IN THE MATTER	of the Resource Management Act 1991 ("RMA" or "the Act")
AND	
IN THE MATTER	of an application under section 88 of the Act to **WAIKATO REGIONAL COUNCIL** and **WAIKATO DISTRICT COUNCIL** (ref LUC0488/22) by **GLEESON MANAGED FILL LIMITED** to establish and operate a managed fill disposal activity at 310 Riverview Road, Huntly.

STATEMENT OF EVIDENCE OF MICHAEL JOHN PARSONSON

EROSION AND SEDIMENT CONTROL

Dated 23 November 2022

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1. INTRODUCTION

1.1 My full name is Michael John Parsonson. I am Director and Environmental and Planning Consultant at SouthernSkies Environmental Limited.

1.2 This evidence is given in respect of resource consent application APP144475 (WRC) (LUC0488/22 WDC) by Gleeson Managed Fill Limited ("GMF") to Waikato Regional Council ("WRC") and ("Waikato District Council") ("WDC") to establish and operate a managed fill disposal activity at 310 Riverview Road, Huntly ("Site").

Qualifications and experience

1.3 I hold a masters degree in geography (1995) from the University of Auckland. I am also a full member of the New Zealand Planning Institute, and a member and former director of the International Erosion Control Association Australasia (IECA).

1.4 I have over 26 years environmental management experience, gained from geotechnical consultancy, consents and compliance, project management and team management roles at the Auckland Regional Council, as well as being a director of SouthernSkies Environmental Limited since 2005. My experience includes assessment and preparation of resource consent applications, Notices of Requirement, and outline plans of work for various activities under regional and district plan, policy and plan development, expert witnessing, erosion and sediment control design, auditing and training, development of best practice guidelines for RMA practitioners, peer reviewing and environmental and relationship management for various projects.

1.5 I am a certified independent hearings commissioner, being experienced in district and regional planning, infrastructure and construction, discharges, and policy development. I have also been a member of two Boards of Inquiry.

1.6 Projects that I have provided planning and / or technical input to that are of particular relevance to this proposal include:

(a) Maitahi Plan Change 2022, involving 287ha greenfields development area within Kākā Valley and Bayview Ridge. I provided erosion and sediment control (ESC) technical input for plan change refinement and was an expert witness for hearing. The plan change was approved by Nelson City Council.

(b) 711 North Road managed fill (16ha) 2017 and 2021. I was involved with the preparation of the AEE and erosion and sediment control (ESC) plans and methodology for the 2017 consent and 2021 reconsenting of fill at Clevedon. The consents were granted.

(c) Twilight Road Managed Fill 2019. I was the hearing commissioner for reconsenting of 5ha fill at Clevedon. The consent was granted.

(d) Lake Road Quarry 2019. I was the hearing commissioner for reconsenting and expansion of quarry at Te Arai. The application was declined.

(e) Huntly Bypass section of the Waikato Expressway 2014. I was the reporting officer and provided ESC review for the regional resource consents.

Involvement in the project

1.7 I was engaged by GMF in June 2020 to assist with the applications lodged for the fill sites. Since that time, I have provided technical advisory and design services for the managed fill proposal, the existing quarry, the quarry reconsenting, and the 2021 consented overburden disposal site. In 2022 my role evolved into preparing the ESC design for the new consent application for Fills 2, 3 and 4, which are now before the panel.

1.8 I was the primary author of the following reports prepared in support of the resource consent application:

(a) *Erosion and Sediment Control Plan – Fill Area 2 and 4* (7 March 2022) ("ESCP 2 and 4")*;* and

(b) *Phase 1 Erosion and Sediment Control Plan Fill Area 3 – Site Establishment and Initial Filling* (7 April 2022) ("ESCP 3").

1.9 An updated version of ESCP 2 and 4, that identifies small, induced wetlands below those fill sites, is provided in **Appendix A**. The ESCP 3 is provided in **Appendix B**.

1.10 I have also provided review and integrating comments to support Mr Rumsby in the development of the Huntly Site & Fill Management Plan[1] (Site & Fill Management Plan), the Surface Water Sampling and Analysis Plan – Huntly Managed Fill[2] (Surface Water Sampling and Analysis Plan) and the Draft Huntly Managed Fill Acid Sulphate Soil Management Plan[3] (Acid Sulphate Soil Management Plan).

Site visits and background material

1.11 I have undertaken various site visits since 2020 that addressed the proposed fill sites. I have walked to the base of each proposed site twice as well an observing the receiving environment of each fill site to the extent that they are located within the applicant's property.

1.1 In preparing this evidence I have read and am familiar with the s42A reports prepared by Ms Cowan for Waikato Regional Council (WRC) and Ms Masters for Waikato District Council (WDC) and the supporting documentation, as well as those submissions that are relevant to my area of expertise.

1 *Huntly Site & Fill Management Plan*; Gleeson Managed Fill, July 2022, Rev 8
2 *Surface Water Sampling and Analysis Plan – Huntly Managed Fill*; EHS Support, July 2022, Rev 7
3 *Draft Huntly Managed Fill Acid Sulphate Soil Management Plan*; EHS Support, June 2022

1.2 I also rely on the technical evidence of Mr Rumsby, Mr Lowry / Ms McLennan, and Mr Chung / Kernot, and the planning evidence of Ms Madsen.

Purpose and scope of evidence

1.3 The purpose of my evidence is to summarise the ESC design approach proposed, and the mitigation of sediment related effects that I anticipate being achieved through the implementation and maintenance of design. My evidence relies on, but does not repeat in full, the consent of the ESC plans provided in Appendix A and Appendix B.

1.4 My evidence is structured as follows:

(a) Briefly describes the sites (Section 3);

(b) Briefly describes the proposal (Section 4);

(c) Sets out the key policy matters (Section 5);

(d) Addresses the relevant erosion and sediment control issues arising (Section 6);

(e) Comments on issues raised by the Officer's Report relevant to my area of expertise (Section 7);

(f) Comments on issues raised by Submitters relevant to my area of expertise (Section 8);

(g) Comments on the conditions (Section 9);

(h) Provides a brief conclusion (Section 10).

1.5 A summary of my evidence is contained in Section 2.

Expert Witness Code of Conduct

1.6 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's 2014 Practice Note. I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.7 I understand and accept that it is my overriding duty to assist the Independent Commissioner in matters which are within my expertise as an environmental and planning consultant.

2. SUMMARY OF EVIDENCE

2.1 GMF proposes to undertake managed filling within two gullies (Fill 2 and Fill 4) and within a topographic basin formed on historic filling (Fill 3). The managed filling is to be staged such that only one site is operated at a time, and filling within each active site will be limited to no more than 3ha of open area at a time.

2.2 An erosion and sediment control (ESC) methodology has been developed for each site, based on industry best practice, the Waikato regional guideline[4], and in recognition of the specific characteristics of each site and its receiving environment.

2.3 The basic components of the ESC system for each site will be:

(a) diverting all sediment laden runoff via dirty water diversion bunds / channels to flocculated sediment retention ponds (SRPs);

(b) minimising the catchment area of each SRP by clean water diversion bunds;

(c) limiting the open area at any time;

(d) progressive stabilisation; and

(e) weekly and pre and post rainfall monitoring and maintenance of all ESC devices.

2.4 An Adaptive Management Plan (AMP) has been drafted and is required by a proposed consent condition. Once the final AMP is submitted and certified by WRC, it will be implemented to provide additional monitoring and responses to ensure that sediment-related effects are maintained within the anticipated range.

2.5 The ESC methodology that is proposed is well tested and proven on many and various projects throughout New Zealand, including within the Waikato River catchment. I anticipate that its adoption, in conjunction with the proposed consent conditions, would ensure that potential sediment-related adverse effects are appropriately minimised such that they are temporary and acceptable.

4 Waikato Regional Council Technical Report No. 2009/02 *Erosion and Sediment Control Guidelines for Soil Disturbing Activities*, January 2009 (TR2009/02)

2.6 In their respective s42A reports, Ms Cowan and Ms Masters suggest additional measures and assessments are required to address potential adverse effects. Noting the acceptance of the proposed ESC by Mr Evans (WRC ESC peer reviewer), I do not consider that changes or additions proposed in the s42A reports are necessary to ensure that the effects of the activity are appropriately minimised.

2.7 From a sediment management perspective, I consider that the proposal, which now includes the conversion of SRPs into wetland, would achieve overall betterment to the Waikato River.

3. SITE DESCRIPTION AND LOCALITY

3.1 The general description of the location is provided in the AEE[5] and Ms Madsen's evidence. Each fill site is also described in more detail in both the Assessment of Environmental Effects (AEE) prepared by Ms Madsen, and the evidence of Ms Madsen and Mr Lowry/Ms McLennan[6]. The geological setting and geotechnical design are described in the evidence of Mr Cheung and Mr Kernot[7].

Fill 2

3.2 Fill 2 consists of a westerly orientated steep sided gully system and drains to the west and then north within the catchment of Lake Puketirini and Lake Waahi, which are within the catchment of the Waikato River. Indigenous vegetation is located to the west of the fill area and is classified as a Significant Natural Area (SNA) by the Waikato District Plan. Fill 2 is located outside of the SNA.

3.3 The vegetation within the site is described in the evidence of Mr Lowry / Ms McLennan.

3.4 An ephemeral watercourse passes through the gully. An existing dam/farm pond that was constructed for stock watering is located at the head of this watercourse and is feed by ephemeral tributaries. I am advised by Ms Madsen that the extent of wetland associated with the farm pond has been confirmed as being artificial and is not subject to the regulations of National Environmental Standards for Freshwater Regulations 2020 (NES: FW 2020).

5 Assessment of Environmental Effects at [7].
6 Ms McLennan EIC at Section 7.
7 Mr Cheung EIC at Section 3.

3.5 An extent of natural inland wetland is identified at the toe of the gully in the general vicinity that it joins the main valley within the SNA. An additional, small, transient induced inland wetland that has formed on forest harvest debris has been identified within gully, downstream of the fill footprint.

Fill 3

3.6 Fill Site 3 is a broad gully being approximately 250m wide from ridge to ridge that trends in a north-westerly direction. The upper reaches of this gully are characterised by moderately steep 2.5H:1V slopes formed in weathered Waikato Coal Measures material. A shallow stock pond within the centre of the site has been drained, with a rock lined channel formed eastward to the eastern gully.

3.7 The vegetation within the site is described in the evidence of Mr Lowry / Ms McLennan.

3.8 The flat area of Fill 3 is underlain by fill placed until approximately 30 years ago, comprising predominantly overburden stripped from adjacent neighbouring coal mines that are no longer in production.

Fill 4

3.9 Fill 4 is a moderately sloping gully feature that drains northward via two upper-catchment ephemeral gullies and farm pond, to an intermittent stream. That stream flows north across the property boundary, westward via a gully in the neighbouring property and then turns south, running parallel to Riverview Road. It discharges to the Waikato River via a culvert under the road. Again, I am advised by Ms Madsen that the extent of wetland associated with the farm pond is deemed artificial.

3.10 The vegetation within the site is described in the evidence of Mr Lowry / Ms McLennan.

3.11 One small additional induced wetland has been identified downstream of the farm pond.

4. DESCRIPTION OF PROPOSAL

4.1 As noted, Fills 2 and 4 are proposed within natural gullies, while Fill 3 is a shallow basin that is underlain by fill placed until approximately 30 years ago. Consequently, while adopting the same overall general principles, the ESC management system for Fill 3 has been developed and reported on separately to that for Fills 2 and 4 (refer to Appendix A and Appendix B).

4.2 The overall ESC principles and design approach to be adopted are consistent with Waikato Regional Council Technical Report No. 2009/02 *Erosion and Sediment Control Guidelines for Soil Disturbing Activities*, January 2009 (TR2009/02). As for all earthworks sites that adopt this approach, the emphasis will be on an overall treatment train to minimise sediment yield (the amount of sediment discharged from the site). This will include a significant focus on erosion control. Only one fill site will be operational at any given time. At each site, the open area exposed to erosion will be minimised by staged stripping and progressively stabilisation, either temporarily with mulch or permanently with topsoil, seed, and mulch.

4.3 Diversion channels or bunds that will divert clean water and dirty water runoff will be sized to accommodate the 1% AEP (100 year) runoff event. This exceeds the minimum require of TR2009/02, which is to provide for the 20% AEP event plus 300m freeboard.

Fill 2

4.4 Approximately 717,000m^3 of managed fill is proposed to be imported to Fill 2 over an area of 4.5ha.

4.5 Prior to the commencement of filling, a silt fence will be installed below the proposed SRP 2. SRP 2 has been located a minimum of 100m upstream of the natural inland wetland located near the toe of the gully, and a minimum of 11m upstream of the small and transient induced wetland area within the gully. While Fill 2 will comprise a cumulative total area of 4.5ha, clean water diversions will be used to limit the catchment area of SRP 2 to no more than 3ha. This allows the SRP to be orientated across the gully and achieve the minimum separation from any wetland. The SRP is proposed to provide for a minimum of 900m^3 of storage volume, sized at 3% of the total contributing 3ha catchment area.

4.6 The establishment works will comprise the dewatering the farm pond, installation of the SRP and diversion bunds / channels. This will require the installation of a silt fence below the works area, and temporary clean water diversions immediately upstream of the SRP site and stabilising the existing access tracks into the SRP site.

4.7 The maximum 3ha catchment area of the SRP will be maintained by adjusting the location of the clean water diversions.

Fill 4

4.8 Approximately 800,000m^3 of managed fill is proposed to be imported to Fill 4 over an area of 5.21ha.

4.9 The fill will be treated by one SRP that has been designed with a contributing catchment area of 4.4ha, providing a minimum storage volume of 1,320m^3, again based on the 3% criteria. Clean water diversions will be used to divert adjacent clean/stabilised area away from the SRP and maintain its maximum catchment at no more than 4.4ha. The SRP will be located at least 25m from the induced wetland downstream of the site.

4.10 As for Fill 2, the establishment works will comprise the dewatering the farm pond, installation of the SRP and diversion bunds / channels. This will require the installation of a silt fence below the works area, and temporary clean water diversions immediately upstream of the SRP site and stabilising the existing access tracks into the SRP site.

Fill 3

4.11 Approximately 478,500m^3 of managed fill is to be imported to the site over an area of 4.34ha. It will be placed in a series of structural bunds and non-engineered fill cells.

4.12 Prior to filling commencing, deep drainage will be installed to dewater the existing fill horizons at a rate necessary to provide for a commercially viable fill importation rate. The site will be progressively stripped, and a clay liner and drainage blanket will be installed before fill is imported. Clay for the liner will be excavated from the southern part of the fill site. Runoff from the fill site will be treated via a sediment retention pond.

4.13 Once the site is established, initial filling has commenced, and discharge limits have been confirmed, the SRP will discharge to the eastern gully and watercourse.

4.14 In summary, the Phase 1 works will comprise:

(a) Installation of the groundwater capture and monitoring system.

(b) Deep drainage.

(c) Construction and commissioning of the SRP;

(d) Establishment of the first fill cell, including the placement of clay lining cut from the adjacent hill slope, and shallow underfill drainage.

4.15 Recognising the nature of the existing fill within the Fill 3 site, the proposed water treatment system is more complex than for Fills 2 and 4. Surface water runoff from the new fill will be treated similarly to the other sites, via the chemically treated SRP.

4.16 The deep drainage will be captured at a manhole and pumped to a holding tank. It will be tested at that point and either released or taken off-site for disposal. This detail is provided in the Site & Fill Management Plan and the and the Surface Water Sampling and Analysis Plan, both prepared by Mr Rumsby.

Sediment Retention Pond Treatment

4.17 It is proposed that each SRP will be chemically treated to enhance sediment settlement and overall device efficiency. The typical treatment system will comprise a rainfall activated dosing system and most likely poly aluminium chloride (PAC) coagulant or a blend of this with polyDADMAC flocculent. PAC is commonly used in municipal water treatment plants and polyDADMAC is a common flocculent used of treat quarry wash water. The suitability and dose rates of these treatments will be confirmed by testing of typical site soils, and then regular re-testing of soils and if necessary, adjustments to the dose rate, as the fill progresses within each site.

4.18 The application of chemical is via the diversion channels upstream of the SRP forebays, to ensure effective mixing. The dosing system is activated when rain occurs, either via a rainfall catch tray, a rain gauge on the device, or a flow sensor within an inlet weir, depending on which system is selected. These systems require regular maintenance but do not require personnel to be on site to the activate and operate.

4.19 The initial dose rates established will be a balance between settlement rates and pH change. The preferred and likely treatment chemicals are aluminium based. Aluminium can be biotoxic at low pH. The dose rates are set such that the treated water is no lower than approximate pH 6. This provides a buffer with the bio safe minimum value of 5.5 that is proposed as a consent condition. In addition to the pH minimum of the dose rate, much of the chemical that is discharged into the SRP is bound into the sediment that are retained in the device. That sediment is periodically removed, dried, and placed within the fill site.

4.20 The effectiveness of the dosing system will be managed in accordance with Chemical Treatment Management Plan (CTMP), day to day site monitoring

and the proposed Adaptive Management Plan (AMP). This will include monitoring the pH of SRP inflows and discharges.

Monitoring

4.21 Monitoring of the ESC system for each site is described in the two ESC Plans. It will comprise day to day monitoring and maintenance, and additional rainfall trigger event monitoring.

4.22 The day-to-day monitoring and maintenance that is required by all contractors on all earthworks sites ensures that ESC systems are operating as anticipated and in accordance with the corresponding consent conditions. This will be undertaken at least weekly, as well as immediately before and after rainfall, and include:

(a) Inspections of all controls to ensure they are fully functional.

(b) Maintaining the chemical treatment system and measuring inflow and outflow pH.

(c) Immediately undertaking any maintenance.

(d) Regular de-silting of devices when no more than 20% full.

(e) Constantly focussing on erosion control and minimising open areas.

4.23 Additional trigger event monitoring is proposed in response to the following rainfall events:

(a) ≥15mm in one hour; or

(b) ≥25mm in 24 hours.

4.24 These rainfall intensities are those that result in the SRPs approaching their detention capacity. The trigger event monitoring is intended to ensure that they are operating within the anticipated range of efficiencies or identify any changes that may be necessary to maintain that outcome.

4.25 Within 24hours of the occurrence of a rainfall trigger event, investigation, response, and reporting will be undertaken against the following SRP performance triggers:

(a) pH (to demonstrate it does not fall outside the range of 6 to 9);

(b) Total suspended solids, to demonstrate it is not greater than 100 g/m^3 or the sediment retention pond/s stormwater treatment is 90% treatment efficiency; and

(c) Turbidity.

4.26 The results of the investigations and sampling will be reported to the Waikato Regional Council within 15 working days of the corresponding rainfall trigger event, including any contingency actions undertaken in response to exceedance of a trigger value.

4.27 If the SRP performance is not as anticipated, another inspection and review of the site controls will be made. If all controls are fully operational, then a remaining response option is to further reduce the open area of the fill.

Adaptive Management Plan

4.28 The applicant proposes the development and implementation of an AMP. That will outline monitoring (in addition to day-to-day site management) and responses to ensure that the anticipated level of effects management is achieved.

The AMP will incorporate:

(a) trigger event monitoring;

(b) methods and locations for monitoring of water quality and stream health at locations downstream of each sediment retention pond;

(c) real-time, continuous automated turbidity monitoring of the inflow and outflow of sediment retention ponds, and continuous automated monitoring of outflow discharge water volumes of sediment retention ponds;

(d) a monitoring and contingency response programme to be implemented in response to rainfall trigger events, including reporting thresholds for turbidity (90% sediment retention pond efficiency), clarity (100mm) and pH (5.5 to 9.0).

(e) the process to develop of a correlation between turbidity and total suspended solids;

(f) procedures and timeframes for reporting the monitoring results to the Waikato Regional Council; and

(g) response to exceedance of reporting thresholds.

Acid Sulphate Soil

4.29 The management of potential acid sulphate soils imported to the site is described in the Acid Sulphate Soil Management Plan. I have assisted in the development of that plan. Treated runoff from the acid sulphate management area will discharge to the quarry pit. I do not make any further comment on that other than to note that the location of that potential discharge is already part of the exposed soil area that drains to the quarry. I do not anticipate any change to the overall performance of the quarry management system or discharges as a result of that activity.

Sediment Retention Pond Conversions to Wetlands

4.30 I understand that the applicant may offer to convert and retain the SRPs as wetlands. I recommend that this conversion be deferred until the filling is completed at each site and the site is fully stabilised. The management of functional SRPs during the filling phase will required periodic excavation of accumulated sediment from each pond. That process conflicts with the establishment of wetland characteristics and function.

5. KEY POLICY MATTERS

5.1 I have read Section 21 of the AEE and adopt the assessment undertaken by Ms Madsen, as it relates to the potential sediment-related effects of runoff from the proposed fill sites. The relevant provisions are those listed under the:

(a) National Policy Statement for Freshwater Management 2020;

(b) Waikato Regional Policy Statement;

(c) Waikato Regional Plan including Plan Change 1;

(d) Te Ture Whaimana o Te Awa o Waikato – Vision & Strategy for the Waikato River;

(e) Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010; and

(f) Waikato-Tainui Environmental Plan (Tai Tumu Tai Pari Tai Ao).

5.2 The common relevant aspects of those planning instruments are the avoidance or minimisation of adverse effects on the Waikato River and its

tributaries. Under Plan Change 1, there is also a strong policy direction to betterment of the awa.

6. EROSION AND SEDIMENT CONTROL ISSUES

Overall ESC Approach

6.1 The ESC methodology proposed for each site is based on industry best-practice. Runoff from the exposed ground within each site is to be directed to a chemically treated SRP. Those are the most efficient sediment retention devices available, achieving 95% sediment retention efficiency if appropriately designed, constructed, and maintained. It is an approach that has been proven to be effective across a range of large earthworks operations on steep sites, including the Huntly Bypass project.[8] It has been supported by real-time and event-base monitoring and reporting of SRP performance, and assessment of receiving environment through significant infrastructure projects such as Ara Tuhono Puhoi to Warkworth motorway extension (Ara Tuhono) and trigger event monitoring undertaken by SouthernSkies Environmental Limited for various stages on the Millwater development near Silverdale.

6.2 Monitoring undertaken during Ara Tuhono has confirmed that the actual sediment yield from the works is typically less than that predicted by the Universal Soil Loss Equation ("USLE") and Groundwater Loading Effects of Agricultural Management Systems ("GLEAMS") modelling undertaken during the consenting of the project. For that project, extensive modelling was undertaken to predict construct sediment yields for two hill country sectors and one of moderate to low gradient sector of the project. Those values were used to assess the likely effect of the works on the receiving environments through a range of storms up to the 50-year ARI event.[9] The receiving environments for that project are high value, low energy estuary environments. Likewise, monitoring of the Millwater development stages has indicated that the performance of SRPs in a range of storms will be within the anticipated efficiencies, subject to good maintenance. The receiving environments of that development are the Orewa and Weiti rivers and estuaries.

6.3 The proposed approach to site management will limit the open area of any SRP to 3ha and only one fill site will operate at a time. In addition, a winter

8 Campbell Stewart of SouthernSkies was the ESC technical specialist for that project.
9 Section 10 of *Final Report and Decision of the Board of Inquiry into the Ara Tūhono - Pūhoi to Wellsford Road of National Significance: Pūhoi to Warkworth Section*, Volume 1 of 4: Final Report and Decision, September 2014.

works restriction is proposed such that any filling undertaken between 30 April and 1 October of any given year will be at the discretion of Waikato Regional Council. Request to undertake filling during that period will likely be supported by revised ESC Plans that confirms a further reduction on open area that will further benefit the efficiency of the corresponding SRP.

Chemical Treatment

6.4 This chemical treatment system proposed for each SRP has been widely adopted through the Auckland, Waikato, and other regions of New Zealand. I am not aware of any recorded adverse effects from its use. As noted above, the typical chemicals used are commonly used in other water treatment applications. There are various precautionary aspects to the design and implementation of these systems which include:

(a) Confirmation of improved settlement rates through testing of site soils;

(b) Setting the dose rate to ensure that it is above a potentially toxic pH;

(c) Chemical being bound into the sediments retained in the SRP;

(d) Management of the system in accordance with the Chemical Treatment Management Plan; and

(e) Regular monitoring of discharges and adjustment to the treatment system, if necessary, in accordance with day to day monitoring and the Adaptive Management Plan.

6.5 For most soils, the implementation of the proposed chemical treatment system will provide a significant benefit in terms of settlement rates and sediment retention. This correspondingly reduces the sediment yield with the generally accepted sediment retention efficiency of SRPs being increased from 75% to 95% with the addition of chemical treatment. In my experience, chemically treating SRPs has a significant environmental benefit without any residual adverse environmental effect.

Fill 3

6.6 As detailed in the Site & Fill Management Plan, the management of Fill 3 differs somewhat from Fills 2 and 4 as a result of the presence of existing fill. However, the overall management of sediment-laden runoff is consistent with the principles adopted for Fills 2 and 4. Other potential contaminants

will be collected, measured, and managed in accordance with the Site & Fill Management Plan and the Surface Water Sampling and Analysis Plan.

6.7 I defer to Mr Rumsby to address the management of other contaminants. However, I am satisfied that the proposed ESC system will appropriately minimise the discharge of sediment and has been developed as an integrated component of the overall Fill 3 treatment system such that other contaminants will be appropriately intercepted and managed.

Monitoring

6.8 Comprehensive monitoring has been detailed through the ESC Plans provided Appendix A and Appendix B, and via the updated ESC Plan that would be required through the proposed consent conditions.

6.9 In addition, the AMP required by the proposed conditions will provide an additional layer of monitoring and response. I am familiar with adaptive management plans in this context, having drafted the Auckland Council adaptive management plan template, and having supported the preparation and implementation of adaptive management plans for various projects. The AMP will also incorporate monitoring identified in the ESC Plans and rainfall event monitoring proposed in the consent conditions.

In my experience of the wider resource management context, adaptive management plans are imposed where there is some residual uncertainty on the actual effects that will arise from a given activity. In this case I do not consider there to be significant uncertainty. I reiterate that the AMP monitoring is additional to the day-to-day monitoring to be undertaken by the site personnel. My general observation of earthworks projects is that diligent day to day monitoring and maintenance does ensure that sites are operating within the anticipated and appropriate level of effects. However, the AMP approach provides additional opportunity to reaffirm the effectiveness of the ESC system and, if necessary, provide for adjustments to ensure that effects continue to be appropriately minimised.

Summary

6.10 Overall, I consider that the proposed ESC methodology will minimise sediment yield to an acceptable level such that any adverse effects on receiving environment will be appropriately minimised. This conclusion is based on my experience with similar systems on sites of similar topography and soils, and with similar or more ecologically sensitive receiving environments.

6.11 Like all earthwork activities, the successful implementation of the earthworks and achievement of the anticipated outcomes is dependent on diligent site management. As discussed below, compliance with the conditions proposed below will, in my opinion, ensure that outcome.

6.12 The Fill 2 site is within the catchment of Lake Puketirini (and Lake Waahi). It is approximately 2km upstream of Lake Puketirini and drains to the lake via farmland and natural and modified channel sections. Because I have assessed the proposal against potential effects on the immediate downstream environment (relying on the ecology assessments in that regard) I do not anticipate that the fill activity will have a material effect on the lake, it values or recreational use.

6.13 The Fill 3 and 4 sites drain to the Waikato River. Likewise, based on the anticipated level of treatment, and the existing characteristics of the intermitted stream and the river, I do not anticipate any material adverse effect on those receiving environment.

6.14 As discussed, in my opinion the various levels of monitoring proposed, including ESC related monitoring, will ensure that the operations can be managed and adjusted to maintain an appropriately low level of effect.

7. ISSUES RAISED BY COUNCIL OFFICER'S REPORTS

7.1 I have read the s42A RMA reports prepared by Ms Cowan for WRC and Ms Masters for WDC. In the following discussion, I limit my specific comments to those matters on which I disagree, and to matters to which I offer amendments or solutions to concerns raised in the reports.

Waikato Regional Council

7.2 Ms Cowan relies on the evidence of Mr Evans with respect to erosion and sediment control, and Dr Caldwell with respect to water quality associated with other contaminants. While I defer to Mr Rumsby to respond to most of the matters associated with other contaminants, I do comment on some matters that overlap with my area of expertise.

7.3 I could not find a copy of Mr Evans' technical review attached to the s42A report. However, at page 28 of her report, Ms Cowan quotes Mr Evans as concluding:

> *"To summarise, upon my reviewal it appears that the proposed methodologies and practices on principle will be appropriate for the proposed works upon review of the*

updated Erosion and Sediment Control Plans. I can confirm that all s92 responses relevant to erosion and sediment control aspects of the application have appropriately addressed queries raised by myself."

7.4 Ms Cowan then raises some additional concerns of her own, and I comment on these as follows.

7.5 Ms Cowan considers that there has been insufficient assessment of the cumulative effects of sediment discharge and methods to quantify and mitigate such effects. To address this, she recommends that in addition to the recommended sediment retention pond performance standards, an additional requirement is imposed that "sediment yield is measured at the final discharge points and compensation is offered to result in a net benefit to the Waikato River catchment (Refer to Vision and Strategy Assessment in this report)". She recommends that this be provide via "real-time monitoring of turbidity and flow, and an Adaptive Management Plan to evaluate and address the effects of sedimentation on an ongoing basis".

7.6 Ms Cowan's suggestion of continuous monitoring of turbidity and outflow volumes is generally consistent with the draft AMP provided to WRC in 2020 and is consistent with the AMP condition offered in the current consent application and Condition 19 (APP144475.04.01) of the condition set attached to the s42A report. The provision of real-time automated monitoring of turbidity is consistent with the approach taken on other significant earthworks projects and is a system with which I am very familiar. Typically, this does not include flow monitoring, but in this case, it has been accepted by the applicant. I comment on this later in my evidence. The equipment necessary to provide the monitoring can be relocated as one site is closed out and the next is commissioned.

7.7 I have discussed the function of the AMP earlier in my evidence. With respect to potential sediment effects, I do not agree with Ms Cowans statement; "I recommend that the surface water monitoring programme is undertaken for at least the duration of the consents and until the fill sites and discharges have been demonstrated to meet the permitted activity standards". In my opinion this conflates the monitoring required for sediment management and other water quality monitoring addressed by Mr Rumsby, and also is not legally binding. On the first point, once a fill site is completed and stabilised, the land use (grass or forestry) that occurs from that point onwards is permitted under the regional and district plans. Accordingly, sediment discharges from those permitted activities are within the permitted baseline of effects. Monitoring of those effects is not required under either plan and

cannot be justified. Secondly, as I understand it, monitoring required by a resource consent for an activity cannot be required after the consent expires i.e., the activity cannot continue and the associated effect ceases. In this regard, it is important to not conflate the monitoring requirements for sediment (as an earthworks effect) from other water quality monitoring that may be required under more enduring consents.

7.8 As mentioned, the purpose of the AMP monitoring is to assist in the management and adjustment of the activity, to ensure that effects remain within the envelope of effects anticipated through the consent process. As confirmed by Mr Evans, the proposed ESC methodology will be appropriate. In my opinion, the proposed ESC system is a well understood, best-practice approach that has been measured and proven effective in terms of minimising sediment yields within the range anticipated during consenting. In this instance, rather than addressing significant residual uncertainty, the implementation of the AMP is a 'belts and braces' approach to add additional confirmatory monitoring and, if necessary, refinement of the activity.

7.9 The proposed ESC management approach has been accepted by councils, boards of inquiry and the Environment Court for a range of significant projects. Moreover, the approach has been proven to acceptably minimise sediment yields and effects within the range estimated prior to construction, with receiving environments more sensitive than the Waikato River at Huntly. This is not to read down the values of the awa or the policy direction of betterment for the awa. But I do consider that the proposed approach will appropriately minimise sediment yield (load).

7.10 I do not agree with Ms Cowan that the information generated from the real-time monitoring and the sampling of the sediment retention ponds will usefully inform cumulative effects on the Waikato River. Fill 2 drains to the intermittent stream within that gully, then to the permanent stream that passes through the SNA and then via dairy farms to Lake Puketirini, some 2km channel length from the site. Lake Puketirini discharges to Lake Waahi via a controlled flow gate near the southern end of Lake Waahi. Lake Waahi outlets from its north-east end via another channel of approximately 2km length into the Waikato River south of the Huntly Power Station. I have assessed that the proposed ESC methodology will approximately minimise the residual discharge of sediment to the immediate receiving environment below the fill and will have a negligible effect on Lake Puketirini (if any). On that basis, I am confident that no measurable amount of residual sediment (if any) will reach the Waikato River from Fill 2. I also note the applicant's proposal to convert the Fill 2 SRP into a wetland. This will provide additional

ecological benefit and will incidentally provide a water quality benefit for discharges from the upstream watercourse to the river. In my opinion, this wetland enhancement and expansion will provide betterment, regardless of whether the need for such to occur is proven.

7.11 Fills 3 and 4 will discharge via the watercourse that flows eastward via the O'Reilly property and then back into the GMF property before discharging to the Waikato River via the culvert under Riverview Road. Again, the proposed ESC methodology for those two sites has been assessed as minimising the potential residual discharge of sediment to an acceptable level. The applicant now the conversion of the SRPs for those sites into wetlands. As for Fill 2, this will provide additional ecological benefit and incidentally provide water quality betterment for discharges from the watercourse to the river.

7.12 In reflecting on Ms Cowan's linkage of sediment monitoring to quantifying betterment, I do not consider it reasonable nor appropriate to assess the impact of treated sediment laden water from the SRPs on a cumulative basis against the kilo-tonnes of sediment load that passes annually along the river at Huntly[10]. In my opinion, the adoption and implementation of ESC system and the AMP is the appropriately means to ensure that effects continue to be appropriately minimised. I do not consider it beneficial to quantify sediment load.

Performance limits vs targets

7.13 In other regions I have worked, including Auckland, Manawatu Whanganui and Nelson, it has been recognised that adopting hard compliance limits for SRPs is not consistent with the function of the ponds, as they are promoted in the regional and industry best-practice guidelines. Rather, where performance monitoring is required (such as turbidity, clarity or TSS), those are included as targets / triggers for response rather than compliance limits. Discharges from SRPs that are designed, constructed and maintained in accordance with industry best-practice will have variable turbidity, clarity and TSS throughout storms. However, as I have noted earlier, their overall (average) performance has been confirmed and found to achieve acceptable reductions in sediment yield for a range of environments including those particular sensitive to sediment inputs (e.g., estuaries).

10 Circa 200kt/yr for the Waipa catchment, that enters the Waikato River at Ngaaruawhaahiia, approximately 11km upstream of the site. *Waikato River suspended sediment: loads, sources, and sinks*; NIWA, 2015

7.14 SRPs function during and just after rain. This corresponds to when the flows in receiving streams are also elevated, although in this case I acknowledge that localised rainfall at the site might not directly correspond to elevated flows in the Waikato River. Each SRP at this site will have three T-bar decants that skim the cleanest water off the top of the water column. The system is set to discharge at a rate of 3l/s/ha of contributing catchment. The T-bars are offset so that they engage in series rather than all at once. This maximises the residence time for water in the pond and hence, maximises pond efficiency. The longer water can sit in the pond, the better the settlement efficiency. Some small rainfall events may not trigger a discharge, as the water level in the pond may not rise to the level of the lowest T-bar. Larger events may engage one, two or three T-bars, depending on the inflow rate of the water entering the pond. As each extra T-bar engages, the flow through rate speeds up and the residence time decreases, and the pond efficiency decreases. If the inflow rate exceeds the combined capacity of the three T-bars, the flow will drop into the manhole riser (primary spillway). In large events that exceed all those capacities, it will spill over the emergency spillway. At each of those stages the efficiency drops accordingly, and then rises again as the inflow rate reduces and the discharge drops back down to the T-bars and the eventually only one T-bar. Hence pond efficiency is an average across a storm and also when compared between a range of storms.

7.15 Aside from the characteristics of each rainfall event, SRP efficiency also varies on other factors including antecedent soil condition of its catchment (how much water in absorbed into the ground), the amount of water in the pond before the event, the period between rainfall events, and the volume of accumulated sediment in the pond.

7.16 It is for these reasons that the focus of adaptive monitoring, including real-time continuous monitoring and trigger event monitoring, is on turbidity and clarity. Turbidity and clarity are simple real-time measures of pond performance and water quality. They provide immediate feedback on the performance that can be immediately responded to. Conversely, TSS requires physical sampling and then laboratory analysis, which typically takes about a week. When adjustments are required to an ESC system, they typically require immediate action and will have been addressed before TSS results are received.

7.17 The conditions offered with the consent application and the monitoring specified in the ESCPs did include sampling and reporting on TSS. Those conditions had been debated with WRC on multiple occasions but ultimately

presented a concession by the applicant. However, for the reasons I have provided above, if the project is to include real-time monitoring of SRP inflows and outflows, I do not support the requirement to take and analyse water samples for monitoring the SRP performance. Instead, I recommend that the monitoring of trigger events be limited to onsite recording of clarity and turbidity. Manual measurement of turbidity on site will assist in maintaining calibration of the automated monitors. Clarity is a simple tool that is used in assessing SRP water quality and is also used in the bench testing of soils to determine chemical treatment dose rates.

7.18 On that basis, I recommend replacing Conditions 3, 4 and 15 of APP144475.04.01 with the following which is based on the condition imposed by the Environment Court for the Te Ahu a Turanga Manawatū Tararua highway project:

(a) The pH of any discharge from sediment retention devices to any watercourse must not be less than 5.5 or greater than 8.5.

(b) Sediment retention ponds must be designed and operated to achieve the following performance targets:

(i) Greater than 90% average treatment efficiency across a rainfall trigger event based on inflow and outflow turbidity monitoring; and

(ii) Discharge clarity of greater than 100mm measured by black disc.

7.19 Adopting these requirements as targets rather than hard compliance limits is consistent with, and encourages, the intent of the AMP monitoring and responses. If accepted the ESCPs can be updated accordingly.

<u>Other matters</u>

7.20 On page 20 of her report Ms Cowan refers to two small wetlands that are shown on the latest ESC drawings. I was advised by the applicant that these had been identified after notification of the application and I added them to the ESC drawings for Fills 2 and 4, to indicate the separation of the land disturbance activities from these features. I consider it very unlikely that either of the features will be impacted by discharges from the clean water diversions of SRPs proposed for those sites.

7.21 On page 23, Ms Cowan discusses the capture and management of water from the deep drainage proposed for Fill 3. She queried the capacity of the holding

tanks proposed for that purpose, and for the tank capacity and disposal method to the linked to high rainfall events. As referenced on the relevant ESC drawing, the tank capacity was based on an estimate of groundwater volumes likely to occur during that dewatering. The drawing notation states:

> *Deep drainage system. Discharge collected in manhole riser and pumped to 30,000L tank that provides for up to 5.4 days' worth of storage at a subsoil discharge rate of 5.6m3/day (maximum long-term inflow rate from memorandum titled 'Estimated groundwater inflow to proposed sub-soil drain in Fill 3 – Gleeson Quarry'; 27 May 2021 prepared by PDP).*
>
> *Tank can accommodate approx. 1 day flow at higher end of predicted initial flow rates.*

7.22 These flow rates, should they occur, can be managed by tanker truck if the measured water quality indicates the need for off-site disposal. Mr Rumsby has indicated to me that the water quality may well meet the water quality limits proposed for the consent and be able to be disposed on site.

7.23 Secondly, these are estimates for groundwater drainage. They are not directly related to rainfall intensities, which will generate surface water runoff that is to be managed via the SRP.

7.24 Also starting on page 23, Ms Cowan addresses the management of acid sulphate soils. I assisted Mr Rumsby with the development of the acid sulphate soil management system. I can clarify that the intended discharge point of that system is the discharge from the holding pond that will service the acid sulphate soil treatment area. In this instance, the quarry pit is a receiving environment and is beyond the boundary of the consented activity. It is not correct to imply that the discharge from the quarry should be included as a discharge point for the management of acid sulphate soils. The quarry consents do not need to include that activity.

7.25 The acid sulphate soil management system is based on avoidance of exposing such soils to rainfall by:

(a) Only accepting soils in periods when rainfall is not forecast.

(b) Mixing lime and testing soils as soon as they arrive on site.

(c) Avoiding stockpiles and moving soil to the active fill site as soon as tested and confirmed as acceptable.

(d) Not accepting soils after 3:30pm so that the last loads can be mixed and moved to the fill before staff leave the site.

(e) Providing a holding pond for runoff that does occur, with the pond sized for the 50-year ARI rain event. In most cases, there will be no acid sulphate soils on the site when it rains. If rain that is not forecasted occurs, it will be captured in the pond, tested, and treated, if necessary, before release to the quarry pit.

7.26 Mr Rumsby will address this matter further.

7.27 Finally, I do not agree with Ms Cowan's opinion expressed on page 26 of her report, that "Management plans lack enforceability and are subject to reviews, changes and hap-hazard approvals over the term of the consent". Detailed draft management plans have been submitted that represent the proposed methods that will be adopted to ensure that the potential effects of the proposal are within the consented envelope of effects. Consent conditions require updated versions of those plans. The management plan conditions are explicit in their content requirements. Those plans must be certified by WRC before works can commence. Changes must also be certified by Council before changes are implemented. In my opinion the plans are enforceable. In my experience, changes to management plans can require significant engagement with Councils and are not haphazard.

Waikato District Council

7.28 At section 8.10, Ms Masters addresses ESC and stormwater management. I consider the matters raised to be beyond the scope of the district assessment but respond to them.

7.29 With regard to water quality, the Beca reviewer has expressed consistency with my assessment and Mr Evans' review in stating:

> *"The sediment retention ponds, in combination with extensive monitoring of both the pond itself and the downstream environment, means it is unlikely that degradation in the water quality in the downstream tributaries. Furthermore, one of the greatest risks to downstream water quality is increased sediment inputs. The likelihood of this is significantly decreased by using sediment retention ponds with chemical flocculation treatment."*

7.30 As quoted by Ms Masters, the Beca reviewer suggests that clarification of SRP catchment areas is required. This query was not raised by Mr Evans, the relevant expert peer reviewer on behalf of WRC. The catchment area of each SRP will be managed by the progressive relocation of clean water diversions. This means that as staged filling is completed, areas can be stabilised and diverted away from the SRP catchment, and new areas brought in. This reduces the required size of the SRPs and the extent they need to extend downstream of Fills 2 and 4, while always maintaining a compliant 3% sizing criteria consistent with the regional guideline.

7.31 The Beca reviewer recommends the need for a Stormwater Management Plan. This point was raised and responded to during the processing of the application. I do not support the provision of yet another management plan when the matters that are sought to be addressed are those that fall within the scope of the ESCPs. In addition, and as noted by Ms Masters, there is no proposal to discharge to, or impact on, council reticulation and the District Plan stormwater provisions "focus on effects to Council's network and ensuring that adequate infrastructure is in place." She rightly notes that stormwater management plans have particular relevance to urban development.

7.32 I comment on the additional matters raised by the Beca reviewer as follows.

<u>Potential stream channel erosion resulting from discharges from clean water diversion and the SRPs</u>

7.33 This is matter that has been addressed on the ESCP and is required by the WRC guideline, on which the ESCP is based. I also note that Condition 36 of APP144475 Schedule 1 conditions requires that clean water diversions are stabilised, and outfalls are protected against erosion. The Beca reviewer acknowledges that outlet protection will be provided. This requirement also applies to the outlet of SRPs, in accordance with the ESCP and WRC guideline. I would support an amendment to that condition to include explicit reference to the SRPs discharges as follows:

(36) The consent holder shall insure that, as far as practicable, all clean water runoff from stabilised surfaces including catchment areas above the site shall be diverted away from the exposed areas via a stabilised system to prevent erosion.

(36A) The outfalls and immediate downstream flow paths of clean water diversion outlets and sediment retention pond outlets shall be stabilised to prevent erosion.

Changes in catchment hydrology and flows as a result of the filling activity, and consequential downstream erosion effects

7.34 As I understand it, the concern is that stripping vegetation from the land surface and diverting other runoff via clean water diversions may increase peak flows and volumes during rainfall. This could result in increased erosion of the stream channels downstream of the fill sites.

7.35 When considering this effect for urban development, it is a relatively binary assessment in comparing pre and post development runoff characteristics. Hydrology mitigation is then provided via attenuation to replicate to the extent practicable, predevelopment flow characteristics. I have never previously had this issue raised in the assessment of a clean fill or managed fill. In my opinion, this is because the potential change in discharges from the fill site when compared to the pre-existing condition is limited, and highly variable, such that it is difficult to mimic through modelling.

7.36 Firstly, the clean water diversion will not increase the volume of runoff from the upper slopes. The diversion will move that runoff around the fill area and then discharge it back to the invert of the gully. The time of concentration may be reduced, but that can be moderated somewhat with the inclusion of rock dams downs the flow path to slow velocities.

7.37 The water within the catchment of the SRP will flow across uneven ground surfaces which will slow and to some extent impound flows. There will also be additional attenuation of flows behind the engineered toe bunds that will be formed as the fill rises up the gully. Flows will then enter the SRP and will be attenuated via the T-bar decants. As noted earlier in my evidence, there is significant variability in storm SRP discharge characteristics. All storms will achieve some extent of attenuation, some smaller ones may not even result in a discharge from the SRP. Therefore, I consider it more useful to require an appropriate extent visual monitoring of the downstream environment and response (e.g., via stabilisation) if additional stream erosion is identified that can attributed to the function of the fill site. I caution that this attribution is fraught, as there will be a number of potential factors and the further from the site one gets, the harder it is to define the cause of erosion.

7.38 In response to this matter, I recommend a condition as follows, and a corresponding addition to the content of the AMP:

(a) Visual monitoring of the intermittent stream below Fill 2; and

(b) Visual monitoring of the reaches of the intermittent stream below Fills 3 and 4 that are located within the consent holder's property;

(c) Inclusion of responses in the event that stream channel erosion is identified that is attributable to the operation of a fill site.

7.39 The extent of stream below Fills 3 and 4 that is within the consent holder's property is that immediately below the fill sites, and then the section prior to the discharge under Riverview Road. I do not support a monitoring condition that would require access to the O'Reilly property, which would necessitate third party approval.

7.40 The extent of intermittent stream below Fill 2 is that section that extends to the permanent stream that passes along the Significant Natural Area to the west of the site. The permanent stream has an additional upstream catchment area of approximately 23ha flat measure and is described as:[11]

> *"Stream channels were located in areas of steeper land gradient and thus had fast flowing water and clear defined banks. Streams lacked hydrophytic vegetation across the channel and were hard-bottomed, with substrate mostly consisting of small gravels, boulders and silt. Hydrologic heterogeneity was observed in stream channels, with areas of runs, riffles, pools and chutes present within the assessed reaches."*

7.41 While I consider the risk of stream channel erosion below the Fill 2 site to be low, I anticipate that the stream extent that is most likely to be affected, if any, would be the intermittent extent within the Fill 2 gully and monitoring can reasonably be limited to that extent.

<u>The extent that climate change needs to be accounted for in ESC sizing</u>

7.42 The Beca review suggests that climate change needs to be incorporated in future detailed design regardless of the temporary nature of the ESC structures and that this is a gap in the information submitted.

7.43 The sizing of the diversion channels and bunds is based on the RPC2.6 Scenario (period 2031-2050) for the HIRDS Huntly C75511 site. The SRP sizing is not based on a design storm; rather it is based on the contributing catchment area and slope, in accordance with the WRC guideline.

11 *Watercourse assessment in Significant Natural Area*; Envoco, March 2022, section 4.2.1

7.44 Future editions of the HIRDS data may be updated, and WRC may review the SRP sizing requirements specified in the WRC guideline. Alternatively, central government may promulgate national standards or design guides for ESC management. Such changes could be addressed through the review condition of the consent. At this time, I do not consider there to be any gap in the information presented.

The management of acid sulphate soils and discharge to the quarry.

7.45 Ms Masters provides the following comment from the Beca reviewer:

> *"Note that water management from the acid sulphate treatment area crosses directly into environmental science which is not strictly the responsibility of Beca nor perhaps WDC to assess. However, I feel that the connection with stormwater management justifies further explanation of the above concerns."*

7.46 I agree that addressing this matter is beyond scope of district applications. Dr Caldwall and Mr Rumsby have addressed the management of acid sulphate soils. Above, I have also clarified some matters relating to the management of the acid sulphate treatment site. I do not consider that it needs to be incorporated into any stormwater management assessment or plan. I can confirm that the location of the acid sulphate soil treatment site was deliberately chosen to be separated from the fill sites. It avoids any conflict with vehicle access and operations at those sites, and deliberately avoids discharging treated water into the fill catchments. Pumping to a SRP is not only impractical, but is not necessary as the acid sulphate management system is independent and does not require additional sediment retention. Doing so would also compromise the design volume and efficiency of the SRPs.

8. ISSUES RAISED BY SUBMITTERS

8.1 A total of 42 submissions have been received. The topics raised in submissions that I can comment are as follows:

(a) Weather events and impact on sediment control ponds/overflows;[12]

(b) Management of sediment ponds;[13] and

12 Submissions of: Alan and Bronwyn Kosoof (#11), Paul Vitasovich (#16), Katie Shepard (#21), Director-General of Conservation (#12), Waikato District Council (#41).

13 Submissions of: Katie Shepard (#21).

(c) Runoff concerns.[14]

8.2 I have carefully and respectfully considered the matters raised. Herein, I provide brief specific responses, as I have already covered these matters indirectly in my preceding evidence.

Weather events and impact on sediment control ponds/overflows

8.3 SRPs design, constructed in accordance with TR2009/02, are flow-through devices. They operate at a range of efficiencies depending on various factors. They are required to accommodate flows up to the 100-year event without compromising the structural integrity of the device, by providing a stabilised emergency spillway. As I have noted, diversion channels and bunds will divert clean water and dirty water runoff will be sized to accommodate the 1% AEP (100 year) runoff event, exceeding the minimum imposed by the regional guideline.

8.4 The proposed SRPs have been sized in accordance with the correct storage capacity, being 3% of the contributing catchments. The SRP construction will be inspected and certified by an engineer and the ESC specialist.

8.5 It is critical that the devices are correctly sized and constructed. For a longer-term earthworks activity such as proposed, the SRP construction can be supervised and certified by the ESC specialist and an engineer.

8.6 Subject to correct sizing, construction, and maintenance, I anticipate that the SRPs proposed will appropriately minimise sediment yield from each site. This confidence is borne from research and experience with these devices over many years.

8.7 In addition to the function of the SRPs, only one site is to be operated any given time and within each site, the area exposed to erosion will be limited to less than the catchment

Management of sediment ponds

8.8 The SRPs must be maintained in accordance with TR2009/02 and the conditions of consent. I am satisfied that the conditions provided with Ms Madsen's evidence, and commented on in section 9 below, are comprehensive. They include regular maintenance as well as monitoring of the performance of the devices through a range of rainfall events. In my

14 Submissions of: Cyril & Marion Shanley (#9), Appollonia Johnston (#10), Paul Vitasovich (#16), and Maree Frances Rutherford (#4).

opinion, that management approach will provide the necessary information for the ongoing management and, if necessary, adjustment of the treatment system to appropriately minimise sediment yield over the duration of filling at each site.

Stormwater runoff

8.9 I am satisfied that the design, construction, and maintenance of the ESC system at each site will appropriately minimise sediment yield for each fill site. I reiterate that the system is a "treatment train" with significant emphasis on erosion control, and incorporating staging of work, operating one fill at a time, and the proposed sediment control measures.

8.10 Monitoring will provide for affirmation or adjustment of the site management system to maintain those outcomes. If necessary, there will be flexibility in the fill site management to further reduce open area, although at this time I do not anticipate that that will be necessary.

9. COMMENT ON CONDITIONS

9.1 I have assisted in the development of, and reviewed, the suggested ESC relevant conditions that are attached to Ms Madsen's evidence. I support those conditions and consider that they will ensure that the anticipated performance of the ESC systems will be achieve.

9.2 In particular, the conditions require:

(a) Specification of minimum design standards for ESC measure in accordance with TR2009/02.

(b) Minimum capacities for all diversion channels / bunds to and the 1% AEP runoff event.

(c) Prior to commencement of works within a given fill site, the submission for certification of:

(i) Updated ESC Plans based on the existing ESC Plans and consent conditions.

(ii) Chemical Treatment Management Plan

(iii) Adaptive Management Plan.

(d) Continuous automated turbidity measurement.

(e) Rainfall trigger event monitoring.

(f) Winter works restriction.

(g) Specific monitoring of diversion channels and bunds.

(h) Pre-start engagement with Council and tangata whenua.

9.3 I have provided suggested changes to conditions at paragraphs 7.18 and 7.33 above to provide:

(a) pH limits for discharges;

(b) performance targets for SRPs;

(c) greater surety regarding the requirement for erosion protection for discharges from clean water diversions and SRP;

(d) visual monitoring and, if necessary responses, to erosion of downstream channels.

9.4 If SRPs are to be converted to wetlands, I recommend that any associated condition allow for this to occur once filling and stabilisation has been completed in any given fill area, so as to avoid conflict with the best-practice management of the SRPs during the filling phase.

10. CONCLUSIONS

10.1 The proposed ESC management system represents industry best practice. It will be supported by comprehensive monitoring and a package of responses to ensure that effects are within the acceptable and anticipated range.

10.2 The ESC system has been proven on a range of significant earthworks projects, that occur within various receiving environments including sensitive environments.

10.3 In my opinion, the proposed ESC approach will achieve consistency with the outcomes sought in the relevant planning instruments.

Michael John Parsonson
SouthernSkies Environmental Limited
23 November 2022

Appendix A: Erosion and Sediment Control Plan and Drawings - Fills 2 and 4

Erosion and Sediment Control Plan
Fill Area 2 and 4

Prepared for

Gleeson Quarries Huntly Limited

Prepared By: Southern Skies Environmental Ltd Rev D 18 September 2022

Contents

Scope

This Erosion and Sediment Control Plan (ESCP) has been prepared to support the resource consent application for the filling of Fill Area 2 and 4 for Gleeson Managed Fills, Huntly. A managed fill operation is proposed for Fill 2 and 4 to the north of Gleeson Quarries Ltd.'s Huntly Quarry on Riverview Road, Huntly.

The ESCP has been prepared in general accordance with the Waikato Regional Council Technical Report No. 2009/02 *Erosion and Sediment Control Guidelines for Soil Disturbing Activities, January 2009* (TR2009/02).

Other documents relied upon in the preparation of this ESCP are:

- AEE
- *Geotech Report*
- *Gleeson Quarries Huntly Limited – District and Regional Resource consents for new fill sites within quarry landholdings Ecological Impact Assessment*; 14 November 2019, prepared by Boffa Miskell (Ecology Report)
- *Huntly Managed Fill*: Wetland Peer Review; dated 24 December 2021, prepared by Stantec. (Wetland Peer Review)
- *Wetland review: Gleeson Managed Fill Ltd wetland areas. Prepared for: Waikato Regional Council*; dated 1 March 2022, prepared by Nicholas Singers Ecological Solution. (WRC Wetland Review)

This ESCP describes the erosion and sediment control (ESC) methodology to be implemented during the establishment and filling of Fill 2 and 4.

A separate ESCP has been prepared for Fill Area 3.

Location and Site Description

The proposed fill sites are located off Riverview Road, south of the Huntly township. The proposed fill sites (Fill 2 and 4) are shown on Figure 1. The two fill areas drain to two separate watercourses, termed watercourse 1 and 2, shown on Figure 1. Both watercourses drain to the Waikato River.

Access to the fill sites will be through the current Gleeson's Quarry entrance and along existing quarry roads before linking to a new/upgraded road that will lead to the separate fill sites (indicative alignment shown on Figure 1).

The sites are described in detail in both the AEE and the Ecology Reports.

Figure 1: Location map Fill 2 and 4 with indicative access from Riverview Road.

Fill Area 2

Fill 2 consists of a westerly orientated steep sided gully system. The proposed filling operation covers approximately 4.5ha and once filled to capacity will contain up to 717,000m^3 of managed fill.

Indigenous vegetation is located to the west of the fill area. The indigenous vegetation is classified as a Significant Natural Area (SNA) by the Waikato District Plan. Fill 2 is located outside of the SNA.

The site is currently vegetated with gorse, weeds and areas of pasture. Pine trees were harvested from this gully area in mid-2015 and remnant slash is present.

Fill 2 contains an existing dam/farm pond that was constructed for stock watering. The Wetland Review states that the 1979 aerial image shows earthworks downstream of the pond and wetland at its upstream margin, providing evidence that this area was created sometime between 1973 and 1979. The WRC Wetland Review concludes that the upstream wetland is artificial as defined by the National Environmental Standards for Freshwater Regulations 2020 (NES: FW 2020) and has formed as a consequence of the farm pond that was constructed for stock water. The ecology report identifies that the base of the gully contains an ephemeral watercourse described as having negligible ecological value. Fill 2 drains to Watercourse 1, as shown on Figure 1, which is part of the Lake Waahi and Lake Puketirini catchment. Lake Waahi subsequently discharges into the Waikato River.

An extent of natural inland wetland is identified at the toe of the gully in the general vicinity that it joins the main valley invert. An additional, small, transient induced inland wetland that has formed on forest harvest debris has been identified within gully, downstream of the fill footprint.

Fill Area 4

Fill 4 is a moderately sloping gully feature that drains to Watercourse 2 (Figure 1). The proposed filling operation covers approximately 5.21ha and once filled to capacity will contain up to 800,000m^3 of managed fill.

The site is currently vegetated with pasture, gorse and weeds. As with Fill 2, the pine trees within Fill 4 have recently been harvested and remnant slash is present.

The Ecology Report identifies that two watercourse branches in the upper reaches that converge to form a single main stem. The western branch contains a 50m long ephemeral watercourse with no defined stream

channel. The main channel has been defined as an intermittent stream. This watercourse drains to Watercourse 2, as shown on Figure 1, which is located within the Waikato River catchment.

The Ecology Report states that a small artificial wetland is located in the downstream section of the middle reach constructed through the bunding of the watercourse to form a forestry track.

The Wetland Review states that an image shows a constructed stock dam in the aerial image dated 1963.

The WRC Wetland Review states that the evidence presented strongly suggests that the area where wetlands occur within Fill sites 2 and 4 were both formerly dryland and the aerial images support this.

The WRC Wetland Review concludes that the wetlands are artificial as defined by the NES: FW 2020.

Since the reports noted above were prepared, one additional small induced wetland has been identified downstream of the farm pond. That has been indicated on Drawing ESCP-004-01 Rev E.

Description of Works

Fill 2

Approximately 717,000m^3 of managed fill is to be imported to Fill 2 over an area of 4.5ha.

Prior to the commencement of filling, a silt fence will be installed below the proposed SRP 2.

SRP 2 has been located a minimum of 100m upstream of the natural inland wetland located near the toe of the gully, and a minimum of 11m upstream of the small and transient induced wetland area within the gully. While Fill 2 will comprise a cumulative total area of 4.5ha, clean water diversions will be used to limit the catchment area of SRP 2 to no more than 3ha. This allows the SRP to be orientated across the gully and achieve the minimum separation form any wetland. Drawings ESCP-002-01A Rev A and ESCP-002-01 Rev E show the methodology for constructing the SRP, and the initial stages of the gully filling.

The SRP is proposed to provide for a minimum of 900m^3 of storage volume, sized at 3% of the total contributing 3ha catchment area. Design details are provided in Appendix A.

The maximum 3ha catchment area of the SRP will be maintained by adjusting the location of the clean water diversions.

The initial construction of SRP 2 will the installation of temporary clean water diversions to minimise the area draining to the SRP site, temporary bunding and diversion of immediate upstream gully flows (if any during summer), and the installation of silt fence below that works site. All organic and unsuitable material will be removed from the footprint of the SRP. It is likely that subsoil drainage will be required to be installed below the SRP and up through the base of the gully. The SRP will be constructed using locally own and potential some clean overburden from elsewhere within the quarry. Its bases and embankments will be compacted to engineer standard, certified by the project engineer. Once installed, the outer embankments and surrounding area will be stabilised with topsoil, seed and mulch. Unsuitables and topsoil stripped from the site will be stockpiled at a location to be confirmed by the project engineer. Silt fence will be used to treat sediment laden runoff from the stockpile.

Once the SRP is constructed, the clean water diversions will be relocated, and dirty water diversions installed to direct gully runoff to the SRP. The stock water pond will be dewatered and then the unsuitables within the gully progressively stripped and underfill drainage installed as fill progresses.

All runoff from the fill extent will be directed to the forebay of the SRP for treatment. Subsoil drainage will continue up the gully extent.

Any area that will remain undisturbed will be diverted away from the SRP using clean water diversions (perimeter bunds). All clean water diversions will be stabilised immediately upon construction.

The fill area will be progressively stripped, setup and filled following the geotechnical engineer's recommendations.

The filling operations will be appropriately staged and managed to restrict the active filling area to 3ha.

Fill 4

Approximately 800,000m^3 of managed fill is to be imported to Fill 4 over an area of 5.21ha.

The fill will be treated by one SRP has been designed with a contributing catchment area of 4.4ha, providing a minimum storage volume of 1,320m^3. Clean water diversions will be used to divert adjacent clean/stabilised area away from the SRP and maintain its maximum catchment at no more than 4.4ha. Design details for the SRP and DEBs are provided in Appendix A. The SRP will be located at least 25m from the induced wetland. Drawing ESCP-004-01 Rev E shows the SRP location and other ESC features. The establishment works will comprise the installation of the SRP and diversion bunds / channels. This will require the installation of a silt fence below the works area, and temporary clean water diversions immediately upstream of the SRP site and stabilising the existing access tracks into the SRP site.

The farm pond will be dewatered by pumping to the gully. Accumulated sediment and unsuitables will be excavated and moved to Fill 2 for drying and placement.

Underfill drainage will be installed and the SRP will be constructed using locally own and potential some clean overburden from elsewhere within the quarry. Its bases and embankments will be compacted to engineer standard, certified by the project engineer. Downstream batters will be topsoiled, seeded and mulched.

Once the SRP is constructed, upstream clean water diversions will be installed to limited the SRP catchment to 4.4ha and dirty water diversions will be installed to direct runoff to the SRP. All clean water diversions will be immediately stabilised. Temporary clean water diversions associated with the ARP construction will be removed. Gully stripping will be undertaken, with material to be stockpiled at a location to be confirmed by the project engineer. The stockpile will be managed with silt fence.

Underfill drainage will be installed within the gully and then further stripping and filling will commence following the geotechnical engineer's recommendations.

Any area that will remain undisturbed will be diverted away from the SRP using clean water diversions (perimeter bunds). All clean water diversions will be stabilised immediately upon construction.

The filling operations will be appropriately staged and managed to restrict the active filling area to 3ha.

Erosion and Sediment Control Specifications

Erosion and sediment control will be installed and maintained in accordance with TR2009/02.

Access

Access will be constructed/upgraded from the existing quarry entrance. An access road will be constructed from the quarry to Fill 2 and 4 as indicatively indicated on Figure 1. The quarry wheel wash at the quarry entrance will be used by fill trucks to minimise sediment tracking onto Riverview Road.

Tip Heads

A stabilised tip head will be established at the uphill edge of each fill. All road going trucks accessing the site will stay on stabilised surfaces.

Silt Fences

Silt fences will be used extensively to manage runoff during the construction of the SRPs. The silt fence will remain in place at least until the outer margins of the SRPs are permanently stabilised. If the silt fence is proposed to remain in place it must be returned up either side of the SRP emergency spillway in order to allow the spillway to activate as designed.

Clean Water Diversions

Clean water diversion bunds, likely constructed using stripped topsoil, will be at least 550mm in height and will be stabilised. Any sections greater than 2% gradient that may be prone to erosion will be further protected with rock lining. The outfalls of the clean water diversions will be rock lined to prevent erosion. Clean water catchment areas are typically small, due to the location of fill sites being within a gully system.

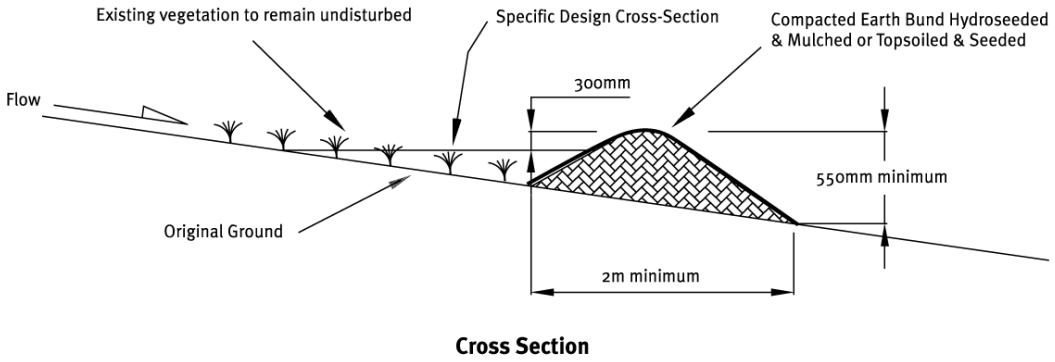


Figure 2: Cross-section of a clean water diversion bund.

Table 1: Clean water diversion sizing details.

Clean water diversions							
Area	5% AEP rainfall depth (mm)	Catchment Area (maximum)	Peak Flow (m^3/s)	Base Width (m)	Slope (minimum)	Diversion capacity (m^3/s)	**Size (including minimum 300mm freeboard)**
Fill 2	121mm	2.0ha	0.250	0.5	2%	0.36	**550**
Fill 4	121mm	2.0ha	0.250	0.5	2%	0.36	**550**

Dirty Water Diversions

Dirty water diversions will direct sediment laden runoff to the sediment control measures. The dirty water diversions have been sized to provide diversion capacity up to the 5% Annual Exceedance Probability (AEP) storm event, plus a freeboard of 300mm. Perimeter bunds / dirty water diversions located around the fill areas will be a minimum of 650mm high. Any sections greater than 2% gradient that may be prone to erosion will be further protected with rock lining.

Calculations are provided in Table 2.

Table 2: Dirty water diversion details assuming maximum dirty water catchment area.

Perimeter Bunds (dirty water diversion)							
Area	5% AEP rainfall depth (mm)	Catchment Area (maximum)	Peak Flow (m^3/s)	Base Width (m)	Slope (minimum)	Diversion capacity (m^3/s)	**Size (including minimum 300mm freeboard)**
Fill 2	121mm	4.5ha	0.805	0.5	3%	0.91	**600**
Fill 4	121mm	5.21ha	0.932	0.5	3%	0.95	**650**

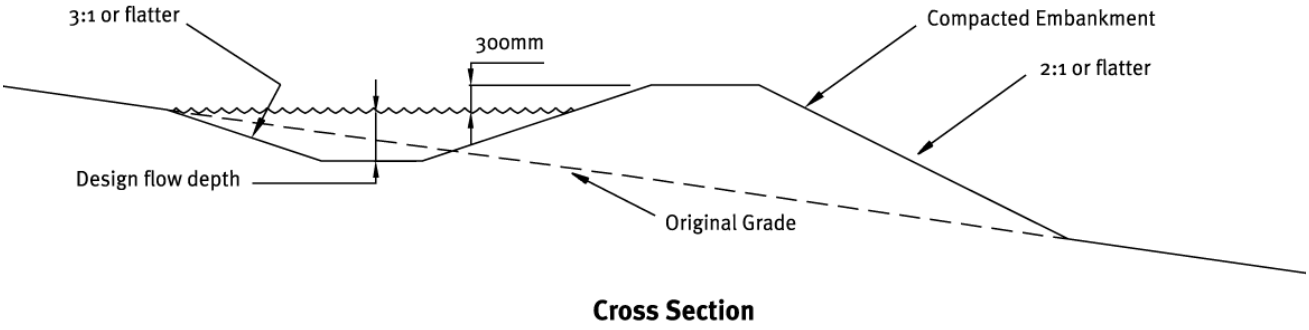


Figure 3: Cross-section of a dirty water diversion.

Sediment Retention Ponds

The SRPs will be constructed to provide a minimum storage volume of 3% of the maximum contributing catchment area. The design details for the SRPs are provided in Appendix A.

Fill 2

Fill 2 SRP has a maximum catchment area of 3ha and will be constructed in accordance with TR2009/02. The fill operation will be managed and progressively stripped and stabilised such that the exposure ground with its contributing catchment will be less than 3ha at any given time. Moreover, during site establishment opportunities to further minimise the catchment within clean water diversions will be investigated and if possible, implemented.

Fill 4

Fill 4 SRP has been designed to cater for 4.4ha. The SRP will be sized and constructed in accordance with TR2009/02. The minimum storage volume will be 1,320m^3.

The fill operation will be managed and progressively stripped and stabilised such that the exposure ground with its contributing catchment will be less than 3ha at any given time. Moreover, during site establishment opportunities to further minimise the catchment within clean water diversions will be investigated and if possible, implemented.

General

Additional weight will be placed in the manholes of the SRPs to prevent movement or displacement in the event that the SRPs fill to capacity with water.

Each SRP will be constructed with a forebay that will provide an additional 10% volume of the pond.

Filling will commence once the SRP has been commissioned and as-built certified.

The SRPs will be cleaned of sediment when no more than 20% full. That material will be disposed of back into the fill site. The SRPs will be located to allow access for removing sediment from the pond.

Decanting Earth Bunds (DEBs)

Fill 4

Two DEBs will be utilised during Fill 4 filling for the lower portion of the fill extent, adjacent to the SRP. Both DEBs will be sized for a maximum catchment of 2,700m^2, with a minimum storage volume of 54m^3.

The design details for the DEBs are provided in Appendix A and will be constructed in accordance with TR2009/02.

Stockpiling

Stockpiles will be located within the footprint of the SRP catchment. If a stockpile is required during the construction of the SRP, that will be treated by silt fence until such time as the SRP is established.
Stockpiles will be stabilised if they are not to be used for a continuous period of more than one month.
In addition to the progressive stabilisation noted above, stockpiles will be stabilised over winter.

Stabilisation

Progressive stabilisation will be undertaken as working areas are completed. Both Fill 2 and 4 will be managed appropriately to limit the amount of exposed area within each fill area to 3ha.

Stabilisation will comprise temporary mulching or permanent topsoiling and seeding to establish grass.

The access tracks and tip heads will be stabilised with aggregate.

Chemical Treatment

Chemical treated will be employed for both SRPs to enhance settlement and sediment retention. Chemical treatment will be implemented in accordance with a Chemical Treatment Management Plan (CTMP) that is to be certified prior to any earthworks associated with Fill 2 and 4 commencing. The treatment system will be monitored and maintained in accordance with the CTMP.

Dust Management

Dust management will be one of prevention. The main source of dust will likely be from trucks moving to and from the fill sites. In order to minimise dust generated by truck movements, the access tracks will be sheeted with aggregate. Vehicle speeds along the access route will be limited to a maximum of 20km/hr and a water cart is available to dampen the route if required.

The site is screened from sensitive receivers by topography and trees.

Water will be used to dampen the site if dust is identified as likely to discharge beyond the site boundary.

Progressive stabilisation of completed/filled areas will be undertaken to reduce the amount of exposed earth.

In the unlikely event that objectionable levels of dust do arise from the fill operation, the incident will be investigated, and the appropriate amendments made to site operations and/or management as required. The investigation will include an assessment of the reasons for the event, mitigation measures and of proposed and ongoing management initiatives to ensure the effect is avoided.

As-Built Certification

Prior to each fill area commencing, as-built certification of the ESCs will be provided to the Waikato Regional Council within five working days of the completion of the construction of these controls. The as-built certification will confirm that the controls have been constructed in accordance with the ESCP and TR2009/02.

Monitoring and Maintenance

Monitoring Procedures

The site will be regularly inspected during the filling operation and until the site is fully stabilised. The aim of these inspections is to ensure that all ESC devices are installed correctly and then operate effectively throughout the duration of the works. Any potential problems will be identified immediately, and remedial works will be promptly carried out.
The inspection programme that will be implement by the delegated Gleeson Quarries staff member will consist of:

- Weekly site walkovers to inspect and determine the effectiveness of all ESC devices installed on site;
- Pre-rain event: Prior to all forecast rainfall events, additional inspections will be made of ESC devices to ensure that they are fully functioning in preparation for the forecast event.
- Rainfall Events During rainfall events inspections will be made of ESC devices, subject to health and safety restrictions, for example inspections will not be undertaken at night.
- Post-rain event: Following all rainfall events, inspections will be made of ESC measures to ensure that all controls have performed as expected and to identify any maintenance requirements.

Any remedial works will be documented during these monitoring inspections and immediately undertaken.

Trigger Event Monitoring

Additional site monitoring and reporting shall be undertaken in response to the following rainfall trigger events:

- ≥15mm in one hour; or
- ≥25mm in 24 hours

Within 24hours of the occurrence of a rainfall trigger event, investigation, response, and reporting shall be undertaken against the following sediment retention pond performance triggers:

- pH (to demonstrate it does not fall outside the range of 6 to 9);
- Total suspended solids, to demonstrate it is not greater than 100 g/m^3 or the sediment retention pond/s stormwater treatment is 90% treatment efficiency;
- Turbidity

The results of the investigations and sampling shall be reported to the Waikato Regional Council within 15 working days of the corresponding rainfall trigger event, including any contingency actions undertaken in response to exceedance of a trigger value.

Removal of ESC Measures

The removal of any erosion and sediment control measure from any area where soil has been disturbed as a result of the exercise of this consent will only occur after consultation and written approval has been obtained from the Waikato Regional Council. In this respect, the main issues that will be considered by the Waikato Regional Council include:

- The quality of the soil stabilisation and/or covering vegetation;
- The quality of the water discharged from the rehabilitated land; and
- The quality of the receiving water

Site Personnel

The Quarry Manager, will have overall responsibility for the works on site and will oversee that day to day implementation of the ESCP to ensure the requirements of that document are met. The name and contact details for that role will be provide to WRC prior to the commence of works.

ESCP Changes

This ESCP is intended to be a live document and if the earthworks, filling methodologies or ESC measures for the anticipated work changes then an update / review of the ESCP drawings will be made before the earthworks/filling commence. Any changes to the ESCP will be confirmed in writing and provided to the Council for certification, prior to the implantation of any changes proposed.

Appendix A – Erosion and Sediment Control Drawings and Details

SRP - Fill 2 (3ha)

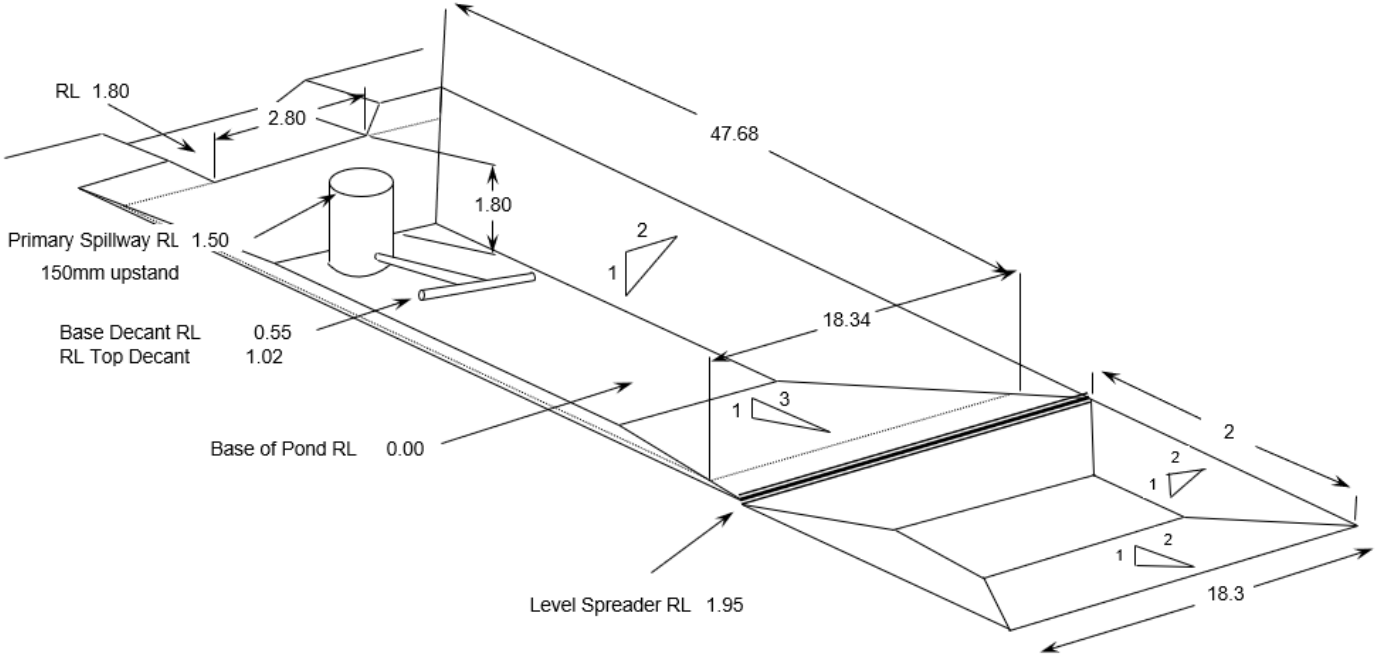
Size criteria	Length Ratio	Side slopes	Depth from Emergency Spillway	R.L. of Pond Base
Auto	3:1	2:1	1.80	0.00

Storage Volume Criteria	3%
Contributing Catchment (ha)	3.00
Minimum Storage Volume (m3)	900
Dead storage (m3)	270
Live storage (m3)	630
Length at Spillway Level	47.68
Width at Spillway Level	18.34
Spillway base width (300mm deep)	2.80
Primary Spillway diameter (min)	150mm
Number of decants	2
Number of holes per decant	200
Minimum outlet diameter	300mm
RL Emergency Spillway	1.80
RL Primary Spillway	1.50
RL Level Spreader (min)	1.95
RL Base Decant	0.55
RL Top Decant	1.02
Length at Base	38.68
Width at Base	11.14

Forebay

Depth	1 m	min. depth
Width	18.34 m	full width of pond
Length	2 m	min. length

Refer to GD05 for cross-sections and plan views.



SRP - Fill 4 (4.4ha)

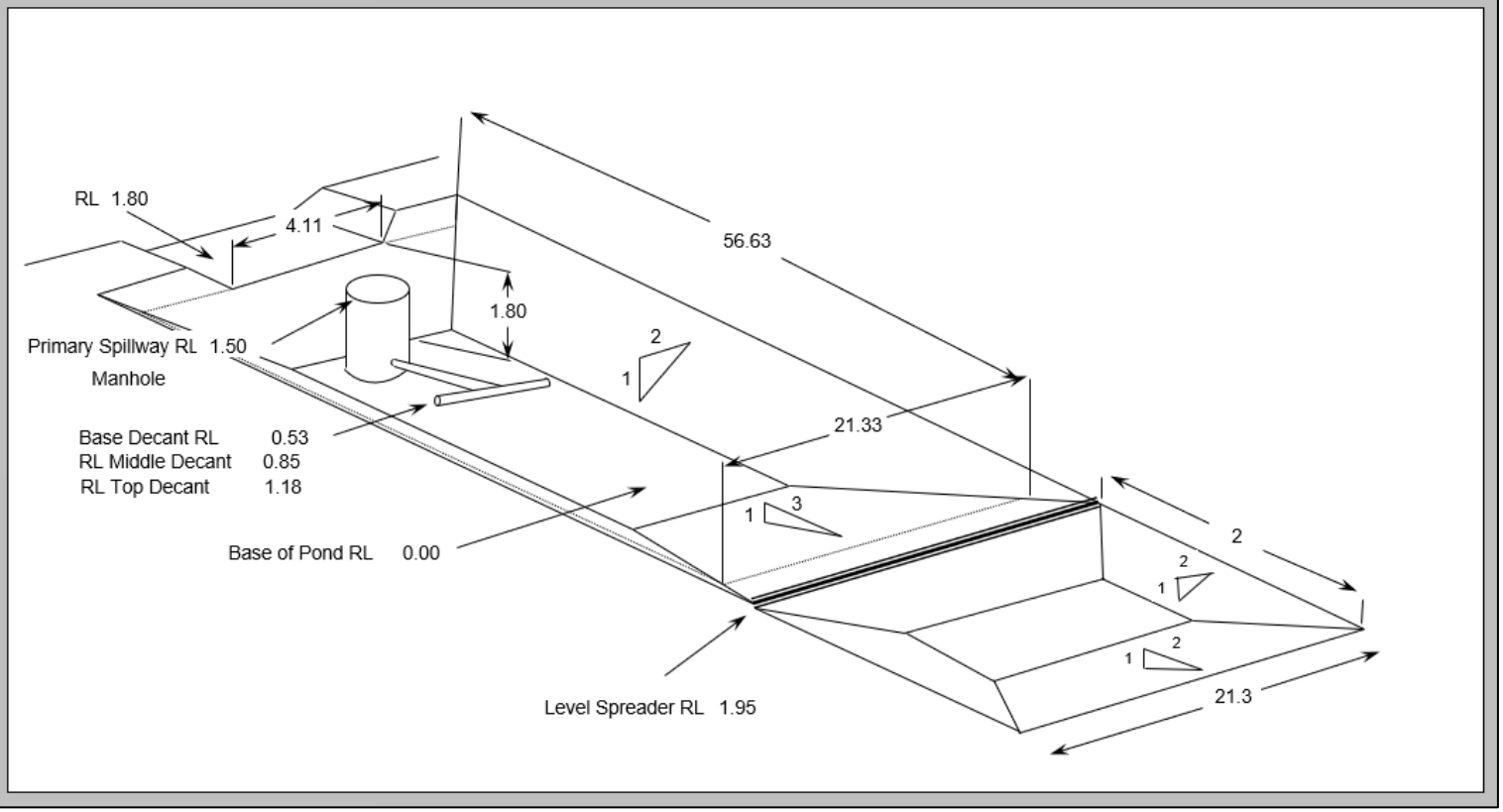
Size criteria	Length Ratio	Side slopes	Depth from Emergency Spillway	R.L. of Pond Base
Auto	3:1	2:1	1.80	0.00

Storage Volume Criteria	3%
Contributing Catchment (ha)	4.40
Minimum Storage Volume (m3)	1320
Dead storage (m3)	396
Live storage (m3)	924
Length at Spillway Level	56.63
Width at Spillway Level	21.33
Spillway base width (300mm deep)	4.11
Primary Spillway diameter (min)	Manhole Required
Number of decants	3
Number of holes per decant	195
Minimum outlet diameter	300mm
RL Emergency Spillway	1.80
RL Primary Spillway	1.50
RL Level Spreader (min)	1.95
RL Base Decant	0.53
RL Middle Decant	0.85
RL Top Decant	1.18
Length at Base	47.63
Width at Base	14.13

Forebay

Depth	1 m	min. depth
Width	21.33 m	full width of pond
Length	2 m	min. length

Refer to GD05 for cross-sections and plan views.



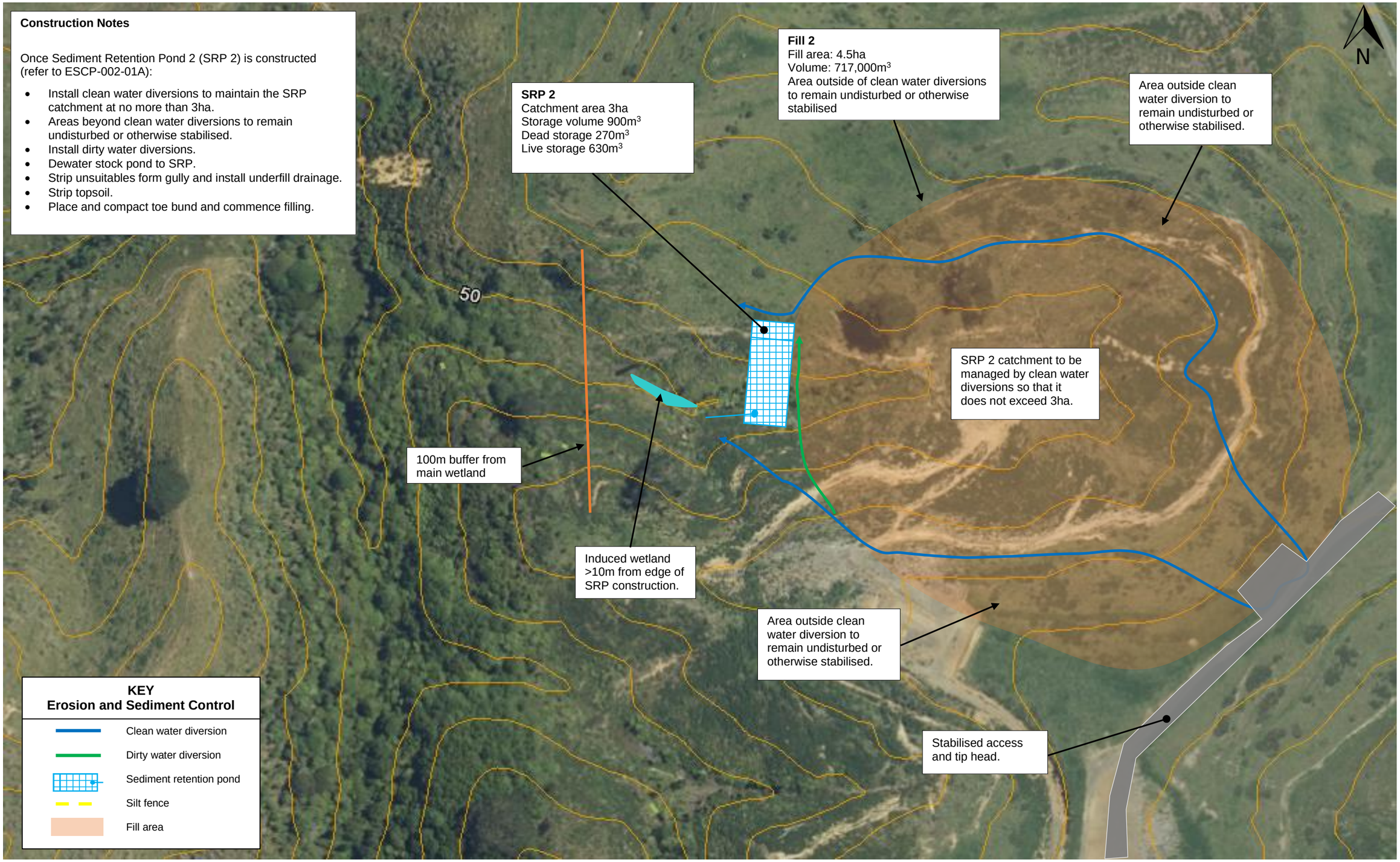
Appendix B – Chemical Treatment Management Plan

TBC

Construction Notes

Once Sediment Retention Pond 2 (SRP 2) is constructed (refer to ESCP-002-01A):

- Install clean water diversions to maintain the SRP catchment at no more than 3ha.
- Areas beyond clean water diversions to remain undisturbed or otherwise stabilised.
- Install dirty water diversions.
- Dewater stock pond to SRP.
- Strip unsuitables form gully and install underfill drainage.
- Strip topsoil.
- Place and compact toe bund and commence filling.



NOTES

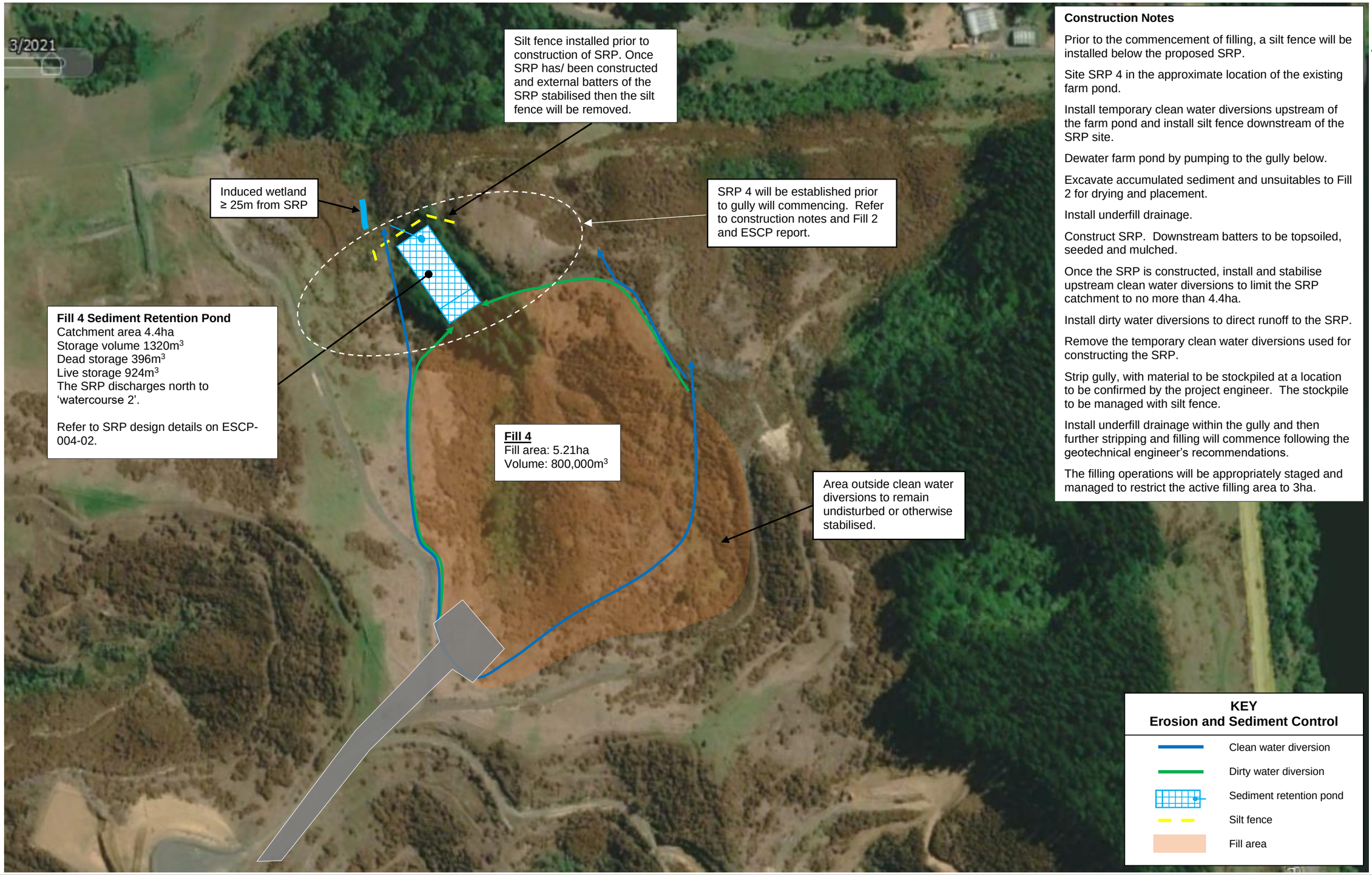
1. All erosion and sediment controls will be installed and maintained in accordance with Waikato Regional Council Technical Report 2009/02 *'Erosion and Sediment Control Guidelines for Soil Disturbing Activities'* (TR09/02).
2. All erosion and sediment control measures will be inspected weekly by the site foreman.
3. Clean out SRP before accumulated sediment reaches 20% of total volume.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

REV	DATE	REVISION DETAILS	APPROVED
A	07.03.22	Draft for review.	
B	16.06.22	For consent	
D	14.09.22	Wetland	
E	18.09.22	Secondary wetland	

Gleeson Managed Fill

Project	**HUNTLY MANAGED FILLS**
Title	**Erosion & Sediment Control Plan** **Fill 2 – First Stages of Filling**

Drawn	Checked	Drawing No.	Sheet No.
ZW	MP	ESCP-002-01	1



Construction Notes

Prior to the commencement of filling, a silt fence will be installed below the proposed SRP.

Site SRP 4 in the approximate location of the existing farm pond.

Install temporary clean water diversions upstream of the farm pond and install silt fence downstream of the SRP site.

Dewater farm pond by pumping to the gully below.

Excavate accumulated sediment and unsuitables to Fill 2 for drying and placement.

Install underfill drainage.

Construct SRP. Downstream batters to be topsoiled, seeded and mulched.

Once the SRP is constructed, install and stabilise upstream clean water diversions to limit the SRP catchment to no more than 4.4ha.

Install dirty water diversions to direct runoff to the SRP.

Remove the temporary clean water diversions used for constructing the SRP.

Strip gully, with material to be stockpiled at a location to be confirmed by the project engineer. The stockpile to be managed with silt fence.

Install underfill drainage within the gully and then further stripping and filling will commence following the geotechnical engineer's recommendations.

The filling operations will be appropriately staged and managed to restrict the active filling area to 3ha.

NOTES

1. All erosion and sediment controls will be installed and maintained in accordance with Waikato Regional Council Technical Report 2009/02 *'Erosion and Sediment Control Guidelines for Soil Disturbing Activities'* (TR09/02).
2. All erosion and sediment control measures will be inspected weekly by the site foreman.
3. Clean out SRP before accumulated sediment reaches 20% of total volume.
4. Site monitoring will be undertaken before and immediately after rain as well as during heavy rainfall events. Any required maintenance or improvements to control measures will be undertaken immediately.

REV	DATE	REVISION DETAILS	APPROVED
A	07.03.22	Draft for review.	
B	16.06.22	For consent	
D	14.09.22	Wetland	
E	18.09.22	Induced wetland	

Gleeson Managed Fill

Project	**HUNTLY MANAGED FILLS**
Title	**Erosion & Sediment Control Plan** **Fill 4**

Drawn	Checked	Drawing No.	Sheet No.
ZW	MP	ESCP-004-01	1

Appendix B: Erosion and Sediment Control Plan and Drawing – Fill 3

Phase 1 Erosion and Sediment Control Plan
Fill Area 3 – Site Establishment and Initial Filling

Prepared for

Gleeson Quarries Huntly Limited

Prepared By:	Southern Skies Environmental Ltd	Rev E	16 June 2022

Contents

1. Scope

This Phase 1 Erosion and Sediment Control Plan (ESCP) has been prepared in general accordance with:

- *Gleeson Managed Fills Ltd, Huntly Fills 2 – 4, Erosion & Sediment Control Plan*; 27 October 2019, prepared by Erosion Management Limited (Erosion Management ESCP), as lodged with the consent application; and
- Waikato Regional Council Technical Report No. 2009/02 *Erosion and Sediment Control Guidelines for Soil Disturbing Activities, January 2009* (TR2009/02).

SouthernSkies Environmental Limited acknowledges the content of the Erosion Management Report prepared by Brian Handyside. This Phase 1 ESCP addresses relies on the Erosion Management document in the overall assessment of sediment related effects.

Other documents relied upon in the preparation of this ESCP are:

- *Fill Site 5 - Geotechnical Design Report*, July 2021, prepared by Gaia Engineers (Geotech Report), incorporating Appendix A Drawings.
- *Gleeson Quarries Huntly Limited – District and Regional Resource consents for new fill sites within quarry landholdings Ecological Impact Assessment*; 14 November 2019, prepared by Boffa Miskell (Ecology Report)

This ESCP describes the erosion and sediment control (ESC) methodology to be implemented during the establishment of the fill site and the formation and filling of the Initial fill cell.

2. Location and Site Description

Fill Site 3 is a broad gully being approximately 250m wide from ridge to ridge that trends in a north-westerly direction. The upper reaches of this gully are characterised by moderately steep 2.5H:1V slopes formed in weathered Waikato Coal Measures material. The gully head slopes exhibit terracettes indicative of shallow downslope soil creep movements. No signs of deeper instability either historic or recent have been observed. There are no watercourses on this site. A shallow stock pond within the centre of the site has been drained, with a rock lined channel formed eastward to the eastern gully.

The flat area of Fill Site 3 is underlain by fill placed until approximately 30 years ago, comprises predominantly overburden stripping from adjacent neighbouring coal mines that are no longer in production. Accordingly, the overburden material is mostly Waikato Coal Measures mudstone. The mudstone is broken into gravel and cobble sized particles and is variably weathered from highly to slightly weathered. The mudstone gravels are typically bound in a matrix of soil strength completely weathered Waikato Coal Measures silt. Lenses of lower strength (soft to firm) clays with variable organic content are also common throughout the observed fill. These lenses are inferred to be stripped alluvium and colluvium from pre-existing gullies.

3. Description of Works

3.1. General Description

Approximately 478,500m^3 of managed fill is to be imported to the site over an area of 4.34ha. It will be placed in a series of structural bunds and non-engineered fill cells.

Prior to filling commencing, deep drainage will be installed to dewater the existing fill horizons at a rate necessary to provide for a commercially viable fill importation rate.

The site will be progressively stripped, and a clay liner and drainage blanket will be installed before fill is imported.

Clay for the liner will be excavated from the southern part of the fill site.

Runoff from the fill site will be treated via a sediment retention pond (SRP).

Once the site is established, initial filling has commenced, and discharge limits have been confirmed, the SRP will discharge to the eastern gully and watercourse. Prior to that the site will be managed in accordance with the Phase 1 works, as described below.

3.2. Phase 1 Works

Phase 1 will provide an adaptive management approach to confirming the discharge limits for the SRP. During Phase 1, the site will be set up to fully contain runoff and avoid any discharges.

Once Phase 1 is completed and the discharge limits have been confirmed, the discharge from the SRP will be diverted to a lined spillway to the eastern gully.

3.2.1. Deep Drainage

Drainage must be installed into the existing fill within the site to allow and commercially viable rate of fill placement and settlement. These drains will comprise an up to 10m deep, 1.5m wide trench with two 160mm Φ punched drainage coils, backfilled with General All Passing 65mm (GAP65) aggregate with less than 4% fines.

These drain lines will discharge via a single outlet into a manhole riser chamber with float pump and gate valve. The drained water be pumped from the chamber to a 30m^3 litre tank. Water will be tested and disposed in accordance with it meeting discharge limits. This is described in the Site and Fill Management Plan (SFMP).

Silt fences will be used to treat the isolated areas of disturbance that will occur during the installation of the deep drainage.

This stage will also require backfilling of the existing surface drainage channel, using excavated fill.

3.2.2. SRP

Once the deep drainage is installed, the SRP will be constructed, and an additional 75m^3 litre tank will be installed downstream. The SRP will be sized to a design maximum catchment of 5.25ha although the maximum anticipated catchment area will be 4.34ha. The SRP will correspond to a ratio of 3.63% of the actual maximum contributing catchment. The Phase 1 works catchment will be significantly less than 4.34ha.

A clean water diversion bund will be installed to minimise the catchment area of this stage of works.

Silt fences will be used to treat runoff during these works, which will also include the placement of a stockpile of material excavated during the SRP construction. Once the SRP is established, a dirty water diversion channel will be installed to carry runoff from the stockpile to the inlet of the SRP. Accordingly, the amount of runoff that is treated via the silt fences will be limited to initial stripping and small areas adjacent to the excavation.

All runoff will enter the SRP, with the tank providing backup storage. Some water may be used for dust suppression within the fill site and pasture irrigation on the adjacent Gleeson farm.

3.2.3. Fill Cell Establishment

Once the water treatment and containment system (SRP / tank) is established, dirty water diversion bunds will be installed to isolate the initial fill cell to an area of approximately 1.5ha.

The cell will be stripped of topsoil and lined with clay excavated form the southern part of the fill site. Topsoil will be used to increase the height of the diversion bunds and surplus will be stockpiled.

A clay bund will be formed at the foot of the fill cell to provide a minimum of 1500m^3 of storage. A lined spillway will be formed from this storage to the dirty water flow path below, that drains to the SRP.

The area of clay excavation will be managed such that no more than approximately 0.7ha is exposed at any given time. It will be progressively stabilised.

The clay excavation face will be managed to ensure that runoff falls into the site and ultimately to the tank system.

3.2.4. Detention Storage and Disposal

The minimum combined storage that will be available on site will be:

Device	Storage (m^3)
Sediment retention pond	1575
Tank	75
Fill cell	1500
Total	3150

The 50 yr average return interval (ARI) rainfall event for the site[1] is 145mm. Based on the total contributing catchment (approximately 2.2ha[2]) of the working area of the site, that would equate to approximately 3190m^3.

[1] HIRDS
[2] The maximum open area during Phase 1 of the works.

Therefore, the onsite storage will be able to contain flows close to the 50 yr event. Additional pumping down of storage during events and off-site disposal will further increase the size of event that can be managed.

As noted, until the final discharge limits are confirmed, stored runoff be removed by tanker truck and used for dust suppression on the fill site and adjacent Gleeson farm.

Once the discharge limits have been confirmed, the site water will be monitored in accordance with the SFMP and Surface Water Sampling and Analysis Plan (SAP). Compliant water will be discharged from the SRP.

4. Erosion and Sediment Control Specification

Erosion and sediment control will be installed and maintained in accordance with TR2009/02.

4.1. Access

Access will be via the existing stabilised approximately 2km route from the quarry entrance.

4.2. Tip Head

A stabilised tip head will be established at the uphill edge of the fill cell. All road going trucks accessing the site will stay on stabilised surfaces.

4.3. Silt Fences

Silt fences will be used extensively to manage runoff during the construction of the deep drainage and the SRP. The silt fence along the northern boundary will remain in place at least until the outer margins of the SRP are permanently stabilised.

4.4. Clean Water Diversions

Clean water diversion bunds will be at least 550mm in height and will be fulling stabilised. Any sections greater than 2% gradient that may be prone to erosion will be further protected with rock lining. The outfalls of the clean water diversions will be rock lined to prevent erosion.

4.5. Dirty Water Diversions

All dirty water diversion bunds will be at least 550mm in height. Any sections greater than 2% gradient that may be prone to erosion will be further protected with rock lining.

4.6. Sediment Retention Pond

The SRP will be constructed in accordance with the originally proposed design, providing a minimum storage volume of 1575m^3, which is sized at a ratio of 3% of its maximum catchment of its original 5.25ha catchment. The actual maximum catchment is now proposed at 4.34ha. The maximum open area associated with Phase 1 will be 2.2ha. The SRP details are provided in **Appendix A**.

As described above, filling will be staged and the catchment of the SRP will be managed to minimise the area draining to the SRP at any given time.

The SRP will be chemical treated to enhance settlement and sediment retention. That will be undertaken in accordance with a chemical treatment management plan (CTMP) that will be submitted to Waikato Regional Council for certification prior to works commencing.

Until the final discharge limits are established, the decants of the SRP will remain raised such that the full storage up to the primary spillway is maintained at all times. The SRP will spill via the primary spillway to the tank.

The SRP will be cleaned of sediment when no more than 20% full, in accordance with TR2009/02. That material will be disposed of back into the fill site.

4.7. Tank

Until the final discharge limits are established, when necessary, the SRP will discharge to the 75m^3 tank that will be relocated from the quarry site. The need for the tank will be determined on the basis of predicted rainfall and available storage within the other storage areas.

4.8. Stockpiling

Stockpiles will be located within the footprint of the SRP catchment. If a stockpile is required during the construction of the SRP, that will be treated by silt fence until such time as the SRP is established.

Stockpiles will be stabilised if they are not to be used for a continuous period of more than one month.

In addition to the progressive stabilisation noted above, stockpiles will be stabilised over winter.

4.9. Stabilisation

As described above, stripping and filling will be staged, and progressive stabilisation will be undertaken as working areas are completed to ensure that no more than approximately 1.5ha of the fill cell and 0.7ha of the clay excavation is exposed to erosion and any one time. Stabilisation will comprise temporary mulching or permanent topsoiling and seeding to establish grass.

5. Chemical Treatment

The SRP will be implemented in accordance with the CTMP that is to be certified prior to the initial fill cell being established. The chemical treatment system will be monitored and maintained in accordance with the CTMP.

6. Dust Management

The working face of the fill cell will be managed to minimise the risk of dust generation.

The site is screened from sensitive receivers by topography and trees.

Water will be used to dampen the site if dust is identified as likely to discharge beyond the site boundary.

Vehicle speeds along the access route will be limited to a maximum of 20km/hr and a water cart is available to dampen the route if required.

In the unlikely event that objectionable levels of dust do arise from the fill operation, the incident will be investigated, and the appropriate amendments made to site operations and/or management as required. The investigation will include an assessment of the reasons for the event, mitigation measures and of proposed and ongoing management initiatives to ensure the effect is avoided.

7. As-Built Certification

Prior to each stage of works commencing, as-built certification of the ESCs will be provided to the Waikato Regional Council within 5 working days of the completion of the construction of these controls. The as-built certification will confirm that the controls have been constructed in accordance with the ESCP and TR2009/02.

8. Site Personnel

Shawn Mclean (029 285 4965), the Quarry Manager, will have overall responsibility for the works on site and will oversee that day to day implementation of the ESCP to ensure the requirements of that document are met.

9. Monitoring and Maintenance

9.1. Monitoring Procedures

The site will be regularly inspected during the filling operation and until the site is fully stabilised. The aim of these inspections is to ensure that all ESC devices are installed correctly and then operate effectively throughout the duration of the works. Any potential problems will be identified immediately, and remedial works will be promptly carried out.

The inspection programme that will be implement by the delegated Gleeson Quarries staff member will consist of:

- Weekly site walkovers to inspect and determine the effectiveness of all ESC devices installed on site;
- Pre-rain event: Prior to all forecast rainfall events, additional inspections will be made of ESC devices to ensure that they are fully functioning in preparation for the forecast event.
- Rainfall Events During rainfall events inspections will be made of ESC devices, subject to health and safety restrictions, for example inspections will not be undertaken at night.
- Post-rain event: Following all rainfall events, inspections will be made of ESC measures to ensure that all controls have performed as expected and to identify any maintenance requirements.

Any remedial works will be documented during these monitoring inspections and immediately attended to.

9.2. Trigger Event Monitoring

Additional site monitoring and reporting shall be undertaken in response to the following rainfall trigger events:

- ≥15mm in one hour; or

- ≥25mm in 24 hours

Within 24hours of the occurrence of a rainfall trigger event, investigation, response and reporting shall be undertaken against the following sediment retention pond performance triggers:

- pH (to demonstrate it does not fall outside the range of 5.5 to 9);
- Total suspended solids, to demonstrate it is not greater than 100 g/m^3 or the sediment retention pond/s stormwater treatment is 90% treatment efficiency;
- Turbidity

The results of the investigations and sampling shall be reported to the Waikato Regional Council within 15 working days of the corresponding rainfall trigger event, including any contingency actions undertaken in response to exceedance of a trigger value.

10. Removal of ESC Measures

The removal of any erosion and sediment control measure from any area where soil has been disturbed as a result of the exercise of this consent will only occur after consultation and written approval has been obtained from the Waikato Regional Council. In this respect, the main issues that will be considered by the Waikato Regional Council include:

i. The quality of the soil stabilisation and/or covering vegetation;

ii. The quality of the water discharged from the rehabilitated land; and

iii. The quality of the receiving water

11. ESCP Changes

Any changes proposed to the ESCP will be submitted as a written request for certification by Waikato Regional Council prior to the implementation of any changes proposed.

Appendix A – Erosion and Sediment Control Drawings and Details

Sediment Retention Pond Sizing

Size criteria	Length Ratio	Side slopes	Depth from Emergency Spillway	R.L. of Pond Base
Auto	3:1	2:1	2.00	0.00

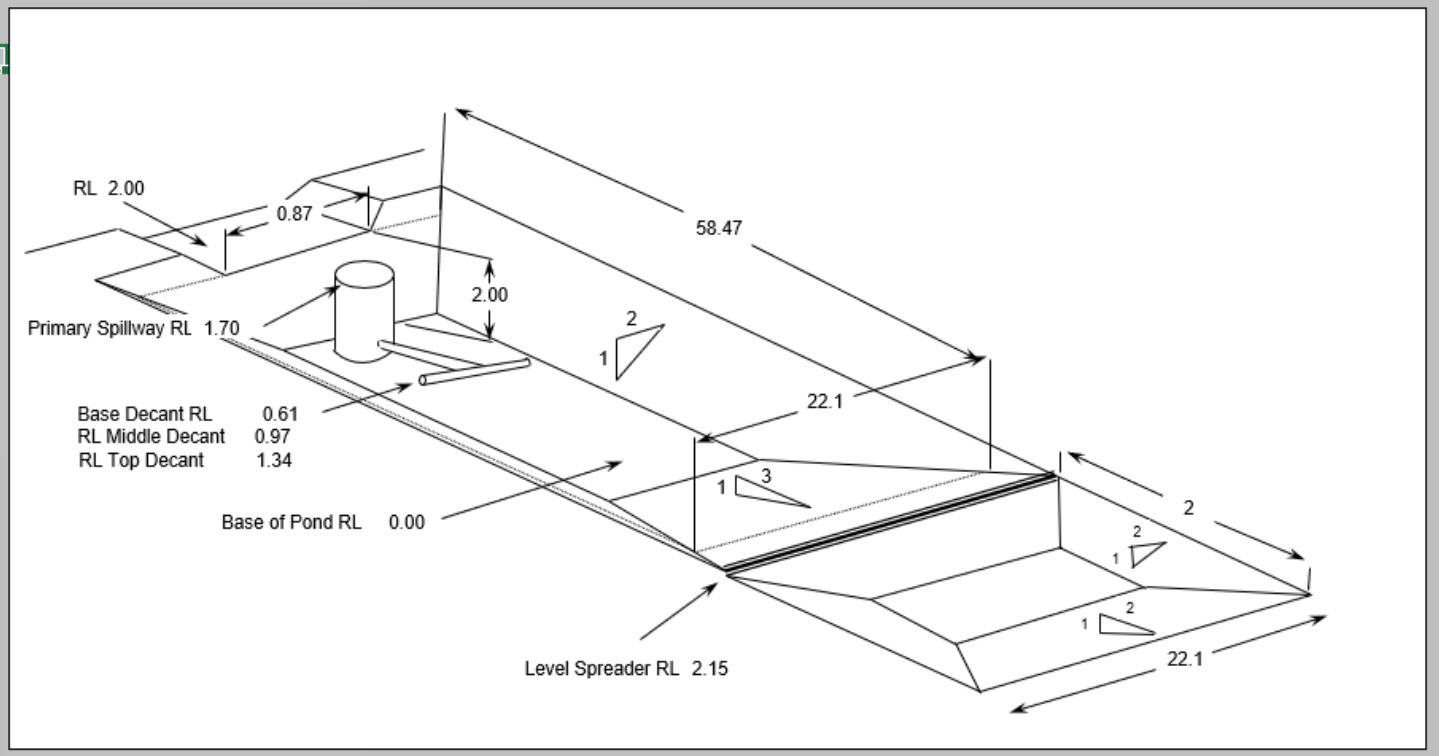
Storage Volume Criteria	3%
Contributing Catchment (ha)	5.25
Minimum Storage Volume (m3)	1575
Dead storage (m3)	472.5
Live storage (m3)	1102.5
Length at Spillway Level	58.47
Width at Spillway Level	22.17
Spillway base width (300mm deep)	0.87
Primary Spillway diameter (min)	Manhole Required
Number of decants	3
Number of holes per decant	233
Minimum outlet diameter	300mm
RL Emergency Spillway	2.00
RL Primary Spillway	1.70
RL Level Spreader (min)	2.15
RL Base Decant	0.61
RL Middle Decant	0.97
RL Top Decant	1.34
Width at Midpoint	17.57
Length at Midpoint	52.72

Forebay

Depth	1 m	min. depth
Width	22.17 m	full width of pond
Length	2 m	min. length

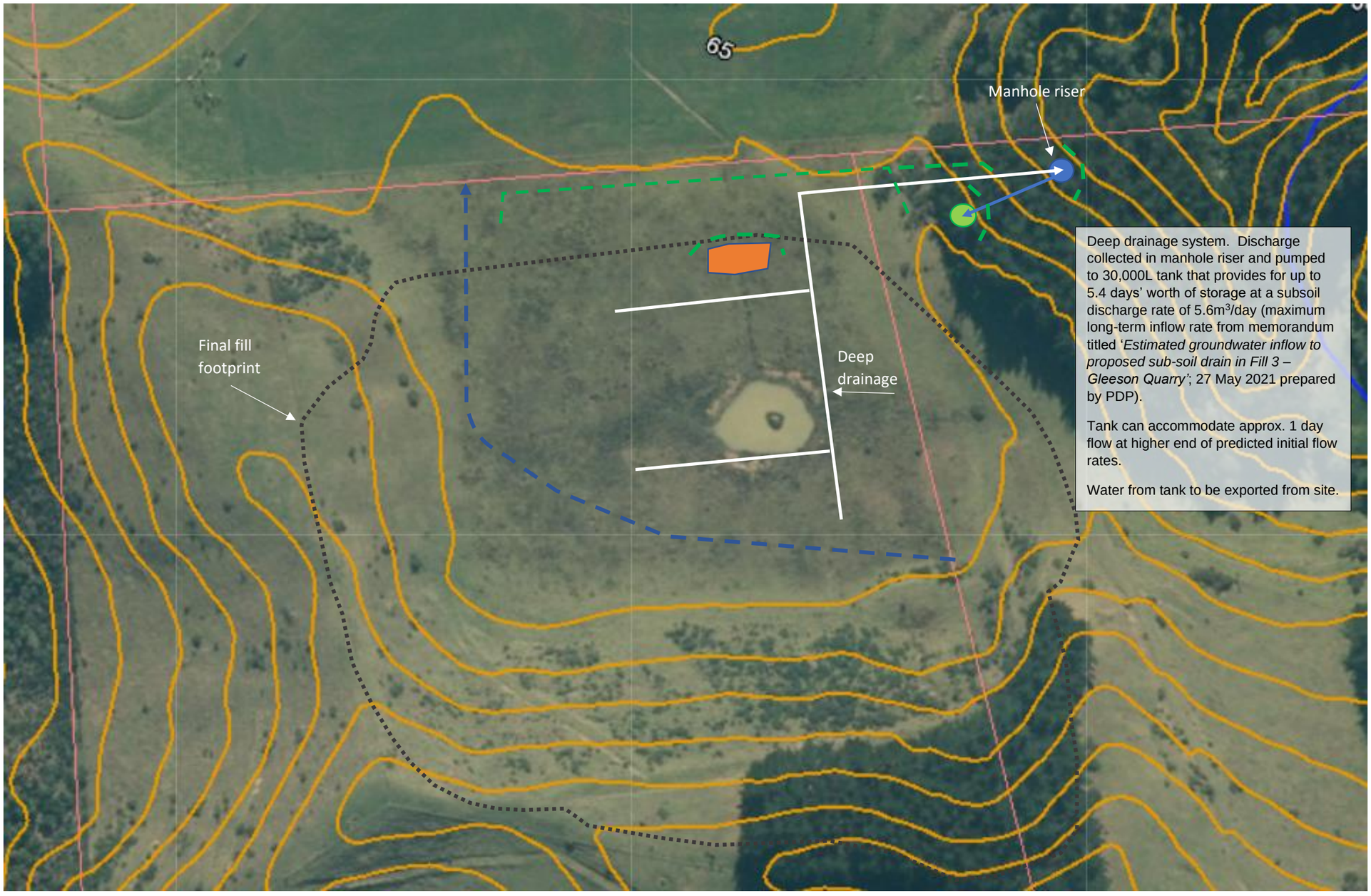
See below for GD05 cross-sections

SRP



Appendix B – Chemical Treatment Management Plan

TBC



Legend

- Deep drainage
- Silt fence
- Dirty water diversion
- Clean water diversion
- Sediment retention pond
- Stockpile
- Fill area
- Floc sed / box
- Deep drainage tank

Stage 1

Install clean water diversion upslope of deep drainage lines.

Install deep drainage. Commence at outlet end with pump chamber and at same time install tank.

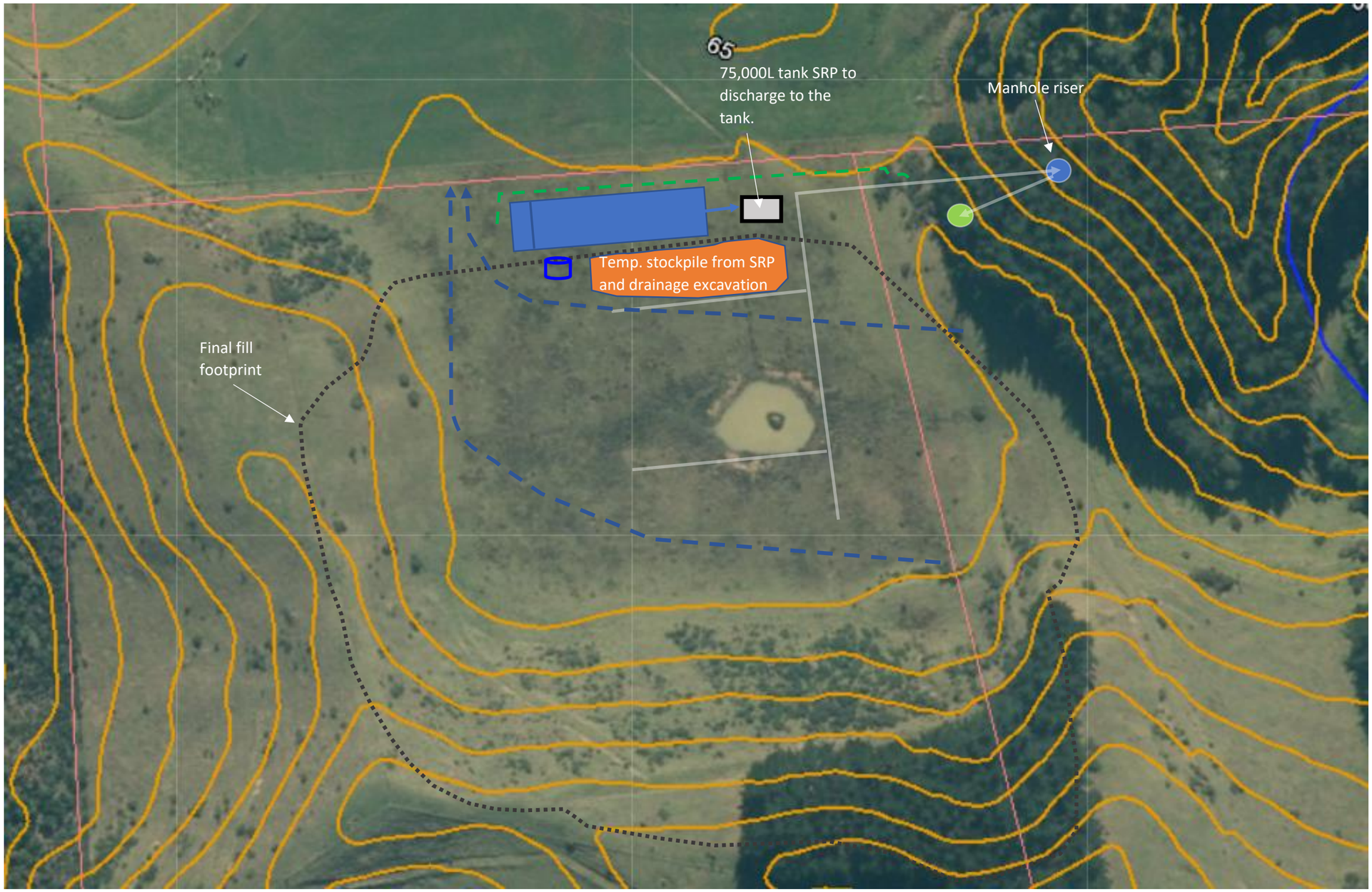
Collect all drainage water from start and remove from site via tank.

Use silt fence and progressive stabilisation. Stockpile surplus trench material and treat with silt fence. Some of stockpile will be used to backfill existing open drain.

REV	DATE	REVISION DETAILS	APPROVED
A	19.07.21	Draft for review	
B	20.11.21	Draft for review	
C	06.04.22	For consent	
D	-	-	
E	16.06.22	S92 Response	

Gleeson Quarries

Drawn:	Checked:	Drawing No:	Project:	Huntly Fills
ZW	MP	ESCP-002-001	Title:	Fill 3 – Phase 1 - ESCP
			Sheet No:	1 of 3



Legend

- Deep drainage
- Silt fence
- Dirty water diversion
- Clean water diversion
- Sediment retention pond
- Stockpile
- Fill area
- Floc shed / box
- Deep drainage tank

Stage 2

Install clean water diversion and silt fence to isolate SRP area. Construct SRP. Install 75,000L tank that SRP will be pumped into when water exported off-site.

Backfill existing drainage channel. Stockpile surplus beside ponds. Stabilise outer banks of SRP.

SRP will be minimum 1575m^3 to service in excess of the full fill area – refer to SRP design.

Stockpile to be relocated into fill cell once that is established.

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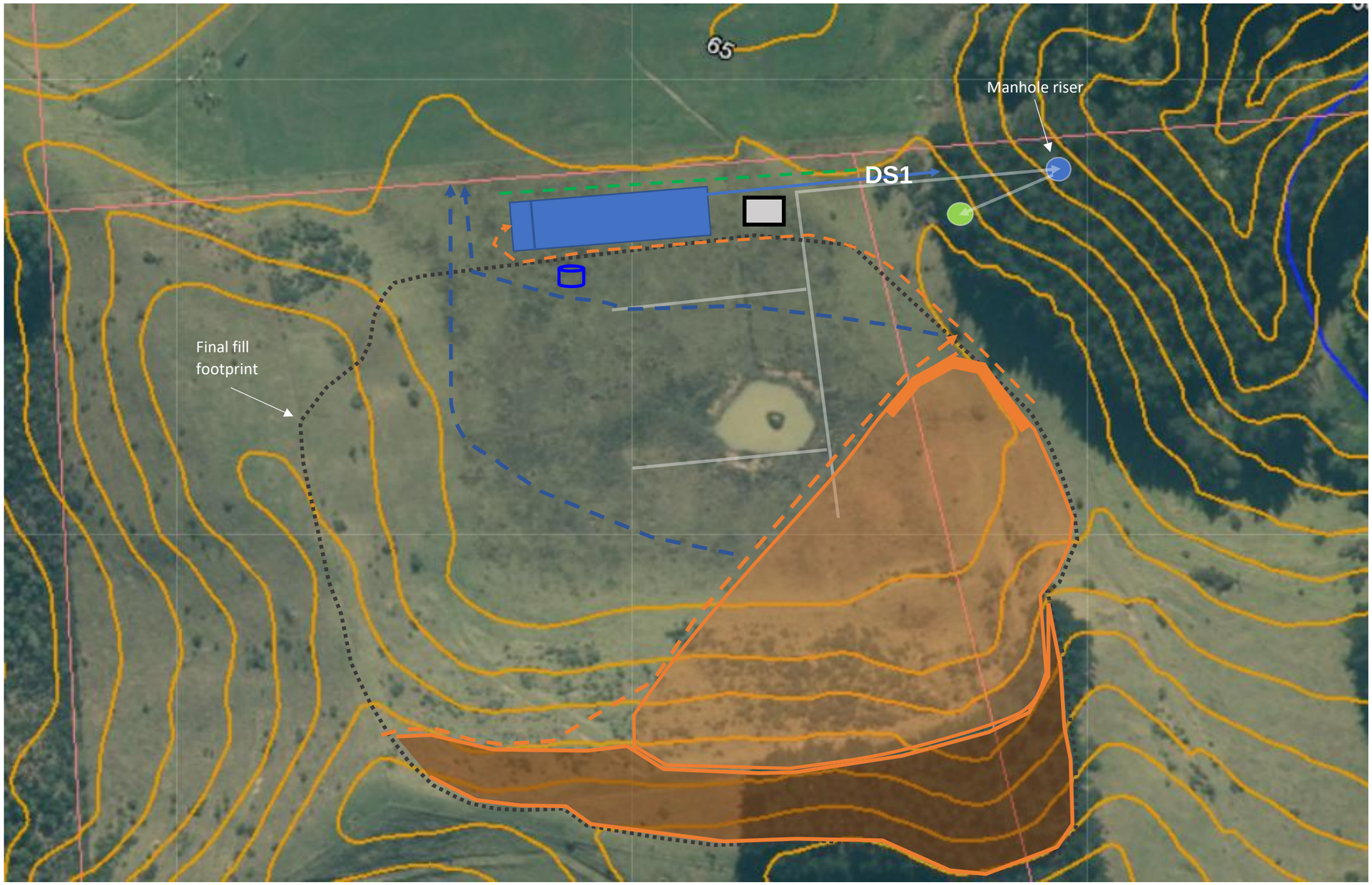
C	06.04.22	For consent	
D	-	-	
E	16.06.22	S92 Response	

Gleeson Quarries

Drawn: ZW	**Checked:** MP	**Drawing No:** ESCP-002-002	**Project:** Huntly Fills	
			Title: Fill 3 – Phase 1 - ESCP	
			Sheet No: 2 of 3	



Legend

- Deep drainage
- Silt fence
- Dirty water diversion
- Clean water diversion
- Sediment retention pond
- Stockpile
- Fill area
- Floc shed / box
- Deep drainage tank

Stage 3

Install dirty water diversions to SRP.

Establish first clay lined fill cell (approx. 1.5ha) using clay cut from southern part of fill site. Form clay bund at downhill end to provide additional ponding of at least 1000m^3.

Clay excavation area to be progressively opened and stabilised to minimize the exposed area to approximately 0.7ha. Manage diversion bunds to minimise catchment. Once Phase 1 fill liner is completed the full area will be stabilised.

Modify clean water diversion bund to minimise catchment area of SRP. Relocate stockpile to fill cell.

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B	20.11.21	Draft for review	
C	06.04.22	For consent	
D	-	-	
E	16.06.22	S92 Response	

Gleeson Quarries

Drawn:	Checked:	Drawing No:	Sheet No:
ZW	MP	ESCP-002-003	3 of 3

Project:	Huntly Fills
Title:	Fill 3 – Phase 1 - ESCP