Monitoring Plan

Dewatering and Settlement Monitoring Plan

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Department	**Sustainability**
Location/Site	Waihi

Approval table

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1	2016	All	All	OceanaGold re-issue	
2	03/04/2019	All	All	New Project Martha Consent	
3	05/04/2022	All	All	Update	
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Table of Contents

Table of Figures

1 PURPOSE

Consents granted by the Waikato Regional Council (WRC) and the Hauraki District Council (HDC) for the Martha Open Pit, Favona Underground Mine, Trio Underground Mine, Correnso Underground Mine, Slevin Underground Project Area (SUPA) and Project Martha require the preparation of a Dewatering and Settlement Monitoring Plan. The relevant consent conditions are reproduced in section 6.

2 SCOPE

This plan combines both the Martha Settlement and Groundwater Monitoring Plan 2004-2005 (v3) and the Favona Settlement, Dewatering and Water Quality Monitoring Plan 2006 (v1) into the one document. The Martha and Favona Plans have been combined to simplify the dewatering, groundwater and settlement monitoring which is conducted at similar monitoring networks and frequencies for Martha, Favona, Trio and Correnso/SUPA.

The plan describes the monitoring regime designed to assess the effects of:

a) Mine dewatering on the regional groundwater system;

b) Mine dewatering on settlement;

c) Leachate from the Favona Ore Stockpile and Polishing Pond Stockpile containing potentially acid forming material on shallow groundwater quality; and

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

3 REFERENCE AND COMPLIANCE

Level	Source
Legislation or Guidelines	• Land Use Consent 97/98-105 • Water Permit 971286 • Mining Licence 32-2388 • Land Use Consent 85.050.326.E • WRC Resource Consents 109742, 109743, 109744, 109745, and 109746 • HDC Resource Consent RC-15735 • WRC Resource Consents 121416, 121417, 121418, 121446, and 121447 • HDC Resource Consent RC-202.2012 • WRC Resource Consent 124860 • Water Permit AUTH139551.01.01 • Land Use Consent 202.2018.00000857.001
Corporate	• OGC-450-STD-019 -Environmental Performance Standards \ Standard 3 – Water Management
	• OGC-450-GUI-005 Risk Management Guidelines
Site	• WAI-200-PRO-012 Groundwater Monitoring

Level	Source
	• WAI-417-PRO-009 Management of Surface Intersecting Drill Hole WAI-200-PRO-021 Waihi Piezometer Network Monitoring

4 RISK ASSESSMENT

The site risk register is to be reviewed after all significant incidents. Formal Risk Assessments (FRA) are to be undertaken where changes to this document affect safety of personnel. Risk Assessments are to be conducted according to OGC-450-GUI-005 Risk Management Guidelines.

5 INTRODUCTION

5.1 Martha

The Martha Mine is an open pit operation that commenced construction in 1987. Mining at Martha was planned to cease in 2006, however mining was extended for an additional 10 years (scheduled until 2016). The Martha Pit is currently in abeyance due to a slip on the North Wall.

5.2 Favona

The Favona Underground mine is located north and east of the existing processing plant. Site preparation works were conducted in 2004, with the construction of the Favona Exploration Decline commencing in November 2004. Groundwater was not intercepted until May 2005, with minor flows until October 2005 when large volume dewatering from the vein was required. Dewatering holes have been drilled at strategic locations throughout the mine to lower the groundwater table surrounding the Favona ore body. Water from the dewatering holes drains into sumps and is pumped to the surface for treatment. Mining of the Favona mine is concluded and backfilling completed.

5.3 Trio

The Trio system sits under Union Hill, about halfway between the existing process plant and the Martha open pit. Trio is accessed from the existing Favona mine and utilises existing Martha and Favona mine surface infrastructure including the already consented stockpile areas. The Trio Underground Mine involves the mining of the Trio, Union and Amaranth mineralised veins (collectively referred to as the Trio system).

Trio mining and backfilling was completed in 2014.

5.4 Correnso

Mining of Correnso began in December 2013 with the construction of a development drive in Waihi East. Access to Correnso is via the existing Trio/Favona system.

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

1) Open stopes are progressively backfilled with waste rock during mining operations. Backfilled stopes are not treated by any specific compaction or consolidation process, but are subjected to blast vibrations, heavy vehicular trafficking, and further backfilling during mining of subsequent stopes above.

2) Waste rock is stockpiled at two locations on the surface. A short-term stockpile is maintained immediately behind the mill area, enabling easy access for back loading. A larger and longer-term volume can be stored at the 'Polishing Pond' Stockpile (near the water treatment plant polishing ponds). Waste rock placement at this stockpile started in early February 2007.

5.5 Slevin Underground Project Area

SUPA was granted consent in October 2016. It is a comparatively small project area and is an offshoot of Correnso. Access to SUPA will be from the CEPA project area. There are no additional monitoring requirements as Correnso monitoring adequately encompasses SUPA also.

5.6 Project Martha

Project Martha was granted consent in February 2019. Underground mining commenced in mid-2019. As part of the consent pre-conditions, this monitoring plan is to be submitted and certified two months prior to dewatering below 700mRL. Additional piezometers, planned in consultation with regulators, were drilled in 2019-2020. A further four piezometers were installed in 2022-2023, including one in the Martha Underground Mine. Upgrades to the network to monitor response from shallow Rex orebody mining were also completed in 2023.

6 RELEVANT CONSENT CONDITIONS

6.1 Martha

This site specific monitoring plan is required under Condition 3.30 of LUC Number 97/98-105; Water Permit Number 971286; and Condition 11 of Mining Licence 32-2388. Full copies of these Conditions are given in Appendix A.

The Conditions require a Dewatering and Settlement Monitoring Plan to address the following:

a) 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 management system.

b) Details of the piezometer network proposed to monitor the effects of pit dewatering on the aquifers under Waihi Township.

c) 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.

d) Details of the survey facilities in the Waihi Township considered by the consent holder to be potentially "at risk" of damage from ground settlement caused by mine dewatering.

e) 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 (vertical) in 1000 (horizontal) between any two network monitoring locations spaced no less than 25 m apart (i.e. Settlement no more than 25 mm over 25 m). The settlement contingency plan shall particularly address those facilities identified by the consent holder as being "at risk" from ground settlement caused by mining.

f) A dewatering contingency monitoring 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.

g) 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.

The conditions allow the consent holder to review and update the plan as necessary.

Monitoring is to include:

- The daily volume of water abstracted.
- Monthly water level monitoring of the piezometer network.
- Six monthly monitoring of ground settlement.
- The chemistry of groundwater, pit runoff and dewatering water.

In the event that a tilt of greater than 1 in 1000 occurs over 25 m and such tilt is due to mine dewatering, or there is a significant variance from predicted settlement rates for the settlement zones given in Table 1 as follows:

Table 1: Maximum Zone Settlements

Zone	Maximum Total Settlement (mm), incl Project Martha (2020)
1	55
2	65
3	95
4	160
5	260
6	340
7	540

Note: Maximum Total Settlement incl. Project Martha Dewatering sourced from Project Martha Hearing Evidence, Appendix R, Table 2 (Engineering Geology Ltd, May 2018)

The consent holder is to:

a) Explain the cause of the non-conformance.

b) Agree with the consent Authorities on appropriate settlement contingency measures to be implemented.

c) Implement settlement contingency measures as appropriate.

d) Advise the councils of the steps proposed to be taken to prevent further occurrence of the situation.

6.2 Favona

Conditions 33 to 36 of the LUC and Conditions for the Favona Underground Mine Project granted by Hauraki District Council (No. 85.050.326.E granted in 2004) and Condition 2 of Schedule 2 – General Conditions attached to the WRC Resource Consents 109742, 109743, 109744, 109745, and 109746 state the following regarding the Settlement, Dewatering and Water Quality Monitoring Plan:

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. 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.

e) 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 and Water Quality Monitoring Plan, then the conditions of this consent shall prevail.

Condition 3 of Schedule 2 – General Conditions attached to the WRC Resource Consents 109742, 109743, 109744, 109745, 109746 and Condition 38 of the LUC and Conditions for the Favona Underground Mine Project granted by Hauraki District Council (No. 85.050.326.E granted in 2004) state the following regarding Monitoring - Tilt:

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:

1. explain the cause of the non-conformance,
2. agree with the Council on the appropriate settlement contingency measures to be implemented as described,
3. implement settlement contingency measures as appropriate,
4. advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

This latter condition is similar to that of Condition 10 (above) for the Martha Mine.

Condition 2 of WRC resource consent number 109742 states the following regarding other water users:

> *“If, in the opinion of the Council, the exercise of the 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 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 Council.”*

Specific conditions relating to the Settlement, Dewatering and Water Quality Monitoring Programme are included in two other WRC consents for the Favona Underground Mine. These conditions relate directly to water quality monitoring as follows.

Resource Consent 109744 authorises the discharge of waste rock and ore onto land in temporary surface stockpiles and to discharge seepage from the temporary stockpiles into the ground. Condition 5 states the following:

> *"In addition to the provisions of conditions 4a) and 4b) above, PAF stockpile site preparation shall include:*
>
> *(c) Shallow piezometers installed immediately up and down catchment of the stockpile(s) to monitor for leachate in the shallow groundwater system (as detailed in the Settlement, Dewatering & Water Quality Monitoring Plan prepared pursuant to condition 2 of Schedule Two – General Conditions."*

Resource Consent 109745 authorises the discharge of 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. Condition 3 states the following in relation to groundwater quality:

> *"Piezometers shall be installed at sites to be approved by the WRC for the purpose of monitoring changes in groundwater quality arising from the exercise of this consent. The groundwater monitoring system shall be detailed in the Settlement, Dewatering & Water Quality Monitoring Plan, prepared pursuant to condition 2 of Schedule Two – General Conditions."*

6.3 Trio

Condition 14 of the HDC Resource Consent RC-15735[1] and Condition 5 of Schedule One – General Conditions attached to the WRC Resource Consents 121416, 121417, 121418, 121446, and 121447 state the following regarding the Settlement, Dewatering and Water Quality Monitoring Plan as it relates to the Trio Development Project:

Prior to (*note: this is specific to the WRC Condition; HDC requires the plan "within 2 months of exercise of the consent"*) 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:

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[1] The HDC Trio Underground Mine consent (RC15774) does not have a requirement for a Dewatering and Settlement Monitoring Plan. The requirement for such a Plan is covered under the Trio Development Consent.

(i) dewatering on the regional groundwater system; and

(ii) dewatering on settlement.

(iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality (*note: this third requirement is unique to the WRC Condition* only)

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.

6.4 Correnso

Conditions 27 to 34 of the HDC Resource Consent RC-202.2012 state the following regarding the Settlement, Dewatering and Water Quality Monitoring Plan as it relates to the Correnso Underground Mine:

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.

Within 2 months of the exercise of this consent, the consent holder shall prepare, and submit to the Council/s for written approval, a Dewatering and Settlement Monitoring Plan. The purpose of the 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 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.

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.

The exercise of the consent must 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 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 the 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.

The consent holder shall promptly 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.

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.

Condition 5 of the WRC Resource Consent 124860 states the following regarding the Settlement, Dewatering and Water Quality Monitoring Plan as it relates to the Golden Link Project Area L:

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.

6.5 SUPA

Dewatering and Settlement Monitoring Plan

21 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.

22 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.

23 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 21.

The monitoring regime shall be designed to assess the effects of:

a) Dewatering on the regional groundwater system; and

b) Dewatering on settlement.

24 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.

25 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.

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.

28 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 and may be prepared in conjunction with similar plans prepared in accordance with the consent conditions applying to the Martha, Favona, Trio and CEPPA projects.

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

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.

6.6 Project Martha

Waikato Regional Council Consent

Resource Consent: AUTH139551.01.01 Water Permit - Dewatering Take

CONDITIONS

GENERAL

1 The activities to which this consent relates shall be generally undertaken in accordance with "Project Martha: Applications for Resource Consents and Assessment of Environmental Effects" and associated appendices dated 25 May 2018 and recorded as document number 12546836 on the Waikato Regional Council's document management system, and as identified in the resource consent conditions below which shall prevail in the event of any inconsistency between the aforementioned documentation and the conditions.

2 The consent holder shall notify the Waikato Regional Council in writing at least 10 working days in advance of the first exercise of this consent.

SCHEDULE ONE

3 The consent holder shall comply with the common conditions between the Waikato Regional Council and Hauraki District Council in Schedule One as relevant to the management of the mining and rehabilitation activities authorised by this consent.

DEWATERING LEVEL

4 The exercise of this consent shall not result in groundwater lowering to a level below 500mRL.

MONITORING

5 Upon commencement of this consent, the consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council.

6 Upon the first exercise of this consent the consent holder must telemeter – via a telemetry system developed after liaison with the Waikato Regional Council to ensure that the telemetry system is compatible with the Waikato Regional Council telemetry system standards and data protocols – continuous 15 minute values of: gross take volume (in units of cubic metres). The data must be reported once daily to the Waikato Regional Council via the telemetry system. There must be 96 values, respectively, per daily report. When no water is being taken the data must specify the gross take volume and calculated net take volume as zero.

7 The consent holder shall monitor the chemistry of the water abstracted under this consent. Prior to the commencement of this consent the sampling parameters and frequencies shall be agreed with the Waikato Regional Council, with the results forwarded to the Waikato Regional Council on an annual basis. The consent holder may change the sampling parameters and frequencies with the agreement of the Waikato Regional Council.

OTHER WATER USERS

8 If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects any existing 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 Council.

MONITORING OF THE SHALLOW AND DEEP AQUIFERS

9 The consent holder shall upon commencement of this consent and at five yearly intervals thereafter, provide a report to the Waikato Regional Council commenting on the effect the groundwater take and dewatering activity is having on the deep and shallow aquifers under the Martha Pit and immediate surrounds. The report shall as a minimum, provide the following information:

(a) The nature of the geology under the Martha Pit and immediate surrounds;

(b) Comment on the existing groundwater chemistry for the deep and shallow aquifers;

(c) Comment on the groundwater levels in the deep and shallow aquifers; and

(e) Provide details of any wetland areas and any other known aquatic ecological values that are dependent on the surface contribution of shallow and deep groundwater outflows.

Taking into account all of this information (and any other relevant data) the consent holder shall provide comment on the effects the dewatering activity is having on the shallow and deep aquifers under the Martha Pit and immediate surrounds.

ADMINISTRATIVE CHARGES

10 The consent holder shall pay to the Waikato Regional Council any administrative charge fixed in accordance with Section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under Section 360 of that Act.

REVIEW OF CONDITIONS

11 Pursuant to Section 128(1)(a)(i) and (iii) of the Act, the Waikato Regional Council may, 12 months from the commencement of this consent and annually thereafter, or on receipt of any of the reports required by this consent, review any or all of the conditions of this consent for the following purposes:

(a) To review the effectiveness of the conditions of this resource consent in avoiding, remedying or mitigating any adverse effects on the environment that may arise from the exercise of this consent, and if necessary to avoid, remedy or mitigate such effects by way of further or amended conditions. In deciding to undertake a review and where further or amended conditions are deemed necessary, the Waikato Regional Council shall have regard to all of the information contained in the reports required under the conditions of this consent; or

(b) To address any adverse effects on the environment which have arisen as a result of the exercise of this consent that were not anticipated at the time of commencement of this consent; or

(c) To review the adequacy of, and the necessity for, any of the monitoring programmes or management plans that are part of the conditions of this consent.

12 Pursuant to Section 128(1)(a)(i) and (iii) of the Act, the Waikato Regional Council may review Conditions 41 to 46 in Schedule One of this consent following any change made to the Trust Deed referred to in Condition 41 of Schedule One.

SCHEDULE ONE

COMMON CONDITIONS BETWEEN THE HAURAKI DISTRICT COUNCIL AND THE WAIKATO REGIONAL COUNCIL

DEWATERING AND SETTLEMENT MONITORING PLAN

14. 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.

15. Two months prior to dewatering below 700 m RL (mine datum), the consent holder shall prepare, and submit to the Councils for its certification, a Dewatering and Settlement Monitoring Plan. The purpose of the Dewatering and Settlement Monitoring 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.

16. 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 14 of this schedule. The monitoring regime shall be designed to assess the effects of:

Dewatering on the regional groundwater system; and

Dewatering on settlement.

17. Monitoring locations are to provide appropriate resolution of mine inflows and pumping, groundwater levels (both for shallow and deep aquifers) and ground surface tilt relative to the scale of surface infrastructure, throughout the area within the maximum extent of the groundwater cone of depression and particularly in the areas above and adjacent to the mining activities provided for in this consent. Final details are to be agreed with the Councils but are to include additional piezometers and extensometers located along the line of upper level workings in the Rex Orebody. The Dewatering and Settlement Monitoring Plan shall also provide groundwater and settlement trigger limits that will initiate the implementation of contingency mitigation and / or monitoring measures and shall detail any linkages with the operation of the Martha Pit and Martha Underground Mine.

18. The exercise of this consent shall be in accordance with the Dewatering and Settlement Monitoring Plan as certified by the Councils. The Dewatering and Settlement Monitoring Plan shall be reviewed and updated as necessary by the consent holder. Any updated Dewatering and Settlement Monitoring Plan shall be promptly forwarded to the Councils for certification, and following this process, the updated plan shall be implemented in place of the previous version.

19. In the event that a tilt greater 1 in 1,000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 15 of this schedule, 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:

    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; and

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

20. The consent holder shall as a matter of urgency, advise the Councils of any significant anomalies identified by the regular 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 Councils within 10 working days of the anomalous results being identified.

A “significant anomaly” is defined as a drop in groundwater level greater than the seasonal variation in piezometers within the alluvium and younger volcanic rocks and a drop of 15 m or more in the recordings from piezometers tapping the upper 50 m of Andesite over a one month period.

21. 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 Note:

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 filling of the Martha Pit.

DEWATERING AND SETTLEMENT MONITORING REPORT

22. The consent holder shall provide to the Councils (within one month of an agreed anniversary date) 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 the 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 14 to 21 of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

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

PROJECT MARTHA LAND USE CONSENT FOR MARTHA UNDERGROUND MINE (LUC 202.2018.00000857.001)

71 (c). No stoping in the Rex Orebody shall occur above a depth of at least 40m below the top of the andesite, unless investigations reported to the Council demonstrate to its satisfaction that a lesser depth will ensure surface stability. Any such investigation report is to include, at least, results from groundwater monitoring above the Rex workings, results from extensometers installed from the surface above the Rex workings, and surface settlement results from markers in the area above the Rex Orebody.

OceanaGold intends to mine higher in the Rex orebody. A hydrogeological assessment was conducted by GWS Ltd. They found that “dewatering of the water table at the surface is generally noted not to occur as a result of mine underdrainage. Deep dewatering has not, therefore, resulted in near surface effects nor ground settlement beyond that expected beyond the consented envelope.”

Additional monitoring was agreed with the Council and implemented prior to mining higher in the Rex Orebody (Section 9.3.4).

7 MONITORING PLAN OBJECTIVES

7.1 General Objectives

The objectives of this Dewatering and Settlement Monitoring Plan are to:

- Outline the monitoring systems in place for dewatering, groundwater and settlement and the requirements for these systems in accordance with the relevant consent conditions.
- Identify trigger limits that will indicate when contingency mitigation and/or monitoring may be necessary;
- Identify what contingency mitigation and/or monitoring would be undertaken in the event that the trigger levels are exceeded, in order to ensure that adverse environmental effects are avoided, remedied or mitigated.

7.2 Specific Objectives

7.2.1 Dewatering Objectives

The objectives of the dewatering monitoring are to:

- Provide data on the dewatering level at the Martha Pit groundwater pumping site so that the drawdown profile can be developed as required by Condition 3.30 (h) of the LUC 97 / 98-105, Condition 13 (c) of Water Permit 971286, Condition 15 of LUC RC-15735 and Condition 6 (Schedule One) of RC 121446.
- Measure and record the daily volume of water pumped from the Martha pit as required under Condition 3.30 (d) of the LUC 97 / 98-105, Condition 7 of Water Permit 971286 and Condition 15(i) of RC-15735.
- Measure and record the daily volume of water pumped from the Favona underground required under Consent 109742, Condition 3.
- Provide data on water chemistry and pit wall run-off chemistry at the Martha pit as required by Condition 11 of Water Permit 971286.
- Provide data on the water chemistry of dewatering water from the underground.
- Ensure that groundwater is not lowered below the consented level of 500mRL.
- Measure and report on the volume of water pumped from the Martha Underground as required under Conditions 5 and 6 of Water Permit AUTH139551.01.01,

Note that objectives related to the Martha Pit are suspended whilst mining is in abeyance.

7.2.2 Groundwater Objectives

The objectives of the groundwater monitoring system are to:

- Monitor the effects on the regional groundwater system from dewatering the Martha Underground, Trio, Favona and Correnso/SUPA Underground.
- Monitor the leachate from the Favona Ore and Polishing Pond stockpiles containing potentially acid forming material on shallow groundwater quality.
- Monitor the discharge of degraded quality water from the Underground backfilled and flooded workings on groundwater quality.

If analysis of the groundwater level data identifies that the magnitude of dewatering is likely to lead to settlement under Waihi Township that is greater than that given in Table 1, or the yield from a water supply bore is adversely affected by mine dewatering, then steps are to be taken by OGNZL to limit, or mitigate, the effects to an acceptable level.

7.2.3 Settlement Objectives

The primary objective of the Waihi Township settlement monitoring is to:

- Measure the magnitude of ground surface settlement that results from dewatering and mining the Martha, Trio, Favona and Correnso/SUPA operations.

If analysis of the settlement data identifies that a structure or service may be damaged by mine activities, steps are to be taken to limit or mitigate the adverse effects to an acceptable level.

8 DEWATERING MONITORING

8.1 Background

Dewatering of the Martha Pit prior to Trio was carried out to maintain pit water levels as close as possible to the 880mRL level (± 20m) so that mining could continue and to minimize any wetting/drying cycle in the historical mine workings.

The close relationship between the Martha and Trio groundwater systems has implications for dewatering for the Trio Underground; to access the lower Trio system, the Martha system had to be lowered further. The Martha/Trio/Correnso/SUPA groundwater system was progressively lowered from 880mRL to 795mRL by the 3 dewatering wells in the Edwards Stope. After the slip in Martha, access to the pumps was severely restricted. Dewatering in Martha ceased May 5th, 2015. On May 18th 2015 dewatering began from Correnso Underground.

Correnso dewatering is conducted by draining groundwater into sumps and pumping to the surface via mono-pumps. The Project Martha dewatering consent, which allows dewatering to no lower than 500 mRL, was activated January 1st, 2020. Water levels are being lowered using dewatering bores drilled from the 800 mRL level (Figure 2).

Dewatering of the Favona mine has resulted in changes in water pressures in the rock surrounding the vein system and induced some minor surface settlement above and immediately adjacent to the vein system. Monitoring is undertaken to verify the effects predicted in the Assessment of Environmental Effects and supporting technical documents that accompanied the applications for the Favona mine consents.

The WTP treats the dewatering water from Martha, Favona, Trio, Correnso/SUPA and Project Martha to within compliance specifications and discharges the treated water into the Ohinemuri River under consent conditions 971318, 971319 and 971320.

8.2 Scope

This section of the monitoring plan covers:

- Location and method of measuring daily pump volume at the Underground.
- Location and method of dewatering water sampling for chemistry analysis.
- Measurement frequencies.
- Data recording and storage.
- Reporting.

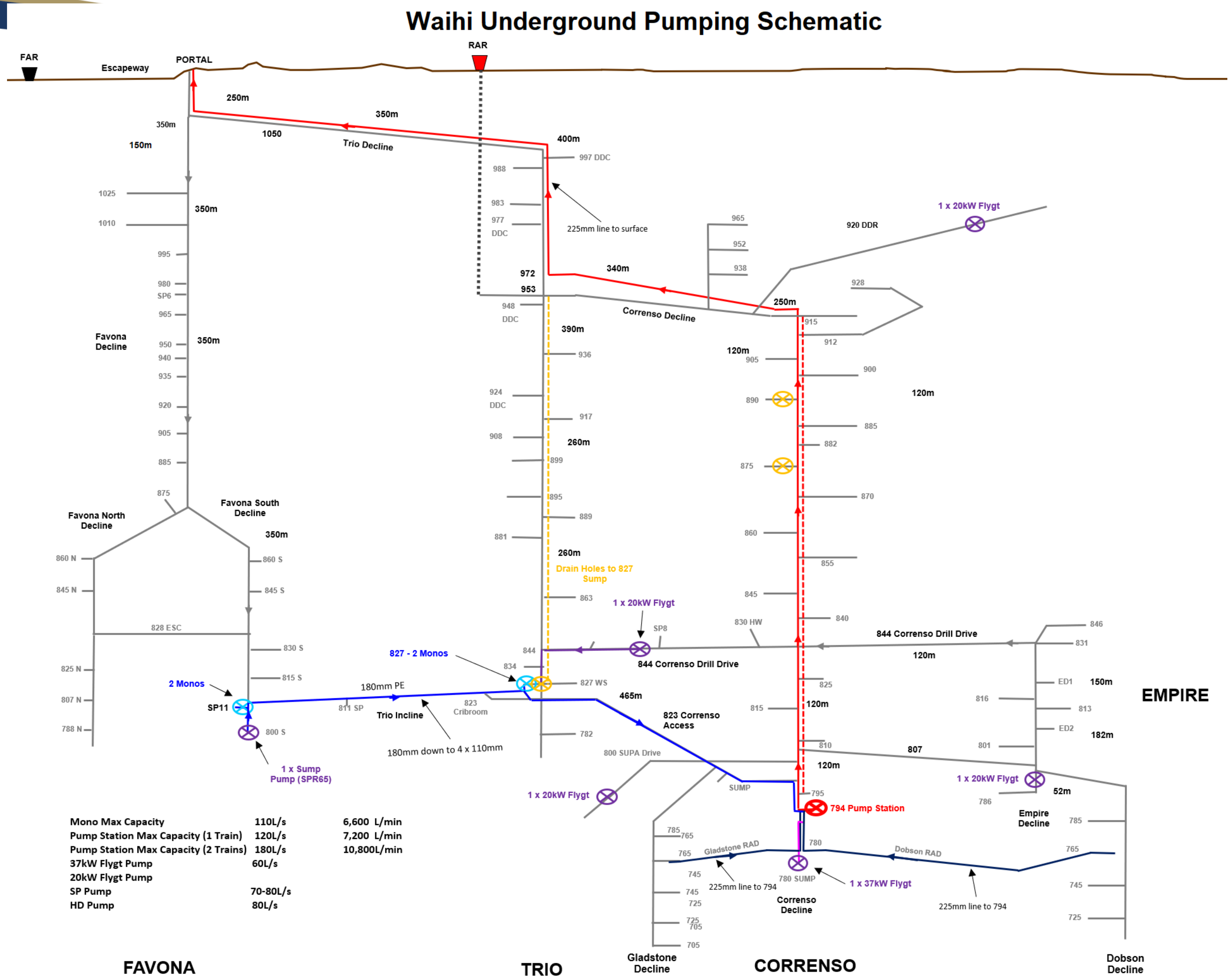

Figure 1: Underground pumping schematic

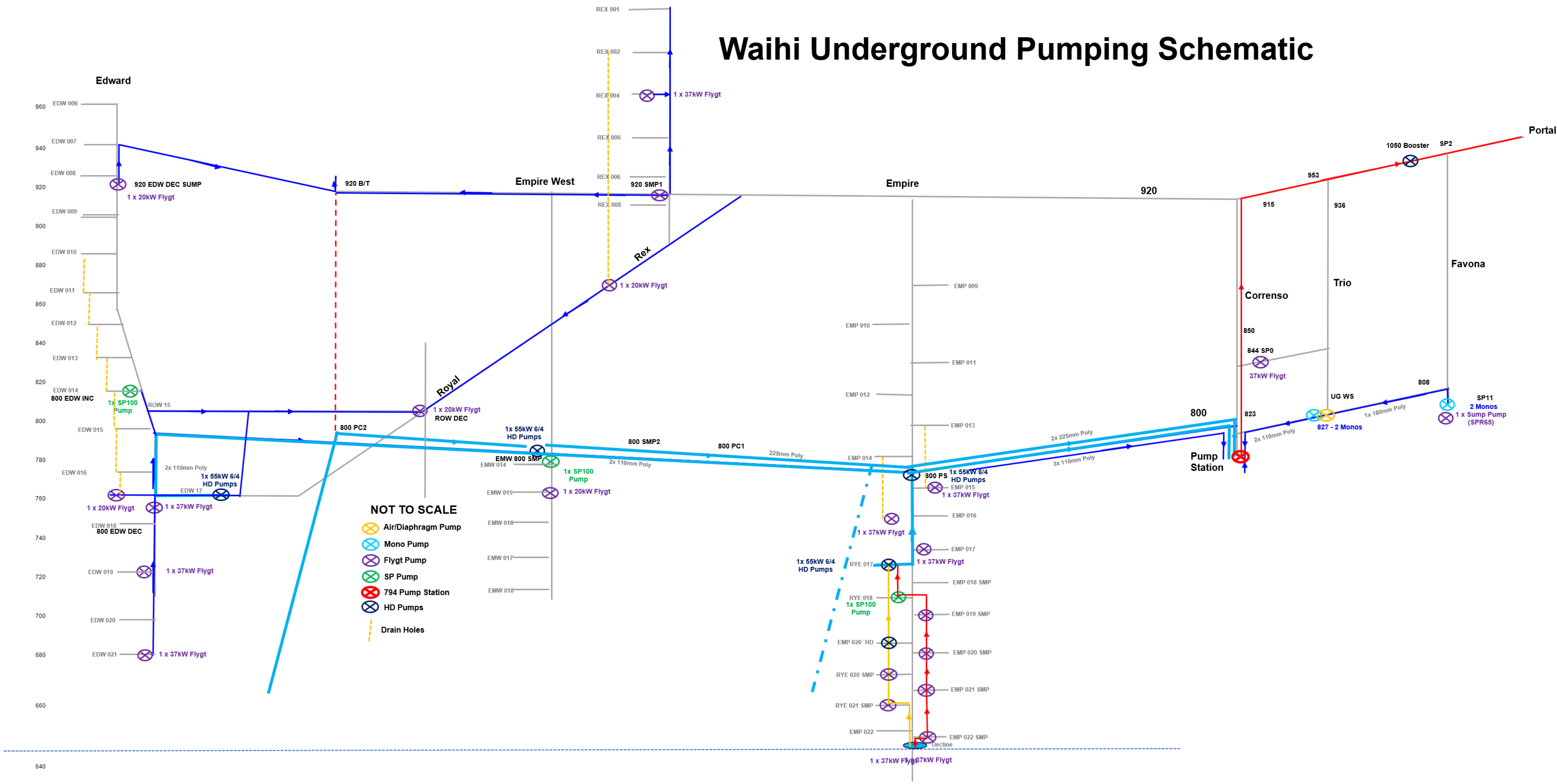

Figure 2: Martha Underground Pumping Schematic

8.3 Martha Pit Groundwater Level Monitoring

8.3.1 Location

Pit groundwater levels are currently not monitored due to pit access and electrical issues. Dewatering now occurs from Martha underground. In July 2022 a piezometer (ROW-17) was installed in an existing exploration drill hole. The collar is in the Edward decline at 773 mRL and the piezometer tip is at 472 mRL. The hole length is around 350 m, however vertically it is 300 m. It terminates approximately under the Empire West orebody and is set in deep Martha andesite.

8.3.2 Method and Frequency of Measurement

ROW-17 is equipped with telemetry and level data is accessed via Cirro.

8.3.3 Further dewatering

As dewatering advances, it is expected that new bores will be drilled to achieve target depths. Current groundwater take permit 139551 allows dewatering from 700mRL to 500 mRL.

8.4 Underground and Favona Dewatering Volume Measurement

8.4.1 Locations

Dewatering volumes for underground are monitored at the WTP on the automated Pi system. Totalising flow meters (Figure 3) are located at dewatering outflow pipelines from the underground portal. An additional flow meter was installed on the Favona line to provide data specific to the Favona mine. However, in 2021 the pump was removed as the area was dry.

In addition to Pi, data is accessible via a web portal. Condition 6 of WRC AUTH139551.01.01 requires installation of a telemetry system on the dewatering take. Daily data provision is presented in 15-minute totals from the underground water take.

Figure 3: Dewatering totalising flow meter

8.4.2 Method and Frequency of Measurement

Dewatering water pumped to the surface from the underground operations are a combination of groundwater and service water (treated water pumped into the mine). The volume of treated service water pumped into the mine is subtracted from the total amount of water pumped from underground to give a net dewatering volume.

8.4.3 Data Management

Meter readings from SCADA are recorded on an Access database daily and values compared with previous readings to identify anomalies. Where an anomaly is identified, the data sheets are to be checked and operations personnel consulted. If the anomaly persists, the meters are to be checked for accuracy. Flow meters are calibrated five-yearly.

8.5 Dewatering Water Chemistry Monitoring

8.5.1 Background

Dewatering water from the underground contains a mixture of groundwater, sediment, sulphide oxidation by-products and service water. As described above, dewatering water is treated through the WTP prior to discharge.

8.5.2 Location

Martha/Favona/Trio/Correnso/SUPA dewatering water from the underground dewatering well is sampled for chemistry from a water sampling spigot on the inflow pipeline to the WTP (Figure 4). Sampling is undertaken monthly according to the relevant sections of the Groundwater Monitoring Standard Operating Procedure (SOP) (WAI-200-PRO-012) provided in Appendix B.

Where possible, quarterly water samples are taken from the Favona mine, the bottom level of the Correnso mine and the Martha Underground dewatering bores. Results are presented in the annual Dewatering and Settlement Monitoring Report.

Figure 4: Underground dewatering sample spigot

8.5.3 Sampling Parameters and Frequency

The parameters monitored in the monthly sampling are shown in Table 2. The number of water chemistry parameters analysed are greater than the requirements outlined in the consent conditions (Appendix A).

Table 2: Underground Dewatering Sampling Parameters

Monthly Full Analysis Parameters (dissolved and acid soluble) RJH Code 38	
pH (field and lab)	
Conductivity (field and lab)	
Ca, K, Mg, Na	Sum of cations
Cl, HCO_3, SO_4	Sum of anions
Acidity/ Total Alkalinity	Pb
Ag	Sb
Al	Se
As	Si
Cd	Tl
CN_{WAD}	TSS
Co	U
Cr	Zn
Cr (VI)	Free ammonia (NH3)
Cu	Total ammoniacal (NH_4-N)
F	Nitrate-N (NO3N)
Fe	Nitrate-N + Nitrite-N (NOxN)
Hardness	P - Total
Hg + Hg Total	
Mn	
Ni	

8.6 Pit Water Quality Monitoring

8.6.1 Background

Pit water quality monitoring is no longer required under Project Martha Water Take permit 139551. Discontinuing this monitoring was recommended by AECOM in their letter dated 2 June 2021, which was included in Appendix D of the Rehabilitation and Closure Plan 2021. This plan was approved by WRC on 30 September 2021 (Doc No: 21867206). Pit wall runoff sampling had previously been conducted quarterly from four surface sumps on benches above the lake level (1104 mRL). From September 2004 a comprehensive monitoring regime was implemented that focused on rain events. Four additional collection sites were installed to collect runoff from below the 1000 mRL. Over 72 samples of runoff from areas of un-oxidised batters were collected and a comprehensive suite of water quality parameters analysed by RJ Hill laboratories.

OGNZL geochemistry advisors AECOM have recommended sampling to recommence when final pit walls are established after MOP4 or MOP5 (if approved).

8.7 Dewatering Reporting

A summary of Pit water levels was included in the annual summary of monitoring, however pit levels are no longer available. Currently water levels in the underground are recorded in Favona and the deepest point of Correnso. A summary of the underground daily dewatering pumping volumes are provided quarterly to the WRC.

Pit water chemistry data is stored for use for pit lake quality assessment and data tables are provided in annual reports. Periodic analysis of data is conducted by AECOM. Any significant trends identified in the dewatering water chemistry will be commented on in the annual Dewatering and Settlement Monitoring Report.

9 GROUNDWATER MONITORING

9.1 Background

Piezometers are used to measure the level of the groundwater table within a geologic unit. Standpipes can measure water level, and if large enough diameter, to sample water for chemical analysis. Pneumatic and Vibrating Wire Piezometers (VWPs) only measure groundwater levels. A piezometer network has been established, maintained and monitored at monthly intervals around the Waihi Township and Martha Pit since 1987 and Favona Underground since 2004. This network is periodically amended as additional monitoring locations are added, or as damaged monitoring locations are repaired or decommissioned. The water levels in the piezometers are monitored to assess the effects of dewatering on the regional groundwater system.

The Favona piezometer network has been established surrounding the Favona underground to detect the discharge of degraded quality water from the backfilled and flooded workings, during operation and following closure. It was designed to monitor groundwater levels in surface soils, younger volcanics (ignimbrites and rhyolitic tephras) where present and andesite bed rock. Monitoring to date has shown some depressurisation of wells in the vein systems and lesser depressurisation in the deeper wells in the bedrock (100 m deep wells). There is no indication of dewatering in shallower wells (<50 m deep) in the bedrock.

The incline from Favona Underground to the Trio system had minor groundwater inflows, which were managed by linking into the existing Favona pumping network.

In 2011, in order to better understand the geology and hydrological system around the predicted Correnso ore body, OGNZL commissioned the drilling and installation of 6 boreholes (P90 – P95) (**Error! Reference source not found.**). Three additional piezometers (P100, P101 and P102) were added in 2014-2016. Each borehole contains between 3 and 4 VWPs and a data logger which continuously records data simultaneously from multiple aquifers, with water table depths ranging from 6 – 156 meters.

Further additions to the network include:

- In 2017 a new well, P106, was drilled on the northwestern side of Martha Pit.
- In 2019/2020 ten new monitoring wells were installed on the southern side of Martha Pit to provide better understanding for Project Martha.
- In 2020, three new piezometers were installed near Gladstone Hill, GLD004 S, I and D (shallow, intermediate, deep).
- Two new piezometers (P122 & P123, each connected to 4 VWPs) equipped with telemetry were added during December 2022 – January 2023.
- In 2023 there were a number of upgrades to the network to monitor response from shallow Rex orebody mining. P113 which was dry, was re-drilled in a nearby location, as P113A. P110, P111, P112, & P114 were upgraded to telemetry monitoring and water level loggers were installed in P110, P113 and P114.
- Also in 2023, a VWP (ROW-17) was installed in the Martha Underground Mine at 773 mRL with a single tip at 472 mRL.

An underground operating procedure has also been developed as required in Condition 24 of the Correnso Consent to ensure mining does not drain the overlying strata via existing drill holes. Management of Surface Intersecting Drill Holes (WAI-400-PRO-076) can be found in Appendix B.

9.2 Scope

This section of the monitoring plan includes:

- Locations of all piezometers within the Martha and Favona monitoring networks.
- Piezometer monitoring methods and procedures.
- A description of monitoring frequencies.
- A description of piezometer network maintenance.
- Trigger limits and mitigation measures for piezometers.
- Guides for recording and managing data.
- Guides for reporting of the piezometer level data.
- Guides for the assessment of the piezometer level data.
- A description of the remediation and mitigation plan.

9.3 Martha Groundwater Drawdown Network

A piezometer network has been established within the Waihi Township and surrounding the Martha mine to monitor groundwater drawdown and the effects of dewatering on the regional groundwater system. The connectivity between the Martha Pit, Trio and Correnso/SUPA system allows this same network to effectively monitor the effects of works related to Correnso/SUPA/Martha.

9.3.1 Piezometer Locations

The Martha Network piezometers currently monitored within the three main geological units (Alluvium, Younger Volcanics and Andesite) are listed in Table 3 and their locations are shown in Figure 5. A listing of all the piezometers in the monitoring networks is included in Appendix C. The piezometer network has been, and will continue to be, revised following annual reviews to remove piezometers which have gone dry, or are no longer providing accurate data. When rewatering the Martha Pit commences upon cessation of mining, water levels will rise and the currently dry piezometers will be monitored again.

Table 3: Martha Network Piezometers

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
ALLUVIUM				
P2-4	1101	1108	7	Standpipe
P8-4	1112	1118	6	Standpipe
P91-1	1113	1119	6	VWP
P93-1	1105	1116	11	VWP
P94-1	1114	1115	1	VWP

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
P101-1	1102	1107	5	VWP
P102-1	1109	1113	4	VWP
WC201-4	1104	1111	7	Standpipe
WC201-5	1110	1111	1	Standpipe
WC203-4	1099	1102	3	Standpipe
GLD004S	1080	1085	5	Standpipe
YOUNG VOLCANICS				
P2-3	1073	1092	19	Standpipe
P4-2	1048	1088	40	Standpipe
P7-2	1039	1091	52	Standpipe
P7-3	1081	1090	9	Standpipe
P8-3	1093	1116	23	Standpipe
P27-1	1074	1078	4	Standpipe
P90-1	1100	1115	15	VWP
P90-2	1020	1100	80	VWP
P91-2	1097	1119	22	VWP
P91-3	1011	1112	101	VWP
P92-1	1096	1119	23	VWP
P92-2	1000	1108	108	VWP
P93-3	1015	1089	74	VWP
P94-2	1094	1114	20	VWP
P94-3	1016	1101	85	VWP
P95-1	1091	1115	24	VWP
P95-2	1031	1102	71	VWP
P100-1	1066	1081	15	VWP
P100-2	996	1052	76	VWP
P101-2	1083	1107	24	VWP
P101-3	1068	1094	26	VWP
P102-2	1079	1092	13	VWP
P102-3	1055	1088	33	VWP
P107	1089	1111	22	Standpipe

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
P108	1116	1121	5	Standpipe
P109	1091	1096	5	Standpipe
P110	1097	1104	7	Standpipe
P111-1	1100	1107	7	VWP
P112-1	1058	1058	0	VWP
P113	1062	1062	0	Standpipe
P113A-1	1090	1089	-	VWP
P113A-2	1069	1071	2	VWP
P114	1054	1055	1	Standpipe
P115	1072	1094	22	Standpipe
P116	1045	1092	47	Standpipe
P122-1	1092	1101	9	VWP
P122-2	1060	1060	0	VWP
BH6	1053	1111	58	Standpipe
BH9	1074	1096	22	Standpipe
BH11	1075	1093	18	Standpipe
BH12	1079	1106	27	Standpipe
GLD004I	1065	1086	21	Standpipe
WC202-2	1048	1072	24	Pneumatic
ANDESITE				
P2-1	974	975	1	Standpipe
P2-2	1035	1045	10	Standpipe
P7-1	989	1003	14	Standpipe
P9-1	1037	1118	81	Standpipe
P69-S	1114	1132	18	Standpipe
P69-D	1063	1091	28	Standpipe
P90-3	983	1084	101	VWP
P91-4	971	1103	132	VWP
P92-3	965	1102	137	VWP
P93-4	975	1039	64	VWP
P94-4	976	994	18	VWP

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
P95-3	1001	1061	60	VWP
P100-3	981	1044	63	VWP
P100-4	956	989	33	VWP
P101-4	1037	1037	0	VWP
P102-4	1027	1032	5	VWP
P106-1	1100	1100	0	VWP
P106-2	1060	1060	0	VWP
P106-3	1010	1011	1	VWP
P106-4	974	974	0	VWP
P111-2	1088	1088	0	VWP
P111-3	1055	1060	5	VWP
P112-2	1035	1035	0	VWP
P112-3	998	998	0	VWP
P113A-3	1035	1059	24	VWP
P122-3	1032	1032	0	VWP
P122-4	933	932	-	VWP
P123-1	1044	1107	63	VWP
P123-2	1004	1003	-	VWP
P123-3	964	968	4	VWP
P123-4	924	925	1	VWP
P124-1	1079	NA	NA	VWP
P124-2	1037	NA	NA	VWP
P124-3	901	NA	NA	VWP
WC201-1	1059	1107	48	Pneumatic
WC201-2	1077	1109	32	Pneumatic
WC201-3	1097	1111	14	Pneumatic
WC202-1	1032	1073	41	Pneumatic
GLD004D	1020	1086	66	Standpipe

9.3.2 Monitoring Method

Martha Network piezometers are made up of a combination of standpipe, pneumatic and VWPs. A flow chart indicating the steps to be followed when measuring the water levels in the piezometer network is shown in Figure 6 and detailed steps are provided in the Township Piezometer Network Monitoring (WAI-200-PRO-021) SOP provided in Appendix B.

9.3.3 Monitoring Frequencies

The piezometer network is monitored on a monthly basis. In the event of a rapid, or unusual, change in the groundwater level being detected in a piezometer, the monitoring frequency in that piezometer (and the piezometers immediately adjacent) will be increased to at least weekly. The results of this monitoring are to be continually reviewed by site Environmental staff. Weekly monitoring is discontinued when monitoring indicates that the piezometric level has stabilised.

9.3.4 Upper Rex Mining

Mining higher within the Rex orebody was proposed by OceanaGold. In consultation with Hauraki District Council additional monitoring and triggers specific to the Rex area were implemented.

GWS Ltd recommended real time monitoring and telemetry in four existing groundwater wells (P111, P112, P113, P114). As P113 was considered dry, a new deeper well (P113A) was drilled nearby to replace it, with three VWP tips installed. These upgrades were completed in 2023 prior to mining higher in the Rex Orebody.

9.3.4.1 Trigger responses

When considering a change that might represent an anomaly, there should be an emphasis on the depth of the piezometer and geologic unit in which that change is occurring. The primary focus of this monitoring is to ensure effects in the near surface (notably in the Young Volcanics) are avoided, managed or mitigated.

Therefore, trigger responses are established at P111-1, P112-1, P113A-1, P113A-2, and P114. In most cases, the natural groundwater level in the wells identified varies up to 2.0 m over the period of a season. It is considered an anomaly as being >2.0 m level decrease in less than a 1-month period. If a response is triggered, the following actions should be followed:

- Verify that the instruments and data collection is accurate.
- Check that any change is not the result of a recent climatic event.
- Commence daily groundwater level measurements at P109 and WC202-1.
- Cross check the groundwater level data with the geotechnical observations.
- Investigate the cause of the anomaly including any recent underground mining activity.
- Advise the Council of the anomaly (within 5 working days) and include an explanation of the anomalous results and actions proposed to further investigate or address any issues identified (if needed)

Figure 5: Martha Network Piezometer Location Plan

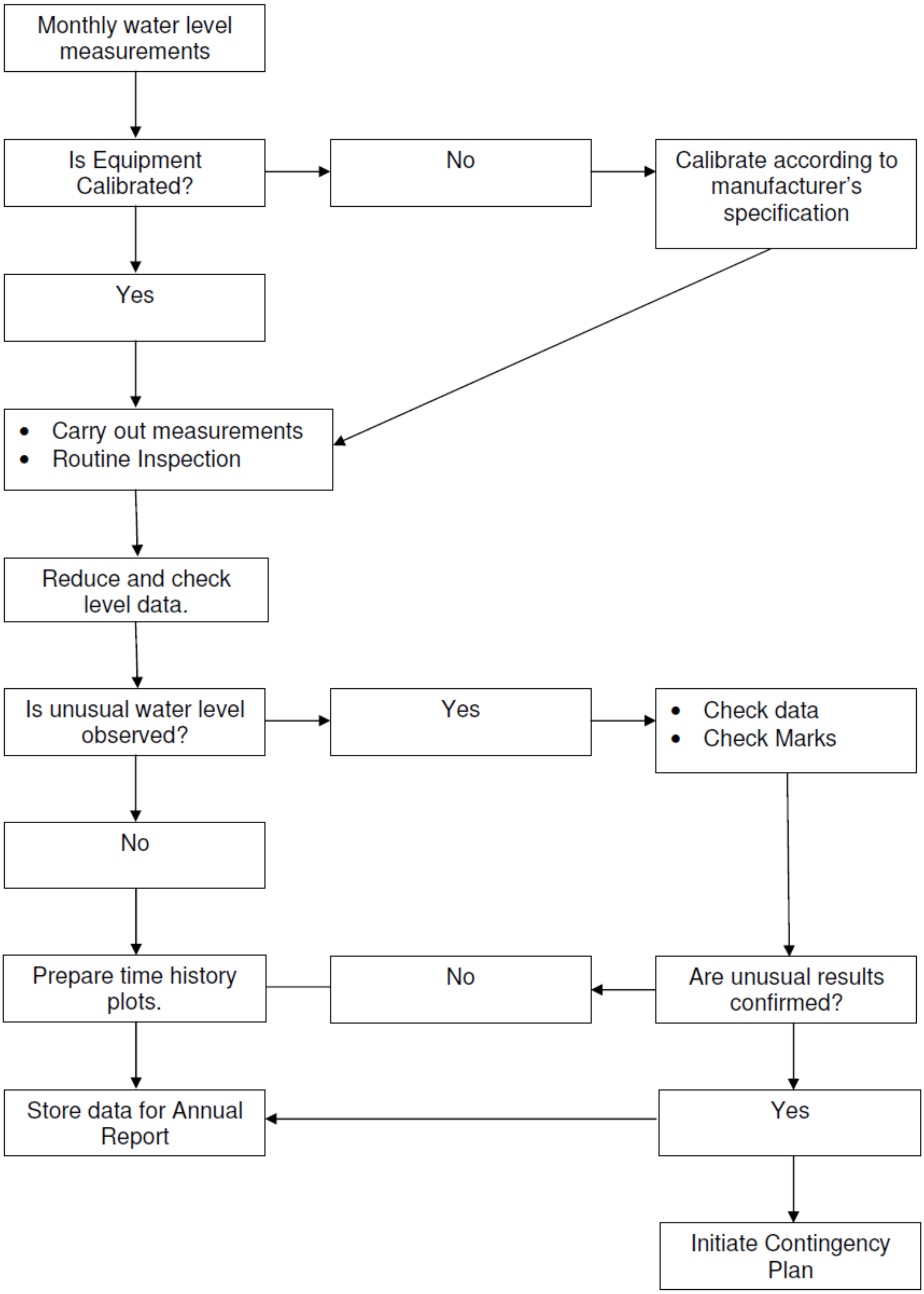

Figure 6: Flow Chart for Monthly Water Level Monitoring

9.4 Backfilled and Flooded Workings – Favona Network

During mine operation, the Martha and Favona mines will be inward gradient sites i.e. groundwater will be moving towards the mine not away from the mine. As a result, there are unlikely to be any water chemistry effects of mine water on the groundwater system outside of the mine during operations. Groundwater from Martha/Trio/SUPA is controlled by Correnso and Martha Underground dewatering; any effect on water chemistry will be drawn at depth and is unlikely to have any expression in shallow groundwater.

Martha and Favona are not directly connected; the amount of groundwater from Favona that will move to Martha is small in relation to the groundwater inflow to the Martha system. With a full mine lake and flooded Favona Mine, the hydraulic gradient between Favona and Martha will be minimal, and the velocity of groundwater movement will be slow. Given the mineralization in the ground around Martha and in the ground between Martha and Favona it is very unlikely that any effect on Martha could be sourced back to Favona.

However, to provide an indication of the likely post-closure water chemistry in accordance with the consent conditions, samples of the underground water discharge and discharges from the Polishing Pond stockpile (as detailed in the Site Water Management Plan) will be analysed for later use in an underground geochemical model. In addition, samples will be taken from monitoring wells P76D, P76I, P77D and P77I located between Favona and Martha to establish baseline groundwater chemistry for that rock mass, for input to the post-closure model. If the geochemical model for post-closure indicates the possibility of significant movement from Favona towards Martha within a rational time frame, a monitoring regime would be developed.

For Trio, sampling of intercepted inflows and discharges from the Polishing Pond stockpile is undertaken for use in geochemical modelling. Monitoring for post-closure water chemistry from Trio will be addressed as part of the Trio Mine Project; monitoring data from groundwater intercepts, flow gradients and waste rock discharges will be used to model likely flow-paths and mass balances, and the need for monitoring wells. It is expected that the existing wells for monitoring Martha and Favona will provide the majority of monitoring information in relation to any future Trio activities.

As Trio, Correnso/SUPA and Martha Underground are accessed from the Favona decline, there is effectively a direct connection between the Favona and Martha systems while Correnso/SUPA and Martha Underground are operating. Prior to any flooding, an option proposed is to construct a bulkhead to plug the preferential pathway.

9.4.1 Piezometer Locations

The current Favona Network piezometers are listed in Table 4 and their locations are shown in Figure 7.

Table 4: Favona Network Piezometers

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
ALLUVIUM				
P63-S	1113	1117	4	Standpipe
P76-S	1109	1111	2	Standpipe
P77-S	1111	1115	4	Standpipe
P78-S	1110	1109	1	Standpipe
P87-S	1110	1115	5	Standpipe

Well ID	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Piezometer Type
YOUNG VOLCANICS				
P63-I	1070	1090	20	Standpipe
P64-I	1086	1100	14	Standpipe
P67-D	1085			Standpipe
P76-I	1073	1103	30	Standpipe
P78-I	1066	1103	37	Standpipe
P79-S	1091	1096	5	Standpipe
P79-I	1061	1092	31	Standpipe
P87-I	1070	1110	40	Standpipe
ANDESITE				
P75	979	1063	84	Standpipe
P76-D	1056	1097	41	Standpipe
P77-I	1046	1095	49	Standpipe
P77-D	1031	1094	63	Standpipe
P78-D	1053	1072	19	Standpipe
P79-D	1048	1087	39	Standpipe
P87-D	1025	1102	77	Standpipe

Figure 7: Favona monitoring piezometers

9.4.2 Monitoring Method

A flow chart indicating the steps to be followed when measuring the water levels in the piezometer network is shown in Figure 6 and detailed steps are provided in the relevant sections of the Township Piezometer Network Monitoring (WAI-200-PRO-021) SOP provided in Appendix B. Water chemistry is monitored according to the relevant sections of the Groundwater Monitoring (WAI-200-PRO-012) SOP provided in Appendix B.

9.4.3 Monitoring Frequencies

The water levels of the Favona Network piezometers are monitored monthly. Water quality sampling is being undertaken where possible to establish background levels (refer to section 0.

9.5 Favona Contingency Plan

In relation to effects, settlement is principally related to depressurisation of the younger volcanics. As a result, groundwater trigger levels and contingency measures in general relate to that unit. Hence, the monitoring focus is to assess whether depressurisation in the deeper andesite is able to extend up into the overlying younger volcanics and if so, whether the magnitude of depressurisation is sufficient to give rise to measurable settlement. The monitoring system and the trigger levels have been developed to that end.

9.5.1 Favona Piezometer Trigger Levels

Favona trigger levels follow the same actions as introduced with the Correnso dewatering consent. These are outlined in Section 9.6.

9.6 Piezometer Action Plan

Condition 20 of the Project Martha Common Conditions states both Councils need to be advised of any significant anomalies in groundwater levels identified in the piezometer network.

A “significant anomaly” is defined as a drop in groundwater level greater than the seasonal variation in piezometers within the alluvium and younger volcanic rocks and a drop of 15 m or more in the recordings from piezometers tapping the upper 50 m of Andesite over a one month period. Such a change would require an explanation to council within 10 working days of the issue being identified.

There is a three-stage set of triggers based upon 5m, 10m or 15m water level changes within 1 month. Some piezometers can have natural 5m changes. Actions consist of monitoring frequency increases, historic data review, increased settlement marker monitoring, visual inspections and expert geotechnical review depending on the degree of water level change discovered (

Table 5).

Table 5: Piezometer responses and actions

Piezometer Response / Trigger	Action		
	Piezometer Monitoring	Settlement Monitoring	Other Actions
5 - 10m over 1 month	Commence weekly monitoring	-	Review historical piezometric data and note if has occurred previously.
10 - 15m over 1 month	Commence weekly monitoring	Commence weekly surveys	Undertake review to identify possible causes of change in monitoring. Undertake weekly visual inspections of area.
15m + over 1 month	Commence weekly monitoring	Commence weekly surveys	Notify Hauraki District Council as required by condition 33 of Schedule A Correnso Underground Mine Conditions of Consent.
			Undertake weekly visual inspections of area to identify evidence of settlement or damage.
			Seek independent advice from experienced geotechnical engineer
			Develop action plan to restore groundwater levels (e.g. grouting of potential drainage pathways, injection of water to maintain groundwater level).

9.7 Groundwater Quality

The groundwater quality monitoring program consists of six-monthly sampling (autumn and spring) of eight standpipe piezometers (P2-4, P8-4, P88, WC203-4, BH6, BH7, BH9, BH11, BH12). Samples are analysed for the parameters listed in Table 6. The objective is to develop a baseline aquifer water quality characterisation to provide a benchmark for desirable groundwater conditions criteria at closure around Martha Pit.

Table 6: Groundwater Quality Sampling Parameters

Scan and Sample Parameters Six monthly RJH Code 40

pH (field and lab)	
Conductivity (field and lab)	
Ca, K, Mg, Na	Sum of cations
Cl, HCO_3, SO_4	Sum of anions
Total Alkalinity	Mn
Ag	Ni
Al	Pb
As	Sb
Cd	Se
CN_{WAD}	TSS
Co	U
Cr	Zn
Cu	Free ammonia (NH3)
F	Total ammoniacal (NH_4-N)
Fe	Nitrate-N (NO3N)
Hardness	Nitrate-N + Nitrite-N (NOxN)
Hg	

9.8 Groundwater Monitoring Procedures

9.8.1 Calibration and Maintenance of the Piezometer Measurement Equipment

Standpipe Piezometer Dipmeter

The piezometer dipmeter is to be maintained in good working condition at all times.

Calibration of the dipmeter tape against a reference tape is to be carried out at least once every twelve months by an accredited provider. If the difference between the dipmeter tape and the reference tape is found to be more than 0.1%, the dipmeter tape is to be replaced.

Pneumatic Piezometer Readout Unit

The pneumatic piezometer readout unit is calibrated at least once every two years. All calibration is undertaken by a manufacturer approved company or service technician and calibration records retained by OGNZL. If there is evidence of unusual behaviour, prolonged flushing of the tubes with inert gas to remove moisture is also an option.

Vibrating Wire Piezometer Logger Unit

Vibrating wire logger units do not require calibration. The unit's batteries are changed annually to ensure continuity of data.

9.8.2 Collection of the Piezometer Data

Standpipe Piezometers

Standpipe piezometers are measured according to the Township Piezometer Network Monitoring (WAI-200-PRO-021) SOP provided in Appendix B. Monitoring of standpipe piezometers is carried out by trained personnel. Water level measurements are compared with the previous monthly measurement for consistency. Where a significant difference between a current and previous measurement is noted, the measurement and field record are double checked. If an anomaly still exists the measurement datum is to be confirmed, or re-measured and recorded.

In addition, the wells depth to bottom is checked 6-monthly to determine any sediment build-up. Arrangement can then be made to 'jet out' any identified build-up that is considered to detrimentally affect the function of the piezometer.

Pneumatic Piezometers

Pneumatic piezometers are to be read according to the Township Piezometer Network Monitoring (WAI-200-PRO-021) SOP provided in Appendix B.

All personnel who take readings of the pneumatic piezometers are trained in the use of the pneumatic piezometer readout unit currently operated by OGNZL. All personnel who take readings of pneumatic piezometers are familiar with the manufacturer's operation and maintenance manual.

All readings taken on the pneumatic piezometers are to be made in accordance with the manufacturer's recommendations. All results are to be immediately checked against the previous month's readings and recorded on a field sheet for future input into a computer database. The measurement and field record are to be double checked before monitoring at each location is completed.

Vibrating Wire Piezometers

The reading of the logger units is conducted monthly by an OGNZL technician. They visit the sites and download the data manually onto a laptop. The data is then uploaded onto a spreadsheet in the office. All personnel who take readings of the VWPs are trained in the use of the readout unit and laptop.

9.8.3 Routine Network Inspection and Maintenance

A visual inspection of all monitoring locations is undertaken during routine monitoring of the piezometer network. If this inspection indicates that a piezometer is unreliable, damaged or malfunctioning, then steps are taken to repair, relocate, renew or decommission the monitoring site. Ongoing monitoring may be required to determine the fate of the monitoring location.

Alternatively, analysis of the monitoring data may identify a monitoring location that is unreliable or dubious. Re-measurement and a thorough inspection of this monitoring location is undertaken to ascertain the reliability of the data and the monitoring location. Ongoing monitoring may be required to determine the ultimate fate of the monitoring location.

9.8.4 Guide for Recording and Managing Piezometer Data

Once a complete set of data has been collected in the field, it is transferred from the field sheet (for standpipe and pneumatic piezometers) and from a laptop for VWPs to the digital database as soon as practicable (at most within one week of the monitoring round being completed).

The groundwater level data is stored digitally in a Microsoft Excel Database managed and maintained by OGNZL. The water levels are corrected to the mine datum reference level to enable comparison between bores and areas. The field records are kept and filed in the OGNZL office.

9.9 Reporting Groundwater Monitoring Results

9.9.1 Ongoing Analysis

Preliminary analyses of the data plots after every monitoring round are undertaken by OGNZL Environmental staff. The purpose of this analysis is to identify if there is a reading/recording error to be re-checked, if unusual dewatering has occurred during the previous monitoring period, or if excessive dewatering that leads to excessive settlement is likely to occur in the immediate future. Unusual or excessive dewatering is a noticeable and sustained change in piezometer groundwater level trend.

Figure 6 shows that if unusual water level changes are observed these are checked and if confirmed, and the contingency plan (Figure 8) initiated.

OGNZL keeps and maintains a log of complaints from the public. If appropriate, OGNZL undertakes field investigations and investigates legitimate mine dewatering and settlement related claims from the public. The complaints log is maintained by the OGNZL Community Liaison Officer.

9.9.2 Annual Summary Analysis and Reporting

A report and summary of the groundwater level data is produced annually and issued to the consenting authorities. This report includes analysis and evaluation of the data by Chartered Professional Engineer or an experienced hydrogeologist. The annual report includes:

a) The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network.

b) Identification of any important trends in dewatering/rewatering behaviour.

c) 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 consent holder proposes to take in response to those predictions.

d) Comment on compliance with all relevant conditions of the consent.

e) A summary and analysis of complaints relevant to the consent from the complaint log.

f) Any reasons for non-compliance or difficulties in achieving conformance with the consent conditions.

g) 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 the consent.

h) Peer review recommendations from the most recent review and reference to how they will or have been addressed

If analysis of the groundwater level data indicates that mine dewatering is likely to result in settlement greater than that in Table 1, a detailed inspection of all settlement susceptible structures within the affected area is to be commissioned by OGNZL. This inspection is to be undertaken by a suitably qualified and experienced Chartered Professional Engineer.

9.10 Groundwater Remediation and Mitigation

Figure 8 summarises the actions to be taken in initiating a contingency plan. The plan covers both groundwater level changes related to settlement and effects on wells used by others. Unusual water level changes would include:

- A sharp change in the dewatering trend.
- A rapid rise of water level.
- A loss of yield from a production well accompanied by a reduction in water level.

The contingency plan for groundwater monitoring is similar to that for settlement monitoring namely:

- Monitoring will be increased, and investigations undertaken to confirm whether the effect is due to mine dewatering and to confirm the extent of the effect.
- If adverse effects are likely, the plan requires mitigation options to be developed and agreed by the parties. In the case of settlement, these are as laid out in the contingency plan developed for settlement effects as summarised in Figure 13. In the case of an affected water well, OGNZL has agreements under which it will mitigate effects due to mine dewatering.

Effects on bore users are considered only likely where bores intercept fault zones or veins connected to the Favona system. The locations of the existing wells and monitoring to date would suggest that connections are unlikely or limited. Nevertheless, the Company has agreements in place with some of the local bore owners to replace these water supplies should effects develop and mitigation be necessary. In addition, Condition 2 of Resource Consent 109742 requires action by the Company in the event that stock, domestic or other water supplies are adversely affected by the exercise of the Favona mine dewatering consent.

For water well effects, contingency options may include:

- Upgrading a pump
- Supplying a different pump
- Deepening a well
- Supplying a new well
- Supplying water from an alternative source

In the event of groundwater contamination from waste rock stockpiles, the most effective solution would be to install a cut-off drain to intercept the water and pump it to the WTP for treatment. If an observed trend is noted in water levels and/or chemistry, this would initiate further investigation and if necessary result in a report to WRC explaining the cause of the observed trend and proposed mitigation. Stockpiles are planned to be temporary structures and therefore removal of the source material will ultimately stop the contamination.

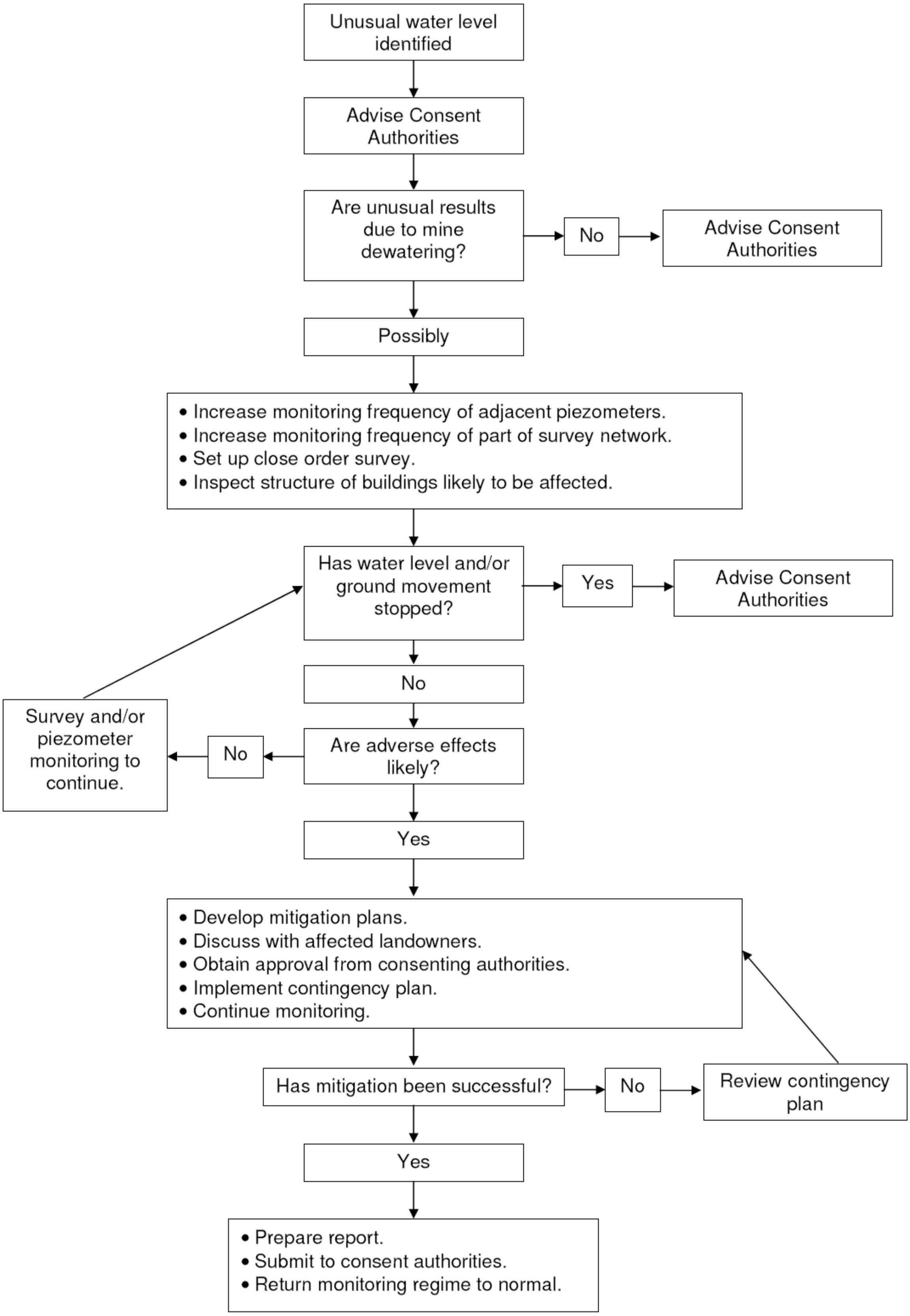

Figure 8: Flow Chart of Water Level Contingency Plan

9.11 Review and Improvement to the Piezometer Network

Review of the piezometer network is undertaken routinely to:

- Ensure that all areas presently affected by dewatering from Correnso, Favona and Martha Undergrounds are adequately covered and monitored by piezometers and survey marks.
- Ensure all areas likely to be affected by mine dewatering in the future, are adequately covered and monitored by piezometers and survey marks.
- Ensure that all areas likely to be affected by backfilling of stopes and flooding the underground workings following closure are adequately covered and monitored by piezometers.

At each additional or replacement piezometer drill-hole location, at least one piezometer should be installed within the following geologic units, if present:

- the andesite rocks,
- the younger volcanics, and,
- The upper alluvial unit or weathered rock zone.

The above three geological units are considered to be those of greatest strategic importance from a geotechnical perspective.

9.12 Shallow and Deep Aquifers

A new requirement was included in the Martha dewatering permit 139551.01.02. Condition 9 (e) requests OGNZL *provide details of any wetland areas and any other known aquatic ecological values that are dependent on the surface contribution of shallow and deep groundwater outflows*.

A new report was created in 2019 “Martha Shallow and Deep Aquifer Report” which addresses the requirements of Condition 9. The report was last issued in 2024 and concluded that there are currently no effects as a result of dewatering associated with Project Martha.

10 SETTLEMENT MONITORING

Settlement monitoring involves monitoring, analysing and reporting on the OGNZL network of survey marks that lie within the zone affected by dewatering of the Martha Pit, Trio, Project Martha, Correnso/SUPA and Favona Underground. The current network is monitored by OGNZL at six monthly intervals with surveys in May and November. The initial settlement survey network was established in 1980 during the exploration phase of the project and has been regularly monitored since December 1988. The network is continually amended as additional monitoring locations are added, or damaged monitoring locations are repaired or relocated.

10.1 Scope of Settlement Monitoring

The following sections cover:

- Locations of all existing survey monitoring locations
- Construction details for the survey network benchmarks
- A description of monitoring frequencies
- A description of survey network measurement procedures
- Maintenance of the survey network
- Guides for recording and managing data
- Guides for the assessment of the survey data
- Guides for reporting the survey data
- A description of the remediation and mitigation plan

10.1.1 Historic Shaft Monitoring

Under Water Right W1740 (granted July 1987, “Licensed Pit”), OceanaGold New Zealand (OGNZL) was required to monitor survey marks that have been established on, or immediately adjacent to, three historic mine shafts throughout the township. However, with the expiry of W1740 OGNZL now only monitors historic shafts on company land. There are two shafts. The remaining shafts are surveyed by HDC.

These survey marks are monitored concurrently with the six-monthly settlement survey and are monitored primarily to detect ground movements due to localised collapse of shaft support and their caps. As such it is inappropriate that these marks are included in the settlement survey network as their inclusion leads to a misleading representation of present-day mine related settlement. Monitoring of the historic shaft survey marks is, therefore, not included in this monitoring plan and associated settlement reports.

10.2 Survey Network Location

The location of the survey network within the Waihi Township and surrounding the Martha Pit, Martha Underground, Trio, Correnso/SUPA and Favona Underground is shown in Figure 9. A blown-up view of the Favona settlement marks in relation to the underground workings is shown in Figure 11. The location of the survey network monitoring locations and benchmarks are provided in Appendix D.

Due to the existing network monitoring Martha Pit, and the close association with the Trio system, the requirement for additional settlement marks for Trio was not considered necessary. The existing network of settlement marks is extensive, and the dewatering associated with Trio is not expected to result in a significant increase in the zone of influence of dewatering and therefore zone of settlements. However, if there was an increase in the zone of influence it would be expected to be identified by the current settlement monitoring network and additional settlement marks could then be installed if there were concerns with any structures beyond the limits of the current monitoring network.

The existing survey network as shown in Figure 9 essentially covers the whole of the urban area. Extensions to the northeast and west take the network beyond the range of settlement induced by mine dewatering.

HDC and WRC have approved removal of erroneous and high-density marks outlined in a GWS review (GWS Tech Memo – Settlement Mark Removal 15.1.2021). A number of marks displayed unusual movement unrelated to dewatering settlement and some marks were deemed too close together to provide meaningful data.

Additional survey marks were required with the development of Correnso (refer **Error! Reference source not found.**), in recognition of operating under a residential area. These were recommended by Consulting Geotechnical Engineers (for both OGNZL and HDC) to provide closer definition of settlement and any potential tilt.

Six new settlement marks were added above the Rex underground in late 2024.

10.3 Close-Order Networks

A number of close-order survey networks had been established within the urban area to assess, in detail, effects on specific properties. These close-order surveys are no longer undertaken, having achieved their objectives. But a number of markers, which were constructed as deep and shallow pairs to highlight seasonal shrink-swell, are incorporated into the 6-monthly survey network.

The settlement markers established for the Favona Underground project are spaced at approximately 50 metre centres, but as the lines cross the decline the survey marks close up to 10 metre centres.

No close order networks are in place for Trio. Unlike Favona, the area has been historically dewatered, and the system is already significantly dewatered from the existing Martha Pit. Further dewatering is forecast to be restricted to the andesite rock mass and is expected to have less than minor effects on differential settlements (or tilt) which are normally the concern for buildings and buried services. If the existing broader settlement network indicates any anomaly, close order networks can be subsequently installed for investigation.

10.4 Settlement Monitoring Frequency

Six monthly settlement surveys are conducted during May and November. Tilt summaries are reported to the Councils no later than 20 working days after results become available following each survey. An annual Dewatering and Settlement Report is provided to the Councils in each year.

Following closure and flooding of the Favona Underground, Martha Pit, Trio, Correnso/SUPA and Martha Undergrounds it is expected that OGNZL will continue settlement monitoring on an annual basis for a period of five years or until rebound (groundwater recovery) is completed.

10.5 Settlement Monitoring Procedure

Figure 12 sets out the procedure to be followed for settlement monitoring. Features of that monitoring procedure are set out in the following sections.

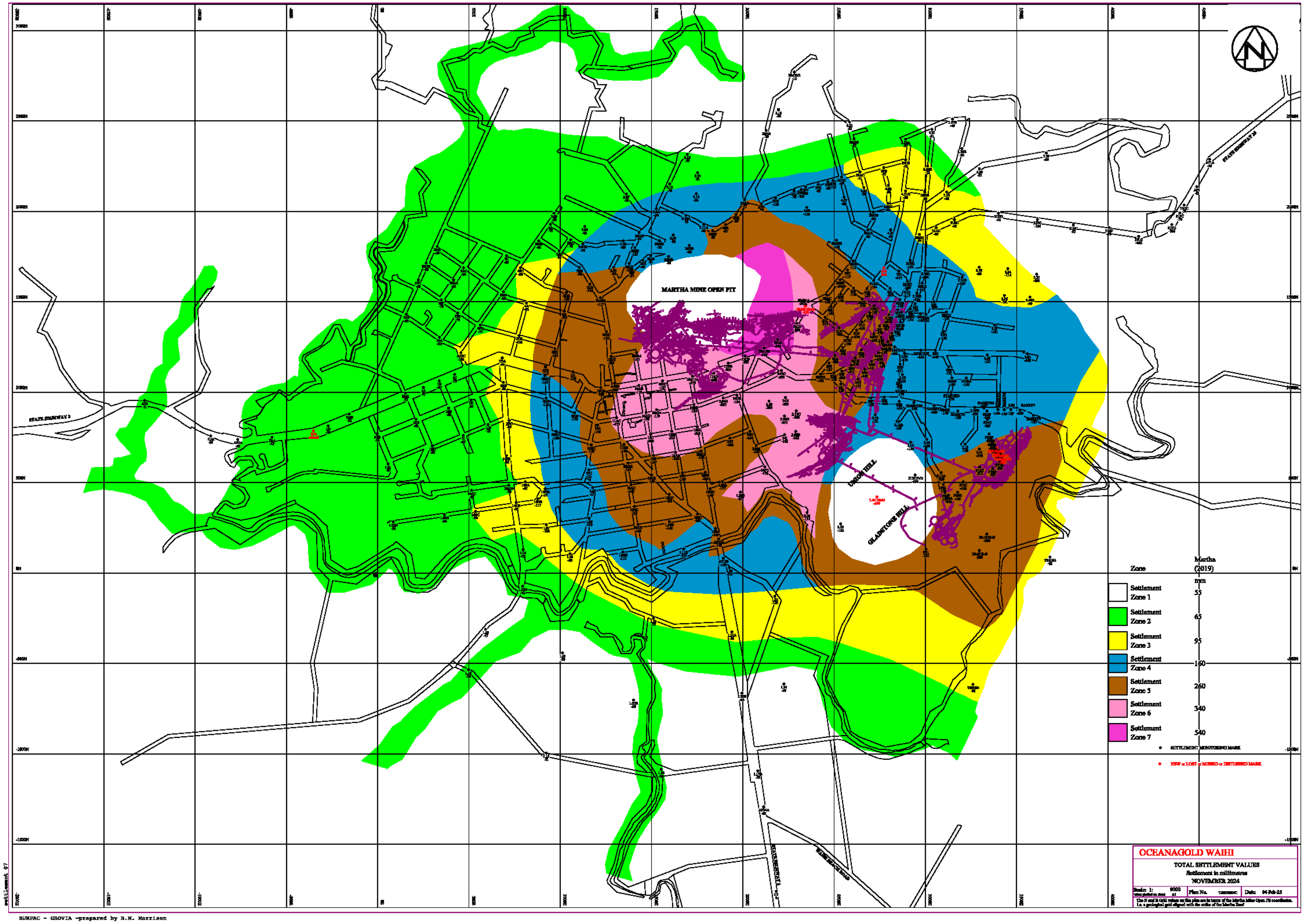

Figure 9: Location of Settlement Markers within the seven settlement zones

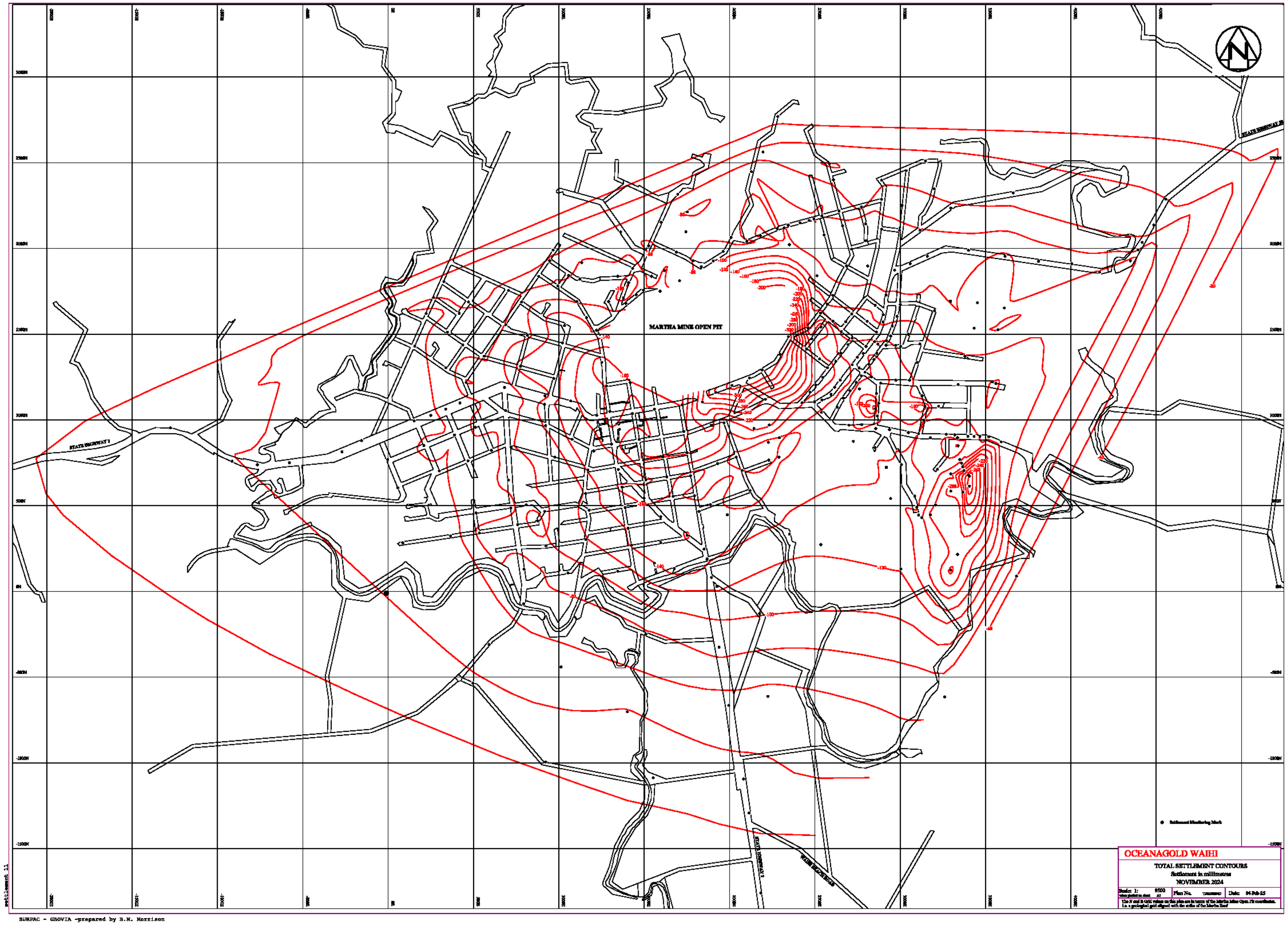

Figure 10: Total Settlement Contours – November 2024

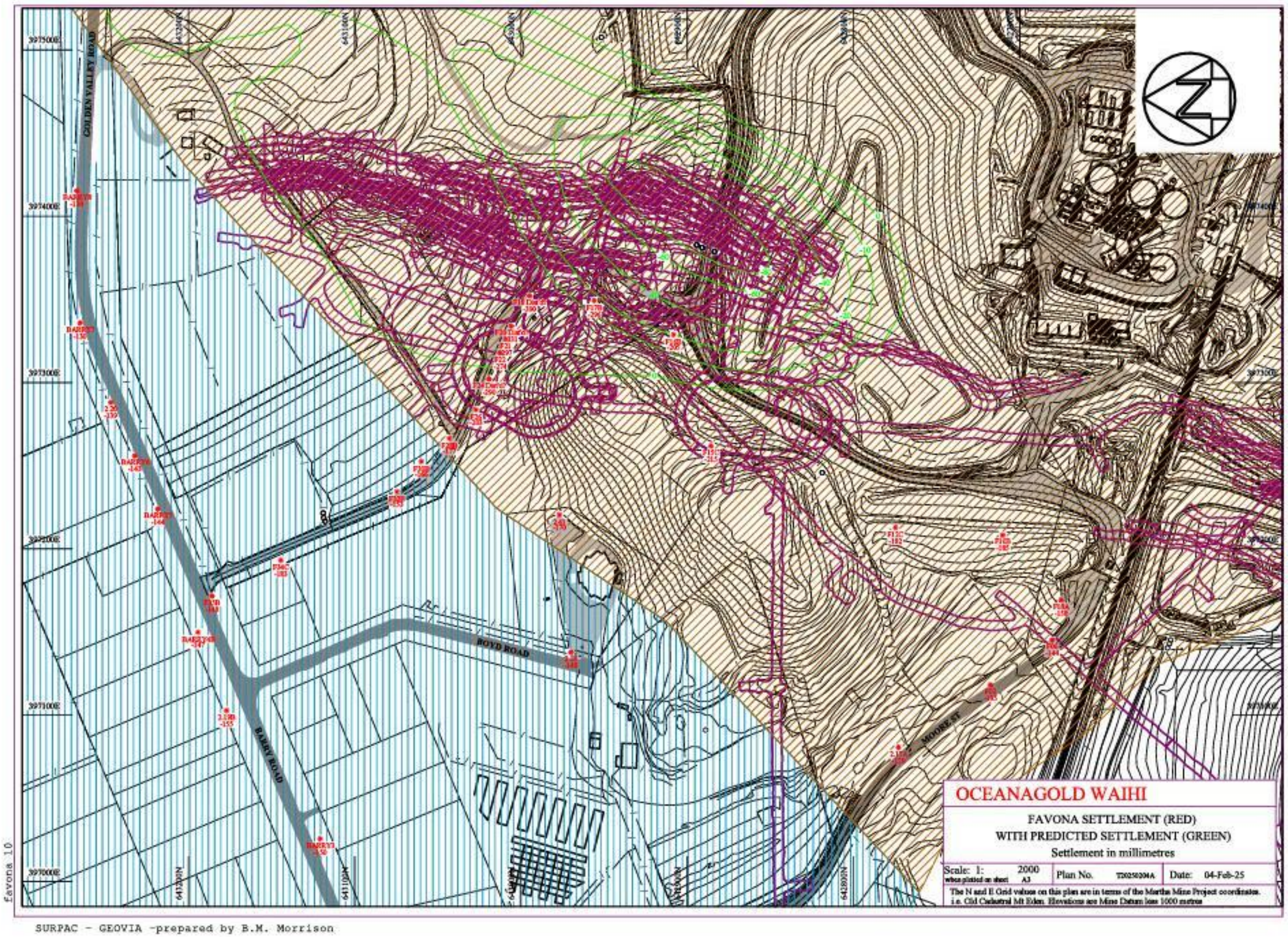

Figure 11: Favona settlement markers in relation to the underground workings and predicted settlement contours

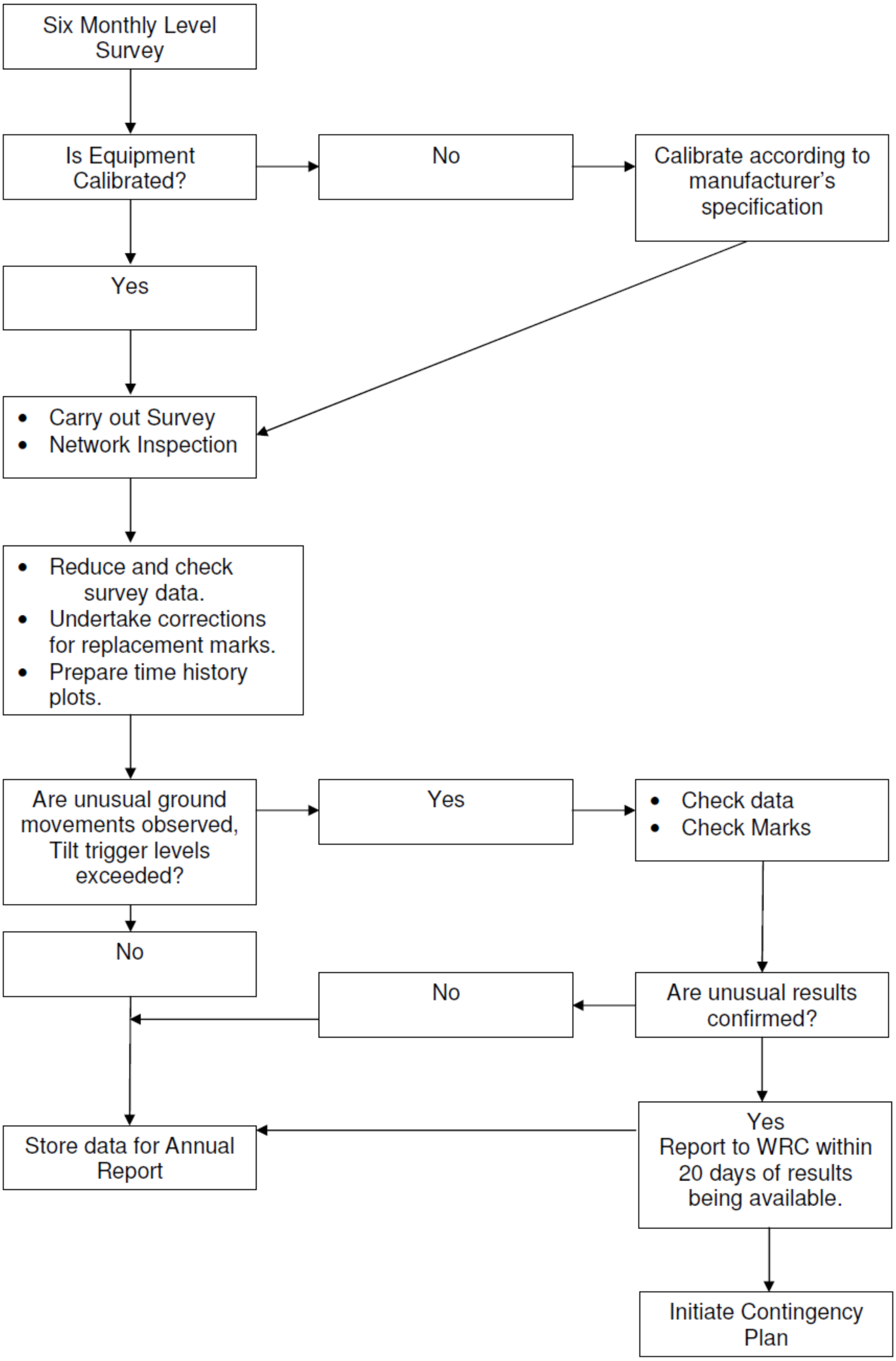

Figure 12: Flow chart for settlement monitoring

10.5.1 Equipment Maintenance and Calibration

All survey equipment used to measure the survey network is to be maintained in good working condition at all times and calibrated in accordance with the manufacturer's recommendations. Copies of the calibrations are to be retained by the OGNZL Survey Department.

10.5.2 Settlement Data Collection

Data collection is to be undertaken having regard to the following:

- All surveying and reduction of levels is performed under the supervision of a Registered Professional Surveyor.
- All levelling is completed in an industry-recognised manner that minimises misclose.
- All survey misclose is redistributed using an industry-recognised method such as a least squares adjustment method.
- All levelling is referenced back to stable benchmarks that are beyond the influence of mine dewatering.
- Levelling along roadsides is in accordance with a NZTA approved traffic management plan.

10.5.3 Routine Network Inspection and Maintenance

A visual inspection of all survey monitoring locations is undertaken during routine monitoring of the survey network. If this inspection indicates that a survey mark is unreliable, damaged or malfunctioning, then steps are taken to repair, relocate, renew or decommission the monitoring site. Ongoing monitoring may be required to determine the ultimate fate of the monitoring location.

Alternatively, analysis of the monitoring data may identify a monitoring location that is unreliable or dubious. Re-measurement and a thorough inspection of the monitoring location is undertaken to ascertain the reliability of the data and the monitoring location. Ongoing monitoring may be required to determine the ultimate fate of the monitoring location.

If it is identified that a monitoring location requires remediation such as repairs or relocation, then these are implemented as soon as practicable, before the next round of monitoring.

All new survey marks will be adjusted to allow for mine related settlement that has occurred since December 1989. This adjustment will be based on the settlement of adjacent survey marks, or, if appropriate, the average settlement of the settlement zone in which the survey mark lies (Refer to Figure 9 and Table 1 for the Settlement Zones). The level of each new survey mark, and each superseded survey mark, will be measured during the same survey round at least once. The length of survey "overlap" will be decided upon on an individual basis by the surveyor.

10.5.4 Data Checking and Storage

Once a complete set of data has been collected in the field, it is transferred to a master database for storage and the production of data plots. Checks involve updating of the time-history graphs (cumulative change in ground surface over time) for each mark and checking the settlement trends produced against the zone trends. Where a settlement trend differs from a zone trend, that trend is compared with the trends of adjacent marks.

Where a settlement trend is different from those of adjacent marks, the mark is revisited and examined. If no damage to the mark is apparent, the mark and adjacent marks are check-levelled to confirm the measurement made before accepting the value and confirming on the database.

10.5.5 Survey Corrections

Where a survey mark has been replaced and a new record has been started, a correction is applied to provide a continuous record at each site from the time of the initiation of dewatering. The corrections are made as follows:

- The corrections are based on trend analysis where sufficient data exists.
- Where insufficient data for reliable trend analysis exists, corrections are based on the behaviour of surrounding marks.
- Where satisfactory corrections are not able to be applied, the mark is not included in the settlement contouring or in the calculation of tilt.

10.5.6 Time-History Plots

Corrected settlement data is plotted onto time-history graphs, together with the Zone maximum settlement and the Zone maximum rate of settlement to the end of mining. This is required to provide a visual check as to whether settlement is likely to exceed Zone maxima by the end of mining.

10.6 Reporting Survey Data

A number of reports are required in the conditions of the consents. These are as set out below.

10.6.1 Surveyors Reports

Current practice is for the surveyor to prepare a report following each 6-monthly survey. This report will continue and will include:

- Survey data.
- A plan of the total settlement values and contours at 20 mm intervals of total settlement.
- Comment on survey marks which are showing unusual behaviour.
- Changes made to the survey network, specifically marks that have been removed and replacement marks added to the network.

The two survey reports for each year are included in the annual summary report.

10.6.2 Annual Summary Report

A report and summary of the survey data is produced by OGNZL and submitted to the consenting authorities. This report is produced on an annual basis and includes analysis and evaluation of the data. The annual report includes:

a) Summary data and graphs of monitoring undertaken during the previous year.

b) Identification of any environmentally important trends in settlement behaviour.

c) Interpretation and analysis of any change in ground surface profile and associated tilt over the previous year, any contingency actions that may have been taken during the year, predictions of future trends that have been identified, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.

d) A comparison of the average zone settlement with that predicted in Table 7.

e) A summary of the settlement related complaints that were received during the previous year, and a description of the Company's response to each complaint.

f) Comment on compliance with the conditions of the consents.

g) Any reasons for non-compliance, or difficulties in achieving conformance, with the conditions of the consent.

h) 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 the consent.

If analysis of the data indicates that the magnitude and type of settlement within a part of Waihi is undesirable, then a detailed inspection of all settlement susceptible structures within the zone is to be commissioned by OGNZL. This inspection is to be undertaken by a suitably experienced person or persons.

10.6.3 Network Review and Analysis

A detailed review and analysis of the survey network has been undertaken at least once every two years to ensure that the global aspects of the survey network, such as the monitoring frequency and extent of the monitoring network, remains satisfactory. This review is now redundant. The current practice is that the survey marks are checked by the survey team each survey round and the network performance is reviewed by the responsible person at the same time as the preparation of the annual report for that year.

Reviews of the network are undertaken independently by the surveyor, the report author, the consultant reviewer, and the peer reviewer. Discrepancies and gaps are investigated during deliberation of the data and, if necessary, resolved with modifications for future monitoring.

Currently, OGNZL maintains a photographic record of the individual survey mark locations. This speeds up finding marks in the field and allows a prompt assessment of any modifications near marks that may cause an artificial movement in a survey mark. This record is updated as alterations are made to marks.

10.7 Unusual Ground Movements

10.7.1 Change in Settlement Rate

In the event of a rapid, or unusual, change in the rate of settlement being identified, Figure 12 shows that the results are to be checked. If the unusual level change is confirmed, the contingency plan described below in Section 7.8 and summarised in Figure 13 is initiated.

10.7.2 Exceedance of Tilt or Zone Maximum

In the event that survey marks exceed the zone maximum or a tilt is indicated to exceed 1 vertical in 1000 horizontal over a distance of no less than 25 m, Figure 12 shows the measurements are to be checked. If confirmed, the contingency plan described below in Section 10.8 and summarised in Figure 13 is to be initiated.

10.7.3 Favona Markers - Settlement and Tilt Trigger Levels

With 10 metre separation between close-order markers, the 1 in 1000 tilt is accomplished by a differential settlement of 10mm. This is close to the survey error. With 50 metre separation between markers, the differential increases to 50mm. This is twice the seasonal fluctuation and beyond survey error and so can be considered potentially to provide a realistic trigger.

The settlement analysis indicates that expected settlement is focused over the vein system where up to 80 mm has been predicted. No settlement is calculated to extend over the ridge towards town. As a result, Favona induced settlement is not expected in the markers along Moore Street.

Where markers are 50 m or more apart, settlement in excess of 50 mm would be needed to initiate the tilt trigger. For this reason, a 50 mm trigger for settlement is appropriate as this would be activated at or before activation of the tilt trigger. This is approximately twice the seasonal fluctuation so would be defensible in determining a real effect. The proposed settlement trigger limit is equivalent to the Martha Settlement Zone 3, and based on experience with Martha, no adverse effects are anticipated. Figure 13 describes the process that would be undertaken in the event that the trigger levels for tilt or settlement are exceeded.

The settlement trigger levels may need to be revisited in the light of ongoing survey results. Changes to the trigger levels would be expected only in response to unexpected settlement behaviour, and would be an outcome of a contingency action, e.g. review of the settlement model. Any change to the trigger levels are to be agreed with the Councils prior to their adoption.

10.8 Remediation and Mitigation of Settlement Effects

A contingency plan to be applied for unusual ground movements is summarised in Figure 13. If monitoring data and field investigations confirm that:

- The magnitude of ground movements due to dewatering the Martha Pit, Martha Underground, Trio, Correnso/SUPA and Favona Underground has exceeded those given in Table 1,
- Mine dewatering has resulted in a tilt greater than 1 in 1000 between any two network monitoring locations spaced no less than 25 metres apart.

OGNZL is to:

a) Notify the Consenting Authorities within 20 working days of receiving the results of the monitoring.

b) Explain the cause of the non-conformance.

c) Agree with the consenting authorities on the appropriate settlement contingency measures to be implemented as described.

d) Implement settlement contingency measures as appropriate.

e) Advise the Consenting Authorities on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Current practice is for OGNZL to increase monitoring frequency; undertake geotechnical investigations; and/or to set up a close order survey around the mark or area of exceedance as a means to comply with requirement b) above. This is indicated by the first action box on the flow diagram in Figure 13.

Where agreed, remediation and mitigation plans are to be developed by OGNZL and forwarded to the consenting authorities for approval prior to their implementation. Such plans should also be agreed to by affected landowners.

The final composition of the remediation and mitigation plan, if required, will depend upon:

- The magnitude of ground movement
- The size of the affected area
- The soil conditions under the affected area
- The type of structure affected, if any
- Environmental and social issues
- The wishes of the affected parties and landowners, and;
- A cost-benefit analysis of the various mitigation options.

Figure 13 shows that these mitigation plans are to be monitored in terms of success and if necessary, revised.

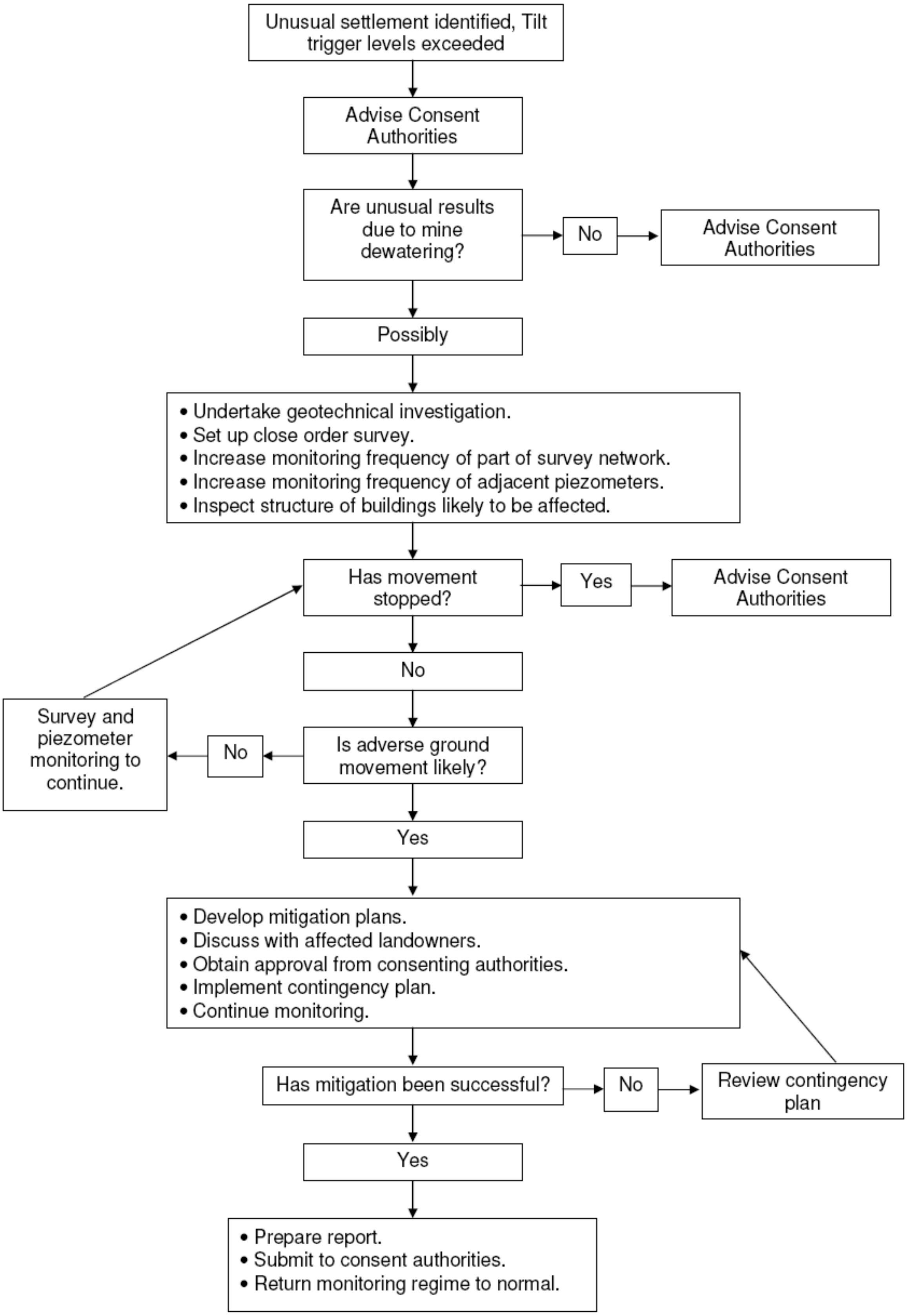

Figure 13: Flow chart of Settlement Contingency Plan

(After Table 5, evidence of Dr Semple as presented to the joint hearing committee dated 13 November 1997.)

Appended with trigger levels for Trio recommended by EGL (2010), trigger levels for Correnso recommended by EGL (2012) and trigger levels for Project Martha recommended by EGL (2018).

Refer to Figure 9 of this Document for a Plan of the Settlement Zones.

Table 7: Predicted Settlement by Zone

Settlement Zone	Range of Surface Movement (mm) Measured Dec. 1989 to May 1997	Measured Average Surface Settlement (mm) due to Mine Dewatering Dec.1989 to May 1997	Predicted Range in Surface Settlement (mm) due to the Extended Mining Operations	Predicted Average Surface Settlement (mm) at cessation of the Extended Mining Operations	Trigger Levels for Settlement (including dewatering for Trio Development) (mm)	Maximum Total Settlement, incl Correnso Dewatering (mm)	Maximum Total Settlement, incl Project Martha Dewatering (mm)
1	+2 to -10	0	0 to 10	0	25	35	55
2	+10 to -10	0	0 to 20	10	35	45	65
3	0 to -25	10	0 to 40	20	60	70	95
4	-15 to -35	25	30 to 80	45	110	125	160
5	-25 to -50	50	70 to 130	85	175	195	260
6	-55 to -85	65	100 to 180	120	220	240	340
7	-95 to -125	110	180 to 260	200	350	400	540

11 RESPONSIBILITIES AND ACCOUNTABILITIES

Role	Responsibility
General Manager	• Ensure that resources are available to meet the Dewatering and Settlement consent conditions and monitoring as outlined in the Dewatering and Settlement Monitoring Plan.
Sustainability Manager	• Ensure that dewatering, groundwater and settlement monitoring is carried out according to the relevant consent conditions and as outlined in this Dewatering and Settlement Monitoring Plan. • Ensure that dewatering and settlement reports are produced and supplied to regulators on time as indicated in this Dewatering and Settlement Monitoring Plan. • Ensure that dewatering, groundwater and settlement monitoring data are reviewed according to this Dewatering and Settlement Monitoring Plan, and contingency and mitigation plans implemented as required.
Processing Superintendent	• Ensure dewatering flows are monitored daily according to this Dewatering and Settlement Monitoring Plan.
TSF Engineer	• Ensure resources are available to complete the 6-monthly settlement surveys as outlined in this Dewatering and Settlement Monitoring Plan.

12 RECORDS AND DOCUMENTATION

Water level data from VWPs with telemetry (P110, P111, P112, P113A, P114, P122, P123, ROW-17) is accessed via the Cirro system. Data from VWPs that do not have telemetry is downloaded onto a laptop in the field and then transferred to Microsoft Excel databases on an OGNZL network drive back in the office. Similarly, dipped standpipe levels and pneumatic piezo levels are recorded on field sheets and then also transferred to Microsoft Excel databases on an OGNZL network drive. The field records are kept and filed in the OGNZL office.

Dewatering volumes for underground are monitored at the WTP on the automated Pi system. Meter readings from SCADA are recorded on an Access database.

Groundwater quality data is recorded in the InForm module of the INX software.

Complaints are recorded in a log that is maintained by the OGNZL Community Liaison Officer.

This Monitoring Plan is a controlled document secured within the OceanaGold document control system Team Binder and published to the site through SharePoint.

13 AUDIT AND REVIEW

This plan shall be reviewed every 2 years minimum, as required by Condition 2 of Water Permit 109742 and forwarded to the WRC for approval. It will also be reviewed in any of the following circumstances:

- Following any event or investigation that impacts on this plan
- Any amendments to the site risk resulting in a changed or increased risk related to dewatering and settlement
- Any amendments to legislation that impacts on this plan

14 RESOURCE CONSENT CONDITION COMPLIANCE

The contents of this monitoring plan are prescribed in various resource consents and summarised in Table 8, with reference to the relevant section of this plan.

Table 8: Resource Consent Condition Compliance

Consent Requirement	Plan Reference
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 management system.	Section 9 Groundwater Section 10 Settlement
Details of the piezometer network proposed to monitor the effects of mine dewatering on the aquifers under Waihi Township.	Sections 9.3 & 9.4 Appendix C
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.	Section 10.2 Appendix D
Details of the survey facilities in the Waihi Township considered by the consent holder to be potentially "at risk" of damage from ground settlement caused by mine dewatering.	No facilities considered at risk
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 (vertical) in 1000 (horizontal) between any two network monitoring locations spaced no less than 25 m apart (i.e. Settlement no more than 25 mm over 25 m). The settlement contingency plan shall particularly address those facilities identified by the consent holder as being "at risk" from ground settlement caused by mining.	Figure 13
A dewatering contingency monitoring 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.	Figure 8
In detailing the monitoring programmes, the consent holder shall provide information on the monitoring methods proposed, the	Section 8 Dewatering Section 9 Groundwater Section 10 Settlement

<table>
<tr><th>Consent Requirement</th><th>Plan Reference</th></tr>
<tr><td>parameters to be monitored and the calibration and maintenance of monitoring equipment.</td><td></td></tr>
<tr><td>Monitoring is to include:
The daily volume of water abstracted.
Monthly water level monitoring of the piezometer network.
Six monthly monitoring of ground settlement.
The chemistry of groundwater, pit runoff and dewatering water.</td><td>Section 8.4
Sections 9.3.3 & 9.4.3
Section 10.4
Section 9.7</td></tr>
<tr><td>In the event that a tilt of greater than 1 in 1000 occurs over 25 m and such tilt is due to mine dewatering, or there is a significant variance from predicted settlement rates for the settlement zones as follows:
<table>
<tr><th>Zone</th><th>Maximum Total Settlement (mm), incl Project Martha (2020)</th></tr>
<tr><td>1</td><td>55</td></tr>
<tr><td>2</td><td>65</td></tr>
<tr><td>3</td><td>95</td></tr>
<tr><td>4</td><td>160</td></tr>
<tr><td>5</td><td>260</td></tr>
<tr><td>6</td><td>340</td></tr>
<tr><td>7</td><td>540</td></tr>
</table>
Note: Maximum Total Settlement incl. Project Martha Dewatering sourced from Project Martha Hearing Evidence, Appendix R, Table 2 (Engineering Geology Ltd, May 2018)

The consent holder is to:
Explain the cause of the non-conformance.
Agree with the consent Authorities on appropriate settlement contingency measures to be implemented.
Implement settlement contingency measures as appropriate.
Advise the councils of the steps proposed to be taken to prevent further occurrence of the situation.</td><td>Section 10.7.2
Figure 13</td></tr>
</table>

15 DEFINITIONS

Term	Definition
CEPA	Correnso Extensions Project Area
HDC	Hauraki District Council
OGNZL	OceanaGold New Zealand Limited
SOP	Standard Operating Procedure
SUPA	Slevin Underground Project Area
WRC	Waikato Regional Council

16 REFERENCES

Engineering Geology Ltd, 2010. Proposed Trio Development Project – Assessment of Ground Settlement. Ref. 6723. Prepared for Newmont Waihi Gold, June 2010.

Engineering Geology Ltd, 2012. Evidence of Trevor Matuschka at Correnso Hearing. Prepared for Newmont Waihi Gold, November 2012.

GEOKEM, 2003: Report No. 0234 Technical review of water quality and geochemistry issues, Favona Underground Project. Prepared for Environment Waikato, October 2003

GWS Ltd, 2010. Proposed Trio Development Project – Assessment of Groundwater Inflows and Throughflows. Prepared for Newmont Waihi Gold, June 2010.

Pattle Delamore Partners Ltd, 2003: Proposed Favona Underground Mine – Review of Groundwater Assessment. Prepared for Environment Waikato, October 2003.

Pells Sullivan Meynink, 2010. Trio Development Project – Effects of Dewatering. Report PSM125.R40. Prepared for Newmont Waihi Gold, May 2010.

Engineering Geology Ltd, 2018. Evidence of Trevor Matuschka at Project Martha Hearing. Prepared for OceanaGold, November 2018.

APPENDIX A – RESOURCE CONSENTS

APPENDIX B – STANDARD OPERATING PROCEDURES

APPENDIX C – PIEZOMETERS

APPENDIX D – SETTLEMENT MARKS

APPENDIX E – SETTLEMENT MARKS & CONTOURS MAPS