Engineering Geology Ltd
+64 9 486 2546
info@egl.co.nz
Unit 7C, 331 Rosedale Road, Albany, Auckland
PO Box 301054, Albany, Auckland 0752
www.egl.co.nz

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OCEANA GOLD (NEW ZEALAND) LIMITED
MACRAES OPERATION
MACRAES PHASE 4 PROJECT
EROSION AND SEDIMENT CONTROL REPORT

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Oceana Gold (New Zealand) Limited
P O Box 5442
Dunedin
OTAGO

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Role	Name	Credentials	Signature	Doc. Rev.	Date
Author	P. Carter	BSc (Geology), PGDIP (Engineering Geology). MESt (Geotechnical Engineering), CMEngNZ, CPEng	[redacted]	1	27/08/2026
Author	E. Mandru	BASc Hons, MEngNZ		1	27/08/2026
Reviewer	E. Torvelainen	BE (Hons), MEngNZ		1	27/08/2026
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Terminology Abbreviations

AEE	Assessment of Environmental Effects
BRWRS	Backroad Waste Rock Stack
CO6	Coronation Stage 6
ECAN	Environment Canterbury Regional Council
ESCP	Erosion and Sediment Control Plan
EGL	Engineering Geology Limited
ESC	Erosion and sediment control
FEWD	Frasers East Waste Dump
FRBF	Frasers Backfill
FSBF	Frasers South Backfill
FSWRS	Frasers South Waste Rock Stack
FTSF	Frasers Tailings Storage Facility
GB2	Golden Bar Stage 2
IM	Innes Mills Pit
IMBF	Innes Mills Pit Backfill
MP3	Macraes Phase III
MP4	Macraes Phase 4
OGNZL	Oceana Gold (New Zealand) Limited
ORC	Otago Regional Council
RH	Round Hill Pit
RHBF	Round Hill Backfill
TSF	Tailings Storage Facility
WRS	Waste Rock Stack

EGL
Geotechnical, Earthquake and Dam Engineers

Engineering Geology Ltd
+64 9 486 2546
info@egl.co.nz
Unit 7C, 331 Rosedale Road, Albany, Auckland
PO Box 301054, Albany, Auckland 0752
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EROSION AND SEDIMENT CONTROL REPORT

1.0 INTRODUCTION

Oceana Gold (New Zealand) Limited (OGNZL) has engaged Engineering Geology Limited (EGL) to prepare an erosion and sediment control report for the new Macraes Phase 4 (MP4) Project at the Macraes Operation.

The Macraes Phase Four (MP4) project seeks to extend the consented mine life through to 2039 and is being progressed under the Fast Track Approvals Act 2024 (FTAA). OGNZL currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago (refer to Figure 1).

Construction works that are associated with the current mining operations include waste rock stacks (WRSs) for disposal of the pit overburden material, tailings storage facilities (TSFs), haul roads, road re-alignments, and administration, workshop, and processing areas. An overall layout of the current mine site is shown in Figure 2.

The primary MP4 project elements expand these areas and are shown on Figure 3. Description of the MP4 project elements is summarised under Section 1.2.

Erosion and sediment controls which are associated with runoff from the existing site are covered under existing Resource Consents and associated conditions.

1.1. Purpose and scope of this report

The purpose of this report is to provide a summary of the erosion and sediment control framework for the MP4 Project to support the Assessment of Environmental Effects. This will require subsequent preparation of an Erosion and Sediment Control Management Plan and site-specific Erosion and Sediment Control Plans. This report describes the existing Macraes erosion and sediment control setting, identifies MP4 work areas where erosion and sediment risk may arise, outlines the control approach for those areas, and identifies where new or revised controls may be required.

1.2. Project summary

The MP4 Project includes the following principal elements:

- Open pit extensions at Coronation, Coronation North, Innes Mills, and Golden Bar.
- Underground mine expansion through further development of the Golden Point Underground mine (GPUG).
- Tailings management, including:
  - Construction of the Frasers Tailings Storage Facility (FTSF) Stage 3 to accommodate a total tailings storage of up to 153 Mt; and
  - Hydraulic mining and relocation of tailings from the Mixed Tailings Impoundment (MTI), Southern Pit Option 10 TSF (SP10), and Southern Pit Option 11A TSF (SP11) to FTSF.
- Waste rock disposal, including increased storage capacity within open pits and at existing waste rock stacks at Coronation, Coronation North, Innes Mills, Golden Bar, Golden Point, and Frasers.
- Water management infrastructure and operations, including:
  - Construction of Camp Creek and Coal Creek water storage dams for flow and water quality management;
  - Construction, operation and maintenance of a Water Treatment Plant; and
  - Ongoing operation and maintenance of the Mine Water Management System (MWMS).
- Infrastructure and roading works, including:
  - Realignment of Macraes Road in two stages; and
  - Relocation of the Open Pit Mining Workshop.
- Ecological enhancements, including establishment of:
  - Murphys Ecological Enhancement Area (MEEA) near Murphys Creek, including predator fencing, access tracks, and site facilities;
  - Mt Highlay restoration area;
  - Cranky Jims Link shrubland enhancement area;
  - Murphys Link tussock protection area; and
  - Additional compensation measures for residual ecological impacts.
- Mine closure and rehabilitation activities, including rehabilitation of mining landforms, creation of pit lakes, capping of tailings storage facilities, and revegetation in accordance with closure objectives.

Most MP4 works are located within or adjacent to the existing Macraes mining disturbance footprint. From an erosion and sediment control perspective, the main areas requiring further consideration are those where new disturbance may drain externally toward natural drainage paths, wetlands or existing receiving environments, and those where existing erosion and sediment control infrastructure may need to be checked or upgraded to accommodate revised catchments or flow paths.

1.3. Erosion and sediment control context

The MP4 Project includes a number of separate work areas across the Macraes Operation. From an erosion and sediment control perspective, the proposed works can be grouped into following broad categories:

1. Working areas draining internally to pits or existing mine water management infrastructure, where sediment laden runoff can be contained and managed within existing operational ponds and the mine water system.
2. Working areas not draining internally to pits or existing mine water infrastructure, associated with waste rock stacks and backfills, where erosion risk is greatest during vegetative/topsoil stripping, initial backfill toe establishment, active placement of outer fill surfaces, and placement of rehabilitation layers.
3. Roading works and associated road drainage, where runoff may drain externally toward natural drainage paths or wetlands and therefore requires dedicated collection, treatment and controlled discharge.

The MP4 elements that will require new erosion and sediment controls:

- Coronation North WRS;
- Trimbells WRS;
- Golden Bar Road realignment;
- Macraes Road realignment;
- Golden Bar Haul Road;
- Golden Bar WRS and associated infrastructure area;

Other MP4 elements, including the pit extensions and in-pit backfills, are expected to not present an erosion and sediment risk during operations because runoff will be contained within pits or existing mine water management infrastructure. This assumption will be confirmed through subsequent site specific ESCP development.

The Trimbells WRS will also require diversion of the existing gully/ephemeral stream alignment where it conflicts with the proposed WRS footprint. The diversion will require further design to confirm the final alignment, channel geometry, erosion protection, disturbance footprint, interaction with existing wetlands and integration with the Trimbells WRS toe.

2.0 SITE SETTING

2.1. Site location

The Macraes Operation is located at Macraes Flat in East Otago as shown in Figure 1. An overall layout of the current mine site is shown in Figure 2 and the new elements that are associated with the proposed MP4 Project are summarised on Figure 3.

The Macraes Operation extends across several local catchments. From north to south, the principal surface mining areas include:

- The Coronation open pit and waste rock stack area is partially north of the Taieri Ridge, which is the dividing ridge line between the Taieri River and Deepdell

Creek (Shag River) catchments. This area includes Coronation Pit, Coronation North Pit, Coronation WRS and Coronation North WRS.

- Deepdell North open pit and waste rock stack area south of the Taieri Ridge, located on Horse Flat which flows to Deepdell Creek via Highlay Creek and Camp Creek. This area includes Deepdell West Waste Rock Stack, Deepdell North Open Pit and Deepdell East WRS.
- Round Hill area naturally reports to Deepdell Creek. This area includes Mixed Tailings Impoundment (MTI) and Southern Pit Option 11A (SP11A) TSFs, Northern Gully Waste Rock Stack and Southern Extension, existing Back Road Waste Rock Stack, Round Hill Pit Backfill and Golden Point Open Pit.
- Frasers area, which naturally reports to the Waikouaiti River North Branch, either directly or via. Murphys Creek. This area includes Innes Mills Open Pit (currently backfilled), Frasers Open Pit, Fraser West Waste Rock Stack, Frasers South Waste Rock Stack, and Frasers East Waste Rock Stack.
- Top Tipperary Tailings Storage Facility (TSF) area is part of the upper branches of Cranky Jims and Tipperary Creeks. Cranky Jims and Tipperary Creeks are part of the Shag River catchment.
- Golden Bar open pit and waste rock stack area naturally flows to Murphys Creek which is part of the Waikouaiti River North Branch.

The existing erosion and sedimentation controls for the Macraes Operation treat stormwater runoff prior to discharge into the following tributaries (listed north to south):

- Trimbells Gully Creek.
- Maori Hen Creek.
- Coal Creek.
- Camp Creek.
- Highlay Creek.
- Deepdell Creek.
- Cranky Jims Creek.
- Tipperary Creek.
- North Branch Waikouaiti River.
- Murphys Creek.

2.2. Site grid

The Macraes Operation plan grids and references are based on Macraes Gold Project Grid (MGPG) which is rotated approximately 45 degrees anti-clockwise from true north.

2.3. Climate

The Glendale Station Site is the closest rain gauge to the Macraes Operation. It is located at the northwest end of the Top Tipperary Tailings Storage Facility (TTTSF). Figure 2 shows the location of the TTTSF.

The mean annual rainfall at the Glendale Station Site, which has been monitored from 1959 to 2008, is 634 mm. The maximum and minimum annual rainfall is 950 mm and 395 mm (recorded in 1998) respectively (Ref. 7). The Golden Point Station, which has been monitored from 1991 to 2022, recorded a mean annual rainfall depth of 665 mm, with a maximum and minimum of 1034 mm and 414 mm.

The mean annual pan evaporation is estimated from pan evaporation data collected from the site between 1991 and 2018. The mean annual pan evaporation is estimated to be 952mm (Ref. 6). These processes include evaporation from surface water features (e.g., streams and ponds) and the soil capillary fringe, as well as transpiration.

Statistical rainfall depths and intensities values from the national High Intensity Rainfall Database (HIRDs) for the Macraes Operation location are summarised in Table 1 and 2.

The relatively low rainfall environment combined with high evaporation limits sediment laden runoff generation. However, short duration high intensity rainfall events can still generate runoff from disturbed fine grained soils, particularly where topsoil or loess is exposed. Erosion and sediment control measures therefore remain necessary where sediment laden runoff could discharge to external receiving environments.

2.4. Site soils and erosion potential

The unmodified natural ground profile at the site typically comprises the following materials, from the ground surface downwards:

- Topsoil
- Loess (silt) varying in thickness from nothing up to 6 m locally, but generally less than 1 m thick. These soils are fine and erodible.
- Colluvium (gravel-sized rock with some sand/silt) near the base of slopes.
- Schist rock which outcrops in places but is generally present at shallow depths typically less than 1 m below the natural ground surface.

Waste rock is predominantly an overburden material excavated from the pits and is mostly disposed of in the WRS sites or used to construct the TSF embankments. It typically varies in particle size from silt, to sand, gravels to boulders (typically 10 to 500 mm size). It is also the largest quantity of fill used in construction of the water and tailings retaining embankments. It forms a well graded rockfill with the fines fraction typically of silt and sand sized particles (i.e. very low clay content).

The surficial soils that blanket the site, in particular the loess soils, are erodible. The waste rock is coarse in nature and is assessed to have a low risk with respect to erosion and sediment loads. In terms of erosion and sediment risk, stripping of the surficial soils is the main risk activity. As such management of this process, and the use of appropriate erosion and sediment controls, are necessary.

3.0 EXISTING EROSION AND SEDIMENT CONTROL PRACTICE

Stormwater runoff from the pits and the associated haul roads generally collects in the base of the open pits and is pumped to the process plant for use in ore processing or dust control. Some haul roads between mining areas require local sediment controls along their alignment as runoff is required to discharged to adjacent ground. Runoff and seepage water from the WRS areas are managed by perimeter bunds or collected by channels and directed into silt ponds or back to the pits. Runoff within the TSF impoundments is managed within the decant pond and mine water circuit. In summary collected stormwater is generally managed by one or more of the following methods:

- Decanted and discharged downstream to existing watercourses in accordance with consent requirements.
- Pumped back to the process plant or managed through the mine circuit.
- Reused for dust suppression.
- Detained within ponds, pits, sumps or waste rock areas, where it reduces through infiltration and evaporation.

The existing erosion and sediment control practice includes the following features and attributes:

- Clean water diversions divert runoff from undisturbed areas away from disturbed areas.
- Diversion drains or perimeter or contour bunds collect and direct storm water runoff from the disturbed areas to the silt ponds.
- Stripping of topsoil and loess soils is generally programmed during drier periods where practicable.
- Progressive stripping of the WRS footprints is undertaken to minimise the exposed ground surface area that is at risk of eroding and generating sediment.
- Steep gullies are not stripped beneath the WRS areas, except in the base of gullies at the toe of the WRSs, to result in the creation of a buffer zone that intercepts sediment from stripped areas above.
- Management of the storm water flow paths across the WRS surface to prevent runoff from discharging over the outside shoulders.
- The design and excavation of soak pits across the WRS surface to facilitate the soakage of stormwater into the underlying waste rock (which acts to filter out fines).
- The adoption of a carefully staged end-tipped construction sequence which creates a layer of coarser rock in the gullies which subsequently acts as an underdrain layer.
- Progressive rehabilitation of the surface of all WRS and TSF embankment areas. Such rehabilitation comprises the placement of a 0.3 m thick layer of oxidised waste rock followed by the placement of a 0.2 m thick layer of topsoil which is immediately seeded with grass to minimise the exposure time and area of bare soil.
- Benches are provided on the shoulders of all WRS areas and TSF embankments at a maximum interval of 20 m vertical height to control runoff.
- The timely construction of appropriate and robust sediment control measures (e.g., silt fences, decanting bunds) in accordance with the relevant recommendation published by ECAN and Auckland Council (Refs. 1 and 2).
- The silt ponds allow for the settlement of suspended solids from the collected water.
- Water discharge points are routinely monitored as required by the consent conditions.

- Regular inspections of silt ponds and diversions is undertaken by OGNZL personnel to check the condition and undertake maintenance if required.

The silt ponds have been constructed, as appropriate, in advance of placing waste rock in the WRS areas or commencing the construction of a TSF embankment. In all cases, the silt ponds have been created by the construction of dams across gullies or streams immediately downstream of the disturbed areas. Typically, the dams are zoned embankments consisting of a central core of low permeability fill with rockfill shoulders. The low permeability fill has either been sourced locally from loess and colluvium or overburden material from the pits. The rockfill has largely been sourced from the pit overburden material.

The design criteria for the silt ponds has changed with time. Those silt ponds which were constructed more recently as part of the Macraes Project program of works (e.g., for the Deepdell South and North WRS, Frasers West WRS, Clydesdale Creek, Murphys Creek) were designed according to the following criteria:

- Storage sufficient to contain at least the initial 24-hour rainfall from a 2-year / 72 hour rainfall event (67 mm rainfall).
- Service and emergency spillways capable of passing flows from 10 year and 100-year return period rainfall events respectively.
- Ponds provided with either pump-back facilities or a constricted flow outlet to decant impounded water. Pump or decant designed to recover the minimum live storage in no more than 5 days.
- Dam, spillway and associated structures designed, constructed, operated and maintained for the life of the dam in accordance with the general principles of New Zealand Society of Large Dams (NZSOLD) Dam Safety Guidelines (Ref. 5).

The stormwater detention pond storage volume has typically been estimated using runoff coefficients (C) between 0.32 and 0.70. Higher runoff coefficients have been adopted for small catchment areas. Local experience is that a large proportion of rainfall either infiltrates or evaporates and that is more significant for larger WRS areas, and where lower runoff coefficients are adopted.

The decant facility which has been provided for most silt ponds comprises a perforated manhole structure. This design has proven to work effectively at the Macraes Project site. The current perforated manhole design also acts as the service spillway. The perforated holes have typically been set at a level which can provide generous dead storage and water is sometimes drawn down further by pumping and the recovered water used for dust control purposes.

The experience on site to date is that the stormwater runoff from WRS is typically low in suspended solids indicated by the very low volume of sediment in the silt ponds. This is due to a combination of the low rainfall, the limited exposure of fine soils, and the nature of the waste rock. Loose-placed waste rock provides a rough, open textured surface with internal void storage and drainage, which reduces runoff velocity, promotes infiltration into the rockfill mass, and provides some filtering of entrained sediment. Running surfaces where the rock surface is broken down to a silt can generate sediment. However, has typically been managed on stack. The waste rock has been typically end dumped in high lifts and this results in segregation with coarse rock at the base of each lift. This has subsequently acted as an underdrain beneath. The surface of the WRS areas is sloped away from the outside shoulder so that water runoff flows back to contact with the natural ground. Infiltration of runoff into the WRS mass has previously been actively encouraged by the of excavation of sumps if

water is observed to pond on the active fill surface. Plates 1 to 8 attached show examples of typical silt ponds and waste rock stack tip heads at Macraes.

The critical time for the generation of sediment is at the initial stage of WRS and TSF embankment construction. Typically, the foundations will be stripped of topsoil and residual soil, except where the ground is too steep to be practical. Stripping can expose problematic foundations soils such as loess. Until waste rock material is placed above, these soils can be quite erodible. However, it is practical to sheet these areas with rockfill quickly if rain is forecast ahead. Steep gullies are not stripped beneath the WRS footprints, except in the base at the downstream toe, and the remaining vegetation acts to assist in intercepting and retaining sediment from higher ground. However, it is generally necessary to construct initial silt ponds in gullies downstream of the disturbed areas where catchments are notable. Once waste rock is placed then the potential for generation of sediment is significantly reduced.

4.0 EXISTING SILT POND PERFORMANCE AND IMPLICATIONS FOR MP4

4.1. Historical Performance

The existing Macraes silt ponds provide useful operational precedent for the design of erosion and sediment controls for MP4. Many of these ponds have been in place for a long period and have operated under Macraes-specific conditions, including relatively low average annual rainfall, permeable waste rock, vegetated drainage channels, long periods between rainfall events, and relatively low ratios of disturbed to undisturbed catchment area.

The existing silt ponds generally operate using a hold-and-release approach (ie. where an initial volume is retained and slowly released over days by means of decant, infiltration and evaporation, with the remaining volume being decanted). Runoff is collected within the pond, flow velocities are reduced, and suspended sediment is allowed to settle before water is discharged, pumped back, reused, or reduced through infiltration and evaporation. Flocculant is not currently used in these ponds at Macraes.

The existing silt ponds typically operate under the following conditions:

- Low volume accumulated sediment within the pond or dry pond conditions between rainfall events.
- Low ratio of disturbed to undisturbed catchment area.
- Vegetated drains leading to the pond entry that reduce flow velocity and promote localised sediment deposition before water enters the pond.
- Partially vegetated pond floor (above dead storage).
- Rock filters around manhole risers.
- Vegetated spillways.

These factors have contributed to the generally good historical performance of the existing Macraes silt ponds. Sediment-laden runoff from disturbed areas is commonly mixed with a larger proportion of runoff from undisturbed or stabilised catchment areas. Vegetated drainage channels and gullies upstream of the ponds also provide additional opportunity for sediment to settle before water reaches the pond. Once runoff enters the pond, detention and slow release allow further settlement of suspended solids.

OGNZL records indicate that sediment accumulation within the existing silt ponds has generally been low. Sediment cover in the ponds has been measured. The majority of records show that silt cover in low flow events is less than 20% of the pond floor, this indicates that it is likely that much of the sediment drops out in the channels before reaching the silt pond. In high flow events more sediment reaches the ponds and settles out on the pond floor as anticipated.

Based on operational experience, the existing erosion and sediment control practices have worked well throughout the life of the mine and no significant erosion or sediment related issues have been observed. This reflects the combined effect of relatively low average annual rainfall, as well as effectiveness of existing controls and ongoing inspection and maintenance.

4.2. Implications for MP4 Control Selection

The historical performance of the existing Macraes silt ponds supports continued use of Macraes-style hold-and-release controls where MP4 catchment conditions are comparable to those that currently exist. For smaller, temporary construction phase catchments, or where clean and dirty water can be practically separated, guideline-based pass-through sediment retention controls may be more appropriate. This distinction forms the basis of the hybrid ESC approach described in Section 5.

5.0 MP4 EROSION AND SEDIMENT CONTROL APPROACH

The erosion and sediment control approach for MP4 will build on the existing Macraes control practices described in Section 3. These practices are well established and are closely integrated with the mine water management system, waste rock stack construction methods, progressive rehabilitation and existing silt pond infrastructure. However, they will need to be adapted to promote surface water runoff rather than infiltration to meet project objectives for groundwater quality.

The MP4 works include a range of different activities and landforms. A single erosion and sediment control approach will not be appropriate for all areas. Instead, the proposed ESC approach will be selected based on the nature of the works, the drainage pathway, the expected sediment generation risk, the availability of existing mine water management infrastructure, and the sensitivity of downstream receiving environments.

In general, MP4 erosion and sediment controls will be based on the following principles:

- Minimise the area and duration of exposed erodible ground;
- Avoid exposing topsoil and loess during wet conditions;
- Progressively stabilise completed surfaces;
- Separate clean water from sediment-laden runoff where practicable;
- Contain runoff within pits, sumps, silt ponds or the mine water management system where available;
- Direct sediment laden runoff to appropriate treatment or detention before discharge;
- Use existing erosion and sediment controls where they remain suitably located and sized;

- Provide new or revised controls where MP4 works alter catchments, increase disturbance or create new external discharge pathways; and
- Confirm the final controls through site-specific ESCPs prior to works commencing.

We recommend that a hybrid approach to pond design is undertaken. In large or steep catchments, it is generally preferable to construct a permanent silt pond which may take the form of a small embankment dam due to the geometric constraints. Where ground profiles are flatter and catchment sizes are smaller (typically 5 ha or less) temporary SRPs may be more suitable. Further details are given in sections 5.1 and 5.2 below.

Temporary construction phase sediment controls for discrete dirty water catchments will generally be designed with reference to recognised erosion and sediment control guidance, including Auckland Council GD05 and IECA Australasia guidance. This approach is expected to apply where catchments can be practically separated, where the contributing dirty water catchment is generally less than approximately 5 ha, and where runoff can be directed to a pass through sediment retention pond, decanting earth bund or similar device prior to controlled discharge.

Where a temporary dirty water catchment is greater than approximately 5 ha, the preferred approach will be to subdivide the catchment using clean water diversions, dirty water diversions, bunds or construction staging so that contributing catchments to individual sediment control devices are reduced where practicable.

Permanent or long term operational stormwater and sediment controls will be designed on a site specific basis. These controls will be informed by the existing Macraes silt pond design criteria and operational performance. Existing Macraes-style hold-and-release silt ponds may be appropriate where catchments are large, the ratio of disturbed ground to undisturbed or stabilised ground is low, and full separation of clean and dirty water is not practicable.

This approach recognises that GD05 type sediment retention ponds are generally suited to smaller temporary construction phase earthworks catchments, while larger mine scale or permanent operational controls require site specific design. Final design criteria for each control will be confirmed through the relevant site specific ESCP.

5.1. Hold and release type silt ponds (Existing ponds)

The existing Macraes erosion and sediment control silt ponds are primarily based on a hold-and-release approach (See Section 3). Under this approach, runoff from disturbed areas is collected in silt ponds and slowly decanted. This provides storage, reduce peak discharge rates and allow suspended sediment to settle before water is discharged. No flocculant is used in these ponds at Macraes.

The benefit of this approach is that it provides substantial detention and operational flexibility if pump back is required.

Permanent or long-term silt ponds for MP4 are expected to generally follow the existing Macraes hold-and-release design approach. This approach may be appropriate for permanent or long-term operational controls where there is a large contributing catchment, where complete separation of clean and dirty water is not practicable, and where the ratio of disturbed ground to undisturbed or stabilised ground is low. The ratio of disturbed ground to undisturbed ground should be typically less than 20% of the total catchment to ensure sufficient dilution under high flow events should the

ESCP overtop. The ponds should be designed to conform with the historical design methodology of the existing ESCP at Macraes. Specifically:

- Silt Pond is sized to contain at least the initial 24-hour rainfall from a 2-year 72 hour rainfall event (67 mm rainfall) from total catchment.
- Service and emergency spillways capable of passing flows from 10 year and 100-year return period rainfall events respectively.
- Ponds provided with either pump-back facilities or a constricted flow outlet to decant impounded water. Pump or decant designed to recover the minimum live storage in no more than 5 days.
- Dam, spillway and associated structures designed, constructed, operated and maintained for the life of the dam in accordance with the general principles of New Zealand Society of Large Dams (NZSOLD) Dam Safety Guidelines (Ref. 5).

5.2. Pass through type sediment retention ponds

Pass-through type sediment retention ponds are more typical of temporary earthworks sites. These may also require the use of flocculant.

Pass-through type sediment retention ponds are expected may be used for temporary ponds for roading works. They could also be used for on stack silt ponds/sumps in areas of limited space as the stack is raised.

Pass through detention ponds can be designed in accordance with GD05 or the International Erosion and Control Association (Australasia) Guidance.

6.0 MP4 WORK AREA AND ESC REQUIREMENTS

6.1. General

The erosion and sediment control considerations for MP4 comprise the following:

- The new pits extension - Coronation North Pit (extended between coronation north and coronation pit), Innes Mill Pit and Golden Bar Stage are self-contained and do not pose an erosion and/or sediment risk. No Site Specific ESCP is required for these project elements as all dirty water from the activities will drain back to each individual pit.
- The Coronation North WRS is bounded by existing ESC measures. The existing ESCP for Coronation WRS should be reviewed to confirm that the existing ESC measures and construction staging will still be adequate to cater for the MP4 Project. Additional site-specific controls may be required if existing controls are not suitably located or sized.
- The Innes Mills Backfill, Coronation Backfill, Golden Point Backfill, Coronation North Backfill and Frasers Backfill are all located within existing pits so they do not pose an erosion and sediment risk as long as the fill surfaces are rehabilitated prior to discharge in closure. No Site Specific ESCP is required for these project elements during production. However, depending on the closure surface, temporary sediment retention ponds (SRP) may be required to be constructed adjacent to the backfill.
- The Coronation North WRS, Coronation WRS, FWWRS, FSBF, and Golden Point Pit Back modifications that will be constructed as part of MP4 are minor and the

existing MP3 ESC measures are expected to be appropriately robust to cater for these.

- Trimbells WRS will require a Site Specific ESC plan to be developed prior to commencing the MP4 construction.
- The Golden Bar WRS Stage 2 will require a Site Specific ESC plan to be developed prior to commencing the MP4 construction.
- The Golden Bar Haul Road will require a Site Specific ESC plan to be developed prior to commencing the MP4 construction.
- The Golden Bar Road and Macraes Road realignment will require a Site Specific ESCP to be developed prior to commencing the MP4 construction.

The adequacy of the existing permanent ESC silt pond at Golden Bar Waste Rock stack will also need to be checked. However, this statement being made, experience has demonstrated during operations that the waste rock stacks result in relatively low levels of erosion and sediment risk as the waste rock is self-filtering and the way the rock stacks are constructed limits direct runoff to the silt controls, by redirecting dirty water back to the associated pit.

The preliminary areas of disturbed ground that are associated with the MP4 project, and which will require the implementation of erosion and sediment control measures, are summarised in Table 3 and provided for in the attached figures. It should be noted that areas that fall to pits are not included in Table 3 as disturbed areas requirement ESC as this water is expected to be contained within the pit and managed through the mine water management system.

6.2. General erosion and sediment controls

Prior to the commencement of construction in any MP4 sub-area where erosion and sediment risk is present, a site-specific ESCP will be prepared by OGNZL or its subconsultants. The site-specific ESCPs will be submitted to ORC as appropriate and in accordance with any relevant consent requirements.

The site-specific ESCPs will describe the ESC practices to be implemented for the relevant work area or construction stage. These practices will generally follow the principles outlined in Auckland Council GD05 and IECA (Australasia) Guidance, modified as appropriate to account for Macraes-specific site conditions, rainfall, soil types, waste rock behaviour, existing ESC infrastructure and operational experience.

In general terms, the design of MP4 erosion and sediment control measures will build on the existing Macraes practices summarised in Section 3.0. Specific control measures may include:

- Clean water diversion drains with small dams located in gullies, where necessary, to divert stormwater runoff into the diversion drains. Where necessary (e.g., in locations where steeper ground or erosive soils are present) these drains will be lined (e.g., with rockfill and geotextile). Energy dissipation features will also be provided at high energy locations.
- Permanent silt ponds downstream of disturbed areas. Permanent silt ponds will be designed according to the existing criteria. The pond sizing depends on the catchment area and runoff coefficient. Decants will also be provided, as appropriate, that are expected to be of a design similar to those currently on site.

Service and emergency spillways will be designed and constructed to convey the storm water flows from 10 and 100-years return period rainfall events.
- The shoulders of the WRS areas will have benches constructed every 20 m vertical height to control runoff.
- Perimeter surface water drains located around the perimeter of WRSs where appropriate, to ensure runoff is conveyed to the base of gullies without erosion. Such drains will be lined where necessary and energy dissipation will be provided at high energy locations.

In general terms, the design of erosion and sediment control measures will follow the existing practice which are summarised in Section 3.0.

Further comments on the proposed erosion and sediment controls for specific areas is discussed in more detail in the following sections.

6.3. Waste rock stacks – Coronation North, Trimbells and Golden Bar Waste Rock Stacks

Surface diversions channels or drains will be constructed around the WRS areas where practical to divert clean water away from the relevant disturbed areas. Small bunds and diversion structures will be located in gullies, where required, to divert water into a clean water diversion drains.

With respect to ESC, the critical construction stage for WRS areas is the initial site stripping/preparation and initial stage of filling as ESC controls are established. Silt ponds will be located in all gullies downstream of the initial toe fills to mitigate this ESC risk.

If required, additional temporary silt ponds will be constructed on the surface of an WRS area (e.g., if the underdrain system beneath a WRS area is suspected to have insufficient capacity). The need and location for such controls will be confirmed through site-specific ESCPs and observations during construction.

Due to the increased extent of the proposed Trimbells WRS, permanent silt ponds are proposed in the gullies to the east of the Trimbells WRS. These have been preliminary sized on the criteria presented above and are shown on Figure 4. A bulk runoff coefficient of 0.4 has been adopted for the preliminary sizing.

6.4. Trimbells WRS Stream Diversion

The proposed Trimbells WRS footprint intersects an existing ephemeral stream alignment. A diversion channel is therefore expected to be required to convey upstream flows around the proposed WRS footprint and provide a controlled drainage path downstream of the WRS.

The preliminary concept is for the diversion channel to generally follow around the toe of the proposed Trimbells WRS. The channel is expected to be formed within the existing gully and excavated into the underlying rock where practicable, to provide natural erosion and scour resistance. The indicative channel extent and location is shown on Figure 4.

The preliminary diversion channel is approximately 1100 m long. An approximate disturbance width of 10 m has been allowed at this stage, resulting in an estimated disturbance area of approximately 1.1 ha. The final alignment, disturbance footprint and channel geometry will be confirmed during detailed design.

The diversion channel is currently being developed to convey flows up to the 1% AEP event (100-year ARI). Localised erosion protection, such as rock armouring, riprap or concrete grouting, may be required at bends, high velocity sections, transitions, or where less competent rock is exposed. Events larger than the design event will be considered further during detailed design, including consideration of controlled overtopping, repairability, and any need for allowance through closure bonding for maintenance.

Where the channel passes between existing wetland areas and the proposed WRS, localised modification to the WRS toe and/or access arrangement may be required to allow the channel and access track to pass without altering the wetland. The channel invert will also need to consider existing wetland levels to minimise the potential for wetland dewatering.

A site specific ESCP will be required for the diversion channel works. The ESCP should address construction staging, temporary flow diversion, clean water and dirty water management, sediment controls, stabilisation of exposed surfaces, erosion protection, discharge points, and the relationship with the WRS toe, access track and nearby wetlands.

6.5. Golden Bar Haul Road, and Golden Bar Road and Macraes Road Realignment

A series of temporary SRPs to collect and treat sediment laden runoff from the road formation, associated earthworks and operation are recommended for the proposed haul road and road realignment works. Runoff will be directed to these controls using road edge windrows, bunds, dirty water swales or diversion drains. These temporary SRPs should be designed in accordance with ESC guideline recommendations.

Indicative temporary SRP locations have been shown in Figure 5 and Figure 6 for the Golden Bar Road and Macraes Road Realignment, Figures 7 through 9 represent indicate temporary SRP locations for Golden Bar Haul Road. The actual locations will vary. The locations of temporary SRPs will generally be in lower lying reaches, and will be outside of areas identified as wetlands, but within OGNZL land. The specific locations and sizes of the temporary SRPs shall be detailed as part of the site specific ESCP.

6.6. Summary of area requiring site specific ESCPS

Based on the current MP4 layout, site specific ESCPs are expected to be required for at least the following areas:

- Coronation North WRS
- Trimbells WRS;
- Golden Bar Road and Macraes Road realignment;
- Golden Bar Haul Road
- Golden Bar WRS and associated ore/infrastructure area;

The requirement for a site-specific ESCP will be confirmed based on whether the work area creates new disturbance, changes existing catchments, relies on existing controls whose capacity requires checking, or creates a potential external discharge pathway.

7.0 ESC DOCUMENTATION

7.1. General

The MP4 Project will require erosion and sediment control documentation at several levels of detail. This report provides the preliminary framework for those later documents.

The subsequent ESC documentation is expected to include:

- An Erosion and Sediment Control Management Plan (ESCMP), to set out the project-wide implementation framework; and
- Site-specific erosion and sediment plans (ESCP) for individual work areas or construction stages where erosion and sediment risk is present.

An Erosion and Sediment Control Management Plan will set out the project-wide implementation framework, responsibilities, inspection and maintenance requirements, rainfall response procedures, monitoring requirements, reporting requirements, and procedures for preparing, certifying and amending site-specific ESCPs.

Site-specific ESCPs will then provide the final design and implementation details for individual work areas or construction stages where erosion and sediment risk is present.

7.2. Site specific ESCPs

Site-specific ESCPs will be prepared for MP4 work areas where erosion and sediment risk is present. These plans will provide the detailed design and implementation requirements for the controls identified conceptually in this report.

Site-specific ESCPs will be prepared prior to the relevant works commencing and will be used to confirm the final control arrangements for each work area or construction stage.

A site-specific ESCP will be required where one or more of the following apply:

- New land disturbance occurs outside existing disturbed mine areas;
- Sediment-laden runoff could discharge to an external receiving environment;
- Works are located near mapped wetlands, natural drainage paths or watercourses;
- Existing ESC controls are relied on but the contributing catchment or flow path changes;
- Clean water diversion or dirty water collection systems are required;
- New sediment retention ponds, silt ponds, decanting earth bunds, silt fences or stabilised outlets are required;

- Construction staging creates temporary exposed surfaces that require specific controls; or
- Backfill, rehabilitation or closure works create new external runoff pathways.

Requirements of what shall be required as part of a site-specific ESCP is provided in the ESC Management Plan (Ref.8).

8.0 SUMMARY AND CONCLUSIONS

OGNZL proposes to extend mining operations at the Macraes Operation through the MP4 Project. The MP4 works include pit extensions, underground mining, waste rock disposal, tailings storage, pit backfilling, road realignments, mine water management works, rehabilitation and closure activities.

This report provides a preliminary erosion and sediment control framework for the MP4 Project. It describes the existing Macraes ESC setting, summarises established control practices, outlines the conceptual ESC approach for MP4, and identifies the work areas where further ESC design is expected to be required.

Existing Macraes ESC practice is based on a combination of mine water containment, large silt ponds, clean water diversions, dirty water drains, pump-back systems, decants, progressive rehabilitation and routine inspection and maintenance. This approach has been developed over the life of the mine and will continue to form the basis of ESC management for MP4 where appropriate.

For many pit extensions and in-pit backfill areas, runoff is expected to remain contained within pits or the mine water management system during operations. These areas are expected to have lower external erosion and sediment risk, subject to confirmation through subsequent design development.

The main MP4 areas expected to require further ESC design are Golden Bar Road and Macraes Road realignment, Golden Bar Haul Road, Golden Bar WRS and associated infrastructure, Trimbells WRS, Coronation North WRS, and any backfill, rehabilitation or closure surface that creates new external runoff pathways. These areas will require site-specific ESCPs prior to the relevant works commencing.

The MP4 ESC approach will use a hybrid control framework. Temporary construction phase controls for discrete dirty water catchments will generally be designed with reference to recognised ESC guidance, while permanent or long term mine stormwater controls will be designed on a site specific basis, informed by existing Macraes silt pond design criteria and operational performance.

Further work is required through the site-specific ESCP process to confirm final disturbance areas, catchments, receiving environments, control sizing, discharge points, monitoring requirements and residual effects.

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6. NIWA (2018) *'High Intensity Rainfall Design System'* https://niwa.co.nz/

7. GHD (2023), Macraes Phase IV Coronation Surface and Groundwater Assessment, Oceana Gold New Zealand Ltd 18 May 2023, Draft Rev 3

8. SouthernSkies Enviromental (2026), Erosion and Sediement Control Management Plan, Macraes Phase 4 Project Macraes Operation, Oceana Gold (New Zealand) Limited 26 August 2023, Rev B

TABLES

Table 1: High Intensity Rainfall Database (HIRDS)
Summary of historic rainfall depth records (mm)

ARI (years)	AEP	Duration (hours)									
		0.17	**0.33**	**0.50**	**1**	**2**	**6**	**12**	**24**	**48**	**72**
1.58	0.633	3mm	5	6	9	13	23	32	43	54	60
2	0.500	4	6	7	10	15	26	36	47	60	67
5	0.200	6	8	10	15	21	36	49	64	80	89
10	0.100	7	10	13	18	26	44	60	78	97	107
20	0.050	9	13	16	22	32	53	72	93	114	125
30	0.033	10	14	18	25	35	59	79	102	125	137
40	0.025	11	16	19	27	38	63	84	109	133	145
50	0.020	12	17	20	28	40	67	89	114	139	152
60	0.017	13	17	21	30	42	69	93	118	144	158
80	0.013	14	19	23	31	45	74	99	126	153	167
100	0.010	14	20	24	34	47	78	103	132	160	174
250	0.004	18	25	30	42	58	94	124	157	189	205

Table Notes:

ARI = Average Recurrence Interval.

AEP = Annual Exceedance Probability.

All rainfall depths are reported in millimetres (mm).

Table 2: High Intensity Rainfall Database (HIRDS)
Summary of historic average rainfall intensity estimates (mm/hr)

ARI (years)	AEP	Duration (hours)									
		0.17	**0.33**	**0.50**	**1**	**2**	**6**	**12**	**24**	**48**	**72**
1.58	0.633	21	15	12	9	7	4	3	2	1	1
2	0.5	24	17	14	10	7	4	3	2	1	1
5	0.2	34	24	20	15	10	6	4	3	2	1
10	0.1	44	31	25	18	13	7	5	3	2	1
20	0.05	54	38	31	22	16	9	6	4	2	2
30	0.033	61	43	35	25	18	10	7	4	3	2
40	0.025	67	47	38	27	19	11	7	5	3	2
50	0.02	71	50	40	28	20	11	7	5	3	2
60	0.017	75	52	42	30	21	12	8	5	3	2
80	0.013	81	56	45	32	22	12	8	5	3	2
100	0.01	86	59	48	34	24	13	9	6	3	2
250	0.004	109	74	60	42	29	16	10	7	4	3

Table Notes:

ARI = Average Recurrence Interval.

AEP = Annual Exceedance Probability.

All average rainfall intensities are reported in units of mm/hr. Such data has been estimated be dividing the measured rainfall depth by the relevant corresponding rainfall duration.

Table 3: Preliminary summary of MP4 work areas requiring further ESC design or site-specific ESCPs

Area	Approximate disturbed area (ha) for individual ESCP	Comment
Coronation North WRS	~ 11 ha	Existing ESC controls to be checked against the revised MP4 disturbance footprint and catchments. Additional site specific ESCP may be required if existing controls are not suitably located or sized.
Trimbells WRS including stream diversion	~ 50 ha	Site specific ESCP required. Potential permanent ESC silt ponds may be required northeast of the WRS and/or adjacent to disturbed areas. Temporary SRPs may be design following GD05 during temporary works when catchments are comparatively smaller, and switch to operational sizing of collection silt ponds once WRS footprint is established.
Golden Bar Road Realignment	~ 5 ha	Site-specific ESCP required. Controls are likely to include new temporary SRPs, dirty water swales, road edge controls and stabilised outlets likely required.
Macraes Road Realignment	~ 5 ha	Site-specific ESCP required. Controls are likely to include temporary SRPs, dirty water swales, road-edge bunds or windrows, stabilised outlets and clean water diversions where practicable.
Golden Bar Haul Road	~ 20 ha	Site-specific ESCP required. Temporary SRPs are expected to be required to collect and treat sediment-laden runoff from the haul road formation, associated earthworks and operation. Runoff should be directed to controls using road-edge windrows, bunds, dirty water swales or diversion drains. Final catchments, temporary SRP locations, sizing, access and discharge points to be confirmed through the site-specific ESCP.
Golden Bar Stage 2 WRS and associated ore and infrastructure area	~ 60 ha	Site-specific ESCP required. Controls are likely to comprise staging of WRS construction to utilise existing Clydesdale Creek Permanent Silt Pond until the WRS footprint extends across it.

FIGURES

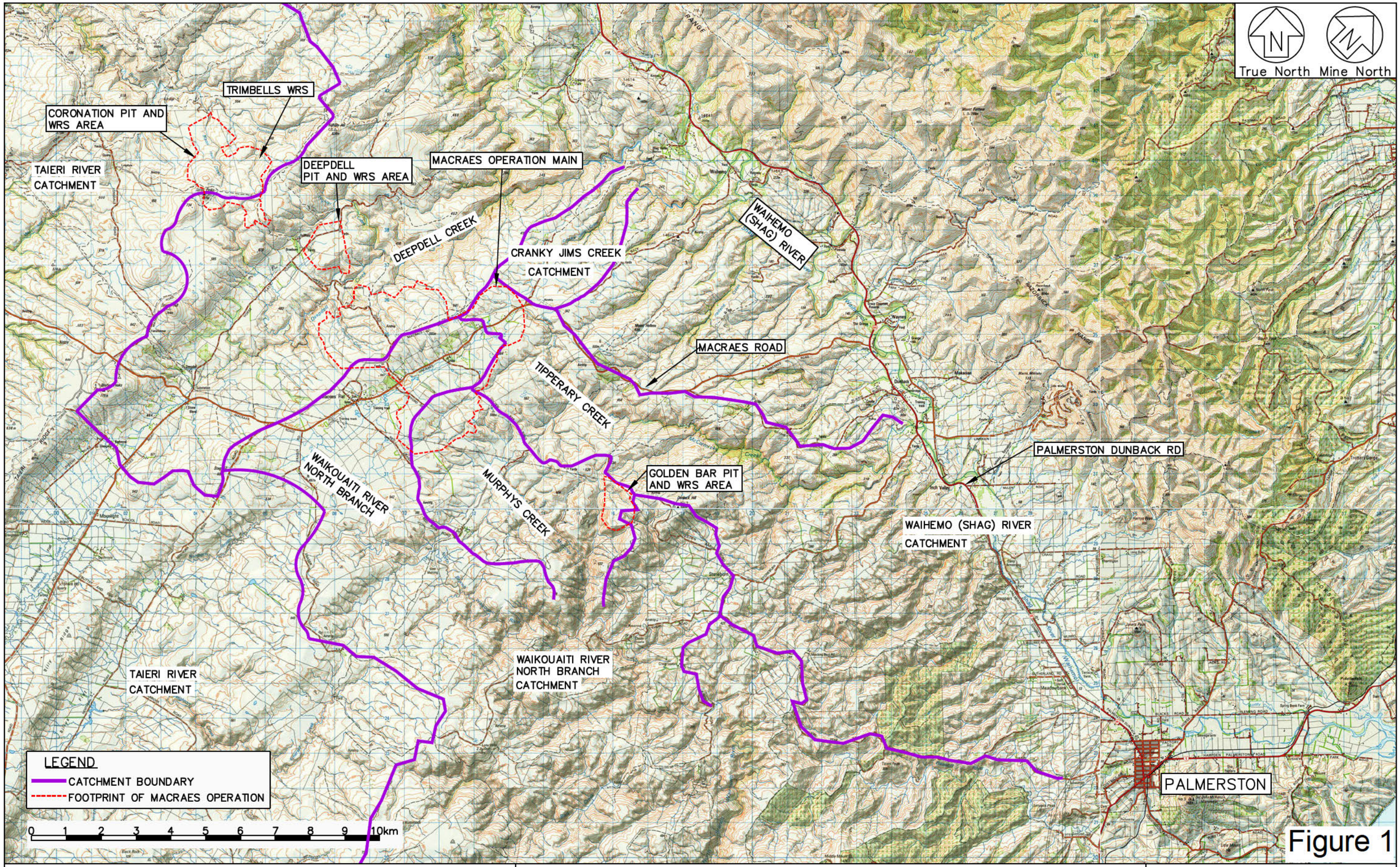

Figure 1

EGL
Geotechnical, Earthquake and Dam Engineers

Engineering Geology Ltd
+64 9 486 2546
info@egl.co.nz
Unit 7C, 331 Rosedale Road, Albany, Auckland
PO Box 301054, Albany, Auckland 0752
www.egl.co.nz

OCEANA GOLD (NEW ZEALAND) LIMITED
MACRAES OPERATION
MACRAES PHASE 4
Locality Plan

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Date:	Jan 2024
Drawn:	PL, RM
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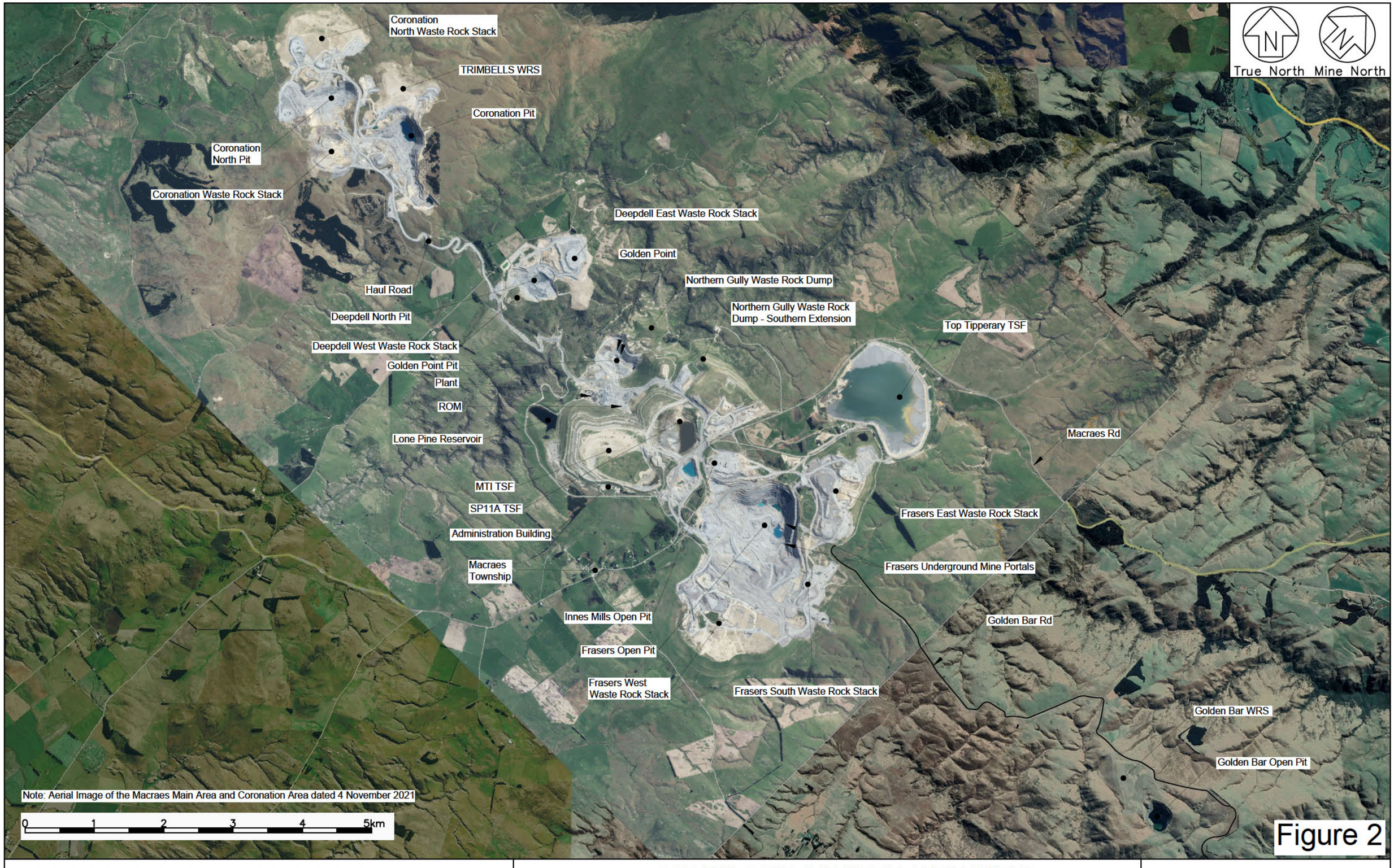

Figure 2

EGL Geotechnical, Earthquake and Dam Engineers

Engineering Geology Ltd
+64 9 486 2546
info@egl.co.nz
Unit 7C, 331 Rosedale Road, Albany, Auckland
PO Box 301054, Albany, Auckland 0752
www.egl.co.nz

OCEANA GOLD (NEW ZEALAND) LIMITED
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MACRAES PHASE 4
Existing Site Layout

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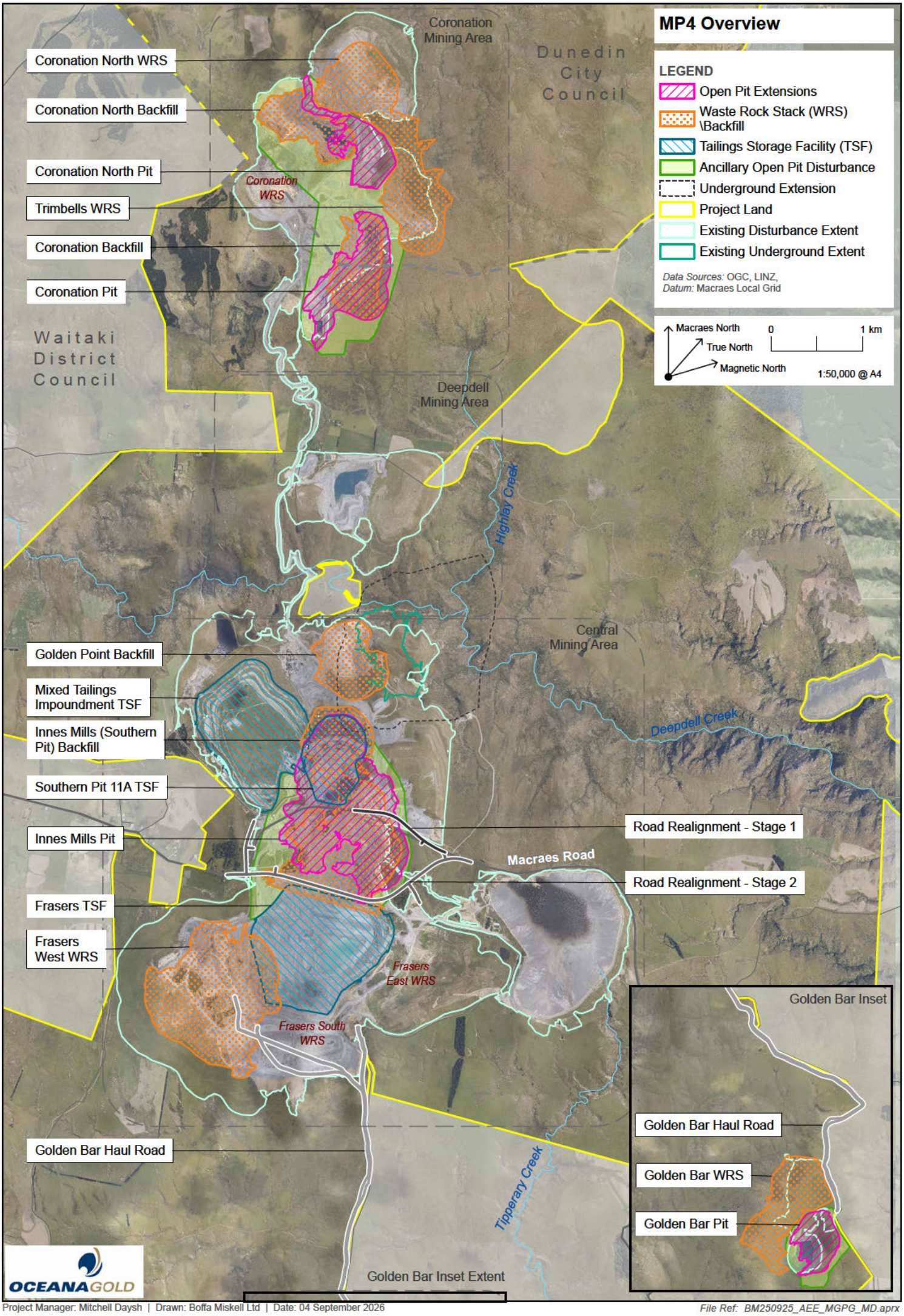

Project Manager: Mitchell Daysh | Drawn: Boffa Miskell Ltd | Date: 04 September 2026

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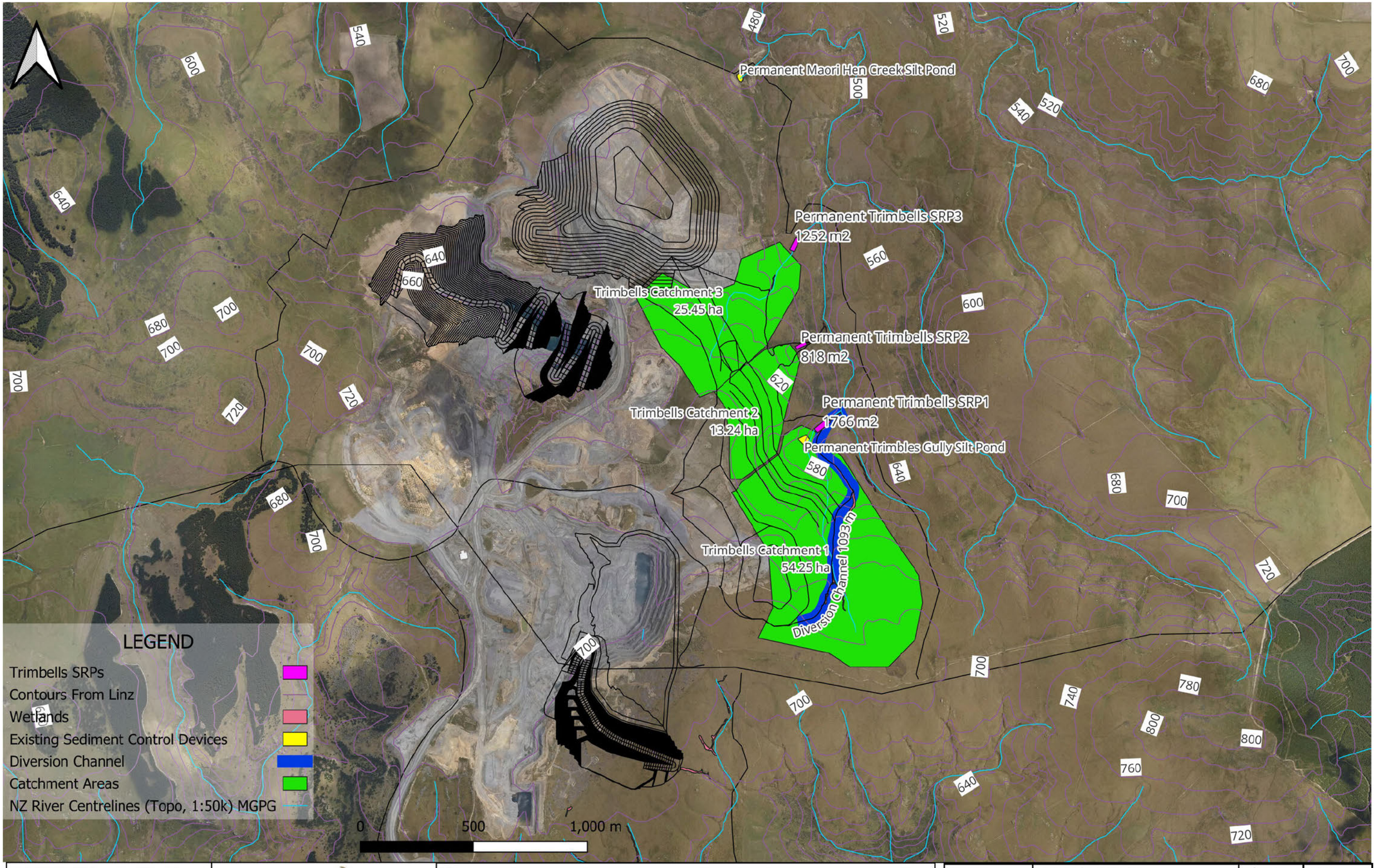

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Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL	Figure no.:	4
Figure:	PROPOSED CONTROLS - TRIMBELLS	Rev:	A
Drawn By:	PC	Date:	2026/08/26
Checked By:	EM	Scale (A3)	1:15,000

GBR Catchment
4.98 ha

Macraes road SRP 4 Catchment (2)
0.41 ha

Macraes Road SRP 4 Catchment (1)
1.84 ha

Wetland 3 SRP

GBR SRP 1

Macraes Road SRP 4

GBR SRP 2

LEGEND

- NZ River Centrelines (Topo, 1:50k) MGPG
- Contours From Linz
- Catchment Areas
- Wetlands
- Temporary Proposed Sediment Retention Ponds.

0 500 1,000 m

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Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL	Figure no.:	5
Figure:	PROPOSED MACRAES ROAD REALIGNMENT	Rev:	A
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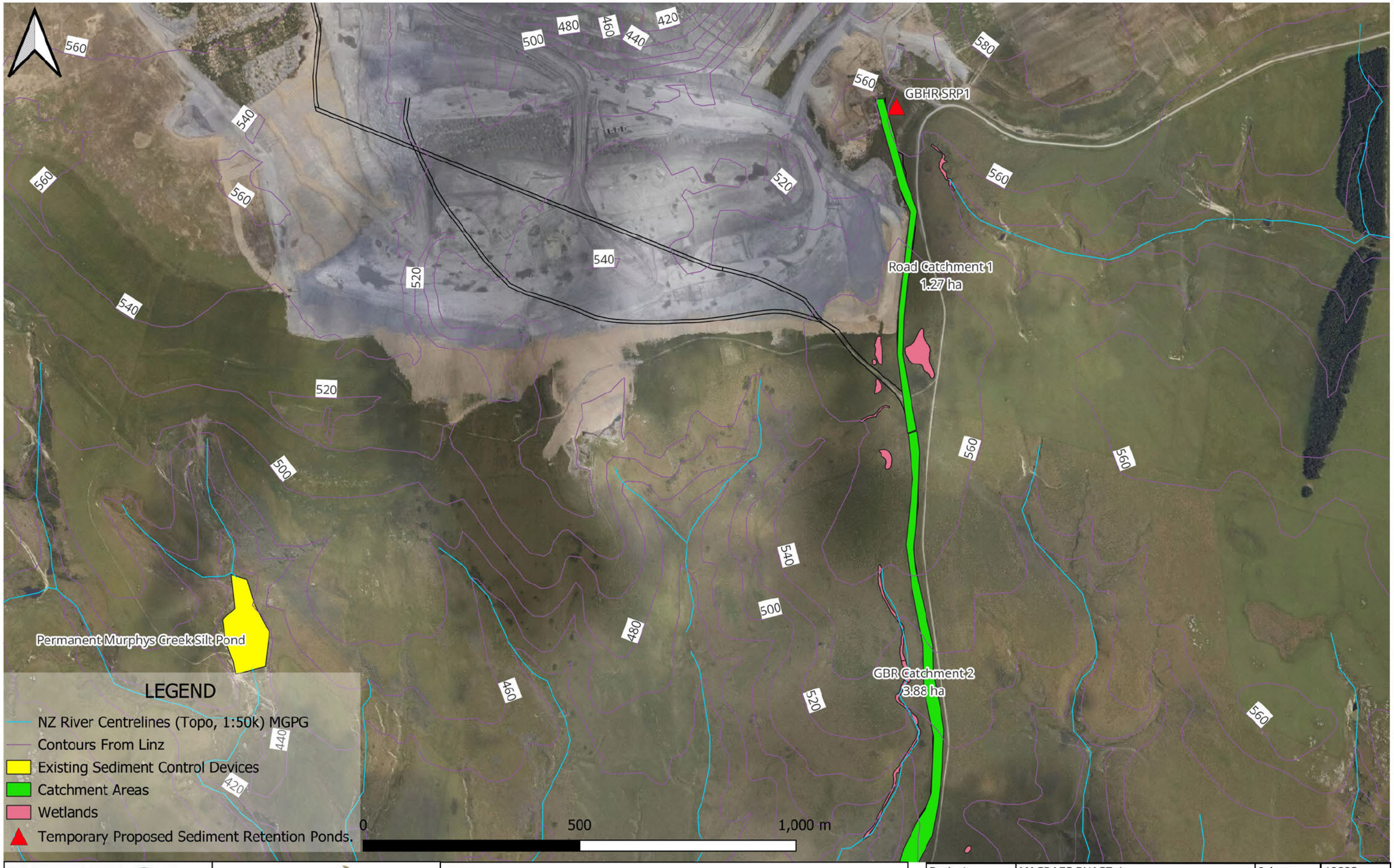
Checked By:	EM	Scale (A3)	1:8,000



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OCEANAGOLD MACRAES OPERATION

Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL	Figure no.:	6
Figure:	PROPOSED - GOLDEN BAR REALIGNMENT	Rev:	A
Drawn By:	PC	Date:	2026/08/26
Checked By:	EM	Scale (A3)	1:8,000

Permanent Murphys Creek Silt Pond

GBR Catchment 2
3.88 ha

GBHR SRP2

GBHR SRP3

GBR Catchment 3
4.78 ha

GBHR SRP4

GBR Catchment 4
2.24 ha

GBR Catchment 5
4.80 ha

GBHR SRP5

LEGEND

RiverCenterline and Names

NZ River Centrelines (Topo, 1:50k) MGPG

Contours From Linz

Existing Sediment Control Devices

Catchment Areas

Wetlands

Temporary Proposed Sediment Retention Ponds.

0 500 1,000 m

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OCEANAGOLD MACRAES OPERATION

Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL REPORT	Figure no.:	7
Figure:	PROPOSED - GOLDEN BAR ROAD REALIGNMENT	Rev:	A
Drawn By:	PC	Date:	2026/08/26
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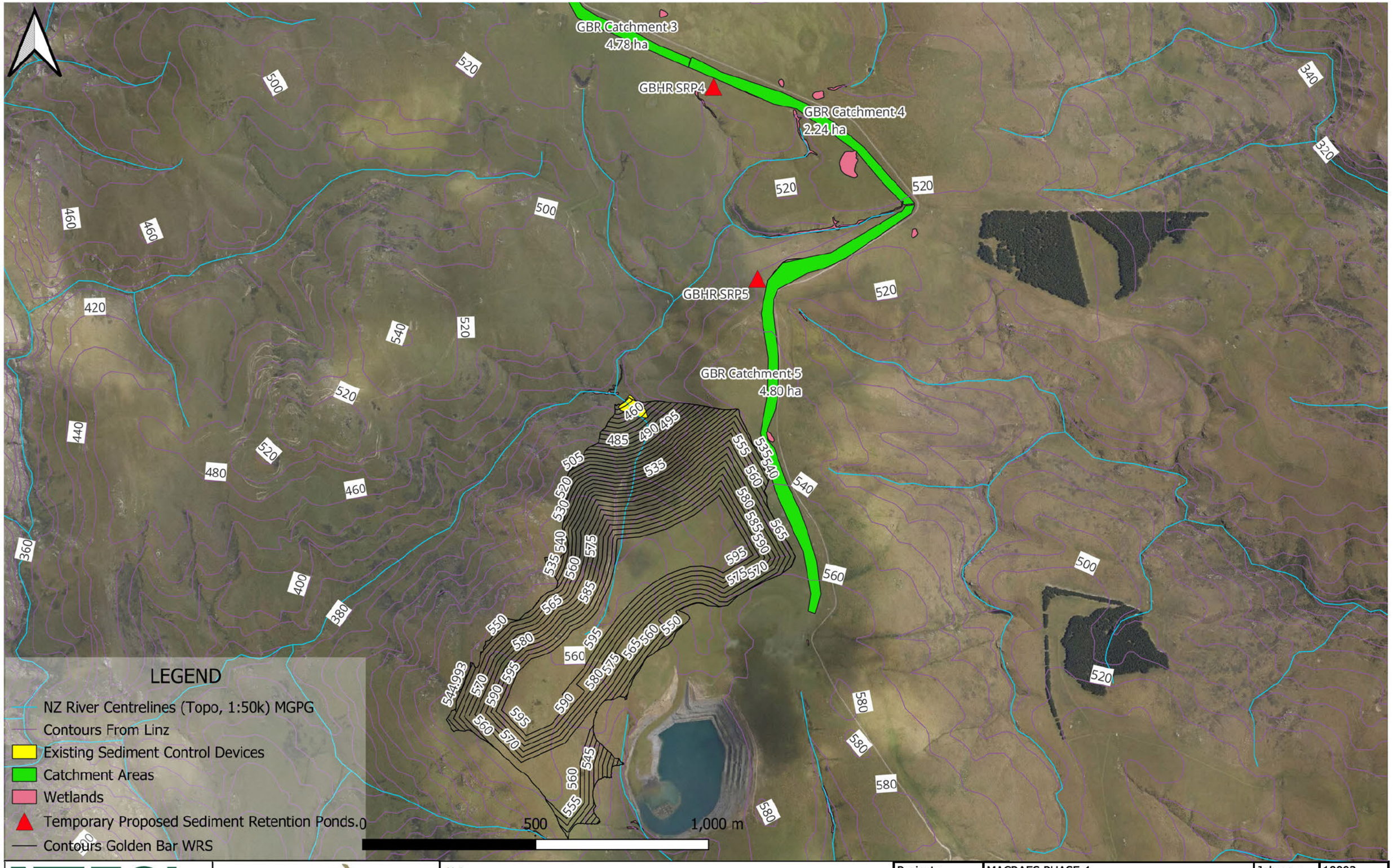

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OCEANAGOLD MACRAES OPERATION

Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL REPORT	Figure no.:	9
Figure:	PROPOSED - GOLDEN BAR ROAD REALIGNMENT	Rev:	A
Drawn By:	PC	Date:	2026/08/26
Checked By:	EM	Scale (A3)	1:5,000

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OCEANAGOLD MACRAES OPERATION

Notes:
Aerials and Topography from LINZ and OGL Recieved 08/01/2026.
Projected in MGPG.
Wetlands provided by OGL Recieved 15/06/2026.

Project:	MACRAES PHASE 4	Job no.:	10092
Report Title:	EROSION SEDIMENT CONTROL REPORT	Figure no.:	8
Figure:	PROPOSED - GOLDEN BAR ROAD REALIGNMENT	Rev:	A
Drawn By:	PC	Date:	2026/08/26
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PLATES

Plate 1. Clydesdale Silt Pond

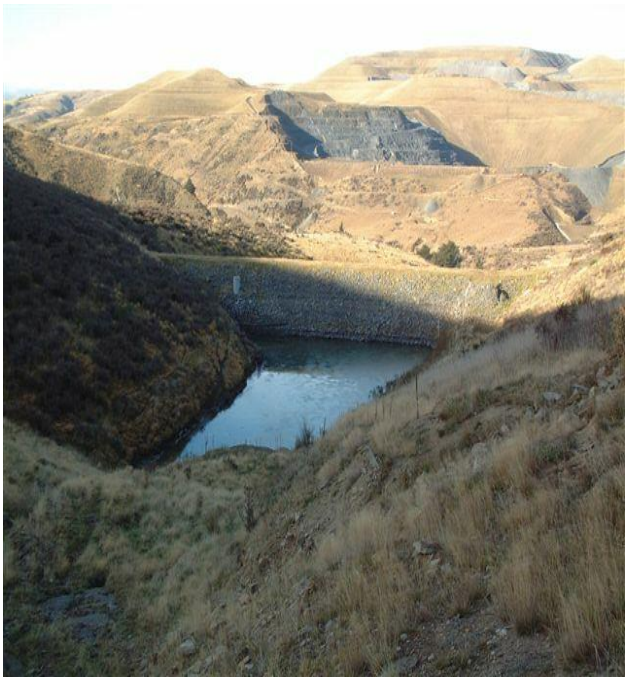

Plate 2. Deepdell North Silt Pond

Plate 3. Deepdell South Silt Pond

Plate 4. Frasers West Silt Pond

Plate 5. Murphys Creek Silt Pond

Plate 6. Typical Silt Pond Decant Structure

Plate 7. Rock Stack Tip Face (initial lift)

Plate 8. Rock Stack showing segregation of waste with coarse rock at base of lift