



Dewatering and Settlement Monitoring Report 2017

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DEWATERING & SETTLEMENT MONITORING REPORT 2017

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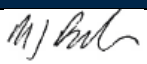

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EXECUTIVE SUMMARY

This Annual Dewatering and Settlement Monitoring Report is a requirement of the consent conditions for the Martha, Favona, Trio, Correnso and SUPA mining projects, Waihi, New Zealand. Compliance monitoring and assessment of groundwater and settlement trends is reported for the period 1 January to 31 December 2017 and is in accordance with the current Dewatering and Settlement Monitoring Plan submitted to Waikato Regional Council 16 November 2016.

On 16 July 2017, the Martha groundwater take permit 971286 was replaced by the Correnso groundwater take permit 124860. This allows dewatering to a lower level (700mRL cf. 755mRL).

Settlement survey results indicated that 83% (332/399) of marks graphed were within the predicted settlement ranges, based on the predicted settlement resulting from mining activities. 67 marks triggered further investigation. The majority of mining related settlements were above the Favona mining area where 33 marks exceeded settlement predictions. 6 Martha settlement markers are deemed affected by Favona mining activities. 3 marks near the OceanaGold Waihi Processing Plant may have also been influenced by Favona mining activities. 2 marks in the Martha Hazard Zone were also triggered. The 23 other triggers were considered most likely due to either marginal zone positioning or marker disturbance.

Martha

Dewatering from the Martha Pit was discontinued on 04 May 2015 after a slip in the pit when access and power supply to the dewatering pumps became limited. Dewatering from within the Correnso area was initiated on 18 May 2015. The Martha, Trio, Correnso and SUPA groundwater systems are hydraulically linked and water levels are controlled by Correnso underground dewatering.

No drawdown effects caused by mine dewatering were indicated in monitoring bores and no tilt trends have developed during 2017 that can be attributed to dewatering operations.

In September 2015, some localised settlement occurred within the hazard zone in Slevin Park. It was initially suspected to be from historic mining. Hauraki District Council (HDC) instigated intensive settlement surveys and the event has not been attributed to current mining. One mark continued to exceed tilt criteria in this settlement area.

In August 2017, a 20m deep sink hole was discovered on HDC land in a planted area near Seddon St on the south side of Martha pit. This was believed to be caused by localised collapse into underlying unfilled historic workings. Nearby settlement markers did not show any changes. The hole was backfilled by HDC with assistance from OceanaGold.

The analysis of data has indicated that most settlement had developed by the mid to late 1990's but widespread small settlement has been ongoing and is likely to be related to dewatering of deeper structures within the Andesite rock mass. Groundwater monitoring data does not show any widespread or significant dewatering of alluvium or the upper portions of the younger volcanic materials, or dewatering of the upper layers of the Andesite rock body which could lead to a greater amount of settlement.

No property damage complaints attributable to mine dewatering or settlement in response to mine dewatering were reported during 2017. Compliance was achieved with the consent conditions granted for the Martha Extended Project.

Favona

At Favona mine, piezometer levels indicate continued dewatering of the vein system, with the water level maintained at approximately 800 mRL mine datum by the end of 2017. Water levels in the country rock surrounding the vein system stand higher and are either not responding or responding slowly to dewatering.

33 marks exceeded settlement prediction, the same quantity as 2015 and 2016.

A settlement trend exists over a 150m wide area above the underground workings with a maximum total settlement of 253 mm (F18), of which up to 204 mm can be attributed to Favona mining activity. This is greater than the 80mm predicted by URS (2002 Technical Report) to be due to dewatering but settlement is attributed to a combination of depressurisation stress (primary consolidation) associated with drawdown in the Andesite rock and relaxation of the country rock as mining proceeded. Primary consolidation (the first time a mine is dewatered) is greater than a second cycle (subsequent dewatering activities). The Favona mine is outside of the Martha groundwater system; the Martha system was historically dewatered for a longer period and to greater depth and is currently undergoing a second period of dewatering.

Three tilt gradients attributable to Favona mining activity were steeper than 1:1000; these are on farmland owned by the company and south of the residential area along Barry Road.

Compliance with the conditions of the Favona consents and Monitoring Plan was achieved.

Trio

Water levels were controlled by Correnso dewatering.

Correnso

The Correnso underground mine was granted consent and operations began on 20 December 2013. New settlement trigger levels were applied in 2017. At the end of 2017 the water level was at approximately 765mRL.

Waikato Regional Council consents were granted allowing groundwater to be lowered beyond what has been experienced during the mining of Trio. The Correnso water take permit was activated in July 2017, allowing dewatering to lower the groundwater down to 700mRL (124860, Schedule One – General Conditions, Condition 1).

No settlement mark in the CEPA mining licence displayed excessive settlement and no consent related groundwater trigger was met. Compliance was achieved with the consent conditions granted for the Correnso Project.

SUPA

The Slevin Underground Project Area is essentially an extension of the Correnso mining area. No new Waikato Regional Council consents were required for the activity which is covered by the existing WRC consent conditions. The HDC dewatering and settlement related conditions are similar to those for Correnso. No new monitoring or reporting is required as the existing networks adequately encompass SUPA. Mining within the SUPA area began January 16, 2017.

MDDP

The Martha Drill Drives Project (MDDP) was granted consent on August 9, 2017. The project involves the construction of two underground drill drives from the SUPA area towards Martha Pit. No specific HDC conditions relate to dewatering and settlement, rather it is covered by the existing WRC Correnso consent conditions. No new monitoring or reporting is required as the existing networks adequately encompass MDDP. Mining in the MDDP began August 17, 2017.

1 INTRODUCTION

The following sets out reporting requirements for Dewatering and Settlement related to gold mining activities in and around Waihi; as set out in various consents held by OceanaGold New Zealand Limited (OGNZL).

1.1 Martha

In 1999 the Waikato Regional Council (WRC) granted consent (No. 971286) to take groundwater to dewater the Extended Martha Mine pit and surrounding areas at a rate of up to 15,000m³/day of surface water and groundwater, with the average annual daily extraction rate not to exceed 10,000 m³/day (Condition 2). This consent condition was superseded by the subsequent water permit for Trio Underground Mine which allows OGNZL to take water as required to achieve the dewatering of the Trio Mine (refer to Section 1.3).

Condition 13 of the consent requires that the consent holder provides an annual dewatering and settlement monitoring report to the WRC and the Hauraki District Council (HDC). The report is to include at least the following information:

- The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network.
- Identification of any environmentally important trends in settlement and dewatering behaviour.
- Interpretation and analysis of any change in ground water profile over the previous year, any contingency actions that may have been taken during the year, predictions of future impacts on other bore users that may arise as a result of any trends that have been identified, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.
- A comparison of the settlement survey data with that predicted by Dr Semple of Woodward-Clyde (NZ) Ltd as provided in evidence to the joint hearing committee.
- Comment on compliance with all conditions of this consent.
- A summary and analysis of complaints relevant to this consent from the complaint log (refer Schedule 1).
- Any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.
- Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the forthcoming year to improve environmental performance in relation to activities permitted by this consent.
- The report is to be forwarded in a format acceptable to the WRC.

Condition 3.30h (Settlement) of the Hauraki District Council Land Use Consent and Condition 11h (Dewatering) of the Ministry of Economic Development (previously the Ministry of Energy) Mining Licence 32-2388 is complimentary to the WRC consent for the Martha Mine with reports required to be submitted to each authority.

In the preparation of this report reference is made to the various conditions of the consents and licence and to the Dewatering and Settlement Monitoring Plan (also a consent requirement). The full consent conditions are provided in Appendix A.

1.2 Favona

In 2004, consents were granted by the WRC for the Favona Underground Mine to;

- take groundwater and mine water for dewatering the underground mine (consent 109742).
- divert and discharge ground and surface water (farm run-off and intercepted groundwater) from around the project area (consent 109743).
- discharge waste rock and ore onto land in temporary surface stockpiles and to discharge seepage from the temporary stockpiles into ground (consent 109744).
- discharge waste rock into land underground in the project area as backfill and to allow degraded quality groundwater to discharge from the flooded workings in the project area into the surrounding ground post closure (consent 109745).
- discharge treated mine water from the Martha Mine Water Treatment Plant to ground in association with flooding the underground mine on completion of the project (consent 109746).

Schedule Two of these consents contain general conditions for reporting to the WRC (with a copy provided to the HDC) of Settlement, Dewatering and Water Quality Monitoring at least the following information:

- the volume of groundwater abstracted,
- the data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network,
- an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information,
- any contingency actions that may have been taken during the year, and
- comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.
- The report is to be forwarded in a format acceptable to the Council(s).

The Environment Court also granted in 2004 a Consent Order for the HDC Land Use Consent with Condition 39 requiring provision of a Settlement and Dewatering Monitoring Report. An additional reference is made to (e) above in that comment is required on compliance with Conditions 33-38 (related to the Settlement and Dewatering Monitoring Plan).

The Favona Mining Permit does not have any specific reporting requirement for Settlement and Dewatering.

1.3 Trio Underground Mine

A Land Use Consent for the Trio Underground Development project was granted by the HDC on 15 September 2010. Pre-commencement actions were confirmed completed by the HDC on 20 September in order to exercise the consent.

On 03 December 2010, consents were granted by WRC for the Trio Underground Mine Project. These consents relate to;

- Place waste rock (overburden) underground into land as backfill (consent 121694).
- Take 15,000 cubic meters of water per day from the Ohinemuri River – associated with flooding of underground workings at closure (consent 121695).
- Discharge untreated and treated water into ground for the purpose of flooding underground workings following closure (consent 121696).

- Undertake dewatering of the underground workings (consent 121446). The quantity of water to be extracted is not specified; the consent is more effects-based by allowing water to be taken as required to achieve the dewatering of the Trio project. This consent is a continuation of the Trio Development Project and any associated authorised mine, issued 24 September 2010.

Schedule One of these consents contains general conditions for providing to the WRC (with a copy provided to the HDC) a report detailing at least the following information:

- the volume of groundwater abstracted,
- the data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network,
- an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information,
- any contingency actions that may have been taken during the year, and
- comment on compliance with condition 5 of the schedule (which details the Monitoring Plan) including any reasons for non-compliance or difficulties in achieving conformance with the conditions of the consents.
- The report is to be forwarded in a format acceptable to the Council(s).

Notification of excise of the consents was provided to WRC on 24 September 2010.

1.4 Correnso Underground Mine

A Land Use Consent 202.2012 for the Correnso Underground Mine was granted by the HDC on 20 December 2013. Commencement of the consent by OGNZL began on December 20 2013 when the first blast in the CEPA mining licence area occurred. Consent conditions stipulated that:

- 35 The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
- a) The volume of groundwater abstracted;
 - b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
 - c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
 - d) Any contingency actions that may have been taken during the year; and
 - e) Comment on compliance with Conditions 27 to 34 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Advice note:



The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.

Additionally, Conditions Condition 6-8 of the WRC Resource Consent 124860 states the following regarding the Settlement, Dewatering and Water Quality Monitoring Report as it relates to the Golden Link Project Area L:

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
 - (i) The volume of groundwater abstracted;
 - (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
 - (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
 - (iv) Any contingency actions that may have been taken during the year; and
 - (v) Comment on compliance with condition 5 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Councils.

Monitoring - Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to condition 5 of this consent, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils to:
 - (i) explain the cause of the non-conformance,
 - (ii) Propose appropriate settlement contingency measures for discussion with Councils and agree with the Councils on the appropriate settlement contingency measures and the timing for their implementation as described,
 - (iii) implement agreed settlement contingency measures as appropriate within the agreed time limit,
 - (iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Monitoring – Water Quality

8. The consent holder shall monitor throughout the period of operation, the chemistry of the groundwater, pit run-off and pit discharge water abstracted from the open pit. The monitoring data is to be used to correlate these inflows with pit lake water quality predictions, and to provide a database for input into the closure plans. The sampling parameters and frequencies shall be described in the Martha Extended Project dewatering consent (unless agreed otherwise with the Waikato Regional Council) with the results forwarded to the Waikato Regional Council on an annual basis.

1.5 Slevin Underground Mine

A Land Use Consent 202.2016 for the Slevin Underground Mine was granted by the HDC on 21 October 2016. Commencement of the consent by OGNZL began on January 16 2017 when the first blast in the SUPA mining licence area occurred. Consent conditions stipulated that:

Monitoring - Tilt

26 In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 22 of this consent, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Hauraki District and Waikato Regional Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

- a) Explain the cause of the non-conformance;
- b) Propose appropriate settlement contingency measures to the Councils and the timing of implementation thereof by the consent holder;
- c) Implement settlement contingency measures as appropriate within the agreed time limit;
- d) Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

27 The consent holder shall as a matter of urgency, advise the Council of any significant anomalies identified by the regular (monthly) reading of groundwater levels in the piezometer network. Such advice is to include an explanation of the anomalous results and actions proposed to address any issues identified. This report is to be provided to the Council within 10 working days of the anomalous results being identified.

A "significant anomaly" is defined as 15m or more offset occurring in piezometer recordings over a 1 month period.

Dewatering and Settlement Monitoring Report

29 The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

- a) The volume of groundwater abstracted;
- b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
- c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
- d) Any contingency actions that may have been taken during the year; and
- e) Comment on compliance with Conditions 21 to 28 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Advice note:

The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the



Waikato Regional Council and may be prepared in conjunction with similar reports prepared in accordance with the consent conditions applying to the Martha, Favona, Trio and CEPPA projects.

2 GEOLOGICAL SETTING

The mineralised vein deposits of the Martha, Favona, Trio and Correnso zones are hosted by altered andesitic lava flows, breccias and tuffs (Figure 1a). The host andesites of Miocene age extend to depths greater than 600m and are extensively modified in places by weathering and hydrothermal alteration. Paleo-weathering and hydrothermal alteration have created an extensive low-permeability clay cap within the upper part of the andesite sequence. This cap generally separates the andesites, hydrogeologically, from a younger overlying sequence of rhyolitic ignimbrite flows and alluvial boulder beds, and prevents the younger volcanic deposits from being fully dewatered. Exposure of the altered andesite in the southern wall of the Martha Pit indicates that the weathered clay cap may extend up to 30 metres in thickness. Dewatering of the Andesites is considered to contribute little to the development of settlement around the mine site due to the stiffness of these rocks.

Groundwater levels in the andesite are controlled in the vicinity of the Martha pit by old underground mine workings and shafts as well as the structural controls of faults and veins in the area. The old mine workings extend mainly in a SW-NE orientation following the Martha lode (see Figure 1b). The historical mine workings act as effective conduits allowing groundwater inflow of water from an area surrounding the current mine pit. Investigation drilling at Union Hill has identified similar water levels in permeable vein systems to those in the historic workings, with water levels at higher elevations in less permeable ground. This pattern of groundwater depressurisation is consistent through the older Andesites in the vicinity of Martha Mine (Figure 1c).

Davies (2002) defined district-scale northeast trending grabens based on general stratigraphic patterns and fault data. The western margin of one of these, informally referred to as the Waihi Graben, hosts the Martha-Favona epithermal system. This system has developed on the graben boundary faults dominated by the Waihi and Martha faults. A mantle of younger ignimbrite cover means that the actual dimensions of the Waihi Graben remain unknown (Davies, 2004).

Principal veins and faults at both Martha and Favona dip to the south-east while the recently discovered Correnso vein that strikes north-north-west with an easterly dip connects the Martha and Union systems. Subsidiary splay veins dip back to the north-west and west, defining a mine-scale horst-graben geometry in which veins coincide with the graben margins. Union and Amaranth veins are located on a paleotopographic high, informally referred to as the Union Horst that separates the Martha graben from the smaller-scale Favona-Moonlight graben. Davies identified north-trending veins and faults such as Trio, which links the Union and Amaranth veins, as structural fault relays. At district scale, the north-trending Favona fault-vein system may represent a structural relay between northeast-trending boundary faults of the Waihi graben. Relays represent domains of strain transfer between fault segments (e.g. between the Union and Amaranth faults) that may or may not be physically linked. These relay systems are important from a mineralization point of view as they represent areas that were foci for hydrothermal fluid flow. From a hydrogeological perspective today these areas may store significant quantities of groundwater. During underground mining at Favona dewatering rates increase for a time when access drives cut across the fault-fracture zones which drain more freely than the country rock.

The upstanding Union Horst block probably acts as a barrier between the more structurally permeable areas of the Martha Graben and Favona-Moonlight fault system. The hydrogeological connectivity of the Martha Graben faults, facilitated by the connecting Correnso structure, is demonstrated by the rise and fall of water levels in the Union Hill shaft in unison with the rise and fall of water levels in the Martha pit. The connectivity of the Martha system with the Favona fault system, however, is very weak as shown by the lack of response in measured water levels. The zone of separation of the two groundwater systems is not well defined, but may be due to a fault boundary, either the No 9 fault or the Favona footwall fault (Figure 1d), both of which are north to northeast trending and have been observed in drilling to extend over one kilometre in strike. The Favona footwall fault is observed as a broken quartz gouge zone encountered 30 m west of the main vein



system at Favona, where it occasionally has strong inflows of water (P. Keall, pers comm.) and the No 9 fault is located further again to the west. However, some aquitards and associated pressurisation are also present in some sections of the underground workings.

Under the Waihi East residential area the Union Horst may be more responsive to the Martha groundwater system as indicated by water level increases in wells in conjunction with a rise in pit water levels in 2007. This is discussed in Section 6. Nevertheless, some early Favona dewatering effect is evident in monitoring data. Faults associated with the Martha and Favona vein systems may intersect in the Waihi East area although their potential connectivity is not well understood, due to a lack of drilling data.

The andesites are overlain by a series of younger rhyolitic volcanics, which are highly variable in thickness and composition. These deposits draped an eroded graben-horst landscape. The younger volcanics consist of rhyolitic tephra and ignimbrites in the form of flows, breccias and tuffs. Paleosols (buried soils) and sedimentary deposits such as alluvium and boulder alluvium mark the top of successive eruption sequences. The ignimbrite deposits underlie much of Waihi township and outcrop to the east and south of the mine pit.

Groundwater inflow is predominantly controlled by infiltration from overlying layers and through outcrops of welded ignimbrite in the beds of streams and at the ground surface. The rhyolitic sequence is considered to be compressible in parts and to give rise to much of the dewatering induced settlement around the mine site. This is indicated by settlement magnitude generally corresponding to the thickness of and the magnitude of dewatering in these materials.

The uppermost layer of alluvium is discontinuous beneath Waihi township (Figure 1a) and is located in areas where old streams and river channels are cut into the top of the ignimbrites, rhyolitic tephra and Andesite. Alluvial deposits are extensive east of Waihi where they are associated with the drainage systems of the Ohinemuri River catchment. Groundwater in the alluvial formation (and the upper weathered contact of the Younger Volcanics) is monitored to depths of less than 10m.

Figure 1 - Summary of Geology - Maps 1(a)-(d)

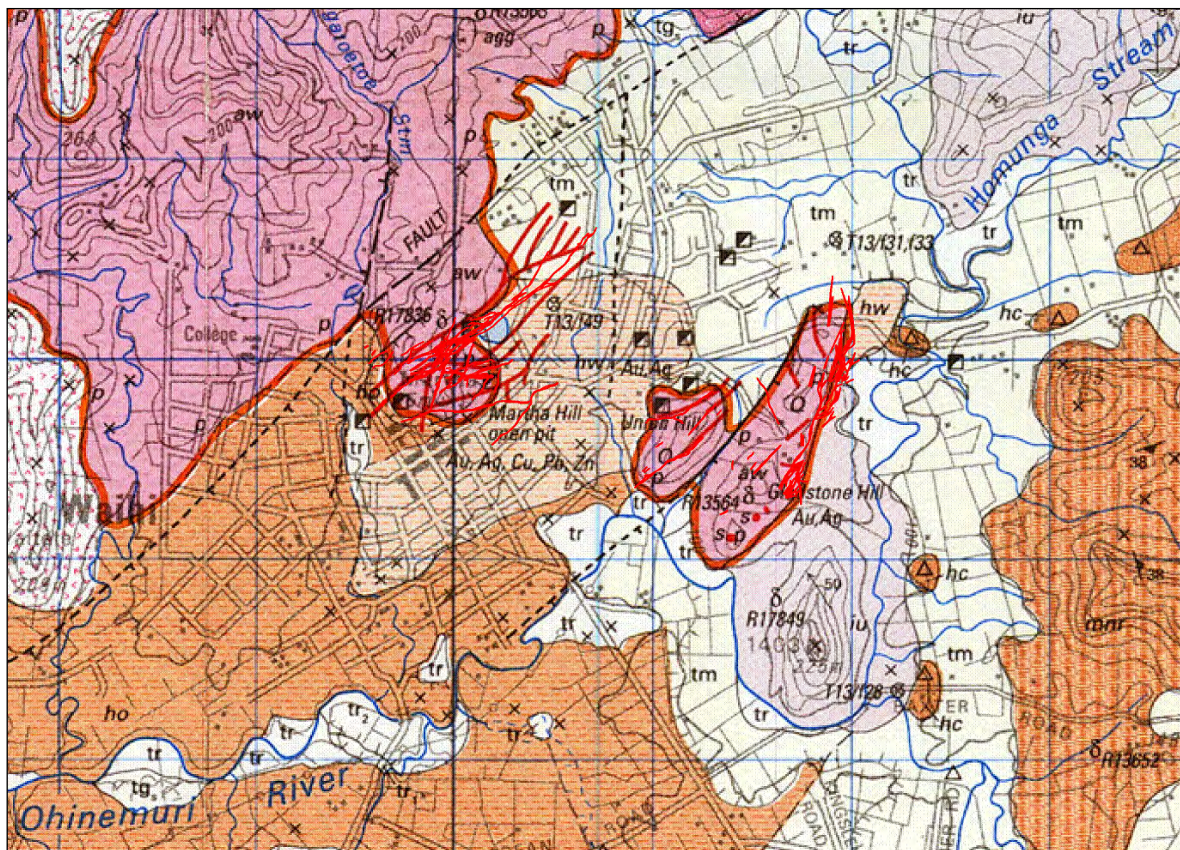


Figure 1(a) Geology Map of Waihi showing distribution of Andesite (aw), Younger Volcanics (ho & hw) and alluvium (tm & tr). The Martha and Favona vein systems (Gladstone Hill area) are defined as fine red lines (derived by exploration and mining surveys).

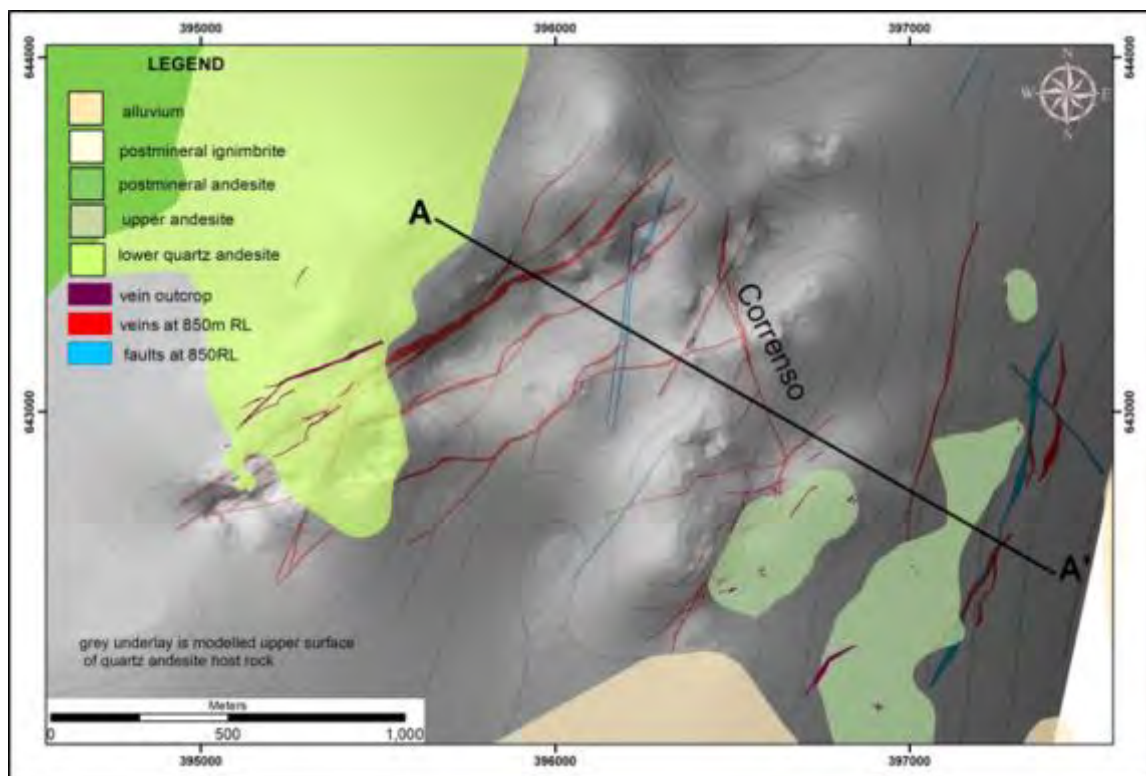


Figure 1(b) Veins and faults from around Martha & Favona mines, showing projected Correnso (J Hobbins, OGNZL Exploration Dept.).

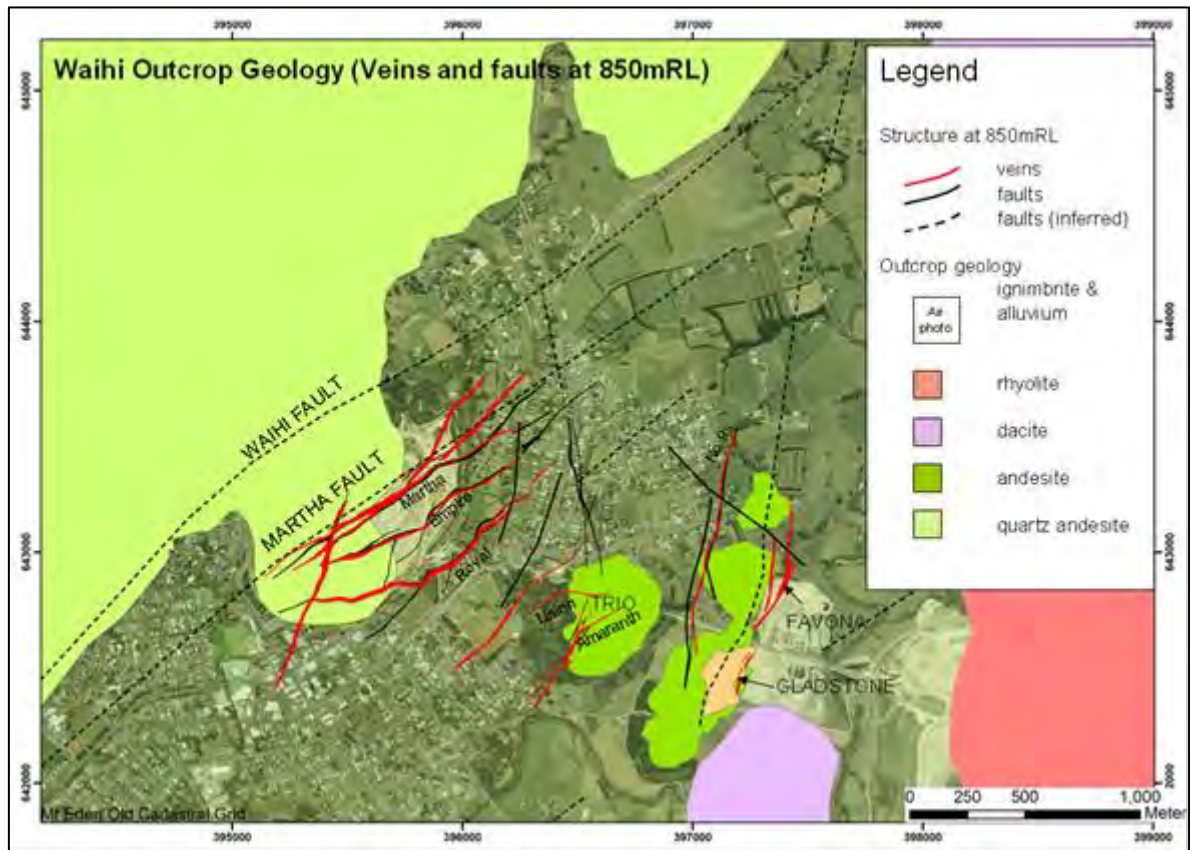


Figure 1(c) Faults and geology at 850 m RL showing main structural elements

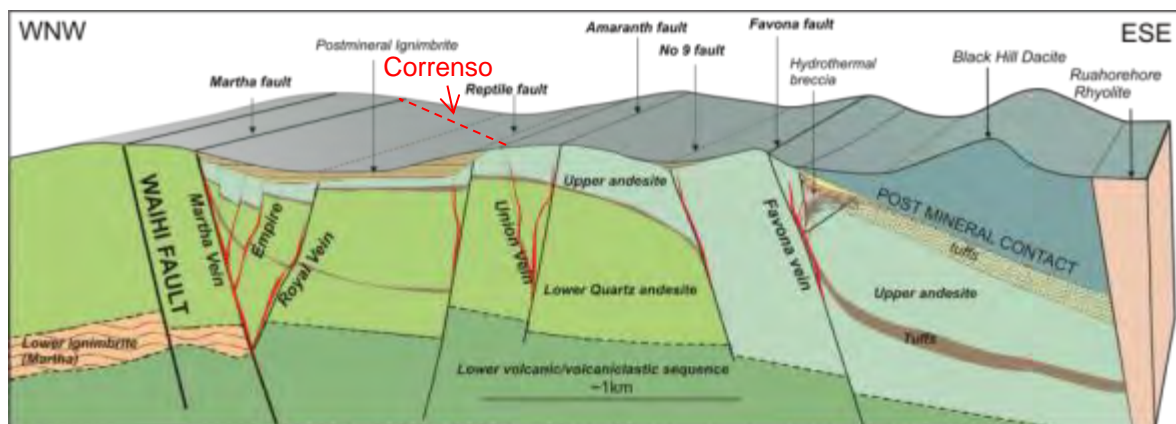


Figure 1(d) Schematic cross section illustrating key elements of fault structures in the Waihi area, including projected surface trace of Correnso.

3 MINING ACTIVITIES

The main features of the mining activities during 2017 (in relation to dewatering and settlement) were:

3.1 Martha

After the Red Zone failure in April 2016, areas around the failure became unstable due to over steeping. It became apparent a large block (~240,000bcm) to the east of the failure had started to creep, so prompt stabilization works needed to be undertaken.

Excavations commenced in December 2016 with noise and visual bunds constructed from a topsoil stock pile. 11,000bcm of material was used to prepare the site for the 'North Wall Interim Remediation Cut'. Stabilization work began in January 2017 and finished in August 2017. During that time a total of 250,000bcm was unloaded from the top of the north wall with:

- 100,000bcm transported to the development site via the conveyor
- 100,000bcm placed on the Run-of-Mine (ROM)
- 50,000bcm side-casted into the pit.

The image below shows the unloaded material (in red) with the majority of excavations occurring in the east. In this area 31000bcm (13%) of the 'Eastern Block' was unloaded leaving a bench level of 1108mRL. In the west the final bench position was 1137.5mRL to stabilize the over-steepened faces. 1147mRL sloping down to 1139mRL were the final bench positions through the central areas.



Figure 2: Martha Mine showing areas mined 2017 (Red).

3.2 Underground

3.2.1 Development

2017 saw the continued development of the Correnso, Daybreak, Empire and Correnso Deeps projects. Throughout 2017 there has been 6,252m of both capital and operating development advancement, with the breakdown as follows:

- 1,938m of Capital development over multiple headings, 1,669m of Capital decline development in Correnso Deeps and Empire in conjunction with Daybreak level access and the 920 exploration drive.
- 2,645m of Operating level development located in Correnso, Daybreak and Empire.

3.2.2 Stopes

2017 saw approximately 456,360 tonnes of waste being backfilled into Correnso and Daybreak stopes. Fill material split was 304,080 tonnes development waste and 152,280 tonnes brought down from surface. Ore for the year came mainly from the Correnso and Daybreak Stopping and Empire development. Total ore extracted for 2017 was 481,040t. The breakdown of the total ore is as follows:

- 346,120t extracted from Stopes from Correnso and Daybreak.
- 134,920 development ore tonnage, extracted from the operating level development located mainly in the Daybreak and Empire mine areas.
- Stopping for 2018 will be heavily focused on Daybreak and Empire, with new stopping fronts in Empire coming online at the beginning of the year. Correnso Main is scheduled to be finished stopping by April 2018.

3.2.3 Waste rock management

Waste rock is managed in two ways: 1) underground stockpiling and backfilling into stopes and 2) placement on temporary stockpiles on the surface.

On the surface, a short-term stockpile is maintained immediately behind the mill area, enabling easy access for backloading. Larger or longer term volumes may be stored at the Favona 'Polishing Pond' Stockpile (near the water treatment plant polishing pond). Waste rock placement at this stockpile started in early February 2007 and the site has also been utilised for interim placement of Martha ore. Before undertaking stockpile construction the Favona Underground Mine Settlement, Dewatering and Water Quality Monitoring Plan was prepared, and approved by Waikato Regional Council (WRC). A separate Favona Water Quality Monitoring Report is prepared mid-year and submitted to WRC.

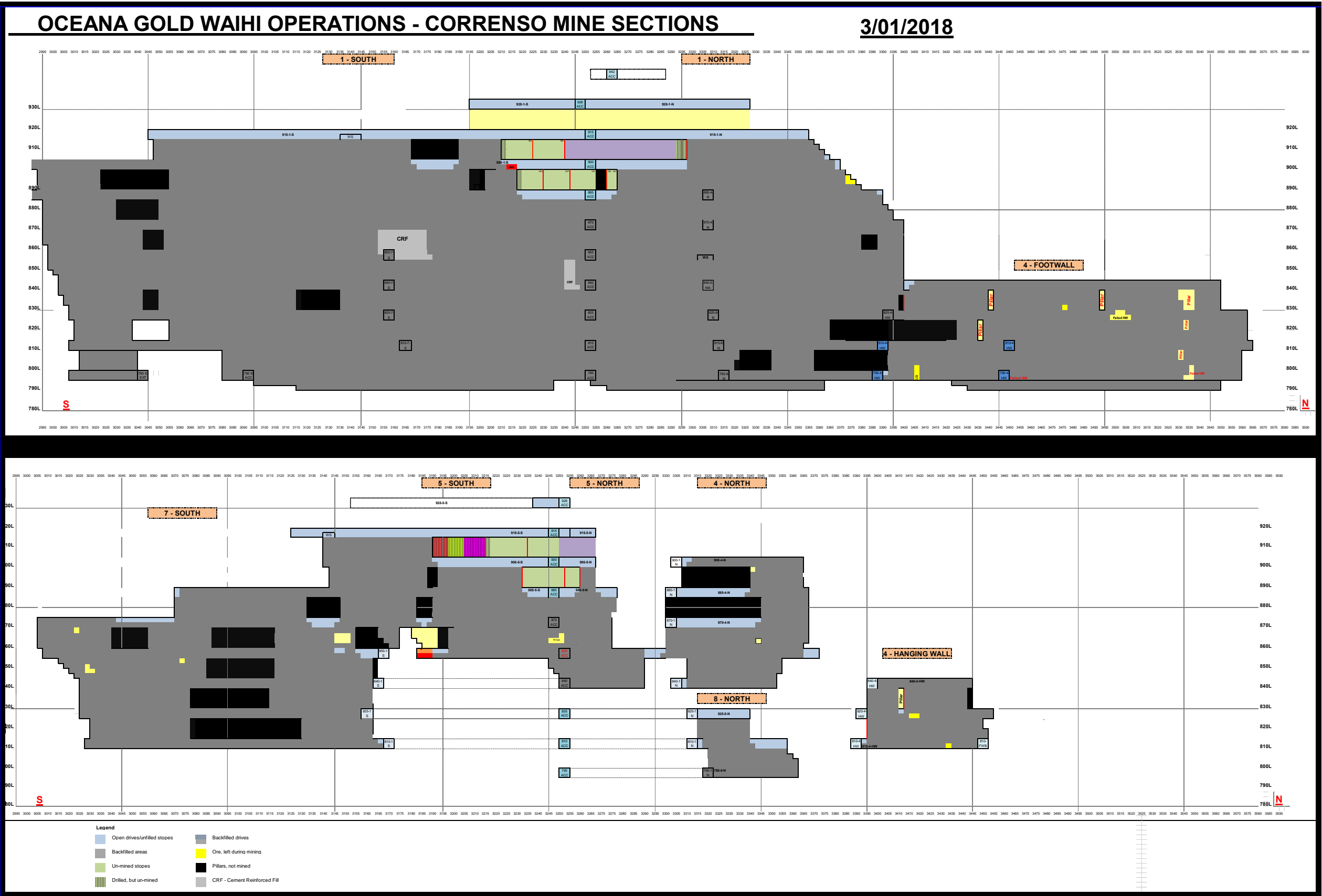


Figure 3 (a): Mine Sections of Correnzo Operations (Development and Backfilling)



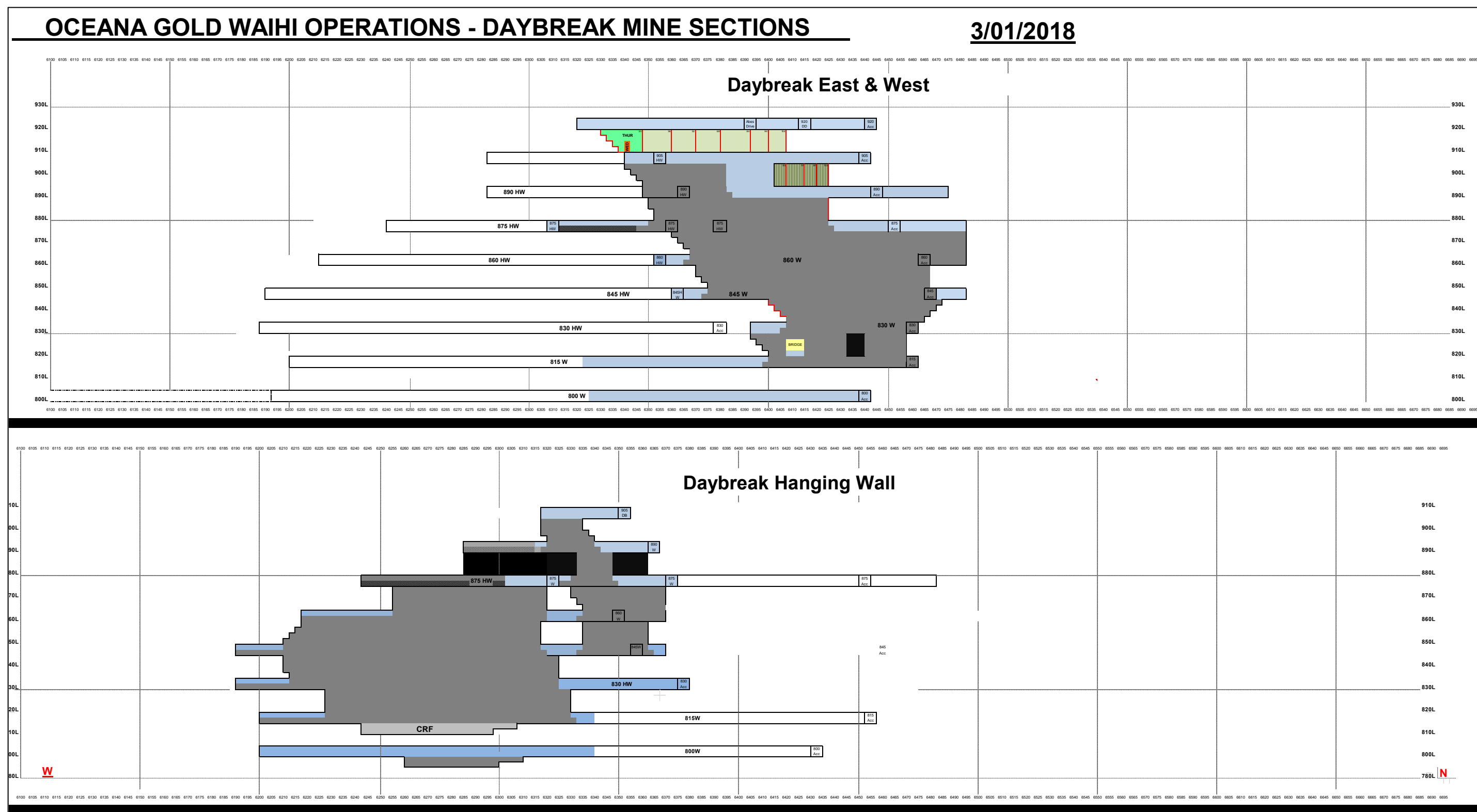


Figure 3 (b): Mine Sections of Daybreak Operations (Development and Backfilling)



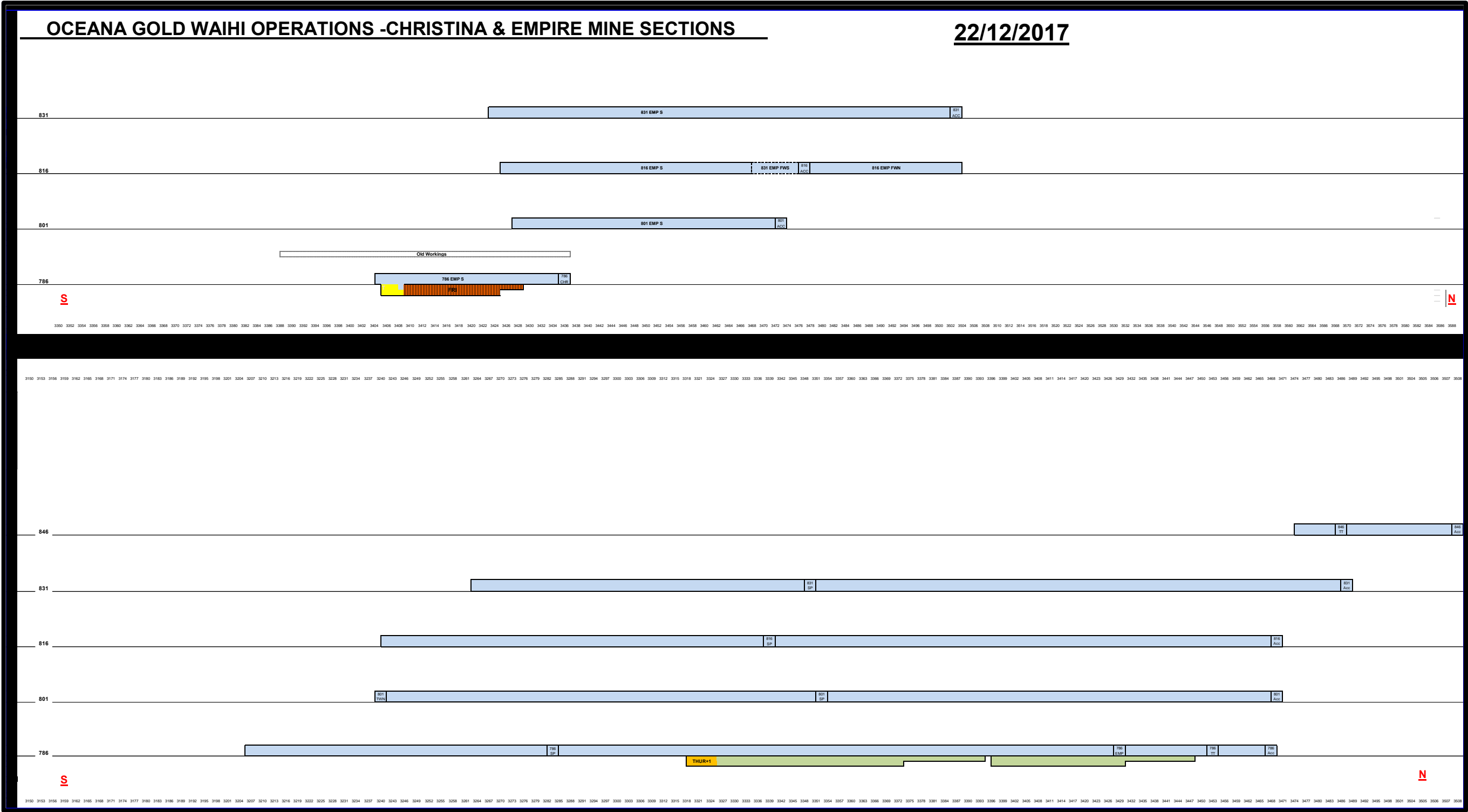


Figure 4 (c): Mine Sections of Empire Operations (Development and Backfilling)

4 DEWATERING

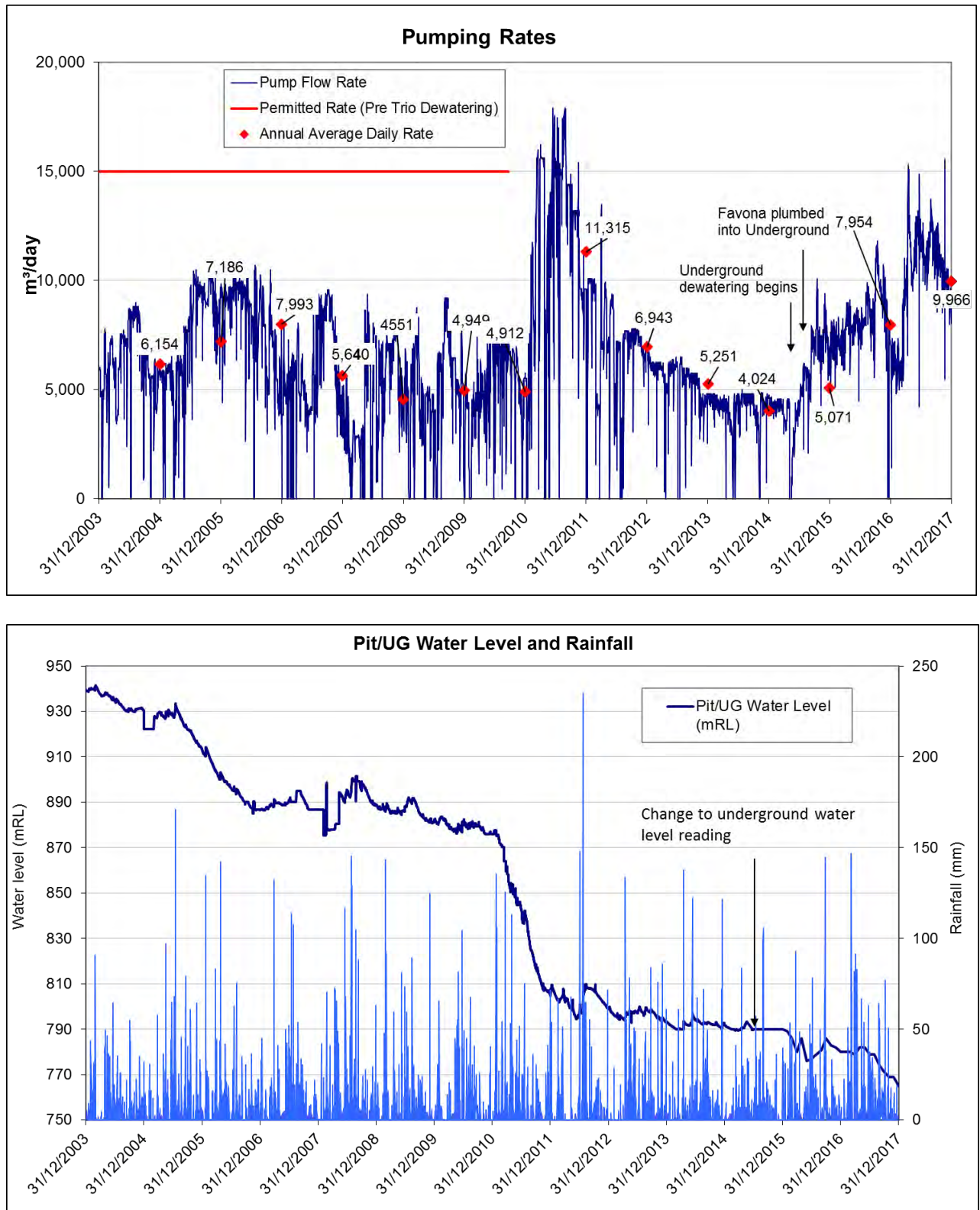
4.1 Martha

Table 1 shows annual volumes extracted and Figure 4a shows the groundwater take for the Martha Mine pit and surrounding areas. Prior to the Trio Development consent (consent 121446), extraction volumes were limited to 15,000 m³ of surface water and groundwater per day, and the average annual daily extraction rate was not to exceed 10,000 m³/day. The initiation of Trio Development in Sept 2010 permitted the dewatering of the underground workings at an unspecified rate; the consent is more effects-based by allowing water to be taken as required to achieve the dewatering of the Trio project.

On 01 April 2015, a slip in Martha Pit suspended many aspects of the mining operation. On 04 May 2015 dewatering discontinued from Martha Mine as access and power supply to the dewatering pumps was restricted. The water level at Martha was also unable to be read.

Table 1 – Martha Mine Annual Dewatering Volumes and Rates

Year	Maximum Allowable Annual Mine Take (m ³)	Total Annual Mine Take (m ³)	Average Pump Rate (m ³ /day)
2004	5,475,000	2,254,575	6,154
2005	5,475,000	2,626,830	7,186
2006	5,475,000	2,906,539	7,993
2007	5,475,000	2,058,660	5,640
2008	5,475,000	1,665,665	4,551
2009	5,475,000	1,806,550	4,949
2010	5,475,000	1,793,016	4,912
2011	Not Applicable	4,129,923	11,315
2012	Not Applicable	2,541,050	6,943
2013	Not Applicable	1,916,674	5,251
2014	Not Applicable	1,468,783	4,024
2015 (up until 04/05/15)	Not Applicable	512,207	4,130

Figure 4 - a) Martha Mine/Correnso Dewatering Rates, and b) Pit Water Level and Rainfall

4.2 Favona

Monitoring of abstraction rate has been reported to Council quarterly (Consent 109742, Condition 3). Favona mine dewatering volumes and rates are shown in Table 2. In early September 2015, the Favona dewatering line was fully plumbed into the main Martha/Trio/Correnso dewatering line.

Table 2 - Favona Mine Annual Dewatering Volumes and Rates

Year	Total Mine take (m ³)	Average pump rate (m ³ /day)
2005	70,946 (first reading 25 Oct 2005)	1,321
2006	625,204	1,693
2007	962,754	2,645
2008	1,012,329	2,766
2009	852,762	2,336
2010	925,635	2,536
2011	797,431	2,185
2012	677,104	1,850
2013	641,451	1,757
2014	573,983	1,573
2015 (Until May)	258,373	1,832

4.3 Martha, Favona, Trio & Correnso

Monitoring of abstraction rate is reported to Council quarterly (Consent 121446, Condition 3). On 18 May 2015 dewatering began from Correnso underground. By May 2015 Favona dewatering was fully plumbed into this dewatering line also. Additionally, a gravity fed line was installed which reports directly from the portal to the Water Treatment Plant. Flow down the Favona drain to the Favona pond is now sporadic. Treated service water is pumped down to the underground for use in fire prevention, drilling, ablution and wash down. The amount is subtracted from the dewatering volume to allow a more accurate dewatering take figure. The combined dewatering of Martha, Trio, Favona & Correnso (and now SUPA) is shown in Table 3.

Table 3 - Martha, Favona, Trio & Correnso Mines Annual Dewatering Volumes and Rates

Year	Total Mine take (m ³)	Average pump rate (m ³ /day)	Service water pumped underground (m ³)	Total Mine take minus Service Water (m ³)
2015 (May 18 th onwards)	1,338,760	5,871	60,727 (23 Sep onwards)	1,278,033
2016	2,911,046	7,954	181,466	2,729,580
2017	3,637,734	9,996	219,198	3,418,536

5 GROUNDWATER MONITORING

This section is provided to meet Conditions 13 a, b and c of the Martha consent, Conditions 2a, 4b, and 4c Schedule 2 of the Favona consent, Conditions 6(ii) and (iii) of the Trio Development consent (referred to by the Trio Underground Mine Consent 6.1.1), Condition 35 of the Correnso Underground Mine Consent and Condition 29 of the SUPA Consent. It includes:

- Data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network.
- Identification and interpretation of any environmentally important trends in dewatering behaviour or groundwater profile. Existing trends identified prior to end of 2017 will not be discussed in depth unless there has been a significant change or trigger reached.

5.1 Method

OGNZL has maintained a piezometer network within and around Martha Mine since 1987 and Favona Mine since 2004. Additional Correnso/SUPA piezometers were installed in 2011, 2014 and 2016. P106 was drilled and four vibrating wire piezometers installed in that drill hole during 2017. It is located to the north west of Martha Pit (Figure 5). Table 4 lists the piezometers currently operational that are assigned to each of the three main geological units.

Table 4 - Current Waihi Piezometer Network

Alluvium	Depth (mRL)	Younger Volcanics	Depth (mRL)	Martha Andesite	Depth (mRL)	Favona Andesite	Depth (mRL)
DM21-1 dry	1103	BH6-1	1052	BH11	1074	P60 ** dry	1075
DM31-1	1112	BH7-1	1078	BH12	1090	P61	1076
DM41	1108	BH8-1 dry	1048	P1-1 dry	1065	P64-D dry	1062
DM51	1104	BH9-1	1073	P2-1 dry	974	P75	979
DM71	1098	P1-2	1091	P2-2	1034	P76-D	1055
DM81-1	1117	P2-3	1073	P4-1	994	P77-D	1031
DM82-1	1114	P4-2	1047	P7-1	988	P78-D	1052
DM83-1	1116	P7-2	1039	P8-2	1044	P79-D	1047
DM85-1	1115	P7-3	1080	P8-1	975	P87-D	1024
P2-4	1111	P8-3	1092	P9-1	1036		
P4-3*	1093	P9-2	1084	P62 dry	1021		
P8-4	1113	P27-1	1073	P69-S	1114		
P9-3	1108	P63-1	1070	P69-D	1063		
P63-S*	1111	P64-I	1086	WC201-1	1058		
P76-S*	1109	P76-I	1072	WC201-2	1077		
P77-S*	1110	P77-I and	1045	WC201-3	1096		
P78-S	1103	P77-I2	1051	WC202-1	1031		
P87-S	1110	P78-I	1066	P90-3	982		
WC201-4	1103	P79-I	1061	P91-4	970		
WC201-5	1109	P79-S	1090	P92-3	965		
WC202-4 dry	1099	P87-I	1069	P93-4	974		
WC202-5 dry	1112	WC202-2	1048	P94-4	976		
P90-1	1096	P90-2	1019	P95-3	1000		
P91-1	1105	P91-2	1096	P100-3	981		
P92-1	1114	P91-3	1010	P100-4	956		
P93-1	1102	P92-2	1000	P101-4	1037		
P94-1	1108	P93-2	1091	P102-4	1026		
P101-1	1102	P93-3	1014	P106-1	1100		
P102-1	1108	P94-2	1094	P106-2	1060		
		P94-3	1016	P106-3	1010		
		P95-1	1090	P106-4	974		
		P95-2	1030				
		P100-1	1066				
		P100-2	996				
		P101-2	1083				
		P101-3	1068				
		P102-2	1078				
		P102-3	1054				

* - at or just below the contact with weathered young volcanics

** - collapsed piezometer

WC – Pneumatic piezos

~~P93~~ – Strikethrough indicates failed or lost piezometer

All piezometers are monitored on a monthly basis as required by the consent conditions. The water levels are translated to the mine datum reference level to enable comparison between bores or areas. Vibrating wire piezometers record values at daily intervals with the data downloaded monthly.

5.2 Inspection and Maintenance

The piezometer dip-meter is maintained in good working condition. A calibration of the dip-meter tape against a reference tape is carried out annually by Hydrodata Ltd. The dip-meter tape is replaced if the difference against the reference tape is more than 0.1%. The dip-meter was calibrated in October 2017.

The consent conditions require an inspection of the piezometer installations and appraisal of the piezometer network every two years. In effect, inspections of the piezometer network are undertaken more frequently, with the piezometer monitoring procedure requiring 6-monthly sounding to the bottom of all standpipe piezometers to identify any with excess silt and mud.

The piezometer designs have screens which allow water inflow into the pipe. Those piezometers that seemed most impacted by sediment were put on a flushing schedule. Piezometer flushing involved the development of a high-pressured water jet on a long length of hose to reach up to 80m depth. Piezometer flushing of silted boreholes occurred in 2014.

5.3 Groundwater Results

The Waihi town piezometer network currently has 55 dipped piezometers and six pneumatic piezometers. An additional 11 vibrating wire data loggers connected to 38 piezometers are also included in monitoring Waihi East (Figure 5). Groundwater contour plans have been updated for the three principal geological units: alluvium (plus shallow groundwater in weathered younger volcanic materials); Younger Volcanics (including ignimbrite); and Andesite. The groundwater plans are presented in Figures 6, 8 and 11 respectively. Discussion of results for each unit follows.

Only the Andesite contour map includes data from the vibrating wire piezometers. Alluvium and younger volcanics contour maps have not included vibrating wire piezometers as the vertical gradients evident do not provide a unique water level.

5.3.1 *Changes to monitoring network 2017*

- Mid-2017 an intermediate vibrating wire piezometer P93-2 began to give erratic readings. Electrical and geotechnical inspections confirmed wire or tip failure.
- P51 logger unit failed due to excessive moisture. The four connected piezometers are shallow and were installed regarding the Gladstone Rd subsidence incident. They are not part of the Waihi network and have had stable readings for over five years. After discussion with reviewers it was decided to decommission the piezometers.
- P106 vibrating wire piezometer was added to the network. Located on the NW Martha Pit rim it was drilled to 163m depth and four piezometer tips installed. Results indicate the hole to be mainly dry.





Figure 5 - Piezometer Location Plan

Figure 6 - Alluvium Water Level Contours

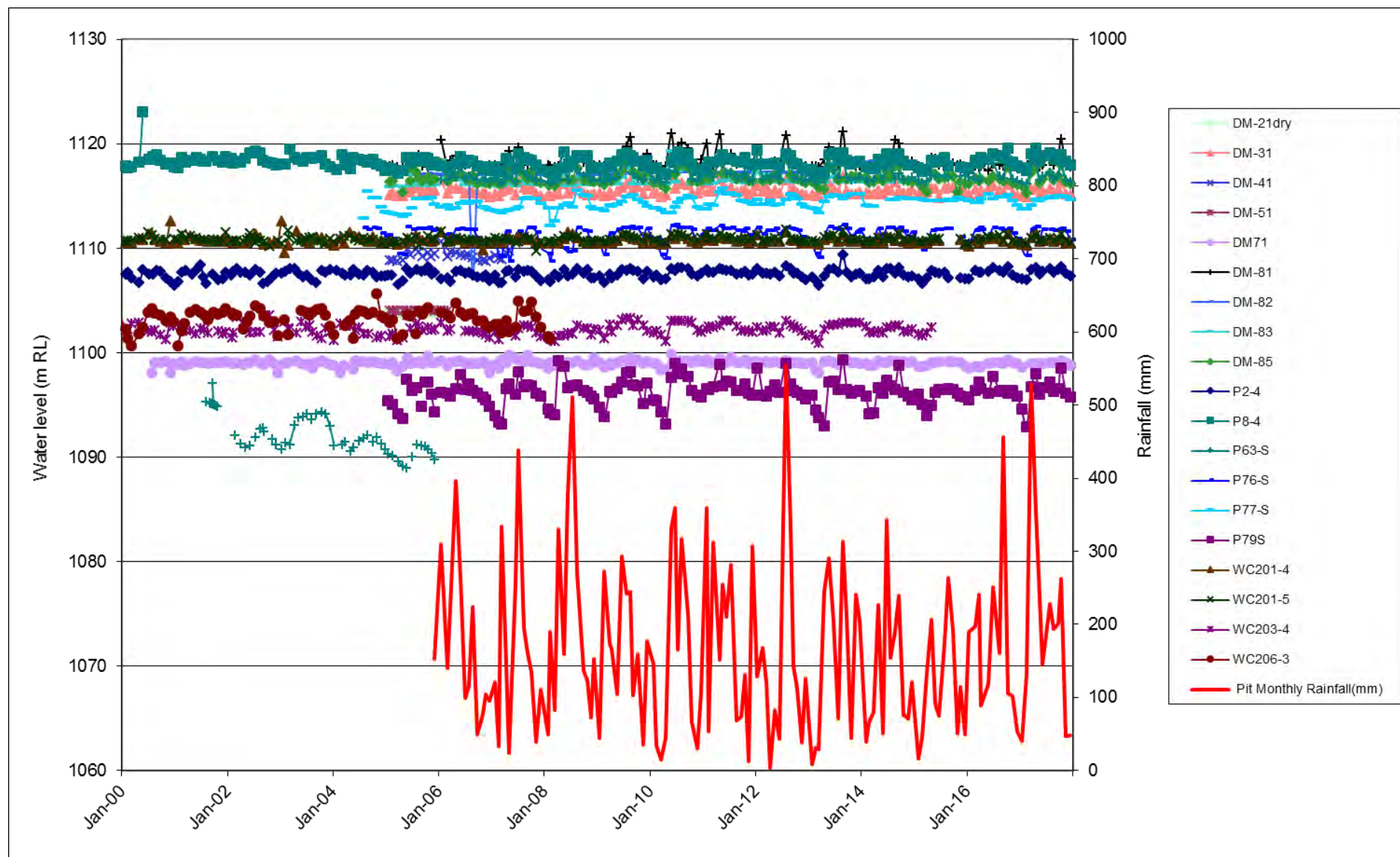


Figure 7 - Groundwater Level Trends – Shallow Groundwater (Alluvium & Weathered Contact of Young Volcanics)

5.3.2 **Shallow Groundwater**

Figure 6 shows the inferred contours for shallow groundwater in alluvium and in weathered younger volcanic materials and Figure 7 shows the water level trends over time. The overall contour pattern and the trend plots demonstrate that the shallow groundwater system remains essentially unaffected by dewatering of the surface and underground mining operations. Shallow groundwater levels are controlled, principally, by rainfall infiltration, low surface soil permeability and natural and assisted drainage to surface water systems.

Contouring of the lobe southwest of Martha Mine (Figure 6) has been restricted by the loss of access to the wells at sites WC203 and WC206. For the purposes of completing the contour plan it was assumed that groundwater levels in the alluvium at these locations remained the same as in previous years.

5.3.3 **Younger Volcanics**

Groundwater contours in the deeper portions of the younger volcanic materials below the shallow groundwater system are shown on Figure 8 and trends are graphed on Figure 9.

The younger volcanic materials infill topographic depressions in the surface of the Andesite rock body in which the open pit and underground mines are constructed.

Groundwater level change and the associated consolidation of the varying thickness of these relatively weak younger volcanic materials is considered to be responsible for much of the settlement and for the settlement patterns around Martha and Favona mines.

The dewatering pattern in the Younger Volcanics around Martha Mine indicates drainage towards the open pit. The limited groundwater discharge at the contact of the younger volcanic materials with the underlying Andesite in the pit (see Figure 8) suggests drainage is affected by features other than the contact (which defines a paleovalley in the Andesite). The most likely additional drain point is a substantial block cave evident in the pit wall. This block cave, referred to as the Milking Cow, was active during historic underground operations and resulted in substantial settlement of the ground surface, down-folding of fill and younger volcanic strata and close fracturing of the welded ignimbrite layers.

Prior to the start of dewatering at Martha Mine, groundwater levels in all rock units were similar. With the onset of mine dewatering, water levels in the veins and historic workings were drawn down. Groundwater levels in the various rock units below the shallow aquifer showed increasing vertical separation until about the mid to late 1990's. Thereafter, the water levels (in other than the veins and workings) stabilised and have remained stable since. This pattern is demonstrated in monitoring wells at site P2. With piezometer P2-1 following the vein water levels until water level dropped below the piezometer tip, P2-2 the upper Andesite water levels P2-3, younger volcanic rock water levels and P4-2 alluvium (shallow aquifer) (Figure 11).

Piezometers P1-1 and P1-2 were lost in early 2016 due to public carpark resurfacing.

The development of the settlement pattern has shown a similar behaviour with an initial higher rate of settlement followed by a much-reduced rate of settlement once groundwater levels in the upper rock layers stabilised. These patterns are discussed in the following sections.





Figure 8 - Deeper Younger Volcanic Water Level Contours



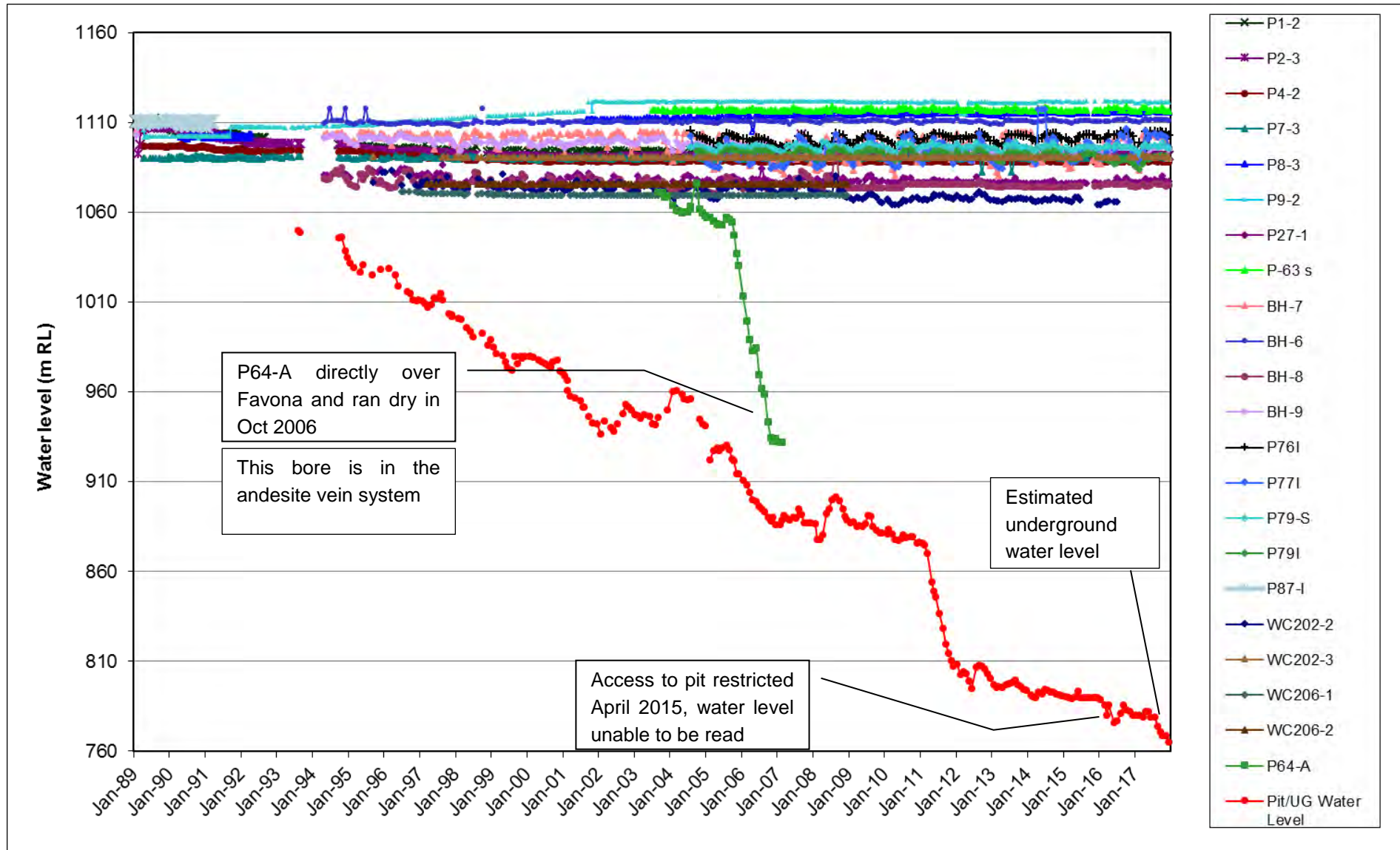


Figure 9 - Groundwater Level Trends - Deeper Younger Volcanic Materials



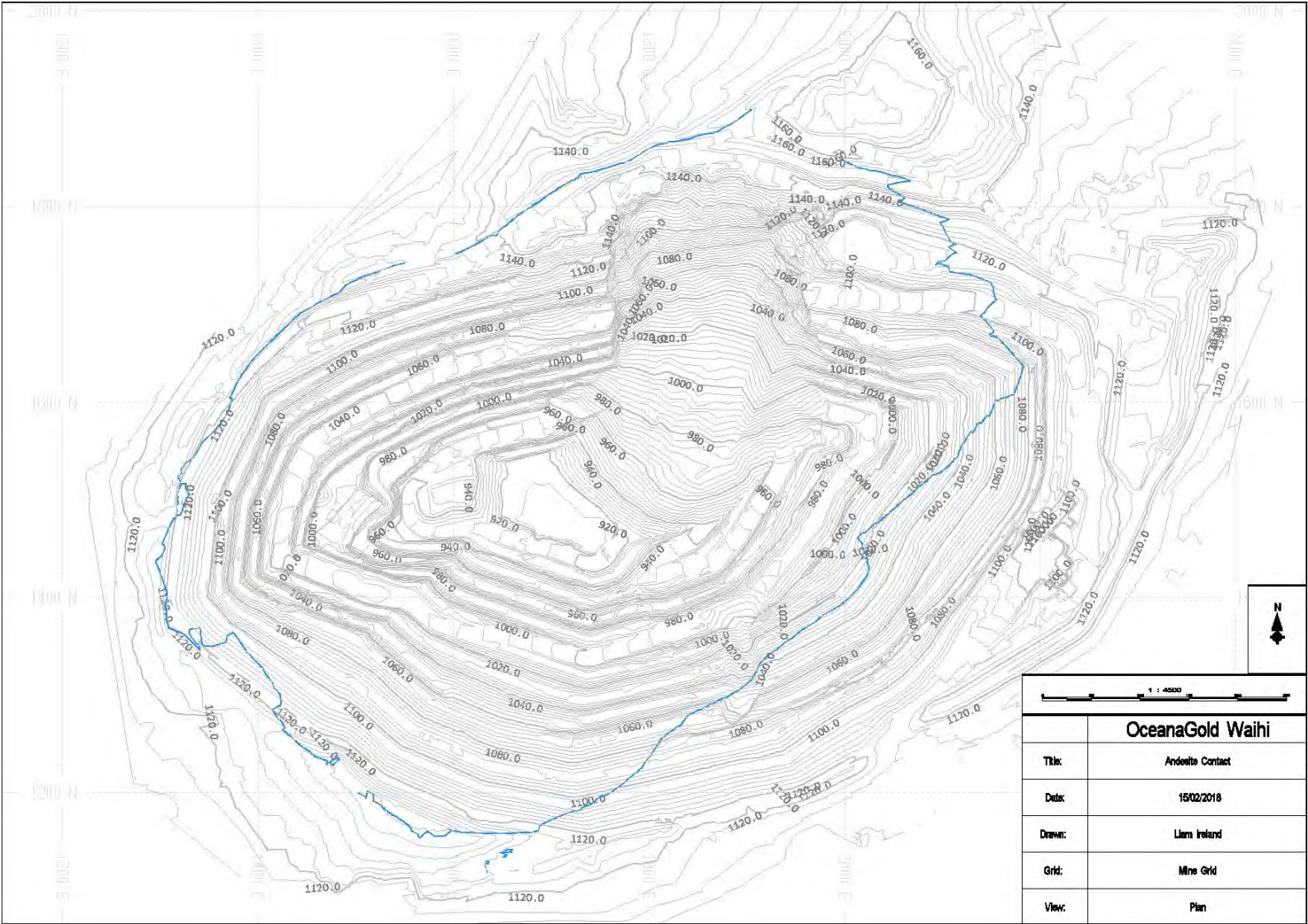


Figure 10 - Andesite Younger Volcanic Materials Contact in Martha Pit



5.3.4 **Andesite**

Andesite rock forms the local basement rock body for the area and hosts the mineralisation which was being mined at Martha Pit and is mined in the Underground.

Figure 11 shows the scope of the dewatering effects in the Andesite rock body as a result of dewatering. Data from the Waihi East vibrating wire piezometer units has been included. Figure 12 provides the water level trends in the Andesite rock body. While groundwater level data is available for the vein systems and the shallower Andesite rock, no monitoring data is available for intermediate depths within the Andesite rockmass outside of development areas. Hence, groundwater levels between the vein and the shallow rockmass has been interpolated.

Groundwater levels in the Andesite vein systems have responded rapidly and substantially to mine dewatering along the strike of the Martha Vein system, along the strike of the Trio vein system beneath Union Hill, and also along the strike of the Favona/Moonlight vein systems (Figure 11). An area of dewatering indicated between Martha Mine and Trio/Correnso vein systems suggests a relatively close linkage. Outside of these structures, the dewatering effect in the Andesite rock is attenuated or absent. This is illustrated by the different responses shown on Figure 12.

The Martha Mine dewatering effect continues to be abruptly attenuated to the north of the mine and also to the west of the mine. This is considered to be the result of faulting which truncates the veining. A lobe of dewatering extends to the southwest of Martha Mine and this is considered to be due to the drainage effect along the N-S Edward lode structure. Dewatering is shown to reduce eastwards along the Martha system but may extend further at depth as the host rocks are more deeply buried in that direction and no deep monitoring wells are available for confirmation.

Figure 11 also indicates the dewatering centralised on the Favona system with the restriction of connection between Favona and the Union systems. The geological model in Section 3 indicates an up-thrown block (Union Horst Figures 1d and 11) between the Union and Favona systems. This structural hiatus is likely to account for the restricted groundwater interconnection between the Martha-Union and Favona systems.



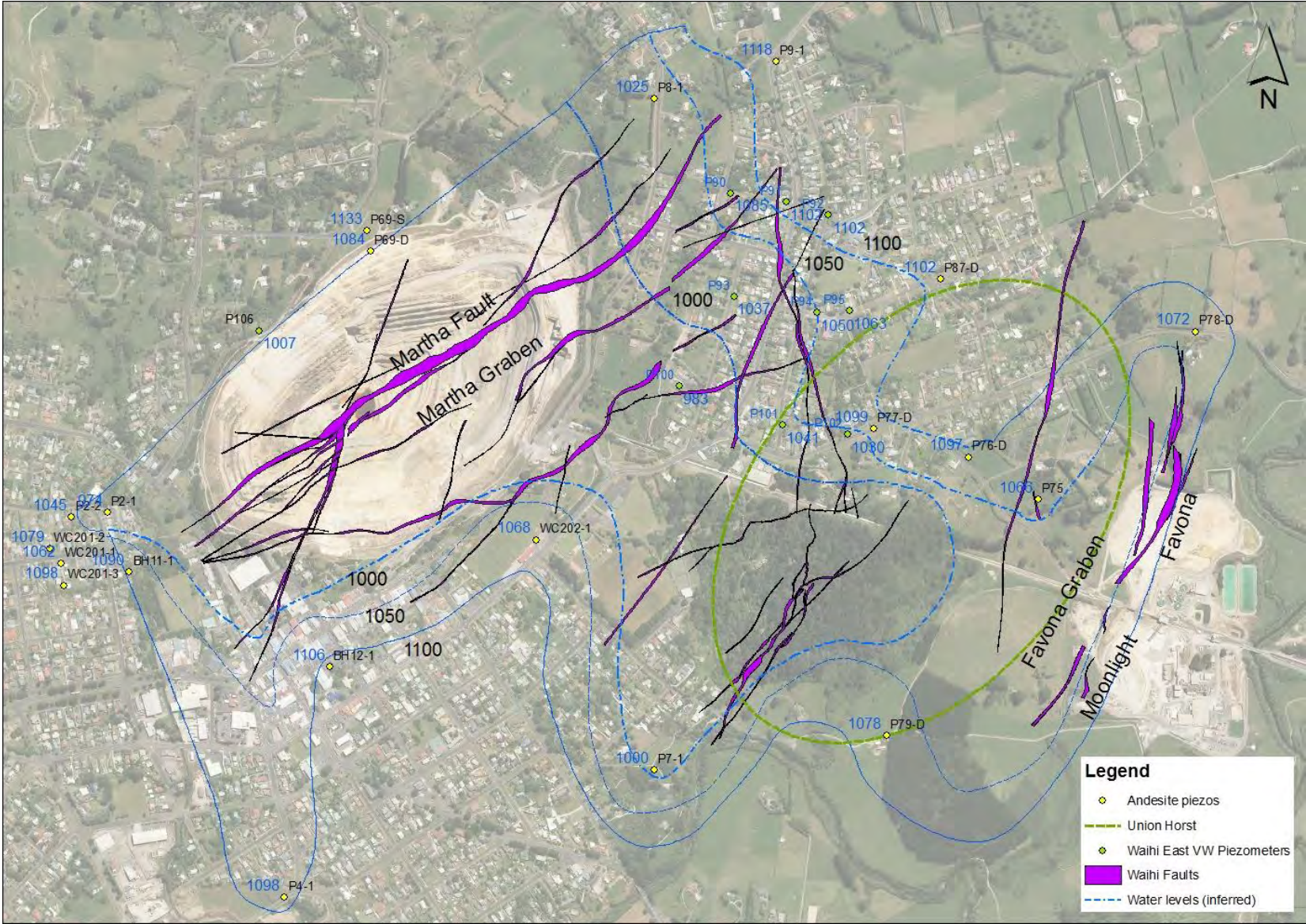


Figure 11: Andesite water level contours



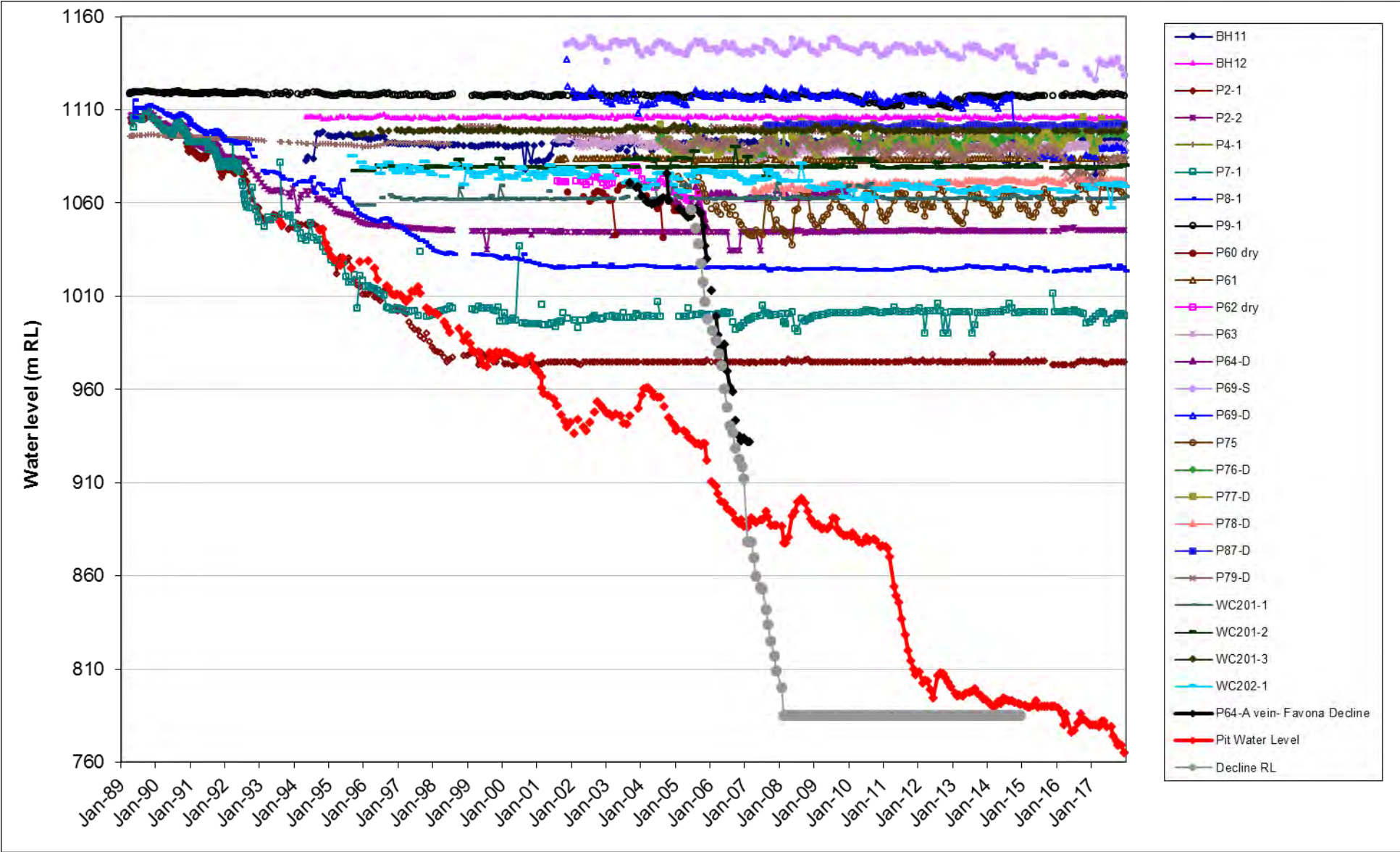


Figure 12 - Groundwater Level Trends – Andesite



5.3.5 *Martha groundwater assessment*

P69D & P69S were installed in 2001 and are located close to the rim of the North Wall of Martha Pit. They were considered control bores and previously uninfluenced by dewatering. Geotechnical stability work in the North Wall was undertaken in October 2014, partly due to excessive water. Drainage holes were drilled into the lower wall. Localised drainage of the wall resulted, and the water levels in P69D and P69S declined. By March 2015 the piezometers had stabilized with P69D and P69S declining by 32m and 12m respectively (Figure 13). With the large north wall slip in April 2016, access to the piezometers was briefly restricted. Real time loggers were installed in mid-2017 and are currently programmed to record hourly.

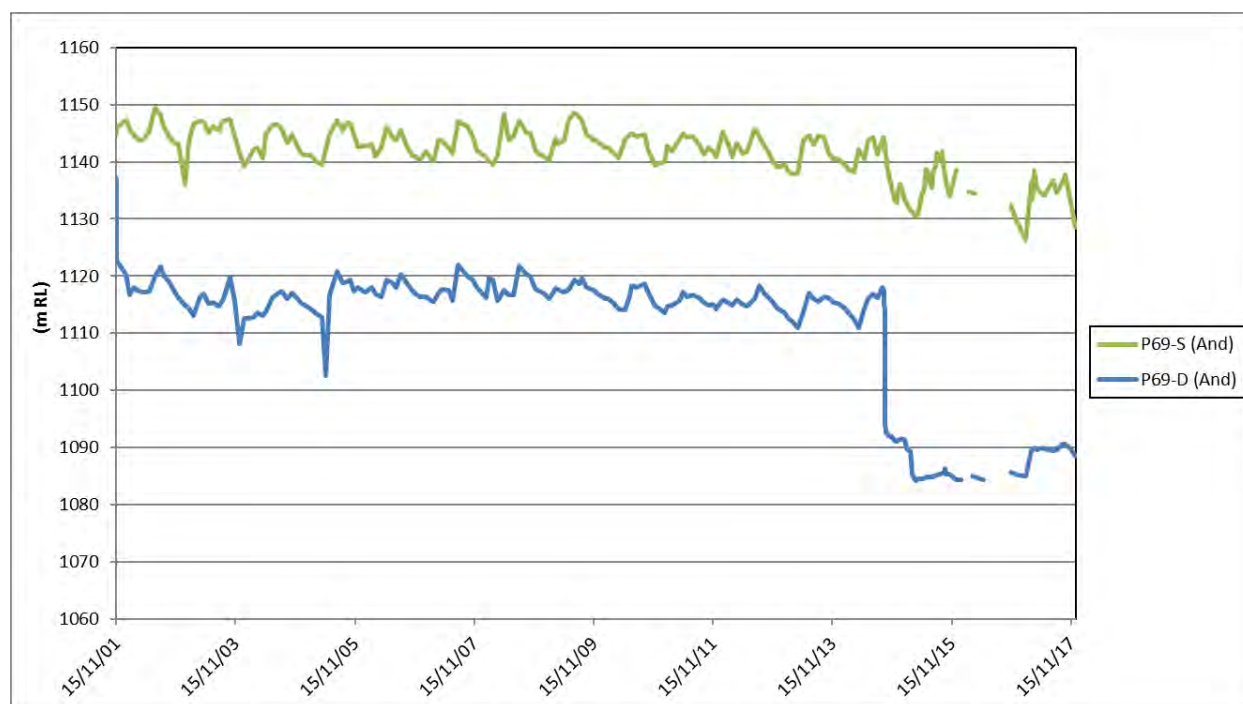


Figure 13 - Water Levels P69 Pit North Wall

In September 2017, a piezometer hole was drilled on the north-west side of Martha pit (Figure 5). Four piezometers were installed to depths between 37 and 163m. The piezometers tips are in dewatered andesite and results indicate the majority of the rockmass is dry with little or no water pressure.

5.3.6 *Private bore assessment*

The private wells show seasonal fluctuations and can be influenced by landowners using the bore. The Whangamata Rd and Mataura Rd bores can no longer be accessed due to health and safety issues. Additionally, an investigation was undertaken on behalf of a local orchardist who requested OGNZL to monitor their bore.

Overall, there is no indication of any influence in the bores from mine dewatering (Figure 14).

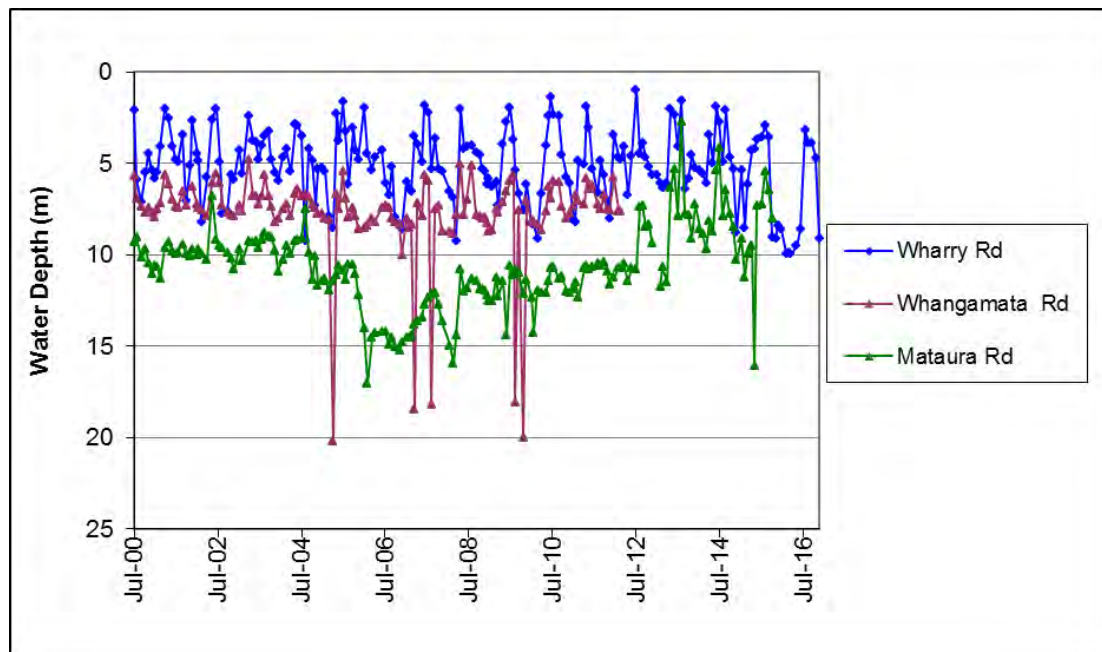


Figure 14 - Water Levels at Monitored Private Bores

5.3.7 *Favona Trigger Levels*

The Favona dewatering effect is indicated to be limited to the vein system or structures interconnected to the vein system. The dewatering effect does not extend to wells in Andesite rock overlying or adjacent to the vein system (wells P76-D; P77-D and P79-D, Figure 11).

The Favona Underground Mine Settlement, Dewatering and Water Quality Monitoring Plan (2006) sets out trigger levels to alert of rapid depressurisation in the Andesite as it could affect the overlying Younger Volcanic rocks.

The Tier 1 trigger level for groundwater change at Favona is defined as, “a drop in water levels greater than seasonal fluctuation in wells tapping the upper 50 m of Andesite in response to a water level drop in deeper wells (100 m) in Andesite rock”. Five wells were selected as suitable for assessment (Figures 15 to 19).

The Tier 1 action involves increasing the monitoring in intermediate wells (i.e. wells tapping the younger volcanic materials) with one option being the installation of pressure transducers. The regulator is to be advised when Tier 1 action is initiated. The trigger level has been calculated as the summer water level less the average seasonal water level change over the record.

Wells P76-D, P77-D and P78-D all show a rising trend in water levels; as such, Tier 1 action is not forecast. P87-D shows gradual reducing trends and projection of those trends suggests the trigger levels will not be exceeded by the end of mining. P79-D did reach the trigger level in 2016 (Figure 18).

Piezometer P79-D (and P79-I) most likely showed a reaction to water loss from an underground horizontal drill hole. In March 2016 while drilling underground, significant water loss was recorded. Monitoring of P79 was undertaken and piezometric level reduction was noted. The drill hole was plugged and no further water loss from the hole occurred. Water levels in P79 have recovered to above the trigger level but currently remain lower than earlier fluctuations. Tier 1 action was therefore not initiated.

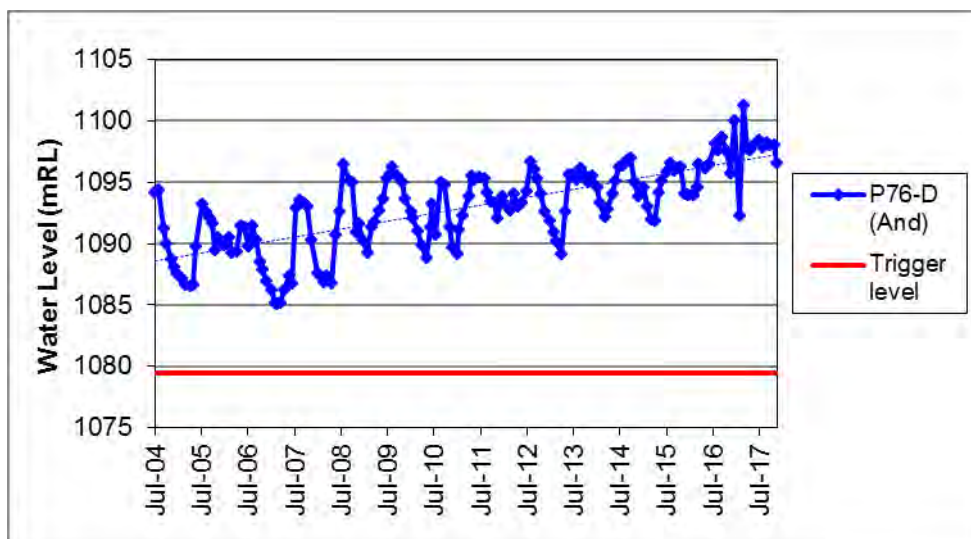


Figure 15 - Trigger Level P76-D

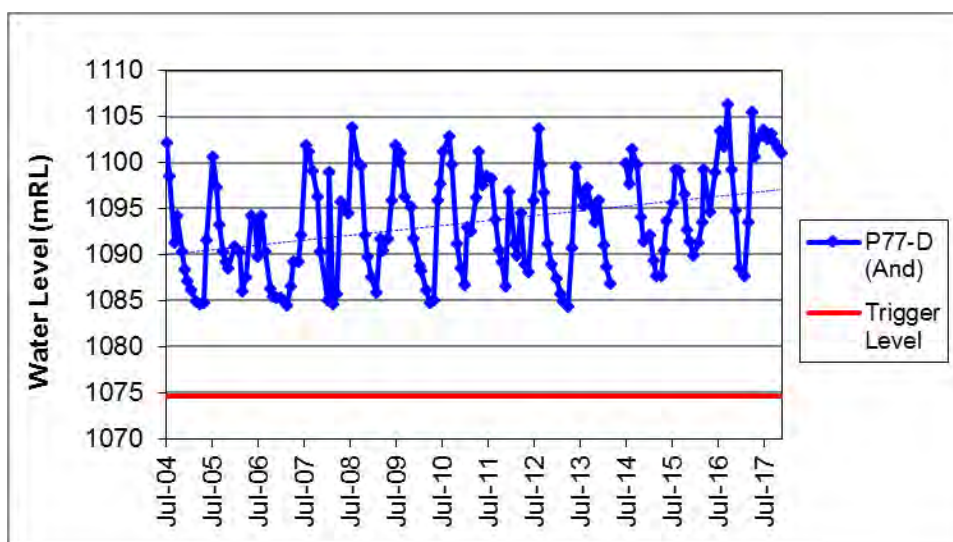


Figure 16 - Trigger Level P77-D

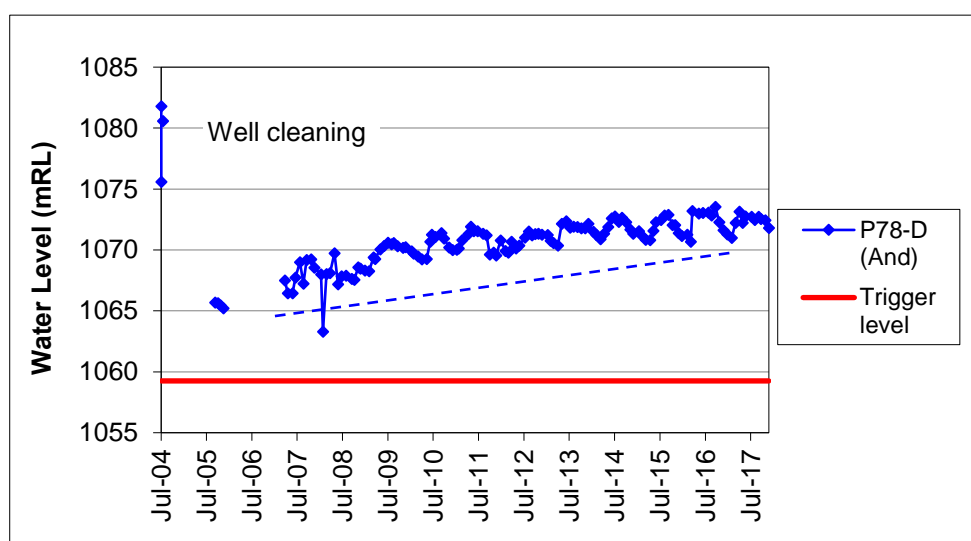
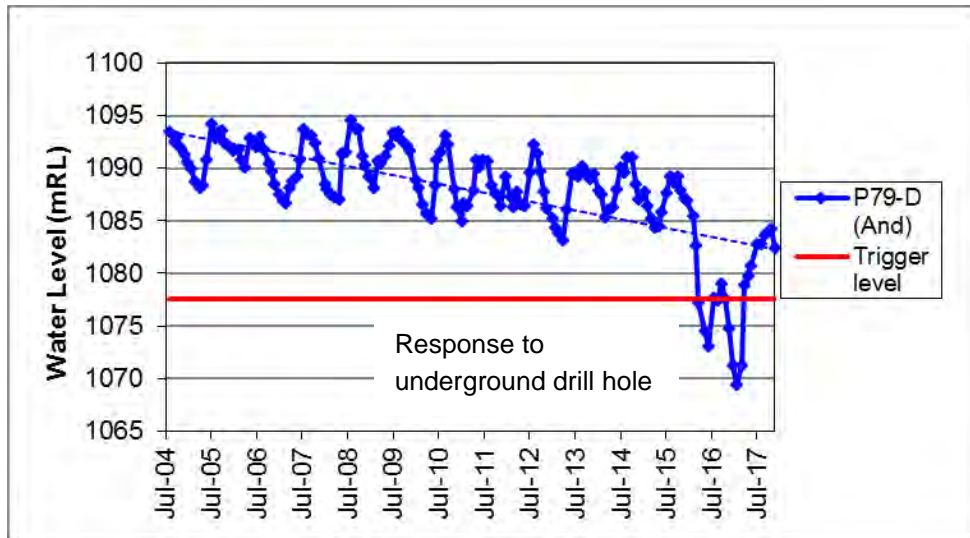
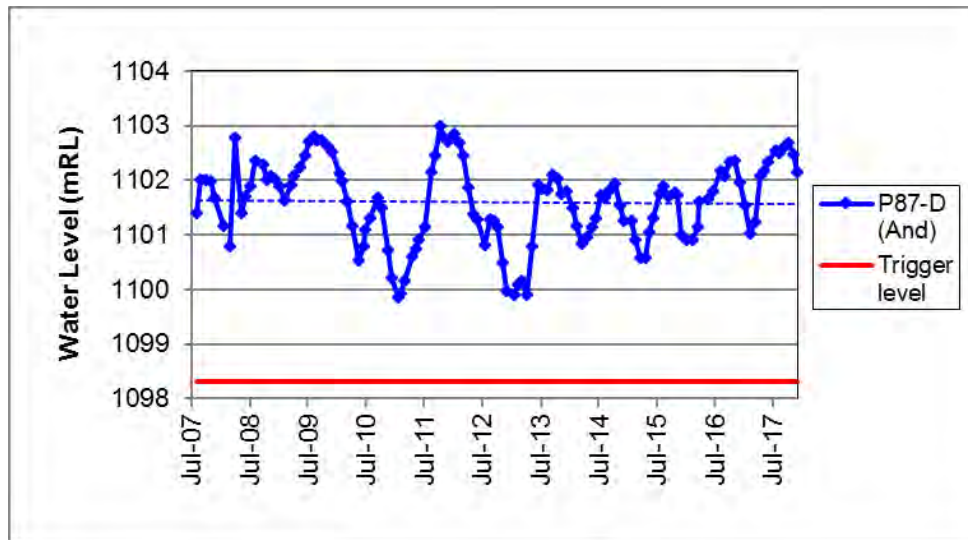


Figure 17 - Trigger Level P78-D

**Figure 18 - Trigger Level P79-D****Figure 19 - Trigger Level P87-D**

Andesite Groundwater Summary

The ongoing evaluation of the groundwater level responses to mining at Martha Mine and at Trio/Favona/Correnso/SUPA Mines has been updated. The data continues to confirm that dewatering effects within the Andesite rock are transmitted via interlinked vein systems, faults and historic workings at depth. When the natural conditions are unmodified, these effects are not extending into shallower geological layers or affecting shallower groundwater. Where trigger levels have been set around the Favona Mine, one exceedance of the trigger levels occurred in 2016 (this was investigated and mitigated; monitoring is ongoing to determine further responses). Current trends do not forecast any new exceedances of trigger levels due to mining and dewatering.

5.3.8 **Waihi East - CEPA**

Six groundwater monitoring boreholes were installed between July – September 2011. They are located east of the Martha pit to provide improved groundwater information in an area with few existing wells and in the vicinity of the Correnso Project. Two additional vibrating wire piezometer boreholes and 39 additional settlement markers were installed in early 2014. One further borehole was installed in 2016 for monitoring related to the Daybreak/SUPA orebody.

The piezometers were located across and perpendicular to the Correnso vein system in three lines (P90, P91 and P92 forming one line, P93, P94 and P95 a second line and P100, P101 and P102 the third). Separation distance between the northern and southern lines is some 500m (Figure 5). The piezometers were constructed to intercept the shallow aquifer, Younger Volcanics, and Andesite rock (Table 5).

Table 5: Geological Units and Depths P90-P95, P100-P102 Piezometers

Bore	Shallow	Younger Volcanics		Andesite	
		Upper	Basal Zone		
P90	-	20	100	137	
P91	9.3	25.5	111.3	151.3	
P92	-	23.3	121.3	156.3	
P93	12.3	26	100	143	
P94	6	25	104	144	
P95	-	35	90	120	
P100	-	50	120	135	160
P101	12.8	32	47	78	
P102	8	38	62	90	

Figures 20 to 28 provide the records from the piezometers expressed as mRL. The charts also display the depth of the piezometer tips. Separation between the shallow and deeper piezometers is evident in the records. The nine groundwater monitoring boreholes have indicated stable water levels in Waihi East.

Note: Gaps in the data are due to either brief logger malfunction issues or flat batteries in the unit

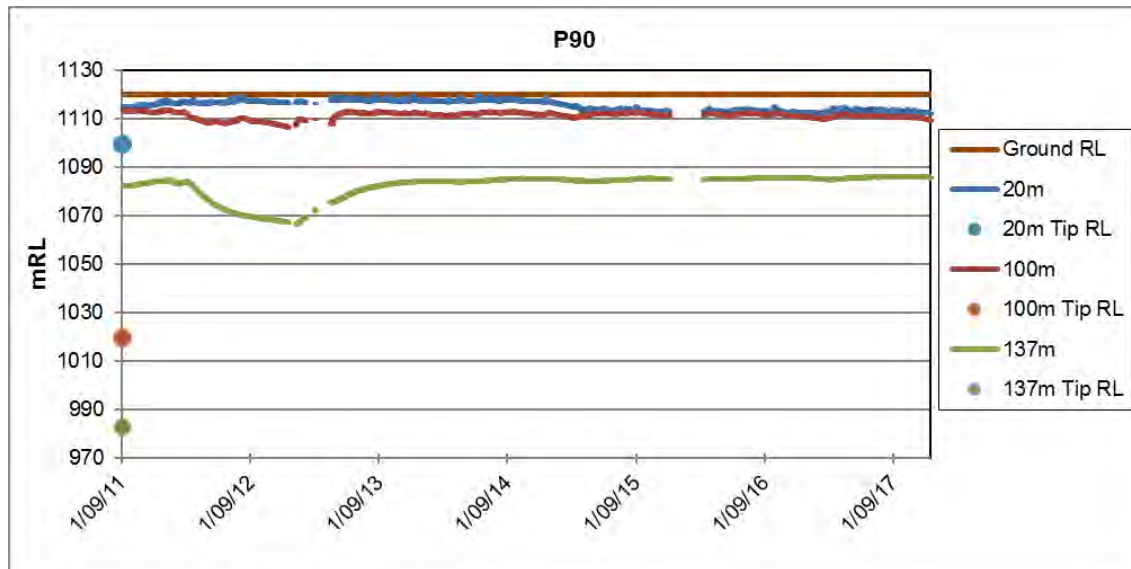


Figure 20: P90 Vibrating Wire Piezometer

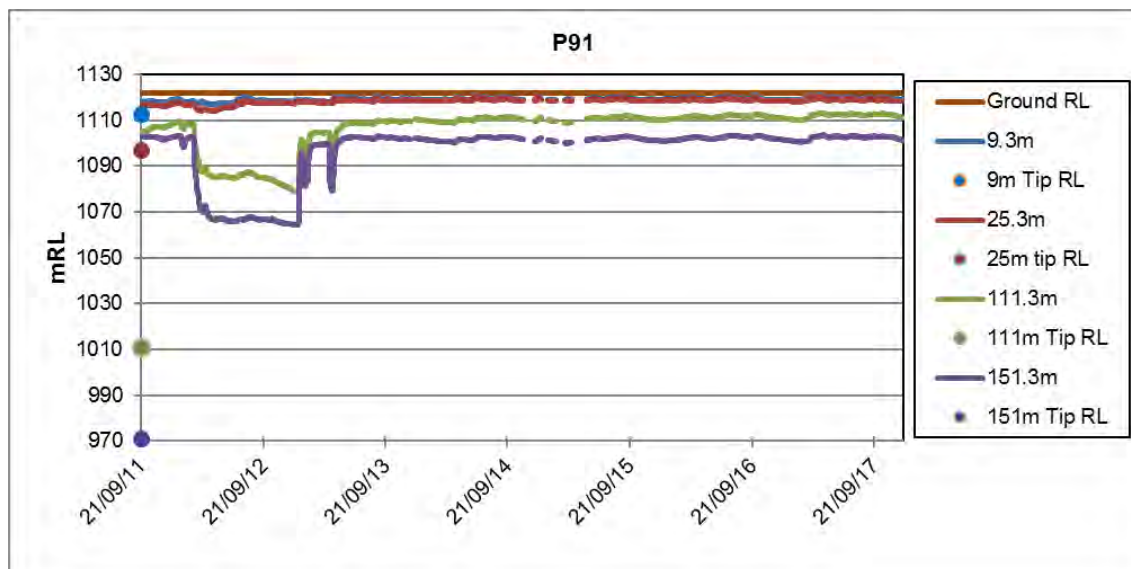


Figure 21: P91 Vibrating Wire Piezometer

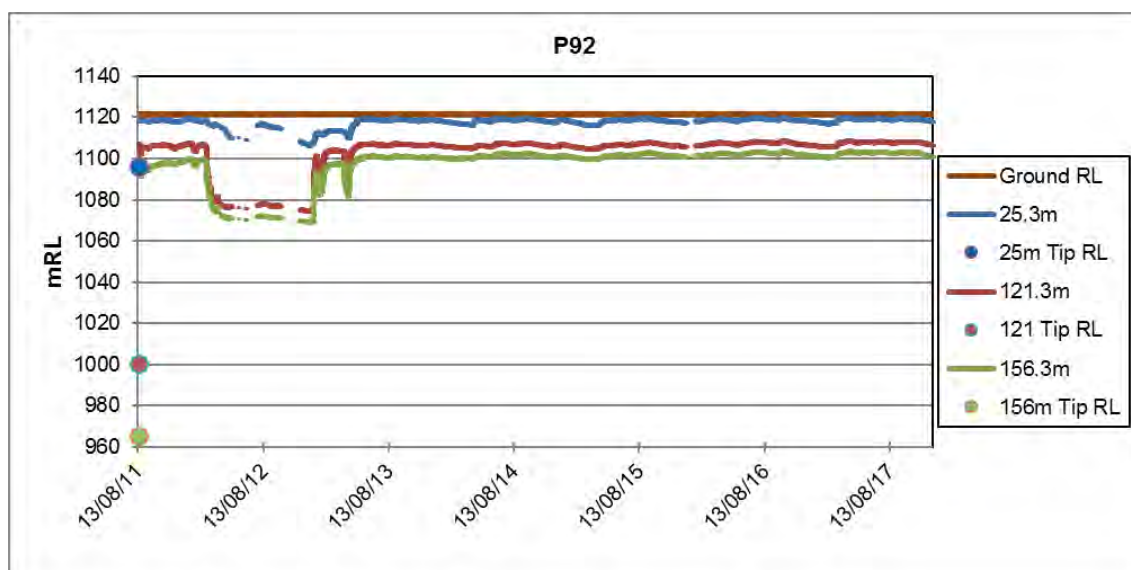


Figure 22: P92 Vibrating Wire Piezometer

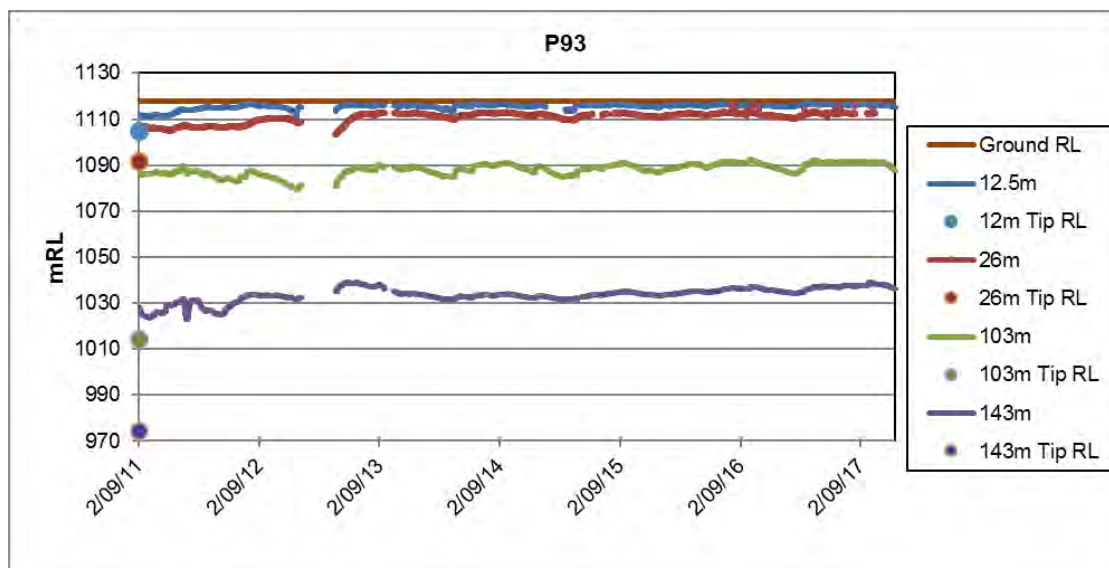


Figure 23: P93 Vibrating Wire Piezometer

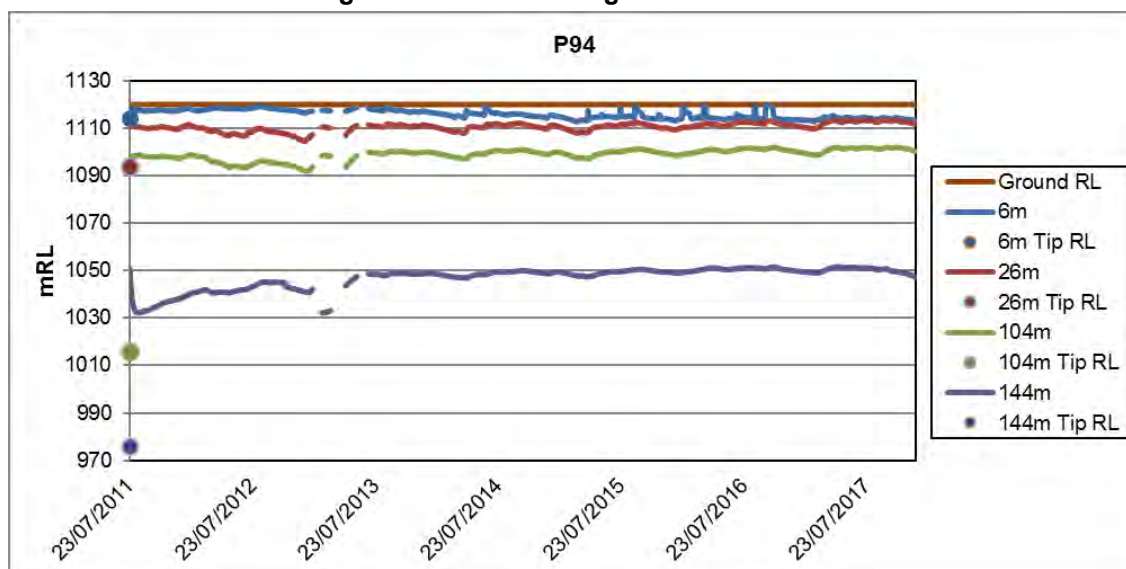


Figure 24: P94 Vibrating Wire Piezometer

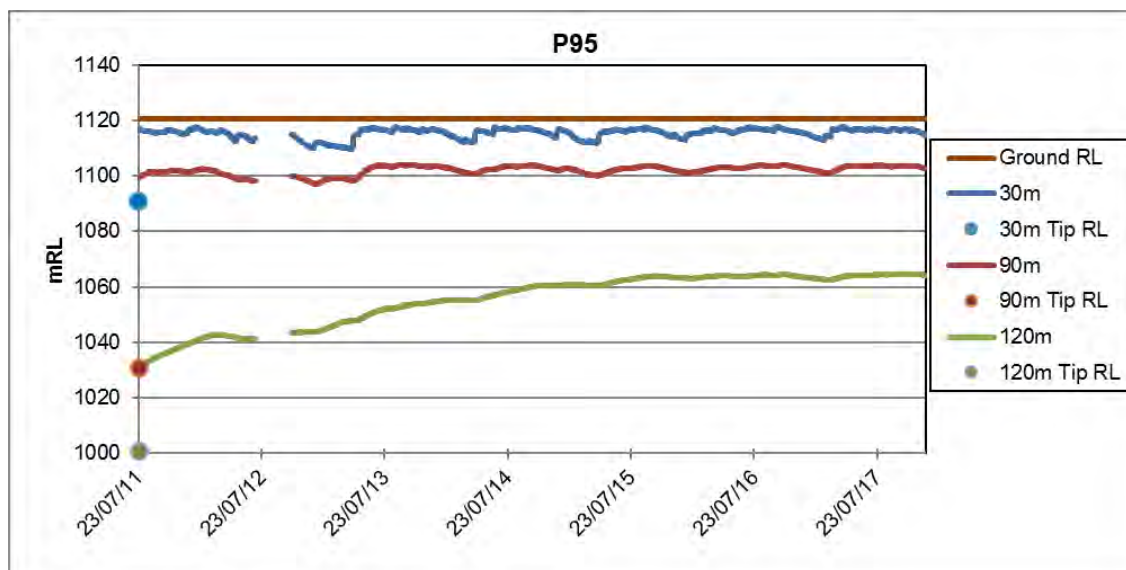


Figure 25: P95 Vibrating Wire Piezometer

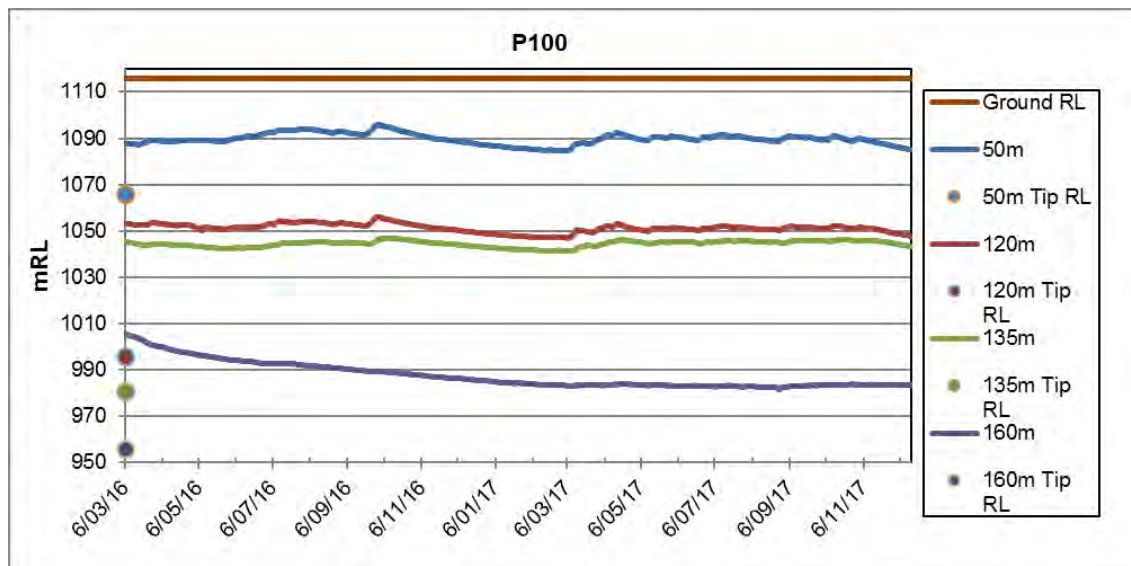


Figure 26: P100 Vibrating Wire Piezometer

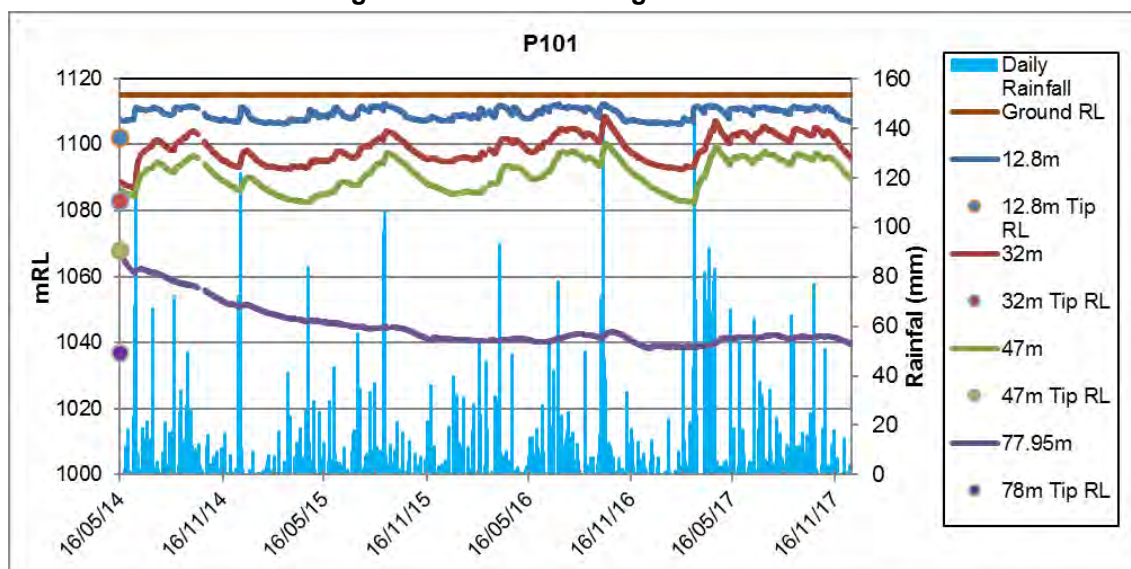


Figure 27: P101 Vibrating Wire Piezometer including daily rainfall

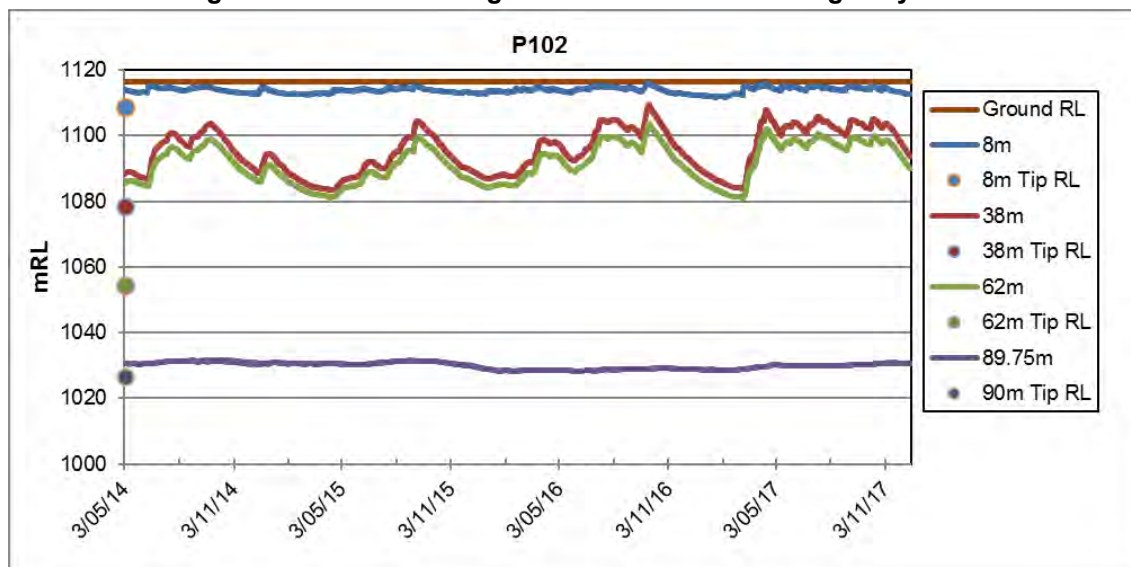


Figure 28: P102 Vibrating Wire Piezometer

Water levels were disrupted during 2012 to 2013 in P90, P91 and P92 by leakage down an incompletely sealed drill hole annulus. Pressures returned to normal after comprehensive effort to seal the leakage pathway. Further comment of the monitoring results is in Section 9.

5.3.9 ***Waihi East – Pressure Graphs***

Measured pressure heads and calculated intermediate pressure heads derived from the multi-level piezometer data base were used to construct these cross-sections. The solid red line on Figures 30 to 32 represents the estimated contact between the upper flow system in the Younger Volcanics and the top of the low permeability weathered Andesites. Elevation is shown as mRL on the vertical axis and distance from Martha pit is shown on the horizontal axis.

Piezometers P90 to P92 are indicated to be in a zone of horizontal flow through the Younger Volcanics more or less normal to the plane of that part of the cross-section. Both vertical and lateral pressure gradient components are indicated for the upper Andesite.

The cross-section containing P93 to P95 also appears to have mainly horizontal flow in the Younger Volcanics but with a vertical component. Within the weathered low permeability Andesite, vertical pressure gradients predominate. Dry areas are indicated at depth within the Andesite rockmass.

The third cross-section shows the Andesite rockmass to extend much closer to the surface at this location, possibly as a result of faulting. Vertical gradients with a minor horizontal flow component are indicated in the shallow Younger Volcanics layer. Strong vertical gradients reflecting the low permeability of the weathered Andesite are indicated with dry conditions present a short distance below the contact.

From P100 to the pit the phreatic surface slopes indicating discharge at the outcrop contact in the pit or to the Milking Cow Block Cave.

When comparing the three cross sections, the dewatered condition appears to extend to greater depth in moving from south to north.

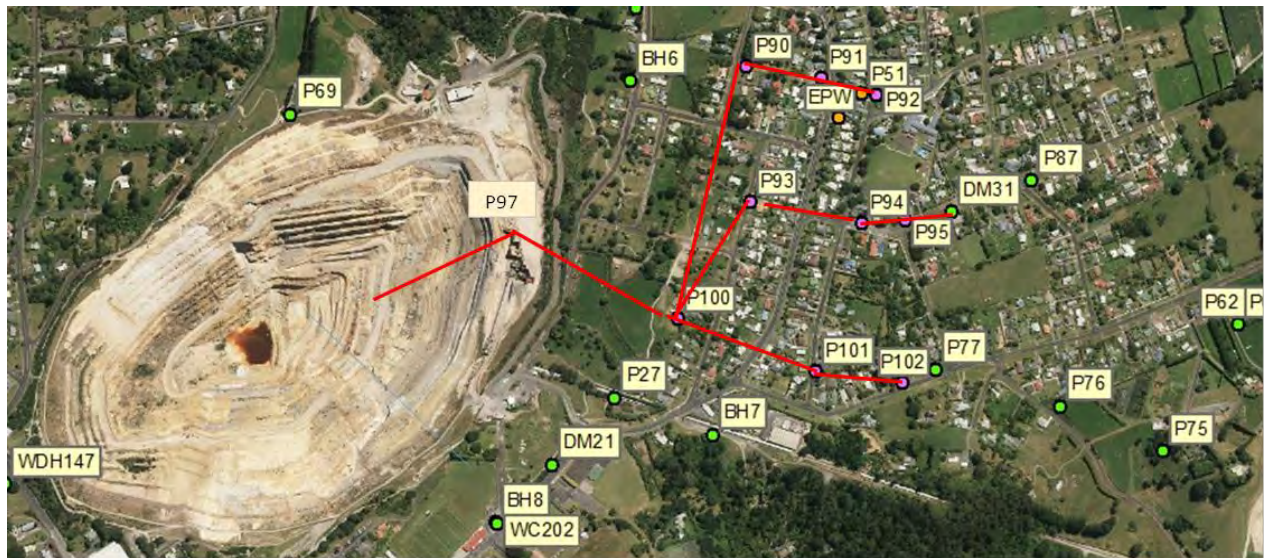


Figure 29: Pressure profile locations

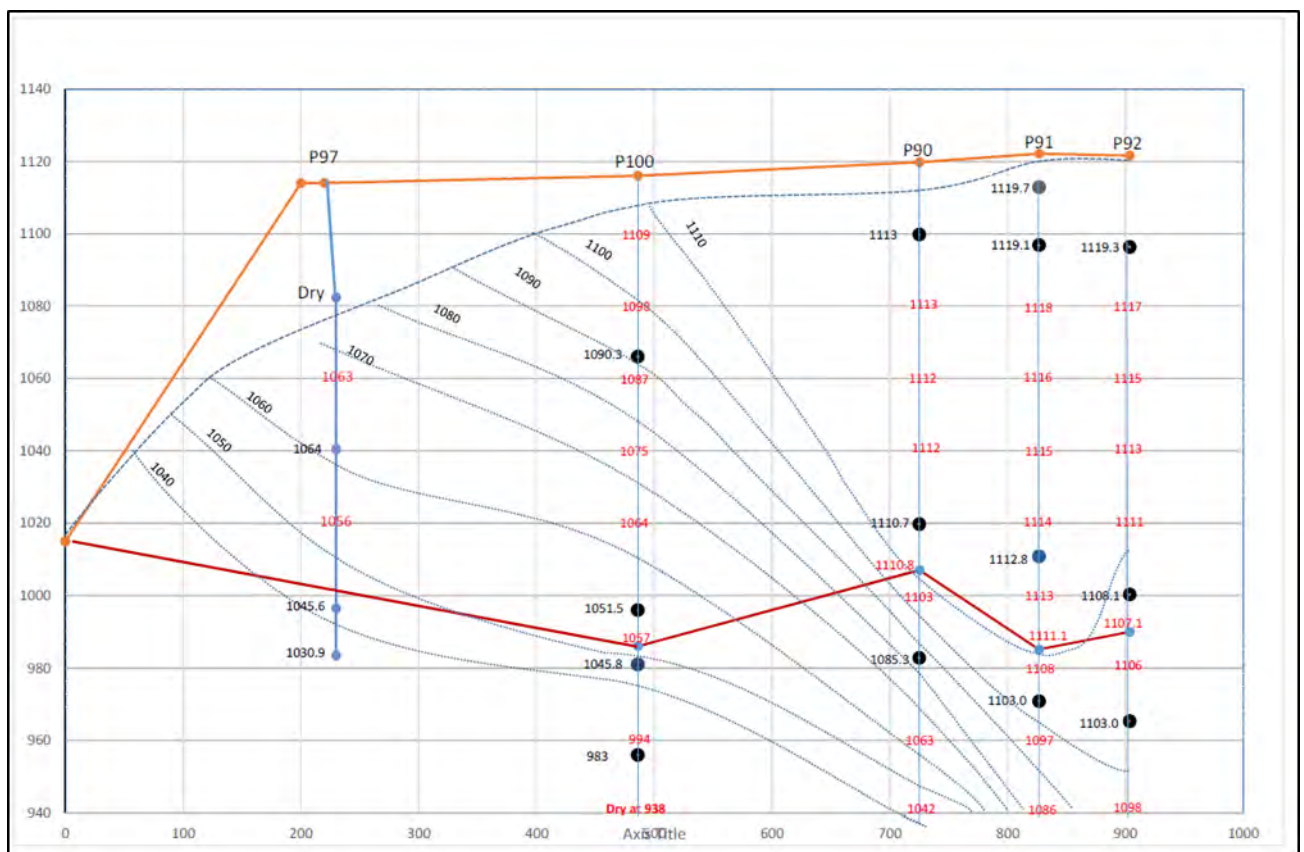


Figure 30: P97 to P92 Pressure profile

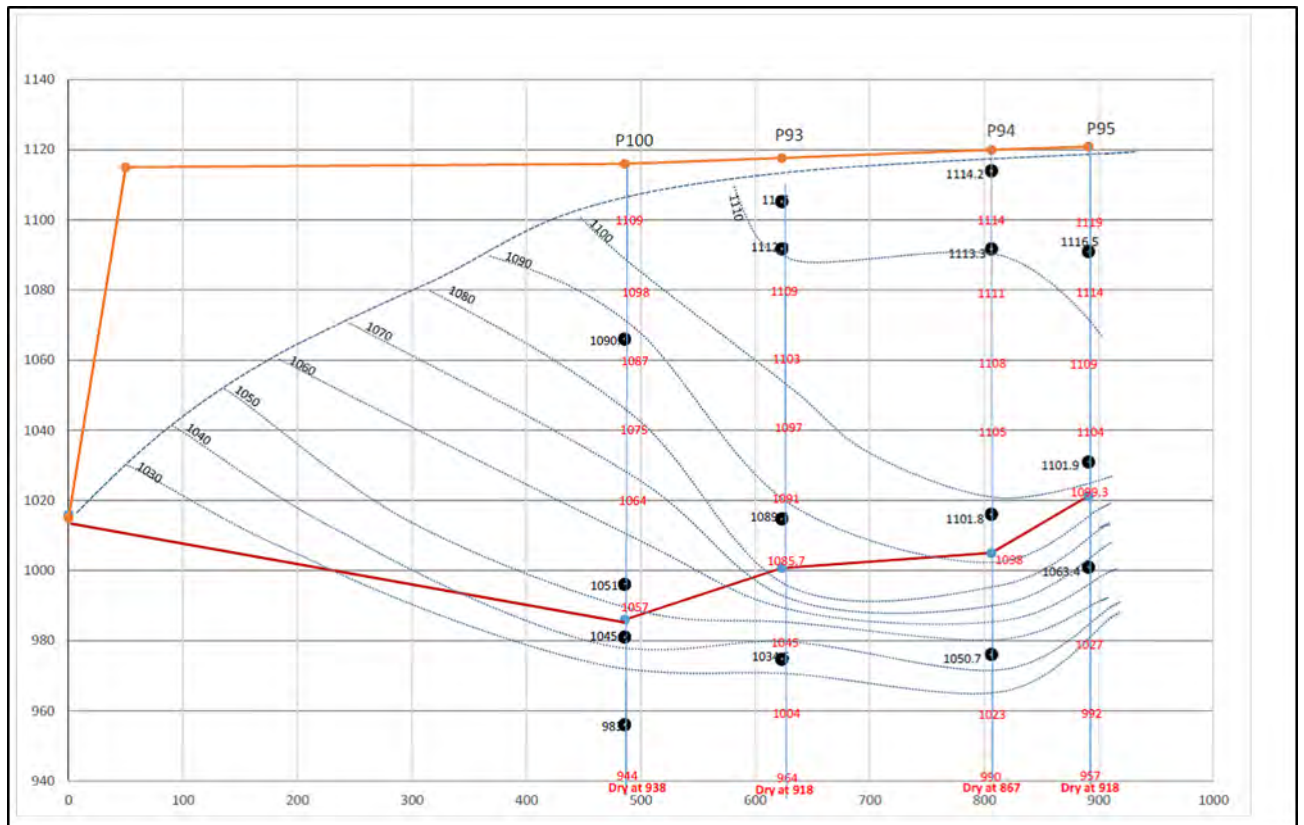


Figure 31: P100 to P95 Pressure profile

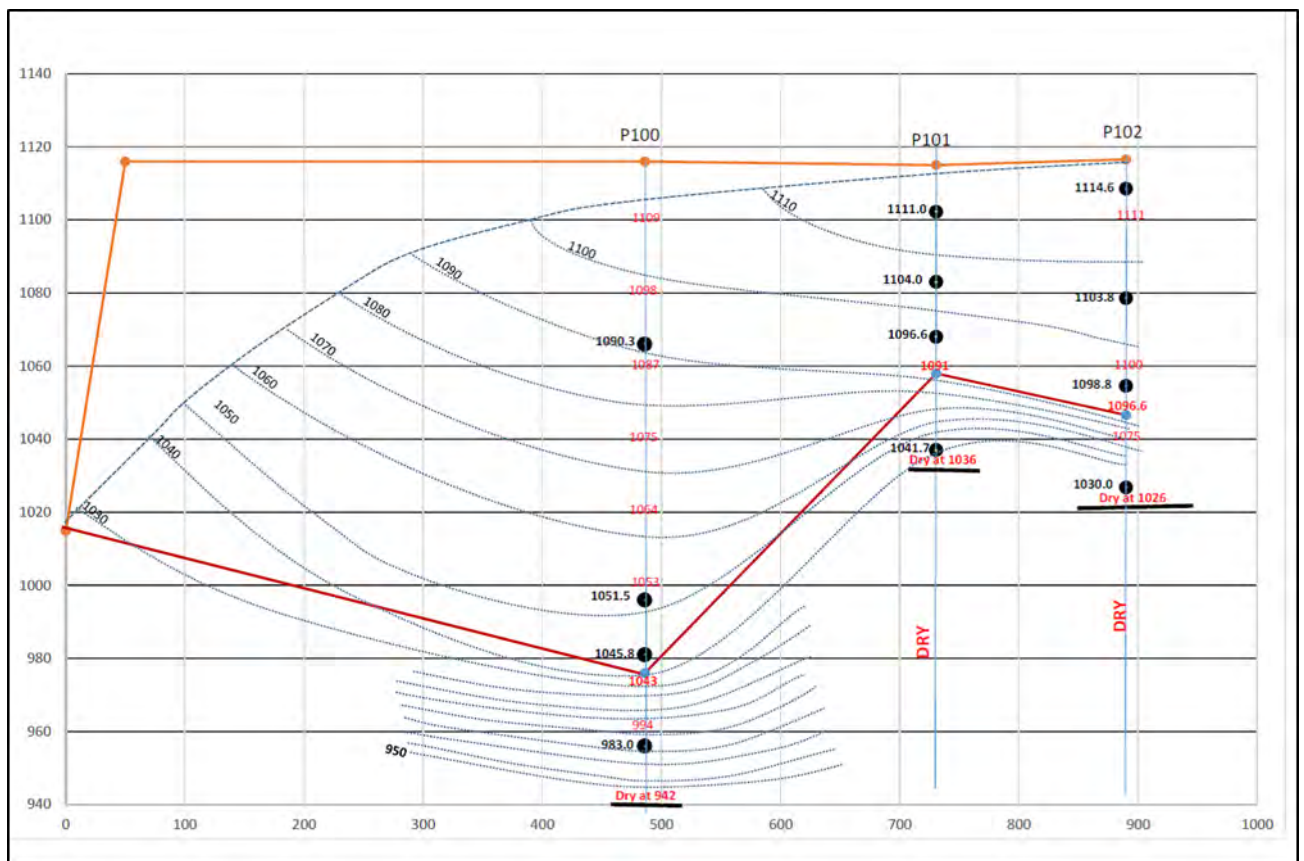






Figure 32: P100 to P102 Pressure profile

Key:	
	Contact between Andesite and younger volcanics
1234 ●	Measured pressure elevations (mine datum 16/12/16)
1234	Calculated Pressure elevations
	Approximate ground surface
	Phreatic surface
	Pressure contours (mRL mine datum)

6 SETTLEMENT MONITORING

Condition 13b of the Extended Martha Mine consent requires the identification of any environmentally important trends in settlement behaviour. Condition 13d of the same consent requires that a comparison of the settlement survey data with that predicted for the consent.

A reassessment for the settlement prediction was conducted for the Trio Development Project (Engineering Geology, June 2010). This review assessed the effect of pumping from the Martha pit to draw down the groundwater level progressively to 755 mRL, which would also dewater the connected Trio system.

Another reassessment was conducted for the Correnso Underground project (Engineering Geology, 2012). The report recommended new trigger levels for settlement based on additional depressurisation of the Andesite layer (Table 6).

Seven settlements zones were defined around the Martha Mine pit in 1999, extending to the outskirts of Waihi. The zones were established based on the first ten years (pre-extension) of settlement history having regard to the then current knowledge of the thickness and composition of compressible materials (such as ash-soils, alluvium, lake sediments, and unconsolidated younger volcanic deposits) and the expected effect from Martha Mine dewatering.

Table 6 - Table of Predicted Settlement with Correnso Trigger Levels

Zone	New Trigger Levels (mm) Correnso (2013)
Settlement Zone 1	35
Settlement Zone 2	45
Settlement Zone 3	70
Settlement Zone 4	125
Settlement Zone 5	195
Settlement Zone 6	240
Settlement Zone 7	400

The settlement measured is an accumulation of all causes of settlement. Generally, this is considered to be the result of mine dewatering, but close to the mines and (in the case of Favona) overlying the mine areas, additional settlement may be the result of primary settlement (as opposed to secondary settlement, which is the process in the Martha groundwater system where historic dewatering resulted in groundwater levels dropping to lower elevations for a longer time period than is proposed for current mining activity). Nevertheless, it is the total settlement that is discussed in this report as settlement due to dewatering alone cannot be separated from other causes.

Comment is provided in relation to the predicted settlements given in Table 6 and these comments are expanded on where monitoring data shows exceedance of the values.

6.1 Method

The initial settlement survey network was established in 1980 during the exploration phase of the project and has been regularly monitored since December 1987. Over the course of the project, settlement survey marks have been added, removed or replaced, as required, to extend the network or to compensate for damaged sites.

Figure 33 shows the location of the Martha Mine settlement marks monitored by OGNZL up to the end of 2017. Also, included on Figure 33 are the defined subsidence hazard zones related to historical underground mine stopes and shafts (IGNS, 2002). Figure 34 provides the settlement

monitoring marks across the Favona Mine and shows the locations of the Favona Mine workings in relation to the marks. Figure 35 provides the marks identified as triggered during the November 2017 survey.

Settlement monitoring was undertaken in May and November 2017 across the settlement network surrounding Waihi Township (refer Appendix C) and also along the Favona network which is an extension of the Martha mine survey network (Figure 33). Appendix B presents the two summary settlement monitoring reports.

The raw data provided by the surveyors has been graphed and where changes in the record are apparent as a result of mark relocation or replacement, corrections have been applied using graphical projection so that total settlement over the life of mining can be determined for each location. The correction process applied was as follows:

- Updating the time-history graph for all data from settlement markers with data up to 1/11/2017.
- Where changes in the time-history graph identified a datum change, a correction was arrived at by projecting the initial data visually on the graph to the time of the new datum and a correction calculated. A smooth settlement curve resulting after the correction was applied and similarity of curve shape to those of adjacent marks was taken as indicating an acceptable correction.
- Where marks were installed in May 1999, the previously determined settlement for that location from 1988 to 1999 was applied as a correction
- Where marks were installed or changed other than in May 1999, the previously assessed settlement at the location as at May 1999 was used with “Goal Seek” on the (Excel) spreadsheet to correct the values to be consistent with the May 1999 value.
- For Favona marks, settlement values as at 1/12/2005 were assessed for each location and used to correct the new marks to account for settlement from 1988 to 2005.
- The corrected data has then been used to generate:
 - Settlement-time trend graphs for each zone
 - Plans of total settlement
 - Contours of total settlement
 - Calculation of tilt.
 - Settlement-time trend graphs of specific areas
- Where Favona development has affected settlement, a projection of the pre-Favona mine settlement trend has been made as a means to estimate the current Martha Mine settlement and this settlement value has been subtracted from the total measured settlement to provide an estimate of the settlement due to the Favona Mine development.

In 2017, 83% (332/399) of the marks were not triggered. 67 marks were triggered with 42 of these related to Favona.

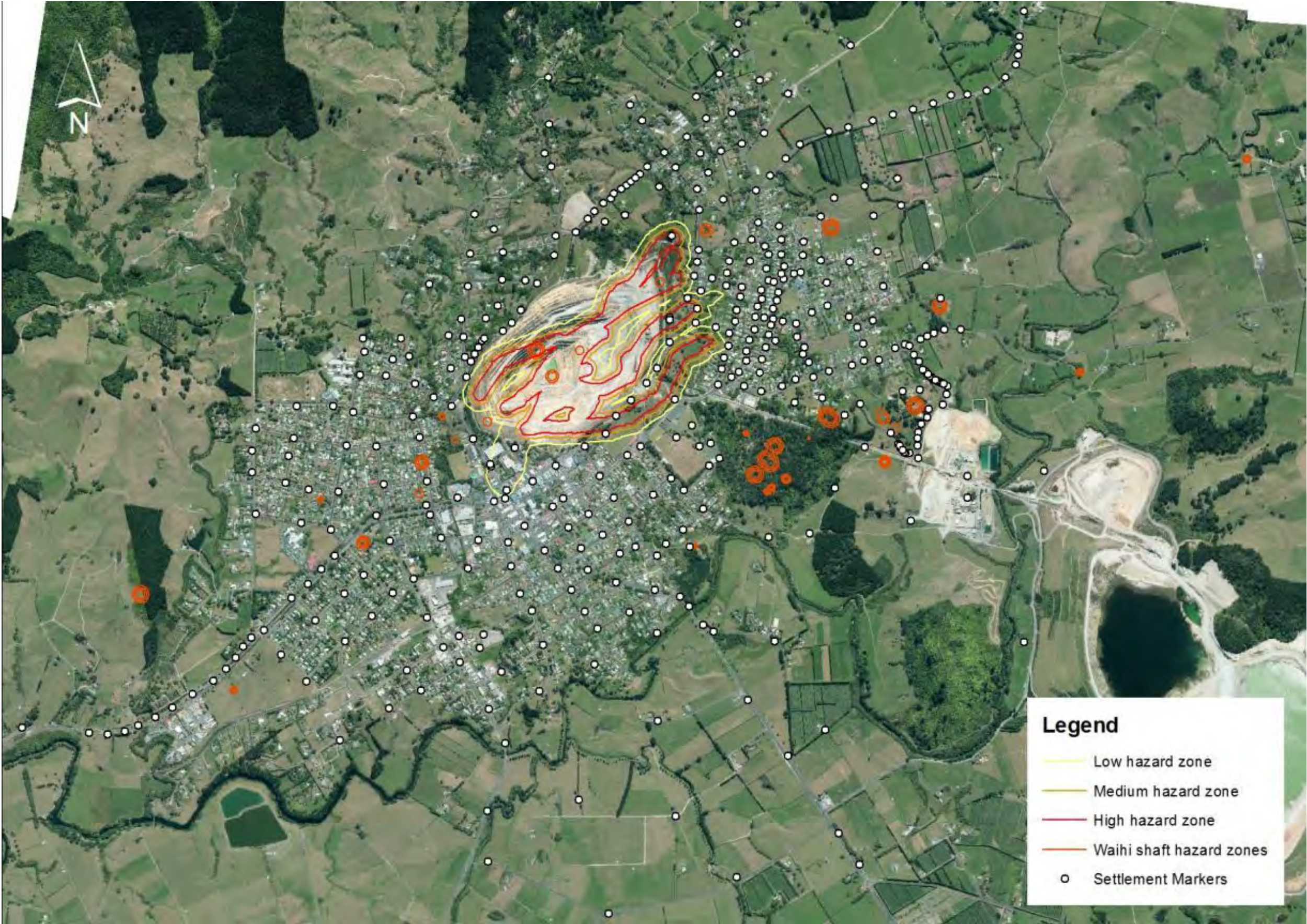


Figure 33 - Settlement Marker Location Plan & Hazard Zones





Figure 34 - Favona Mine Settlement Markers



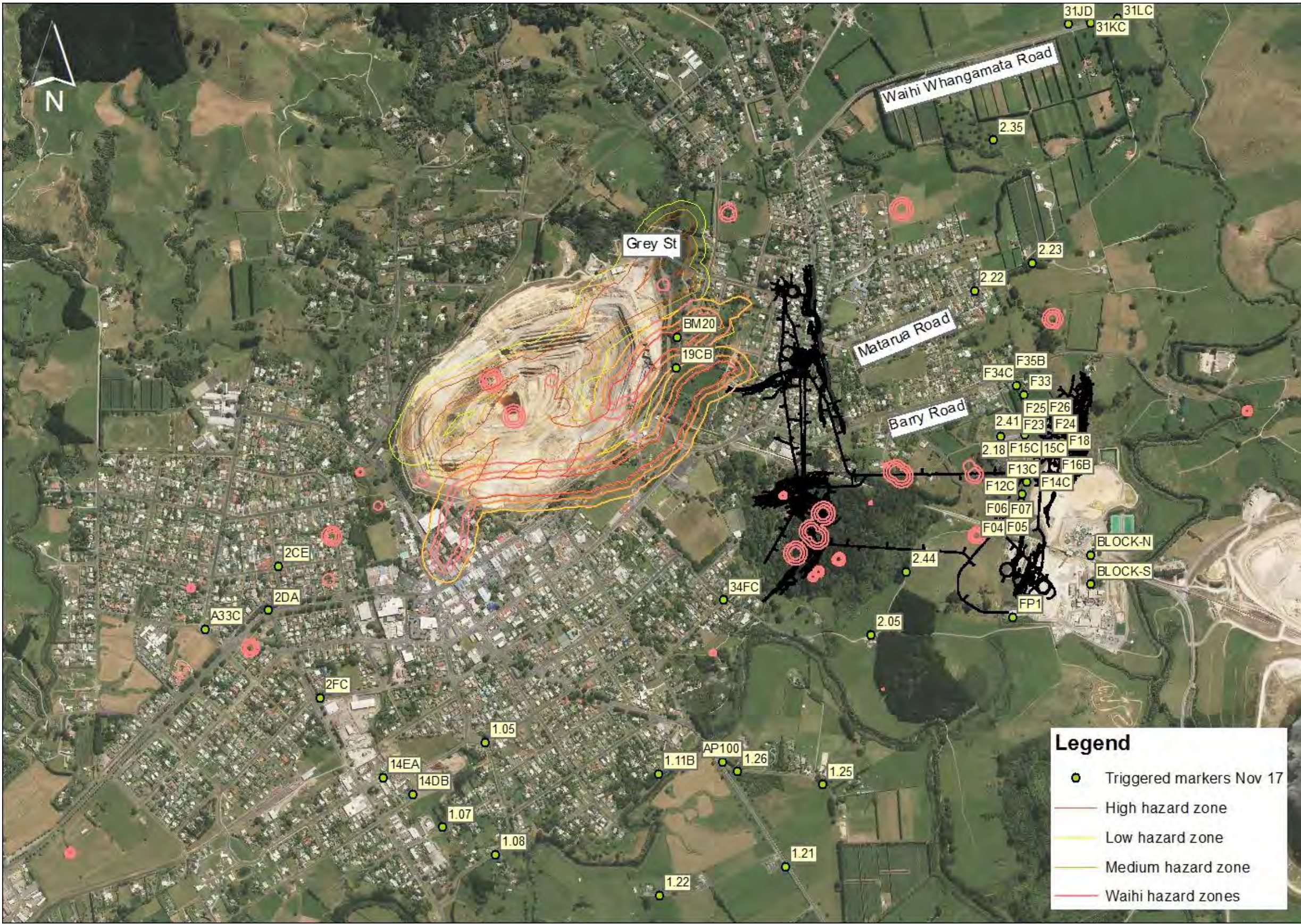


Figure 35: Nov 2017 triggered settlement markers, hazard zones and underground workings

NB: Not all marks are able to be labelled due to marker congestion



6.2 Results

Appendix C presents plans showing settlement marks, settlement values and settlement contours.

Time-history plots of settlement survey data for each zone are presented in Appendix D. The plots also depict the zone settlement predictions (for the Martha Extended Project, Trio Development and Correnso project) shown as horizontal lines on each set of graphs.

The projected trends and the maximum settlements are provided on the graphs in Appendix D. Key trends are described below.

Figure 35 displays the 67 triggered settlement markers from the November 2017 survey. The majority (42) are close to the Favona Underground, two are east of the pit near historic workings and the remaining 23 are in the wider area of Waihi.

6.2.1 ZONE 1 – Trigger 35mm

The Zone 1 time-history plot (Appendix D) shows two groupings, one without settlement or little settlement, the other showing a general increase in the rate of settlement after about 1999 of some 15 to 25 mm. To further assess these observations the marks for Zone 1 were re-plotted as groups namely:

- Zone 1 along Waihi Whangamata Road (see Figure 36)
- Zone 1 south of Waihi (see Figure 37)
- Zone 1 west of Waihi (see Figure 38)
- Zone 1 north of Waihi (no trends evident)

This grouping shows that the marks with a slow downward trend are located along Waihi Whangamata Road to the east of Waihi and to the south of Waihi, not in marks to the north and west of Waihi. A similar pattern of 15 to 25 mm of settlement from about 1999 can also be observed in most markers in Zones 2 to 6, suggesting that there is a small and widespread effect occurring.

These observations suggest the following:

- The widespread 15 to 25 mm settlement observed from about 1999 at many Zone 1 marks and also the Zone 2 to 6 marks is a response to the ongoing dewatering of the deeper structures in the Andesite rock body (fracture depressurisation) as a result of Mine dewatering. This is a broad effect and has negligible influence on differential tilt between marks.
- The settlement evident at marks in the vicinity of the Favona Mine is in response to the dewatering of the deeper structures linked to that system and to rockmass relaxation into mining voids.
- The stable water levels in the wells monitoring the deeper younger volcanic materials and the upper Andesite layers show that the observed settlement behaviour is not related to on-going consolidation of these materials at these locations as no on-going dewatering is evident at these locations.
- Marks to the west of Waihi were adjusted by the surveyor. The levelling mark was noted to have decreased in the previous survey. Therefore, all marks to the west of Martha pit that 'calibrate' from the levelling mark had to decrease. In some instances this caused a 10mm reduction in level. This reduction is not mine related.

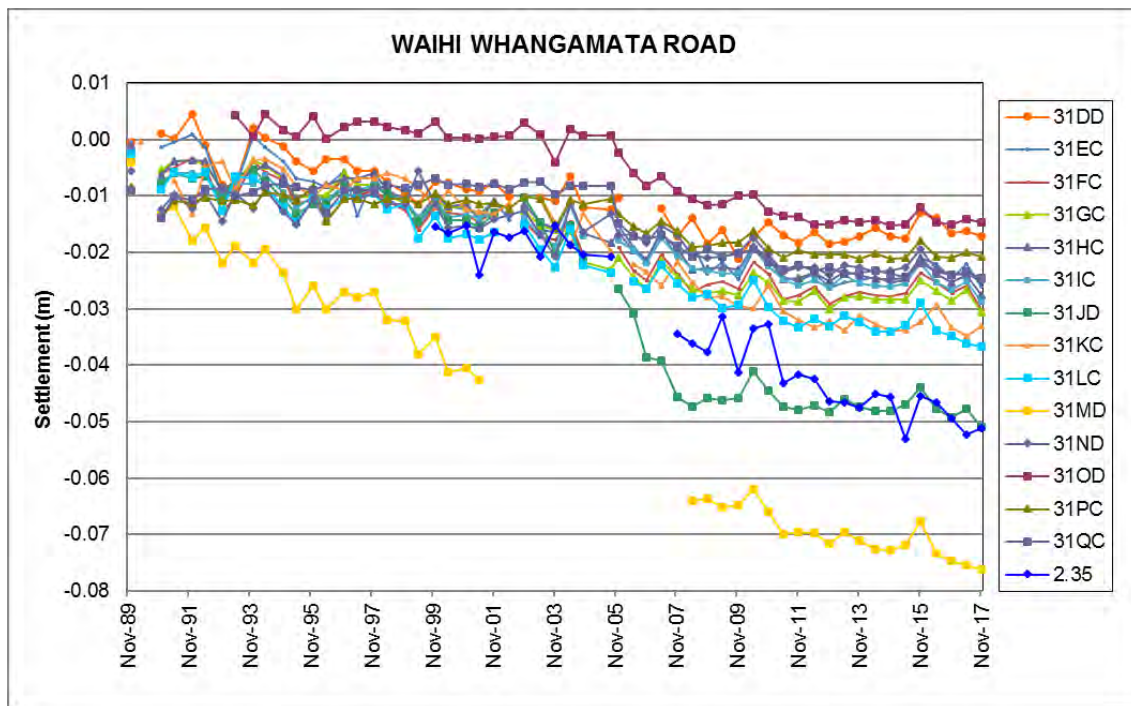


Figure 36 - Zone 1 Waihi Whangamata Road

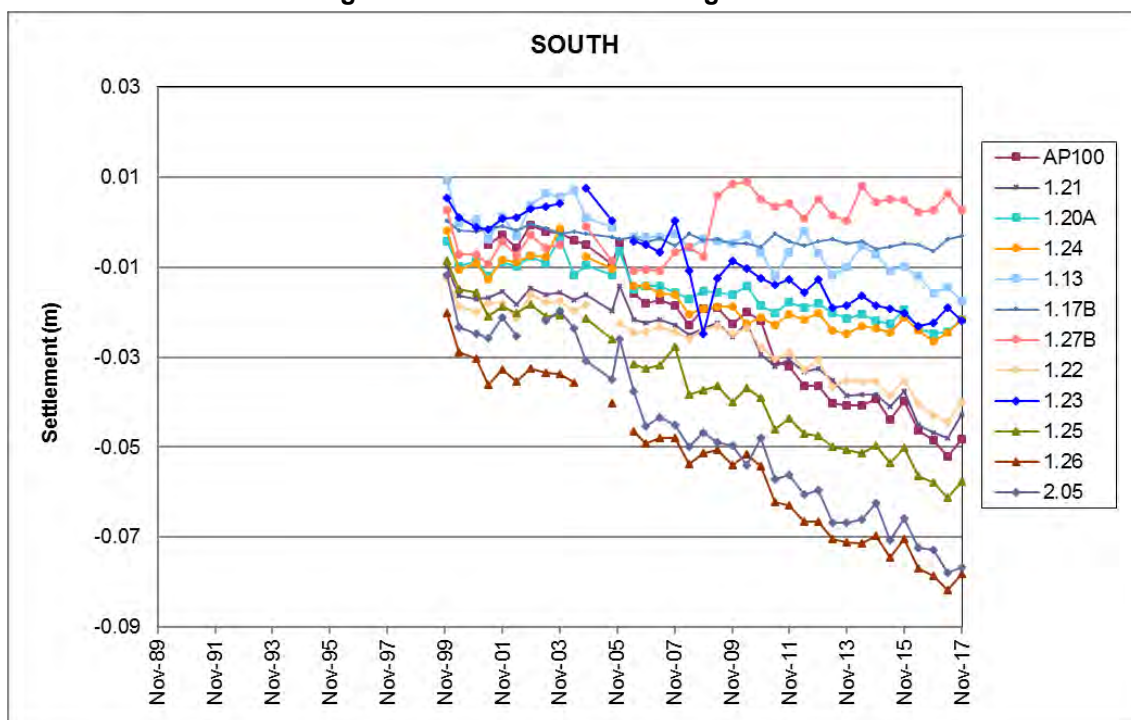


Figure 37 - Zone 1 South of Waihi

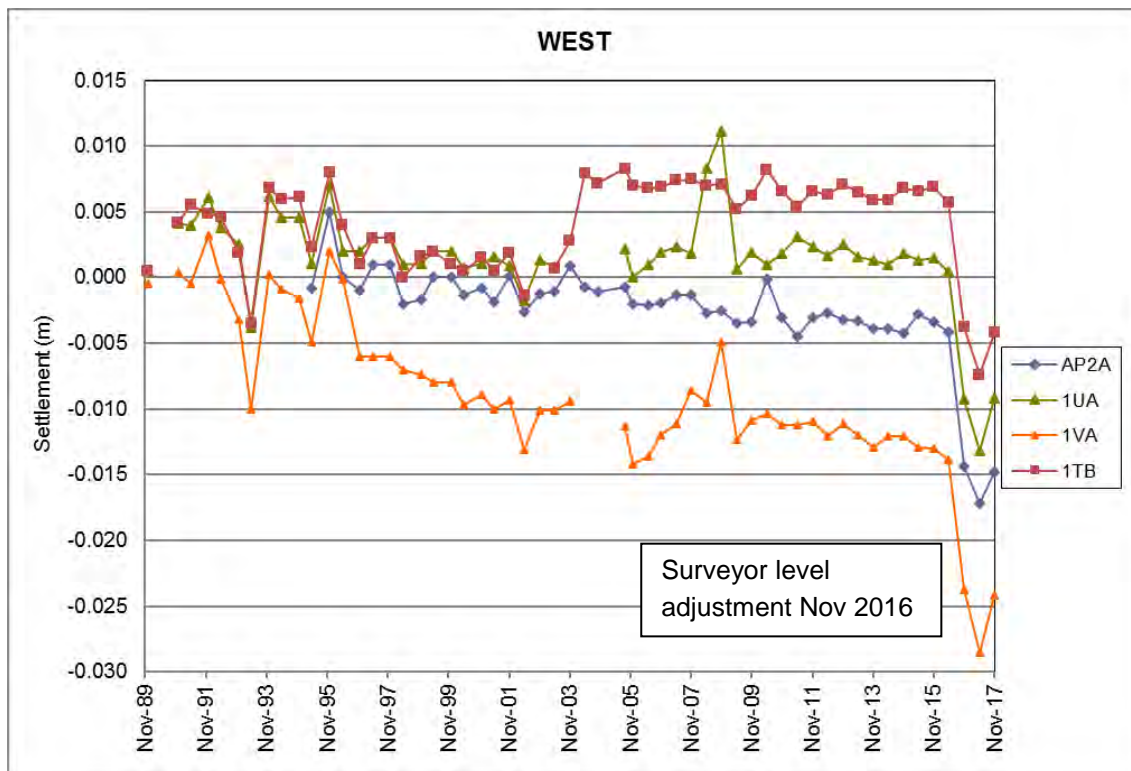


Figure 38 - Zone 1 West of Waihi

The absence of widespread effect from Favona dewatering supports the current geological and hydrogeological models.

Anomalous results shown on the Zone 1 time – history plot are discussed below.

1.21	This mark on SH 2 has shown a steady rate of settlement which began prior to Trio mining.
1.22	West of 1.21 down a private driveway, this mark has also shown a steady settlement rate similar to 1.21.
1.25	This mark on Heath Road to the south of Waihi probably indicates an extension of Zone 5.
1.26	This mark is located near Zone 5 at the junction of Heath Road and SH2 and parallels mark 1.25. Its behaviour has been similar to 1.25.
AP100	This mark on State Highway 2 is near to 1.26 and may be behaving similarly.
2.05	This mark is near Winner Hill and like other marks to the south of Waihi indicates an acceleration of settlement after 2003 or possibly 2004. Local slope movement is indicated to be affecting this site; 2.05 is adjacent to mark 2.44 (discussed in earlier monitoring reports).
2.35	This mark is south of Waihi Whangamata Road and close to a Zone 3 boundary. The data suggests an acceleration of settlement after September 2005, however neighbouring marks in Zone 3 have similar settlement values indicative of a general trend in this area.
2.44	It has been investigated in the past and the cause has been attributed to some localised surface movement.
31MD	This mark is on Waihi Whangamata Road to the east of Martha Mine; it has shown consistent settlement since 1989 while other Waihi Whangamata Road marks show accelerated settlement from 2005 to 2007. The behaviour is considered to reflect localised impact.
31JD	This mark is also along Waihi Whangamata Road. This mark shows a similar pattern to the other Waihi Whangamata Road marks, but the response has been accentuated. While the 2005-2007 acceleration coincides with Favona dewatering, there has been negligible settlement since 2007 which infers other influences.
31KC	This mark has just reached the trigger level at 35.9mm and is part the Waihi Whangamata Road series.
31LC	This mark has just reached the trigger level at 36.7mm and is part the Waihi Whangamata Road series.

BM28/2 lies to the north of Martha Mine pit on upper Bulltown Road. It has not triggered and the data shows the ground surface to be rising and may reflect local movements unrelated to the mine.

The 31 series marks along Waihi Whangamata Road generally exhibit settlement greater than predicted from 2005 to 2007, then negligible settlement since. These results may well be related to road works and associated road surface settlements.

6.2.2 **ZONE 2 – Trigger 45mm**

The time-history plot for Zone 2 (Appendix D) shows most Zone 2 marks to be tracking less than the predicted maximum settlement rate with only a few exceeding the predicted maximum settlement. As with Zone 1 most of the marks exhibit 15 to 25 mm settlement since about 1999. Anomalous movements are discussed below.

2CE	This mark lies to the west of Martha Mine. Settlement accelerated between 1991 and 1995 and took the settlement below the predicted zone maximum. Thereafter, settlement has stabilised at a similar rate to that of the other marks in the zone.
2DA	This is a new mark triggered. It is close to 2CE and near the edge of Zone 5.
2FC	This too is a new triggered mark. It is SW of the pit and near the edge of Zone 4.

A33C	This mark also lies to the west of Martha Mine and is on Kensington Road. Like mark 2CE this mark showed early acceleration before stabilising and following the settlement rates of the other markers.
14DB	This mark is located on Bradford Street southwest of Martha Mine. The record shows a linear rate of settlement over the full record.
1.07	A newly triggered mark with a long period of settlement. It is SW of the pit and near the edge of Zone 4.
1.08	A newly triggered mark with a long period of settlement. It is SW of the pit and near the edge of Zone 4.
1.11B	This mark is close to AP100 and seems to be behaving similarly as the Zone 1 anomalies, with a long period of settlement.
14EA	A newly triggered mark with a long period of settlement. It is SW of the pit and near the edge of Zone 4.
FP1	Located near the underground portal this mark is near the edge of Zone 3. This mark reported adjusted settlement greater than the trigger at its first record in 2009. The mark has shown positive and negative movement since installation. It could be influenced by Favona dewatering or is perhaps disturbed.
Block-S	This mark is located near the mill at Baxter's Rd. Like FP1, this mark reported adjusted settlement greater than the trigger at its first record in 2009. The mark has shown positive and negative movement since installation. It could be influenced by Favona dewatering or perhaps disturbed.

Groundwater records in these areas show no ongoing dewatering or only minor water level changes in the deeper Younger Volcanic materials or the upper Andesite rock mass. With no significant water level change except in the structures in the Andesite rock body, the anomalous responses observed are considered to be localised impacts.

6.2.3 **ZONE 3 – Trigger 70mm**

Zone 3 is the first zone with predicted settlement that may be greater than seasonal ground movements. This zone is predominantly to the east of the Martha mine and includes the Favona mine, with two small zones to the south and one small zone to the north.

Inspection of the time-history plot for Zone 3 shows most marks (30) have moved less than the predicted maximum rate and maximum settlement for the zone. 10 marks have exceeded the latter criterion.

Five of the marks exceeding the maximum settlement for the zone are located to the south east of Waihi and towards Favona Mine. These marks are listed in Table 7. To check whether the initial corrections (1988 to 1999) were acceptable, data for BM23, a long-term record from Zone 4 and close to these marks was plotted on the Settlement Zone 3 graph (Appendix D). This showed the corrections as not excessive and the corrected settlements are considered representative.

Table 7 – Martha Marks Affected by Favona Dewatering

Mark	Location	Martha Settlement (mm)	Favona Settlement (mm)
2.18	End of Boyd Road (west of 2.41)	43	57
2.19B	Barry Road	59	47
2.22	Mataura Road	41	32
2.23	Mataura Road	47	40
2.41	Adjacent to & west of Favona workings	39	79

The on-going settlement assigned to Martha Mine dewatering and the onset of settlement assigned to Favona dewatering are considered to reflect the consolidation of the deeper Andesite rock, specifically the rock mass containing the vein structures, and is unlikely to be related to any additional consolidation of the alluvium, younger volcanic materials or upper Andesite materials. Since 2006, most of these marks have stabilised and settlement has moderated.

Mark 34FC defines the area south of Martha Mine at the corner of Clark and George St. This small area of Zone 3 lies within a strip of Zone 6 reflecting more compressible material. The location is also near a bank of ash material and the exceedance of the predicted zone settlement may have been influenced by some localised disturbance. The marks in Zone 6 either side of 34FC are well within their predicted settlement values.

Block-N is located near the Mill at Baxter's Rd. The mark has shown positive and negative movement since installation. It could be influenced by Favona dewatering or perhaps disturbed.

Mark 1.05 is located in a small isolated area of Zone 3 west of Martha pit. This may be better positioned in Zone 4. Mark 15C has also recently triggered and is located near mark 1.05.

6.2.4 ZONE 4 – Trigger 125mm

Zone 4 time-history plots (Appendix D) show that one mark has exceeded the predicted maximum settlement for this zone. 23AB exceeded for the first time in May 2017 but did not exceed in the November survey. It is located north of Barry Rd.

6.2.5 ZONE 5 – Trigger 195mm

The data for the Zone 5 marks are provided in the time-history plot in Appendix D. Marks BM20 and 19CB are the only marks that continue to exceed the predicted maximum settlement and, as has been discussed in previous reports, it is considered they should have been assigned to Zone 7. BM20 was also noted as disturbed by the surveyor.

No residential properties are affected in the vicinity of these marks.

6.2.6 ZONE 6 – Trigger 240mm

The settlement in this zone is shown on the Zone 6 time-history plot in Appendix D. This zone extends through the centre of the Waihi commercial area. No exceedances of the predicted maximum settlement are indicated.

6.2.7 ZONE 7 – Trigger 400mm

Zone 7 settlements are all within the predicted maximum settlement (Zone 7 time-history plot, Appendix D). No new trends are indicated.

6.3 Favona Settlement

Settlement in the vicinity of the Favona Mine has a component of settlement due to Martha Mine dewatering as well as settlement related to Favona Mine dewatering.

A separation of total settlement into Martha and Favona settlement components has been undertaken by projecting the settlement evident before the commencement of the Favona Mine and accepting these projected settlements as Martha settlements. The difference between the projected (Martha) settlement and total measured settlement has been taken as the Favona component of settlement. Table 8 sets out the total settlement, the settlement attributed to Martha dewatering and the settlement attributed to Favona Mine dewatering as assessed for the Favona Mine settlement markers.

Table 8 - Separation of Settlement – Favona Marks (Nov 2017)

Mark	Total Settlement (mm)	Martha Settlement (mm)	Favona Settlement (mm)
F02	107	50	57
F03	123	46	74
F04	104	44	57
F05	102	46	53
F06	104	40	61
F07*	158	42	68
F08A	113	44	69
F09A	130	38	92
F10B	160	44	116
F11C	160	42	118
F12C	139	39	100
F13C	137	55	82
F14C	141	60	81
F15C	135	55	80
F16B	165	55	110
F17B	212	55	157
F18	253	49	204
F20	218	44	174
F21	197	43	154
F22	185	42	143
F23	182	49	133
F24	174	42	132
F25	169	49	120
F26	153	45	108
F27B	131	50	81
F28B	133	49	84
F29B	123	48	75
F30B	127	52	75
F31B	124	55	69
F32B	117	49	68
F33	124	52	72
F34C	156	58	98
F35B	111	61	50

* Disturbed by 40+mm

The largest settlement at Favona Mine occurs where the markers overlie mine workings (marks F16B to F26). The maximum predicted settlement over the workings from dewatering was assessed as 80 mm, with mine dewatering related settlement not extending into the urbanised area. The actual total settlement and the extent of settlement exceed the predictions for the dewatering settlement. The difference between the predictions and measured settlement is considered to reflect depressurisation and consolidation of the Andesite rock body, which was not considered in the initial predictions. Andesite rock was considered to be a stiff material with negligible consolidation characteristics, but the long-term settlement observed in response to Martha Mine dewatering (in Zones 1 to 6, discussed above) suggests that some minor consolidation of the deeper Andesite rock is occurring, possibly as a response to fracture depressurisation. In addition, some further relaxation of the rockmass towards the mine workings may be occurring, and this may be providing further volume reduction of the Andesite rockmass in the vicinity of the mine.

Another potential influence is that the Favona Andesite has been undergoing primary consolidation, as current water level monitoring data suggests that the Favona system was not dewatered to the

same extent as the Martha groundwater system during historic mining in the early 1900's. Consolidation predictions for Favona were made based on Martha's second dewatering consolidation data. The amount of primary consolidation is greater for the first time of dewatering compared to the second or subsequent times of dewatering. This is because the first cycle of dewatering results in preconsolidation and an increase in the stiffness of the ground, and subsequent re-watering does not result in full rebound of levels to their original levels.

6.4 Trio Underground

The only anomalous result in the vicinity of Trio Underground has been apparent settlement at mark 2.44 (located on a farm track between Union and Black Hill) with pronounced acceleration since the May 2010 survey. This was investigated and determined to be related to a shallow pre-existing landslide, not any mine influence. The mark will continue to be monitored on a biennial basis as per other survey marks, but will not be included in any settlement profiling.

6.5 Summary

The analysis of the data to the end of 2017 continues to indicate that current slow settlements associated with Martha Mine are likely to be related to dewatering of the deeper structures within the Andesite rock mass. Groundwater monitoring data does not show any widespread or significant ongoing dewatering of alluvium, Younger Volcanic materials or the upper layers of the Andesite rock body.

Settlement triggers include modification to Martha Mine Extended pit associated with the cutback projects; the extended duration of dewatering at Martha Mine; assumptions made in the Favona settlement predictions (fracture depressurisation, secondary rather than primary consolidation); and localised natural, induced and historic effects.

The area around Martha Mine of greatest settlement is adjacent to the eastern pit wall where the weaker younger volcanic rocks are thickest and dewatering of this geological unit is greatest. This is also an area that has historic underground workings that have not been backfilled.

The main area of settlement at Favona overlies the workings, is directly under farmland and within the area of Company owned land. Outside the workings area, settlement reduces at a relatively constant rate. The conditions giving rise to settlement at Favona differ from those in the Martha Groundwater System as the latter has been dewatered to a greater extent for a longer time than the current dewatering while the former has not been previously dewatered. While settlement has exceeded initial estimates at Favona, those estimates were based on Martha settlement data which was responding to secondary consolidation. The primary consolidation at Favona has contributed to the greater settlement than predicted.

In relation to Trio, Correnso and SUPA mines, these are located in the dewatered Martha Groundwater System and settlement as described in this document has already been developing in those areas in response to Martha Mine dewatering. Also, as these are linked to the Martha system, settlement will be based on additional consolidation.

7 TILT

7.1 Martha

The settlement contingency plan requires those facilities identified by the Company as being potentially at risk of damage from ground settlement caused by mine dewatering to be addressed. (As noted above, settlement from all causes is considered in this document).

Tilt has been calculated from the corrected surveyed marks at a point where contours are shown to be closest to the total settlement plan. One mark from the routine survey exhibited greater tilt than 1:1000 during the 2017 surveys in relation to Martha settlement (Table 9). This was most likely related to a nearby surface slump.

7.2 Favona

Locations surveyed in 2017 with tilt values steeper than the 1:1000 criterion between adjacent marks are listed in Table 9. The locations of the marks in relation to the Favona mine workings are shown in Appendix C.

Table 9: November 2017 Tilt Results for Favona, Martha, Correnso and SUPA Marks

	Mark	x	y	Distance (m)	Nov 2017 (m)	Abs	Δh (m)	Tilt (1:X)
--	------	---	---	--------------	--------------	-----	--------	------------

Favona

F02	3097.60	490.00	9.07	-0.1075	0.1075			N/A
F05	3104.66	455.54	35.18	-0.1023	0.1023	0.0052		6766
F08A	3126.97	430.49	33.54	-0.1132	0.1132	0.0109		3077
F09A	3157.20	388.28	51.92	-0.1305	0.1305	0.0173		3001
F10B	3176.88	446.75	61.69	-0.1603	0.1603	0.0298		2070
F11C	3192.52	479.44	36.24	-0.1618	0.1618	0.0015		24190
F12C	3207.32	503.82	28.52	-0.1393	0.1393	0.0225		1268
F13C	3236.43	533.63	41.66	-0.1372	0.1372	0.0021		19840
F14C	3275.29	551.31	42.69	-0.1417	0.1417	0.0045		9485
F15C	3297.17	585.32	40.44	-0.1350	0.1350	0.0067		6036
F16B	3367.38	578.70	70.52	-0.1659	0.1659	0.0309		2282
F17B	3405.48	613.91	51.88	-0.2126	0.2126	0.0467		1111
F18	3423.83	648.30	38.98	-0.2533	0.2533	0.0407		958
F21	3405.99	672.00	29.66	-0.1971	0.1971	0.0562		528
F24	3388.13	690.85	25.97	-0.1744	0.1744	0.0227		1144
F27B	3372.41	717.52	30.96	-0.1311	0.1311	0.0433		715
F29B	3363.20	738.71	23.11	-0.1236	0.1236	0.0075		3081
F32B	3348.78	769.10	33.64	-0.1172	0.1172	0.0064		5256
F33	3348.56	812.51	43.41	-0.1248	0.1248	0.0076		5712
F34C	3339.49	849.57	38.15	-0.1564	0.1564	0.0316		1207
F35B	3336.68	896.06	46.58	-0.1119	0.1119	0.0445		1047

Martha

20BB	2533.26	1622.29		-0.0794	0.0794			
20AC	2461.04	1536.91	111.83	-0.0964	0.0964	0.0170		6565
BM20A	2345.50	1484.90	126.71	-0.1200	0.1200	0.0236		5369
20D	2482.07	1473.48	137.05	-0.1121	0.1121	0.0079		17344
19CB	2296.71	1381.40	206.97	-0.2573	0.2573	0.1452		1425
19BB	2191.56	1292.02	138.00	-0.2765	0.2765	0.0192		7178
BM19B	2117.17	1244.36	88.35	-0.2808	0.2808	0.0043		20672
17CB	2014.23	1201.01	111.70	-0.2895	0.2895	0.0087		12839

17BB	1919.52	1160.79	102.90	-0.2336	0.2336	0.0559	1841
17AB	1841.32	1104.80	96.18	-0.1759	0.1759	0.0577	1667
BM17A	1724.44	1088.92	117.95	-0.1131	0.1131	0.0628	1878

North Wall

27AB	2009.08	2064.33		-0.0170	0.0170		
26Q	1963.00	1982.71	93.73	-0.0242	0.0242	0.0072	13018
26R	1905.59	1927.17	79.88	-0.0272	0.0272	0.0030	26626
26PB	1834.84	1893.11	156.38	-0.0288	0.0288	0.0016	97734
26OB	1706.93	1812.27	229.49	0.0042	0.0042	0.0246	9337
26NC	1641.16	1772.40	228.22	-0.0091	0.0091	0.0049	46766
26MB	1593.46	1750.66	122.11	-0.0196	0.0196	0.0073	16727
26JB	1495.71	1756.55	93.74	-0.0135	0.0135	0.0065	14422
BM26	1542.45	1837.81	100.98	-0.0200	0.0200	0.0004	252452
3.09	1618.51	1870.17	217.54	-0.0269	0.0269	0.0227	9592

Correnso

25E	2472.35	1162.01		-0.1074	0.1074		N/A
25B	2497.67	1105.83	61.63	-0.1070	0.1070	0.0004	154064
25I	2537.20	1045.04	72.51	-0.1228	0.1228	0.0158	4589
24CD	2603.21	987.72	87.42	-0.1293	0.1293	0.0065	13450
24H	2630.70	1072.28	88.92	-0.0966	0.0966	0.0327	2719
24B	2667.67	1126.40	65.54	-0.0831	0.0831	0.0135	4855
24G	2705.96	1170.46	58.38	-0.0963	0.0963	0.0132	4422
24L	2761.67	1181.33	56.76	-0.0972	0.0972	0.0009	63062
24AC	2743.58	1218.90	41.70	-0.0936	0.0936	0.0036	11584
24F	2772.80	1257.27	48.23	-0.0938	0.0938	0.0002	241171
BM24	2794.55	1279.36	31.00	-0.0843	0.0843	0.0095	3263
24E	2758.43	1303.23	43.29	-0.0890	0.0890	0.0047	9212
24DC	2718.29	1323.13	44.80	-0.0881	0.0881	0.0009	49781
24I	2692.57	1269.71	59.29	-0.0966	0.0966	0.0085	6950
25H	2648.48	1232.96	57.40	-0.1014	0.1014	0.0048	12033
25CB	2615.91	1190.50	53.51	-0.1057	0.1057	0.0043	12567
25G	2594.60	1149.42	46.28	-0.1030	0.1030	0.0027	17413
25F	2542.53	1116.24	61.74	-0.1025	0.1025	0.0005	123472
25B	2497.67	1105.83	46.06	-0.1070	0.1070	0.0045	10235
BM25	2424.91	1100.25	72.97	-0.1245	0.1245	0.0175	4170
25E	2472.35	1162.01	77.88	-0.1074	0.1074	0.0171	4554
25A	2505.13	1203.77	53.09	-0.1206	0.1206	0.0132	4022
25D	2547.05	1248.02	60.95	-0.1075	0.1075	0.0131	4653
21DC	2573.96	1304.15	62.25	-0.1174	0.1174	0.0099	6288
21N	2623.25	1342.44	62.41	-0.0911	0.0911	0.0263	2373
21C	2651.57	1389.82	55.20	-0.0907	0.0907	0.0004	138006
21M	2694.90	1439.65	66.03	-0.0734	0.0734	0.0173	3816
21BC	2719.27	1477.80	45.27	-0.0717	0.0717	0.0017	26678
21EB	2799.95	1429.09	94.24	-0.0847	0.0847	0.0130	7250
24K	2783.89	1387.72	44.38	-0.0752	0.0752	0.0095	4672
24J	2749.39	1365.76	40.89	-0.0763	0.0763	0.0011	37177
24DC	2718.29	1323.13	52.77	-0.0881	0.0881	0.0118	4472
22F	2815.91	1325.41	97.65	-0.0752	0.0752	0.0129	7570
22C	2846.39	1352.54	40.80	-0.0957	0.0957	0.0205	1990

22G	2866.82	1385.23	38.55	-0.0739	0.0739	0.0218	1768
22BC	2916.75	1435.77	71.05	-0.0637	0.0637	0.0102	6965
22I	2918.98	1461.37	25.69	-0.0634	0.0634	0.0003	85646
22H	2869.25	1441.80	53.44	-0.0635	0.0635	0.0001	534378
21P	2849.17	1456.90	25.13	-0.0592	0.0592	0.0043	5844
21FB	2861.65	1512.21	56.70	-0.0525	0.0525	0.0067	8463
21Q	2899.60	1571.32	70.24	-0.0466	0.0466	0.0059	11905
21GC	2901.12	1614.05	42.76	-0.0501	0.0501	0.0035	12217
22K	2985.12	1610.91	84.06	-0.0493	0.0493	0.0008	105075
2.29	2955.27	1547.42	70.16	-0.0600	0.0600	0.0107	6557
22J	2944.47	1489.76	58.66	-0.0549	0.0549	0.0051	11502
22I	2918.98	1461.37	38.16	-0.0634	0.0634	0.0085	4489
22H	2869.25	1441.80	53.44	-0.0635	0.0635	0.0001	534378
21EB	2799.95	1429.09	70.46	-0.0847	0.0847	0.0212	3323
21BC	2719.27	1477.80	94.24	-0.0717	0.0717	0.0130	7250
BM21	2654.80	1515.40	74.63	-0.0747	0.0747	0.0030	24878
20F	2605.79	1575.98	77.92	-0.0677	0.0677	0.0070	11131
20E	2535.65	1542.67	77.65	-0.0665	0.0665	0.0012	64708
21C	2651.57	1389.82	191.84	-0.0907	0.0907	0.0242	7927
21N	2623.25	1342.44	55.20	-0.0911	0.0911	0.0004	138006
21DC	2573.96	1304.15	62.41	-0.1174	0.1174	0.0263	2373
25D	2547.05	1248.02	62.25	-0.1075	0.1075	0.0099	6288
25A	2505.13	1203.77	60.95	-0.1206	0.1206	0.0131	4653

SUPA

BM20A	2345.50	1484.90		-0.1200	0.1200		N/A
20D	2482.07	1473.48	137.05	-0.1121	0.1121	0.0079	17344
20C	2450.61	1413.86	67.41	-0.1888	0.1888	0.0767	879
21O	2527.37	1356.34	95.92	-0.1171	0.1171	0.0717	1339
19CB	2296.71	1381.40	232.01	-0.2573	0.2573	0.1402	1655
19BB	2191.56	1292.02	138.00	-0.2765	0.2765	0.0192	7178
34GC	2211.33	1119.52	173.63	-0.1741	0.1741	0.1024	1695
34C	1968.90	982.67	278.39	-0.1267	0.1267	0.0474	5873
2.10	2143.92	950.39	177.97	-0.0799	0.0799	0.0468	3803
34H	2233.59	970.56	91.91	-0.1517	0.1517	0.0718	1280
BM25	2424.91	1100.25	231.13	-0.1245	0.1245	0.0272	8498

	Above Mine Workings
	Tilt Greater than 1:1000

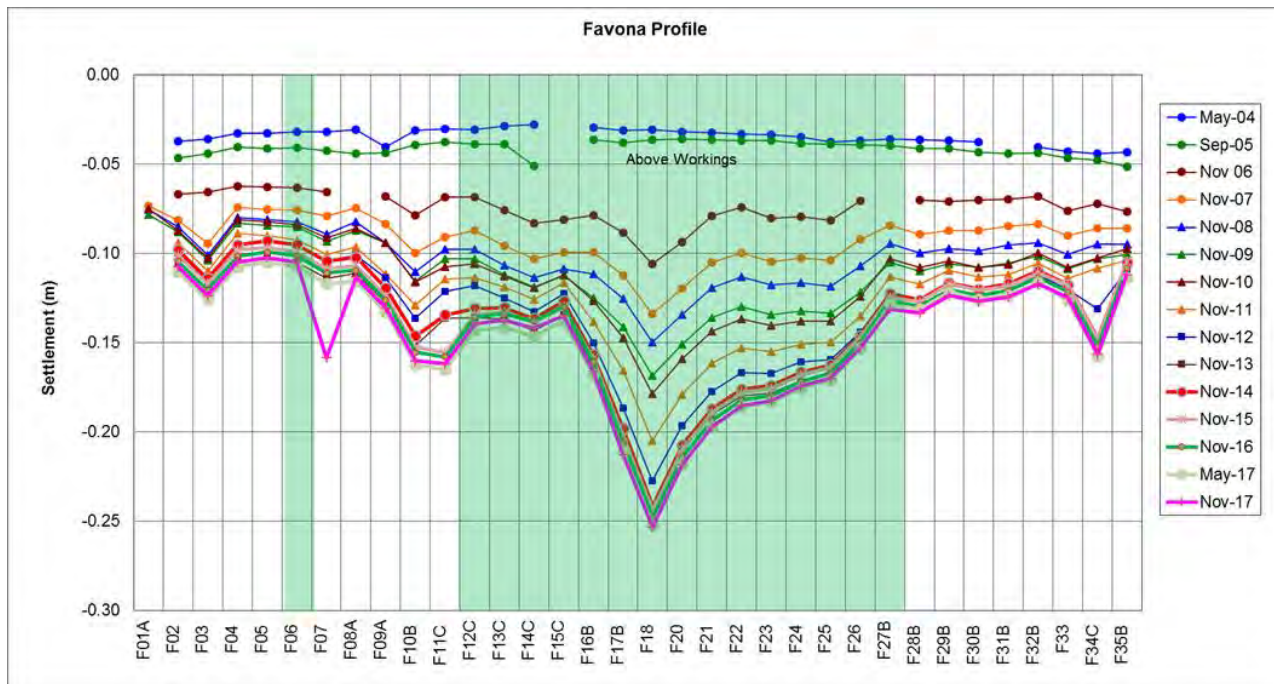


Figure 39: Total Favona Settlement



Figure 40: Favona Settlement Markers

Discussion

Favona Tilt

The results for Favona indicate no new trends compared with recent surveys.

Most marks showed less settlement than the previous May 2017 survey but greater settlement than the November 2016 survey. Mark F18 had the greatest settlement recorded (Figure 39). F18 has been listed by the surveyor as possibly disturbed. Mark F07 had a 40mm drop compared to the previous survey. It was noted a heavy vehicle tyre impression was over the mark and it was recorded as disturbed. F07 is not included in the tilt assessment as it is less than 25m to the nearest marks.

Tilt calculations greater than 1:1000 were determined in three locations (F17B/F18, F18/F21 and F24/27B). These were all located over underground workings. Tilt in this area has changed little since mining began, with small increases in tilt as the dewatered underground workings adjust compared to the adjacent land. These locations are on farmland owned by the company; are over 100m south of any non-company residences; and not considered to be an issue. Ongoing monitoring will continue and this will determine any anomalous results that need to be addressed.

Note 1: Marks F18, F20, F23, F24 & F25 have been identified by the surveyor as possibly disturbed or damaged, which could exacerbate the amount of settlement and tilt recorded.

Note 2: The Favona tilt calculation is calculated from the total settlement at each mark, without separation of any Martha effect. While the calculated tilt may not precisely reflect the tilt due to Favona alone, the discrepancy is considered to be minor.

Note 3: Mark F34C was identified as having been 'disturbed', probably by an excavator passing over the mark. Although this resulted in an anomalous settlement for the mark, the tilt between adjacent marks did not exceed 1:1000.

Note 4: Mark F07 is now identified as disturbed

Martha/North Wall Tilt

For Martha Mine, there was one tilt calculation greater than 1:1000; between marks 20C/20D. OGNZL believes the movement is not related to modern mining, but to the nature of the ground and historic unfilled stopes. This area has been identified as being near a high hazard zone.

Slevin Park is a swampy area, historically infilled with poor material and slumping/subsidence has occurred previously. We understand that HDC is also undertaking regular monitoring of this area. The nearest dwelling is 95m (Figure 41). 20D and 21O are new marks, first surveyed in 2014.

Three new marks (26R, 26OB, 26NC) were installed near the North Wall slip. These do not allow historic comparison with the older established marks. There was no indication of tilt in the November survey.

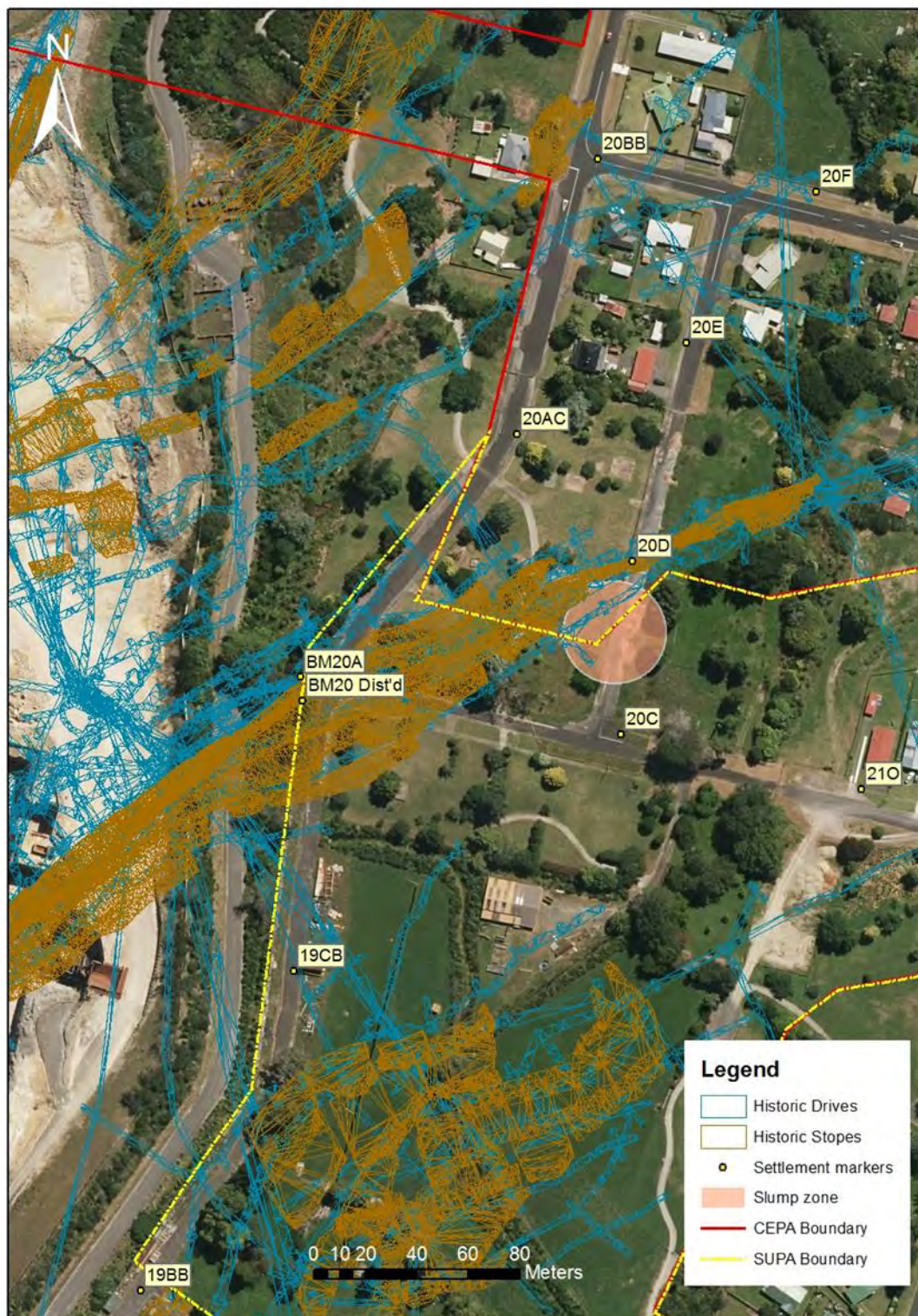


Figure 41: Slevin Park slump, historic workings and markers

7.3 Correnso

There was no indication of tilt between any of the marks above Correnso.

7.4 SUPA

Mark 20C is in the SUPA area; however, the slump/tilt occurred before the SUPA area was created and is discussed in the Martha tilt section.

8 COMPLAINTS

The company maintains a complaints database in accordance with consent condition 13f. Three complaints were received during 2017 in relation to dewatering or settlement, all regarding Underground mining. All complaints were investigated and perceived issues were not deemed to have resulted from dewatering or settlement.

A number of other property damage complaints or enquiries were made during the year, generally in relation to impacts of blast vibration. As a result, some of the properties were inspected to determine likely sources. No evidence was found of land deformation as a consequence of mining activities.

9 CONTINGENCY ACTIONS AND FUTURE IMPACTS

No consent or management plan settlement trigger has been activated.

10 PIT WATER QUALITY

Pit water quality is required to be monitored (Condition 11) to validate the predicted final pit lake water quality model. To date, this has included the monitoring of pit wall runoff and groundwater water quality. Pit wall runoff water quality was monitored until around June 2015. Monitoring has been temporarily discontinued due to safety concerns regarding the North Wall stability. Pit groundwater quality continued to be sampled monthly throughout the year (Appendix E). With the cessation of dewatering from the pit, the underground dewatering is considered the most representative of Martha water as the groundwater systems are linked.

Many pit wash sites were lost due to the north wall slip. A review of the data was undertaken by AECOM and on-going sampling recommended. Site SU1 is to be continued to be sampled at 6-monthly intervals.

11 IMPROVEMENT ACTIVITIES

Works that have been undertaken to improve environmental performance during 2017 include:

- P106 piezometer was drilled and installed in September 2017. This provides additional groundwater monitoring resolution on the north-west side of Martha Pit. The piezometer had been requested by OGNZL advisors and peer reviewers.

Proposed activities to be undertaken in 2018:

- On-going 6-monthly monitoring and reviews of dipped piezometers to determine sediment levels and the need for flushing to expose sufficient screened section. Flushing and reassessment will be coordinated as required. A review of the effectiveness of this system is underway with some piezometers potentially being decommissioned. This will be reviewed with Council prior to any implementation of changes.
- Repair SU1 pit wall runoff site and conduct 6-monthly sampling as recommended by AECOM.
- An underground piezometer designed to intercept a Martha vein at depth has been requested by a peer reviewer. The location and feasibilities have yet to be determined.
- Favona and Correnso mine dewatering flow rates are to be measured separately as requested by peer review.
- Favona and Correnso mine water quality are to be measured separately as requested by peer review.

12 RESOURCE CONSENT EVALUATION

Comments on compliance with all conditions of the Martha, Favona, Trio, and Correnso consents including any reasons for non-compliance or difficulties in achieving conformance with the consent conditions are summarised in Table 10. Martha dewatering consent 971286 has been superseded by the Correnso/Golden Link take 124860.

Table 10 – Favona, Trio & Correnso/Golden Link Consent Condition Compliance Assessment

Description	Consent (Condition)	Compliance	Comment
Favona Dewatering and Settlement Plan	109742 - 109746		
Favona groundwater take	109742 (3)	Full	Favona discharge plumbed into main dewatering line
Divert and discharge ground and surface water (farm run-off and intercepted groundwater) from around the (Favona) project area.	109743	Full	Non-mine run-off has been diverted to natural drainage.
Discharge waste rock and ore onto land in temporary surface stockpiles and to discharge seepage from the temporary stockpiles into ground.	109744	Full	Stockpile area design & construction. Water quality monitoring in manholes and shallow bores (the subject of a separate report – <i>Favona Water Quality Monitoring Annual Report</i>).
Discharge waste rock into land underground in the project area as backfill and to allow degraded quality groundwater to discharge from the flooded workings in the project area into the surrounding ground post closure.	109745	Full	Favona back-filling completed. Dewatering being maintained
Discharge treated mine water from the Martha Mine Water Treatment Plant to ground in association with flooding the underground mine on completion of the project.	109746	Full	Favona Water Quality Monitoring Annual Report
	109742 – 109746		
	Schedule 2		
Water Management Plan	(1)		Under separate negotiation
Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering and Water Quality Monitoring Plan	(2)	Full	Combined plan, Nov 2016
The monitoring regime shall be designed to assess the effects of:		Full	Defined in this document
a) mine dewatering on the regional groundwater system,			
b) mine dewatering on settlement;			
c) leachate from stockpiles containing potentially acid forming material on shallow groundwater quality, and			c) Reported annually in Favona Water Quality Monitoring Report. d) Combined dewatering sample taken monthly

d) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.

Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

Full

Section 5

Stockpile water quality bores agreed in Nov 2006

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder at least once every two years. Any updated Plan shall be promptly forwarded to the Council for approval and following approval the updated Plan shall be implemented in place of the previous version.

Full

Consent activated following approval of Plan. Combined plan, approved by WRC, Nov 2016

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering and Water Quality Monitoring Plan, then the conditions of this consent shall prevail.

Full

No inconsistency identified

In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

(3)

Full

Section 7

Correspondence in Jun 2017 & Jan 2018

a) explain the cause of the non-conformance,

Section 7

b) agree with the Council on the appropriate settlement contingency measures to be implemented as described,

Propose ongoing monitoring

c) implement settlement contingency measures as appropriate,

Not considered necessary as on company owned farmland

d) advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Propose ongoing monitoring

The report shall include at least the following information:

(4)

a) volume of groundwater abstracted

Full

Section 4

b) data from monitoring undertaken during the previous year including groundwater contour plans

Full

Section 5

c) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.

Full

Section 5 & 9

This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.

Full

GWS Ltd & OGNZL staff

d) any contingency actions that may have been taken during the year.	Full	Section 9
e) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.	Full	This section
Trio Dewatering and Settlement Plan - General conditions	121416 - 121418, 121446 & 121447	
Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering and Water Quality Monitoring Plan	Schedule 1 (5)	Full Combined plan Approved by WRC Nov 2016
The monitoring regime shall be designed to assess the effects of:	Full	Defined in plan
i) dewatering on the regional groundwater system,		
ii) dewatering on settlement;		
iii) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.		iii) No significant flooded workings as yet.
Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.	Full	Defined in approved Plan
The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.	Full	Consent activated following approval of Plan Jul 2014
In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering and Water Quality Monitoring Plan, then the conditions of this consent shall prevail.	Full	No inconsistency identified
Dewatering and Settlement Monitoring Report.	Schedule 1 (6)	
The Report shall, as a minimum, provide the following information:		
i) volume of groundwater abstracted	Full	Section 4
ii) data from monitoring undertaken during the previous year including groundwater contour plans	Full	Section 5
iii) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.	Full	Section 5 & 9

This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.	Full	GWS Ltd & OGNZL staff
iv) any contingency actions that may have been taken during the year.	Full	Section 9
v) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.	Full	This section
Monitoring - Tilt:	Schedule 1 (7)	
In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, installed in accordance with the Settlement, Dewatering and Water Quality Monitoring Plan required pursuant to condition 2 above, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:	Full	Section 6 Correspondence in Jun 2017 & Jan 2018
i) explain the cause of the non-conformance,		Section 9
ii) agree with the Councils on the appropriate settlement contingency measures to be implemented,		Propose ongoing monitoring
iii) implement settlement contingency measures as appropriate,		Not considered necessary
iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.		Propose ongoing monitoring
35		
The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:		
a) The volume of groundwater abstracted;	Full	Section 4
b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	Full	Section 5
c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;	Full	Annual Report reviewed by GWS Ltd and Engineering Geology
d) Any contingency actions that may have been taken during the year; and	Full	Section 9

e) Comment on compliance with Conditions 27 to 34 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.	Full	Section 12
<p>The report shall be forwarded in a form acceptable to the Council.</p> <p>Advice note:</p> <p>The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.</p>		
<p>Golden Link Project Area Groundwater Take – 124860</p> <p>General conditions</p>		
Monitoring - Abstraction Volume	Full	Section 4
<p>4.The consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council on a quarterly basis.</p>		
<p>Dewatering and Settlement Monitoring Plan</p> <p>5. Prior to the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.</p> <p>The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:</p> <ul style="list-style-type: none"> (i) dewatering on the regional groundwater system; and (ii) dewatering on settlement; and (iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality. 	Full	Latest plan Nov 2016
<p>Monitoring locations are to provide appropriate resolution of surface tilt relative to the scale of surface infrastructure and final details are to be agreed with the Councils. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.</p>	Full	Defined in plan
<p>The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Such updated Plans shall relate to the Correnso Mine or to any new mine within Area L. Any updated Plan shall be promptly forwarded to the Council for written approval and following</p>	Full	Plan Nov16

approval, the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

(vi)	The volume of groundwater abstracted;	Full	Section 4
(vii)	The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	Full	Section 5
(viii)	An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;	Full	Section 5 & 9
(ix)	Any contingency actions that may have been taken during the year; and	Full	Section 9
(x)	Comment on compliance with condition 5 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.	Full	Section 12

The report shall be forwarded in a form acceptable to the Councils.

Monitoring - Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to condition 5 of this consent, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils:

		Full	Section 6 Correspondence in Jun 2017 & Jan 2018
(i)	explain the cause of the non-conformance,		Section 9
(ii)	Propose appropriate settlement contingency measures for discussion with Councils and agree with the Councils on the appropriate settlement contingency measures and the timing for their implementation as described,		Propose ongoing monitoring
(iii)	implement agreed settlement contingency measures as appropriate within the agreed time limit,		Not considered necessary

(iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Propose ongoing monitoring

Monitoring – Water Quality

8. The consent holder shall monitor throughout the period of operation, the chemistry of the groundwater, pit run-off and pit discharge water abstracted from the open pit. The monitoring data is to be used to correlate these inflows with pit lake water quality predictions, and to provide a database for input into the closure plans. The sampling parameters and frequencies shall be described in the Martha Extended Project dewatering consent (unless agreed otherwise with the Waikato Regional Council) with the results forwarded to the Waikato Regional Council on an annual basis.

Partial

Pit sampling limited, dewatering sampled monthly. Favona and Correnso WQ to be measured separately

Other Water Users

9. If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects stock, domestic or other water supplies, then the consent holder shall, at its own cost, be responsible for providing to the owner of those water supplies an alternative equivalent water supply, to the satisfaction of Waikato Regional Council. The consent holder shall be responsible for making an alternative water supply available within 12 hours of being directed to do so by the Waikato Regional Council.

Full

13 CONCLUSION

Monitoring of dewatering, groundwater, settlement, tilt, and water quality in and around the Martha, Favona, Trio, Correnso and SUPA operations was undertaken during 2017 in accordance with the consent conditions and the approved monitoring plan.

In 2017, water levels Underground lowered from approximately 775 mRL to 765 mRL. No significant changes to groundwater contours in the alluvium, Younger Volcanics and the upper Andesite rock occurred relating to the Martha Mine site during 2017.

At Favona water levels were maintained around 800 mRL and dewatering has maintained the steep but localised depression of the groundwater (contour pattern) along the NE-SW trending vein structure. Water levels in the Younger Volcanic suite and overlying alluvium have not responded to the significant dewatering of the vein-hosted Andesite. Minor or no response has been seen in wells monitoring the upper layers of the Andesite rock body. Response is only evident in deeper wells into the Andesite intercepting structures connected to the vein systems.

Settlement monitoring, to assess any effects from groundwater changes, was conducted in May and November 2017. Settlement survey results indicated that 83% (332/399) of marks graphed were within the predicted settlement ranges, based on the Correnso predicted settlement. The majority of greater-than-predicted settlements were above or near the Favona mining area where 39 marks exceeded settlement predictions. Three other marks near the processing plant could also be influenced by dewatering. Other anomalous settlements were considered due to either marker disturbance or marginal Zone assignment.

A general settlement rate across town of 20 to 30 mm over the period from 1999 to present has been identified and is considered to be a response to ongoing dewatering of structures within the deeper Andesite within the Martha Groundwater System. There are no widespread ongoing dewatering effects observed in the Younger Volcanic or upper Andesite rock that would give rise to such widespread settlement.

Settlement continues to be observed in marks near and overlying the Favona mine, although the total amount is similar to previous years. The deep monitoring wells connected to the Favona vein system are the only wells showing dewatering changes consistent with this settlement, indicating the settlement is likely to be a response to dewatering of the deeper structures of the Favona vein system and/or to changes in the rockmass volume associated with mining at Favona. Tilt is also apparent between marks near and overlying the Favona mine which is occurring on farmland owned by OGNZL and is not expected to be an issue.

Settlement of three marks in the Grey St area (BM20, BM20A and 19CB) (investigated in 2002) is attributed to consolidation of a thicker zone of rhyolitic tephra than previously mapped at that location or other factors related to developments within Martha Mine pit. Other anomalous settlements are close to the boundary of zones of greater predicted levels of settlement and could be influenced by the geology near these boundaries.

Some control marks along Waihi Whangamata Road showed a greater rate of settlement between 2005 and 2007 and this was primarily attributed to disturbance through road maintenance activities. The 2005-2007 period coincides with Favona mine dewatering and may indicate an extension of the Favona structure, but the effect attributable to dewatering is considered minor as further settlement since 2007 has been negligible.

Monitoring of the Waihi East piezometer network show levels consistent with baseline data recorded in 2011.

14 REFERENCES

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- Engineering Geology Ltd, 2010: Proposed Trio Development Project – Assessment of Ground Settlement. Technical Report for Newmont Waihi Gold, June 2010.
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- URS, 2009: Favona Temporary Stockpile – Water Quality Report.

Appendix A Relevant Consent Conditions

Extract from conditions of Waikato Regional Council Resource Consents 109742 to 109746, pertaining to Dewatering and Settlement:

SCHEDULE TWO – GENERAL CONDITIONS

The granting of consents (109742 to 109746 inclusive) is subject to the following conditions, which shall apply to each individual consent.

Water Management Plan

1. Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Water Management Plan describing the water management system to be applied across the project area, with emphasis on management of stormwater including water storage options, decline and mine dewatering, and stockpile runoff.

The consent holder shall exercise this consent in accordance with the approved Water Management Plan.

Settlement, Dewatering and Water Quality Monitoring Plan

2. Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering & Water Quality Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement, the groundwater hydraulic regime and on water quality, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

- a) mine dewatering on the regional groundwater system,
- b) mine dewatering on settlement;
- c) leachate from stockpiles containing potentially acid forming material on shallow groundwater quality, and
- d) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.

Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

The Plan shall be consistent with the recommendations included in the reports to the Council entitled;

- *“Proposed Favona Underground Mine – Review of Groundwater Assessment” dated October 2003 and prepared by Pattle Delamore Partners; and*
- *“Technical Review of Water Quality and Geochemistry Issues - Favona Underground Project”, dated October 2003 and prepared by GEOKEM.*

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder at least once every two years. Any updated Plan shall be promptly forwarded to the Council for approval and following approval the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering & Water Quality Monitoring Plan, then the conditions of this consent shall prevail.

3. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, installed in accordance with the Settlement, Dewatering & Water Quality Monitoring Plan required pursuant to condition 2 above, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:
 - a) explain the cause of the non-conformance,
 - b) agree with the Council on the appropriate settlement contingency measures to be implemented as described,
 - c) implement settlement contingency measures as appropriate,
 - d) advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Settlement, Dewatering & Water Quality Monitoring Report

4. The consent holder shall provide to the Council (with a copy provided to the Hauraki District Council) an annual Settlement, Dewatering & Water Quality Monitoring Report. The report shall include at least the following information:
 - a) the volume of groundwater abstracted,
 - b) the data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network,
 - c) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information,
 - d) any contingency actions that may have been taken during the year,
 - e) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.

The report shall be forwarded in a format acceptable to the Council.

Extract from conditions of Hauraki District Council Resource Consent 97/98-105, pertaining to Dewatering and Settlement:

3.30 Settlement

- a) The consent holder shall prepare a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of dewatering on land settlement and the effects of the mining activities on the subsurface hydraulic regime. The Dewatering and Settlement Monitoring Plan shall address at least the following:

- i) An overall description of the groundwater and settlement monitoring system and the measures to be adopted to meet the objectives of the groundwater and settlement monitoring system.
- ii) Details of the piezometer network proposed to monitor the effects of pit dewatering on the aquifers under Waihi township.

Any monitoring bores additional to the existing piezometer network shall be installed and operational prior to the exercising of this consent.

- iii) Details of the settlement monitoring network proposed to monitor the extended zone which has been, or is likely to be, affected by settlement caused by mine dewatering.

Any settlement monitoring network locations additional to the existing monitoring locations shall be installed and operational prior to exercising this consent.

- iv) Details of the survey of facilities in the Waihi township considered by the consent holder to be potentially "at risk" of damage from ground settlement caused by mine dewatering. The survey to be completed shall include collection of information about the facility's location, the nature of construction materials, the nature of sensitive equipment that might be potentially "at risk", and the sensitivity of this equipment to ground settlement caused by mine dewatering and/or tilt.

This survey shall be completed prior to exercise of the Waikato Regional Council consent number 971286.

- v) A settlement contingency plan to include mitigation measures to be implemented in the event that ground settlement caused by mine dewatering induces a tilt that exceeds 1 in 1000 between any two network monitoring locations spaced no less than 25 metres apart. The settlement contingency plan shall particularly address those facilities identified by the consent holder as being potentially "at risk" of damage from ground settlement caused by mine dewatering.
- vi) A dewatering contingency plan that describes the steps the consent holder shall implement in the event that dewatering results in adverse impacts on affected aquifer systems and associated groundwater supplies used for domestic, stock or other purposes.

In detailing the monitoring programmes the consent holder shall provide information on the monitoring methods proposed, the parameters to be monitored, and the calibration and maintenance of monitoring equipment.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of Waikato Regional Council consent number 971286 shall prevail.

- b) The Dewatering and Settlement Monitoring Plan shall be submitted to Hauraki District Council for approval at least one month prior to the exercise of this consent. The Hauraki District Council shall consult with the Waikato Regional Council prior to approving the Dewatering and Settlement Monitoring Plan. The consent holder shall review and update (as necessary) the Plan and shall provide promptly such updated Plan to the Hauraki District Council annually for approval.

- c) If in the opinion of Hauraki District Council the dewatering adversely affects land or facilities, then the consent holder shall at its own cost be responsible for reinstating the facilities to an equivalent standard to the reasonable satisfaction of Council.
- d) The consent holder shall measure and record the daily volume of water abstracted from the pit.
- e) The consent holder shall undertake monthly water level monitoring of the piezometer network in accordance with the Dewatering and Settlement Monitoring Plan.
- f) The consent holder shall monitor ground settlement at a minimum of six monthly intervals in accordance with the Dewatering and Settlement Monitoring Plan.
- g) In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations spaced no less than 25 metres apart, and such tilt is caused by mine dewatering, or there is a significant variance from the predicted settlement rates described in the evidence of Dr Semple (Table 5, Figure 8 dated 13 November 1997 as presented to the Joint Hearing Committee – attached hereto as Appendix C), the consent holder shall notify the Hauraki District Council and the Waikato Regional Council, in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:
 - explain the cause of the non-conformance,
 - agree with the Hauraki District Council and Waikato Regional Council on the appropriate settlement contingency measures to be implemented as described,
 - implement settlement contingency measures as appropriate,
 - advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.
- h) The consent holder shall provide to the Hauraki District Council and the Waikato Regional Council an annual dewatering and settlement monitoring report. The report shall include at least the following information:
 - The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network.
 - Identification of any environmentally important trends in settlement and dewatering behaviour.
 - Interpretation and analysis of any change in ground water profile over the previous year, any contingency actions that may have been taken during the year, predictions of future impacts on other bore users that may arise as a result of any trends that have been identified, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.
 - A comparison of the settlement survey data with that predicted in Table 5 and Figure 8 (dated 13 November 1997) by Dr Semple of Woodward Clyde (NZ) Ltd as provided in evidence to the Joint Hearing Committee.
 - Comment on compliance with this condition.
 - A summary and analysis of complaints relevant to this condition.
 - Any reasons for non-compliance or difficulties in achieving conformance with this condition.
 - Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the forthcoming year to improve environmental performance in relation to activities permitted by this condition.

The report shall be forwarded in a format acceptable to the Hauraki District Council.

(Note: This condition is complementary to Waikato Regional Council consent number 971286).

Extract from conditions of Hauraki District Council Resource Consent RC-15735, as pertaining to Dewatering and Settlement:

Dewatering and Settlement Monitoring Plan

14. Within 2 months of the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

- (i) dewatering on the regional groundwater system; and
- (ii) dewatering on settlement.

Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

15. The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
- (i) The volume of groundwater abstracted;
 - (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
 - (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
 - (iv) Any contingency actions that may have been taken during the year; and
 - (v) Comment on compliance with condition 14 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Monitoring – Tilt

16. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the De-watering and Settlement Monitoring Plan required pursuant to condition 14 of this consent, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Hauraki District and Waikato Regional Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:
- (i) Explain the cause of the non-conformance,
 - (ii) Agree with the Councils on the appropriate settlement contingency measures to be implemented as described,
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- (iii) Implement settlement contingency measures as appropriate,
- (iv) Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Extract from conditions of Waikato Regional Council Resource Consents 121416, 121417, 121418, 121446, and 121447, pertaining to Dewatering and Settlement:

SCHEDULE ONE – GENERAL CONDITIONS

Resource Consents **121416, 121417, 121418, 121446, and 121447** are subject to the following general conditions, which are applicable to all consents.

Dewatering and Settlement Monitoring Plan

- 5 Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

- (i) dewatering on the regional groundwater system; and
- (ii) dewatering on settlement, and
- (iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality.

Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

- (i) The volume of groundwater abstracted;
- (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
- (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
- (iv) Any contingency actions that may have been taken during the year; and
- (v) Comment on compliance with condition 5 of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Monitoring – Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the De-watering and Settlement Monitoring Plan required pursuant to condition 5 of this schedule, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils:
- (i) explain the cause of the non-conformance,
 - (ii) agree with the Councils on the appropriate settlement contingency measures to be implemented as described,
 - (iii) implement settlement contingency measures as appropriate,
 - (iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Extract from conditions of Mining Licence 32 2388, pertaining to Dewatering and Settlement:

Dewatering

11. (a) The licensee shall prepare a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of dewatering associated with the extended project on land settlement and the effects of the mining activities on the subsurface hydraulic regime. The Dewatering and Settlement Monitoring Plan shall address at least the following:
- (i) An overall description of the groundwater and settlement monitoring system and the measures to be adopted to meet the objectives of the groundwater and settlement monitoring system.
 - (ii) Details of the piezometer network proposed to monitor the effects of pit dewatering on the aquifers under Waihi township.
Any monitoring bores additional to the existing piezometer network shall be installed and operational prior to the commencement of the extended project.
 - (iii) Details of the settlement monitoring network proposed to monitor the extended zone which has been, or is likely to be, affected by settlement caused by mine dewatering.
Any settlement monitoring network locations additional to the existing monitoring locations shall be installed and operational prior to the commencement of the extended project.
 - (iv) Details of the survey of facilities in the Waihi township considered by the licensee to be potentially "at risk" of damage from ground settlement caused by mine dewatering. The survey to be completed shall include collection of information about the facility's location, the nature of construction materials, the nature of sensitive equipment that might be potentially "at risk", and the sensitivity of this equipment to ground settlement caused by mine dewatering and/or tilt.
This survey shall be completed prior to the commencement of the extended project.
 - (v) A settlement contingency plan to include mitigation measures to be implemented in the event that ground settlement caused by mine dewatering induces a tilt that exceeds 1 in 1000 between any two network monitoring locations spaced no less than 25 metres apart. The settlement contingency plan shall particularly address those facilities identified by the licensee as being potentially "at risk" of damage from ground settlement caused by mine dewatering.
 - (vi) A dewatering contingency plan that describes the steps the licensee shall implement in the event that dewatering results in adverse impacts on affected aquifer systems and associated groundwater supplies used for domestic, stock or other purposes.
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In detailing the monitoring programmes the licensee shall provide information on the monitoring methods proposed, the parameters to be monitored, and the calibration and maintenance of monitoring equipment.

In the event of any conflict or inconsistency between these conditions and the provisions of the Dewatering and Settlement Monitoring Plan, these conditions shall prevail.

- (b) The Dewatering and Settlement Monitoring Plan shall be submitted to the Minister for approval at least one month prior to the commencement of the extended project. The licensee shall review and update (as necessary) the Plan and shall provide promptly such updated Plan to the Minister annually for approval.
 - (c) If in the opinion of the Minister the dewatering adversely affects land or facilities, then the licensee shall at its own cost be responsible for reinstating the facilities to an equivalent standard to the reasonable satisfaction of the Minister.
 - (d) The licensee shall measure and record the daily volume of water abstracted from the pit.
 - (e) The licensee shall undertake monthly water level monitoring of the piezometer network in accordance with the Dewatering and Settlement Monitoring Plan.
 - (f) The licensee shall monitor ground settlement at a minimum of six monthly intervals in accordance with the Dewatering and Settlement Monitoring Plan.
 - (g) In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations spaced no less than 25 metres apart, and such tilt is caused by mine dewatering, or there is a significant variance from the predicted settlement rates described in the evidence of Dr Semple (Table 5, Figure 8 dated 13 November) the licensee shall notify the Minister, in writing, within 20 working days of receiving the results of the monitoring. The licensee shall then:
 - Explain the cause of the non-conformance;
 - Agree with the Minister on the appropriate settlement contingency measures to be implemented as described;
 - Implement settlement contingency measures as appropriate;
 - Advise the Minister on the steps the licensee proposes to take in order to prevent any further occurrence of the situation.
 - (h) The licensee shall provide to the Minister an annual dewatering and settlement monitoring report. The report shall include at least the following information:
 - The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network;
 - Identification of any environmentally important trends in settlement and dewatering behaviour;
 - Interpretation and analysis of any change in groundwater profile over the previous year, any contingency actions that may have been taken during the year, predictions of future impacts on other bore users that may arise as a result of any trends that have been identified, and what contingency actions, if any, the licensee proposes to take in response to those predictions;
 - A comparison of the settlement survey data with that predicted in Table 5 and Figure 8 (dated 13 November 1997 by Dr Semple of Woodward Clyde (NZ) Ltd);
 - Comment on compliance with this condition;
 - A summary and analysis of complaints relevant to this condition;
 - Any reasons for non-compliance or difficulties in achieving conformance with this condition;
 - Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the forthcoming year to improve environmental performance in relation to activities permitted by this condition;
 - The report shall be forwarded in a format acceptable to the Minister.
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Extract from conditions of Hauraki District Council Resource Consent 202.2012 (Correnso), as pertaining to Dewatering and Settlement:

Dewatering and Settlement Monitoring Plan

- 27 The objectives of the groundwater and settlement management system shall be to ensure that dewatering operations do not give rise to surface instability and differential settlement beyond that authorised by this consent.
- 28 Within 2 months of the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.
- 29 The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system set out in Condition 27. The monitoring regime shall be designed to assess the effects of:
 - a) Dewatering on the regional groundwater system; and
 - b) Dewatering on settlement.
- 30 Monitoring locations are to provide appropriate resolution of groundwater levels and surface tilt relative to the scale of surface infrastructure, particularly in the areas above and adjacent to the mining activities provided for in this consent. Final details are to be agreed with the Council. The Plan shall also provide settlement trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.
- 31 The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.
- 32 In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 28 of this consent, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Hauraki District and Waikato Regional Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:
 - a) Explain the cause of the non-conformance;
 - b) Propose appropriate settlement contingency measures to the Councils and the timing of implementation thereof by the consent holder;
 - c) Implement settlement contingency measures as appropriate within the agreed time limit;
 - d) Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.
- 33 The consent holder shall as a matter of urgency, advise the Council of any significant anomalies identified by the regular (monthly) reading of groundwater levels in the piezometer network. Such advice is to include an explanation of the anomalous results and actions proposed to address any issues identified. This report is to be provided to the Council within 10 working days of the anomalous results being identified.

 A "significant anomaly" is defined as 15m or more offset occurring in piezometer recordings over a 1 month period.
- 34 In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Advice notes:

1. The Dewatering and Settlement Monitoring Plan shall be consistent with the Dewatering and Settlement Monitoring Plan prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.
2. The monitoring undertaken in terms of the Dewatering and Settlement Monitoring Plan may need to be continued for a period beyond the term of this consent depending on recharge of the groundwater following cessation of underground mining activities and the filling of the Martha Pit.

Dewatering and Settlement Monitoring Report

35 The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

- a) The volume of groundwater abstracted;
- b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
- c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
- d) Any contingency actions that may have been taken during the year; and
- e) Comment on compliance with Conditions 27 to 34 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Advice note:

The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.

Extract from conditions of Waikato Regional Council Resource Consent 124860, pertaining to Dewatering and Settlement:

Monitoring - Abstraction Volume

4. The consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council on a quarterly basis.

Dewatering and Settlement Monitoring Plan

5. Prior to the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

- (i) dewatering on the regional groundwater system; and
- (ii) dewatering on settlement; and
- (iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality.

Monitoring locations are to provide appropriate resolution of surface tilt relative to the scale of surface infrastructure and final details are to be agreed with the Councils. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Such updated Plans shall relate to the Correnso Mine or to any new mine within Area L. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
 - (i) The volume of groundwater abstracted;
 - (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
 - (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
 - (iv) Any contingency actions that may have been taken during the year; and
 - (v) Comment on compliance with condition 5 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Councils.

Monitoring - Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to condition 5 of this consent, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils:
- (i) explain the cause of the non-conformance,
 - (ii) Propose appropriate settlement contingency measures for discussion with Councils and agree with the Councils on the appropriate settlement contingency measures and the timing for their implementation as described,
 - (iii) implement agreed settlement contingency measures as appropriate within the agreed time limit,
 - (iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Monitoring – Water Quality

8. The consent holder shall monitor throughout the period of operation, the chemistry of the groundwater, pit run-off and pit discharge water abstracted from the open pit. The monitoring data is to be used to correlate these inflows with pit lake water quality predictions, and to provide a database for input into the closure plans. The sampling parameters and frequencies shall be described in the Martha Extended Project dewatering consent (unless agreed otherwise with the Waikato Regional Council) with the results forwarded to the Waikato Regional Council on an annual basis.

Other Water Users

9. If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects stock, domestic or other water supplies, then the consent holder shall, at its own cost, be responsible for providing to the owner of those water supplies an alternative equivalent water supply, to the satisfaction of Waikato Regional Council. The consent holder shall be responsible for making an alternative water supply available within 12 hours of being directed to do so by the Waikato Regional Council.

Extract from conditions of Waikato Regional Council Resource Consent 124861, pertaining to Dewatering and Settlement:**Groundwater Monitoring**

5. Piezometers shall be installed at sites to be approved by the Waikato Regional Council for the purpose of monitoring changes in groundwater arising from the exercise of this consent. The groundwater monitoring system shall be detailed in the dewatering and Settlement Monitoring Plan, prepared pursuant to condition 5 of consent number 124860.
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Appendix B Surveyor Reports

MEMORANDUM

TO: **KEVIN STORER, KERRY WATSON**

FROM: **BRUCE MORRISON**

DATE: **7TH JUNE 2017**

SUBJECT: **GROUND SETTLEMENT MONITORING –MAY 2017**

Introduction

This report outlines the results from the May 2017 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during May 2017 for OceanaGold utilising experienced *Allied Work Force* persons under my supervision.

Equipment used was a LEICA DNA03 electronic digital level paired with a 3 section 4 metre fibreglass bar coded staff. To minimise 'windage', the staff was used in 2 section 'mode'. The level was serviced and check calibrated by the supplier in July 2016. A field calibration check was carried out by myself before commencing this event and the check result was satisfactory.

Benchmarks AP19 to AP1 were treated as fixed and the +1.0 mm level misclose distributed. A level run was then taken off this base line from 34BE to AP6 (a.k.a. AP24), which was also held fixed and this +0.4 mm misclose distributed. The remaining monitoring marks were levelled from these baselines and adjusted using LEICA LEVELPAK-PRO software.

A summary of the above framework 'misclosures' for the last twenty one events is tabulated below.

Event	West –East misclose (mm)	North –South misclose (mm)
	AP2 > 34BE > AP1	34BE > AP6
May 2007	+2.4	+6.4
Nov 2007	+2.7	+3.1
May 2008	+13.2	+4.0
Nov 2008	-8.1	+7.3
May2009	+8.8	+3.7
Nov 2009	-5.8	+2.0
May 2010	-8.1	+4.3
Nov 2010	-0.6	+6.4

May 2011	+2.0	+2.7
Nov 2011	+6.9	+6.5
May 2012	+4.1	+6.7
Nov 2012	+23.3	+5.3
May 2013	+2.7	+9.5
Nov 2013	-0.9	+4.5
May 2014	-1.1	+11.5
Nov 2014	-2.6	+7.0
May 2015	+1.6	+6.3
Nov 2015	-8.0	+10.3
May 2016	+9.2	+12.2
	AP20 No 2 > AP2 > 34BE > AP1	34BE > AP6
Nov 2016	+14.2	+3.6
	AP19 > AP2 > 34BE > AP1	34BE > AP6
May 2017	+1.0	+0.4

Extending Levelling

This levelling event included LINZ benchmarks AP2, AP20 No 2, AP19, AP18, and AP17A (to the west of Waihi), AP1 (to the east of Waihi), and AP24 a.k.a AP6 (south of Waihi). The relative levels of benchmarks AP19, AP18, and AP17A and AP24 (a.k.a. AP6) were in good agreement with historical relative values. AP2 and AP20 No 2 have now been 'unfixed' and AP19 is the fixed benchmark west of Waihi. The 'fixed' elevation value for AP19 was deduced from LINZ data comparing the relative levels of AP19, AP2, AP20 No2, and AP24 dating back to the year 1990.

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Photographs

The order of levelling of the monitoring points has now been fixed. This has been achieved by photographing all of the settlement points and placing them in 20 albums –generally in the order the points are to be levelled. This will achieve repeatable error distribution and should therefore give better results. I believe **all** the marks now have accurate GPS fixes. In the future, this should make the task of locating these marks easier if the marks are covered over by re-seal etc, or quickly confirm if the marks have definitely been 'lost' to street maintenance etc. New mark 2.09B has been established at Morgan Park. New mark 26R was established on Bulltown Road and levelled. GPS coordinates were used to reference the new location.

Some more updating of the photograph albums for new marks (or new backgrounds) has been done. I recommend continuing this 'maintenance' detail before or during the next levelling event.

Adjustments

Disturbed marks BM20 and 2.44 are excluded from the settlement contouring- as are marks F18, F20, F23, F24, and F25. New marks 1NB and 1MD have been established.

A previous history for new marks 26R, 2.09B, 1NB, and 1MD will be deduced for the next levelling event.

Results

One A1 plan is attached -colour coded by seven zones as identified in the 'Settlement and Groundwater Monitoring Plan.'

This plan "Total Settlement Contours" (T20170625A) identifies all marks (in black and brown) that have been used to produce the contours for the plan. The plan shows total movement (in millimetres) at the monitoring mark itself. Missed, 'lost', or disturbed marks are shown in red and these marks are not used for contouring. New marks are also shown in red and generally not used for settlement contouring until the next levelling event.

This plan also displays settlement contours in 20mm intervals. The Settlement and Groundwater Monitoring Plan identifies gradients steeper than 1:1000 to be cause for concern. BM20 has been a large mover in the past and has been identified in past surveys as being placed on shrinking material. There are no buildings in this area anymore. I understand (from Mark Halloran) BM20A was placed near BM20 with a 'foot' bedded in firm ground. Significant differential settlement (1:153) is now occurring between BM20A and BM20 –sufficient to decide to omit BM20 from the settlement 'contour' calculation.

These contours represent the total negative (–ve) movement (or settlement) around Waihi since monitoring began. Positive contours are not shown. Small consistent ground 'rises' are associated with the sector north-west of the pit -with the mark with the highest elevation (BM28/2) showing the most (+49 millimetre) rise.

The closest contours (omitting disturbed marks) are between marks 20AC and BM20A. The distance between these marks using GPS measurements, calculates at 126.706 metres, and show 0.1776 metres of relative vertical movement to give a gradient of 1:743. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1623 metres of relative vertical movement to give a gradient of 1:844. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1358 metres of relative vertical movement to give a gradient of 1:934. Some cracks are visible in the sealed pavements in this area of closest contours.

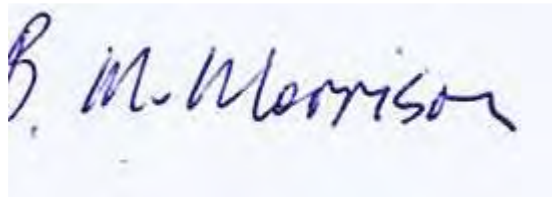
Table 1 (pages 3-13) lists all the marks used for this settlement levelling event with the marks sorted first by Zone and then by settlement value. Marks that record 'exceedences' in terms of zone predictions (for Martha Extension 1999) are highlighted with colour and have comments attached. Note the different trigger levels for Martha Extension (1999), Trio (2010) , and Correnso (2013). All marks that 'exceeded' in Table 1 were analysed further and field inspections were conducted where required.

The comments included below attempt to explain the probable reason for 'excess' movement. Most comments remained unchanged -indicating the results of this May 2017 levelling event are consistent with those of November 2016.

The 'Favona' marks were installed for monitoring the effects of dewatering in the underground mine area. The underlying original 'Martha' zone is Zone 3 but the Favona marks have not been given zone exceedence parameters in terms of the original Martha zones. The Favona marks all report significant settlement. Note marks F18, F20, F23, F24, F25 are tentatively labelled as 'Dist'd' and not used for contouring the settlement.

The five extra 'Favona' settlement marks are again shown on the plan. These are FP1, BLOCK-S, BLOCK-N, TRIG 22, and TRIG 24. The settlements for these marks have generally been deduced relative to original reduced levels measured around the year 1987 –although FP1 (at the Favona portal) was established about the year 2000.

I understand that Time-History plots for all survey marks grouped by zone will be produced by other persons in accordance with the "Settlement and Groundwater Monitoring Plan 31 July 2005"



Bruce Morrison

Registered Professional Surveyor

Table 1. Total Movement

		SURVEY			TOTAL	SETTLEMENT	
Zone	station i.d.	DATE	X	Y	Z	May-17	
Zone7	BM19B	01-05-17	2117.17	1244.36	35.5876	-0.2784	Near edge of pit
Zone7	19BB	01-05-17	2191.56	1292.02	35.5847	-0.2731	Near edge of pit
Zone7	17CB	01-05-17	2014.23	1201.01	35.5163	-0.2573	Nr edge of Zone 7
Zone6	17BB	01-05-17	1919.52	1160.79	37.4111	-0.2199	
Zone6	17AB	01-05-17	1841.32	1104.80	36.9312	-0.1841	
Zone6	34GC	01-05-17	2211.33	1119.52	32.1753	-0.1765	
Zone6	2.04B	01-05-17	1893.21	968.34	29.1286	-0.1622	
Zone6	18EE	01-05-17	1750.73	809.33	23.4666	-0.1548	
Zone6	34H	01-05-17	2233.59	970.56	32.1935	-0.1536	
Zone6	18IB	01-05-17	1611.19	784.79	25.8632	-0.1522	
Zone6	18C	01-05-17	1494.95	767.19	27.5044	-0.1505	
Zone6	34AD	01-05-17	1470.88	886.92	29.7976	-0.1492	

Zone6	34BE	01-05-17	1732.56	931.60	28.3691	-0.1376	
Zone6	2.10	01-05-17	2143.92	950.39	30.3315	-0.1374	
Zone6	34C	01-05-17	1968.90	982.67	30.1394	-0.1305	
Zone6	BM34	01-05-17	1528.38	903.30	30.3536	-0.1295	
Zone6	11AC	01-05-17	1308.26	859.51	29.372	-0.1249	
Zone6	18AB	01-05-17	1632.39	667.73	22.1716	-0.1198	
Zone6	10BC	01-05-17	1560.13	1062.92	38.1482	-0.1194	
Zone6	10AB	01-05-17	1430.61	1037.00	35.0368	-0.1162	
Zone6	18B	01-05-17	1510.36	650.58	23.5909	-0.1161	
Zone6	1.28B	01-05-17	1987.03	447.71	12.1313	-0.1136	
Zone6	2.08	01-05-17	2289.44	777.68	24.4847	-0.1116	
Zone6	2.11	01-05-17	2280.71	858.98	26.5173	-0.1097	
Zone6	BM16	01-05-17	1418.09	1218.03	46.4866	-0.1078	
Zone6	BM17A	01-05-17	1724.44	1088.92	40.0837	-0.1045	
Zone6	34I	01-05-17	2229.55	765.53	28.4986	-0.0996	
Zone6	2.06	01-05-17	2351.95	334.47	11.3086	-0.0931	
Zone6	2.09B	01-05-17	2227.00	865.64	28.6794	new mark	new mark
Zone5	BM20	01-05-17	2342.50	1476.25	35.6508	-0.3300	dist'd
Zone5	BM20A	01-05-17	2345.50	1484.90	35.8071	-0.2701	Nr edge of Zone 7
Zone5	19CB	01-05-17	2296.71	1381.40	34.9757	-0.2542	Nr edge of Zone 7
Zone5	A10B	01-05-17	1298.62	1049.61	30.7218	-0.1433	Nr edge of Zone 6
Zone5	A11D	01-05-17	1277.04	1017.33	30.8864	-0.1370	Nr edge of Zone 6
Zone5	20C	01-05-17	2450.61	1413.86	36.3731	-0.1343	Nr edge of Zone 7
Zone5	16BC	01-05-17	1252.81	1336.47	39.4943	-0.1332	Nr edge of Zone 6
Zone5	BM25	01-05-17	2424.91	1100.25	33.5186	-0.1295	
Zone5	10DB	01-05-17	1276.64	1194.54	35.1785	-0.1255	
Zone5	25E	01-05-17	2472.348	1162.013	34.819	-0.1245	
Zone5	21O	01-05-17	2527.366	1356.342	36.0545	-0.1213	
Zone5	25A	01-05-17	2505.13	1203.77	35.9888	-0.1210	
Zone5	21DC	01-05-17	2573.96	1304.15	37.8189	-0.1208	
Zone5	25D	01-05-17	2547.045	1248.02	36.9202	-0.1206	
Zone5	10CB	01-05-17	1222.46	1025.86	29.8121	-0.1200	
Zone5	2.03	01-05-17	1930.08	745.94	22.6239	-0.1195	
Zone5	18F	01-05-17	1752.28	551.03	17.362	-0.1191	
Zone5	12CE	01-05-17	1499.92	543.08	21.0164	-0.1190	
Zone5	2.02	01-05-17	1992.61	536.10	15.3052	-0.1164	
Zone5	34EB	01-05-17	2073.93	705.95	24.6714	-0.1162	
Zone5	18G	01-05-17	1669.05	554.60	18.5076	-0.1152	
Zone5	1.28A	01-05-17	1888.26	505.89	13.2403	-0.1152	
Zone5	BM12	01-05-17	1370.27	607.74	23.9944	-0.1123	
Zone5	13AC	01-05-17	1751.98	327.38	18.6333	-0.1116	

Zone5	25B	01-05-17	2497.67	1105.83	34.8654	-0.1116	
Zone5	34D	01-05-17	2038.90	783.43	25.3755	-0.1106	
Zone5	BM18	01-05-17	1771.96	674.53	19.4604	-0.1100	
Zone5	25F	01-05-17	2542.534	1116.24	36.0433	-0.1096	
Zone5	2A	01-05-17	1069.03	1111.86	23.8332	-0.1096	
Zone5	13BC	01-05-17	1850.36	246.59	13.7519	-0.1091	
Zone5	20D	01-05-17	2482.07	1473.478	36.6096	-0.1078	
Zone5	25G	01-05-17	2594.599	1149.415	37.6368	-0.1077	
Zone5	18HB	01-05-17	1826.79	471.19	14.921	-0.1073	
Zone5	21N	01-05-17	2623.251	1342.435	38.3417	-0.1073	
Zone5	12DC	01-05-17	1596.95	435.49	20.0003	-0.1052	
Zone5	12AC	01-05-17	1388.32	488.89	19.0801	-0.1050	
Zone5	25I	01-05-17	2537.197	1045.036	34.7284	-0.1043	
Zone5	25CB	01-05-17	2615.91	1190.50	38.3475	-0.1038	
Zone5	25H	01-05-17	2648.484	1232.956	38.9724	-0.1033	
Zone5	AP22A	01-05-17	1868.44	188.57	12.4367	-0.1023	
Zone5	24I	01-05-17	2692.57	1269.713	39.3365	-0.1010	
Zone5	15A	01-05-17	1204.79	818.86	28.808	-0.1007	
Zone5	24L	01-05-17	2761.668	1181.326	39.3791	-0.0991	
Zone5	24DC	01-05-17	2718.29	1323.13	39.6834	-0.0974	
Zone5	20AC	01-05-17	2461.04	1536.91	37.0619	-0.0972	
Zone5	24H	01-05-17	2630.7	1072.279	36.1971	-0.0967	
Zone5	15BC	01-05-17	1169.90	708.86	26.3692	-0.0957	
Zone5	24B	01-05-17	2667.67	1126.40	39.4256	-0.0957	
Zone5	22F	01-05-17	2815.914	1325.407	40.282	-0.0955	
Zone5	21C	01-05-17	2651.57	1389.82	38.5167	-0.0955	
Zone5	24AC	01-05-17	2743.58	1218.90	40.14	-0.0954	
Zone5	24G	01-05-17	2705.961	1170.464	39.8478	-0.0950	
Zone5	12BC	01-05-17	1405.27	368.30	14.9529	-0.0948	
Zone5	BM13	01-05-17	1426.61	269.34	13.6106	-0.0945	
Zone5	24E	01-05-17	2758.433	1303.234	40.4137	-0.0944	
Zone5	24J	01-05-17	2749.392	1365.756	40.2772	-0.0939	
Zone5	24F	01-05-17	2772.803	1257.274	40.18	-0.0937	
Zone5	1.10A	01-05-17	1599.70	278.94	16.6703	-0.0932	
Zone5	11BB	01-05-17	1348.57	710.57	26.9661	-0.0928	
Zone5	20E	01-05-17	2535.651	1542.672	37.1683	-0.0925	
Zone5	24K	01-05-17	2783.888	1387.719	40.6655	-0.0924	
Zone5	21EB	01-05-17	2799.95	1429.09	41.6834	-0.0902	
Zone5	BM24	01-05-17	2794.55	1279.36	40.4532	-0.0899	
Zone5	24CD	01-05-17	2603.21	987.72	34.8795	-0.0895	
Zone5	4DB	01-05-17	1033.26	1550.66	32.2901	-0.0877	

Zone5	BM2	01-05-17	915.74	1091.80	24.8646	-0.0859	
Zone5	2BC	01-05-17	970.20	1241.90	30.4211	-0.0849	
Zone5	21M	01-05-17	2694.898	1439.648	39.2334	-0.0821	
Zone5	20BB	01-05-17	2533.26	1622.29	37.9295	-0.0816	
Zone5	4B	01-05-17	1021.54	1448.63	31.293	-0.0814	
Zone5	20F	01-05-17	2605.794	1575.98	37.6214	-0.0802	
Zone5	BM21	01-05-17	2654.80	1515.40	39.4737	-0.0797	
Zone5	21BC	01-05-17	2719.27	1477.80	41.3185	-0.0764	
Zone5	21K	01-05-17	2681.109	1572.207	40.0503	-0.0750	
Zone5	30C	01-05-17	2573.538	1675.395	38.4816	-0.0723	
Zone5	AP3	01-05-17	918.94	1140.59	26.101	-0.0693	
Zone5	7CB	01-05-17	1161.74	1597.63	30.6466	-0.0692	
Zone5	BM9B	01-05-17	1220.25	1523.29	34.7882	-0.0692	
Zone5	26EE	01-05-17	1343.86	1621.82	44.3325	-0.0494	
Zone5	26F	01-05-17	1392.77	1680.26	43.8967	-0.0432	
Zone4	23AB	01-05-17	3145.42	1078.73	37.2457	-0.1261	Near Correnso
Zone4	2.14A	01-05-17	2853.28	838.67	41.3596	-0.1080	Nr Trio/Correnso
Zone4	23B	01-05-17	2856.49	949.79	38.7942	-0.1059	Near Correnso
Zone4	22C	01-05-17	2846.39	1352.54	40.3753	-0.1040	Near Correnso
Zone4	BARRY1	01-05-17	3047.74	926.576	38.1612	-0.1036	Near Correnso
Zone4	2.25	01-05-17	2874.51	1097.26	38.0343	-0.1009	Near Correnso
Zone4	BANK1	01-05-17	2866.214	1023.248	37.8536	-0.1007	Near Correnso
Zone4	2HB	01-05-17	1078.24	886.85	24.4246	-0.1007	Nr edge of Zone 5
Zone4	23E	01-05-17	2774.821	972.514	37.761	-0.1005	Nr Trio/Correnso
Zone4	BARRY3	01-05-17	3176.849	895.991	37.7314	-0.0992	?
Zone4	22G	01-05-17	2866.818	1385.229	41.0874	-0.0984	Near Correnso
Zone4	23C	01-11-16	2856.143	1068.014	37.6686	-0.0975	Near Correnso
Zone4	2.24	01-05-17	2885.91	1215.47	41.3495	-0.0975	Near Correnso
Zone4	23D	01-05-17	2861.417	1154.885	38.9208	-0.0961	Nr Trio/Correnso
Zone4	BM23	01-05-17	3107.42	921.05	38.1311	-0.0960	?
Zone4	STAFORD	01-05-17	3139.861	998.179	37.3603	-0.0939	?
Zone4	2.13	01-05-17	2725.42	874.95	47.2623	-0.0936	Nr Trio/Correnso
Zone4	MATAURA1	01-05-17	2831.84	1250.81	41.1265	-0.0933	Near Correnso
Zone4	BARRY2	01-05-17	2936.955	944.224	38.4035	-0.0921	Near Correnso
Zone4	2.16	01-05-17	3007.62	739.64	33.6358	-0.0920	?
Zone4	23F	01-05-17	2700.766	968.793	36.7074	-0.0902	Near Trio/Correnso
Zone4	22E	01-05-17	3055.20	1231.50	40.8356	-0.0879	Near Correnso
Zone4	22BC	01-05-17	2916.75	1435.77	42.1541	-0.0877	Near Correnso
Zone4	2.15	01-05-17	2918.94	723.52	38.4104	-0.0865	Near Trio/Correnso
Zone4	22H	01-05-17	2869.252	1441.796	41.6722	-0.0846	Near Correnso

Zone4	GW	01-05-17	3128.83	1140.94	38.5862	-0.0832	?
Zone4	MORTON	01-05-17	2975.42	1231.91	40.7765	-0.0832	Near Correnso
Zone4	CUBA	01-05-17	3224.319	1079.177	35.8705	-0.0827	?
Zone4	22M	01-05-17	2973.44	1434.656	41.7235	-0.0825	Near Correnso
Zone4	22I	01-05-17	2918.977	1461.367	41.9671	-0.0821	Near Correnso
Zone4	21P	01-05-17	2849.169	1456.9	41.9033	-0.0800	Near Correnso
Zone4	2.28	01-05-17	3076.72	1555.99	42.9912	-0.0793	
Zone4	22A	01-05-17	3003.28	1429.77	41.6936	-0.0791	
Zone4	22L	01-05-17	3047.698	1499.876	41.0429	-0.0788	
Zone4	22D	01-05-17	3100.02	1335.44	41.4984	-0.0777	
Zone4	22J	01-05-17	2944.467	1489.763	42.4723	-0.0774	
Zone4	2GB	01-05-17	922.38	967.66	22.7102	-0.0753	
Zone4	1.06	01-05-17	1159.34	302.26	17.2587	-0.0724	
Zone4	21FB	01-05-17	2861.65	1512.21	42.6985	-0.0718	
Zone4	2.26	01-05-17	3241.22	1380.89	39.2623	-0.0709	
Zone4	1.09B	01-05-17	1344.14	117.48	9.9554	-0.0697	
Zone4	21L	01-05-17	2806.788	1575.074	43.1343	-0.0695	
Zone4	BM22	01-05-17	3115.79	1442.95	40.6649	-0.0693	
Zone4	21AC	01-05-17	2716.64	1617.77	39.7402	-0.0688	
Zone4	30BB	01-05-17	2604.86	1726.50	41.5882	-0.0667	
Zone4	2.29	01-05-17	2955.27	1547.42	42.5603	-0.0659	
Zone4	26BE	01-05-17	1408.78	1800.55	38.8507	-0.0654	
Zone4	SM822	01-05-17	2512.906	1841.132	41.4936	-0.0645	
Zone4	BM15	01-05-17	976.94	783.00	20.5528	-0.0637	
Zone4	21Q	01-05-17	2899.598	1571.317	43.1744	-0.0628	
Zone4	21I	01-05-17	2854.699	1668.793	41.6906	-0.0592	
Zone4	26CE	01-05-17	1377.77	1711.89	40.6456	-0.0580	
Zone4	21GC	01-05-17	2901.12	1614.05	43.4897	-0.0571	
Zone4	22K	01-05-17	2985.121	1610.908	42.7404	-0.0569	
Zone4	21J	01-05-17	2773.436	1688.923	40.0101	-0.0566	
Zone4	2.31B	01-05-17	3201.23	1637.29	42.1377	-0.0556	
Zone4	15DB	01-05-17	917.56	466.15	15.6259	-0.0541	
Zone4	27KB	01-05-17	2320.23	2120.21	63.3916	-0.0540	
Zone4	7BB	01-05-17	1105.69	1689.90	35.9746	-0.0527	
Zone4	27E	01-05-17	2494.09	2171.62	50.3859	-0.0523	
Zone4	2.30	01-05-17	3000.42	1672.37	43.254	-0.0506	
Zone4	21HC	01-05-17	2916.84	1728.84	42.9268	-0.0492	
Zone4	26AE	01-05-17	1432.47	1883.48	37.5864	-0.0464	
Zone4	27N	01-05-17	2179.57	2075.99	71.9649	-0.0457	
Zone4	3.04	01-05-17	1132.43	1822.85	38.4058	-0.0456	
Zone4	4.08	01-05-17	2350.64	2022.32	73.2616	-0.0455	

Zone4	3.01	01-05-17	1291.95	1690.33	37.335	-0.0445	
Zone4	4.07	01-05-17	2554.47	2079.24	45.089	-0.0441	
Zone4	4.09	01-05-17	2249.27	2029.94	78.9676	-0.0411	
Zone4	4.05	01-05-17	2809.68	1897.68	40.6605	-0.0409	
Zone4	3.02	01-05-17	1344.87	1837.74	34.977	-0.0402	
Zone4	27J	01-05-17	2344.14	2136.14	62.1759	-0.0400	
Zone4	27G	01-05-17	2440.97	2157.30	54.6053	-0.0398	
Zone4	27H	01-05-17	2413.27	2149.76	57.0707	-0.0398	
Zone4	BM30	01-05-17	2715.36	1996.21	44.1238	-0.0398	
Zone4	26H	01-05-17	1452.90	1729.59	50.0009	-0.0379	
Zone4	26G	01-05-17	1425.06	1706.75	47.0378	-0.0370	
Zone4	27I	01-05-17	2385.10	2141.94	59.5708	-0.0347	
Zone4	3.11A	01-05-17	1786.17	1929.22	62.1875	-0.0346	
Zone4	26PB	01-05-17	1834.84	1893.11	67.9881	-0.0345	
Zone4	26I	01-05-17	1481.67	1750.49	52.7665	-0.0342	
Zone4	30AB	01-05-17	2685.64	1898.44	46.2745	-0.0341	
Zone4	27F	01-05-17	2466.48	2164.03	52.3609	-0.0340	
Zone4	3.09	01-05-17	1618.51	1870.17	51.9589	-0.0331	
Zone4	26Q	01-05-17	1963.00	1982.71	73.7194	-0.0317	
Zone4	27DC	01-05-17	2541.24	2190.71	48.229	-0.0305	
Zone4	3.10A	01-05-17	1689.03	1978.29	53.474	-0.0304	
Zone4	27M	01-05-17	2224.38	2095.26	69.2004	-0.0267	
Zone4	BM26	01-05-17	1542.45	1837.81	45.4596	-0.0265	
Zone4	3.13	01-05-17	1744.89	2097.49	53.7998	-0.0248	
Zone4	27L	01-05-17	2280.24	2115.41	65.8836	-0.0243	
Zone4	27AB	01-05-17	2009.08	2064.33	73.5274	-0.0232	
Zone4	27O	01-05-17	2101.57	2042.82	75.0732	-0.0173	
Zone4	3.6A	01-05-17	1526.28	2015.74	38.9533	-0.0123	
Zone4	26R	01-05-17	1905.59	1927.17	71.4021	new mark	new mark
Zone3	2.41	01-05-17	3296.32	685.40	46.2962	-0.1202	Nr edge of Zone 4
Zone3	34FC	01-05-17	2120.79	587.93	19.0933	-0.1127	Nr edge of Zone 6
Zone3	2.19B	01-05-17	3270.21	916.06	38.5988	-0.1101	Nr edge of Zone 4
Zone3	BARRY4B	01-05-17	3320.164	912.693	38.9273	-0.1033	Nr edge of Zone 4
Zone3	2.18	01-05-17	3218.04	712.76	44.5844	-0.1023	Nr edge of Zone 4
Zone3	BARRY5	01-05-17	3397.585	904.647	41.0317	-0.1007	Nr edge of Zone 4
Zone3	BARRY6	01-05-17	3432.52	904.356	42.5183	-0.0990	Nr edge of Zone 4
Zone3	2.23	01-05-17	3560.02	1212.80	36.6762	-0.0963	?
Zone3	2.20	01-05-17	3467.69	904.56	43.8258	-0.0953	?
Zone3	BARRY8	01-05-17	3592.279	871.451	37.9719	-0.0898	?
Zone3	2.21	01-05-17	3563.088	1045.181	34.0703	-0.0893	?
Zone3	2.17A	01-05-17	3085.76	555.87	36.9408	-0.0887	Nr edge of Zone 4

Zone3	BARRY7	01-05-17	3518.868	901.897	43.6533	-0.0880	?
Zone3	1.05	01-05-17	1176.96	473.45	21.8554	-0.0840	Nr edge of Zone 5
Zone3	2.22	01-05-17	3339.13	1206.60	40.3961	-0.0817	Nr edge of Zone 4
Zone3	15C	01-05-17	1156.82	571.08	24.2474	-0.0742	Nr edge of Zone 5
Zone3	2.27	01-05-17	3379.40	1371.48	37.798	-0.0726	Nr edge of Zone 4
Zone3	2.34	01-05-17	3452.45	1683.50	37.7579	-0.0554	Nr edge of Zone 4
Zone3	2.36	01-05-17	3433.14	1534.88	35.9617	-0.0535	Nr edge of Zone 4
Zone3	2.40B	01-05-17	3572.85	1526.45	33.188	-0.0521	?
Zone3	2.33	01-05-17	3294.51	1691.95	40.3457	-0.0472	Nr edge of Zone 4
Zone3	4.02	01-05-17	2797.90	2143.57	45.8023	-0.0468	Nr edge of Zone 4
Zone3	4.03B	01-05-17	2794.90	2044.78	43.8358	-0.0451	Nr edge of Zone 4
Zone3	BM31	01-05-17	2967.04	1873.48	43.3232	-0.0423	Nr edge of Zone 4
Zone3	4.04	01-05-17	2662.60	2131.77	45.9549	-0.0403	Nr edge of Zone 4
Zone3	31BC	01-05-17	3159.33	1954.86	45.5449	-0.0376	
Zone3	31AC	01-05-17	3059.04	1910.63	44.1088	-0.0337	
Zone3	4.01C	01-05-17	2891.78	2113.15	47.3451	-0.0330	
Zone3	26JB	01-05-17	1495.71	1756.55	53.7695	-0.0329	
Zone3	26MB	01-05-17	1593.46	1750.66	59.0104	-0.0327	
Zone3	29DB	01-05-17	2996.63	2106.66	47.8483	-0.0306	
Zone3	3.25	01-05-17	3116.90	2107.06	49.8546	-0.0225	
Zone3	31CC	01-05-17	3248.97	1989.89	47.0774	-0.0225	
Zone3	29AC	01-05-17	2641.62	2218.07	48.5565	-0.0194	
Zone3	29CE	01-05-17	2891.84	2285.59	51.6133	-0.0163	
Zone3	29B	01-05-17	2772.84	2242.22	50.0356	-0.0111	
Zone3	3.24	01-05-17	3017.29	2258.71	51.9753	-0.0109	
Zone3	26NB	01-11-16	1645.68	1770.04	lost	lost	
Zone3	26O	01-11-16	1708.94	1807.17	lost	lost	
Zone2	1.11B	01-05-17	1675.83	133.62	9.0558	-0.1072	Nr edge of Zone 5
Zone2	2CE	01-05-17	774.75	1313.19	34.6487	-0.0772	Nr edge of Zone 5
Zone2	14DB	01-05-17	876.99	411.22	15.1832	-0.0706	Nr edge of Zone 4
Zone2	1.07	01-05-17	924.43	267.49	12.5289	-0.0547	Nr edge of Zone 4
Zone2	A33C	01-05-17	456.03	1219.23	35.8858	-0.0541	Nr 2CE above
Zone2	14CB	01-05-17	759.10	389.77	18.8439	-0.0519	Nr 14DB above
Zone2	14EA	01-05-17	808.56	504.72	17.1184	-0.0504	Nr edge of Zone 4
Zone2	2FC	01-05-17	720.33	843.06	23.9562	-0.0503	Nr edge of Zone 4
Zone2	1.08	01-05-17	1052.91	107.17	16.5525	-0.0463	Nr edge of Zone 4
Zone2	14BC	01-05-17	535.45	340.67	20.9395	-0.0460	Nr 14CB above
Zone2	4A	01-05-17	815.01	1494.15	40.7267	-0.0457	Nr edge of Zone 5
Zone2	4EC	01-05-17	782.01	1687.78	41.167	-0.0427	Nr edge of Zone 5
Zone2	2DA	01-05-17	682.15	1189.58	35.846	-0.0426	Nr edge of Zone 4

Zone2	2EB	01-05-17	689.02	1054.62	29.2909	-0.0411	Nr edge of Zone 4
Zone2	14FB	01-05-17	705.60	649.14	20.179	-0.0404	Nr edge of Zone 4
Zone2	1K	01-05-17	511.74	957.17	29.6306	-0.0384	Near 2EB above
Zone2	3.03	01-05-17	1134.46	1917.24	39.3789	-0.0360	Nr edge of Zone 4
Zone2	7AC	01-05-17	994.54	1781.82	43.5564	-0.0355	Nr edge of Zone 4
Zone2	1.04	01-05-17	795.98	129.36	12.8264	-0.0325	Nr 1.07 above
Zone2	1.12	01-05-17	800.71	-50.23	10.8147	-0.0320	Nr 1.08 above
Zone2	1JB	01-05-17	604.79	822.76	26.4389	-0.0313	Nr 2FC above
Zone2	1SC	01-05-17	-674.31	739.27	14.4627	-0.0301	?
Zone2	3.12	01-05-17	1599.68	2152.41	40.2982	-0.0296	Nr edge of Zone 4
Zone2	BM7	01-05-17	1057.32	1843.07	44.1474	-0.0290	Nr edge of Zone 4
Zone2	BM14	01-05-17	718.16	485.96	19.8587	-0.0289	Nr 14 EA above
Zone2	3.14	01-05-17	1752.75	2214.32	48.7883	-0.0283	Nr edge of Zone 4
Zone2	BM4	01-05-17	689.21	1555.55	42.3126	-0.0281	Nr 4A above
Zone2	33A	01-05-17	338.15	1303.89	36.7512	-0.0274	Nr A33C above
Zone2	4FB	01-05-17	562.51	1370.97	39.4058	-0.0273	Nr 2CE above
Zone2	1C	01-05-17	421.48	1098.89	34.8217	-0.0269	Nr A33C above
Zone2	33F	01-05-17	347.95	1511.68	42.0824	-0.0261	?
Zone2	14AC	01-05-17	515.17	457.62	24.0477	-0.0254	Nr BM14 above
Zone2	1I	01-05-17	468.34	761.23	27.3051	-0.0239	Nr 1JB above
Zone2	3.07	01-05-17	1362.08	2096.82	48.0754	-0.0238	Nr edge of Zone 4
Zone2	33E	01-05-17	437.71	1437.52	41.0229	-0.0234	Nr 4FB above
Zone2	6A	01-05-17	946.43	1928.12	47.5449	-0.0231	Nr BM7 above
Zone2	1B	01-05-17	337.50	1062.94	34.035	-0.0222	Nr 1C above
Zone2	1O	01-05-17	-271.35	814.18	22.7365	-0.0212	?
Zone2	1HC	01-05-17	299.70	702.80	27.0702	-0.0207	Nr 1L above
Zone2	1FB	01-05-17	210.46	850.78	29.8572	-0.0203	?
Zone2	33DB	01-05-17	265.40	1714.72	46.3994	-0.0190	
Zone2	1EB	01-05-17	388.60	912.09	30.4613	-0.0176	
Zone2	1LC	01-05-17	-100.09	901.97	28.3549	-0.0172	
Zone2	1.03	01-05-17	364.38	325.77	19.4735	-0.0170	
Zone2	3.15	01-05-17	1696.24	2315.82	39.1311	-0.0169	
Zone2	BM6	01-05-17	881.86	1837.08	46.2669	-0.0167	
Zone2	AP2	01-05-17	-1276.40	954.13	5.7795	-0.0165	
Zone2	1GB	01-05-17	-2.87	769.74	29.3188	-0.0159	
Zone2	1A	01-05-17	249.92	1026.38	33.361	-0.0147	
Zone2	1.02B	01-05-17	86.19	282.80	18.6417	-0.0132	
Zone2	1PA	01-05-17	-351.51	787.24	20.0867	-0.0131	
Zone2	1.01	01-05-17	56.47	604.08	25.4738	-0.0131	
Zone2	1RA	01-05-17	-579.06	750.36	16.7548	-0.0130	

Zone2	5C	01-05-17	705.43	1754.71	45.2046	-0.0124	
Zone2	33GA	01-05-17	415.95	1621.64	45.3884	-0.0121	
Zone2	BM1	01-05-17	152.75	994.87	32.8028	-0.0118	
Zone2	33B	01-05-17	156.88	1430.80	34.4433	-0.0097	
Zone2	BM29	01-05-17	2608.80	2400.76	55.9999	-0.0085	
Zone2	1QC	01-05-17	-466.05	769.15	18.1713	-0.0085	
Zone2	1.14	01-05-17	496.74	-535.10	8.4616	-0.0080	
Zone2	BM5	01-05-17	325.93	1806.47	47.8394	-0.0060	
Zone2	5BC	01-05-17	547.16	1824.60	49.1728	-0.0060	
Zone2	33C	01-05-17	222.53	1621.24	44.4432	-0.0049	
Zone2	3.05	01-05-17	966.29	1990.77	47.2278	-0.0046	
Zone2	5AC	01-05-17	470.30	1688.45	47.0739	-0.0039	
Zone2	3.22A	01-05-17	2891.15	2398.65	56.7012	-0.0035	
Zone2	1D	01-05-17	-32.05	911.59	30.0703	-0.0025	
Zone2	1.16	01-05-17	1552.97	-1086.27	18.3792	0.0012	No -ve settlm't
Zone2	1NB	01-05-17	-206.98	842.12	24.8344	new mark	dist'd?
Zone2	1MD	01-05-17	-154.98	879.17	25.8192	new mark	new mark
Zone2	1MC	01-05-17	-154.95	879.09	lost		lost
Zone1	2.44	01-05-17	2734.64	421.03	27.3495	-0.4792	dist'd
Zone1	AP100	01-05-17	1893.80	81.27	11.8109	-0.0969	Nr edge of Zone 5
Zone1	1.26	01-05-17	1926.81	30.05	15.1239	-0.0829	Nr AP100 above
Zone1	2.05	01-05-17	2535.68	272.68	20.8004	-0.0797	Nr Trio
Zone1	31MD	01-05-17	4275.09	1884.55	30.7421	-0.0679	?
Zone1	31ND	01-05-17	4345.57	1917.81	33.5316	-0.0651	?
Zone1	1.25	01-05-17	2175.94	-129.11	20.0843	-0.0617	Nr 1.26 and Trio
Zone1	31LC	01-05-17	4168.53	1862.11	32.1069	-0.0607	?
Zone1	2.35	01-05-17	3609.80	1652.68	34.1333	-0.0524	Nr edge of Zone 3
Zone1	31KC	01-05-17	4076.39	1883.20	34.5029	-0.0514	?
Zone1	31FC	01-05-17	3614.22	1954.15	43.453	-0.0491	Nr edge of Zone 3
Zone1	1.21	01-05-17	1944.45	-334.62	19.6239	-0.0488	?
Zone1	1.22	01-05-17	1510.00	-249.93	15.8874	-0.0454	Nr edge of Zone 2
Zone1	31JD	01-05-17	4005.65	1911.42	35.5767	-0.0438	?
Zone1	31HC	01-05-17	3810.83	1924.65	40.3529	-0.0426	?
Zone1	31IC	01-05-17	3909.03	1909.90	37.8679	-0.0425	?
Zone1	31GC	01-05-17	3711.83	1939.28	42.2038	-0.0395	?
Zone1	31DD	01-05-17	3400.43	1989.83	46.7243	-0.0356	Nr edge of Zone 3
Zone1	31PC	01-05-17	4393.52	1991.66	37.7474	-0.0353	?
Zone1	31QC	01-05-17	4417.71	2035.37	39.6435	-0.0322	?
Zone1	1VA	01-05-17	-994.62	800.62	6.4395	-0.0275	Nr edge of Zone 2
Zone1	31EC	01-05-17	3495.33	1971.48	45.6993	-0.0259	Nr edge of Zone 3
Zone1	1.20A	01-05-17	2010.78	-657.65	21.5855	-0.0242	?

Zone1	1.24	01-05-17	2225.16	-613.23	16.7105	-0.0231	Nr edge of Zone 2
Zone1	AP2A	01-05-17	-766.18	738.51	12.3298	-0.0199	Nr edge of Zone 2
Zone1	1.23	01-05-17	1013.01	-440.77	13.2914	-0.0172	Nr edge of Zone 2
Zone1	31OD	01-05-17	4374.76	1958.38	36.0817	-0.0170	?
Zone1	27CD	01-05-17	2122.89	2374.36	85.0906	-0.0152	Nr edge of Zone 2
Zone1	1.13	01-05-17	591.36	-310.80	7.0781	-0.0144	Nr edge of Zone 2
Zone1	1UA	01-05-17	-914.75	759.05	8.7412	-0.0134	Nr AP2A above
Zone1	1.27B	01-05-17	1401.56	-701.57	15.3525	-0.0086	
Zone1	1TB	01-05-17	-832.77	738.92	11.2466	-0.0079	
Zone 1	AP20No2	01-05-17	-2303.63	731.68	20.2046	-0.0050	
Zone1	3.30	01-05-17	3296.29	2235.94	50.4177	-0.0050	
Zone1	3.28A	01-05-17	3212.99	2636.00	53.8659	-0.0038	
Zone1	1.17B	01-05-17	2082.20	-1093.92	25.6008	-0.0028	
Zone1	3.21	01-05-17	2585.77	2493.38	64.9753	-0.0009	
Zone1	3.26B	01-05-17	3200.09	2347.92	55.4536	-0.0009	
Zone1	AP19	01-05-17	-3242.58	480.68	-6.5213	0.0000	Control mark
Zone1	AP1	01-05-17	4486.29	2137.01	41.3925	0.0000	Control mark
Zone1	AP6(AP24)	01-05-17	2111.57	-1268.48	27.375	0.0000	Control mark
Zone1	3.29	01-05-17	3662.64	2323.53	44.9512	0.0007	No -ve settlm't
Zone1	1.15	01-05-17	923.35	-995.41	14.3738	0.0018	No -ve settlm't
Zone1	28AC	01-05-17	2120.29	2447.12	85.8204	0.0020	No -ve settlm't
Zone1	3.23	01-05-17	3035.80	2453.65	59.662	0.0044	No -ve settlm't
Zone1	3.27B	01-05-17	3148.37	2510.53	60.3163	0.0047	No -ve settlm't
Zone1	3.16	01-05-17	2195.60	2563.08	95.652	0.0055	No -ve settlm't
Zone1	BM28/2	01-05-17	2282.46	2770.68	101.935	0.0493	No -ve settlm't
Favona	F18	01-05-17	3423.83	648.30	40.0945	-0.2369	Dist'd?
Favona	F23	01-05-17	3393.93	684.82	40.6699	-0.2307	Dist'd?
Favona	F24	01-05-17	3388.13	690.85	40.6766	-0.2113	Dist'd?
Favona	F20	01-05-17	3411.70	665.72	41.0001	-0.2040	Dist'd?
Favona	F21	01-05-17	3405.99	672.00	40.8302	-0.1831	No Prediction?
Favona	F17B	01-05-17	3405.48	613.912	44.0571	-0.1824	No prediction?
Favona	F25	01-05-17	3381.55	697.88	40.6427	-0.1788	Dist'd?
Favona	F22	01-05-17	3399.79	678.39	40.7641	-0.1723	No prediction?
Favona	BLOCK-S	01-05-17	3295.816	124.324	24.8431	-0.1689	No prediction?
Favona	BLOCK-N	01-05-17	3336.449	215.694	24.3133	-0.1497	No prediction?
Favona	F16B	01-05-17	3367.379	578.696	46.419	-0.1470	No prediction?
Favona	F11C	01-05-17	3192.52	479.44	51.4636	-0.1467	No prediction?
Favona	F26	01-05-17	3374.47	705.54	40.626	-0.1399	No prediction?

Favona	F27B	01-05-17	3372.41	717.52	40.5413	-0.1319	No prediction?
Favona	F34C	01-05-17	3339.492	849.569	40.2094	-0.1311	No prediction?
Favona	F10B	01-05-17	3176.88	446.75	49.2982	-0.1299	No prediction?
Favona	F09A	01-05-17	3157.20	388.28	45.1752	-0.1298	No prediction?
Favona	F12C	01-05-17	3207.322	503.824	53.5236	-0.1292	No prediction?
Favona	F15C	01-05-17	3297.171	585.319	57.3897	-0.1268	No prediction?
Favona	F14C	01-05-17	3275.289	551.312	60.6827	-0.1251	No prediction?
Favona	F13C	01-05-17	3236.432	533.631	57.9317	-0.1238	No prediction?
Favona	F28B	01-05-17	3365.208	727.17	40.5399	-0.1198	No prediction?
Favona	F08A	01-05-17	3126.97	430.49	42.7629	-0.1146	No prediction?
Favona	F30B	01-05-17	3359.36	748.26	40.7247	-0.1128	No prediction?
Favona	F31B	01-05-17	3354.47	756.84	41.2685	-0.1119	No prediction?
Favona	F33	01-05-17	3348.56	812.51	40.6523	-0.1114	No prediction?
Favona	F29B	01-05-17	3363.2	738.71	40.5226	-0.1094	No prediction?
Favona	F07	01-05-17	3110.57	437.24	41.42	-0.1066	No prediction?
Favona	F32B	01-05-17	3348.78	769.103	40.8871	-0.1049	No prediction?
Favona	F35B	01-05-17	3336.677	896.063	39.7929	-0.1043	No prediction?
Favona	F04	01-05-17	3100.96	470.88	38.7366	-0.0983	No prediction?
Favona	F02	01-05-17	3097.60	490.00	38.2136	-0.0971	No prediction?
Favona	F06	01-05-17	3107.08	445.21	40.5208	-0.0970	No prediction?
Favona	ITXCIVB	01-05-17	2943.85	542.17	32.626	-0.0967	No prediction?
Favona	F03	01-05-17	3099.03	480.33	38.4112	-0.0965	No prediction?
Favona	F05	01-05-17	3104.66	455.54	39.474	-0.0951	No prediction?
Favona	FP1	01-05-17	3004.154	131.25	45.432	-0.0770	No prediction?
Favona	TRIG 24	01-05-17	3260.756	-615.678	25.6861	-0.0439	No prediction?
Favona	TRIG 22	01-05-17	3681.965	89.358	26.1546	-0.0354	No prediction?

MEMORANDUM

TO: **KEVIN STORER, KERRY WATSON**

FROM: **BRUCE MORRISON**

DATE: **20TH DECEMBER 2017**

SUBJECT: **GROUND SETTLEMENT MONITORING –NOVEMBER 2017**

Introduction

This report outlines the results from the November 2017 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during November 2017 for OceanaGold utilising experienced *Allied Work Force* persons under my supervision.

Equipment used was a LEICA DNA03 electronic digital level paired with a 3 section 4 metre fibreglass bar coded staff. To minimise 'windage', the staff was used in 2 section 'mode'. The level was serviced and check calibrated by the supplier in July 2017. A field calibration check was carried out by myself before commencing this event and the check result was satisfactory.

Benchmarks AP19 to AP1 were treated as fixed and the -10.2 mm level misclose distributed. A level run was then taken off this base line from 34BE to AP6 (a.k.a. AP24), which was also held fixed and this -0.5 mm misclose distributed. The remaining monitoring marks were levelled from these baselines and adjusted using LEICA LEVELPAK-PRO software.

A summary of the above framework 'misclosures' for the last twenty-two events is tabulated below.

Event	West –East misclose (mm)	North –South misclose (mm)
	AP2 > 34BE > AP1	34BE > AP6
May 2007	+2.4	+6.4
Nov 2007	+2.7	+3.1
May 2008	+13.2	+4.0
Nov 2008	-8.1	+7.3
May2009	+8.8	+3.7
Nov 2009	-5.8	+2.0
May 2010	-8.1	+4.3
Nov 2010	-0.6	+6.4
May 2011	+2.0	+2.7

Nov 2011	+6.9	+6.5
May 2012	+4.1	+6.7
Nov 2012	+23.3	+5.3
May 2013	+2.7	+9.5
Nov 2013	-0.9	+4.5
May 2014	-1.1	+11.5
Nov 2014	-2.6	+7.0
May 2015	+1.6	+6.3
Nov 2015	-8.0	+10.3
May 2016	+9.2	+12.2
	AP20 No 2 > AP2 > 34BE > AP1	34BE > AP6
Nov 2016	+14.2	+3.6
	AP19 > AP2 > 34BE > AP1	34BE > AP6
May 2017	+1.0	+0.4
Nov 2017	-10.2	-0.5

Extending Levelling

This levelling event included LINZ benchmarks AP2, AP20 No 2, AP19, AP18, (to the west of Waihi), AP1 (to the east of Waihi), and AP24 a.k.a AP6 (south of Waihi). The relative levels of benchmarks AP19, AP18, and AP24 (a.k.a. AP6) were in good agreement with historical relative values. AP2 and AP20 No 2 have now been 'unfixed' and AP19 is the fixed benchmark west of Waihi. The 'fixed' elevation value for AP19 was deduced from LINZ data comparing the relative levels of AP19, AP2, AP20 No2, and AP24 dating back to the year 1990.

.Photographs

The order of levelling of the monitoring points has now been fixed. This has been achieved by photographing all of the settlement points and placing them in 20 albums –generally in the order the points are to be levelled. This will achieve repeatable error distribution and should therefore give better results. I believe **all** the marks now have accurate GPS fixes. In the future, this should make the task of locating these marks easier if the marks are covered over by re-seal etc, or quickly confirm if the marks have definitely been 'lost' to street maintenance etc. New marks 1.02C and 1.03B have been established on Bradford St. New mark 18HC has been established on Gilmour St. New mark 2.09C has been established at Morgan Park. New mark 28AD was established on Bulltown Road. New marks 26NC and 26OB were established on the NW new ramp within the open pit. These new marks were levelled and GPS coordinates were used to reference the new locations.

Some more updating of the photograph albums for new marks (or new backgrounds) has been done. I recommend continuing this 'maintenance' detail before or during the next levelling event.

Adjustments

Disturbed marks BM20 and 2.44 are excluded from the settlement contouring- as are marks F18, F20, F23, F24, F25, and F07. New marks 1.02C, 1.03B, 18HC, 26NC, 26OB, 28AD and 2.09C have been established. 'Previous histories' for new marks will be deduced for the next levelling event. These new marks are excluded from the settlement contouring.

'Previous histories' for marks 26R, 2.09B, 1NB, and 1MD were deduced.

Results

One A1 plan is attached -colour coded by seven zones as identified in the 'Settlement and Groundwater Monitoring Plan.'

This plan "Total Settlement Contours" (T20171224A) identifies all marks (in black and brown) that have been used to produce the contours for the plan. The plan shows total movement (in millimetres) at the monitoring mark itself. Missed, 'lost', or disturbed marks are shown in red and these marks are not used for contouring. New marks are also shown in red and generally not used for settlement contouring until the next levelling event.

This plan also displays settlement contours in 20mm intervals. The Settlement and Groundwater Monitoring Plan identifies gradients steeper than 1:1000 to be cause for concern. BM20 has been a large mover in the past and has been identified in past surveys as being placed on shrinking material. There are no buildings in this area anymore. I understand (from Mark Halloran) BM20A was placed near BM20 with a 'foot' bedded in firm ground. Significant differential settlement (1:152) is now occurring between BM20A and BM20 –sufficient to decide to omit BM20 from the settlement 'contour' calculation.

These contours represent the total negative (–ve) movement (or settlement) around Waihi since monitoring began. Positive contours are not shown. Small consistent ground 'rises' are associated with the sector north of the pit -with the mark with the highest elevation (BM28/2) showing the most (+56.5 millimetre) rise.

The closest contours (omitting disturbed marks) are between marks 20AC and BM20A. The distance between these marks using GPS measurements, calculates at 126.706 metres, and show 0.1746 metres of relative vertical movement to give a gradient of 1:726. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1582 metres of relative vertical movement to give a gradient of 1:866. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1319 metres of relative vertical movement to give a gradient of 1:962. Some cracks are visible in the sealed pavements in this area of closest contours.

Table 1 (pages 3-13) lists all the marks used for this settlement levelling event with the marks sorted first by Zone and then by settlement value. Marks that record 'exceedences' in terms of zone predictions (for Martha Extension 1999) are highlighted with colour and have comments attached. Note the different trigger levels for Martha Extension (1999), Trio (2010), and Correnso (2013). All marks that 'exceeded' in Table 1 were analysed further and field inspections were conducted where required.

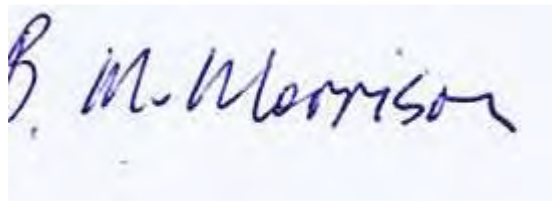
The comments included below attempt to explain the probable reason for 'excess' movement. Most comments remained unchanged -indicating the results of this November 2017 levelling event are consistent with those of May 2017.

The 'Favona' marks were installed for monitoring the effects of dewatering in the underground mine area. The underlying original 'Martha' zone is Zone 3 but the Favona marks have not been given zone exceedence parameters in terms of the original Martha zones. The Favona marks all report significant settlement. Note marks F18, F20, F23, F24, F25 are tentatively labelled as 'Dist'd' and not used for contouring the settlement.

The five extra 'Favona' settlement marks are again shown on the plan. These are FP1, BLOCK-S, BLOCK-N, TRIG 22, and TRIG 24. The settlements for these marks have generally been deduced relative to original reduced levels measured around the year 1987 –although FP1 (at the Favona portal) was

established about the year 2000. Favona mark F07 is disturbed. I confirm there is a depressed heavy vehicle(?) track over this mark consistent with the sudden 40 mm 'settlement' of this mark.

I understand that Time-History plots for all survey marks grouped by zone will be produced by other persons in accordance with the "Settlement and Groundwater Monitoring Plan 31 July 2005"



Bruce Morrison

Registered Professional Surveyor

Table 1. Total Movement

		SURVEY			TOTAL	SETTLEMENT	
Zone	station i.d.	DATE	X	Y	Z	Nov-17	Ccmments
Zone7	BM19B	1/11/2017	2117.17	1244.36	35.5862	-0.2798	Near edge of pit
Zone7	19BB	1/11/2017	2191.56	1292.02	35.5834	-0.2744	Near edge of pit
Zone7	17CB	1/11/2017	2014.23	1201.01	35.5161	-0.2575	
Zone6	17BB	1/11/2017	1919.515	1160.787	37.4111	-0.2199	Near edge of pit
Zone6	17AB	1/11/2017	1841.32	1104.80	36.9325	-0.1828	Near edge of pit
Zone6	34GC	1/11/2017	2211.33	1119.52	32.1743	-0.1775	
Zone6	2.04B	1/11/2017	1893.212	968.34	29.1299	-0.1609	
Zone6	18EE	1/11/2017	1750.73	809.33	23.4676	-0.1538	
Zone6	34H	1/11/2017	2233.59	970.56	32.1947	-0.1524	
Zone6	18IB	1/11/2017	1611.19	784.79	25.8635	-0.1519	
Zone6	18C	1/11/2017	1494.954	767.193	27.5052	-0.1497	
Zone6	34AD	1/11/2017	1470.88	886.92	29.798	-0.1488	
Zone6	2.10	1/11/2017	2143.92	950.39	30.3307	-0.1382	
Zone6	34BE	1/11/2017	1732.56	931.60	28.3704	-0.1363	
Zone6	34C	1/11/2017	1968.90	982.67	30.1403	-0.1296	

Zone6	BM34	1/11/2017	1528.38	903.30	30.3545	-0.1286	
Zone6	11AC	1/11/2017	1308.26	859.51	29.3724	-0.1245	
Zone6	10BC	1/11/2017	1560.13	1062.92	38.149	-0.1186	
Zone6	18AB	1/11/2017	1632.39	667.73	22.1739	-0.1175	
Zone6	10AB	1/11/2017	1430.61	1037.00	35.038	-0.1150	
Zone6	2.11	1/11/2017	2280.71	858.98	26.5129	-0.1141	
Zone6	18B	1/11/2017	1510.363	650.578	23.5944	-0.1126	
Zone6	1.28B	1/11/2017	1987.03	447.71	12.1328	-0.1121	
Zone6	2.08	1/11/2017	2289.435	777.682	24.4843	-0.1120	
Zone6	2.09B	1/11/2017	2227.00	865.64	28.6792	-0.1073	
Zone6	BM16	1/11/2017	1418.09	1218.03	46.488	-0.1064	
Zone6	BM17A	1/11/2017	1724.44	1088.92	40.0849	-0.1033	
Zone6	34I	1/11/2017	2229.55	765.53	28.4973	-0.1009	
Zone6	2.06	1/11/2017	2351.95	334.47	11.3081	-0.0936	
Zone6	2.09C	1/11/2017	2228.35	868.63	28.6766	new mark	new mark
Zone5	BM20	1/11/2017	2342.50	1476.25	35.6493	-0.3315	dist'd
Zone5	BM20A	1/11/2017	2345.50	1484.90	35.8061	-0.2711	Nr edge of Zone 7
Zone5	19CB	1/11/2017	2296.713	1381.4	34.9747	-0.2552	Nr edge of Zone 7
Zone5	A10B	1/11/2017	1298.62	1049.61	30.7223	-0.1428	Nr edge of Zone 6
Zone5	20C	1/11/2017	2450.61	1413.86	36.3682	-0.1392	Nr edge of Zone 7
Zone5	A11D	1/11/2017	1277.04	1017.33	30.8865	-0.1369	Nr edge of Zone 6
Zone5	16BC	1/11/2017	1252.81	1336.47	39.4961	-0.1314	Nr edge of Zone 6
Zone5	BM25	1/11/2017	2424.91	1100.25	33.52	-0.1281	
Zone5	25E	1/11/2017	2472.348	1162.013	34.8186	-0.1249	
Zone5	10DB	1/11/2017	1276.64	1194.54	35.1803	-0.1237	
Zone5	21O	1/11/2017	2527.366	1356.342	36.0531	-0.1227	
Zone5	21DC	1/11/2017	2573.96	1304.15	37.8176	-0.1221	
Zone5	25D	1/11/2017	2547.045	1248.02	36.9187	-0.1221	
Zone5	25A	1/11/2017	2505.13	1203.77	35.9884	-0.1214	
Zone5	10CB	1/11/2017	1222.46	1025.86	29.8122	-0.1199	
Zone5	2.03	1/11/2017	1930.08	745.94	22.6253	-0.1181	
Zone5	18F	1/11/2017	1752.282	551.027	17.3635	-0.1176	
Zone5	34EB	1/11/2017	2073.93	705.95	24.6709	-0.1167	
Zone5	12CE	1/11/2017	1499.92	543.08	21.0195	-0.1159	
Zone5	2.02	1/11/2017	1992.613	536.097	15.3057	-0.1159	
Zone5	1.28A	1/11/2017	1888.26	505.89	13.2415	-0.114	
Zone5	18G	1/11/2017	1669.05	554.60	18.5097	-0.1131	
Zone5	20D	1/11/2017	2482.07	1473.478	36.6045	-0.1129	
Zone5	25B	1/11/2017	2497.67	1105.83	34.866	-0.1110	
Zone5	34D	1/11/2017	2038.90	783.43	25.3752	-0.1109	
Zone5	13AC	1/11/2017	1751.984	327.376	18.6345	-0.1104	
Zone5	2A	1/11/2017	1069.03	1111.86	23.833	-0.1098	
Zone5	25F	1/11/2017	2542.534	1116.24	36.0434	-0.1095	
Zone5	BM12	1/11/2017	1370.27	607.74	23.9981	-0.1086	
Zone5	21N	1/11/2017	2623.251	1342.435	38.3406	-0.1084	

Zone5	25G	1/11/2017	2594.599	1149.415	37.6365	-0.108	
Zone5	BM18	1/11/2017	1771.96	674.53	19.4626	-0.1078	
Zone5	13BC	1/11/2017	1850.36	246.59	13.7539	-0.1071	
Zone5	25CB	1/11/2017	2615.914	1190.496	38.3473	-0.1040	
Zone5	25H	1/11/2017	2648.484	1232.956	38.9723	-0.1034	
Zone5	25I	1/11/2017	2537.197	1045.036	34.7296	-0.1031	
Zone5	12DC	1/11/2017	1596.95	435.49	20.0033	-0.1022	
Zone5	12AC	1/11/2017	1388.32	488.888	19.0834	-0.1017	
Zone5	24I	1/11/2017	2692.57	1269.713	39.3362	-0.1013	
Zone5	15A	1/11/2017	1204.79	818.86	28.8089	-0.0998	
Zone5	AP22A	1/11/2017	1868.44	188.57	12.4396	-0.0994	
Zone5	24DC	1/11/2017	2718.288	1323.127	39.6829	-0.0979	
Zone5	20AC	1/11/2017	2461.04	1536.905	37.0626	-0.0965	
Zone5	21C	1/11/2017	2651.565	1389.816	38.5163	-0.0959	
Zone5	24L	1/11/2017	2761.668	1181.326	39.383	-0.0952	
Zone5	15BC	1/11/2017	1169.90	708.86	26.3699	-0.0950	
Zone5	20E	1/11/2017	2535.651	1542.672	37.1668	-0.0940	
Zone5	22F	1/11/2017	2815.914	1325.407	40.2838	-0.0937	
Zone5	24J	1/11/2017	2749.392	1365.756	40.2776	-0.0935	
Zone5	24E	1/11/2017	2758.433	1303.234	40.4156	-0.0925	
Zone5	12BC	1/11/2017	1405.274	368.295	14.9558	-0.0919	
Zone5	24K	1/11/2017	2783.888	1387.719	40.6662	-0.0917	
Zone5	11BB	1/11/2017	1348.57	710.57	26.9673	-0.0916	
Zone5	24AC	1/11/2017	2743.58	1218.9	40.1439	-0.0915	
Zone5	24B	1/11/2017	2667.67	1126.40	39.4299	-0.0914	
Zone5	BM13	1/11/2017	1426.61	269.34	13.6139	-0.0912	
Zone5	1.10A	1/11/2017	1599.70	278.94	16.6724	-0.0911	
Zone5	24G	1/11/2017	2705.961	1170.464	39.8525	-0.0903	
Zone5	24F	1/11/2017	2772.803	1257.274	40.1839	-0.0898	
Zone5	24H	1/11/2017	2630.7	1072.279	36.2042	-0.0896	
Zone5	21EB	1/11/2017	2799.946	1429.087	41.6843	-0.0893	
Zone5	4DB	1/11/2017	1033.26	1550.66	32.2891	-0.0887	
Zone5	BM24	1/11/2017	2794.55	1279.36	40.4547	-0.0884	
Zone5	BM2	1/11/2017	915.74	1091.80	24.8648	-0.0857	
Zone5	21M	1/11/2017	2694.898	1439.648	39.2318	-0.0837	
Zone5	2BC	1/11/2017	970.20	1241.90	30.4226	-0.0834	
Zone5	24CD	1/11/2017	2603.211	987.721	34.8862	-0.0828	
Zone5	4B	1/11/2017	1021.54	1448.63	31.2927	-0.0817	
Zone5	20F	1/11/2017	2605.794	1575.98	37.6217	-0.0799	
Zone5	20BB	1/11/2017	2533.26	1622.291	37.9314	-0.0797	
Zone5	BM21	1/11/2017	2654.80	1515.40	39.4741	-0.0793	
Zone5	21BC	1/11/2017	2719.27	1477.80	41.3193	-0.0756	
Zone5	21K	1/11/2017	2681.109	1572.207	40.0518	-0.0735	
Zone5	30C	1/11/2017	2573.54	1675.40	38.4842	-0.0697	
Zone5	AP3	1/11/2017	918.94	1140.59	26.1009	-0.0694	

Zone5	7CB	1/11/2017	1161.74	1597.63	30.6469	-0.0689	
Zone5	BM9B	1/11/2017	1220.25	1523.29	34.7894	-0.0680	
Zone5	26EE	1/11/2017	1343.86	1621.82	44.3348	-0.0471	
Zone5	26F	1/11/2017	1392.77	1680.26	43.9009	-0.0390	
Zone5	18HC	1/11/2017	1821.52	466.47	14.9219	new mark	
Zone4	23AB	1/11/2017	3145.42	1078.73	37.248	-0.1238	Near Correnso
Zone4	2.14A	1/11/2017	2853.28	838.67	41.3632	-0.1044	Nr Trio\Correnso
Zone4	23C	1/11/2017	2856.143	1068.014	37.6631	-0.103	Nr Correnso
Zone4	22C	1/11/2017	2846.39	1352.54	40.3763	-0.1030	Nr Correnso
Zone4	23B	1/11/2017	2856.49	949.79	38.7978	-0.1023	Nr Correnso
Zone4	BARRY1	1/11/2017	3047.74	926.58	38.1631	-0.1017	Nr Correnso
Zone4	BANK1	1/11/2017	2866.214	1023.248	37.8542	-0.1001	Nr Correnso
Zone4	2HB	1/11/2017	1078.235	886.849	24.4258	-0.0995	Nr edge of Zone 5
Zone4	2.25	1/11/2017	2874.51	1097.26	38.0366	-0.0986	Nr Correnso
Zone4	BARRY3	1/11/2017	3176.849	895.991	37.732	-0.0986	?
Zone4	23D	1/11/2017	2861.417	1154.885	38.9187	-0.0982	Nr Trio/Correnso
Zone4	22G	1/11/2017	2866.818	1385.229	41.0885	-0.0973	Nr Correnso
Zone4	2.24	1/11/2017	2885.913	1215.469	41.3501	-0.0969	Nr Correnso
Zone4	23E	1/11/2017	2774.821	972.514	37.766	-0.0955	Nr Correnso
Zone4	BM23	1/11/2017	3107.42	921.05	38.133	-0.0941	?
Zone4	MATAURA1	1/11/2017	2831.837	1250.806	41.1282	-0.0916	Nr Correnso
Zone4	STAFORD	1/11/2017	3139.861	998.179	37.3627	-0.0915	?
Zone4	2.16	1/11/2017	3007.62	739.64	33.6378	-0.0900	?
Zone4	BARRY2	1/11/2017	2936.955	944.224	38.406	-0.0896	Nr Correnso
Zone4	2.13	1/11/2017	2725.42	874.95	47.267	-0.0889	Nr Trio/Correnso
Zone4	22E	1/11/2017	3055.20	1231.50	40.8374	-0.0861	Nr Correnso
Zone4	22BC	1/11/2017	2916.751	1435.773	42.156	-0.0858	Near Correnso
Zone4	2.15	1/11/2017	2918.94	723.52	38.4127	-0.0842	Nr Trio/Correnso
Zone4	23F	1/11/2017	2700.766	968.793	36.7136	-0.084	Nr Trio/Correnso
Zone4	22H	1/11/2017	2869.252	1441.796	41.6737	-0.0831	Nr Correnso
Zone4	MORTON	1/11/2017	2975.42	1231.91	40.778	-0.0817	Nr Correnso
Zone4	22M	1/11/2017	2973.44	1434.656	41.7249	-0.0811	Nr Correnso
Zone4	22I	1/11/2017	2918.977	1461.367	41.9682	-0.081	Nr Correnso
Zone4	GW	1/11/2017	3128.828	1140.936	38.5885	-0.0809	?
Zone4	CUBA	1/11/2017	3224.319	1079.177	35.8727	-0.0805	?
Zone4	22L	1/11/2017	3047.698	1499.876	41.0433	-0.0784	
Zone4	21P	1/11/2017	2849.169	1456.9	41.9051	-0.0782	
Zone4	22A	1/11/2017	3003.28	1429.77	41.6948	-0.0779	
Zone4	2.28	1/11/2017	3076.715	1555.994	42.9933	-0.0772	
Zone4	22D	1/11/2017	3100.02	1335.44	41.5001	-0.0760	
Zone4	22J	1/11/2017	2944.467	1489.763	42.4744	-0.0753	
Zone4	1.06	1/11/2017	1159.34	302.26	17.2576	-0.0735	
Zone4	2GB	1/11/2017	922.38	967.66	22.7122	-0.0733	
Zone4	21FB	1/11/2017	2861.65	1512.21	42.7006	-0.0697	
Zone4	2.26	1/11/2017	3241.221	1380.889	39.2642	-0.0690	

Zone4	BM22	1/11/2017	3115.79	1442.95	40.6662	-0.0680	
Zone4	21L	1/11/2017	2806.788	1575.074	43.1366	-0.0672	
Zone4	1.09B	1/11/2017	1344.14	117.48	9.9587	-0.0664	
Zone4	21AC	1/11/2017	2716.64	1617.77	39.7429	-0.0661	
Zone4	2.29	1/11/2017	2955.27	1547.42	42.5621	-0.0641	
Zone4	30BB	1/11/2017	2604.86	1726.50	41.5916	-0.0633	
Zone4	26BE	1/11/2017	1408.78	1800.55	38.853	-0.0631	
Zone4	BM15	1/11/2017	976.94	783.00	20.5536	-0.0629	
Zone4	21Q	1/11/2017	2899.598	1571.317	43.1768	-0.0604	
Zone4	SM822	1/11/2017	2512.906	1841.132	41.4978	-0.0603	
Zone4	21I	1/11/2017	2854.699	1668.793	41.6922	-0.0576	
Zone4	22K	1/11/2017	2985.121	1610.908	42.7411	-0.0562	
Zone4	26CE	1/11/2017	1377.77	1711.89	40.6485	-0.0551	
Zone4	21GC	1/11/2017	2901.12	1614.05	43.4919	-0.0549	
Zone4	2.31B	1/11/2017	3201.23	1637.29	42.1393	-0.0540	
Zone4	21J	1/11/2017	2773.436	1688.923	40.0128	-0.0539	
Zone4	15DB	1/11/2017	917.56	466.15	15.6263	-0.0537	
Zone4	7BB	1/11/2017	1105.69	1689.90	35.9748	-0.0525	
Zone4	27E	1/11/2017	2494.09	2171.62	50.3878	-0.0504	
Zone4	27KB	1/11/2017	2320.23	2120.21	63.3956	-0.0500	
Zone4	2.30	1/11/2017	3000.42	1672.37	43.2558	-0.0488	
Zone4	21HC	1/11/2017	2916.84	1728.84	42.9289	-0.0471	
Zone4	3.04	1/11/2017	1132.43	1822.85	38.4069	-0.0445	
Zone4	26AE	1/11/2017	1432.466	1883.479	37.59	-0.0428	
Zone4	4.07	1/11/2017	2554.47	2079.24	45.0916	-0.0415	
Zone4	27N	1/11/2017	2179.57	2075.99	71.9693	-0.0413	
Zone4	3.01	1/11/2017	1291.95	1690.33	37.3383	-0.0412	
Zone4	4.08	1/11/2017	2350.64	2022.32	73.2665	-0.0406	
Zone4	27H	1/11/2017	2413.27	2149.76	57.071	-0.0395	
Zone4	27G	1/11/2017	2440.97	2157.30	54.6063	-0.0388	
Zone4	4.05	1/11/2017	2809.68	1897.68	40.6634	-0.0380	
Zone4	3.02	1/11/2017	1344.874	1837.735	34.9802	-0.0370	
Zone4	4.09	1/11/2017	2249.27	2029.94	78.9722	-0.0365	
Zone4	27J	1/11/2017	2344.14	2136.14	62.1797	-0.0362	
Zone4	BM30	1/11/2017	2715.36	1996.21	44.1279	-0.0357	
Zone4	27F	1/11/2017	2466.48	2164.03	52.3628	-0.0321	
Zone4	26G	1/11/2017	1425.06	1706.75	47.043	-0.0318	
Zone4	26H	1/11/2017	1452.90	1729.59	50.0074	-0.0314	
Zone4	27I	1/11/2017	2385.10	2141.94	59.5741	-0.0314	
Zone4	26PB	1/11/2017	1834.84	1893.11	67.9913	-0.0313	
Zone4	3.11A	1/11/2017	1786.167	1929.216	62.1914	-0.0307	
Zone4	26R	1/11/2017	1905.59	1927.17	71.4049	-0.0303	
Zone4	30AB	1/11/2017	2685.64	1898.44	46.2787	-0.0299	
Zone4	3.09	1/11/2017	1618.512	1870.174	51.9623	-0.0297	
Zone4	27DC	1/11/2017	2541.24	2190.71	48.2308	-0.0287	

Zone4	26I	1/11/2017	1481.67	1750.49	52.7736	-0.0271	
Zone4	26Q	1/11/2017	1963.00	1982.71	73.7243	-0.0268	
Zone4	3.10A	1/11/2017	1689.03	1978.29	53.4789	-0.0255	
Zone4	BM26	1/11/2017	1542.45	1837.81	45.463	-0.0231	
Zone4	27M	1/11/2017	2224.38	2095.26	69.2049	-0.0222	
Zone4	3.13	1/11/2017	1744.89	2097.49	53.8028	-0.0218	
Zone4	27L	1/11/2017	2280.24	2115.41	65.8885	-0.0194	
Zone4	27AB	1/11/2017	2009.08	2064.33	73.5318	-0.0188	
Zone4	27O	1/11/2017	2101.57	2042.82	75.0772	-0.0133	
Zone4	3.6A	1/11/2017	1526.28	2015.74	38.9578	-0.0078	
Zone3	2.41	1/11/2017	3296.32	685.40	46.2983	-0.1181	Nr edge of Zone 4
Zone3	34FC	1/11/2017	2120.79	587.93	19.0932	-0.1128	Nr edge of Zone 6
Zone3	2.19B	1/11/2017	3270.208	916.063	38.6004	-0.1085	Nr edge of Zone 4
Zone3	BARRY4B	1/11/2017	3320.16	912.69	38.929	-0.1016	Nr edge of Zone 4
Zone3	2.18	1/11/2017	3218.044	712.756	44.5855	-0.1012	Nr edge of Zone 4
Zone3	BARRY5	1/11/2017	3397.59	904.65	41.033	-0.0994	Nr edge of Zone 4
Zone3	BARRY6	1/11/2017	3432.52	904.36	42.5191	-0.0982	Nr edge of Zone 4
Zone3	2.20	1/11/2017	3467.69	904.56	43.8269	-0.0942	?
Zone3	2.23	1/11/2017	3560.016	1212.795	36.6808	-0.0917	?
Zone3	BARRY7	1/11/2017	3518.87	901.90	43.6545	-0.0868	?
Zone3	2.17A	1/11/2017	3085.76	555.87	36.9428	-0.0867	Nr edge of Zone 4
Zone3	BARRY8	1/11/2017	3592.28	871.45	37.9753	-0.0864	?
Zone3	2.21	1/11/2017	3563.088	1045.181	34.0736	-0.0860	?
Zone3	1.05	1/11/2017	1176.96	473.45	21.855	-0.0844	Nr edge of Zone 5
Zone3	2.22	1/11/2017	3339.131	1206.603	40.3989	-0.0789	Nr edge of Zone 4
Zone3	15C	1/11/2017	1156.82	571.08	24.248	-0.0736	Nr edge of Zone 5
Zone3	2.27	1/11/2017	3379.40	1371.48	37.8009	-0.0697	Nr edge of Zone 4
Zone3	2.34	1/11/2017	3452.45	1683.50	37.7577	-0.0556	Nr edge of Zone 4
Zone3	2.36	1/11/2017	3433.14	1534.88	35.9635	-0.0517	Nr edge of Zone 4
Zone3	2.40B	1/11/2017	3572.85	1526.45	33.1933	-0.0468	?
Zone3	4.02	1/11/2017	2797.90	2143.57	45.8033	-0.0458	Nr edge of Zone 4
Zone3	2.33	1/11/2017	3294.506	1691.952	40.3478	-0.0451	Near edge of Zone 4
Zone3	4.03B	1/11/2017	2794.90	2044.78	43.8374	-0.0435	Nr edge of Zone 4
Zone3	BM31	1/11/2017	2967.04	1873.48	43.3244	-0.0411	Nr edge of Zone 4
Zone3	31BC	1/11/2017	3159.33	1954.86	45.5442	-0.0383	
Zone3	4.04	1/11/2017	2662.60	2131.77	45.959	-0.0362	
Zone3	4.01C	1/11/2017	2891.78	2113.15	47.3451	-0.0330	
Zone3	31AC	1/11/2017	3059.04	1910.63	44.1096	-0.0329	
Zone3	29DB	1/11/2017	2996.63	2106.66	47.8477	-0.0312	
Zone3	26JB	1/11/2017	1495.71	1756.55	53.777	-0.0254	
Zone3	26MB	1/11/2017	1593.46	1750.66	59.018	-0.0251	
Zone3	31CC	1/11/2017	3248.97	1989.89	47.0767	-0.0232	
Zone3	3.25	1/11/2017	3116.90	2107.06	49.8542	-0.0229	
Zone3	29AC	1/11/2017	2641.62	2218.07	48.5592	-0.0167	
Zone3	29CE	1/11/2017	2891.84	2285.59	51.613	-0.0166	

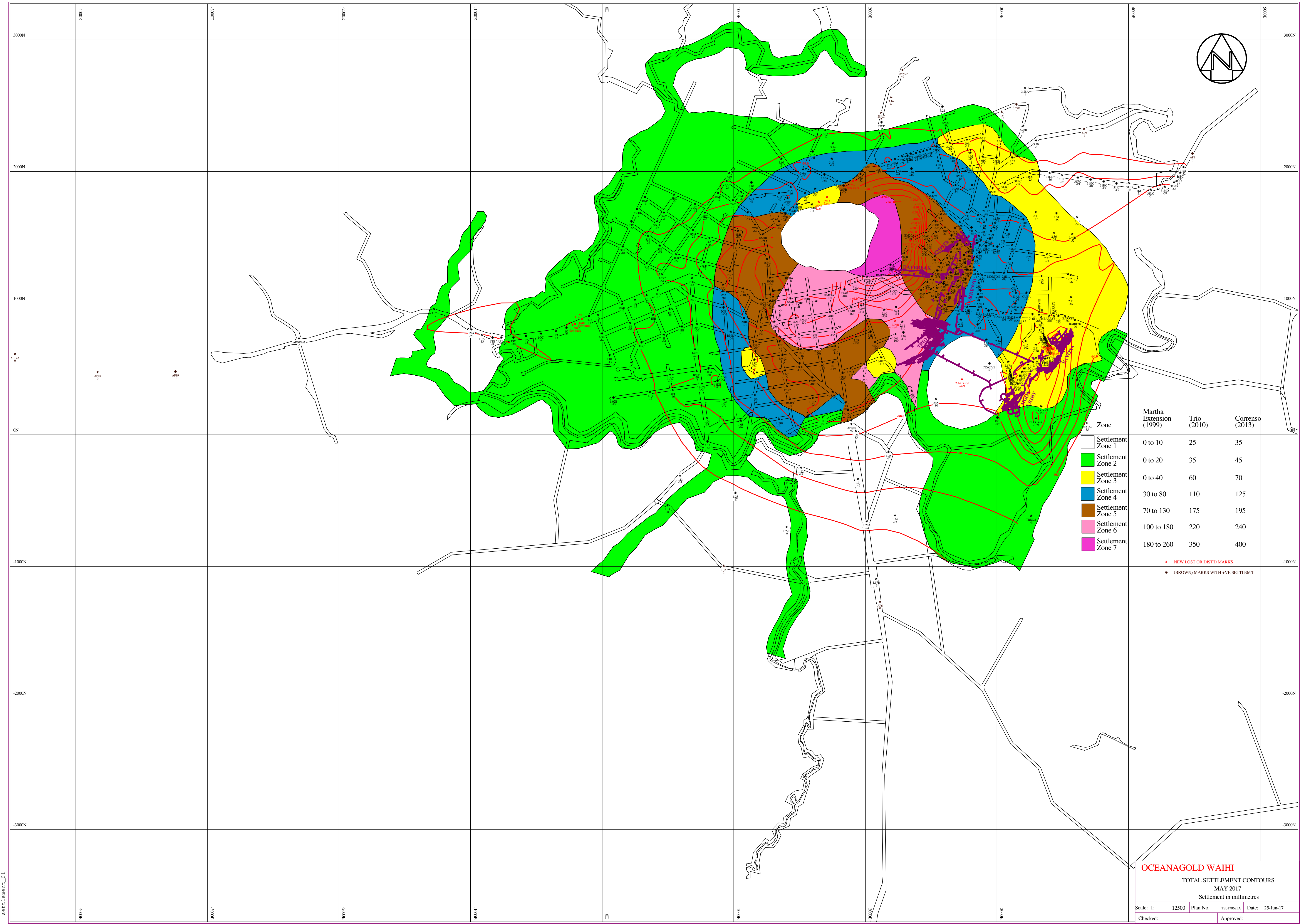
Zone3	3.24	1/11/2017	3017.29	2258.71	51.9747	-0.0115	
Zone3	29B	1/11/2017	2772.84	2242.22	50.0377	-0.0090	
Zone3	26NC	1/11/2017	1641.16	1772.40	60.4386	new mark	
Zone3	26OB	1/11/2017	1706.93	1812.27	67.2321	new mark	
Zone2	1.11B	1/11/2017	1675.83	133.62	9.0595	-0.1035	Nr edge of Zone 5
Zone2	2CE	1/11/2017	774.75	1313.19	34.6497	-0.0762	Nr edge of Zone 5
Zone2	14DB	1/11/2017	876.99	411.22	15.1845	-0.0693	Nr edge of Zone 4
Zone2	1.07	1/11/2017	924.43	267.49	12.5283	-0.0553	Nr edge of Zone 4
Zone2	A33C	1/11/2017	456.03	1219.23	35.887	-0.0529	Nr 2CE above
Zone2	14CB	1/11/2017	759.10	389.77	18.8451	-0.0507	Nr 14DB above
Zone2	2FC	1/11/2017	720.33	843.06	23.9562	-0.0503	Nr edge of Zone 4
Zone2	14EA	1/11/2017	808.56	504.72	17.1186	-0.0502	Nr edge of Zone 4
Zone2	1.08	1/11/2017	1052.91	107.17	16.5519	-0.0469	Nr edge of Zone 4
Zone2	14BC	1/11/2017	535.45	340.67	20.9397	-0.0458	Nr 14CB above
Zone2	4A	1/11/2017	815.01	1494.15	40.7271	-0.0453	Nr edge of Zone 5
Zone2	2DA	1/11/2017	682.15	1189.58	35.8466	-0.042	Nr edge of Zone 4
Zone2	4EC	1/11/2017	782.01	1687.78	41.1678	-0.0419	Nr edge of Zone 5
Zone2	2EB	1/11/2017	689.02	1054.62	29.2908	-0.0412	Nr edge of Zone 4
Zone2	14FB	1/11/2017	705.60	649.14	20.1786	-0.0408	Nr edge of Zone 4
Zone2	1K	1/11/2017	511.74	957.17	29.6295	-0.0395	Nr 2EB above
Zone2	3.03	1/11/2017	1134.46	1917.237	39.3804	-0.0345	Nr edge of Zone 4
Zone2	7AC	1/11/2017	994.54	1781.82	43.5584	-0.0335	Nr edge of Zone 4
Zone2	1.12	1/11/2017	800.71	-50.23	10.8135	-0.0332	Nr 1.08 above
Zone2	1.04	1/11/2017	795.98	129.36	12.8258	-0.0331	Nr 1.07 above
Zone2	1JB	1/11/2017	604.79	822.76	26.4387	-0.0315	Nr 2FC above
Zone2	BM14	1/11/2017	718.16	485.96	19.8592	-0.0284	Nr 14EA above
Zone2	1I	1/11/2017	468.337	761.228	27.301	-0.0280	Nr 1JB above
Zone2	1SC	1/11/2017	-674.31	739.27	14.4655	-0.0273	?
Zone2	BM7	1/11/2017	1057.32	1843.07	44.1494	-0.0270	Nr edge of Zone 4
Zone2	BM4	1/11/2017	689.21	1555.55	42.3138	-0.0269	Nr 4A above
Zone2	4FB	1/11/2017	562.51	1370.97	39.4068	-0.0263	Nr 2CE above
Zone2	1C	1/11/2017	421.48	1098.89	34.8224	-0.0262	Nr A33C above
Zone2	3.12	1/11/2017	1599.68	2152.41	40.3017	-0.0261	Nr edge of Zone 4
Zone2	33A	1/11/2017	338.15	1303.89	36.7532	-0.0254	Nr A33C above
Zone2	14AC	1/11/2017	515.17	457.62	24.0482	-0.0249	Nr BM14 above
Zone2	3.14	1/11/2017	1752.75	2214.32	48.7926	-0.0240	Nr edge of Zone 4
Zone2	33F	1/11/2017	347.95	1511.68	42.0846	-0.0239	?
Zone2	33E	1/11/2017	437.71	1437.52	41.0236	-0.0227	Nr 4FB above
Zone2	6A	1/11/2017	946.43	1928.12	47.5466	-0.0214	Nr BM7 ABOVE
Zone2	1B	1/11/2017	337.495	1062.935	34.0365	-0.0207	Nr 1C above
Zone2	1FB	1/11/2017	210.46	850.78	29.8569	-0.0206	?
Zone2	3.07	1/11/2017	1362.08	2096.818	48.0788	-0.0204	Nr edge of Zone 4
Zone2	1O	1/11/2017	-271.346	814.183	22.7379	-0.0198	
Zone2	1HC	1/11/2017	299.70	702.80	27.0722	-0.0187	
Zone2	1EB	1/11/2017	388.60	912.09	30.4605	-0.0184	

Zone2	33DB	1/11/2017	265.40	1714.72	46.4009	-0.0175	
Zone2	1NB	1/11/2017	-206.98	842.12	24.8363	-0.0170	
Zone2	1LC	1/11/2017	-100.092	901.97	28.3553	-0.0168	
Zone2	BM6	1/11/2017	881.86	1837.08	46.268	-0.0156	
Zone2	1GB	1/11/2017	-2.874	769.742	29.32	-0.0147	
Zone2	1MD	1/11/2017	-154.984	879.173	25.8215	-0.0142	
Zone2	1A	1/11/2017	249.92	1026.38	33.3626	-0.0131	
Zone2	5C	1/11/2017	705.43	1754.71	45.2048	-0.0122	
Zone2	3.15	1/11/2017	1696.24	2315.82	39.1363	-0.0117	
Zone2	1PA	1/11/2017	-351.51	787.24	20.0882	-0.0116	
Zone2	1.01	1/11/2017	56.47	604.08	25.4753	-0.0116	
Zone2	AP2	1/11/2017	-1276.40	954.13	5.785	-0.0110	
Zone2	33GA	1/11/2017	415.95	1621.64	45.3899	-0.0106	
Zone2	1RA	1/11/2017	-579.06	750.36	16.7573	-0.0105	
Zone2	1.14	1/11/2017	496.74	-535.10	8.4598	-0.0098	
Zone2	BM1	1/11/2017	152.75	994.87	32.8049	-0.0097	
Zone2	33B	1/11/2017	156.88	1430.80	34.4444	-0.0086	
Zone2	1QC	1/11/2017	-466.05	769.15	18.1735	-0.0063	
Zone2	BM29	1/11/2017	2608.80	2400.76	56.004	-0.0044	
Zone2	3.22A	1/11/2017	2891.15	2398.65	56.7012	-0.0035	
Zone2	3.05	1/11/2017	966.29	1990.77	47.2292	-0.0032	
Zone2	33C	1/11/2017	222.53	1621.24	44.4449	-0.0032	
Zone2	5BC	1/11/2017	547.16	1824.60	49.1756	-0.0032	
Zone2	5AC	1/11/2017	470.30	1688.45	47.0755	-0.0023	
Zone2	BM5	1/11/2017	325.93	1806.47	47.8435	-0.0019	
Zone2	1.16	1/11/2017	1552.97	-1086.27	18.3765	-0.0015	
Zone2	1D	1/11/2017	-32.05	911.59	30.0721	-0.0007	
Zone2	1.02B	1/11/2017	86.19	282.80	Lost	lost	lost
Zone2	1.02C	1/11/2017	86.31	283.86	18.6592	new mark	
Zone2	1.03	1/11/2017	364.38	325.77	LOST	lost	lost
Zone2	1.03B	1/11/2017	365.55	323.37	19.4089	new mark	
Zone1	2.44	1/11/2017	2734.642	421.025	27.3536	-0.4751	dist'd
Zone1	AP100	1/11/2017	1893.80	81.27	11.8148	-0.0930	Nr edge of Zone 5
Zone1	1.26	1/11/2017	1926.81	30.05	15.1276	-0.0792	Nr AP100 above
Zone1	2.05	1/11/2017	2535.68	272.68	20.8016	-0.0785	Nr Trio
Zone1	31MD	1/11/2017	4275.09	1884.55	30.7412	-0.0688	?
Zone1	31ND	1/11/2017	4345.57	1917.81	33.5303	-0.0664	?
Zone1	31LC	1/11/2017	4168.53	1862.11	32.1063	-0.0613	?
Zone1	1.25	1/11/2017	2175.94	-129.11	20.0877	-0.0583	Nr 1.26 and Trio
Zone1	31KC	1/11/2017	4076.39	1883.20	34.5001	-0.0542	?
Zone1	31FC	1/11/2017	3614.22	1954.15	43.4489	-0.0532	Nr edge of Zone 3
Zone1	2.35	1/11/2017	3609.80	1652.68	34.1345	-0.0512	Nr edge of Zone 3
Zone1	31JD	1/11/2017	4005.65	1911.42	35.5735	-0.0470	?
Zone1	31HC	1/11/2017	3810.83	1924.65	40.3493	-0.0462	?
Zone1	31IC	1/11/2017	3909.03	1909.90	37.8643	-0.0461	?

Zone1	1.21	1/11/2017	1944.45	-334.62	19.6292	-0.0435	?
Zone1	31GC	1/11/2017	3711.83	1939.28	42.1998	-0.0435	?
Zone1	1.22	1/11/2017	1510.00	-249.93	15.8918	-0.0410	Nr edge of Zone 2
Zone1	31DD	1/11/2017	3400.43	1989.83	46.7235	-0.0364	Nr edge of Zone 3
Zone1	31PC	1/11/2017	4393.52	1991.66	37.7468	-0.0359	?
Zone1	31QC	1/11/2017	4417.71	2035.37	39.6424	-0.0333	?
Zone1	31EC	1/11/2017	3495.33	1971.48	45.6954	-0.0298	Nr edge of Zone 3
Zone1	1VA	1/11/2017	-994.62	800.62	6.4438	-0.0232	Nr edge of Zone 2
Zone1	1.20A	1/11/2017	2010.78	-657.65	21.588	-0.0217	?
Zone1	1.24	1/11/2017	2225.16	-613.23	16.7134	-0.0202	Nr edge of Zone 2
Zone1	1.23	1/11/2017	1013.01	-440.77	13.2886	-0.0200	Nr edge of Zone 2
Zone1	31OD	1/11/2017	4374.76	1958.38	36.0811	-0.0176	?
Zone1	AP2A	1/11/2017	-766.18	738.51	12.3322	-0.0175	Nr edge of Zone 2
Zone1	1.13	1/11/2017	591.36	-310.80	7.075	-0.0175	Nr edge of Zone 2
Zone1	1.27B	1/11/2017	1401.56	-701.57	15.3488	-0.0123	Nr edge of Zone 2
Zone1	1UA	1/11/2017	-914.75	759.05	8.7452	-0.0094	
Zone1	27CD	1/11/2017	2122.89	2374.36	85.0965	-0.0093	
Zone1	3.30	1/11/2017	3296.29	2235.94	50.4144	-0.0083	
Zone1	1TB	1/11/2017	-832.77	738.92	11.2498	-0.0047	
Zone1	3.26B	1/11/2017	3200.09	2347.92	55.4511	-0.0034	
Zone1	3.29	1/11/2017	3662.64	2323.53	44.9475	-0.0030	
Zone1	3.28A	1/11/2017	3212.99	2636.00	53.8667	-0.0030	
Zone1	1.17B	1/11/2017	2082.20	-1093.92	25.6017	-0.0019	
Zone1	1.15	1/11/2017	923.35	-995.41	14.371	-0.0010	
Zone1	AP1	1/11/2017	4486.29	2137.01	41.3925	0.0000	Control mark
Zone1	AP6	1/11/2017	2111.57	-1268.48	27.375	0.0000	Control Mark
Zone1	3.23	1/11/2017	3035.80	2453.65	59.6606	0.0030	No -ve settlm't
Zone1	3.27B	1/11/2017	3148.37	2510.53	60.3151	0.0035	No -ve Settlm't
Zone1	3.21	1/11/2017	2585.77	2493.38	64.9803	0.0041	No -ve settlm't
Zone1	3.16	1/11/2017	2195.60	2563.08	95.6588	0.0123	No -ve settlm't
Zone1	BM28/2	1/11/2017	2282.46	2770.68	101.9422	0.0565	No -ve settlm't
Zone1	28AC	1/11/2017	2120.29	2447.12	1	lost	
Zone1	28AD	1/11/2017	2126.91	2448.93	85.6993	new mark	
Favona	F18	1/11/2017	3423.83	648.30	40.0932	-0.2382	Dist'd?
Favona	F23	1/11/2017	3393.93	684.82	40.6704	-0.2302	Dist'd?
Favona	F24	1/11/2017	3388.13	690.85	40.6779	-0.2100	Dist'd?
Favona	F20	1/11/2017	3411.70	665.72	40.9999	-0.2042	Dist'd?
Favona	F17B	1/11/2017	3405.48	613.91	44.0554	-0.1841	No prediction?
Favona	F21	1/11/2017	3405.99	672.00	40.8304	-0.1829	No prediction?
Favona	F25	1/11/2017	3381.55	697.88	40.6438	-0.1777	Dist'd?
Favona	F22	1/11/2017	3399.79	678.39	40.7648	-0.1716	No prediction?
Favona	BLOCK-S	1/11/2017	3295.816	124.324	24.8462	-0.1658	No prediction?
Favona	F07	1/11/2017	3110.57	437.24	41.3784	-0.1482	Dist'd
Favona	BLOCK-N	1/11/2017	3336.45	215.69	24.316	-0.1470	No prediction?
Favona	F16B	1/11/2017	3367.38	578.70	46.4206	-0.1454	No prediction?

Favona	F11C	1/11/2017	3192.52	479.44	51.4668	-0.1435	No prediction?
Favona	F26	1/11/2017	3374.47	705.54	40.6259	-0.1400	No prediction?
Favona	F27B	1/11/2017	3372.41	717.52	40.5386	-0.1346	No prediction?
Favona	F34C	1/11/2017	3339.49	849.57	40.2105	-0.1300	No prediction?
Favona	F10B	1/11/2017	3176.88	446.75	49.3003	-0.1278	No prediction?
Favona	F09A	1/11/2017	3157.20	388.28	45.1775	-0.1275	No prediction?
Favona	F12C	1/11/2017	3207.32	503.82	53.5272	-0.1256	No prediction?
Favona	F15C	1/11/2017	3297.17	585.32	57.3926	-0.1239	No prediction?
Favona	F28B	1/11/2017	3365.208	727.17	40.5376	-0.1221	No prediction?
Favona	F14C	1/11/2017	3275.29	551.31	60.6874	-0.1204	No prediction?
Favona	F13C	1/11/2017	3236.43	533.63	57.9361	-0.1194	No prediction?
Favona	F30B	1/11/2017	3359.36	748.26	40.7234	-0.1141	No prediction?
Favona	F31B	1/11/2017	3354.47	756.84	41.2679	-0.1125	No prediction?
Favona	F08A	1/11/2017	3126.97	430.49	42.7654	-0.1121	No prediction?
Favona	F29B	1/11/2017	3363.20	738.71	40.5207	-0.1113	No prediction?
Favona	F33	1/11/2017	3348.56	812.51	40.6537	-0.1100	No prediction?
Favona	F32B	1/11/2017	3348.78	769.103	40.8865	-0.1055	No prediction?
Favona	F35B	1/11/2017	3336.68	896.06	39.7946	-0.1026	No prediction?
Favona	ITXCIVB	1/11/2017	2943.85	542.17	32.6255	-0.0972	No prediction?
Favona	F04	1/11/2017	3100.96	470.88	38.7391	-0.0958	No prediction?
Favona	F06	1/11/2017	3107.08	445.21	40.5232	-0.0946	No prediction?
Favona	F02	1/11/2017	3097.60	490.00	38.2163	-0.0944	No prediction?
Favona	F03	1/11/2017	3099.03	480.33	38.4133	-0.0944	No prediction?
Favona	F05	1/11/2017	3104.66	455.54	39.4767	-0.0924	No prediction?
Favona	FP1	1/11/2017	3004.15	131.25	45.4379	-0.0711	No prediction?
Favona	TRIG 24	1/11/2017	3260.756	-615.678	25.6891	-0.0409	No prediction?
Favona	TRIG 22	1/11/2017	3681.97	89.36	26.1573	-0.0327	No prediction?

Appendix C Plans of Settlement Marks & Contours



Zone	Martha Extension (1999)	Trio (2010)	Correnso (2013)
Settlement Zone 1	0 to 10	25	35
Settlement Zone 2	0 to 20	35	45
Settlement Zone 3	0 to 40	60	70
Settlement Zone 4	30 to 80	110	125
Settlement Zone 5	70 to 130	175	195
Settlement Zone 6	100 to 180	220	240
Settlement Zone 7	180 to 260	350	400

NEW LOST OR DISTD MARKS

(BROWN) MARKS WITH +VE SETTLEMT

OCEANAGOLD WAIHI

TOTAL SETTLEMENT CONTOURS

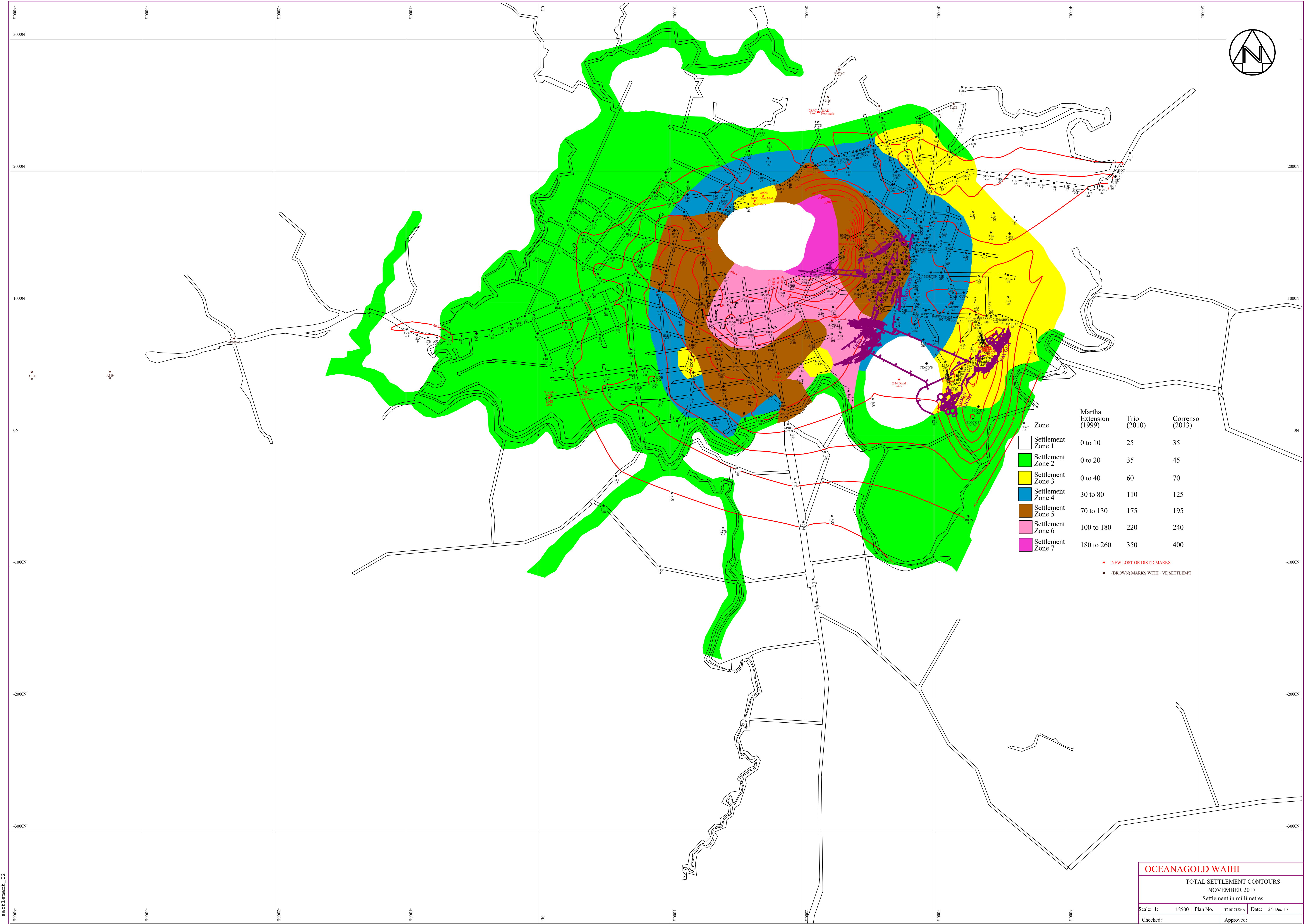
MAY 2017

Settlement in millimetres

Scale: 1:	12500	Plan No.	T20170625A	Date:	25-Jun-17
Checked:				Approved:	

settlement_01



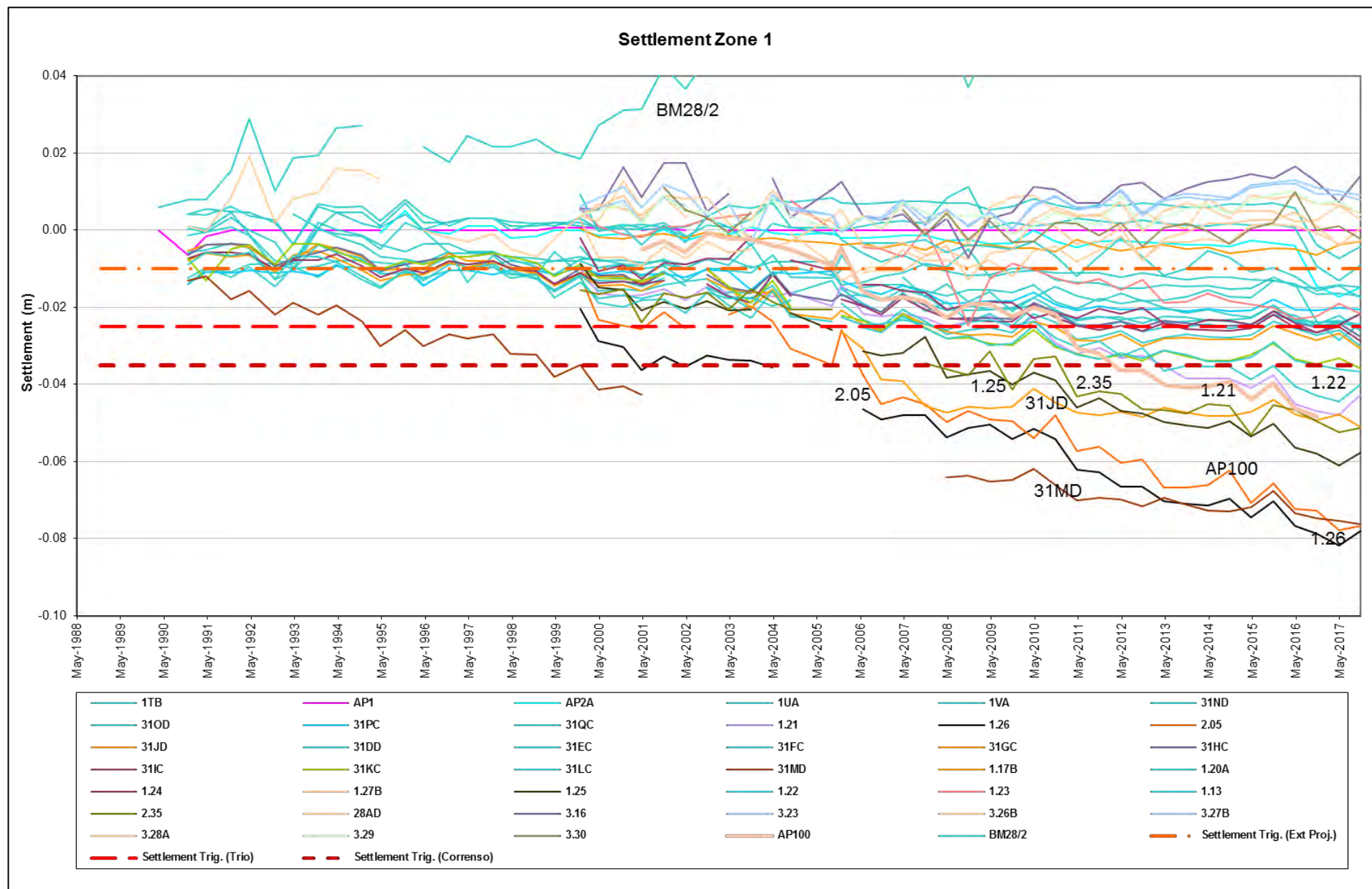


OCEANAGOLD WAIHI

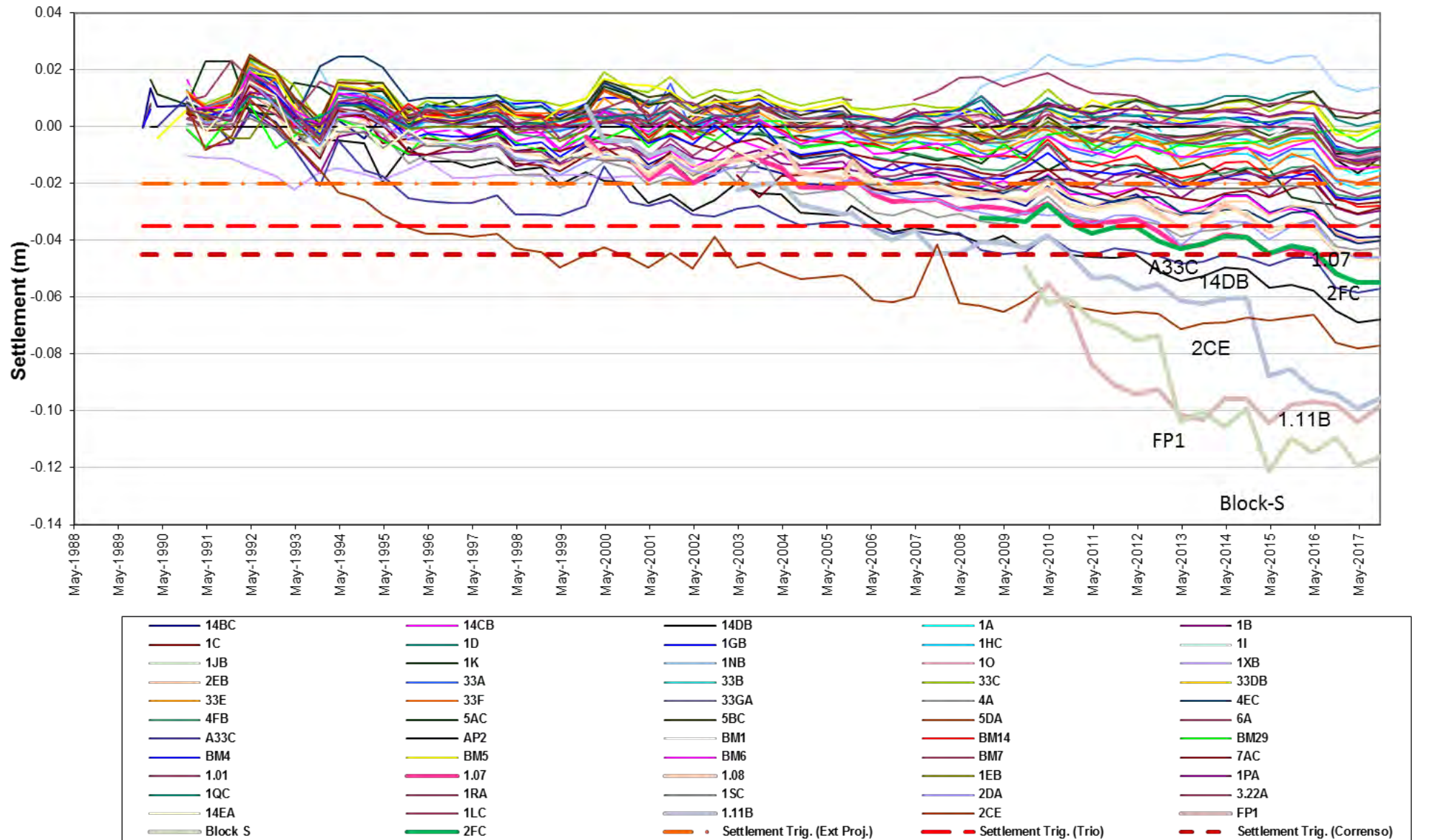
TOTAL SETTLEMENT CONTOURS
NOVEMBER 2017
Settlement in millimetres

Scale: 1:	12500	Plan No.	T210171234A	Date:	24-Dec-17
Checked:		Approved:			

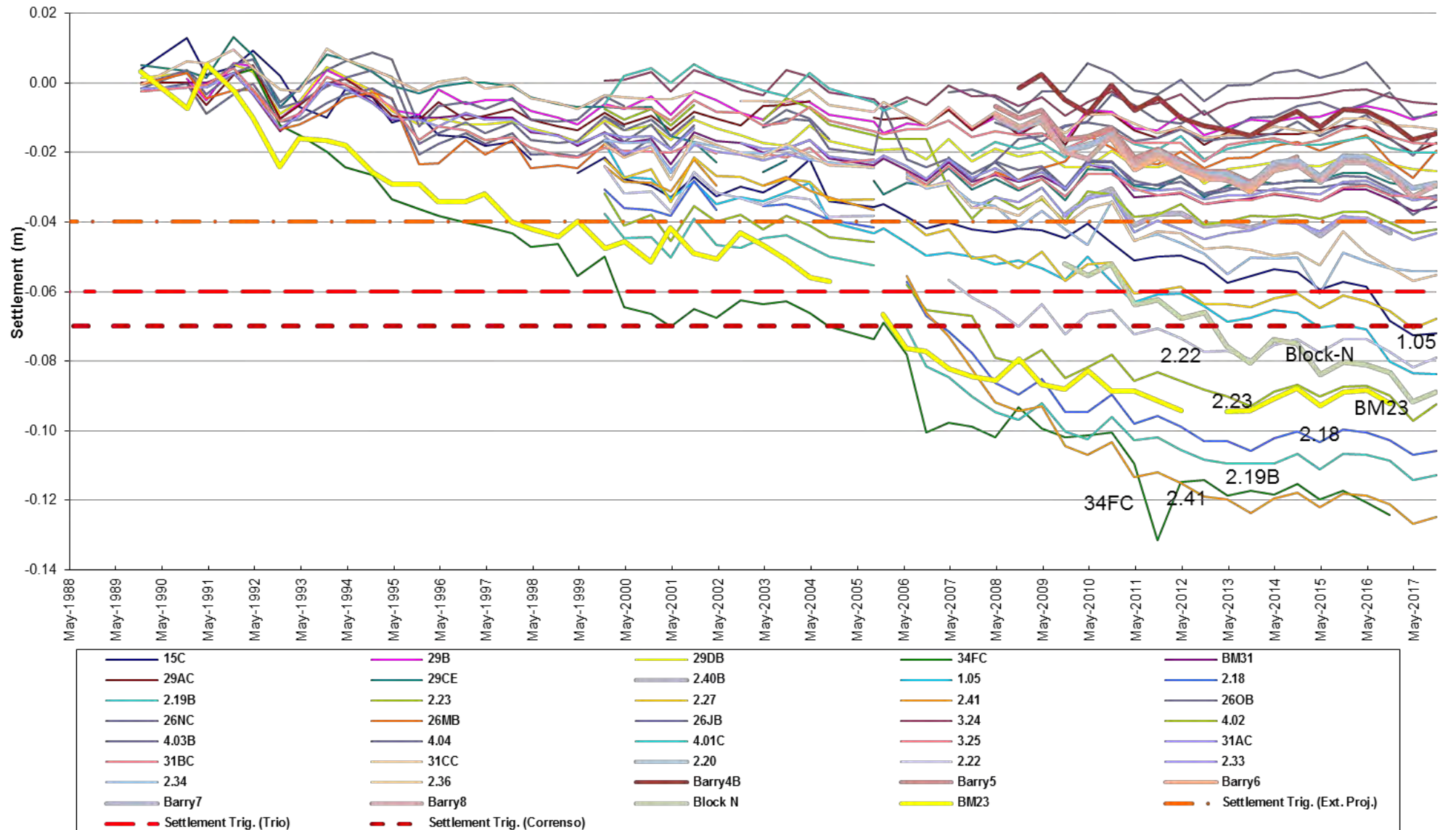
Appendix D Trend Plots of Settlement Zones



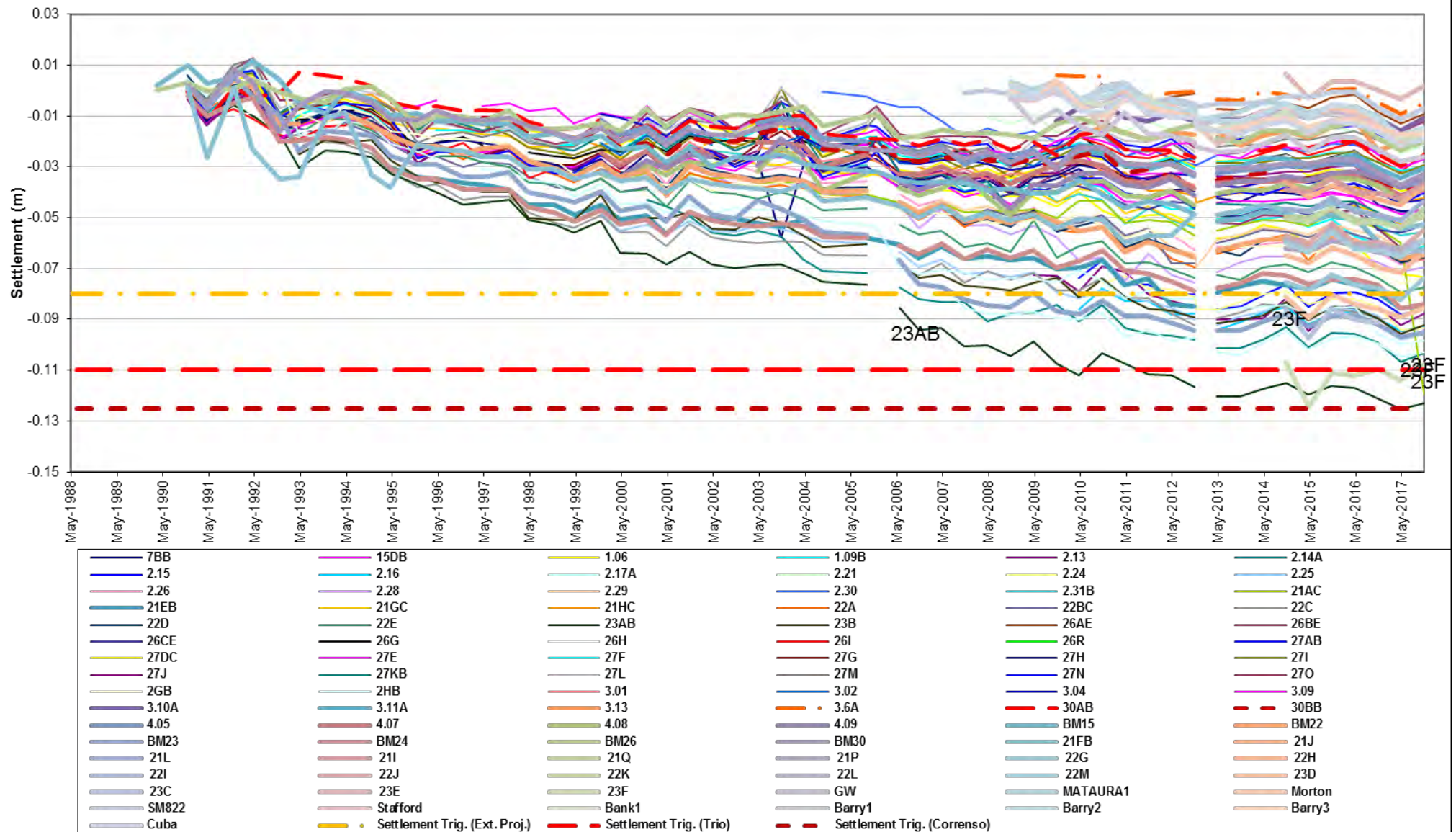
Settlement Zone 2



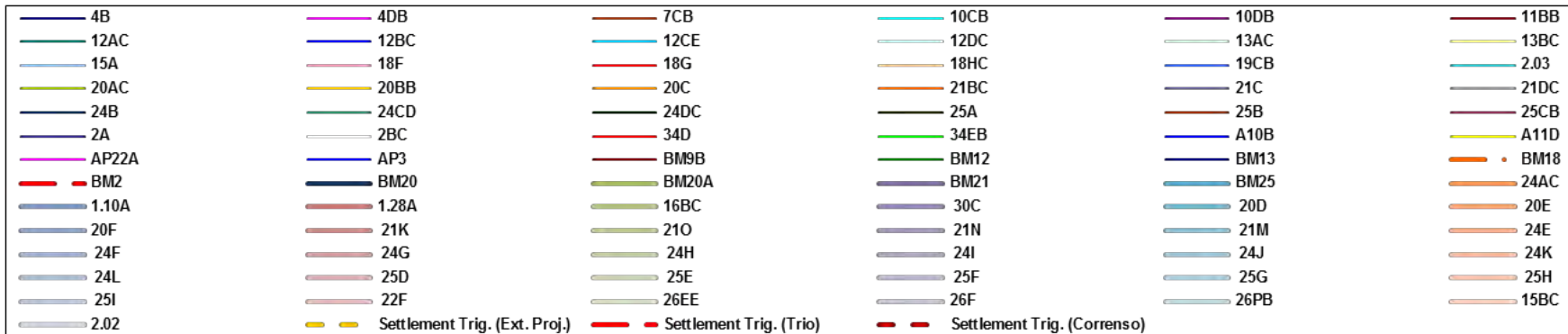
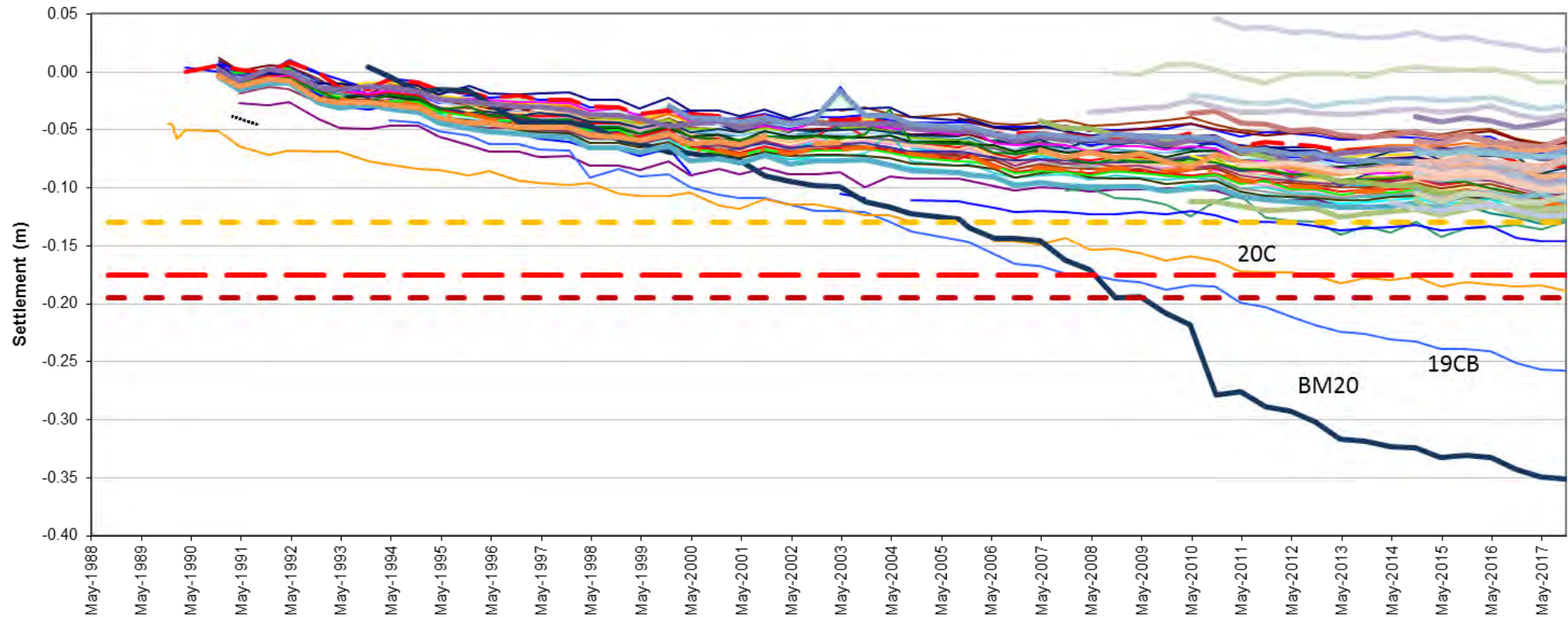
Settlement Zone 3



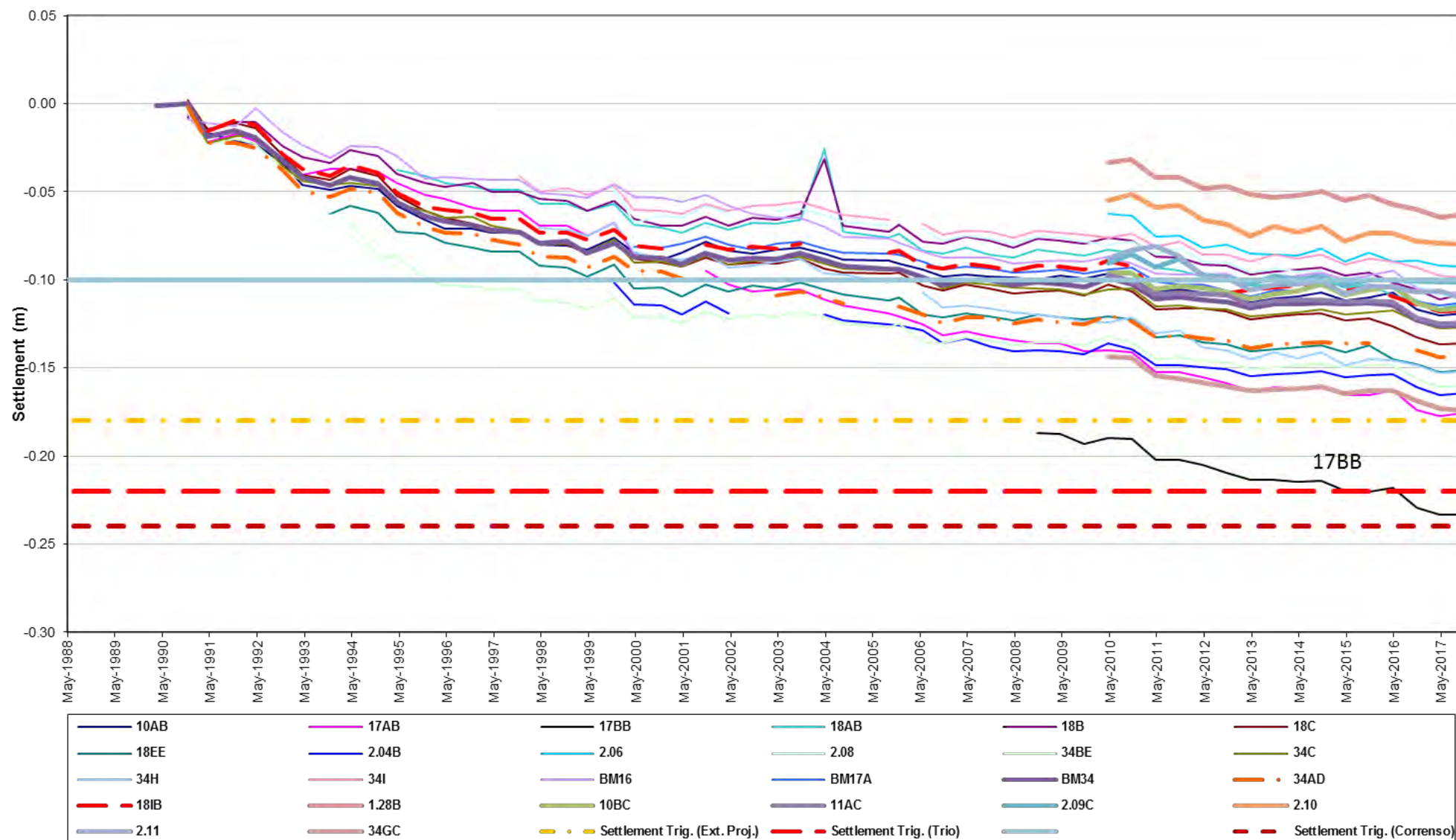
Settlement Zone 4



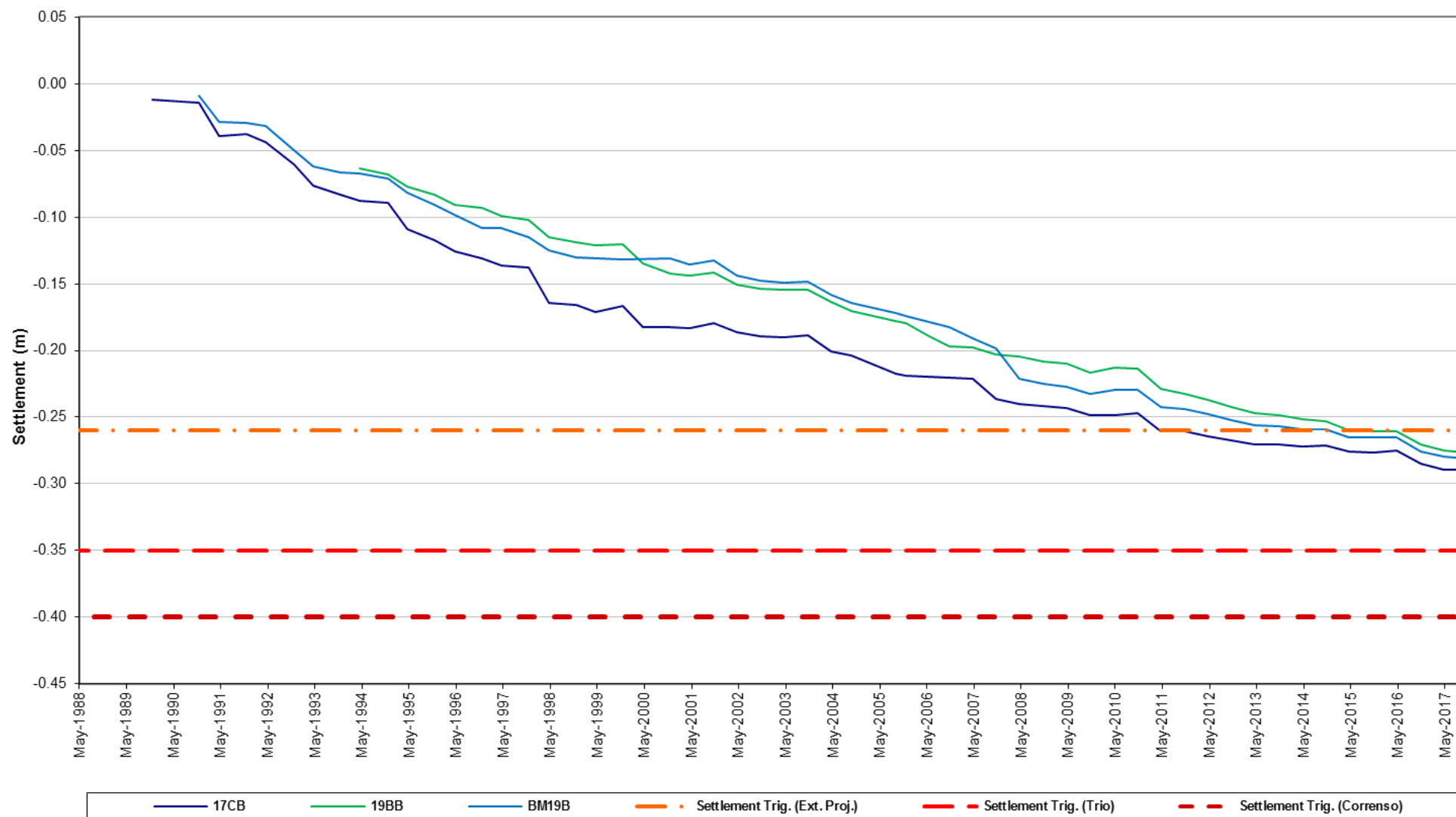
Settlement Zone 5



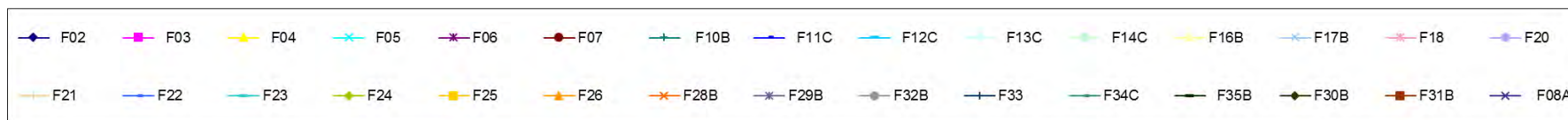
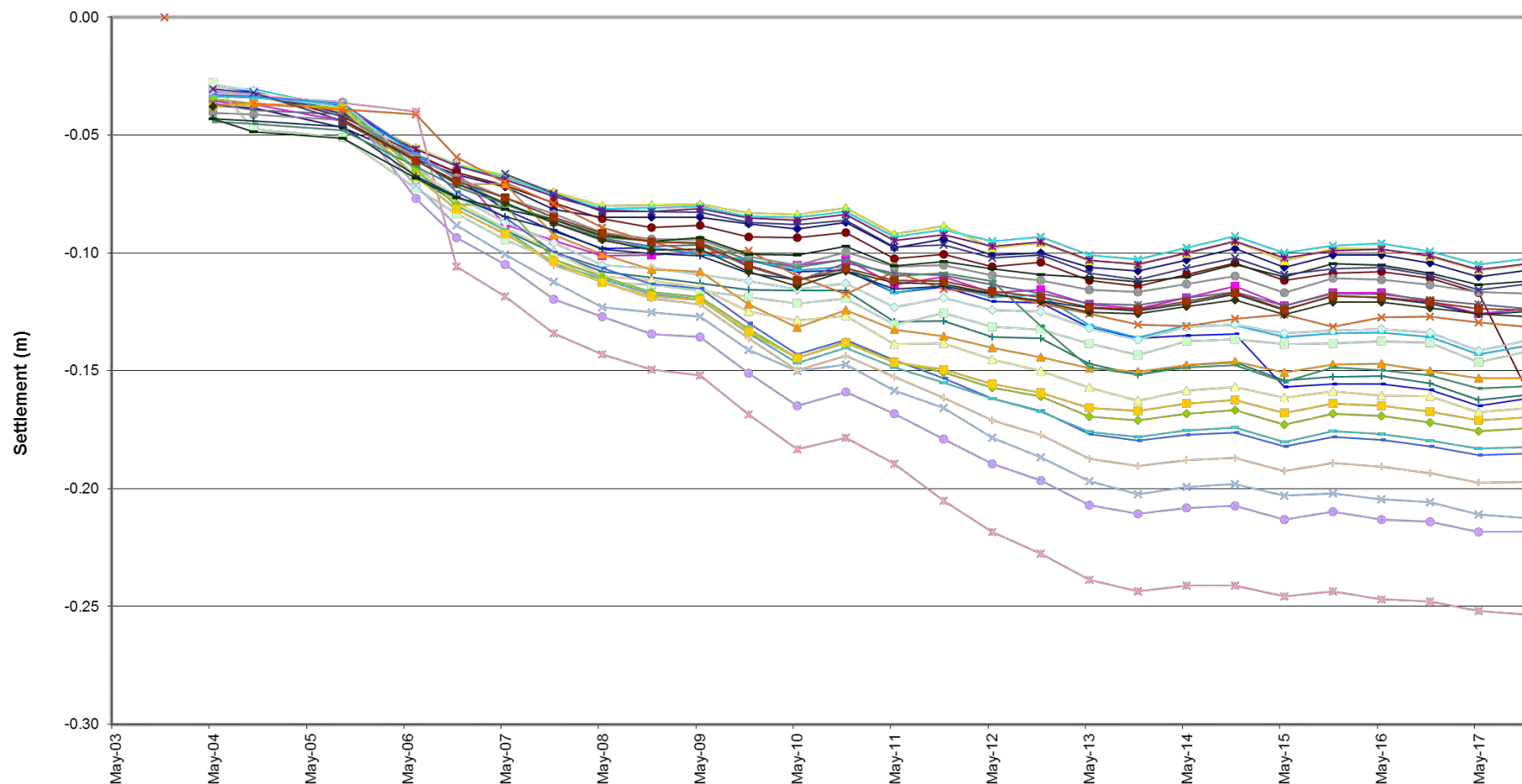
Settlement Zone 6



Settlement Zone 7



Favona



Appendix E Pit/Underground & Pit Wall Runoff – Water Quality 2017



Pit / Underground Dewatering Water Quality

Date	Data Point	FLS EC (mS/m)	FLS pH	FLS Temp	Acidity (ph 8.3)(g/m3 as CaCO3)	Acidity (pH 3.7)	Alk-Bicarb	Alk-T	Alk	AIA	AIS	SbA	SbS	AsA	AsS	Bicarb	CdA	CdS	CaSO	Carb	COD	Cl	CrS
18/01/2017	Underground Dewatering	235.7	7.3	28.4		1	187	188			0.012		0.0035		0.013	230		0.00164	510		6	13.2	0.001
20/02/2017	Underground Dewatering	260.4	6.55	28.4	1				137										509.6161406				14.6
16/03/2017	Underground Dewatering				1				365										291				17.2
26/04/2017	Underground Dewatering	234.6	6.8	24.1		1	360	360			0.03		0.0059		0.004	440		0.0026	440		6	12.5	0.001
25/05/2017	Underground Dewatering				1				116										563				14.4
14/06/2017	Underground Dewatering				1				200										534				12.1
27/07/2017	Underground Dewatering	223.3	6.65	27.4		1	100	100			0.029		0.0051		0.009	122		0.00142	530		14	14.6	0.001
1/08/2017	Dobson 765 Access					1	210	210		0.006	0.006	0.0004	0.0004	0.033	0.035	250	0.0001	0.0001	460	1	6	12.5	0.001
29/08/2017	Underground Dewatering				1				140										517				16.3
29/09/2017	Underground Dewatering	278	6.9	25.2	1				174										521				16.1
6/10/2017	Underground Dewatering	278	6.95	26.1																			
9/10/2017	Underground Dewatering	284	6.9	26																			
10/10/2017	Underground Dewatering	278.4	6.95	25.8																			
11/10/2017	Underground Dewatering	293.4	6.9	27																			
12/10/2017	Underground Dewatering	276.9	6.8	27.3																			
13/10/2017	Underground Dewatering	283.4	6.75	27.1																			
16/10/2017	Underground Dewatering	243.4	6.75	25.3																			
17/10/2017	Underground Dewatering	268.4	6.9	26																			
18/10/2017	Underground Dewatering	274.6	6.8	26.4																			
19/10/2017	Underground Dewatering	262.4	6.9	27.2																			
20/10/2017	Underground Dewatering	258.4	6.8	27.4																			
24/10/2017	Underground Dewatering	324.6	6.5																				
26/10/2017	Underground Dewatering	332	6.7	25.1		1	430	430			0.022		0.0048		0.009	520		0.00083	440		68	14	0.001
26/10/2017	Underground Dewatering	332	6.7	25.2																			
31/10/2017	Underground Dewatering	302	6.85	26.4																			
1/11/2017	Underground Dewatering	301.4	6.9	25.7																			
2/11/2017	Underground Dewatering	300.3	7	28																			
3/11/2017	Underground Dewatering	296.4	6.9	26.5																			
7/11/2017	Underground Dewatering	297.4	7.1	27.5																			
8/11/2017	Underground Dewatering	310.6	6.9	25.6																			
9/11/2017	Underground Dewatering	310	7	26.8																			
10/11/2017	Underground Dewatering	310.4	6.95	26.8																			
22/11/2017	Underground Dewatering	221.3	7.05	30.4	1				136										459				14.6
14/12/2017	Underground Dewatering				1				314										615				13.5

Date	Data Point	Cr6col	Cr-T	CoA	CoS	CuA	CuS	CNTOT	EC (mS/m)	F-	NH3	AuS	Hard	FeA	FeS	FeT	PbA	PbS	MgSO	MnA	MnS	HgA	HgS	HgT	NiA	NiS
18/01/2017	Underground Dewatering	0.01			0.035		0.0018	0.0035	259		0.01	0.0006	1610	8.4		29		0.0002	83		8.9	8.00E-05		0.00018		0.037
20/02/2017	Underground Dewatering								270				1700	24.38118857					95.47280712	11.36444421						
16/03/2017	Underground Dewatering								147				870	27					35	7.1						
26/04/2017	Underground Dewatering	0.01			0.079		0.027	0.033	223		0.031	0.0006	1530	15.5		31		0.0002	102		9.6	8.00E-05		0.00014		0.106
25/05/2017	Underground Dewatering								293.4				1900	23					120	13						
14/06/2017	Underground Dewatering								279.2				1800	24					110	14						
27/07/2017	Underground Dewatering	0.01			0.04		0.0037	0.0048	282		0.01	0.0006	1770	4.6		6.2		0.0002	108		11.3	8.00E-05		8.00E-05		0.068
1/08/2017	Dobson 765 Access	0.001	0.0011	0.0004	0.0004	0.001	0.001	0.001	229	0.07	0.01		1270	0.14	0.11	0.151	0.0002	0.0002	30	3.1	3.1	8.00E-05	8.00E-05	8.00E-05	0.001	0.001
29/08/2017	Underground Dewatering								253				1600	16					82	15						
29/09/2017	Underground Dewatering								2.59				1600	9.6					82	11						
6/10/2017	Underground Dewatering																									
9/10/2017	Underground Dewatering																									
10/10/2017	Underground Dewatering																									
11/10/2017	Underground Dewatering																									
12/10/2017	Underground Dewatering																									
13/10/2017	Underground Dewatering																									
16/10/2017	Underground Dewatering																									
17/10/2017	Underground Dewatering																									
18/10/2017	Underground Dewatering																									
19/10/2017	Underground Dewatering																									
20/10/2017	Underground Dewatering																									
24/10/2017	Underground Dewatering																									
26/10/2017	Underground Dewatering	0.01			0.041		0.001	0.001	275		0.01	0.0006	1400	15.4		27		0.0002	74		8.4	8.00E-05		8.00E-05		0.058
26/10/2017	Underground Dewatering																									
31/10/2017	Underground Dewatering																									
1/11/2017	Underground Dewatering																									
2/11/2017	Underground Dewatering																									
3/11/2017	Underground Dewatering																									
7/11/2017	Underground Dewatering																									
8/11/2017	Underground Dewatering																									
9/11/2017	Underground Dewatering																									
10/11/2017	Underground Dewatering																									
22/11/2017	Underground Dewatering								2.52				1400	4.4					66	8.5						
14/12/2017	Underground Dewatering								2.62				1800	6.3					72	10						

Date	Data Point	NO3-N	NOxN	NO2-N	NH4N	pH	PTO	KSO	DRP	SeA	SeS	SeT	SI	AgA	AgS	NaSO	SO4	Sum Anion	Sum Cation	TiA	TiS	TKN	SeTR	TSS	UA	US	CNWAD
18/01/2017	Underground Dewatering	2.2	2.4	0.19	0.5	7.7	0.134	9	0.004		0.002	0.0025	43		0.0002	59	1620	38	35			0.83		840			0.0015
20/02/2017	Underground Dewatering					6.7		9.508706377			0.0094					61.86349984	1750						0.0094	1200			
16/03/2017	Underground Dewatering					7.7		12			0.0094					41	750						0.0094	7300			
26/04/2017	Underground Dewatering	15.7	15.9	0.18	11.6	7.1	2.4	11.3	0.004		0.002	0.0028	30		0.0002	50	1510	40	34			7.4		7500			0.028
25/05/2017	Underground Dewatering					6.6		10			0.0094					62	2200						0.0094	1100			
14/06/2017	Underground Dewatering					6.6		9.5			0.0094					54	1610						0.0094	2100			
27/07/2017	Underground Dewatering	1.26	1.37	0.1	0.87	6.9	0.167	9.8	0.004		0.002	0.0035	41		0.0002	54	1750	39	39			1.7		580			0.0033
1/08/2017	Dobson 765 Access	0.25	0.25	0.1	0.128	7.1	0.012	8.4	0.004	0.002	0.002		50	0.0002	0.0002	90	1390	33	30	0.0001	0.0001	0.15		5	4.00E-05	4.00E-05	0.001
29/08/2017	Underground Dewatering					6.9		9.2			0.0094					53	1610						0.011	4400			
29/09/2017	Underground Dewatering					7.1		12			0.0094					66	1560						0.0094	1100			
6/10/2017	Underground Dewatering																										
9/10/2017	Underground Dewatering																										
10/10/2017	Underground Dewatering																										
11/10/2017	Underground Dewatering																										
12/10/2017	Underground Dewatering																										
13/10/2017	Underground Dewatering																										
16/10/2017	Underground Dewatering																										
17/10/2017	Underground Dewatering																										
18/10/2017	Underground Dewatering																										
19/10/2017	Underground Dewatering																										
20/10/2017	Underground Dewatering																										
24/10/2017	Underground Dewatering																										
26/10/2017	Underground Dewatering	4.7	4.8	0.15	4	6.9	1.06	13.2	0.004		0.002	0.0036	44		0.0002	55	1840	48	31			7.3		2800			0.001
26/10/2017	Underground Dewatering																										
31/10/2017	Underground Dewatering																										
1/11/2017	Underground Dewatering																										
2/11/2017	Underground Dewatering																										
3/11/2017	Underground Dewatering																										
7/11/2017	Underground Dewatering																										
8/11/2017	Underground Dewatering																										
9/11/2017	Underground Dewatering																										
10/11/2017	Underground Dewatering																										
22/11/2017	Underground Dewatering					7		7.7			0.0094					50	1490						0.0094	240			
14/12/2017	Underground Dewatering					7.5		8.5			0.0094					60	1620						0.0094	2000			

Date	Data Point	ZnA	ZnS
18/01/2017	Underground Dewatering		0.89
20/02/2017	Underground Dewatering		
16/03/2017	Underground Dewatering		
26/04/2017	Underground Dewatering		1.61
25/05/2017	Underground Dewatering		
14/06/2017	Underground Dewatering		
27/07/2017	Underground Dewatering		1.04
1/08/2017	Dobson 765 Access	0.017	0.015
29/08/2017	Underground Dewatering		
29/09/2017	Underground Dewatering		
6/10/2017	Underground Dewatering		
9/10/2017	Underground Dewatering		
10/10/2017	Underground Dewatering		
11/10/2017	Underground Dewatering		
12/10/2017	Underground Dewatering		
13/10/2017	Underground Dewatering		
16/10/2017	Underground Dewatering		
17/10/2017	Underground Dewatering		
18/10/2017	Underground Dewatering		
19/10/2017	Underground Dewatering		
20/10/2017	Underground Dewatering		
24/10/2017	Underground Dewatering		
26/10/2017	Underground Dewatering		0.78
26/10/2017	Underground Dewatering		
31/10/2017	Underground Dewatering		
1/11/2017	Underground Dewatering		
2/11/2017	Underground Dewatering		
3/11/2017	Underground Dewatering		
7/11/2017	Underground Dewatering		
8/11/2017	Underground Dewatering		
9/11/2017	Underground Dewatering		
10/11/2017	Underground Dewatering		
22/11/2017	Underground Dewatering		
14/12/2017	Underground Dewatering		



Pit Wall Runoff Water Quality

No pit wall sampling was undertaken in 2017.