electronic	Max. Wt. of Expl. in Overlapped Decks:	367.8 kg	Volume Produced:	8,690.5 m³
Firing Device:	E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	367.8 kg	Weight Produced:	20,860.5 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	4	Powder Factor 1:	2.366 t/kg
Mfg and Model:	DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	92.0 kg	Powder Factor 2:	1.015 kg/m³
Initiation Settings:		Scaled Distance Factor (max charge):	58.90	Rock Density:	2.400 t/m³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	29.45		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

Blast occurred other than scheduled time: No      Misfire Occurred: No      Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	No
BRAGAN	COREY, T			No	Yes	Yes	No	No
FRALICK	CRAIG, A			No	No	Yes	No	No
KOUYOUMJIAN	MACKENZI E, H			No	Yes	Yes	No	No
MOUNTENAY	AUSTIN, B			No	Yes	Yes	No	No
O'DONOHUE	LIAM, J			No	Yes	Yes	No	Yes
PETRY	BRANDON , R			No	No	Yes	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/03/2019 13:14

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	194.00 ea	194.00
15003	40' E*STAR Detonator - QM	194.00 ea	0.00
15128	Hydromite 4100 Bulk NB	8,620.00 kg	8,620.00
12981	Mini Stem Plug - 6015	96.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	6.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			8,814.00

**COMMENTS / EXPLANATIONS**

General Comments: Imported on 9/4/2019 1:33:43 PM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/03/2019 13:14

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**SEISMOGRAPH 1 - 178841 GREY RD. 17**

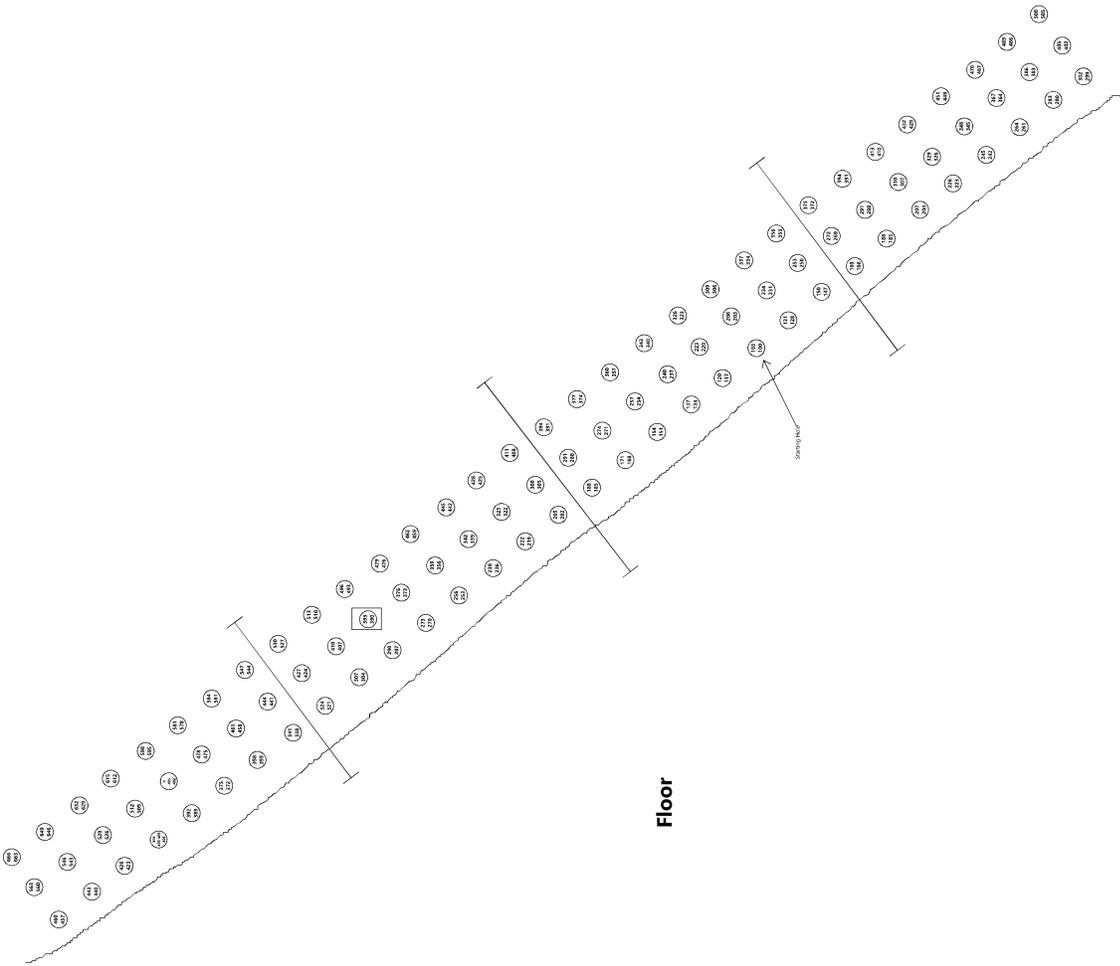
Data Type: No Trigger      Seismograph Type: InstanTel-MicroMate  
Date: 09/03/19              Trigger Level: 1.50 mm/s 115.00 dB  
Time: 13:14                  Calibration Date: 05/30/19  
Distance From Blast: 567.84 m      Calibration Signal: OK  
Direction From Blast: NNW      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz  
Location: Bolted to bedrock in front of property.  
U.T.M.: 17N 500101 mE 4943011 mN  
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Liam O'Donohoe, Austin Powder

**SEISMOGRAPH 2 - 178706 GREY RD. 17**

Data Type: No Trigger      Seismograph Type: InstanTel Mini-Mate II  
Date: 09/03/19              Trigger Level: 1.50 mm/s 115.00 dB  
Time: 13:14                  Calibration Date: 01/22/19  
Distance From Blast: 612.95 m      Calibration Signal:  
Direction From Blast: SE      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz  
Location: Buried at the front of the property.  
U.T.M.: 17N 500660 mE 4941991 mN  
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Liam O'Donohoe, Austin Powder

**SEISMOGRAPH 3 - 283197 10TH CONC.**

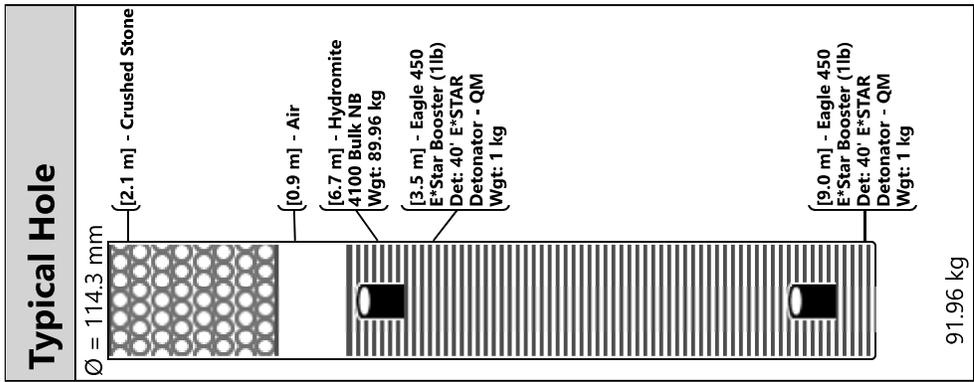
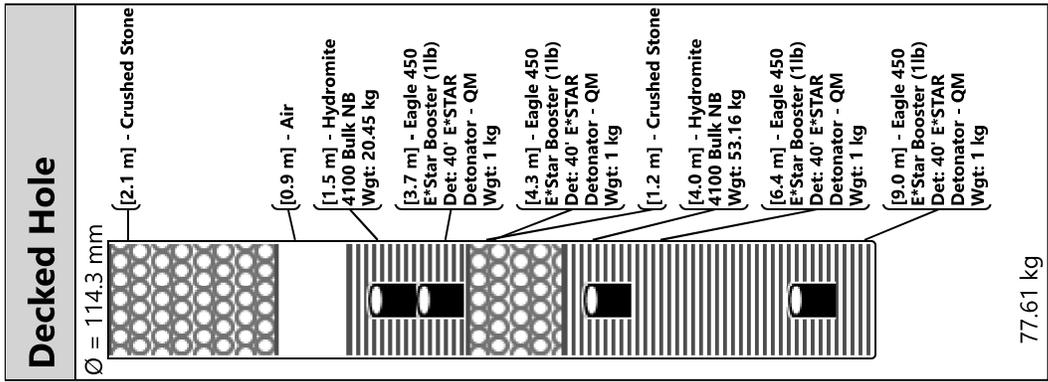
Data Type: No Trigger      Seismograph Type: InstanTel Minimate  
Date: 09/03/19              Trigger Level: 1.50 mm/s 115.00 dB  
Time: 13:14                  Calibration Date: 03/30/19  
Distance From Blast: 1,011.02 m      Calibration Signal:  
Direction From Blast: ESE      Geophone Min. Freq.: --- Hz  
Readout:                      Mic. Min. Freq.: --- Hz  
Location: Behind the mail box.  
U.T.M.: 17N 501117 mE 4941905 mN  
Reader and Firm: Liam O'Donohoe, AUSTIN POWDER  
Analyst and Firm:  
Installer and Firm: Liam O'Donohoe, Austin Powder



Hole	Load	Surface Delay	Deck 1 Delay
ZZ87	Typical Hole	0	612/615
ZZ76	Typical Hole	0	561/564
ZZ78	Typical Hole	0	355/358
ZZ61	Typical Hole	0	270/273
ZZ45	Typical Hole	0	374/377
ZZ21	Typical Hole	0	391/394
ZZ84	Typical Hole	0	389/392
ZZ24	Typical Hole	0	166/169
ZZ6	Typical Hole	0	280/283
ZZ86	Typical Hole	0	509/512
ZZ37	Typical Hole	0	134/137
ZZ93	Typical Hole	0	646/649
ZZ94	Typical Hole	0	663/666
ZZ67	Typical Hole	0	304/307
ZZ72	Typical Hole	0	321/324
ZZ16	Typical Hole	0	410/413
ZZ74	Typical Hole	0	441/444
ZZ47	Typical Hole	0	288/291
ZZ79	Typical Hole	0	372/375
ZZ96	Typical Hole	0	457/460
ZZ43	Typical Hole	0	168/171
ZZ80	Typical Hole	0	475/478
ZZ23	Typical Hole	0	269/272
ZZ12	Typical Hole	0	242/245
ZZ25	Typical Hole	0	147/150
ZZ22	Typical Hole	0	372/375
ZZ20	Typical Hole	0	288/291
ZZ28	Typical Hole	0	334/337
ZZ95	Typical Hole	0	560/563
ZZ52	Typical Hole	0	425/428
ZZ73	Typical Hole	0	338/341
ZZ30	Typical Hole	0	128/131
ZZ7	Typical Hole	0	261/264
ZZ13	Typical Hole	0	223/226
ZZ71	Typical Hole	0	424/427
ZZ41	Typical Hole	0	254/257
ZZ68	Typical Hole	0	407/410
ZZ36	Typical Hole	0	117/120
ZZ10	Typical Hole	0	448/451
ZZ58	Typical Hole	0	459/462
ZZ51	Typical Hole	0	408/411
ZZ55	Typical Hole	0	236/239
ZZ89	Typical Hole	0	526/529
ZZ44	Typical Hole	0	271/274
ZZ85	Typical Hole	0	406/406/409/409
ZZ3	Typical Hole	0	505/508

Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ77	Typical Hole	0	458/461	
ZZ69	Typical Hole	0	510/513	
ZZ56	Typical Hole	0	339/342	
ZZ8	Typical Hole	0	364/367	
ZZ29	Typical Hole	0	231/234	
ZZ66	Typical Hole	0	287/290	
ZZ50	Typical Hole	0	305/308	
ZZ33	Typical Hole	0	306/309	
ZZ64	Typical Hole	0	493/496	
ZZ11	Typical Hole	0	345/348	
ZZ63	Typical Hole	0	476/479	
ZZ31	Typical Hole	0	100/103	
ZZ70	Typical Hole	0	527/530	
ZZ17	Typical Hole	0	307/310	
ZZ35	Typical Hole	0	220/223	
ZZ75	Typical Hole	0	544/547	
ZZ53	Typical Hole	0	322/325	
ZZ34	Typical Hole	0	323/326	
ZZ4	Typical Hole	0	486/489	
ZZ2	Typical Hole	0	402/405	
ZZ65	Typical Hole	0	390/393	
ZZ90	Typical Hole	0	423/426	
ZZ15	Typical Hole	0	429/432	
ZZ48	Typical Hole	0	185/188	
ZZ5	Typical Hole	0	383/386	
ZZ42	Typical Hole	0	151/154	
ZZ88	Typical Hole	0	629/632	
ZZ18	Typical Hole	0	204/207	
ZZ54	Typical Hole	0	219/222	
ZZ27	Typical Hole	0	353/356	
ZZ92	Typical Hole	0	543/546	
ZZ26	Typical Hole	0	250/253	
ZZ19	Typical Hole	0	185/188	
ZZ59	Typical Hole	0	356/359	
ZZ49	Typical Hole	0	202/205	
ZZ14	Typical Hole	0	326/329	
ZZ57	Typical Hole	0	442/445	
ZZ39	Typical Hole	0	340/343	
ZZ83	Decked Hole	0	492/495	0
ZZ62	Typical Hole	0	373/376	
ZZ9	Typical Hole	0	467/470	
ZZ82	Typical Hole	0	595/598	
ZZ81	Typical Hole	0	578/581	
ZZ46	Typical Hole	0	391/394	
ZZ40	Typical Hole	0	357/360	
ZZ60	Typical Hole	0	253/256	

Hole	Load	Surface Delay	Deck 1 Delay
ZZ91	Typical Hole	0	440/443
ZZ1	Typical Hole	0	299/302
ZZ32	Typical Hole	0	203/206
ZZ38	Typical Hole	0	237/240





# AUSTIN POWDER LTD.

## BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/20/2019 15:40

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: West Bench

### ENVIRONMENT

Method Used: U.T.M.

Weather: Overcast /  
Low Clouds

Wind From: S

Temperature: 24 °C

Terrain: Flat

Wind Velocity: 5-10 km/h

Blast U.T.M.: 17N 500116 mE 4942394 mN

### NEAREST PROTECTED STRUCTURE

Structure Name: 178841 Grey Rd. 17

Compass Point: N

Structure Type: Dwelling

Direction/Bearing: 359 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 615 m

### LAYOUT

	Hole Depth:	9.14 m	Material Blasted: Limestone	Total Meters Drilled:	1,088.1 m
No. of Holes:	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth: 0.00 m
No. of V.P.† Holes:	Face Height:	9.14 m	Spacing:	3.05 m	Stem Length: min 1.83 m
No. of Rows:	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type: Conventional
Diameter:	Mats Used:	No	Stem Type: Clear stone	Method:	Specified
					(H = 3.66 m)

† V.P. = Volume Producing

### WEIGHTS

	Max. Wt. of Expl. in Overlapped Decks:	576.2 kg	Volume Produced:	10,108.0 m <sup>3</sup>
Initiation: Electronic	Max. Wt. of Expl. Per 8 ms Interval:	576.2 kg	Weight Produced:	24,257.8 t
Firing Device: E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	7	Powder Factor 1:	0.964 t/kg
Other Method:	Max. Wt. of Explosive Per Hole:	94.6 kg	Powder Factor 2:	2.490 kg/m <sup>3</sup>
Mfg and Model: DBM Remote Unit	Scaled Distance Factor (max charge):	63.21	Rock Density:	2.400 t/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (per delay):	25.61		
Series Resistance (ohms):				

### SEISMOGRAPHS

See seismographs on separate page

### CREW

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
KLINGSPOR	DAVID, A	* ON - 278B-454184 [12/31/2099]		Yes	Yes	Yes	No	No
BELTRAME	ALEXANDE R, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
NEWTON	JOHN, D	* ON - N/A		No	Yes	Yes	No	No
O'DONOHUE	LIAM, J			No	No	No	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike	Harold Sutherland			No	No	No	Yes	Yes



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/20/2019 15:40

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: West Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15103	Eagle 450 Booster (1lb)	238.00 ea	238.00
15003	40' E*STAR Detonator - QM	238.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	1.00 sp	0.00
07602	Hydromite 4100 Bulk	9,830.00 kg	9,830.00
12981	Mini Stem Plug - 6015	119.00 ea	0.00
Total Weight of Explosives (Include Primers) ( kg ):			<u>10,068.00</u>

**COMMENTS / EXPLANATIONS**

General Comments: Imported on 9/23/2019 7:39:17 AM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 09/20/2019 15:40

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: West Bench

**SEISMOGRAPH 1 - 178841 GREY ROAD #17**

Data Type: Seismic Record    Seismograph Type: InstanTel Mini-Mate II

Date: 09/20/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 1.49 mm/s    42.7 Hz

Time: 15:40                          Calibration Date: 05/30/19                      Vertical: 1.403 mm/s    11.9 Hz

Distance From Blast: 616.92 m    Calibration Signal:                      Longitudinal: 1.632 mm/s    42.7 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 117 dB    --- Hz

Location: Weight bagged on bedrock at the front of the property.                      Vector Sum: 2.245 mm/s

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: John Newton, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.

**SEISMOGRAPH 2 - 283197 10TH CONC.**

Data Type: No Trigger              Seismograph Type: InstanTel Mini-Mate II

Date: 09/20/19                      Trigger Level: 2.50 mm/s    120.00 dB

Time: 15:40                          Calibration Date: 01/22/19

Distance From Blast: 1,114.35 m    Calibration Signal:

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

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

Location: Behind the mail box.

U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: John Newton, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.

**SEISMOGRAPH 3 - 178717 GREY RD. 17**

Data Type: Seismic Record    Seismograph Type: InstanTel Mini-Mate II

Date: 09/20/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 1.198 mm/s    26.9 Hz

Time: 15:40                          Calibration Date: 05/30/19                      Vertical: 1.411 mm/s    12.8 Hz

Distance From Blast: 677.27 m    Calibration Signal:                      Longitudinal: 1.679 mm/s    36.6 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 123 dB    --- Hz

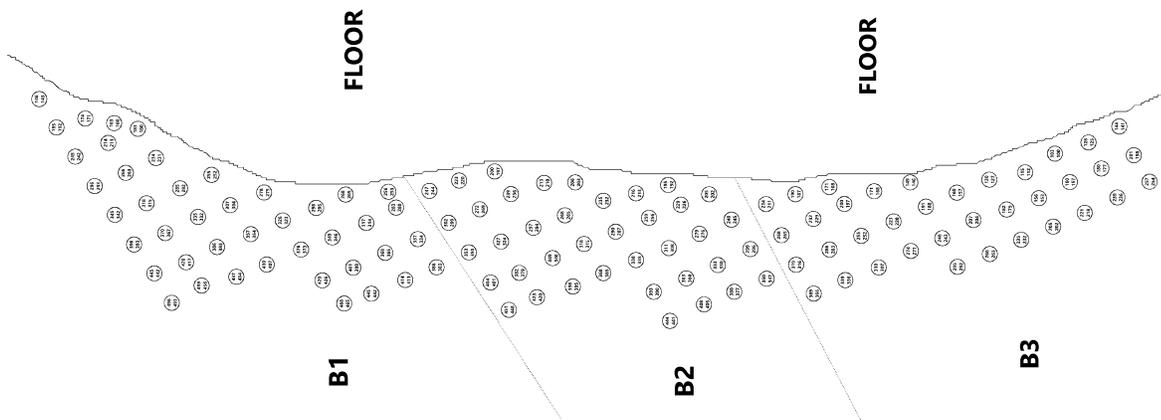
Location: Spiked and weight bagged at the front of the property.                      Vector Sum: 1.785 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: John Newton, AUSTIN POWDER

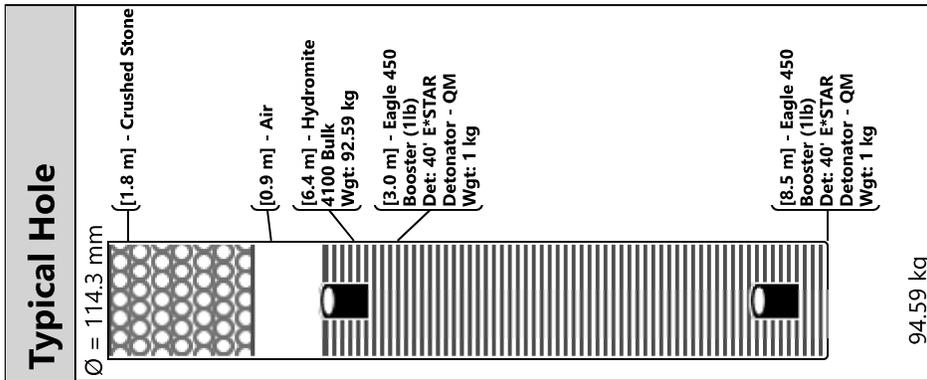
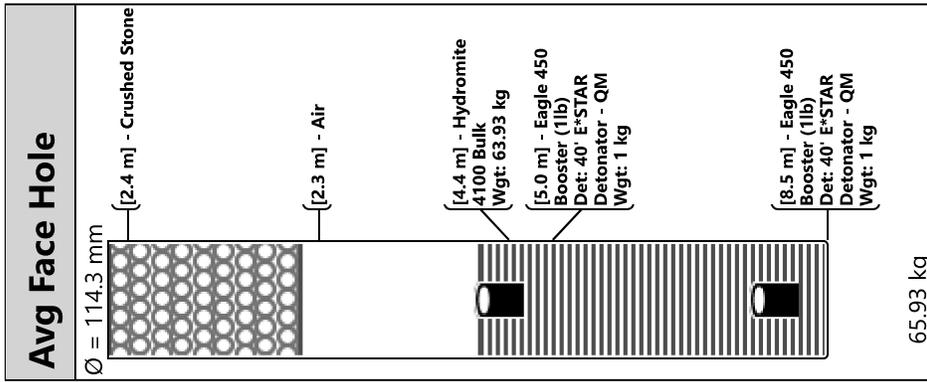
Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ7	Low Burden	0	146/149	ZZ85	Typical Hole	0	308/311
ZZ2	Avg Face Hole	0	125/128	ZZ119	Typical Hole	0	153/156
ZZ61	Typical Hole	0	383/386	ZZ116	Typical Hole	0	202/205
ZZ110	Typical Hole	0	157/160	ZZ105	Typical Hole	0	188/191
ZZ92	Typical Hole	0	296/299	ZZ23	Avg Face Hole	0	295/298
ZZ58	Typical Hole	0	314/317	ZZ16	Avg Face Hole	0	203/206
ZZ111	Typical Hole	0	177/180	ZZ43	Typical Hole	0	211/214
ZZ64	Typical Hole	0	299/302	ZZ26	Avg Face Hole	0	231/234
ZZ99	Typical Hole	0	229/232	ZZ10	Avg Face Hole	0	187/190
ZZ47	Typical Hole	0	434/437	ZZ42	Typical Hole	0	263/266
ZZ8	Avg Face Hole	0	168/171	ZZ90	Typical Hole	0	377/380
ZZ96	Typical Hole	0	366/369	ZZ6	Typical Hole	0	157/160
ZZ52	Typical Hole	0	373/376	ZZ30	Avg Face Hole	0	143/146
ZZ29	Avg Face Hole	0	171/174	ZZ24	Avg Face Hole	0	275/278
ZZ38	Typical Hole	0	456/459	ZZ54	Typical Hole	0	465/468
ZZ15	Typical Hole	0	232/235	ZZ112	Typical Hole	0	198/201
ZZ57	Typical Hole	0	346/349	ZZ107	Typical Hole	0	292/295
ZZ19	Avg Face Hole	0	220/223	ZZ40	Typical Hole	0	367/370
ZZ53	Typical Hole	0	426/429	ZZ48	Typical Hole	0	407/410
ZZ70	Typical Hole	0	324/327	ZZ35	Typical Hole	0	393/396
ZZ18	Avg Face Hole	0	197/200	ZZ101	Typical Hole	0	252/255
ZZ78	Typical Hole	0	265/268	ZZ50	Typical Hole	0	304/307
ZZ83	Typical Hole	0	405/408	ZZ62	Typical Hole	0	334/337
ZZ113	Typical Hole	0	254/257	ZZ88	Typical Hole	0	276/279
ZZ77	Typical Hole	0	315/318	ZZ56	Typical Hole	0	398/401
ZZ115	Typical Hole	0	218/221	ZZ63	Typical Hole	0	280/283
ZZ31	Typical Hole	0	192/195	ZZ97	Typical Hole	0	336/339
ZZ91	Typical Hole	0	347/350	ZZ109	Typical Hole	0	204/207
ZZ106	Typical Hole	0	243/246	ZZ59	Typical Hole	0	365/368
ZZ13	Low Burden	0	192/195	ZZ87	Typical Hole	0	226/229
ZZ14	Low Burden	0	213/216	ZZ94	Typical Hole	0	265/268
ZZ27	Low Burden	0	180/183	ZZ41	Typical Hole	0	315/318
ZZ25	Low Burden	0	252/255	ZZ117	Typical Hole	0	232/235
ZZ22	Low Burden	0	265/268	ZZ44	Typical Hole	0	282/285
ZZ28	Low Burden	0	160/163	ZZ21	Avg Face Hole	0	253/256
ZZ49	Typical Hole	0	354/357	ZZ33	Typical Hole	0	293/296
ZZ4	Avg Face Hole	0	112/115	ZZ11	Avg Face Hole	0	211/214
ZZ37	Typical Hole	0	493/496	ZZ46	Typical Hole	0	383/386
ZZ108	Typical Hole	0	263/266	ZZ86	Typical Hole	0	256/259
ZZ71	Typical Hole	0	269/272	ZZ73	Typical Hole	0	294/297
ZZ102	Typical Hole	0	307/310	ZZ69	Typical Hole	0	379/382
ZZ3	Avg Face Hole	0	100/103	ZZ76	Typical Hole	0	365/368
ZZ67	Typical Hole	0	448/451	ZZ72	Typical Hole	0	236/239
ZZ66	Typical Hole	0	401/404	ZZ12	Avg Face Hole	0	202/205
ZZ45	Typical Hole	0	332/335	ZZ80	Typical Hole	0	335/338
ZZ81	Typical Hole	0	390/393	ZZ95	Typical Hole	0	316/319

Hole	Load	Surface Delay	Deck 1 Delay
ZZ79	Typical Hole	0	287/290
ZZ84	Typical Hole	0	360/363
ZZ75	Typical Hole	0	395/398
ZZ93	Typical Hole	0	245/248
ZZ39	Typical Hole	0	417/420
ZZ9	Avg Face Hole	0	168/171
ZZ20	Avg Face Hole	0	244/247
ZZ55	Typical Hole	0	442/445
ZZ51	Typical Hole	0	323/326
ZZ60	Typical Hole	0	411/414
ZZ100	Typical Hole	0	197/200
ZZ34	Typical Hole	0	342/345
ZZ98	Typical Hole	0	283/286
ZZ32	Typical Hole	0	242/245
ZZ89	Typical Hole	0	330/333
ZZ65	Typical Hole	0	350/353
ZZ103	Typical Hole	0	271/274
ZZ74	Typical Hole	0	346/349
ZZ5	Avg Face Hole	0	127/130
ZZ17	Avg Face Hole	0	210/213
ZZ104	Typical Hole	0	220/223
ZZ114	Typical Hole	0	236/239
ZZ68	Typical Hole	0	420/423
ZZ36	Typical Hole	0	442/445
ZZ82	Typical Hole	0	441/444
ZZ118	Typical Hole	0	179/182
ZZ1	Avg Face Hole	0	141/144





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/07/2019 14:29

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Cloudy / High  
Clouds

Wind From: NW

Temperature: 16 °C

Terrain: Flat

Wind Velocity: 6-10 km/h

Blast U.T.M.: 17N 500272 mE 4942394 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Road #17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 345 °

Structure U.T.M.: 17N 500101 mE 4943011 mN

Distance: 640 m

**LAYOUT**

Hole Depth:	10.06 m	Material Blasted:	Limestone	Total Meters Drilled:	955.5 m
No. of Holes:	95	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	95	Face Height:	9.45 m	Spacing:	3.35 m
No. of Rows:	4	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	5/8" Clear Stone
				Area Type:	Conventional
				Method:	Specified
					(H = 9.45 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	432.2 kg	Volume Produced:	9,173.2 m <sup>3</sup>
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	432.2 kg	Weight Produced:	22,019.4 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	5	Powder Factor 1:	2.682 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	86.8 kg	Powder Factor 2:	0.895 kg/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (max charge):	68.72	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):	Scaled Distance Factor (per delay):	30.80		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDE R, A			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
PETRY	BRANDON , R			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/07/2019 14:29

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15106	Eagle 340 E*Star Booster (3/4lb)	148.00 ea	111.00
15107	Eagle 450 E*Star Booster (1lb)	42.00 ea	42.00
15001	24' E*STAR Detonator - QM	95.00 ea	0.00
15003	40' E*STAR Detonator - QM	95.00 ea	0.00
15128	Hydromite 4100 Bulk NB	8,060.00 kg	8,060.00
12981	Mini Stem Plug - 6015	95.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	5.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			<b>8,213.00</b>

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



# AUSTIN POWDER LTD. BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-09

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/07/2019 14:29

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

## SEISMOGRAPH 1 - 178717 GREY RD #17

Data Type: Seismic Record    Seismograph Type: Instantel - Micromate

Date: 10/07/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 0.859 mm/s    32.0 Hz

Time: 14:29                          Calibration Date: 05/30/19                      Vertical: 1.505 mm/s    11.1 Hz

Distance From Blast: 559.31 m    Calibration Signal: OK                      Longitudinal: 2.191 mm/s    32.0 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 110 dB    --- Hz

Location: Spiked and buried.                      Vector Sum: 2.246 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

## SEISMOGRAPH 2 - 178841 GREY ROAD #17

Data Type: Seismic Record    Seismograph Type: Instantel - Micromate

Date: 10/07/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 0.127 mm/s    12.2 Hz

Time: 14:29                          Calibration Date: 05/30/19                      Vertical: 0.3 mm/s    9.3 Hz

Distance From Blast: 640.38 m    Calibration Signal: OK                      Longitudinal: 0.229 mm/s    5.8 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 119 dB    --- Hz

Location: Bolted to bedrock at the front of the property.                      Vector Sum: 0.325 mm/s

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

## SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type: Seismic Record    Seismograph Type: Instantel - Minimate Blaster

Date: 10/07/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 1.778 mm/s    37.0 Hz

Time: 14:29                          Calibration Date: 01/22/19                      Vertical: 1.27 mm/s    39.0 Hz

Distance From Blast: 976.27 m    Calibration Signal: OK                      Longitudinal: 1.651 mm/s    37.0 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 110 dB    --- Hz

Location: Spiked and weight bagged beside the mail box.                      Vector Sum: 2.087 mm/s

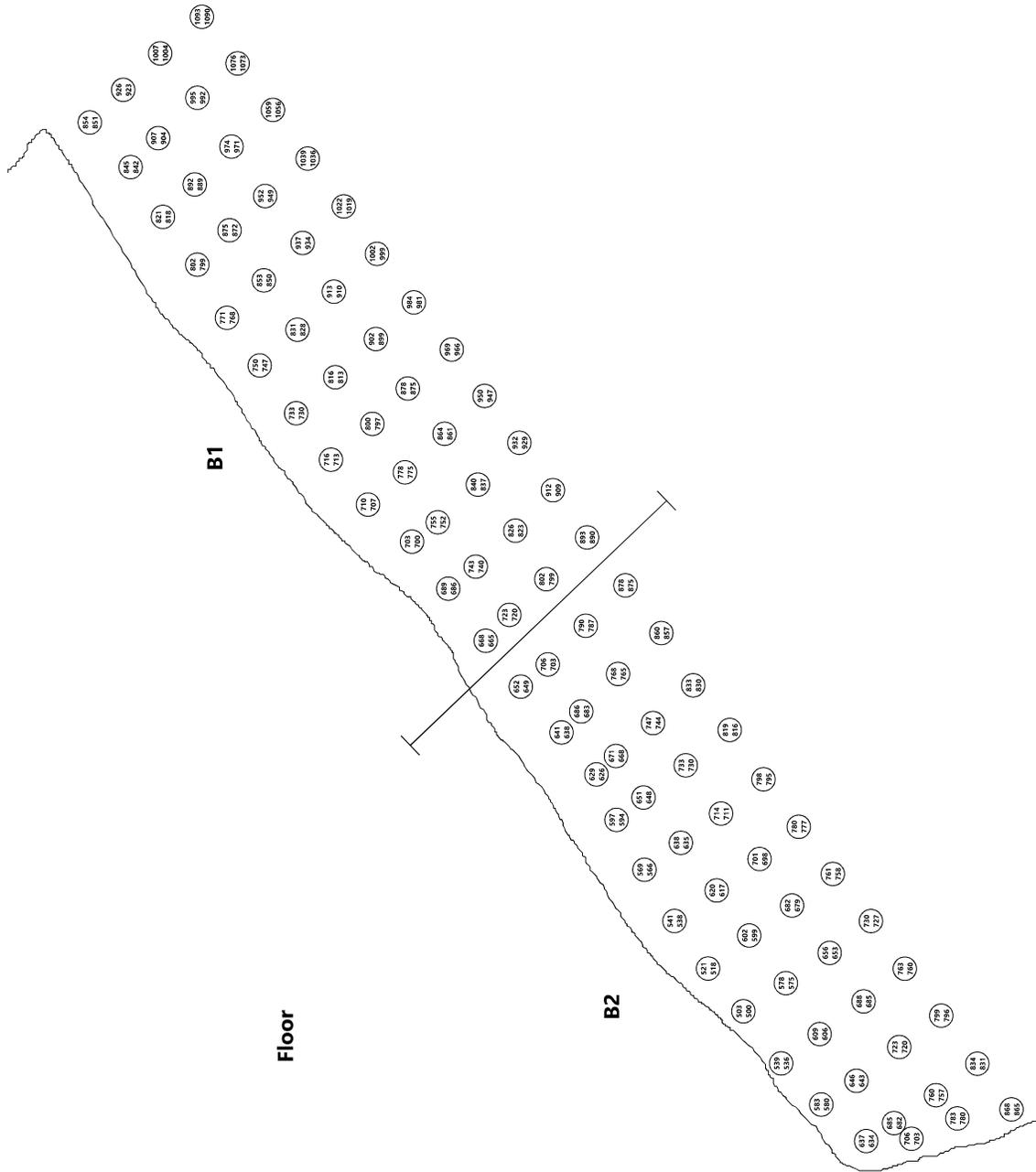
U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

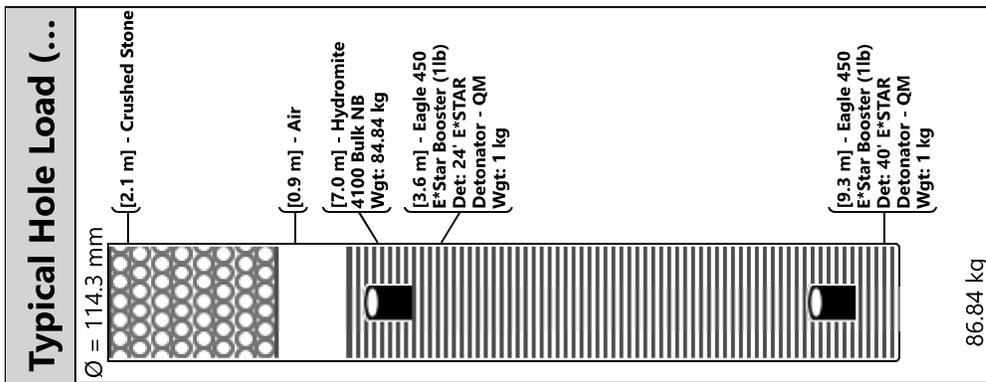
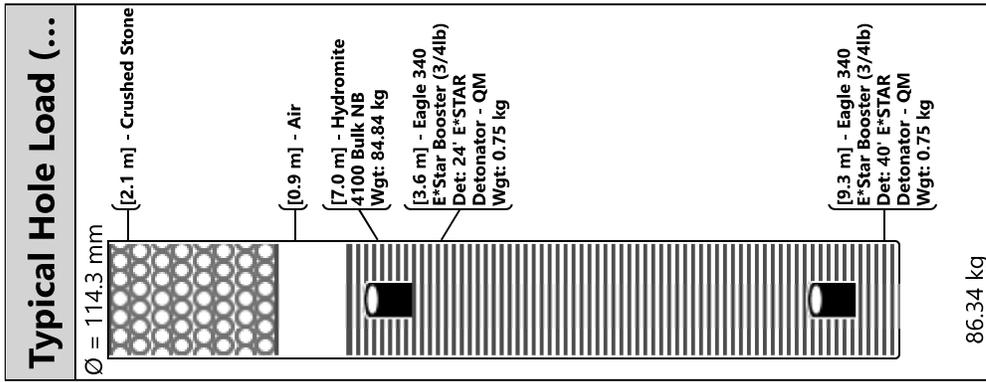
Installer and Firm: Evan Smart, Austin Powder Ltd.

Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ87	Typical Hole Load (3/4lb)	0	682/685	ZZ49	Typical Hole Load (3/4lb)	0	875/878
ZZ82	Typical Hole Load (3/4lb)	0	796/799	ZZ74	Typical Hole Load (3/4lb)	0	727/730
ZZ1	Typical Hole Load (1lbs)	0	1090/1093	ZZ89	Typical Hole Load (3/4lb)	0	757/760
ZZ58	Typical Hole Load (3/4lb)	0	816/819	ZZ55	Typical Hole Load (3/4lb)	0	668/671
ZZ63	Typical Hole Load (3/4lb)	0	635/638	ZZ64	Typical Hole Load (3/4lb)	0	711/714
ZZ14	Typical Hole Load (1lbs)	0	872/875	ZZ3	Typical Hole Load (1lbs)	0	923/926
ZZ29	Typical Hole Load (3/4lb)	0	713/716	ZZ77	Typical Hole Load (3/4lb)	0	500/503
ZZ44	Typical Hole Load (3/4lb)	0	686/689	ZZ15	Typical Hole Load (1lbs)	0	949/952
ZZ46	Typical Hole Load (3/4lb)	0	720/723	ZZ47	Typical Hole Load (3/4lb)	0	799/802
ZZ35	Typical Hole Load (3/4lb)	0	775/778	ZZ66	Typical Hole Load (3/4lb)	0	777/780
ZZ83	Typical Hole Load (3/4lb)	0	720/723	ZZ69	Typical Hole Load (3/4lb)	0	538/541
ZZ88	Typical Hole Load (3/4lb)	0	703/706	ZZ31	Typical Hole Load (3/4lb)	0	875/878
ZZ41	Typical Hole Load (3/4lb)	0	909/912	ZZ11	Typical Hole Load (1lbs)	0	889/892
ZZ40	Typical Hole Load (3/4lb)	0	929/932	ZZ86	Typical Hole Load (3/4lb)	0	634/637
ZZ71	Typical Hole Load (3/4lb)	0	599/602	ZZ32	Typical Hole Load (3/4lb)	0	966/969
ZZ70	Typical Hole Load (3/4lb)	0	518/521	ZZ62	Typical Hole Load (3/4lb)	0	566/569
ZZ20	Typical Hole Load (1lbs)	0	768/771	ZZ97	Typical Hole Load (3/4lb)	0	787/790
ZZ57	Typical Hole Load (3/4lb)	0	830/833	ZZ65	Typical Hole Load (3/4lb)	0	795/798
ZZ79	Typical Hole Load (3/4lb)	0	606/609	ZZ54	Typical Hole Load (3/4lb)	0	626/629
ZZ72	Typical Hole Load (3/4lb)	0	679/682	ZZ43	Typical Hole Load (3/4lb)	0	740/743
ZZ78	Typical Hole Load (3/4lb)	0	536/539	ZZ67	Typical Hole Load (3/4lb)	0	698/701
ZZ90	Typical Hole Load (3/4lb)	0	831/834	ZZ37	Typical Hole Load (3/4lb)	0	700/703
ZZ13	Typical Hole Load (1lbs)	0	799/802	ZZ85	Typical Hole Load (3/4lb)	0	580/583
ZZ68	Typical Hole Load (3/4lb)	0	617/620	ZZ23	Typical Hole Load (3/4lb)	0	910/913
ZZ50	Typical Hole Load (3/4lb)	0	857/860	ZZ84	Typical Hole Load (3/4lb)	0	643/646
ZZ25	Typical Hole Load (3/4lb)	0	981/984	ZZ24	Typical Hole Load (3/4lb)	0	999/1002
ZZ96	Typical Hole Load (3/4lb)	0	703/706	ZZ59	Typical Hole Load (3/4lb)	0	730/733
ZZ5	Typical Hole Load (1lbs)	0	842/845	ZZ75	Typical Hole Load (3/4lb)	0	653/656
ZZ17	Typical Hole Load (1lbs)	0	1019/1022	ZZ92	Typical Hole Load (3/4lb)	0	780/783
ZZ48	Typical Hole Load (3/4lb)	0	890/893	ZZ38	Typical Hole Load (3/4lb)	0	752/755
ZZ22	Typical Hole Load (3/4lb)	0	828/831	ZZ80	Typical Hole Load (3/4lb)	0	685/688
ZZ12	Typical Hole Load (1lbs)	0	818/821	ZZ51	Typical Hole Load (3/4lb)	0	765/768
ZZ2	Typical Hole Load (1lbs)	0	1004/1007	ZZ7	Typical Hole Load (1lbs)	0	992/995
ZZ73	Typical Hole Load (3/4lb)	0	758/761	ZZ9	Typical Hole Load (1lbs)	0	1056/1059
ZZ19	Typical Hole Load (1lbs)	0	850/853	ZZ91	Typical Hole Load (3/4lb)	0	865/868
ZZ18	Typical Hole Load (1lbs)	0	934/937	ZZ8	Typical Hole Load (1lbs)	0	1073/1076
ZZ52	Typical Hole Load (3/4lb)	0	683/686	ZZ61	Typical Hole Load (3/4lb)	0	594/597
ZZ53	Typical Hole Load (3/4lb)	0	638/641	ZZ27	Typical Hole Load (3/4lb)	0	813/816
ZZ95	Typical Hole Load (3/4lb)	0	649/652	ZZ36	Typical Hole Load (3/4lb)	0	707/710
ZZ4	Typical Hole Load (1lbs)	0	851/854	ZZ30	Typical Hole Load (3/4lb)	0	797/800
ZZ76	Typical Hole Load (3/4lb)	0	575/578	ZZ26	Typical Hole Load (3/4lb)	0	899/902
ZZ33	Typical Hole Load (3/4lb)	0	947/950	ZZ16	Typical Hole Load (1lbs)	0	1036/1039
ZZ81	Typical Hole Load (3/4lb)	0	760/763	ZZ10	Typical Hole Load (1lbs)	0	971/974
ZZ34	Typical Hole Load (3/4lb)	0	861/864	ZZ56	Typical Hole Load (3/4lb)	0	744/747
ZZ39	Typical Hole Load (3/4lb)	0	837/840	ZZ60	Typical Hole Load (3/4lb)	0	648/651
ZZ21	Typical Hole Load (1lbs)	0	747/750	ZZ28	Typical Hole Load (3/4lb)	0	730/733

Hole	Load	Surface Delay	Deck 1 Delay
ZZ45	Typical Hole Load (3/4lb)	0	665/668
ZZ6	Typical Hole Load (1lbs)	0	904/907
ZZ42	Typical Hole Load (3/4lb)	0	823/826





# AUSTIN POWDER LTD.

## BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/21/2019 13:54

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

### ENVIRONMENT

Method Used: U.T.M.

Weather: Clear

Wind From: E

Temperature: 16 °C

Terrain: Flat

Wind Velocity: 3-6 km/h

Blast U.T.M.: 17N 500266 mE 4942377 mN

### NEAREST PROTECTED STRUCTURE

Compass Point: NNW

Structure Name: 178841 Grey Road #17

Direction/Bearing: 345 °

Structure Type: Dwelling

Distance: 655 m

Structure U.T.M.: 17N 500101 mE 4943011 mN

### LAYOUT

Hole Depth:	9.45 m	Material Blasted:	Limestone	Total Meters Drilled:	916.5 m
No. of Holes:	97	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P. † Holes:	96	Face Height:	8.84 m	Spacing:	3.35 m
No. of Rows:	3	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	5/8" Clear Stone
				Area Type:	Conventional
				Method:	Specified

† V.P. = Volume Producing

(H = 8.75 m)

### WEIGHTS

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	195.6 kg	Volume Produced:	8,671.8 m <sup>3</sup>
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	195.6 kg	Weight Produced:	20,815.6 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	2.250 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	97.8 kg	Powder Factor 2:	1.067 kg/m <sup>3</sup>
Initiation Settings:	Scaled Distance Factor (max charge):	66.24	Rock Density:	2.400 t/m <sup>3</sup>
Series Resistance (ohms):	Scaled Distance Factor (per delay):	46.84		

### SEISMOGRAPHS

See seismographs on separate page

### CREW

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
FRALICK	CRAIG, A			No	Yes	No	No	No
KOUYOUMJIAN	MACKENZI E, H			No	Yes	No	No	No
O'DONOHUE	LIAM, J			No	Yes	No	No	No
PETRY	BRANDON , R			No	Yes	No	No	No



**AUSTIN POWDER LTD.**  
**BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/21/2019 13:54

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15106	Eagle 340 E*Star Booster (3/4lb)	194.00 ea	145.50
15003	40' E*STAR Detonator - QM	194.00 ea	0.00
15128	Hydromite 4100 Bulk NB	8,980.00 kg	8,980.00
20334	Hydromite 880 76x400 (3x16)	15.00 st	34.05
12981	Mini Stem Plug - 6015	97.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	5.50 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			9,159.55

**COMMENTS / EXPLANATIONS**

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-10

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 10/21/2019 13:54

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Bottom Bench

**SEISMOGRAPH 1 - 178717 GREYRD #17**

Data Type: Seismic Record    Seismograph Type: InstanTEL - Micromate

Date: 10/21/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 0.127 mm/s    24.4 Hz

Time: 13:54                          Calibration Date: 05/30/19                      Vertical: 0.127 mm/s    3.4 Hz

Distance From Blast: 551.69 m    Calibration Signal: OK                      Longitudinal: 0.127 mm/s    13.8 Hz

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

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

Location: Spiked and buried.                      Vector Sum: 0.13 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 2 - 178841 GREY ROAD #17**

Data Type: No Trigger              Seismograph Type: InstanTEL - Micromate

Date: 10/21/19                      Trigger Level: 1.50 mm/s    115.00 dB

Time: 13:54                          Calibration Date: 05/30/19

Distance From Blast: 655.02 m    Calibration Signal: OK

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

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

Location: Bolted to bedrock at the front of the property.

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type: Seismic Record    Seismograph Type: InstanTEL - Minimate Blaster

Date: 10/21/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 1.27 mm/s    39.0 Hz

Time: 13:54                          Calibration Date: 01/22/19                      Vertical: 1.651 mm/s    51.0 Hz

Distance From Blast: 973.23 m    Calibration Signal: OK                      Longitudinal: 1.651 mm/s    39.0 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 100 dB    --- Hz

Location: Spiked and weight bagged beside the mail box.                      Vector Sum: 1.845 mm/s

U.T.M.: 17N 501117 mE 4941905 mN

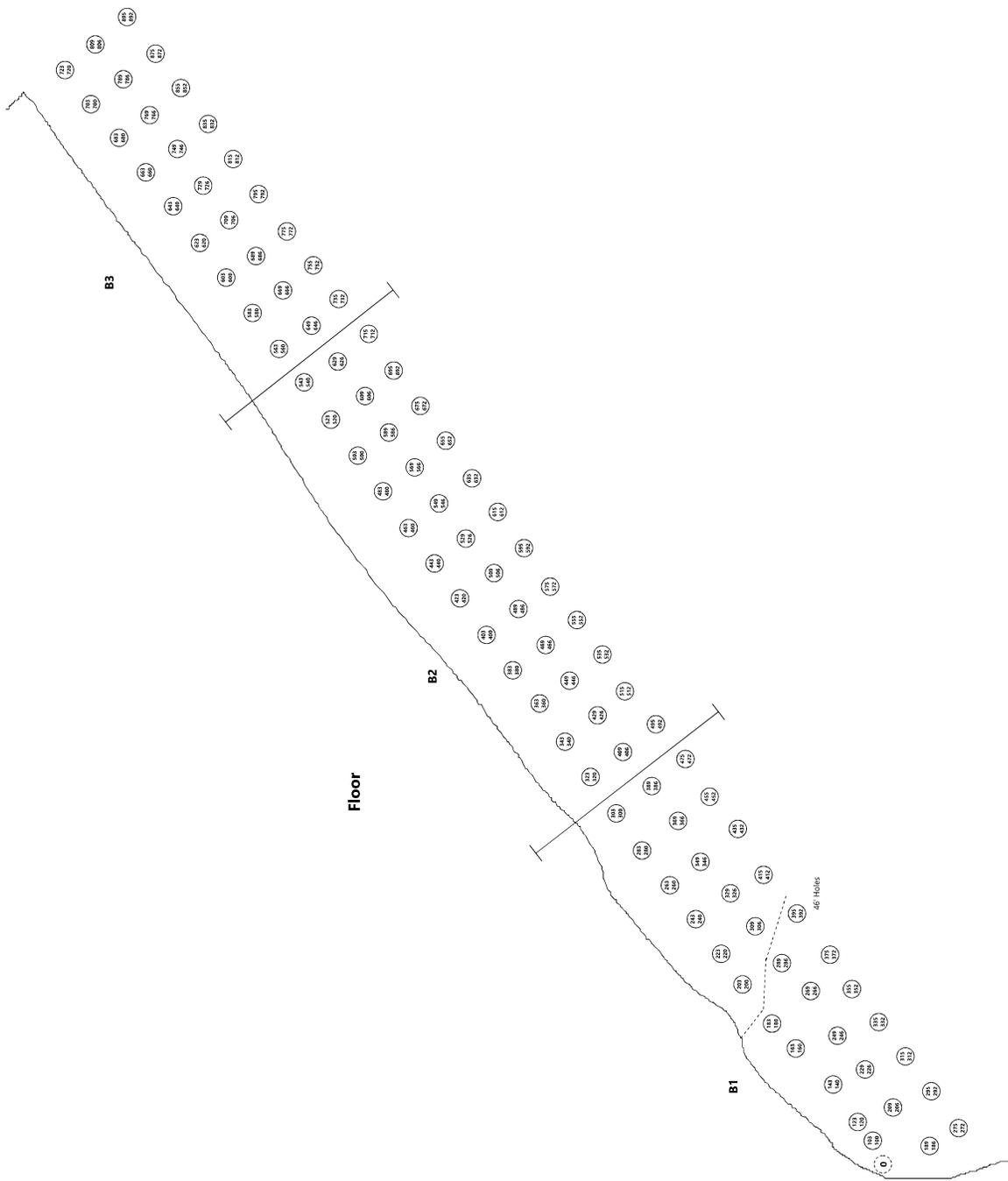
Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

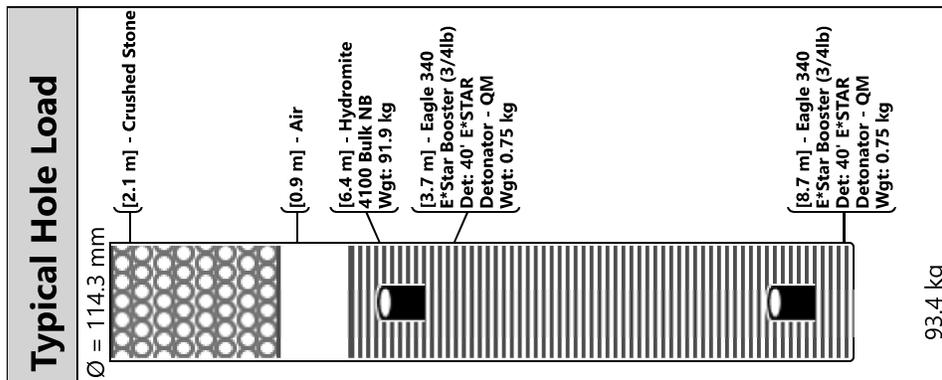
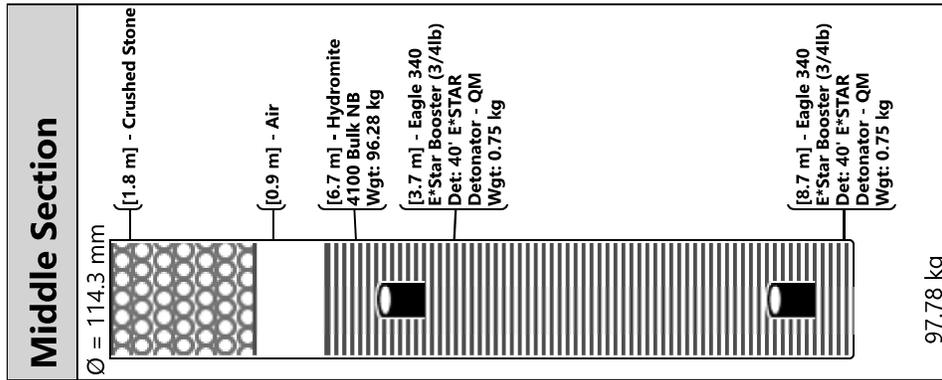
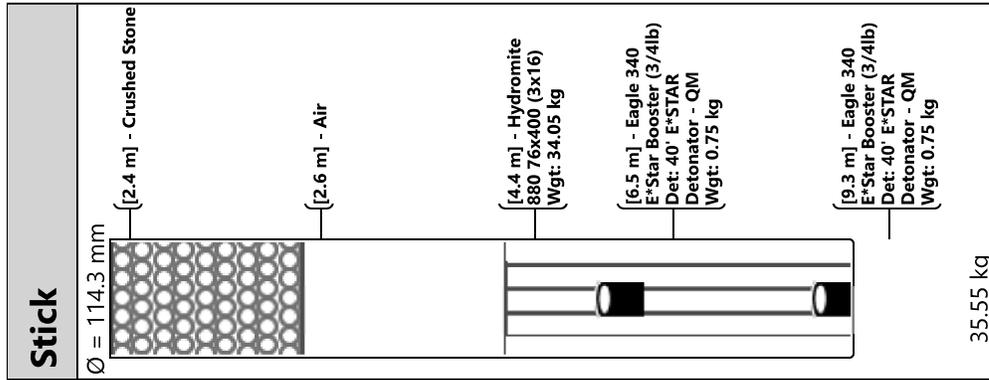


Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ62	Typical Hole Load	0	586/589	ZZ18	Typical Hole Load	0	306/309
ZZ60	Middle Section	0	652/655	ZZ61	Typical Hole Load	0	672/675
ZZ84	Typical Hole Load	0	812/815	ZZ9	Typical Hole Load	0	186/189
ZZ66	Typical Hole Load	0	692/695	ZZ31	Middle Section	0	386/389
ZZ36	Middle Section	0	492/495	ZZ95	Typical Hole Load	0	806/809
ZZ39	Middle Section	0	340/343	ZZ33	Middle Section	0	300/303
ZZ50	Middle Section	0	506/509	ZZ69	Typical Hole Load	0	540/543
ZZ22	Typical Hole Load	0	240/243	ZZ43	Middle Section	0	552/555
ZZ24	Typical Hole Load	0	412/415	ZZ25	Middle Section	0	346/349
ZZ82	Typical Hole Load	0	640/643	ZZ83	Typical Hole Load	0	726/729
ZZ40	Middle Section	0	360/363	ZZ75	Typical Hole Load	0	580/583
ZZ63	Typical Hole Load	0	500/503	ZZ93	Typical Hole Load	0	700/703
ZZ23	Typical Hole Load	0	326/329	ZZ67	Typical Hole Load	0	712/715
ZZ7	Typical Hole Load	0	226/229	ZZ45	Middle Section	0	380/383
ZZ58	Middle Section	0	480/483	ZZ27	Middle Section	0	280/283
ZZ76	Typical Hole Load	0	600/603	ZZ89	Typical Hole Load	0	766/769
ZZ87	Typical Hole Load	0	660/663	ZZ72	Typical Hole Load	0	732/735
ZZ10	Typical Hole Load	0	100/103	ZZ34	Middle Section	0	320/323
ZZ21	Typical Hole Load	0	220/223	ZZ94	Typical Hole Load	0	720/723
ZZ54	Middle Section	0	612/615	ZZ81	Typical Hole Load	0	620/623
ZZ88	Stick	0	680/683	ZZ44	Middle Section	0	466/469
ZZ3	Typical Hole Load	0	312/315	ZZ92	Typical Hole Load	0	786/789
ZZ16	Typical Hole Load	0	372/375	ZZ15	Typical Hole Load	0	266/269
ZZ65	Typical Hole Load	0	606/609	ZZ5	Typical Hole Load	0	352/355
ZZ20	Typical Hole Load	0	200/203	ZZ77	Typical Hole Load	0	686/689
ZZ4	Typical Hole Load	0	332/335	ZZ64	Typical Hole Load	0	520/523
ZZ73	Typical Hole Load	0	752/755	ZZ49	Middle Section	0	592/595
ZZ85	Typical Hole Load	0	832/835	ZZ51	Middle Section	0	420/423
ZZ71	Typical Hole Load	0	646/649	ZZ11	Typical Hole Load	0	120/123
ZZ56	Middle Section	0	546/549	ZZ6	Typical Hole Load	0	246/249
ZZ52	Middle Section	0	440/443	ZZ19	Typical Hole Load	0	286/289
ZZ46	Middle Section	0	400/403	ZZ38	Middle Section	0	426/429
ZZ8	Typical Hole Load	0	206/209	ZZ26	Middle Section	0	260/263
ZZ68	Typical Hole Load	0	626/629	ZZ74	Typical Hole Load	0	666/669
ZZ17	Typical Hole Load	0	392/395	ZZ55	Middle Section	0	632/635
ZZ12	Typical Hole Load	0	140/143	ZZ13	Typical Hole Load	0	160/163
ZZ70	Typical Hole Load	0	560/563	ZZ2	Typical Hole Load	0	292/295
ZZ14	Typical Hole Load	0	180/183	ZZ28	Middle Section	0	452/455
ZZ1	Typical Hole Load	0	272/275	ZZ90	Typical Hole Load	0	852/855
ZZ42	Middle Section	0	532/535	ZZ48	Middle Section	0	572/575
ZZ35	Middle Section	0	406/409	ZZ53	Middle Section	0	526/529
ZZ86	Typical Hole Load	0	746/749	ZZ47	Middle Section	0	486/489
ZZ91	Typical Hole Load	0	872/875	ZZ79	Typical Hole Load	0	792/795
ZZ78	Typical Hole Load	0	772/775	ZZ30	Middle Section	0	472/475
ZZ29	Middle Section	0	432/435	ZZ80	Typical Hole Load	0	706/709
ZZ57	Middle Section	0	460/463	ZZ37	Middle Section	0	512/515

Hole	Load	Surface Delay	Deck 1 Delay
ZZ59	Middle Section	0	566/569
ZZ32	Middle Section	0	366/369
ZZ96	Typical Hole Load	0	892/895
ZZ41	Middle Section	0	446/449
ZZ97	Typical Hole Load	0	0





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/04/2019 16:01

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location:

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Heavy Rain

Wind From: WSW

Temperature: 3 °C

Terrain: Flat

Wind Velocity: 10-15 km/h

Blast U.T.M.: 17N 500215 mE 4942327 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 351 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 690 m

**LAYOUT**

Hole Depth:	9.75-13.72 m	Material Blasted:	Limestone	Total Meters Drilled:	1,096.4 m
No. of Holes:	99	Subdrilling:	0.00 m	Burden:	3.05 m
No. of V.P.† Holes:	98	Face Height:	9.75-13.72 m	Spacing:	3.35 m
No. of Rows:	3	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone
				Area Type:	Conventional
				Method:	Specified
					(H = 11.54 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation:	Electronic	Max. Wt. of Expl. in Overlapped Decks:	255.2 kg	Volume Produced:	11,557.0 m <sup>3</sup>
Firing Device:	E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	255.2 kg	Weight Produced:	30,168.6 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	3.118 t/kg
Mfg and Model:	DBM Remote Unit	Max. Wt. of Explosive Per Hole:	127.6 kg	Powder Factor 2:	0.837 kg/m <sup>3</sup>
Initiation Settings:		Scaled Distance Factor (max charge):	61.12	Rock Density:	2.611 t/m <sup>3</sup>
Series Resistance (ohms):		Scaled Distance Factor (per delay):	43.22		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
REED	ADAM, G	* ON - N/A		Yes	No	No	No	Yes
BRAGAN	COREY, T			No	No	No	No	No
FRALICK	CRAIG, A			No	No	No	No	No
KLINGSPOR	DAVID, A	* ON - 278B-454184 [12/31/2099]		No	Yes	Yes	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/04/2019 16:01

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location:

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15106	Eagle 340 E*Star Booster (3/4lb)	128.00 ea	96.00
15001	24' E*STAR Detonator - QM	32.00 ea	0.00
15003	40' E*STAR Detonator - QM	64.00 ea	0.00
15004	60' E*STAR Detonator - QM	32.00 ea	0.00
15128	Hydromite 4100 Bulk NB	9,580.00 kg	9,580.00
Total Weight of Explosives (Include Primers) ( kg ):			9,676.00

**COMMENTS / EXPLANATIONS**

General Comments:

Imported on 11/5/2019 6:04:36 PM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-11

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/04/2019 16:01

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location:

**SEISMOGRAPH 1 - 178717 GREYRD 17**

Data Type: Seismic Record    Seismograph Type: instancel

Date: 11/04/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 2.034 mm/s    34.1 Hz

Time: 16:01                      Calibration Date: 05/30/19                      Vertical: 2.325 mm/s    36.6 Hz

Distance From Blast: 557.78 m    Calibration Signal: OK                      Longitudinal: 1.868 mm/s    39.4 Hz

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

Readout:                      Mic. Min. Freq.: --- Hz                      Acoustic: 110 dB    --- Hz

Location:                      Vector Sum: --- mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Adam Reed, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Adam Reed Austin Powder

**SEISMOGRAPH 2 - 178841 GREYRD. 17**

Data Type: No Trigger                      Seismograph Type: Instancel-MicroMate

Date: 11/04/19                      Trigger Level: 1.50 mm/s    115.00 dB

Time: 16:01                      Calibration Date: 05/30/19

Distance From Blast: 693.12 m    Calibration Signal: OK

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

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

Location: Bolted to bedrock in front of property.

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Adam Reed, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Adam Reed Austin Powder

**SEISMOGRAPH 3 - 283197 10TH CONC.**

Data Type: No Trigger                      Seismograph Type: Instancel Minimate

Date: 11/04/19                      Trigger Level: 1.50 mm/s    115.00 dB

Time: 16:01                      Calibration Date: 03/30/19

Distance From Blast: 996.09 m    Calibration Signal:

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

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

Location: Behind the mail box.

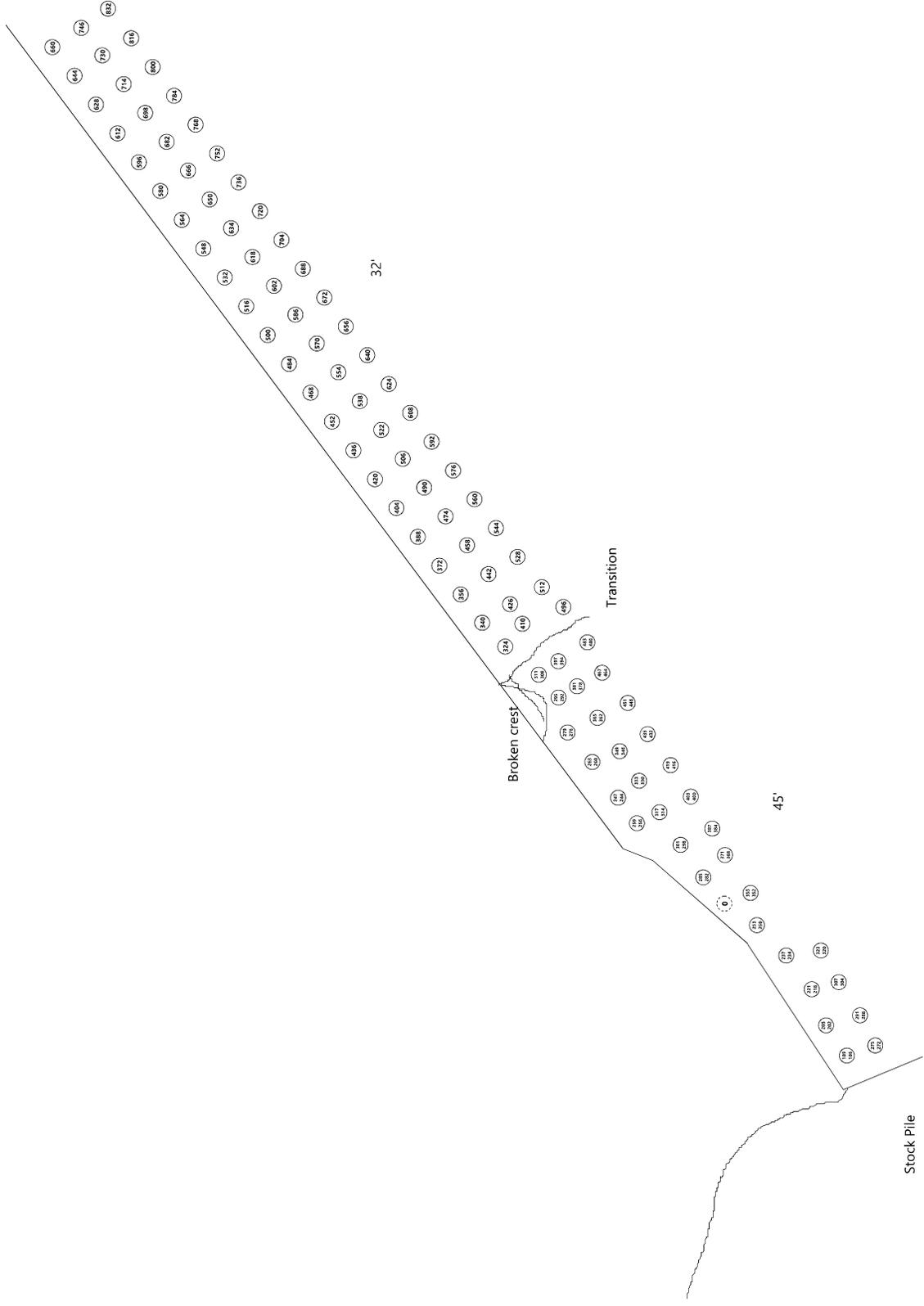
U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: Adam Reed, AUSTIN POWDER

Analyst and Firm:

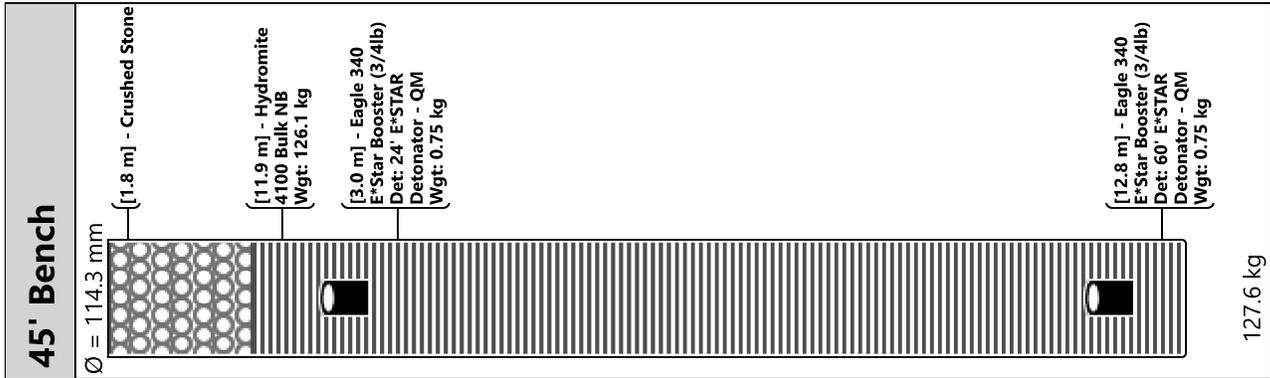
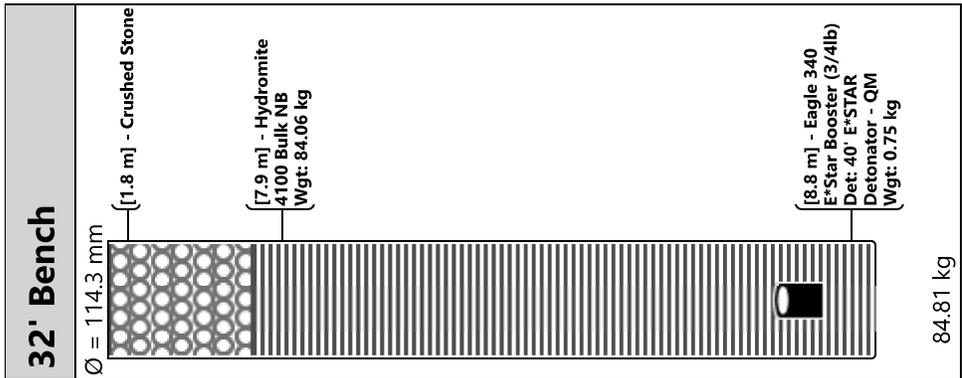
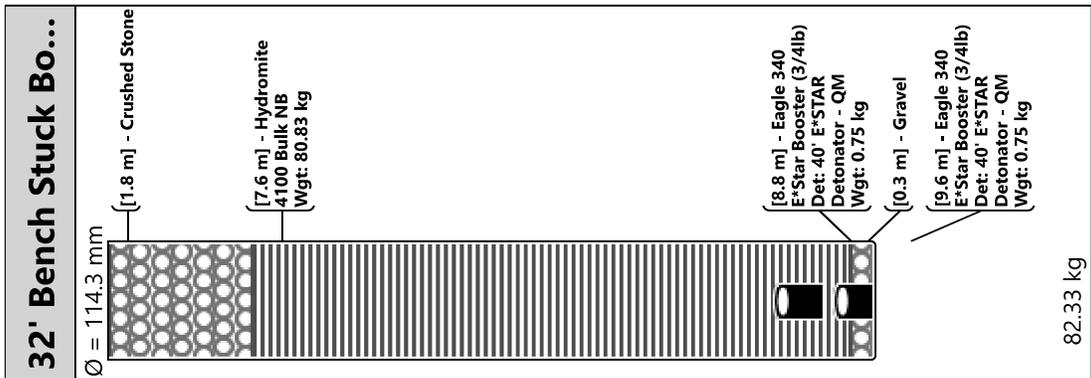
Installer and Firm: Adam Reed Austin Powder

Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ39	32' Bench Stuck Booster	0	496	ZZ48	32' Bench	0	452
ZZ1	45' Bench	0	272/275	ZZ49	32' Bench	0	468
ZZ2	45' Bench	0	186/189	ZZ50	32' Bench	0	484
ZZ3	45' Bench	0	202/205	ZZ51	32' Bench	0	500
ZZ4	45' Bench	0	288/291	ZZ52	32' Bench	0	516
ZZ5	45' Bench	0	304/307	ZZ53	32' Bench	0	532
ZZ6	45' Bench	0	218/221	ZZ54	32' Bench	0	548
ZZ7	45' Bench	0	320/323	ZZ55	32' Bench	0	564
ZZ8	45' Bench	0	234/237	ZZ56	32' Bench	0	580
ZZ9	45' Bench	0	250/253	ZZ57	32' Bench	0	596
ZZ10	45' Bench	0	352/355	ZZ58	32' Bench	0	612
ZZ11	45' Bench	0	368/371	ZZ59	32' Bench	0	628
ZZ12	45' Bench	0	282/285	ZZ60	32' Bench	0	644
ZZ13	45' Bench	0	298/301	ZZ61	32' Bench	0	528
ZZ14	45' Bench	0	384/387	ZZ62	32' Bench	0	544
ZZ15	45' Bench	0	400/403	ZZ63	32' Bench	0	560
ZZ16	45' Bench	0	314/317	ZZ64	32' Bench	0	576
ZZ17	45' Bench	0	256/259	ZZ65	32' Bench	0	592
ZZ18	45' Bench	0	244/247	ZZ66	32' Bench	0	608
ZZ19	45' Bench	0	330/333	ZZ67	32' Bench	0	624
ZZ20	45' Bench	0	416/419	ZZ68	32' Bench	0	640
ZZ21	45' Bench	0	432/435	ZZ69	32' Bench	0	656
ZZ22	45' Bench	0	346/349	ZZ70	32' Bench	0	672
ZZ23	45' Bench	0	260/263	ZZ71	32' Bench	0	688
ZZ24	45' Bench	0	276/279	ZZ72	32' Bench	0	704
ZZ25	45' Bench	0	362/365	ZZ73	32' Bench	0	720
ZZ26	45' Bench	0	448/451	ZZ74	32' Bench	0	736
ZZ27	45' Bench	0	464/467	ZZ75	32' Bench	0	752
ZZ28	45' Bench	0	378/381	ZZ76	32' Bench	0	768
ZZ29	45' Bench	0	292/295	ZZ77	32' Bench	0	784
ZZ30	45' Bench	0	308/311	ZZ78	32' Bench	0	800
ZZ31	45' Bench	0	394/397	ZZ79	32' Bench	0	816
ZZ32	45' Bench	0	480/483	ZZ80	32' Bench	0	442
ZZ34	32' Bench	0	832	ZZ81	32' Bench	0	458
ZZ35	32' Bench	0	340	ZZ82	32' Bench	0	474
ZZ36	32' Bench	0	324	ZZ83	32' Bench	0	490
ZZ37	32' Bench	0	410	ZZ84	32' Bench	0	506
ZZ38	32' Bench	0	512	ZZ85	32' Bench	0	522
ZZ40	32' Bench	0	426	ZZ86	32' Bench	0	538
ZZ41	32' Bench	0	746	ZZ87	32' Bench	0	554
ZZ42	32' Bench	0	356	ZZ88	32' Bench	0	570
ZZ43	32' Bench	0	372	ZZ89	32' Bench	0	586
ZZ44	32' Bench	0	388	ZZ90	32' Bench	0	602
ZZ45	32' Bench	0	404	ZZ91	32' Bench	0	618
ZZ46	32' Bench	0	420	ZZ92	32' Bench	0	634
ZZ47	32' Bench	0	436	ZZ93	32' Bench	0	650

Hole	Load	Surface Delay	Deck 1 Delay
ZZ94	32' Bench	0	666
ZZ95	32' Bench	0	682
ZZ96	32' Bench	0	698
ZZ97	32' Bench	0	714
ZZ98	32' Bench	0	730
ZZ33	32' Bench	0	660
ZZ99	45' Bench Not Loaded	0	0





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/18/2019 14:26

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Overcast /  
Low Clouds

Wind From: W

Temperature: 0 °C

Terrain: Flat

Wind Velocity: - km/h

Blast U.T.M.: 17N 500229 mE 4942331 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 350 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 689 m

**LAYOUT**

Hole Depth:	14.63 m	Material Blasted:	Limestone	Total Meters Drilled:	1,111.9 m
No. of Holes:	76	Subdrilling:	0.00 m	Burden:	3.05 m
No. of V.P.† Holes:	76	Face Height:	14.63 m	Spacing:	3.05 m
No. of Rows:	6	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear Stone
				Area Type:	Conventional
				Method:	Specified
					(H = 14.63 m)

† V.P. = Volume Producing

**WEIGHTS**

Initiation:	Electronic	Max. Wt. of Expl. in Overlapped Decks:	324.5 kg	Volume Produced:	10,330.0 m³
Firing Device:	E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	324.5 kg	Weight Produced:	24,796.1 t
Other Method:		Max. No. of Holes Per 8 ms Interval:	2	Powder Factor 1:	2.082 t/kg
Mfg and Model:	DBM Remote Unit	Max. Wt. of Explosive Per Hole:	162.3 kg	Powder Factor 2:	1.153 kg/m³
Initiation Settings:		Scaled Distance Factor (max charge):	54.08	Rock Density:	2.400 t/m³
Series Resistance (ohms):		Scaled Distance Factor (per delay):	38.24		

**SEISMOGRAPH 1 - 178841 GREY RD. 17**

Data Type:	Seismic Record	Seismograph Type:	InstanTel-MicroMate		
Date:	11/18/19	Trigger Level:	1.50 mm/s 115.00 dB	Transverse:	1.651 mm/s 34.0 Hz
Time:	14:26	Calibration Date:	05/30/19	Vertical:	1.143 mm/s 51.0 Hz
Distance From Blast:	691.59 m	Calibration Signal:	OK	Longitudinal:	1.397 mm/s 28.0 Hz
Direction From Blast:	NNW	Geophone Min. Freq.:	--- Hz	Acoustic:	91 dB --- Hz
Readout:		Mic. Min. Freq.:	--- Hz	Vector Sum:	2.075 mm/s
Location:	Bolted to bedrock in front of property.				
U.T.M.:	17N 500101 mE 4943011 mN				
Reader and Firm:	Liam O'Donohoe, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Corey Bragan, Austin Powder LTD.				



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-12

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/18/2019 14:26

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**CREW**

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Loader Bucket

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
KLINGSPOR	DAVID, A	* ON - 278B-454184 [12/31/2099]		Yes	Yes	Yes	No	No
BELTRAME	ALEXANDE R, A			No	No	No	No	No
BRAGAN	COREY, T			No	No	No	No	No
LI	JACKSON, A			No	No	Yes	No	No
NEWTON	JOHN, D			No	No	No	No	No
Other Crew Members	Company			In Charge	Tied In	Chk. Tie-In	Driller	Layout
Mike	Harold Sutherland Const.			No	No	No	Yes	Yes

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15106	Eagle 340 E*Star Booster (3/4lb)	152.00 ea	114.00
15002	30' E*STAR Detonator - QM	74.00 ea	0.00
15004	60' E*STAR Detonator - QM	78.00 ea	0.00
15128	Hydromite 4100 Bulk NB	11,800.00 kg	11,800.00
12981	Mini Stem Plug - 6015	76.00 ea	0.00
Total Weight of Explosives (Include Primers) ( kg ):			11,914.00

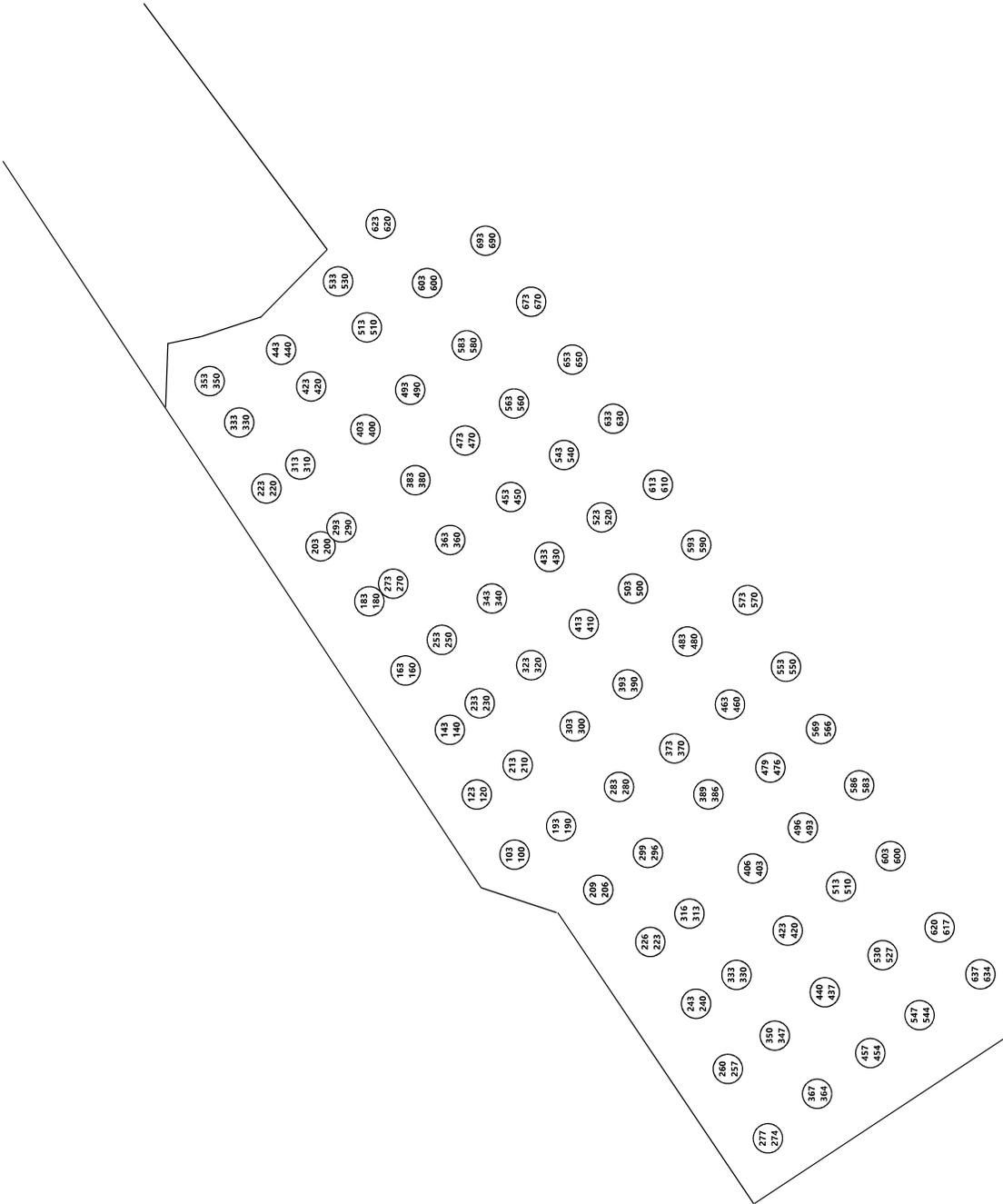
**COMMENTS / EXPLANATIONS**

General Comments:

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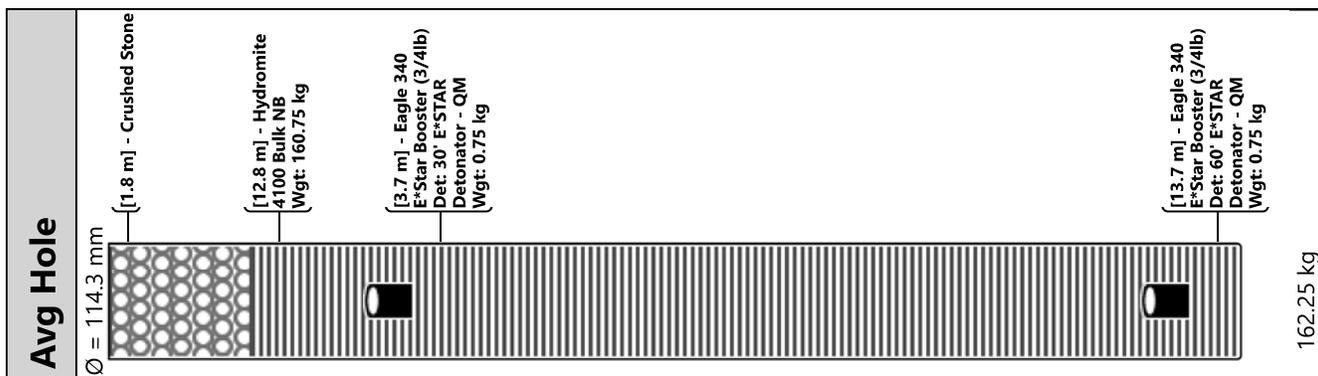
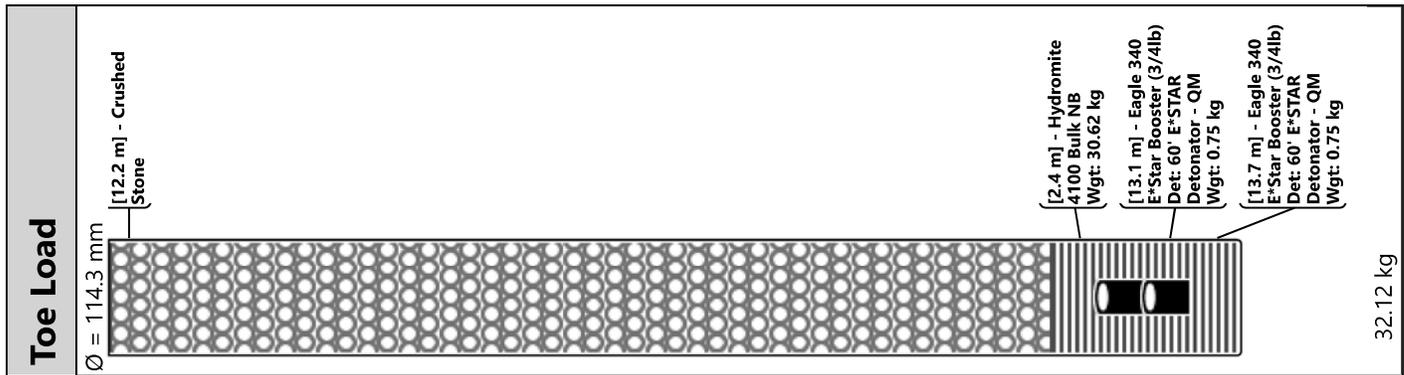
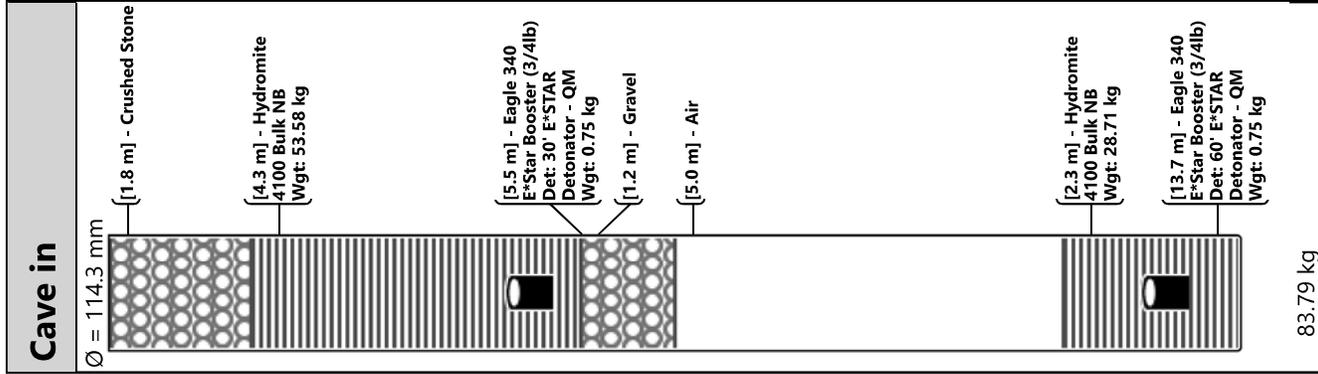
Signature of Blaster in Charge

Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay
ZZ64	Cave in	0	490/493
ZZ51	Avg Hole	0	540/543
ZZ21	Avg Hole	0	386/389
ZZ59	Avg Hole	0	470/473
ZZ45	Avg Hole	0	250/253
ZZ73	Avg Hole	0	530/533
ZZ44	Avg Hole	0	160/163
ZZ56	Avg Hole	0	200/203
ZZ68	Avg Hole	0	330/333
ZZ43	Avg Hole	0	140/143
ZZ69	Avg Hole	0	350/353
ZZ70	Avg Hole	0	440/443
ZZ10	Toe Load Air Deck	0	257/260
ZZ1	Toe Load	0	274/277
ZZ18	Avg Hole	0	223/226
ZZ11	Avg Hole	0	240/243
ZZ19	Avg Hole	0	206/209
ZZ32	Avg Hole	0	120/123
ZZ31	Avg Hole	0	100/103
ZZ55	Avg Hole	0	180/183
ZZ67	Avg Hole	0	220/223
ZZ7	Avg Hole	0	527/530
ZZ4	Avg Hole	0	544/547
ZZ5	Avg Hole	0	634/637
ZZ16	Avg Hole	0	403/406
ZZ30	Avg Hole	0	190/193
ZZ6	Avg Hole	0	617/620
ZZ62	Avg Hole	0	670/673
ZZ72	Avg Hole	0	510/513
ZZ33	Avg Hole	0	210/213
ZZ41	Avg Hole	0	320/323
ZZ63	Avg Hole	0	580/583
ZZ54	Avg Hole	0	270/273
ZZ38	Avg Hole	0	590/593
ZZ47	Avg Hole	0	430/433
ZZ17	Avg Hole	0	313/316
ZZ58	Avg Hole	0	380/383
ZZ74	Avg Hole	0	600/603
ZZ15	Avg Hole	0	493/496
ZZ48	Avg Hole	0	520/523
ZZ37	Avg Hole	0	570/573
ZZ28	Avg Hole	0	370/373
ZZ25	Avg Hole	0	600/603
ZZ39	Avg Hole	0	500/503
ZZ57	Avg Hole	0	290/293
ZZ2	Avg Hole	0	364/367

Hole	Load	Surface Delay	Deck 1 Delay
ZZ14	Avg Hole	0	510/513
ZZ20	Avg Hole	0	296/299
ZZ46	Avg Hole	0	340/343
ZZ60	Avg Hole	0	560/563
ZZ23	Avg Hole	0	566/569
ZZ50	Avg Hole	0	630/633
ZZ22	Avg Hole	0	476/479
ZZ8	Avg Hole	0	437/440
ZZ35	Cave in	0	390/393
ZZ13	Avg Hole	0	420/423
ZZ77	Avg Hole	0	690/693
ZZ9	Avg Hole	0	347/350
ZZ66	Avg Hole	0	310/313
ZZ61	Avg Hole	0	650/653
ZZ40	Avg Hole	0	410/413
ZZ53	Avg Hole	0	360/363
ZZ75	Avg Hole	0	620/623
ZZ26	Avg Hole	0	550/553
ZZ71	Avg Hole	0	420/423
ZZ3	Avg Hole	0	454/457
ZZ29	Avg Hole	0	280/283
ZZ27	Avg Hole	0	460/463
ZZ49	Avg Hole	0	610/613
ZZ52	Avg Hole	0	450/453
ZZ34	Avg Hole	0	300/303
ZZ36	Avg Hole	0	480/483
ZZ42	Avg Hole	0	230/233
ZZ12	Avg Hole	0	330/333
ZZ24	Avg Hole	0	583/586
ZZ65	Avg Hole	0	400/403





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-13

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/22/2019 15:38

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Light Snow

Wind From: WSW

Temperature: -4 °C

Terrain: Flat

Wind Velocity: 6-25 km/h

Blast U.T.M.: 17N 500307 mE 4942389 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Rd. 17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 342 °

Structure U.T.M.: 17N 500105 mE 4943009 mN

Distance: 652 m

**LAYOUT**

	Hole Depth:	9.75-14.33 m	Material Blasted:	Limestone	Total Meters Drilled:	1,149.1 m	
No. of Holes:	100	Subdrilling:	0.00 m	Burden:	3.05 m	Water Depth:	4.27 m
No. of V.P.† Holes:	100	Face Height:	9.75-14.33 m	Spacing:	3.35 m	Stem Length:	min 1.83 m
No. of Rows:	5	Drilling Angle:	°	Back Fill Depth:	0.00 m	Area Type:	Conventional
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	Clear stone	Method:	Specified
							(H = 10.97 m)

† V.P. = Volume Producing

**WEIGHTS**

	Max. Wt. of Expl. in Overlapped Decks:	471.0 kg	Volume Produced:	11,213.5 m <sup>3</sup>	
Initiation:	Electronic	Max. Wt. of Expl. Per 8 ms Interval:	471.0 kg	Weight Produced:	26,916.8 t
Firing Device:	E*Star Blasting Machine (WRFD)	Max. No. of Holes Per 8 ms Interval:	5	Powder Factor 1:	2.586 t/kg
Other Method:		Max. Wt. of Explosive Per Hole:	157.4 kg	Powder Factor 2:	0.928 kg/m <sup>3</sup>
Mfg and Model:	DBM1600-2-KC	Scaled Distance Factor (max charge):	51.99	Rock Density:	2.400 t/m <sup>3</sup>
Initiation Settings:		Scaled Distance Factor (per delay):	30.05		
Series Resistance (ohms):					

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

Blast occurred other than scheduled time: No

Misfire Occurred: No

Protective Cover: Shot Remotely

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDE R, A			No	No	No	No	No
MACPHADEN	AARON, K			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	No	No	No	No
O'DONOHUE	LIAM, J			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-13

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/22/2019 15:38

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15106	Eagle 340 E*Star Booster (3/4lb)	203.00 ea	152.25
15001	24' E*STAR Detonator - QM	79.00 ea	0.00
15003	40' E*STAR Detonator - QM	86.00 ea	0.00
15030	60' E*STAR Detonator - QM/HD	38.00 ea	0.00
12276	E*Star Bus Wire - 1250' spool	2.00 sp	0.00
15128	Hydromite 4100 Bulk NB	10,260.00 kg	10,260.00
12981	Mini Stem Plug - 6015	100.00 ea	0.00
Total Weight of Explosives (Include Primers) ( kg ):			<u>10,412.25</u>

**COMMENTS / EXPLANATIONS**

General Comments: Imported on 11/25/2019 3:03:19 PM

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-13

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 11/22/2019 15:38

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**SEISMOGRAPH 1 - 178717 GREYRD 17**

Data Type: Seismic Record Seismograph Type: instandel

Date: 11/22/19 Trigger Level: 1.50 mm/s 115.00 dB Transverse: 0.762 mm/s 23.0 Hz

Time: 15:37 Calibration Date: 05/30/19 Vertical: 1.778 mm/s 14.0 Hz

Distance From Blast: 531.88 m Calibration Signal: OK Longitudinal: 1.27 mm/s 13.0 Hz

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

Readout: Mic. Min. Freq.: --- Hz Acoustic: 121 dB --- Hz

Location: Vector Sum: 1.818 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Liam O'Donohoe, Austin Powder

**SEISMOGRAPH 2 - 178841 GREYRD. 17**

Data Type: Seismic Record Seismograph Type: Instandel-MicroMate

Date: 11/22/19 Trigger Level: 1.50 mm/s 115.00 dB Transverse: 1.27 mm/s 34.0 Hz

Time: 15:36 Calibration Date: 05/30/19 Vertical: 1.651 mm/s 9.7 Hz

Distance From Blast: 655.62 m Calibration Signal: OK Longitudinal: 2.413 mm/s 27.0 Hz

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

Readout: Mic. Min. Freq.: --- Hz Acoustic: 124 dB --- Hz

Location: Bolted to bedrock in front of property. Vector Sum: 2.643 mm/s

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Liam O'Donohoe, Austin Powder

**SEISMOGRAPH 3 - 283197 10TH CONC.**

Data Type: No Trigger Seismograph Type: Instatel Minimate

Date: 11/22/19 Trigger Level: 1.50 mm/s 115.00 dB

Time: 15:38 Calibration Date: 03/30/19

Distance From Blast: 943.66 m Calibration Signal:

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

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

Location: Behind the mail box.

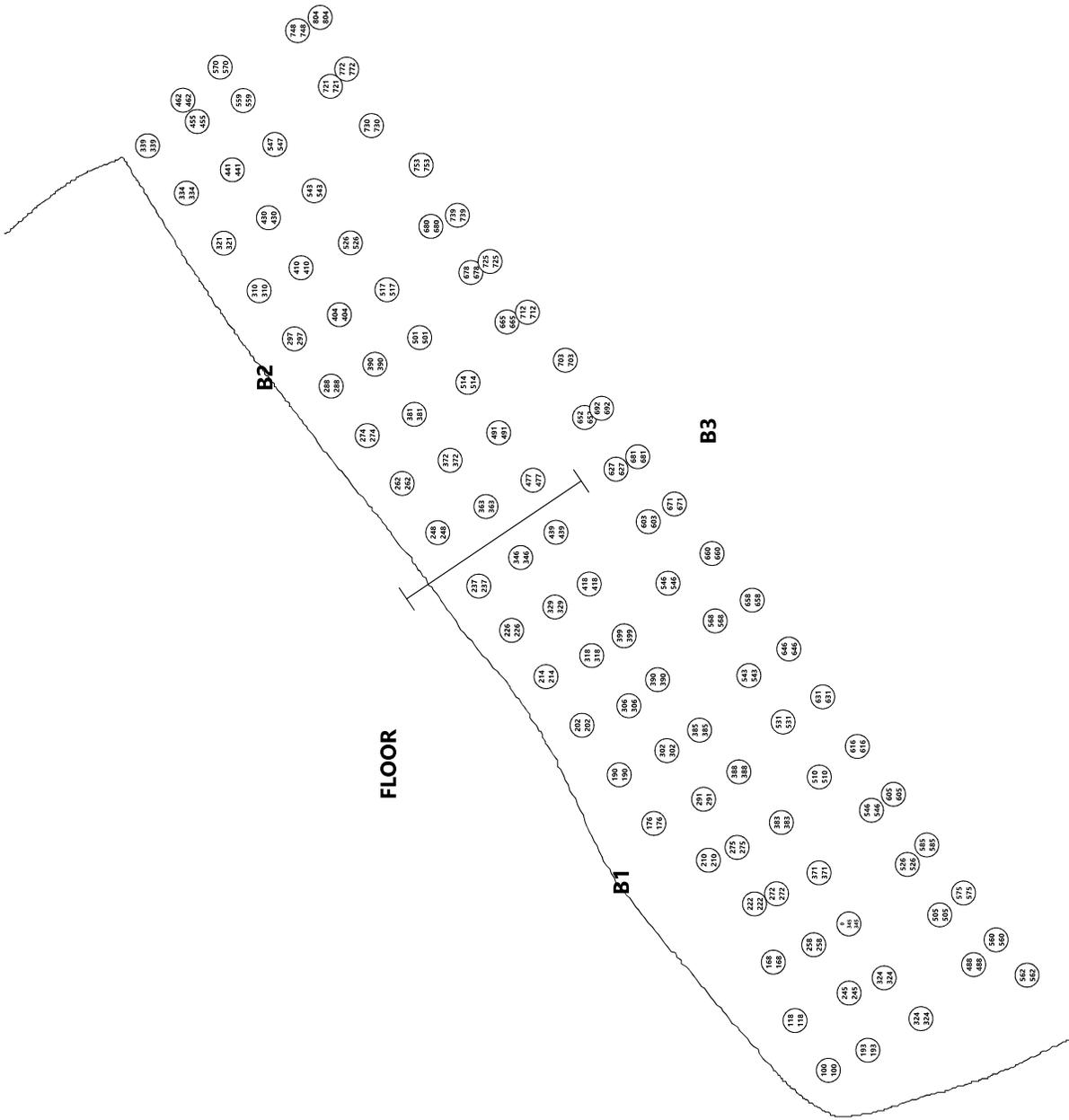
U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: Liam O'Donohoe, AUSTIN POWDER

Analyst and Firm:

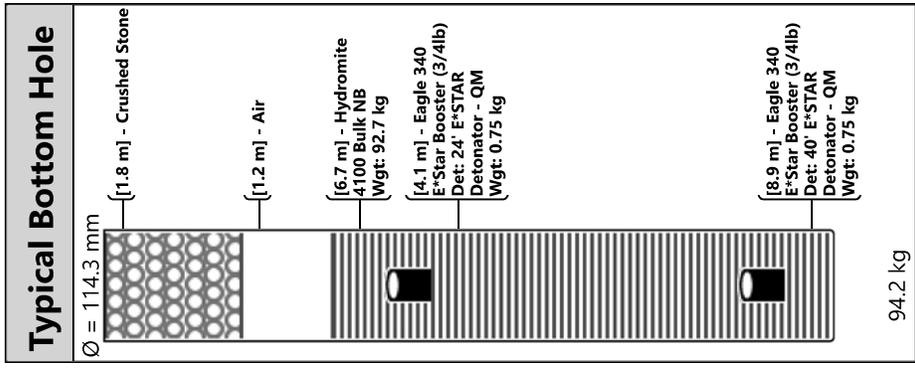
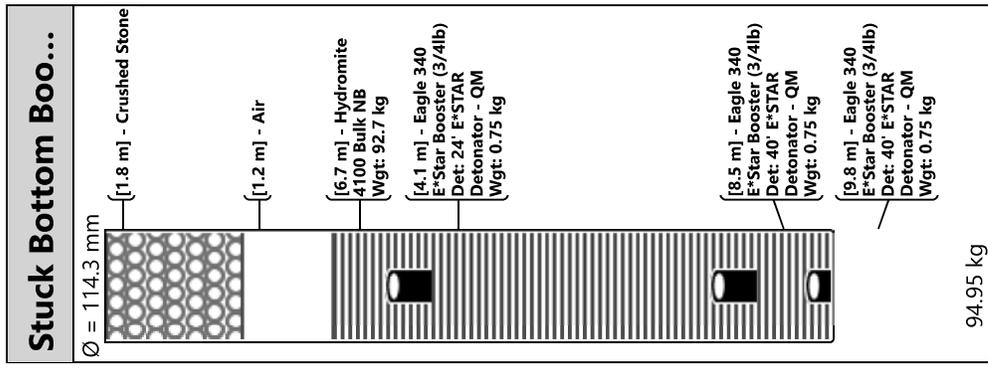
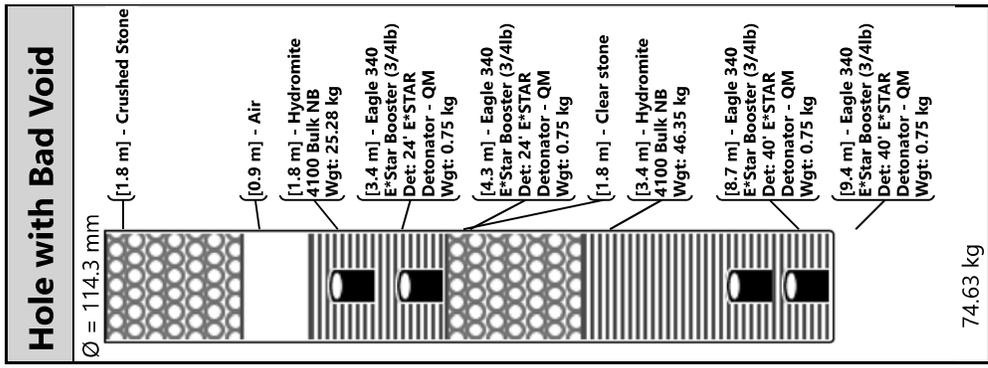
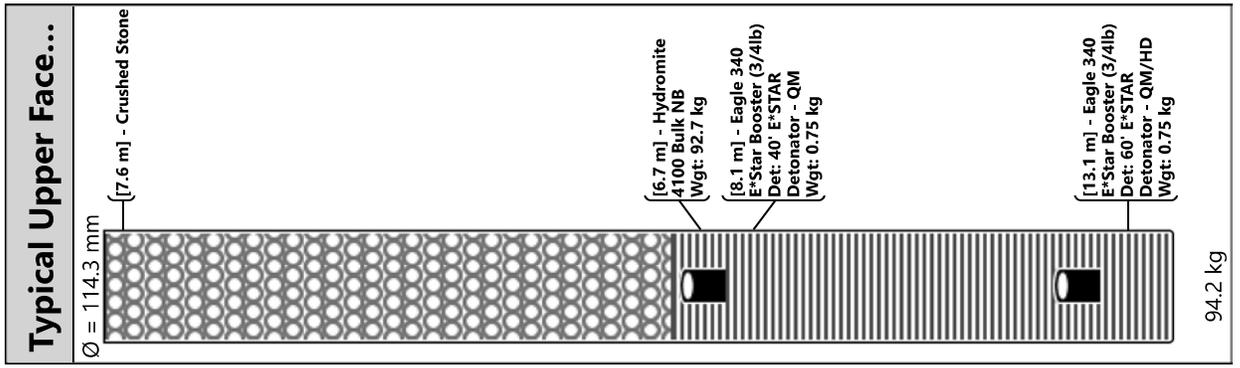
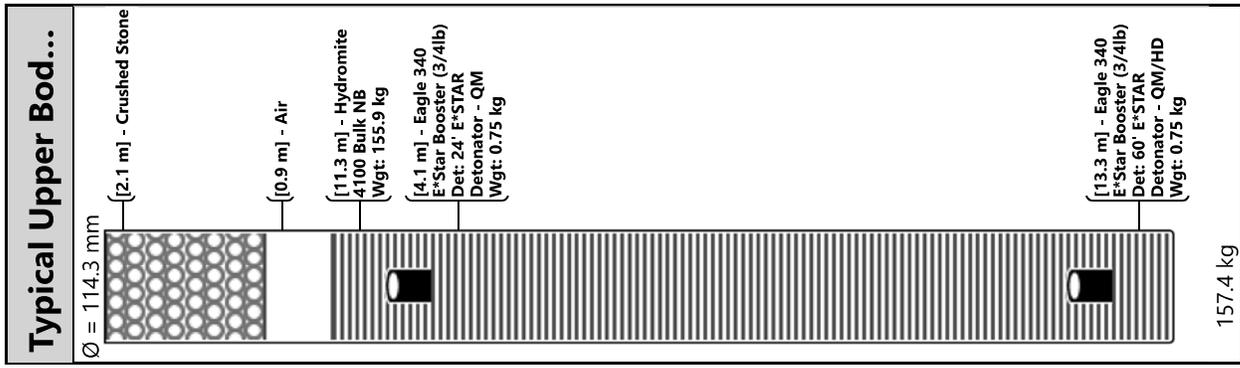
Installer and Firm: Liam O'Donohoe, Austin Powder

Hole Label Mode: Cumulative In-Hole Delays



Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay	Hole	Load	Surface Delay	Deck 1 Delay
ZZ71	Typical Upper Body Hole	0	605/605		ZZ14	Typical Bottom Hole	0	190/190
ZZ17	Typical Bottom Hole	0	222/222		ZZ83	Typical Upper Body Hole	0	671/671
ZZ28	Stuck Bottom Booster	0	272/272		ZZ32	Typical Bottom Hole	0	291/291
ZZ26	Hole with Bad Void	0	345/345	0	ZZ38	Typical Bottom Hole	0	399/399
ZZ70	Typical Upper Face Hole	0	546/546		ZZ54	Typical Bottom Hole	0	526/526
ZZ82	Typical Upper Face Hole	0	603/603		ZZ49	Typical Bottom Hole	0	390/390
ZZ96	Typical Upper Face Hole	0	730/730		ZZ55	Typical Bottom Hole	0	543/543
ZZ66	Typical Upper Face Hole	0	505/505		ZZ48	Typical Bottom Hole	0	381/381
ZZ95	Typical Upper Face Hole	0	753/753		ZZ67	Typical Upper Body Hole	0	575/575
ZZ68	Typical Upper Face Hole	0	526/526		ZZ34	Typical Bottom Hole	0	385/385
ZZ63	Typical Upper Face Hole	0	562/562		ZZ33	Typical Bottom Hole	0	302/302
ZZ89	Typical Upper Face Hole	0	665/665		ZZ46	Typical Bottom Hole	0	491/491
ZZ80	Typical Upper Face Hole	0	546/546		ZZ73	Typical Upper Body Hole	0	616/616
ZZ78	Typical Upper Face Hole	0	568/568		ZZ43	Typical Bottom Hole	0	477/477
ZZ72	Typical Upper Face Hole	0	510/510		ZZ90	Typical Upper Body Hole	0	712/712
ZZ97	Typical Upper Face Hole	0	721/721		ZZ36	Typical Bottom Hole	0	306/306
ZZ76	Typical Upper Face Hole	0	543/543		ZZ41	Typical Bottom Hole	0	346/346
ZZ84	Typical Upper Face Hole	0	627/627		ZZ37	Typical Bottom Hole	0	318/318
ZZ88	Typical Upper Face Hole	0	703/703		ZZ35	Typical Bottom Hole	0	390/390
ZZ91	Typical Upper Face Hole	0	678/678		ZZ40	Typical Bottom Hole	0	329/329
ZZ86	Typical Upper Face Hole	0	652/652		ZZ44	Typical Bottom Hole	0	363/363
ZZ93	Typical Upper Face Hole	0	680/680		ZZ77	Typical Upper Body Hole	0	646/646
ZZ100	Typical Upper Face Hole	0	804/804		ZZ53	Typical Bottom Hole	0	410/410
ZZ99	Typical Upper Face Hole	0	748/748		ZZ75	Typical Upper Body Hole	0	631/631
ZZ74	Typical Upper Face Hole	0	531/531		ZZ57	Typical Bottom Hole	0	441/441
ZZ64	Typical Upper Face Hole	0	488/488		ZZ79	Typical Upper Body Hole	0	658/658
ZZ3	Typical Bottom Hole	0	321/321		ZZ31	Typical Bottom Hole	0	388/388
ZZ15	Typical Bottom Hole	0	176/176		ZZ47	Typical Bottom Hole	0	514/514
ZZ22	Typical Bottom Hole	0	324/324		ZZ45	Typical Bottom Hole	0	372/372
ZZ18	Typical Bottom Hole	0	168/168		ZZ42	Typical Bottom Hole	0	439/439
ZZ2	Typical Bottom Hole	0	334/334		ZZ24	Typical Bottom Hole	0	245/245
ZZ16	Typical Bottom Hole	0	210/210		ZZ25	Typical Bottom Hole	0	258/258
ZZ11	Typical Bottom Hole	0	226/226		ZZ27	Typical Bottom Hole	0	371/371
ZZ20	Typical Bottom Hole	0	100/100		ZZ65	Typical Upper Body Hole	0	560/560
ZZ7	Typical Bottom Hole	0	274/274		ZZ98	Typical Upper Body Hole	0	772/772
ZZ9	Typical Bottom Hole	0	248/248		ZZ30	Typical Bottom Hole	0	383/383
ZZ5	Typical Bottom Hole	0	297/297		ZZ29	Typical Bottom Hole	0	275/275
ZZ19	Typical Bottom Hole	0	118/118		ZZ56	Typical Bottom Hole	0	430/430
ZZ12	Typical Bottom Hole	0	214/214		ZZ39	Typical Bottom Hole	0	418/418
ZZ8	Typical Bottom Hole	0	262/262		ZZ62	Typical Bottom Hole	0	570/570
ZZ6	Typical Bottom Hole	0	288/288		ZZ58	Typical Bottom Hole	0	547/547
ZZ21	Typical Bottom Hole	0	193/193		ZZ51	Typical Bottom Hole	0	517/517
ZZ4	Typical Bottom Hole	0	310/310		ZZ94	Typical Upper Body Hole	0	739/739
ZZ1	Typical Bottom Hole	0	339/339		ZZ81	Typical Upper Body Hole	0	660/660
ZZ10	Typical Bottom Hole	0	237/237		ZZ52	Typical Bottom Hole	0	404/404
ZZ13	Typical Bottom Hole	0	202/202		ZZ87	Typical Upper Body Hole	0	692/692

Hole	Load	Surface Delay	Deck 1 Delay
ZZ92	Typical Upper Body Hole	0	725/725
ZZ59	Typical Bottom Hole	0	559/559
ZZ85	Typical Upper Body Hole	0	681/681
ZZ69	Typical Upper Body Hole	0	585/585
ZZ23	Typical Bottom Hole	0	324/324
ZZ50	Typical Bottom Hole	0	501/501
ZZ60	Typical Bottom Hole	0	455/455
ZZ61	Typical Bottom Hole	0	462/462





**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-14

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 12/11/2019 15:06

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**ENVIRONMENT**

Method Used: U.T.M.

Weather: Heavy Snow

Wind From: NE

Temperature: -6 °C

Terrain: Flat

Wind Velocity: 20-30 km/h

Blast U.T.M.: 17N 500292 mE 4942353 mN

**NEAREST PROTECTED STRUCTURE**

Structure Name: 178841 Grey Road #17

Compass Point: NNW

Structure Type: Dwelling

Direction/Bearing: 344 °

Structure U.T.M.: 17N 500101 mE 4943011 mN

Distance: 685 m

**LAYOUT**

Hole Depth:	15.24 m	Material Blasted:	Limestone	Total Meters Drilled:	914.4 m
No. of Holes:	60	Subdrilling:	0.61 m	Burden:	3.05 m
No. of V.P.† Holes:	60	Face Height:	14.63 m	Spacing:	3.35 m
No. of Rows:	4	Drilling Angle:	°	Back Fill Depth:	0.00 m
Diameter:	114.3 mm	Mats Used:	No	Stem Type:	5/8" Clear Stone
				Method:	Specified

† V.P. = Volume Producing

(H = 14.63 m)

**WEIGHTS**

Initiation: Electronic	Max. Wt. of Expl. in Overlapped Decks:	452.3 kg	Volume Produced:	8,372.7 m³
Firing Device: E*Star Blasting Machine (WRFD)	Max. Wt. of Expl. Per 8 ms Interval:	452.3 kg	Weight Produced:	20,097.9 t
Other Method:	Max. No. of Holes Per 8 ms Interval:	3	Powder Factor 1:	2.262 t/kg
Mfg and Model: DBM1600-2-RC	Max. Wt. of Explosive Per Hole:	150.8 kg	Powder Factor 2:	1.061 kg/m³
Initiation Settings:	Scaled Distance Factor (max charge):	55.80	Rock Density:	2.400 t/m³
Series Resistance (ohms):	Scaled Distance Factor (per delay):	32.22		

**SEISMOGRAPHS**

See seismographs on separate page

**CREW**

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

Last Name	First Name	License / Cert	2nd License / Cert	In Charge	Tied In	Chk. Tie-In	Driller	Layout
SMART	EVAN, C	* ON - N/A		Yes	Yes	Yes	No	Yes
BELTRAME	ALEXANDE R, A			No	Yes	No	No	No
BRAGAN	COREY, T			No	Yes	No	No	No
FRALICK	CRAIG, A			No	Yes	No	No	No
KOUYOUJIAN	MACKENZI E, H			No	Yes	No	No	No
MOUNTENAY	AUSTIN, B			No	Yes	No	No	No
O'DONOHUE	LIAM, J			No	Yes	No	No	No



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-14

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 12/11/2019 15:06

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**PRODUCTS AND SERVICES**

Number	Product Description	Quantity	Weight ( kg )
15107	Eagle 450 E*Star Booster (1lb)	122.00 ea	122.00
15001	24' E*STAR Detonator - QM	61.00 ea	0.00
15030	60' E*STAR Detonator - QM/HD	61.00 ea	0.00
15161	E*Star Duplex HDPE Bus Wire - 400mtr	1.00 sp	0.00
15128	Hydromite 4100 Bulk NB	8,760.00 kg	8,760.00
12981	Mini Stem Plug - 6015	60.00 ea	0.00
A0075	Blaster Charge	1.00 ea	0.00
AB007	Bulk Truck Charge	1.00 ea	0.00
AB013	Labour Charge	7.00 hr	0.00
Total Weight of Explosives (Include Primers) ( kg ):			<b>8,882.00</b>

**COMMENTS / EXPLANATIONS**

General Comments: One hole had a locked booster with a cut line. No communication possible with 60' det and no emulsion near it. A secondary cave in at 10' prevented us from loading the column. The quarry foreman and loader operator was shown the problem area and was told to be mindful when pulling muck from this location. The hole has been identified with both survey equipment and also markers on the bench directly behind the shot.

Signature of Blaster in Charge



**AUSTIN POWDER LTD.  
BLAST REPORT**



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2019-14

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND  
CONST.-KEPPEL  
(HAR1525-001)

Date/Time: 12/11/2019 15:06

Pit/Permit: KEPPEL QUARRY / SHOT SERVICE

Location: Top Bench

**SEISMOGRAPH 1 - 178717 GREYRD #17**

Data Type: Seismic Record    Seismograph Type: InstanTEL - Micromate

Date: 12/11/19                      Trigger Level: 1.50 mm/s    115.00 dB                      Transverse: 1.97 mm/s    33.3 Hz

Time: 15:06                          Calibration Date: 05/30/19                      Vertical: 1.52 mm/s    33.3 Hz

Distance From Blast: 516.33 m    Calibration Signal: OK                      Longitudinal: 3.43 mm/s    33.3 Hz

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

Readout: Printed Copy              Mic. Min. Freq.: --- Hz                      Acoustic: 111 dB    --- Hz

Location: Spiked and buried.                      Vector Sum: 3.43 mm/s

U.T.M.: 17N 500660 mE 4941991 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 2 - 178841 GREY ROAD #17**

Data Type: No Trigger              Seismograph Type: InstanTEL - Micromate

Date: 12/11/19                      Trigger Level: 1.50 mm/s    115.00 dB

Time: 15:06                          Calibration Date: 05/30/19

Distance From Blast: 685.19 m    Calibration Signal: OK

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

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

Location: Bolted to bedrock at the front of the property.

U.T.M.: 17N 500101 mE 4943011 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

**SEISMOGRAPH 3 - 283197 CONC. RD. #10**

Data Type: No Trigger              Seismograph Type: InstanTEL - Minimate Blaster

Date: 12/11/19                      Trigger Level: 1.50 mm/s    115.00 dB

Time: 15:06                          Calibration Date: 01/22/19

Distance From Blast: 938.78 m    Calibration Signal: OK

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

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

Location: Spiked and weight bagged beside the mail box.

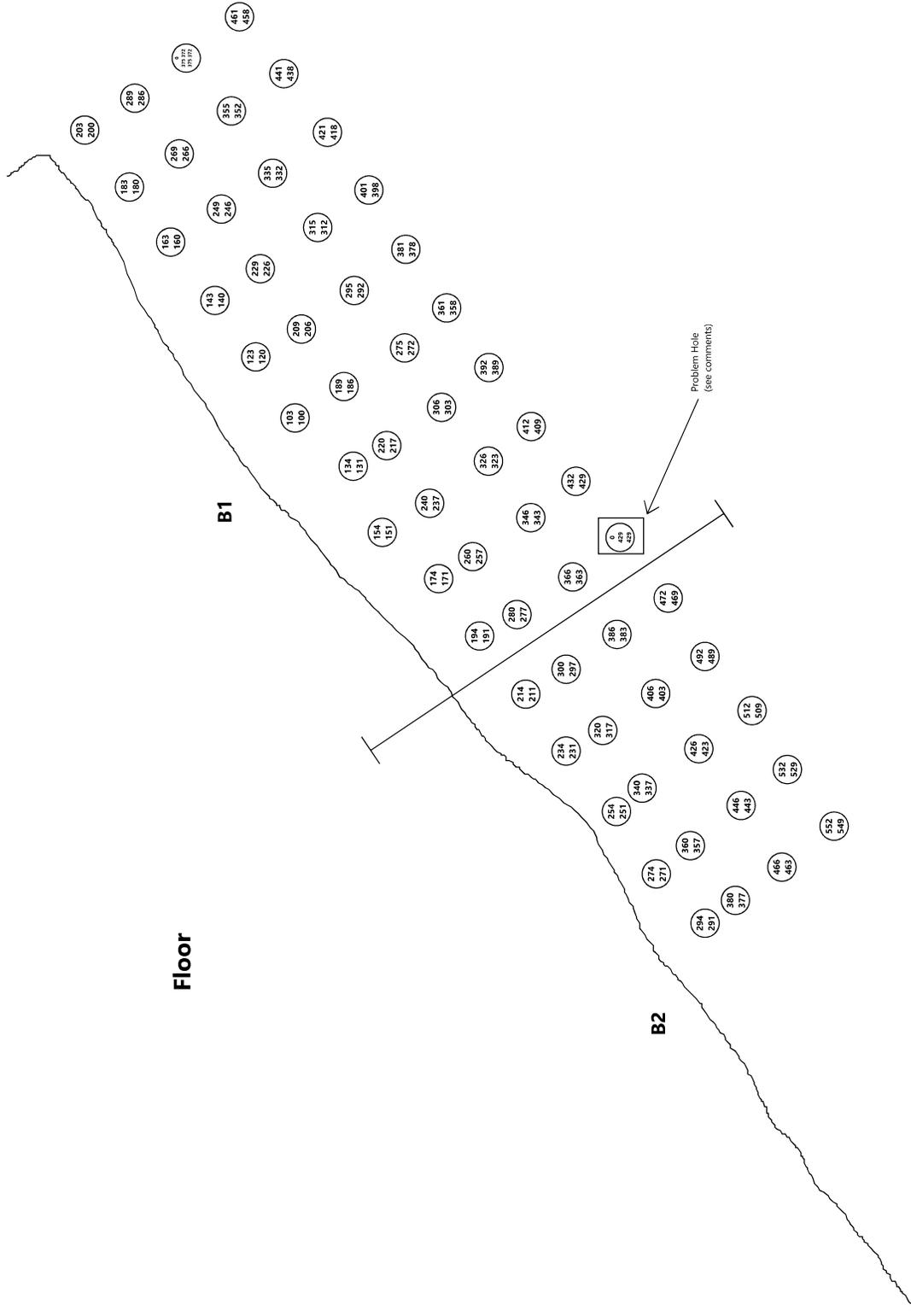
U.T.M.: 17N 501117 mE 4941905 mN

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

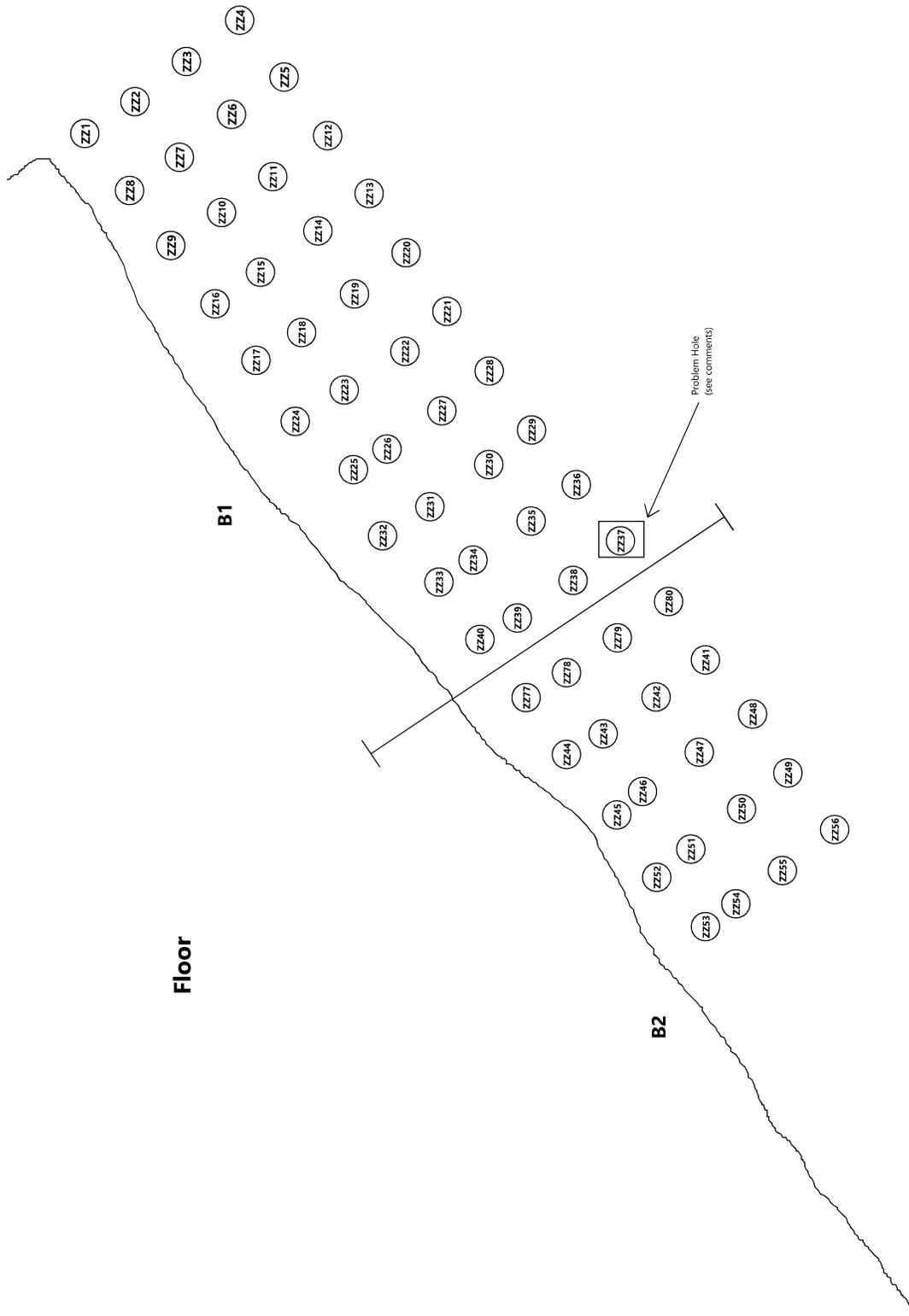
Installer and Firm: Evan Smart, Austin Powder Ltd.

Hole Label Mode: Cumulative In-Hole Delays



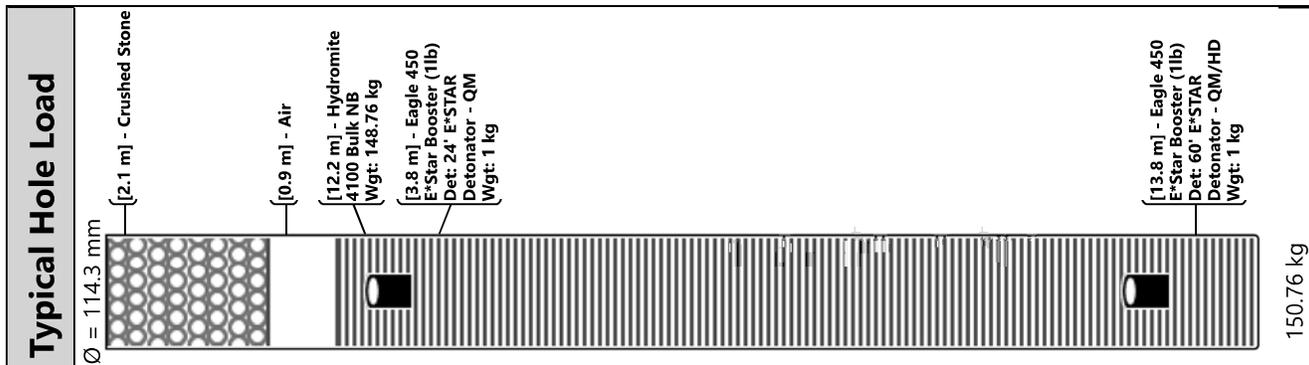
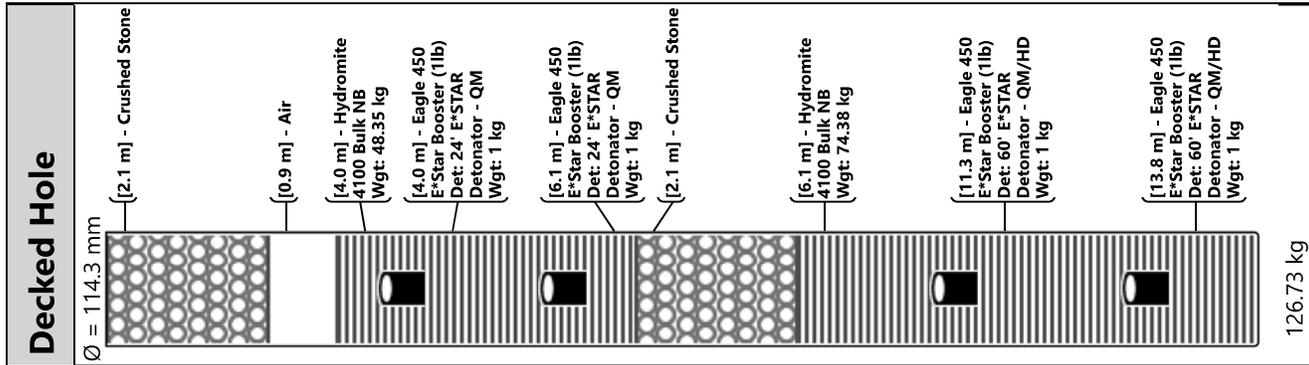
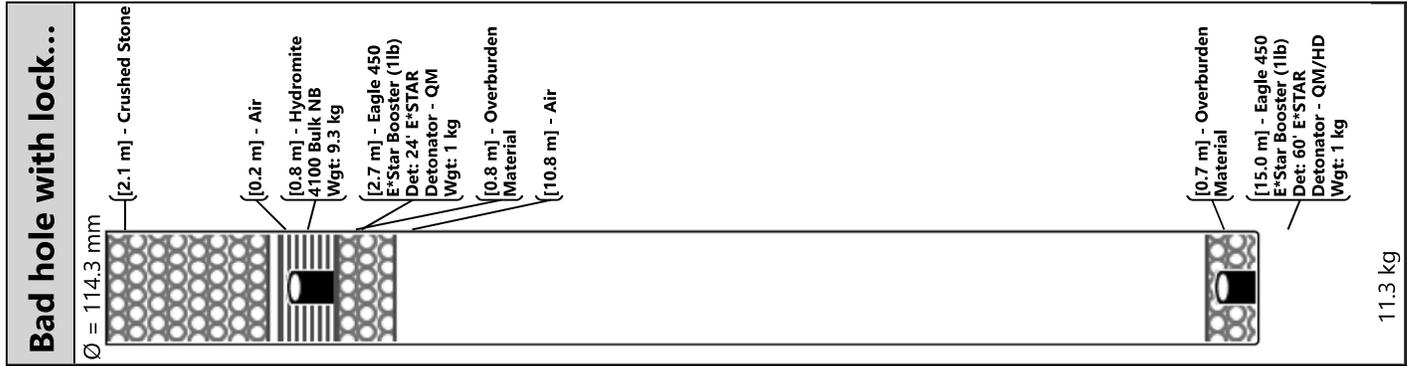


Hole Label Mode: Default (A1)



Hole	Load	Surface Delay	Deck 1 Delay	Deck 2 Delay
ZZ10	Typical Hole Load	0	246/249	
ZZ20	Typical Hole Load	0	378/381	
ZZ14	Typical Hole Load	0	312/315	
ZZ33	Typical Hole Load	0	171/174	
ZZ47	Typical Hole Load	0	423/426	
ZZ19	Typical Hole Load	0	292/295	
ZZ80	Typical Hole Load	0	469/472	
ZZ34	Typical Hole Load	0	257/260	
ZZ38	Typical Hole Load	0	363/366	
ZZ43	Typical Hole Load	0	317/320	
ZZ55	Typical Hole Load	0	463/466	
ZZ51	Typical Hole Load	0	357/360	
ZZ18	Typical Hole Load	0	206/209	
ZZ5	Typical Hole Load	0	438/441	
ZZ31	Typical Hole Load	0	237/240	
ZZ25	Typical Hole Load	0	131/134	
ZZ77	Typical Hole Load	0	211/214	
ZZ49	Typical Hole Load	0	529/532	
ZZ32	Typical Hole Load	0	151/154	
ZZ15	Typical Hole Load	0	226/229	
ZZ54	Typical Hole Load	0	377/380	
ZZ52	Typical Hole Load	0	271/274	
ZZ6	Typical Hole Load	0	352/355	
ZZ50	Typical Hole Load	0	443/446	
ZZ35	Typical Hole Load	0	343/346	
ZZ39	Typical Hole Load	0	277/280	
ZZ27	Typical Hole Load	0	303/306	
ZZ42	Typical Hole Load	0	403/406	
ZZ78	Typical Hole Load	0	297/300	
ZZ8	Typical Hole Load	0	180/183	
ZZ45	Typical Hole Load	0	251/254	
ZZ53	Typical Hole Load	0	291/294	
ZZ7	Typical Hole Load	0	266/269	
ZZ44	Typical Hole Load	0	231/234	
ZZ1	Typical Hole Load	0	200/203	
ZZ9	Typical Hole Load	0	160/163	
ZZ17	Typical Hole Load	0	120/123	
ZZ41	Typical Hole Load	0	489/492	
ZZ30	Typical Hole Load	0	323/326	
ZZ37	Bad hole with locked booster	0	429/429	0
ZZ48	Typical Hole Load	0	509/512	
ZZ23	Typical Hole Load	0	186/189	
ZZ36	Typical Hole Load	0	429/432	
ZZ29	Typical Hole Load	0	409/412	
ZZ26	Typical Hole Load	0	217/220	
ZZ16	Typical Hole Load	0	140/143	

Hole	Load	Surface Delay	Deck 1 Delay
ZZ12	Typical Hole Load	0	418/42
ZZ4	Typical Hole Load	0	458/46
ZZ40	Typical Hole Load	0	191/19
ZZ21	Typical Hole Load	0	358/36
ZZ3	Decked Hole	0	372/37
ZZ28	Typical Hole Load	0	389/39
ZZ46	Typical Hole Load	0	337/34
ZZ2	Typical Hole Load	0	286/28
ZZ11	Typical Hole Load	0	332/33
ZZ13	Typical Hole Load	0	398/40
ZZ22	Typical Hole Load	0	272/27
ZZ56	Typical Hole Load	0	549/55
ZZ24	Typical Hole Load	0	100/10
ZZ79	Typical Hole Load	0	383/38



0 m

5 m

10 m

15 m