OceanaGold New Zealand Ltd
Fourth Quarter Summary Report 2021
Vibration Levels in Waihi

Contents

Summary

- Results from the Blasthub vibration monitoring system for the fourth quarter 2021 are reported for the Favona, Trio, Correnso, SUPA and Project Martha Underground Mines. The number of stope and development blasting events was reduced in relation to Correnso/SUPA, with development and production blasting continuing in the Martha Underground component of Project Martha. Mining in Favona and Trio has ceased.
- Compliance for Correnso/SUPA development and production blasting, as defined by the consents, was achieved for the average limits and the 95 percentile. Of the 27 blast events, 18 of these triggered compliance monitors (maximum vibration 4.36 mm/s).
- Compliance for Project Martha blasting was not achieved for a period of 50 days during the quarter. More than 1 in 20 consective blasts in the first 100 Project Martha production blasts recorded vibration greater than 5 mm/s, in violation of condition 44 of Project Martha consent 202.2018.857.1. The maximum vibration recorded during the quarter was 7.73 mm/s.
- Mitgating actions and an investigation into the Pensioner Flats monitoring location were initiated as a result. Iinvestigations showed the Pensioner Flats monitor is recording anmolously high vibration results. Compliance would have been achieved throughout the quarter if the Pensioner Flats monitoring results were discounted and replaced with the monitor with the next highest results.
- Compliance was re-achieved on 28 December 2021 when 100 production blasts were completed in the Project Martha area, and the 95 percentile 5 mm/s limit came into effect.
- 22 vibration-related complaints were received during the reporting period, up from the 13 received in the previous quarter. The number of complainants also increased slightly; 16 during the quarter cf. 13 in the previous period.
- The total number of blasts (858) was similar to the previous quarter (833), while the the number of blast events was higher (163, cf. 115 in the previous quarter).

1. Introduction

This report documents vibration measurements and assessments to meet the requirements of:

a) Hauraki District Council (HDC) LUC No. 97/98-105 (Condition 3.11) for the extended Martha Mine Project.
b) HDC Land Use Consent 85.050.326E (Condition 24) for the Favona Underground Mine.
c) HDC Land Use Consent RC - 15774 (Condition 9) for the Trio Underground Mine Project.
d) HDC Land Use Consent RC – 202.2012 (Condition 22 (f)) for the Correnso Underground Mine.
e) HDC Land Use Consent RC – 202.2016 (Condition 14 (f)) for the Slevin Underground Mine (SUPA).
f) HDC Land Use Consent RC – 202.2017 (Condition 18 (f)) for the Martha Drill Drive Project (MDDP), Condition 18 (f) for MDDP has been assumed by Project Martha below (g).
g) HDC Land Use Consent LUC 202.2018.857.1 (Condition 53) for Project Martha.

As agreed between OceanaGold and HDC these reports summarise vibration results and general performance of the monitoring system over calendar quarters rather than the dates set out in the consents.

2. Equipment

“Blasthub”, the vibration monitoring system, has been used for reporting purposes, providing real-time monitoring, recording and review of results on a website. Access to the website is controlled, with permissions for review provided to HDC staff and OceanaGold users. The system is set with trigger levels between 0.40 and 0.75 mm/s for Martha and Underground operations.

The Project Martha vibration monitoring network comprises 13 monitors (some shared with the Correnso network). These all have a trigger limit currently set at 0.75 mm/s. Any blasts fired during the period (highlighted in red) and the monitor locations are shown in Figure 1.

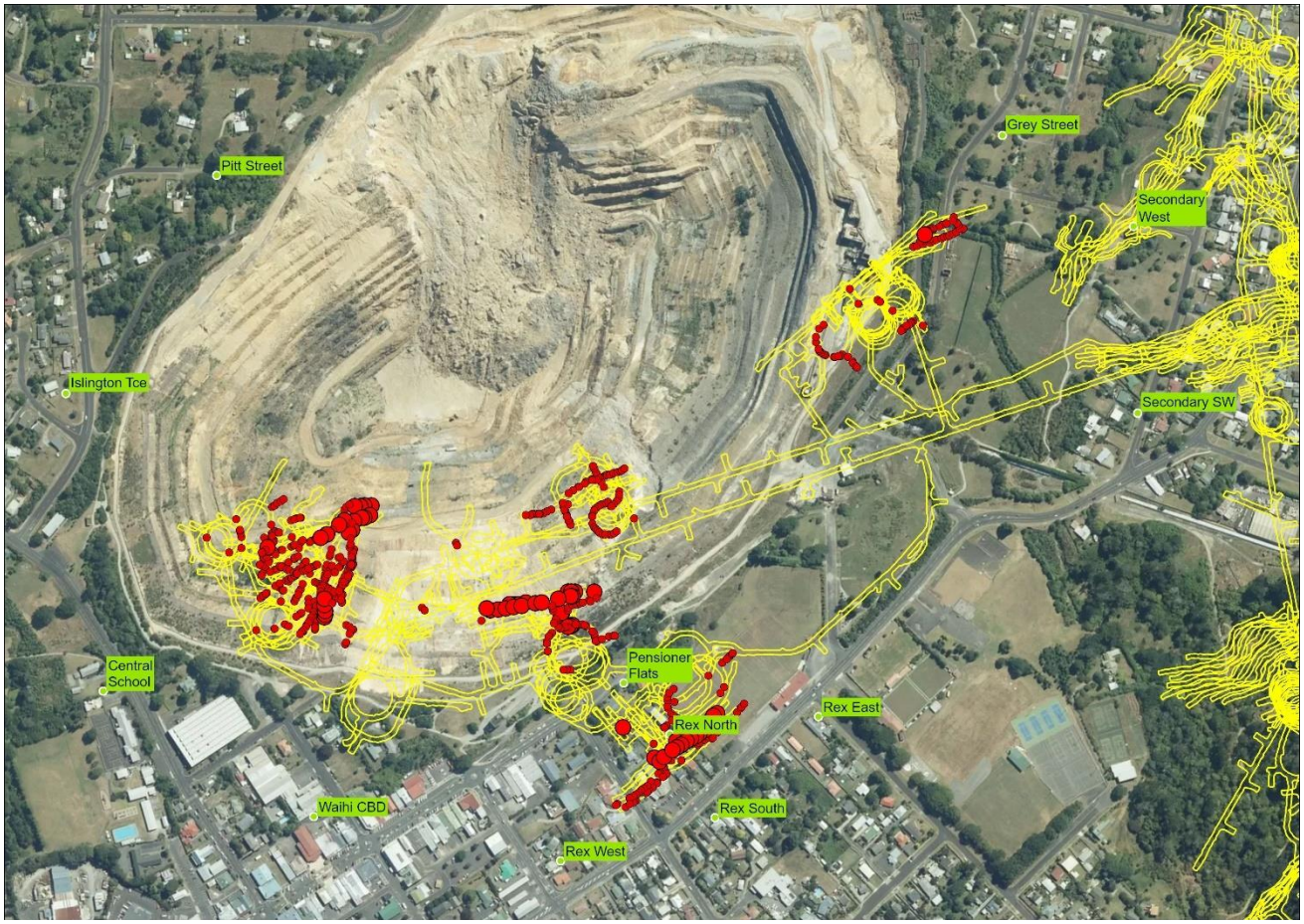

Figure 1. Vibration Monitor & Blast Locations – Project Martha

Note: Larger icons indicate production blasts

The Trio Underground Operations have five compliance monitoring locations situated at Boyd Rd, Moore St, Clarke St, the Coreshed (Barry Rd) and the Scout Hall (Baker St). In addition to these, one other monitoring location is located near the Trio vent shaft (Trio VS). As there is currently no mining being undertaken in the Trio Project area, vibration monitors are not installed at these locations, but the infrastructure remains so monitors can be reinstalled should work in the Trio area recommence. Monitoring locations are shown in Figure 2.

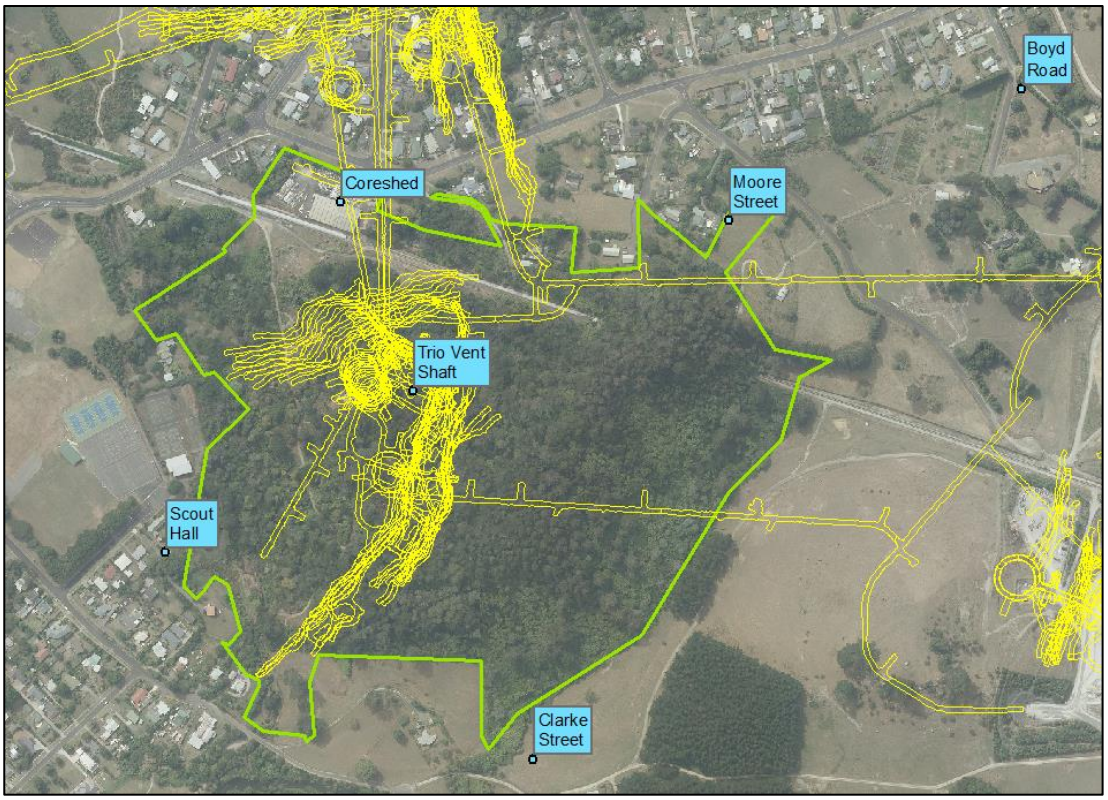

Figure 2. Vibration Monitor Locations – Underground Operations (Trio)

The Correnso Underground monitoring network comprises 10 permanent vibration monitors. These all have a trigger limit currently set at 0.75 mm/s. The blasts fired during the period (highlighted in red) and monitor locations are shown in Figure 3. SUPA utilises the same compliance monitors as Correnso, with the data incorporated into a shared database.

Figure 3. Vibration Monitor & Blast Locations – Correnso, SUPA Operations

Note: Larger icons indicate production blasts

3. Calibration

Calibration of monitoring equipment, including the roving monitors, is completed on a quarterly rotation to allow enough coverage of vibration monitoring while calibrations take place. Due to Covid-19 border restrictions, some calibrations were delayed during 2021. Calibrations were completed throughout quarter four of 2021 to get the network up to date with calibration following the delays. Calibration certificates can be viewed on Blasthub; refer to the monitoring results during those periods. The calibrations were undertaken by the Saros Group Pty Ltd in Queensland and conducted in accordance with AS/NZS ISO9000-2000 and AS ISO/IEC17025-2005 quality standards.

4. Compliance Assessment

4.1 Project Martha

160 blast events occurred in Martha Underground during the reporting period (cf. 106 in the previous quarter) with 113 triggering compliance monitors.

Of the 826 individual blasts during the period:

- 746 were development blasts
- 80 were production blasts

The peak vibration levels for Martha Underground Operations during the quarter are shown in Figure 4 below.

Development:

- The highest six-month average[1] for development blasting at a compliance monitor was assessed as 1.32 mm/s at Pensioner Flats, below the consent limit average of 2mm/s.
- The development six month rolling 95 percentile[1] for all locations was assessed as 2.75 mm/s, below the 5mm/s limit.
- One Martha Underground development blast event with vibration above 5 mm/s was recorded during the period. The blast, on 22 October 2021, caused vibration above 5 mm/s to be recorded at one compliance monitor (5.26 mm/s at Pensioner Flats). 95 percentile vibration levels for development following this high-level blast was 2.67 mm/s and therefore did not cause non-compliance with the 5 mm/s 95 percentile limit.

Production:

- Martha Underground is now in full production.
- The 100th production blast in the Martha Underground was completed during the quarter on 28 December 2021. As less than 100 production blasts occurred in Martha Underground prior to this date, the 95 percentile 5 mm/s limit did not apply (c. 33 of Project Martha consent 202.2018.857.1). Instead, c. 44 of the consent applied (no more than 1 in 20 consecutive production blasts may be greater than 5 mm/s). After this date, the 95 percentile 5 mm/s limit applied.
- Two production blasts recorded vibration levels greater than 5 mm/s in the quarter. These blast events were on the 04 October 2021 and 08 November 2021, recording 5.12 mm/s and 7.73 mm/s respectively, both at the Pensioner Flats monitoring location. As these two high-level blasts were within 20 consecutive blasts, compliance was not achieved with c.44 from the 08 November 2021.
- On 28 December 2021, when the 95 percentile limit came into effect, compliance was again achieved with a 95 percentile value of 4.68 mm/s.

As previously reported, the Pensioner Flats monitoring location has been recording erroneously high results. When erroneous results from the Pensioner Flats monitor are removed from the compliance assessment and replaced with results from the monitor with the next highest vibration levels, no high-level production or development blasts were recorded, meaning compliance would have been achieved for the quarter. For full details of roving monitoring undertaken around the Pensioner Flats monitor during the quarter, see section 7.1 of this report.

No maintenance/safety blasts were required in Martha Underground during the period.

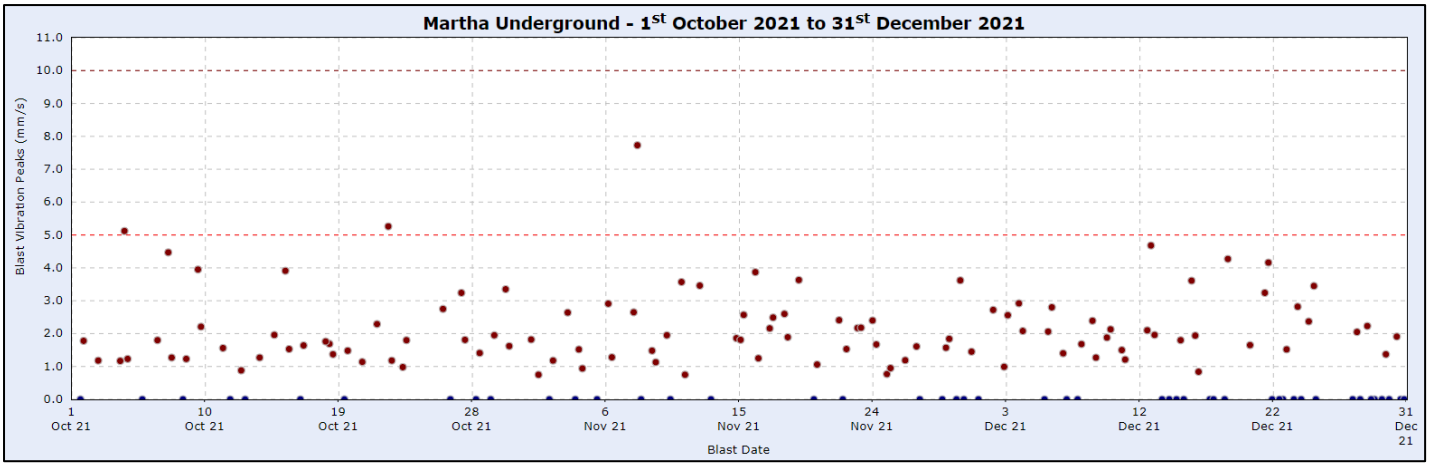

Figure 4. Maximum Peak Vibration Levels – Martha Underground Operations

4.2 Underground (Favona & Trio) Operations

Current mining plans for Trio were exhausted in the first quarter of 2020, and no blasting occurred during the reporting period. Likewise, no blasting was undertaken within Favona.

4.3 Correnso and SUPA

[1] Data is presented as at the end of the quarter

During the reporting period, 27 blast events (cf. 71) in the previous quarter) occurred in the Correnso and SUPA projects. Of the 27 blast events, 16 of these triggered compliance monitors (maximum vibration 4.36 mm/s). The blast locations are presented in Figure 3 above, with the relative locations indicated for development and production blasting. The peak vibration levels for the period are shown in Figure 5 below.

The 27 blast events during the period comprised 32 sub-blasts, with 19 classified as development and 13 production.

Development:

- The highest six-month average[1] for development blasting at a compliance monitor was 0.70mm/s at Main Central and Main South, below the consent limit average of 2mm/s.
- The development six month rolling 95 percentile[1] for all locations was 0.75mm/s, below the 5mm/s limit.

Production:

- No blasts exceeded the 5mm/s level at a compliance monitor during the quarter.
- The highest six-month average[1] for production blasting at a compliance monitor was 2.03mm/s at Main Central, below the consent limit average of 3mm/s.
- The production six month rolling 95 percentile[1] for all locations was 3.95mm/s, below the 5mm/s limit.

No blasts exceeded the blasting duration limits during the period.

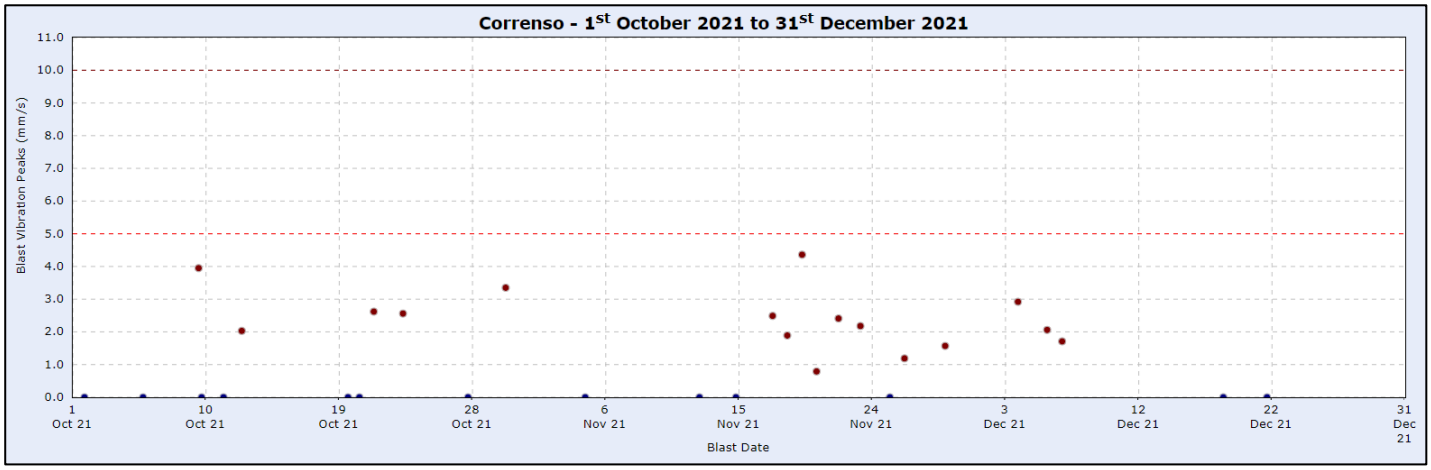

Figure 5. Maximum Peak Vibration Levels – Correnso/SUPA Operations

5. Blasting

The 163 blast events during the period was an increase in events from the previous quarter (Table 1). This reflects Martha Underground operations moving to full production following the development phase.

Table 1: Quarterly blast events

Operation	1st Quarter 2021	2nd Quarter 2021	3rd Quarter 2021	4th Quarter 2021
Martha Underground	163	133	106	160
Underground (Trio)	0	0	0	0
Correnso/SUPA	102 (20 independent)	70 (20 independent)	71 (9 independent)	27 (3 independent)
Total	**183***	**153***	**115***	**163***

**Some blasts occurred simultaneously with blasting in other operational areas and did not contribute to the total number of blast events. Trio and Correnso events only contribute to the total when they are independent of Martha Underground.*

Multiple blasts may be fired during the one blast event. There were 858 sub-blasts initiated within 163 blast events during the reporting period (Figure 6).

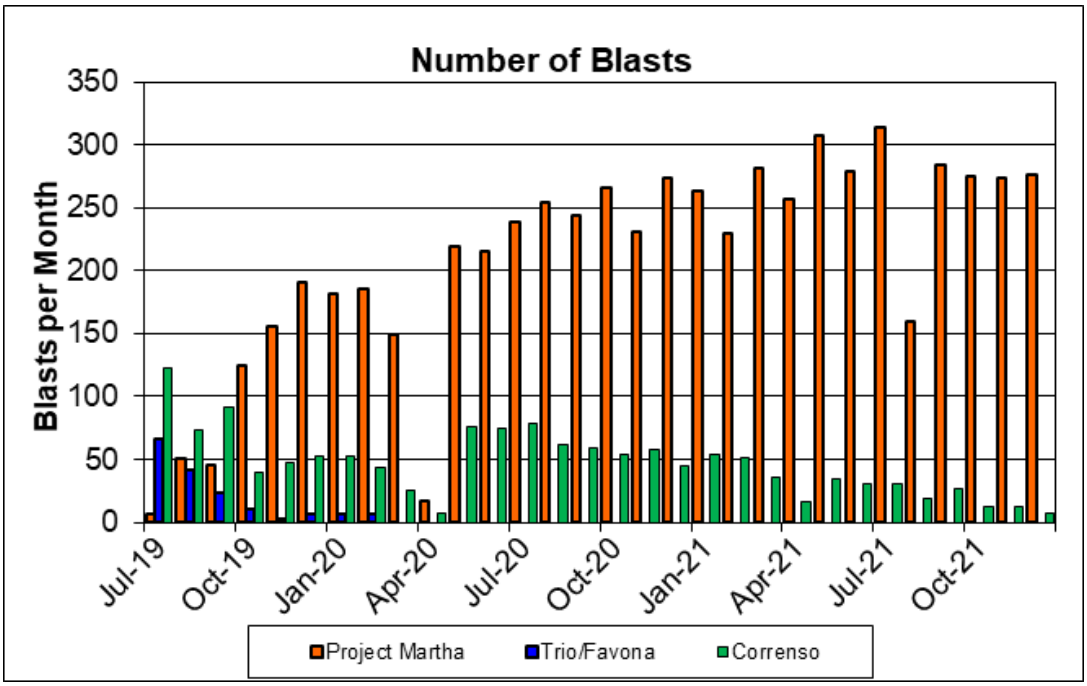

Figure 6. Number of Blasts (all operations)

6. Complaints

22 vibration-related complaints were received during the reporting period, up from the 13 received in the previous quarter (Figures 7 & 8). The number of complainants also slightly increased; 16 during the quarter cf. 13 in the previous period. Table 2 provides a summary of the complaints received during the quarter.

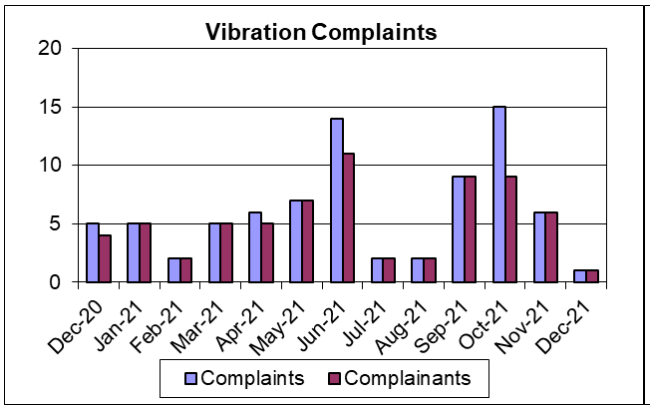

Figure 7. Number of Complaints & Complainants

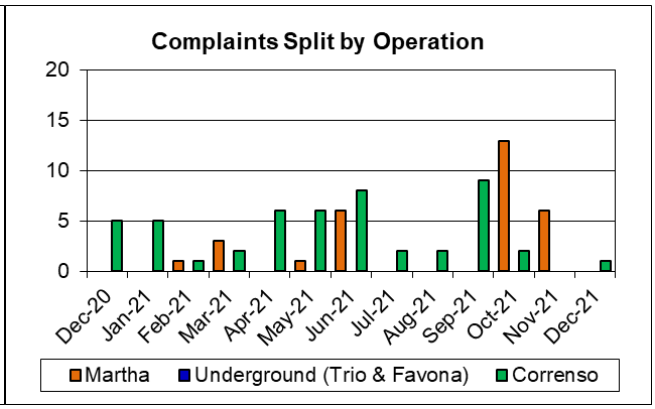

Figure 8. Complaints by Operation

Table 2: Summary of vibration complaints registered by OceanaGold

Date	Location	Nearest Monitor	Reading (mm/s)	Highest Blasthub Reading (mms)	Site
4-Oct-21	Clarke St	Rex East	2.19	5.12	Pensioner Flats
4-Oct-21	Kenny St	Rex South	1.76	5.12	Pensioner Flats
4-Oct-21	Phillips Lane	Rex East	2.19	5.12	Pensioner Flats
4-Oct-21	Johnston St	Rex South	1.76	5.12	Pensioner Flats
4-Oct-21	Union St	Rex East	2.19	5.12	Pensioner Flats
12-Oct-21	Stafford Street	Secondary East	1.82	2.03	Main South
22-Oct-21	Clarke St	Rex East	3.59	5.26	Pensioner Flats
22-Oct-21	Phillips Lane	Rex West	2.32	5.26	Pensioner Flats
22-Oct-21	Clarke St	Rex East	3.59	5.26	Pensioner Flats
22-Oct-21	Phillips Lane	Rex South	2.24	5.26	Pensioner Flats
22-Oct-21	Johnston St	Rex East	3.59	5.26	Pensioner Flats
22-Oct-21	Kenny St	Rex South	2.24	5.26	Pensioner Flats
23-Oct-21	Stafford St	Main South	1.31	2.56	Main Central
30-Oct-21	Phillips Lane	Rex South	1.90	3.35	Pensioner Flats
6-Nov-21	Kenny St	Rex South	1.32	2.91	Pensioner Flats
8-Nov-21	Johnston St	Rex West	2.45	7.74	Pensioner Flats
8-Nov-21	Gilmour St	Rex South	2.7	7.74	Pensioner Flats
19-Nov-21	Phillips Ln	Rex East	3.6	3.60	Rex East
28-Nov-21	Phillips Ln	General complaint			
30-Nov-21	Phillips Ln	Rex East	1.50	3.60	Pensioner Flats
21-Dec-21	Gladstone Rd	Main South	2.00	4.20	Pensioner Flats

7. Vibration and Complaint Management

7.1 Roving Monitoring

Roving monitoring was undertaken at two locations during the period; at Phillips Lane, and near the Pensioner Flats compliance monitoring location.

Roving monitoring at 6 Phillips Lane was undertaken following a resident complaint. A monitor was deployed for an initial period of one week between 13 October and 20 October 2021. Results appear elevated compared to the closest long-term monitoring locations (Figure 9, Table 3).

The roving monitor was installed for an additional week between 02 November and 08 November 2021 at a different location on the property to confirm the elevated results recorded in October were not related to monitor placement. Results from the second week of monitoring undertaken in November are shown in Table 4. Results were again elevated when compared to nearby long-term monitoring locations.

Possible reasons for the elevated roving monitoring results are being investigated by Heilig and Partners and a programme of further monitoring is planned at 6 Phillips Lane and surrounding properties during quarter one of 2022.

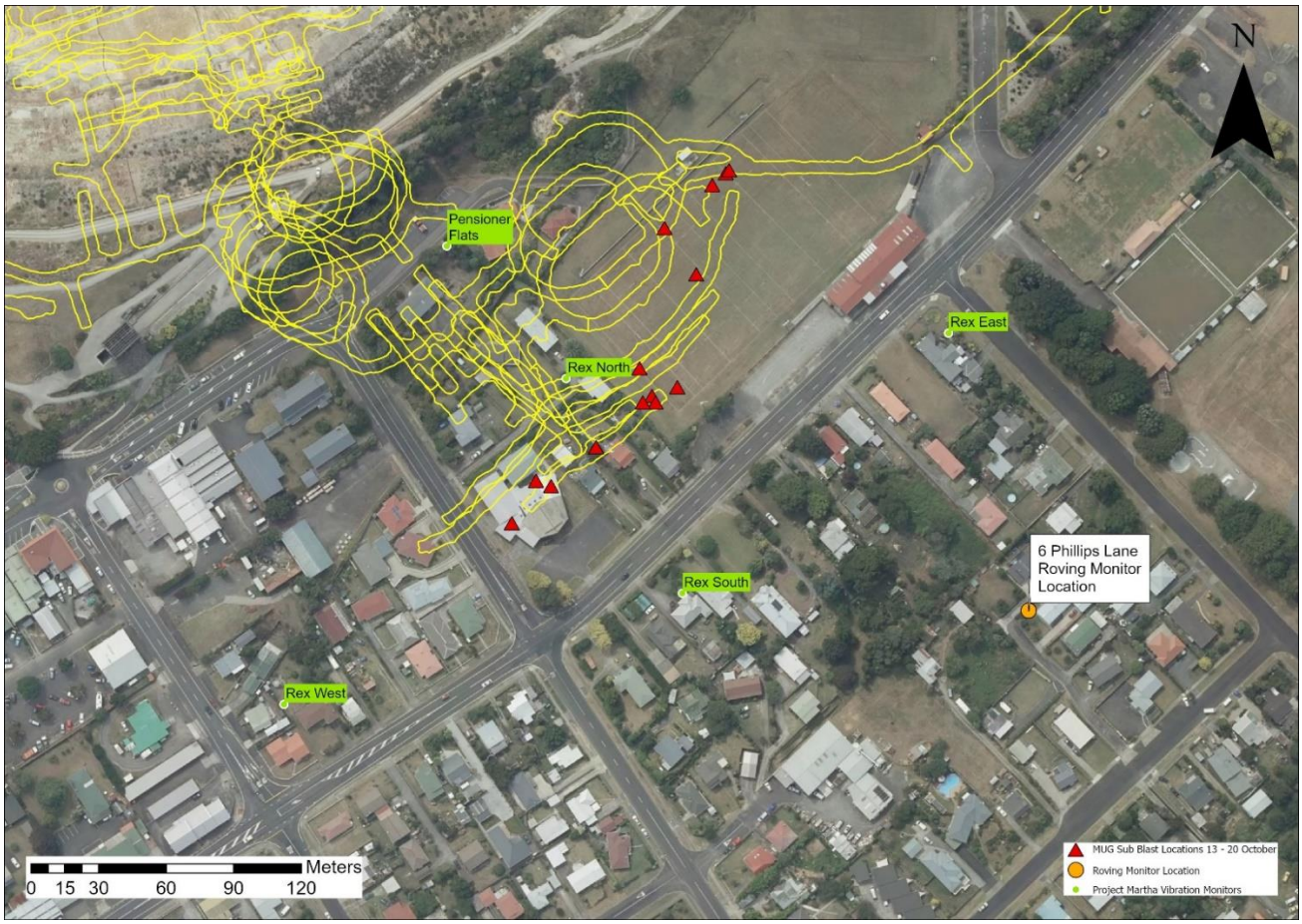

Figure 9. Phillips Lane roving monitor location, long-term monitoring locations, and blasting locations 13-20 October

Table 3: Phillips Lane roving monitor results comparison, 13-20 October 2021

Date	Time	PVS (mm/s)				
		Pensioner Flats	Rex East	Rex North	Rex South	Roving monitor
13/10/2021	19:05:42	1.27	0.86	0.84	NR	1.64
14/10/2021	19:08:19	1.62	0.98	0.91	1.96	2.95
15/10/2021	13:19:31	3.92	1.62	1.40	1.69	6.02
15/10/2021	19:21:11	1.53	0.97	1.00	-	2.14
16/10/2021	19:04:51	1.64	1.09	0.94	1.36	2.58
18/10/2021	07:07:11	1.75	1.43	0.93	1.42	2.99
19/10/2021	19:16:59	1.48	1.16	0.92	-	2.21

Table 4: Phillips Lane roving monitor results comparison, 02-08 November 2021

Date	Time	PVS (mm/s)				
		Pensioner Flats	Rex East	Rex North	Rex South	Roving Monitor
2/11/2021	19:11:58	1.17	-	-	1.02	1.26
3/11/2021	19:05:58	2.64	0.84	-	-	1.71
4/11/2021	13:20:28	-	-	-	-	0.51
4/11/2021	19:04:28	0.84	0.85	-	-	1.86
6/11/2021	13:31:13	1.26	-	0.94	1.32	5.70
6/11/2021	19:24:43	1.26	-	-	1.28	1.53
8/11/2021	07:04:13	2.65	0.89	1.03	1.58	1.84
8/11/2021	13:05:28	7.74	2.53	2.00	-	10.74

Roving monitoring was also undertaken near the Pensioner Flats compliance monitoring location during the quarter in response to continued elevated results being recorded at the Pensioner Flats monitor when compared to nearby monitors.

On the advice of Heilig & Partners, three roving monitors were deployed around the Pensioner Flats monitor for a period of one week. Results indicate that results vary significantly between the roving and long-term monitoring locations. (Figure 10, Table 5). Based on an analysis of the results, the elevated results are likely as a result of anomalous geology, close to the vibration source (i.e. blasting location). Heilig & Partner's analyses of roving monitoring results are attached as Appendix 1. Further roving monitoring to collect waveform data is planned for quarter one of 2022.

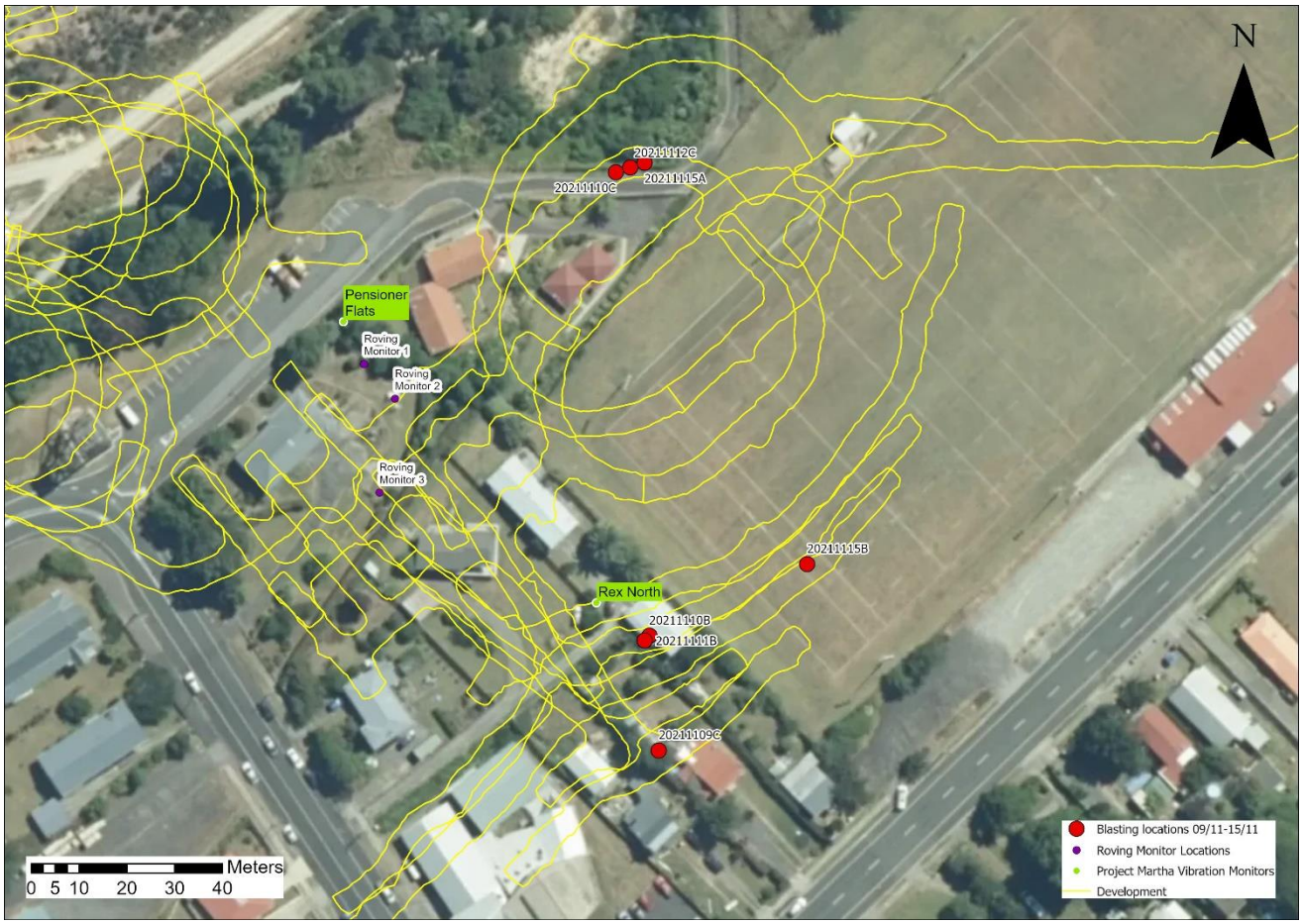

Figure 10. Pensioner Flats roving monitor locations, long-term monitoring locations and blast locations, 09-15 November 2021

Table 5. Pensioner Flats roving monitor results comparison, 09-15 November 2021

Date/Time	Pensioner Flats		Roving 1		Roving 2		Roving 3	
	PVS (mm/s)	Distance from blast (m)	PVS (mm/s)	Distance from blast (m)	PVS (mm/s)	Distance from blast (m)	PVS (mm/s)	Distance from blast (m)
09/11/2021 19:10	0.93	204	0.74	200	1.09	194	0.94	188
10/11/2021 13:23	1.95	228	1.5	224	2.56	219	2.08	216
10/11/2021 19:04	2.36	214	1.7	209	3.81	207	1.92	213
11/11/2021 13:17	3.57	228	2.27	224	4.55	219	3.20	215
12/11/2021 19:09	3.46	215	1.45	210	3.07	208	2.25	214
15/11/2021 07:09	1.08	216	0.6	211	1	2019	1.06	215
15/11/2021 13:53	1.81	232	1.12	226	1.43	220	1.1	219

7.2 Mitigation Actions

Mitigating actions were required in relation to the three high level blasts recorded at the Pensioner Flats monitor during the quarter. These mitigation actions included:

- Lowering blast charge weights to reduce the likelihood of further high level blasts
- Using blast hole liners to reduce the effects of poor ground on vibration propagation.