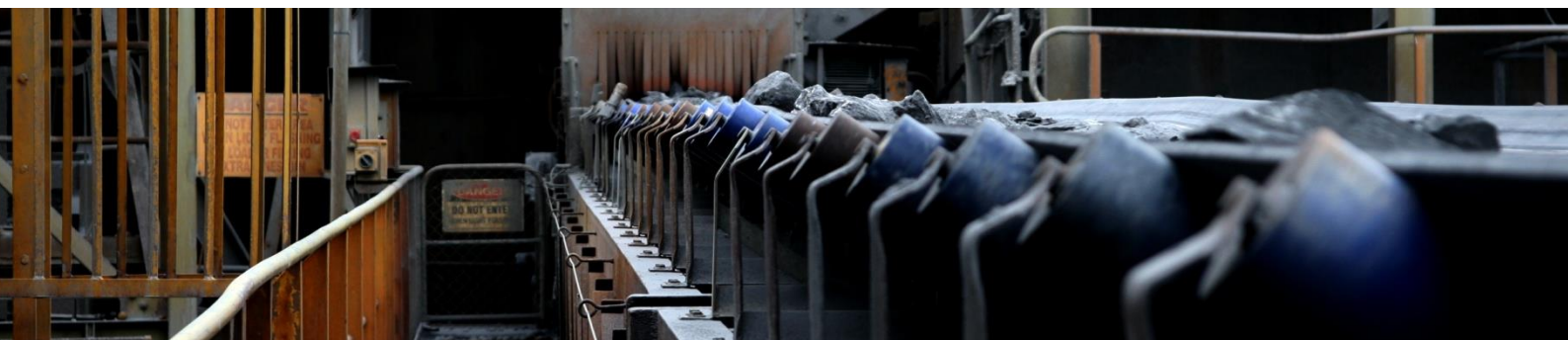




Coronation North Project

Assessment of Environmental Effects

24 May 2016



1 TABLE OF CONTENTS

1	Table of Contents.....	2
2	Executive Summary.....	9
3	Introduction.....	11
3.1	Background and site description.....	11
3.2	OceanaGold (New Zealand) Ltd Operations.....	12
3.3	Project Description.....	12
4	Legal Description.....	15
4.1	Land and Ownership.....	15
4.2	Neighbouring 'Sensitive Receptors'	15
5	Cross Boundary Co-operation.....	20
6	Activity Status and Consents Required.....	21
7	Statutory Considerations.....	26
7.1	Part II of the RMA	26
7.1.1	Section 105 of the RMA	28
7.1.2	Section 107 of the RMA	28
7.2	National Environmental Standards (NES).....	29
7.3	National Policy Statement for Freshwater Management.....	29
7.4	Regional Policy Statement for Otago (RPS).....	29
7.4.1	Operative RPS	29
7.4.2	Proposed RPS	32
7.5	Regional Plan: Water for Otago (RPW).....	34
7.6	Regional Plan: Waste for Otago (RP Waste).....	36
7.7	Regional Plan: Air for Otago (RPA)	36
7.8	Waitaki District Plan (WDP).....	37
7.8.1	Nature Conservation Values	38
7.8.2	Natural Hazards	39
7.8.3	Transport.....	39
7.8.4	Hazardous Substances	39
7.8.5	Farming Activity.....	39
7.9	Dunedin District Plan	40
7.9.1	Landscape.....	40
7.9.2	Hazards.....	40
7.9.3	Indigenous Vegetation and Fauna	40
7.9.4	Manawhenua.....	40
7.9.5	Sustainability	41
7.9.6	Farming Activity.....	41
7.10	DCC Proposed 2GP.....	41
7.11	KTKO NRMP 2005.....	42
8	The Mineral Resource.....	43
8.1	Mining History.....	43
8.2	Geology and Mineral Resources	44
8.3	Rationale for the Coronation North Project.....	44
9	Existing Environment.....	45
9.1	Landscape	45
9.2	Climate	45
9.3	Regional Geology	46
9.4	Topography and Soils.....	46
9.5	Groundwater, Surface Water and Hydrogeology	46
9.5.1	Introduction	46
9.5.2	Existing Water Quality & Compliance Levels	48
9.5.3	Groundwater	49
9.6	Ecology.....	51
9.6.1	Macraes Ecological District	51
9.6.2	Botanical Features	51
9.6.3	Avifauna and Herpetofauna.....	52
9.6.4	Aquatic Values	53
9.6.5	Benthic macroinvertebrate communities	53
9.6.6	Fish Communities	53
9.7	Human Environment.....	53
9.7.1	Community.....	53
9.7.2	Heritage Values.....	54
9.7.3	Summary of Tangata Whenua Values.....	54
9.7.4	Iwi Archaeology.....	55

9.8	Existing Economic and Social Environment.....	55
9.8.1	Population	55
9.8.2	Employment	56
9.9	Road Network.....	56
9.10	Noise.....	59
10	Detailed Project Description	60
10.1	Overview.....	60
10.2	Environmental Issues to be addressed	61
10.3	The Mine.....	62
10.4	Environmental Engineering and Management Details	62
10.5	Construction Phase.....	62
10.6	Ore Processing	63
10.7	Waste Rock Disposal.....	63
10.7.1	Overview	63
10.7.2	Description of Stacks.....	63
10.7.3	Environmental Engineering & Management Details	63
10.8	General Ground & Surface Water Management	64
10.8.1	Overview	64
10.8.2	Treatment Method Options.....	64
10.8.3	Coal Creek Freshwater Dam	65
10.9	Access, Site Roads, Public Roads.....	67
10.10	Utilities	69
10.10.1	Power Supply	69
10.10.2	Post Mining Phase	69
10.11	Infrastructure and Ancillary Features	69
10.11.1	Fencing	69
10.11.2	Fuel and Chemicals Storage	69
10.11.3	Temporary Buildings	71
10.12	Workforce	71
10.13	Rehabilitation	71
10.14	Mine Closure.....	72
10.14.1	Overview	72
11	Impact Assessment: Natural Environment.....	73
11.1	Water Quality	73
11.1.1	Surface Water Quality	73
11.1.2	Pit Lake Water Quality Modelling	75
11.1.3	Coal Creek Freshwater Dam	78
11.2	Aquatic Ecology – Effects and Mitigation	79
11.2.1	Introduction.....	79
11.2.2	Coal Creek Catchment.....	79
11.2.3	Mare Burn catchment.....	80
11.2.4	Mitigation	80
11.3	Terrestrial Ecology	82
11.3.1	Botanical Features	82
11.3.2	Botanical features – effects and mitigation.....	84
11.3.3	Avifauna and Herpetofauna – Effects and Mitigation.....	86
12	Impact Assessment: Human Environment.....	88
12.1	Economic Effects	88
12.2	Effects on Tangata Whenua Values.....	89
12.2.1	Culturally Important Landscape Features.....	90
12.2.2	Taonga Species	90
12.2.3	Sites of Significance, Waahi Tapu and Waahi Taonga.....	91
12.2.4	Water.....	91
12.2.5	Air.....	91
12.2.6	Conclusion.....	91
12.3	Amenity Effects	92
12.3.1	Introduction.....	92
12.3.2	Landscape and Visual Assessment.....	92
12.3.3	Landscape and Visual Assessment - Mitigation	93
12.4	Traffic.....	93
12.4.1	Effects on the Macraes transportation network	93
12.5	Noise.....	94
12.6	Blasting.....	96
12.6.1	Sensitive Areas	96
12.6.2	Blast Requirements	96
12.6.3	Predictions - Blast Induced Vibrations.....	96
12.6.4	Predictions – Airblast.....	96

	12.6.5	Potential Blasting Hazards	96
	12.6.6	Conditions of Consent	97
	12.6.7	Blasting/Vibration Summary	97
12.7		Dust	97
12.8		Seismic/Stability	99
	12.8.1	Waste rock stack stability	99
	12.8.2	Impact of WRSs on Open Pits	99
	12.8.3	Coronation North Pit Slope Design	99
	12.8.4	The Coal Creek Freshwater Dam	100
12.9		Heritage features	101
	12.9.1	Introduction	101
	12.9.2	Summary of archaeological values	101
	12.9.3	General Heritage Mitigation	101
	12.9.4	Summary	101
13		Affected Person/Consultation	102
	13.1	Affected Residences	102
	13.2	Consultation Undertaken	102
	13.2.1	Local Community	102
	13.2.2	Heritage New Zealand (HNZ)	102
	13.2.3	Department of Conservation (DoC)	103
	13.2.4	Kati Huirapa ki Puketeraki, Moeraki and Otakou	103
	13.2.5	Otago Fish and Game Council	104
14		Monitoring	105
	14.1	Existing Monitoring	105
	14.2	Proposed Monitoring	105
	14.2.1	Surface Water	105
	14.2.2	Ground Water	106
	14.2.3	Aquatic Biology	106
	14.2.4	Dust	107
	14.2.5	Noise	109
	14.2.6	Blasting	109
	14.2.7	Seismic/stability	110
	14.2.8	Dam Monitoring	110
	14.2.9	Restoration/Rehabilitation	110
15		Assessment of Alternatives	111
16		Conditions	112
17		Conclusion	113

List of Figures

Figure 3–1 General Location of Macraes Gold Operation	12
Figure 4–1 Coronation North Project Base Map.....	17
Figure 4–2 Coronation North Project Area	18
Figure 4–3 Coronation North Project Area – Contours.....	19
Figure 8–1 Macraes Historical Mining Areas.....	43
Figure 9-1 Roads within the MGP Area.....	57
Figure 1–2 Local road network.....	58
Figure 10-1 Consented realignment of Matheson Road.....	68
Figure 11-1 Coronation North Proposed Pit Lakes.....	76
Figure 14–1 Proposed Dust Monitoring Site Locations	108

List of Tables

Table 4.1: Land Legal Description.....	15
Table 6.1 Activity Status and Consents/Consent Variations Required - Waitaki District Council	21
Table 6.2 Activity Status and Consents Required - Dunedin City Council Operative Plan.....	22
Table 6.3 Activity Status and Consents Required - Dunedin City Council 2GP.....	23
Table 1.4 Activity Status and Consents Required - Otago Regional Council.....	24
Table 9.1 Estimated catchment areas of Coronation North Project elements.	47
Table 9.2 Deepdell Creek flow statistics.....	47
Table 9.3 Mare Burn derived flow statistics.....	48
Table 9.4 Summary of water quality monitoring data from MB01 (Dec 2014 - Nov 2015).....	48
Table 9.5 Water quality compliance criteria.....	49
Table 9.6 Daily Traffic Volumes.....	59
Table 11.1 Estimated 95 th percentile sulphate concentrations at Mare Burn compliance point MB02.	74
Table 11.2 Sulphate concentration during various mining stages.	74
Table 11.3 Pit Water Quality Assumptions.....	77
Table 11.4 Estimated pit water quality assumptions.	78
Table 11.5 Vegetation types, areas and percentages within the proposed development areas of the Coronation North Project Area.....	83
Table 11.6 Vegetation types in revised Project area.....	85
Table 12.1 Typical blast design parameters.....	96
Table 14.1 Proposed surface water quality compliance limits.	105

List of Appendices

- APPENDIX 1:** KTKO NRMP 2005 (Extracts)
- APPENDIX 2:** *Macraes Gold Project – Coronation North Project, Assessment of Economic Impacts*, Brown, Copeland and Co Ltd, April 2016
- APPENDIX 3:** *OceanaGold (NZ) Ltd Coronation North – Assessment of Environmental Effects of Discharges to Air*, Beca Infrastructure Ltd, April 2016
- APPENDIX 4:** *Coronation North Project, Surface Water Modelling*, Golder Associates New Zealand Limited, May 2016; *Arsenic and Iron Mobility in Coronation North Project Surface Water*, Golder Associates New Zealand Limited, 23 May 2016
- APPENDIX 5:** *Coronation North Project, Groundwater Assessment*, Golder Associates New Zealand Limited, May 2016
- APPENDIX 6:** *Coronation North, Ecological Impact Assessment, Vegetation, Avifauna & Herpetofauna*, ERA Ecology NZ Ltd, April 2016; *Clarifications regarding Coronation North (0219-04) and Coal Creek Dam (0219-08) Ecological Impact Assessments*, ERA Ecology NZ Ltd, 22 May 2016;
- APPENDIX 7:** *Ecological Impact of Proposed Coal Creek Water Storage Dam*, ERA Ecology NZ Ltd, 27 April 2016
- APPENDIX 8:** *Coronation Project, Aquatic Ecology Assessment*, Ryder Consulting Ltd, April 2016
- APPENDIX 9:** *Coronation North Macraes, Archaeological Assessment*, Origin Consultants, May 2016
- APPENDIX 10:** Memorandum of Understanding between Kati Huirapa Runaka ki Puketeraki and Oceana Gold (New Zealand) Limited
- APPENDIX 11:** *Coronation North Area Iwi Archaeological Survey*, May 2016, B.J. Allingham
- APPENDIX 12:** *Coronation North Project Transportation Assessment*, Carriageway Consulting, May 2016
- APPENDIX 13:** *Coronation North Project, Assessment of Noise Effects*, Hegley Acoustic Consultants, 3 May 2016
- APPENDIX 14:** *Macraes Gold Project Coronation North Project, Erosion and Sediment Control*, Engineering Geology Ltd, 29 April 2016
- APPENDIX 15:** *Coronation North Project, Water Quality Mitigation – Fresh Water Dam Scenario*, Golder Associates New Zealand Limited, April 2016
- APPENDIX 16:** *Macraes Gold Project Coronation North Project, Landscape and Visual Assessment*, Opus International Consultants Ltd, April 2016
- APPENDIX 17:** *Mining Vibration Assessment – Coronation Project Macraes NZ*, techNick Consulting Pty Ltd, March 2013 and *Technical Report Update – Mining Vibration Assessment Coronation Project Macraes NZ*, techNick Consulting Pty Ltd, December 2015
- APPENDIX 18:** *Macraes Gold Project, Coronation North Waste Rock Stack Design Report*, Engineering Geology Ltd, 29 April 2016
- APPENDIX 19:** *Impact of the Coronation and Coronation North Waste Rock Stack on Open Pits*, Pells Sullivan Meynink, April 2016

APPENDIX 20: *Coronation North Pit – slope design angles*, Pells Sullivan Meynink, April 2016

APPENDIX 21: *Macraes Gold Project Coal Creek Freshwater Dam Assessment*, Engineering Geology Ltd, May 2016

APPENDIX 22: *Coronation North Project, Impact Management of Project Ecological Effects*, ERA Ecology NZ Ltd, 22 May 2016

APPENDIX 23: Proposed Conditions of Consent

2 EXECUTIVE SUMMARY

OceanaGold Corporation (“OGC”) is a significant multinational gold producer and New Zealand’s largest producer of gold. OceanaGold’s current operating assets in New Zealand consist of two large open pit mines (at Macraes in the South Island and at Waihi in the North Island), and four underground mines (Frasers at Macraes and Favona, Trio and Correnso at Waihi). Further OceanaGold has a large open pit mine at Reefton in the South Island which was placed into care and maintenance in 2016. OceanaGold also owns and operates an open pit mine at Didipio in the Northern Philippines, and has another mine under development in South Carolina, United States.

The ore produced by the mine at Macraes (and until March 2016 Reefton) is processed at the Macraes Gold Project. OGC subsidiary Oceana Gold (New Zealand) Limited (“OceanaGold”) commenced operations in New Zealand at the Macraes Gold Project in 1990 and has been operating continuously since that time, for 26 years now. Presently the NZ operations directly employ close to 620 people, comprising the work forces for the three mine operations, together with staff based in the Dunedin office.

OceanaGold holds resource consents from Otago Regional Council (“ORC”), Dunedin City Council (“DCC”) and Waitaki District Council (“WDC”) for the Coronation Project (“Coronation”). Coronation is an extension of the Macraes Gold Project. Coronation is located on the ridgeline to the north of Horseflat Road along the Shag River and Taieri River catchment divide. It straddles the DCC and WDC boundaries.

Recent exploration success has resulted in OceanaGold reviewing its long term mine plan for Macraes. The Coronation North Project is a further expansion and will add about 3 years to the mine life.

The main features of the Coronation North Project will be:

- Expansion of the currently consented Coronation Pit;
- Reduction in size of the consented Coronation Waste Rock Stack;
- Construction of a new Coronation North Pit;
- Construction of a new Coronation North Waste Rock Stack;
- Extension of the existing haul road by 2 kilometres;
- Variation of the realignment to unformed Matheson Road that was consented for Coronation Project;
- Potential construction of a freshwater storage dam;
- Potential construction of new temporary buildings adjacent to Coronation North Pit;
- Creation of diversion drains, silt control dams and sediment control facilities surrounding the pits, waste rock stacks and haul road.

The following matters will not change from the consented Coronation Project:

- The Coronation North Project will use the existing haul road and existing infrastructure (such as toilet facilities and cribroom, diesel storage and refuelling facility) which will remain in place.
- The same mining fleet equipment that is being used for Coronation will be used for Coronation North Project.
- The existing processing rate at the plant of approximately six million tonnes per annum will remain the same.
- Progressive rehabilitation of the waste rock stack, opportunistic pit backfilling and formation of pit lakes at closure.

Effects on traffic, noise, dust and vibration have been assessed and are of a similar nature to effects of existing operations, and are considered acceptable.

Effects on landscape and visual values have been assessed and overall are considered acceptable. There is one viewpoint where the visual impact will be high, reducing, with rehabilitation, to moderate over time.

Large scale mining results in the mobilisation of naturally occurring metals and other substances from the rock mass. These can find their way through groundwater and overland flow to the surface water bodies in and around the mine area, giving rise to impacts on surface water quality. This is an expected consequence of hard rock mining, and has been actively managed since mining commenced at Macraes. A detailed assessment of effects on water quality of receiving water (pit lakes, streams and rivers) has been undertaken. The assessments recommend a package of measures that will manage water quality outputs to ensure there is compliance with appropriate standards at the various relevant monitoring points. Part of the package includes the possible construction of a freshwater storage dam on Coal Creek (a tributary to Mare Burn) to be used to supplement natural low flow periods and dilute sulphate within discharged mine water. The proposed dam may not be required or may be reduced in scale (or possibly located elsewhere) as a result of OceanaGold's ongoing work to identify viable alternative mitigation methods to achieve water quality. OceanaGold intends to consent the proposed dam, but before it seeks to activate those consents the company will provide consent authorities with a mitigation and best practice options (BPO) report which identifies whether the dam is the best way to ensure water quality. Should the BPO report identify better mitigation options OceanaGold will apply for consent variations or new consents as are required.

There will be minor and temporary changes to downstream water availability. This will not have an adverse impact on aquatic ecology values and will have a minor effect on water users in the Mare Burn Catchments. Potentially the freshwater dam will benefit local farming by providing a secure supply of stock and/or irrigation water.

The Coronation North Project footprint will have an unavoidable impact on terrestrial and aquatic ecology values and some heritage and archaeology values. OceanaGold is proposing an ecological mitigation package and continues consultation with key stakeholders on this topic. As a result of expert assessments OceanaGold proposes to amend the project footprint in order to mitigate or avoid potential adverse effects on some values. For example, the Coronation North Waste Rock Stack will be modified to avoid archaeological features within the upper tributaries of Trimbells Gully. As a number of technical reports have been prepared on the basis of the larger, initial footprint the technical reports attached to the Assessment of Environmental Effects ("AEE") represent a conservative or "worst-case" scenario. During consultation on mitigation further amendments to the project footprint may be agreed in order to avoid some values, whilst recognising that there are constraints on the ability to avoid impacts on many values since mining and associated infrastructure needs to be based on the location of the gold resource. Accordingly the final Project footprint is likely to change further. **Figure 2-1** shows a refined footprint (and the relevant footprint for the purposes of this application) and identifies some values that OceanaGold intends to avoid.

In summary the Coronation North Project will assist in providing for the continuation of a range of major benefits from the Macraes Gold Project relating to employment and socio-economic well-being and will continue to support the infrastructure and activities of local communities through rating and other direct and indirect contributions.

Potential adverse effects are of a similar nature to those currently managed by OceanaGold at MGP. Comprehensive modelling and monitoring, combined with operational management and careful post-mining planning, will result in adverse effects being avoided, remedied or mitigated appropriately and in accordance with accepted industry standards.

3 INTRODUCTION

3.1 Background and site description

The Macraes Gold Project (“MGP”) is located approximately 30 kilometres (km) to the northwest of Palmerston in the Otago Region of the South Island, New Zealand (**Figure 3–1**). The existing main mining operation is located 1 to 2 km to the east of the Macraes township and is predominantly surrounded by farmland. The proposed Coronation North Project is located to the north of the existing mining operation.

The Project continues to be located on the ridgeline located to the north of Horse Flat Road along the Shag River and Taieri River catchment divide and is situated between the features known as Sister Peaks and Highlay Hill.

Development will continue to be within the upper reaches of Maori Hen Creek, Mare Burn Creek and Trimbells Gully Creek (Taieri Catchment).

The Waitaki District Council and Dunedin City Council boundary passes through the Coronation site. The Coronation North Waste Rock Stack and Coronation North Pit will be entirely within the DCC District. The extension of the existing Coronation pit will be partly in the DCC District but largely in the Waitaki District.

The MGP was commissioned in 1990 following the construction of a gold processing plant to treat ore mined from open pit mining methods. The processing plant capacity has increased since 1990 through continual upgrades and now processes approximately 6 million tonnes of ore per annum which currently includes remaining stockpiled ore concentrate sourced from OceanaGold's Reefton Globe Progress Gold Mine (which was placed in care and maintenance in March 2016).

Mining operations continue using open pit methods combined with an underground mine that has been operating since 2006.

The MGP is the largest goldmine in New Zealand and since the commencement of operations 4.4 million ounces of gold has been produced.

OceanaGold extended the operational life of the MGP beyond 2012 with the granting of resource consents for the Macraes Phase III project (“MPIII”). Remaining ore stocks identified at that time and currently capable of economic extraction are scheduled to be mined out over the next 12 to 18 months. Mining at Coronation, under existing consents, will be completed this year.

The Coronation North Project resource consents now sought by OceanaGold will extend the MGP mine life and its attendant benefits to the local and regional communities by an additional 3 years of ore processing (i.e. it is expected that the Coronation North Project will contribute around 12.5 million tonnes of ore), using existing tailings capacity consented as part of MPIII and taking mining operations at MGP to about 2020.

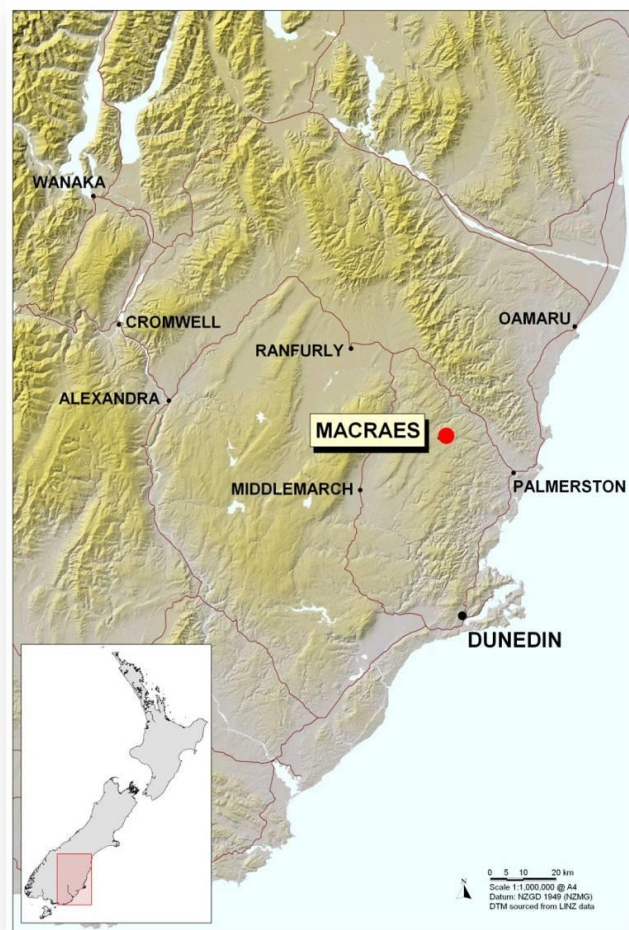


Figure 3–1 General Location of Macraes Gold Operation

3.2 OceanaGold (New Zealand) Ltd Operations

OceanaGold (New Zealand) Limited (OceanaGold) is a wholly owned subsidiary of Oceana Gold Corporation (“OGC”). OGC is a publicly listed company on the Australian, New Zealand and Toronto stock exchanges.

OceanaGold currently provides about 620 jobs for permanent staff between its MGP, Reefton and Waihi operations. Of this total, the Macraes operation has approximately 440 employees engaged at the site and a further 25 engaged in Dunedin.

The Macraes mining and prospecting/exploration tenements cover a contiguous area of 15,705 hectares. OceanaGold does not own all of the land in the prospecting/exploration tenements and enters access arrangements with landowners to enable prospecting/exploration activities.

3.3 Project Description

OceanaGold is continually reviewing the life of the MGP in light of current knowledge of the gold resource and the economic value of mining. Recent exploration success has highlighted opportunities for expansion of the mine area. The Coronation North Project (“the Project”) is an extension to the existing consented Coronation project. A summary of the main features of the Coronation North Project follows:

- Extension of the existing consented Coronation Pit from a total area of about 62 hectares to about 85 hectares (an increase of 23 hectares), which will expand expected ore recovery from 5Mt to approximately 8.5Mt (including that which has already been extracted).
 - The extension will be primarily to the southern end of the Coronation Pit, expanding from the currently consented edge of the pit.
 - The expanded Coronation Pit will continue to be opportunistically partially backfilled where practicable and a pit lake, similar to that currently consented, will remain on closure.
- Mining of a resource which has been identified within the area of the existing consented Coronation Waste Rock Stack. A new open pit (Coronation North Pit) will be developed. Coronation North Pit will cover a maximum potential area of 63 hectares and is estimated to contain approximately 9Mt of ore (for total additional ore stocks comprised in this application of 12.5 Mt).
 - The Coronation North Pit will be opportunistically partially backfilled where practicable and will become a pit lake upon closure.
- The existing Coronation Waste Rock Stack will not be constructed to the fully consented extent. The total volume of waste rock will reduce from a currently consented 94Mt (an area of approximately 105 hectares) to approximately 29Mt (an area of approximately 41 hectares). This is a reduction of approximately 65Mt (and 64 hectares in area). The consented maximum height of the Coronation Waste Rock Stack will remain 730 mRL.
- A new waste rock stack (Coronation North Waste Rock Stack) will be constructed to the north east of the existing Coronation Waste Rock Stack. If constructed to its greatest extent the total volume of waste rock will be a maximum of 280 Mt (a maximum potential area of about 230 hectares). The maximum height will be 695mRL.
 - The Coronation North Waste Rock Stack is capable of containing the total excavated waste material from Coronation North Pit and the Coronation Pit expansion.
 - With the potential for opportunistic backfill placement within the Coronation pits, the size of the waste rock stack may reduce in proportion to the amount of backfill placed in the pits.
- All water from the Coronation North Pit and Coronation North Waste Rock Stack and any overflow from the Coronation Pit lake will report to the Mare Burn catchment, a tributary of the Taieri River.
- A freshwater dam may be constructed within Coal Creek catchment. The proposed dam will consist of an embankment with an approximate height of 27m behind which about 685 million litres of water will be stored when at full capacity. This dam will provide a constant water supply downstream, of about 5 litres per second, to supplement naturally occurring low flows in Coal Creek and Mare Burn for water quality purposes.
- Coronation Project consent conditions provide for unformed Matheson Road to be realigned and unformed public access (15 metres wide) to be provided around the consented Coronation pit and waste rock stack when mining operations cease. Since the footprints of the Coronation North Pit and Coronation North Waste Rock Stack overlap the consented realignment OceanaGold will identify an alternative route for the realigned Matheson Road and apply to vary the Coronation land use consent.
- The existing haul road will be extended by about 2km to the north to reach the Coronation North Pit.

- As is currently occurring, ore will be hauled from the pits to the Macraes processing plant via the existing haul road across Horse Flat Road and along the Golden Point Road alignment to the processing plant.
- In all other respects, the roading for the Project will remain the same as for the consented Coronation project.
- New temporary buildings (including toilet facilities and crib room) may be located adjacent to the Coronation North Pit.
 - Temporary buildings already in place beside Coronation Pit will remain.
 - The portable diesel storage and refuelling facility installed adjacent to Coronation Pit will remain and be utilised for the Project.

The Project will be carried out, managed and monitored on substantially the same basis as the consented Coronation Project during operations in terms of mining methods, operating 24 hours a day seven days a week, drilling and blasting, use of the existing fleet of diesel powered mining equipment, transport movements, dust management, surface water and groundwater management, sediment control, progressive rehabilitation of waste rock stacks, and opportunistic backfilling of pits during operations.

The Project will be carried out on substantially the same basis as the consented Coronation Project during closure in terms of formation of pit lakes, removal of any buildings and other temporary structures, decommissioning of the silt ponds to likely become stock water ponds, removal of the haul road crossing over Horse Flat Road, and rehabilitation of the main haul road from the pits and waste rock stacks to Horse Flat Road. On the completion of mining and rehabilitation Golden Point Road will be reopened for public access.

The estimated duration of the operation and rehabilitation phases of the Project will be approximately 5 years and the Project will add approximately 3 years of operations to the MGP mine life.

4 LEGAL DESCRIPTION

4.1 Land and Ownership

The legal descriptions of land upon which aspects of the proposed Coronation Project will be located are identified in Table 4.1 as follows:

Table 4.1: Land Legal Description

Coronation Project Element	Parcel Description	CT Number	Owner
Coronation North Waste Rock Stack	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold
Coronation North Open Pit	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold
Pit Infrastructure	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold
Silt Ponds	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold
Additional Haul Road	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold
Coronation Pit Extension	Part Section 2 Block V Highlay SD Lot 1 DP 465577 Part Section 2 Block VII Highlay SD Part Section 11 Block VII Highlay SD	OT15A/514 OT620415 OT16B/855	OceanaGold OceanaGold OceanaGold OceanaGold
Coal Creek Freshwater Dam	Part Section 2 Block V Highlay SD	OT15A/514	OceanaGold

Figure 4–1 identifies land ownership, for the proposed Coronation North Project elements. **Figure 4–2** provides a closer view of the Coronation project elements on an orthophoto base. The same layout is provided on a topographical background at **Figure 4–3** to show the site contours.

4.2 Neighbouring ‘Sensitive Receptors’

As **Figure 4-1** demonstrates, OceanaGold owns the land upon which the Coronation North Project is located, including one residence. OceanaGold leases properties to the Howard family and to the Peddie family and those properties are actively farmed. Both have been consulted about the Project and do not object to it.

For the purposes of the expert assessments that support these applications, and for this AEE, the properties and residences that are owned by OceanaGold are not considered as ‘affected’ by the Project, although for completeness the residences are identified in **Figure 4–1**.

The privately owned residences in the vicinity of the Coronation Project, that have been considered as ‘sensitive receptors’ of effects such as noise, dust, blasting and vibration and visual amenity are:

- C and M Howard residence – Bellfield homestead – Horse Flat Road – situated about 2 km from the Project area
- R and M O'Connell residence – situated at the end of the road past the school (past the village) about 7km from the Project area
- O'Neil residence – Mount Highlay homestead about 3.5km from the Project area
- Roy residence – situated just over 5km from the Project area.

This AEE has taken into account the effects of the Coronation North Project on these residences.

Figure 4–1 Coronation North Project Base Map

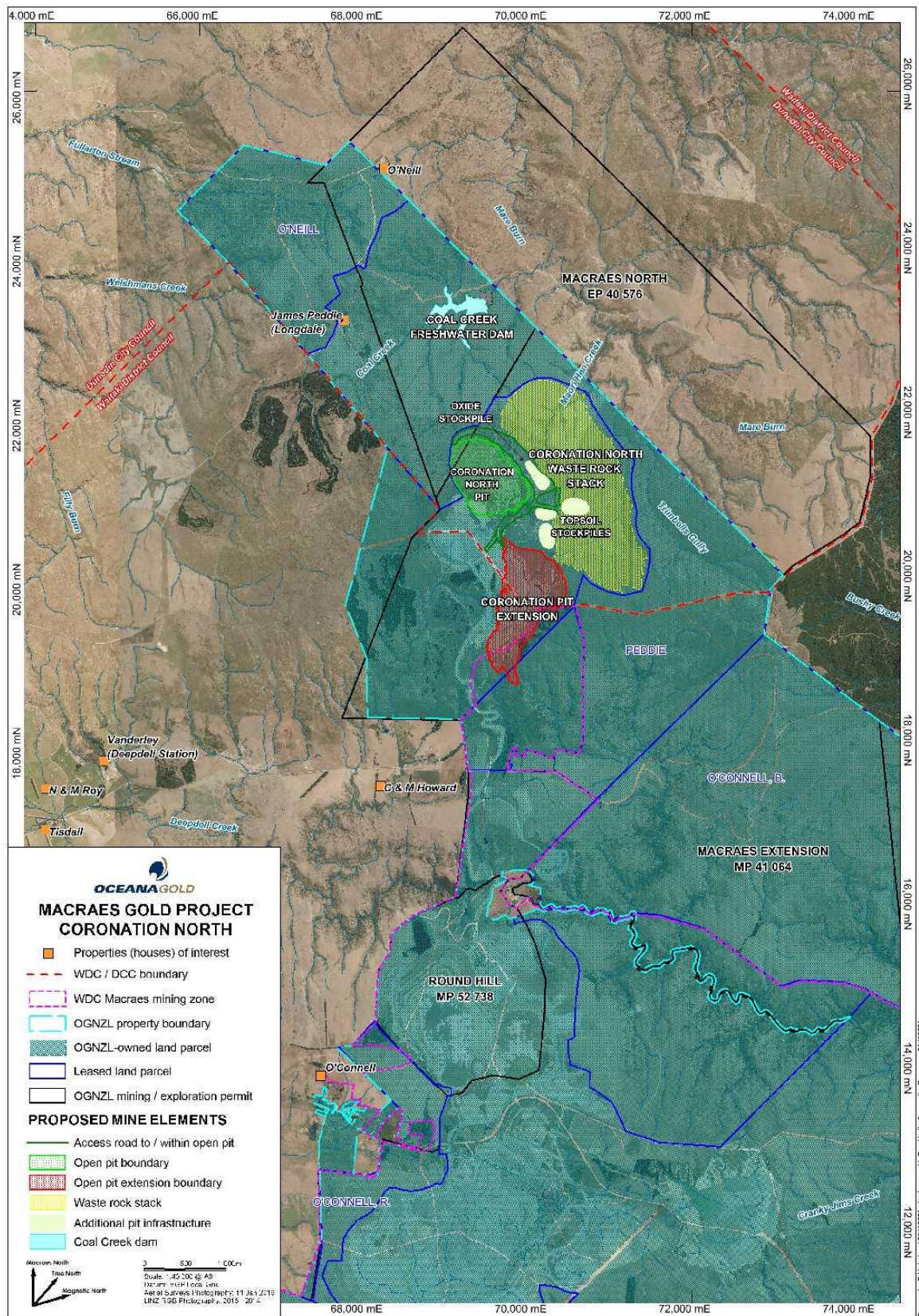


Figure 4-2 Coronation North Project Area

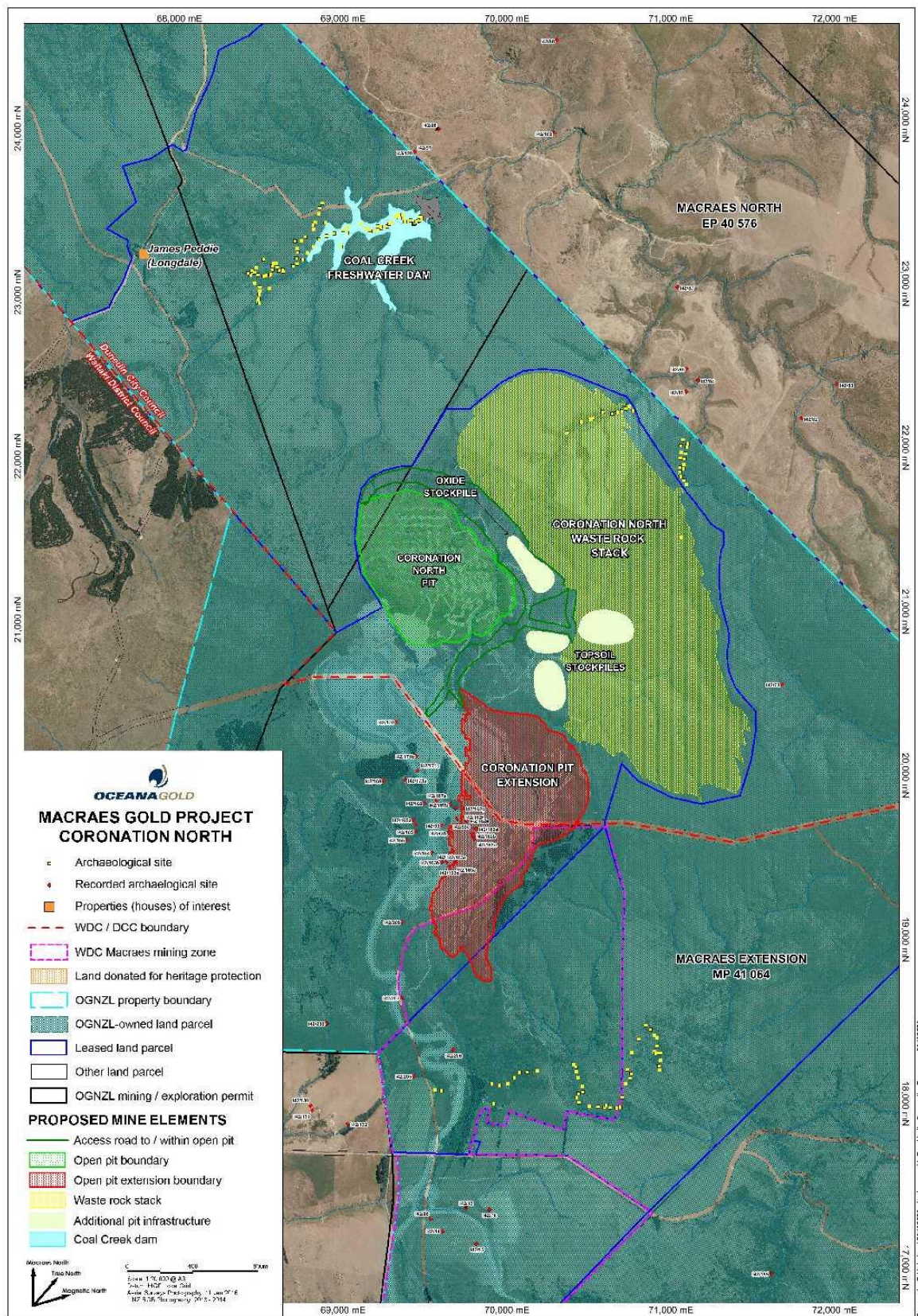
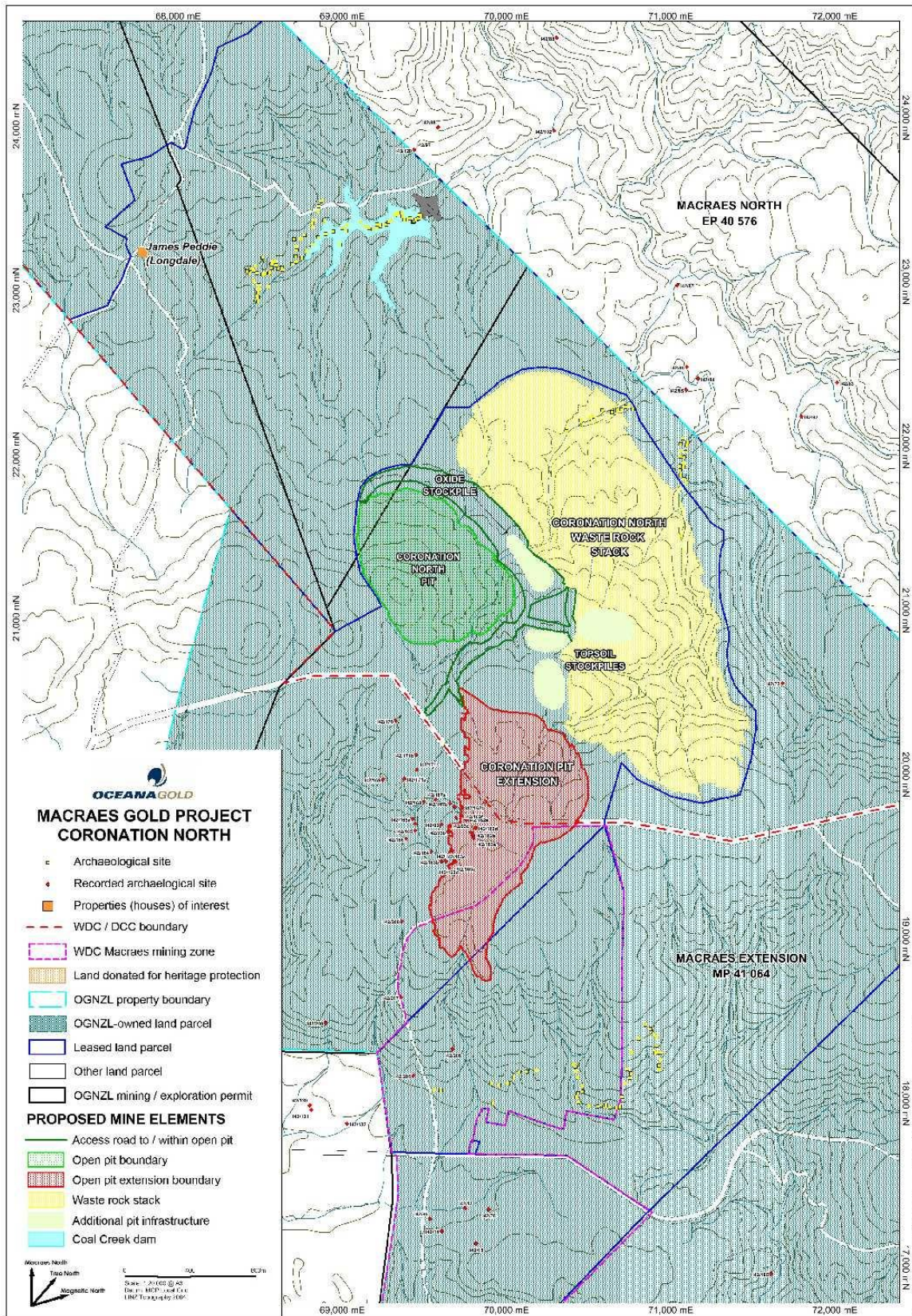


Figure 4-3 Coronation North Project Area – Contours



The Coronation North Project is located entirely within the Otago region, but the Project elements are situated partly within the WDC boundary and partly within the adjacent DCC boundary. Any environmental effects of the project will straddle these district boundaries. Accordingly the three Councils (ORC, WDC and DCC) will be required to address cross-boundary issues in a co-ordinated way. This will be achieved through a joint hearing process, which will invite a co-operative and co-ordinated response to issues and should result in the integrated management of any adverse effects. The effective management of resources will be ensured by ongoing monitoring of the environment and the processes put in place as part of the Coronation North Project.

OceanaGold understands that the ORC is likely to take the lead in any arrangements for a hearing as it did for the Coronation Project.

6 ACTIVITY STATUS AND CONSENTS REQUIRED

The following four tables identify the activity status of mining activities associated with the Coronation North Project, and the consents or extensions to consents required from the WDC, DCC and ORC respectively.

Table 6.1 Activity Status and Consents/Consent Variations Required - Waitaki District Council

Type	Purpose	Plan Rule	Activity Status
Land Use	a) Extraction of minerals and overburden by mechanical means from Coronation Open Pit (centred at grid reference NZTM 1395770E 4977492N);	6.3.2(1) (within MMPMineral Zone) 4.3.3(4) (within Rural Scenic Zone)	Restricted Discretionary Discretionary
	b) Deposition of waste rock (centred at grid reference NZTM 1395770E 4977492N) as backfill into the Coronation open pit;	6.3.2(1) (within MMPMineral Zone) 4.3.3(4) (within Rural Scenic Zone)	Restricted Discretionary Discretionary
	c) Operation and maintenance of various silt ponds and silt control facilities for controlling runoff from mining operations;	6.3.2(1) (within MMPMineral Zone) 4.3.3(4) (within Rural Scenic Zone)	Restricted Discretionary Discretionary
	d) Use of a haul road;	6.3.2(1) (within MMPMineral Zone) 4.3.3(4) (within Rural Scenic Zone)	Restricted Discretionary Discretionary
	e) Use of 2 haul road crossings;	6.3.2(1) (within MMPMineral Zone) 4.3.3(4) (within Rural Scenic Zone) 12.1.1	Restricted Discretionary Discretionary Discretionary
	f) Realignment of Matheson Road and variation to timing of re-opening of Golden Point Road	6.3.2 (within MMPMineral Zone) 4.3.3(4) or 4.3.3(14) (within Rural Scenic Zone)	Discretionary Discretionary
	g) Use and storage of hazardous substances (explosives and diesel)	16.1.2(1)	Discretionary
	h) Use of temporary buildings;	10.1.1.2	Discretionary
	i) Decommissioning and rehabilitation of the structures and works listed above.	4.3.3(4)	Discretionary

Additional approvals will be required pursuant to the Heritage New Zealand Pouhere Taonga Act 2014 and the Building Act 2004 for works affecting historic sites and construction of the waste rock stack. A building consent will also be required for construction of the Coal Creek Dam if it proceeds. OceanaGold will manage these applications separately. OceanaGold holds numerous archaeological authorities and building consents for the MGP and complies with their requirements.

It is noted that mining activity within the Rural Scenic Zone is expressly provided for as a discretionary activity in rule 4.3.3(4). This indicates the recognised value of the mining industry to the district.

There are district wide rules relevant to the Rural Zone, including resource consent assessment matters (18.2). The assessment matters will be considered by the WDC when assessing these applications. For mining activities this includes matters such as: vegetation clearance; roads and buildings; rehabilitation; dust, noise, lighting, vibration; contingency plan for early mine closure; bond; and monitoring (18.2xxiii). Assessment matters relating to general nature conservations values, riparian management (18.2xxvi) and the surface of waterways (18.2xxix) may also be relevant. These matters are generally addressed within the AEE as each aspect of the Coronation North Project is assessed for any environmental effects.

In the WDP "development" and "other development" is defined in Section 14.1 and includes: construction of any building, fixed plant or machinery, or other works; drainage, earthworks, filling or reclamation of land; the removal of rocks, or soil from land; the removal or destruction of vegetation; the arresting or elimination of erosion or flooding; and development for mining activity. Development which has a value exceeding \$200,000 may attract a development contribution requirement under 14.2.2(2) (a) or (b) to enable the WDC to provide for open space and recreation. This provision is not considered applicable to the Coronation North Project because the project does not create any demand for additional open space or recreation within the district. The same approach was adopted for the larger MPIII project, and for the Coronation Project, and there is no reason to depart from this approach.

There will be a variation required to Land Use Consent (WDC Reference: 201.2013.360, DCC Reference: LUC-2013-225) conditions 13.1 and 13.3 relating to roading (additions in bold, deletions in strikethrough).

13.1 Within 6 months of **Coronation and Coronation North** pit excavations ceasing the consent holder shall reinstate for public use that part of Golden Point Road south of Horse Flat Road shown on "Coronation Project October 2013 WDC/DCC LUC Consents Map 1" annexed.

The change to condition 13.1 will provide for reinstatement of Golden Point Road once pit excavations at **both** Coronation pits have ceased.

13.3 The consent holder shall provide unformed legal public access of a width not less than 15m that generally follows the blue line, and orange line north of Horse Flat Road shown on "Coronation Project October ~~2013~~ **2016** WDC/DCC LUC Consents Map 1" annexed.

The change to condition 13.3 will provide for an alternative realignment of Matheson Road, an unformed road, to avoid the Coronation North Pit and Coronation North waste rock stack footprints (this aspect of the project is further detailed in the Project Description, Section 10.9, of this AEE). OceanaGold will consult with Mr Roy (whose appeal resulted in the current consented alignment) and the Councils regarding an appropriate alternative alignment, and a revised plan containing an alternative 'blue line' will be annexed to the land use consent.

Table 6.2 Activity Status and Consents Required - Dunedin City Council Operative Plan

Type	Purpose	Plan Rule	Activity Status
Land Use	a) Extraction of minerals and overburden by mechanical means from Coronation North Pit (centred at grid reference NZTM 1394460E 4978050N);	6.5.6(v) 17.7.5	Discretionary Restricted Discretionary
	b) Deposition of waste rock produced by the operation to Coronation North Waste Rock Stack(centred at grid reference NZTM 1395310E 4978930N) and the deposit of waste rock as backfill into the Coronation North open pit;	6.5.6(v)	Discretionary

c)	Construction, operation and maintenance of various silt ponds and silt control facilities for controlling runoff from mining operations;	6.5.6(v) 17.7.5	Discretionary Restricted Discretionary
d)	Construction and use of haul roads;	6.5.6(v) 17.7.5	Discretionary Restricted Discretionary
e)	Construction and use of temporary buildings;	6.5.6(v)	Discretionary
f)	Earthworks in wetlands;	16.6.2(ii)	Discretionary
g)	Clearance or modification of indigenous vegetation;	16.6.2(i)	Discretionary
h)	Decommissioning and rehabilitation of the structures and works listed above;	6.5.6(v) 16.3.3(13) 16.3.4(16)	Discretionary Discretionary or Restricted Discretionary
i)	The excavation, construction and operations of Coal Creek Dam and tracks associated with mining.	6.5.6(v) 16.3.3(13) 16.3.4(16)	Discretionary Discretionary or Restricted Discretionary

Additional approvals will be required pursuant to the Building Act 2004 for construction of the waste rock stack and Coal Creek Dam, if it proceeds, as well as any temporary buildings. As previously mentioned OceanaGold has experience in making these applications and will manage them separately to this consenting.

The assessment matters set out in 6.7 of the DDP will be considered when the DCC is assessing these applications. These matters are generally addressed within the AEE as each aspect of the Coronation North Project is assessed for any environmental effects.

The DCC's development contribution policy has been reviewed and is not considered applicable to the Coronation North Project. This is consistent with the MPIII and Coronation resource consent processes where the Waitaki District Council's development contribution policy was not considered applicable.

Table 6.3 Activity Status and Consents Required - Dunedin City Council 2GP

As there is a proposed 2GP consents are required under both the operative plan and the proposed plan.

Type	Purpose	Plan Rule	Activity Status
Land use	Mining (not in a General Residential 1 Transition Overlay Zone)	16.3.3 13	Discretionary
	Buildings and structure activities	16.3.3 3	Permitted
	Earthworks – large scale	16.3.3 16	Restricted discretionary

16.10.3 addresses the assessment of restricted discretionary development activities. For large scale earthworks that exceed the scale thresholds for the rural zones, the Council retains a discretion over the effects on visual amenity and character, effects on the amenity of surrounding properties, and effects on the stability of land, buildings and structures. For large scale earthworks that exceed scale thresholds within 20 metres of a water body the Council retains a discretion over effects on biodiversity and natural character of riparian margins and effects on public access.

Table 6.4 Activity Status and Consents Required - Otago Regional Council

Type	Purpose	Plan Rule	Activity Status
Coronation North Waste Rock Stack			
Land Use	To disturb, deposit and reclaim the bed of unnamed tributaries of Maori Hen Creek, Trimbells Gully, Mare Burn and Camp Creek for the purpose of constructing the Coronation North Waste Rock Stack.	RPW 13.5.3.1	Discretionary
Discharge	To discharge silt and sediment to water for the purpose of constructing the Coronation North Waste Rock Stack.	RPW 12.C.3.2	Discretionary
Discharge	To discharge waste rock and contaminants from waste rock to land for the purpose of constructing the Coronation North Waste Rock Stack.	RPWaste 6.6.1(1)	Discretionary
Discharge	To discharge contaminants to water from the base and toe of the Coronation Waste Rock Stack for the purpose of waste rock disposal.	RPWaste 6.6.1(2)	Discretionary
Discharge	To discharge water from silt ponds to unnamed tributaries of Maori Hen Creek, Trimbells Gully, Mare Burn and Camp Creek for the purpose of operating silt ponds for the Coronation North Waste Rock Stack.	RPW 12.C.3.2	Discretionary
Coronation North Open Pit			
Water	To take surface water for the purpose of dewatering Coronation North Pit.	RPW 12.1.4.2	Restricted Discretionary
Water	To take groundwater for the purpose of dewatering Coronation North Pit.	RPW 12.2.4.1	Discretionary
Water	To divert water around the open pit known as Coronation North Pit for the purpose of preventing surface water ingress and managing the surface water runoff.	RPW 12.3.4.1	Discretionary
Discharge	To discharge waste rock to land within the Coronation North Pit for the purpose of disposing of waste rock.	RPWaste 6.6.1(1)	Discretionary
Coronation North Pit Lake			
Water	To dam water in Coronation North Pit for the purpose of creating the Coronation North Pit Lake.	RPW 12.3.4.1	Discretionary
Water	To take groundwater for the purpose of	RPW 12.2.4.1	Discretionary

	creating the Coronation North Pit Lake.		
Water	To take surface water for the purpose of creating the Coronation North Pit Lake.	RPW 12.1.4.2	Restricted Discretionary
Discharge	To discharge water from Coronation North Pit Lake to unnamed tributaries of Maori Hen Creek, Trimbells Gully, Mare Burn and Camp Creek for the purpose of pit lake overflow.	RPW 12.C.3.2	Discretionary
Air			
Discharge	To discharge contaminants from mining operations and post mining rehabilitation to air for the purpose of undertaking mining operations.	RPA 16.3.5.9	Discretionary
Coal Creek Fresh Water Dam			
Discharge	To discharge silt and sediment to Coal Creek for the purpose of constructing the Coal Creek Freshwater Dam	RP Waste 6.6.191)	Discretionary
Water	To dam water for the purpose of operating the Coal Creek Freshwater Dam	RPW 12.3.4.1	Discretionary
Water	To divert water for the purpose of construction of the Coal Creek Freshwater Dam	RPW 12.3.4.1	Discretionary
Discharge	To discharge water from the Coal Creek Freshwater Dam to Coal Creek for the purpose of operating the Coal Creek Freshwater Dam and supplementing flows in the Coal Creek and Mare Burn catchments	RPW 12.B.4.1	Discretionary
Land Use	To place a structure and disturb the bed of Coal Creek for the purpose of constructing the Coal Creek Freshwater Dam embankment	RPW 13.2.3.1	Discretionary

Haul road water management is considered to be a permitted activity. Temporary diversion drains will be constructed on the upstream catchment side of the haul road and the water directed to the natural drainage gullies. Where the haul road crosses gullies, culverts will be constructed in the bottom of the fill to allow the continued flow of storm water runoff down the gully. Silt ponds will be constructed along the length of the haul road to collect storm water runoff from the haul road surface in accordance with Environment Canterbury Guidelines.

The silt ponds are considered to be a permitted activity under 12.3.2.1 of the RPW. Further information is provided about the silt ponds in section 10.8 of this AEE.

7 STATUTORY CONSIDERATIONS

7.1 Part II of the RMA

The purpose of the RMA through section 5 is to promote the sustainable management of natural and physical resources. Section 5 defines "sustainable management" as:

"Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –

- (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- (b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
- (c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment."

The Coronation North Project achieves the purpose of the RMA. As outlined in the 'Economic Impacts Assessment' (**Appendix 2**) it is clear that the project will have positive economic and social impact at a local, regional and to a lesser extent national level, and a positive effect on employment, businesses, goods and services in the Waitaki District and to a lesser extent Dunedin City District.

The sustainable nature of mining activities undertaken by OceanaGold for 26 years has been recognised through the resource consents issued for mining at MGP.

The WDP is a significant consideration under section 5. It recognises and provides for mining as a discretionary activity in the Rural Zone. Similarly the Regional Plans: Air, Waste and Water require the avoidance, mitigation or remedying of effects on the resources they regulate. None of the Regional Plans specifically address mining as an activity, but the effects of mining are regulated. The DDP and 2GP provide for mining as a discretionary activity.

Section 6 of the RMA states that in achieving the purpose of the RMA all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

- (a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development;
- (b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development;
- (c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- (d) The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers;
- (e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga;
- (f) The protection of historic heritage from inappropriate subdivision, use, and development;
- (g) The protection of recognised customary activities.

There will be some loss of habitat associated with wetlands within the Coronation North Project Area. Section 6(a) and (c) are relevant to the Coronation Project only if it is considered that the proposed Coronation North Project is an inappropriate use of the land. The applicant believes the Project is an appropriate use of the land as it is located where the mineral resource is located, and its proximity to the MGP operations makes it an efficient use of resources.

Part of the Coronation North Project is located within the Dunedin City District which is zoned as an Outstanding Natural Landscape, with an underlying Rural zoning in the operative Plan. Section 6(b) is relevant only if it is considered that the proposed Coronation North Project is an inappropriate use of the land. The applicant believes the Project is an appropriate use of the land as it is located where the mineral resource is located, and its proximity to the MGP operations makes it an efficient use of

resources. The Coronation North Project Area is zoned Rural in the 2GP without any 'outstanding' overlay.

Section 6(d) is not relevant to this application; the land is in private ownership and as a result there is no public access to the project location.

Section 6(e) may be relevant although this depends on the issues raised within the CIA. The CIA will not be available for consideration as part of this application. It can be examined at a later date because OceanaGold will offer a condition of consent that allows for Council review and consideration of any issues arising from the CIA (refer to section 12.2.6 of this AEE). However in general terms OceanaGold considers section 6(e) has been satisfactorily addressed by the Memorandum of Understanding (MOU) that OceanaGold has with Kati Huirapa Runaka ki Puketeraki and the consultation that has been undertaken on wider MGP matters including the project area. There are no known cultural associations with the site location or recognised customary activities (s6(g)) that occur there.

There will be a loss of some historic heritage particularly associated with the Coal Creek dam (if it is constructed), although there will be steps taken to survey and record heritage sites and OceanaGold is exploring mitigation options with relevant stakeholders such as Heritage New Zealand. Accordingly section 6(f) may be relevant to the Coronation North Project if it is considered that the proposed Coronation North Project is an inappropriate use of the land. The applicant believes the Project is an appropriate use of the land as it is located where the mineral resource is located and its proximity to the MGP operations makes it an efficient use of resources.

Section 7 of the RMA states that in achieving the purpose of the RMA, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to a range of matters, namely:

- "(a) *Kaitiakitanga;*
- (aa) *The ethic of stewardship;*
- (b) *The efficient use and development of natural and physical resources;*
- (ba) *The efficiency of the end use of energy;*
- (c) *The maintenance and enhancement of amenity values;*
- (d) *Intrinsic values of ecosystems;*
- (e) *Repealed;*
- (f) *Maintenance and enhancement of the quality of the environment;*
- (g) *Any finite characteristics of natural and physical resources;*
- (h) *The protection of that habitat of trout and salmon;*
- (i) *The effects of climate change;*
- (j) *The benefits to be derived from the use and development of renewable energy."*

Section 7 (ba), (i) and (j) are not relevant to this application.

In respect of section 7(a) and (aa) a CIA will be undertaken as a means to address iwi concerns (if any). The MOU and ongoing consultation with iwi will also address these matters.

The Coronation North Project represents an efficient use of resources under section 7(b) because it utilises existing physical resources from the MGP and develops a natural resource that is recognised as being of value to the Waitaki District in particular (which provides for mining through a relevant zone), to the Dunedin District and to the region more generally. The Coal Creek Freshwater Dam will augment flows in Coal Creek and the Mare Burn which will benefit the ecosystem and downstream landholders who use water from the creeks for stock water.

In terms of section 7(c) the definition of amenity values means "*those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes*". The amenity in the Macraes area has already been modified with the existing MGP mining operation. The Coronation North Project is an extension of previously consented activity, is not unexpected, and will be seen as a continuation of what has previously occurred. Coal Creek and the Mare Burn have no known recreational attributes. The location of the proposed Coal Creek Dam is on privately owned land in a deeply incised gully which is

difficult to access. People will not have an opportunity to access the site or appreciate its pleasantness or aesthetic coherence. The dam will be nestled within the gully and the only noticeable effect of it will be a potential increase in water bird activity and the augmented flows in the creeks.

In respect of section 7(d), (f) and (g) the intrinsic values of the ecosystems, including the flora and fauna that form part of them, at the Coronation North Project Area and downstream will be appropriately protected, remedied or mitigated once the proposed conditions of consent are taken into account. In particular, the proposed rehabilitation plan will ensure the longer term quality of the natural and physical resources within the area. In respect of the Coal Creek Dam, OceanaGold can point to the recently constructed Tipperary Fresh Water Dam as an example of successful dam rehabilitation.

Section 7 (h) is not relevant to this application; there is no known trout and salmon habitat in these parts of the creeks. They are ephemeral watercourses.

It is considered that the application is consistent with the requirements of Section 7 of the RMA.

Section 8 of the RMA requires all persons acting under the RMA to take into account the principles of the Treaty of Waitangi. This will be addressed by having regard to the CIA.

7.1.1 Section 105 of the RMA

When considering an application for a discharge permit, section 105(1) of the RMA requires regard to be had to:

- "(a) The nature of the discharge, the sensitivity of the receiving environment, and the applicant's reasons for the proposed choice;*
- (b) Any possible alternative methods of discharge including discharge into any other receiving environment."*

OceanaGold has chosen to locate the Coronation North Project at the MGP site because that is where the gold resource is and it is economically sensible to minimise the distance that rock must be carried. The discharges from the Coronation North Pit and WRS are unavoidable and OceanaGold will manage them into the ultimate receiving environments in a manner that will not give rise to anything other than minor effects. The Coal Creek Dam discharge is a diversion of natural water flows in Coal Creek into the receiving environment. OceanaGold has chosen to locate the dam at this site due to the large catchment of Coal Creek and the deeply incised nature of the gully, which from a dam construction perspective will minimise disturbance to the area.

7.1.2 Section 107 of the RMA

Section 107(1) of the RMA states that a discharge permit shall not be granted if, after reasonable mixing, the contaminant or water discharged is likely to give rise to all or any of the following effects in receiving waters:

- The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material; or
- Any conspicuous change in the colour or visual clarity; or
- Any emission of objectionable odour; or
- The rendering of freshwater unsuitable for consumption by farm animals; or
- Any significant adverse effects on aquatic life.

Water modelling assessment indicates that, provided proposed mitigation measures are implemented, the discharges should not give rise to any of the effects listed above. The discharges associated with Coal Creek Dam are not expected to give rise to any of the effects listed above as it will be fresh water from Coal Creek that will be stored and then discharged.

7.2 National Environmental Standards (NES)

The following current NES are relevant to the Coronation North Project:

- Air Quality Standards;
- Assessing and managing contaminants in soil to protect human health.

As the Beca '*Assessment of Environmental Effects of Discharges to Air*' report states (refer **Appendix 3**) there are no restrictions under the National Environmental Standards for Ambient Air Quality (NESAQ) to the granting of consent for the Coronation North Project.

Under the regulations that govern assessing and managing contaminants in soil to protect human health, land is considered to be actually or potentially contaminated if an activity or industry on the Hazardous Activities or Industries List (HAIL) has been, is, or is more likely than not to have been, undertaken on that land. The land upon which the Coronation North Project is to be located has not been used for any of the activities listed on the HAIL because it has been used for farming, predominantly grazing. There are therefore no restrictions to the granting of consent for the Coronation North Project with regard to managing contaminants in soil to protect human health.

7.3 National Policy Statement for Freshwater Management

The NPS for freshwater management took effect on 1 July 2011 and was updated in 2014 to provide greater direction for Councils in setting freshwater objectives and limits in their regional plans by prescribing a National Objectives Framework (NOF). It provides overarching objectives and policies for managing the quality and quantity of freshwater resources within the country. It is considered that granting OceanaGold consents to take water is not in conflict with the NPS. The quantity of freshwater in the Mare Burn once the Coal Creek Dam is constructed will be increased from the levels that currently exist. Water quality will be monitored and managed to comply with the same water quality standards approved for the Coronation project.

7.4 Regional Policy Statement for Otago (RPS)

The Otago Regional Policy Statement (RPS) was made operative on 1 October 1998. The RPS gives an overview of the resource management issues facing Otago and establishes policies and methods to manage Otago's natural and physical resources.

The Proposed RPS was publicly notified on 23 May 2015. OceanaGold made extensive submissions on the Proposed RPS and opposed the RPS's failure to adequately acknowledge that mining is location specific and the mining resources may be situated where other values (for example ecological values or heritage values) are present. Hearings on the RPS were held in November 2015 and at the date of this application there have been no decisions issued. The ORC website indicates that a decision may be notified in September 2016. Where there is an operative RPS and a proposed RPS, both documents must be considered and the Proposed RPS is given weight depending on how far through the planning process it has progressed.

7.4.1 Operative RPS

The provisions of Chapter 5 (Land), Chapter 6 (Water), Chapter 7 (Air), Chapter 10 (Biota), Chapter 11 (Natural Hazards), Chapter 13 (Wastes and Hazardous Substances) and Chapter 14 (Monitoring and Review) of the operative RPS are relevant to this application.

7.4.1.1 Land

In Chapter 5, Issue 5.3.2, the primary productive capacity of Otago's land resource may be compromised by activities which result in loss of vegetation cover, or the spread of plant and animal pests or degradation of the soil resource.

Objective 5.4.1 seeks to promote the sustainable management of Otago's land resource to maintain and enhance primary productive capacity and life-supporting capacity and meet the present and reasonably foreseeable needs of people and communities. This project is consistent with the purpose of sustainable management. The areas of disturbed land will progressively be rehabilitated into pasture and this therefore preserves the future use of the land. The mining itself helps support the economic and social wellbeing of the Macraes community and wider area by the provision of jobs, expenditure in the region and involvement of the workforce in community groups and clubs. Objective 5.4.5 specifically refers to promoting the sustainable management of Otago's mineral resources in order to meet the needs of Otago's communities. This project will promote sustainable management by being able to utilise the existing mine infrastructure to access the ore.

Policy 5.5.1 seeks to recognise and provide for Kai Tahu's relationship with the land resource by establishing processes to allow heritage sites and waahi tapu and waahi taoka to be taken into account when considering use and development of the land resource and protecting archaeological sites where practicable. In this instance there are no waahi tapu or waahi taoka recorded, however the Cultural Impact Assessment which was developed during the Coronation Project will ensure that there are appropriate procedures in place in the event any waahi tapu or waahi taoka are located.

The RPS seeks diversification of the use of land resources in Otago (Policy 5.5.4) and one form of land use is mining. The RPS recognises that mineral deposits are a finite resource and consideration needs to be given to preserve access to such deposits (Policy 5.5.8). Following this policy approach the WDP also acknowledges the importance of known mineral deposits and seeks to discourage activities or development that are likely to compromise such resources (Policy 16.7.2). The DDP provides for some scheduled mining activities but regulates others (including the Coronation North project).

Other Land Chapter policies require the need to maintain/enhance the land resource (Policy 5.5.3) and minimise effects on water resources from land use (Policy 5.5.5).

Water modelling reports indicate that the Coronation North Project will impact on water quality but, provided that appropriate mitigation is provided, water quality will remain within the consented limits that were deemed appropriate for the Coronation Project activities. On this basis it is considered that the Coronation North Project does not conflict with the policies in Chapter 5 of the RPS.

7.4.1.2 *Water*

Chapter 6 of the RPS recognises and provides for the relationship that Kai Tahu have with the water resource in Otago (Policy 6.5.1). The Coronation North Project activities are highly unlikely to impact on the food and recreational resources in the Waikouaiti, Shag and Taieri Rivers that are known to be of value to local iwi.

The RPS contains policies requiring the efficient consumptive use of water (Policy 6.5.3) and the desire to reduce the adverse effects of contaminant discharges into water bodies (Policy 6.5.5). OceanaGold recycles water around the MGP site, both to reduce the impact on water resources in terms of the volume of water that is taken, and to reduce the volume of contaminated water that is discharged, directly or indirectly, into surrounding water bodies and ground water. The same approach will be applied to the Coronation North Project. This approach is consistent with those policies in the RPS. Contamination levels will not be increased beyond the proposed compliance limits, so overall it can be concluded that the application is consistent with the purpose and principles of Chapter 6 of the RPS.

7.4.1.3 *Air*

The RPS contains a policy that seeks to avoid, remedy or mitigate adverse effects on air (Policy 7.5.2). The Coronation North Project has the potential to be in conflict with this policy in terms of discharges to air of dust associated with the project. However dust suppression measures will be implemented and will address any adverse effects adequately so that the purpose and principles of this policy in the RPS can be met.

7.4.1.4 *Built Environment*

Chapter 9 of the RPS includes a policy about enhancing the quality of life for people and communities (Policy 9.5.5). The RPS also seeks to recognise and protect regionally significant sites (Policy 9.5.6). The erection of waste rock stacks, while not a building in the traditional sense, is a structure that will permanently alter the landscape and the communities' appreciation of it. OceanaGold have considered the visual effect of the proposed Coronation North Project on the landscape and the communities' appreciation of it. While the mining activity includes large scale earthworks, they will occur in a large scale landscape which has the ability to assimilate the project. The overall cumulative effect of the project is considered to be negligible to low from Macraes Flat looking north to Taieri Ridge. From the northern side of the Ridge at one viewpoint on Longdale Road looking south to the Ridge (at the Coronation North Waste Rock Stack, Pit and haul road) the effect will initially be high, becoming moderate with rehabilitation over time.

7.4.1.5 *Biota*

Policies within Chapter 10 seek to protect mahika kai (Policy 10.5.1). However there are no effects on mahika kai expected from the Coronation North Project. The maintenance or enhancement of the diversity of significant indigenous vegetation and significant habitat of indigenous fauna, trout and salmon (Policy 10.5.2), and the maintenance and enhancement of the life-supporting capacity and diversity of Otago's biota are promoted in the RPS (Objective 10.4.1). It is considered that the effect of Coal Creek Dam, which is to augment flows, will offset any lost aquatic creek habitat. Downstream habitat will be maintained or enhanced as a result of the improved flows. New lake habitat will also be created in the dam reservoir. It is considered that reasoned mitigation measures have been volunteered to compensate for any loss of habitat and overall the application is consistent with the purpose and principles of Chapter 10 of the RPS.

7.4.1.6 *Natural Hazards*

The policies in Chapter 11 of the RPS that address natural hazards seek to identify hazards, restrict development in areas where hazards occur and take action to minimise their effects (Policies 11.5.1, 11.5.3, 11.5.4). Several earthquake fault lines run through the MGP site and accordingly there is a risk of failure of some structures due to seismic activity. OceanaGold has investigated the impact of this natural hazard upon the structures proposed for the Coronation North Project. The effects of the hazard have been assessed and are considered to be manageable. In respect of Coal Creek Dam the effects of a possible seismic hazard have been assessed by Engineering Geology Ltd as part of their design for the dam. EGL conservatively assessed the dam to have a medium potential impact classification, and will revisit this assessment following a dam break analysis carried out for final design, consenting under the Building Act and construction. Accordingly the application is considered to be consistent with the purpose and principles of Chapter 11 of the RPS.

7.4.1.7 *Wastes and Hazardous Substances*

Policies in Chapter 13 of the RPS seek to avoid/remedy/mitigate the effects of disposing of solid waste (Policy 13.5.2), hazardous substances (Policy 13.5.4) and to minimise waste (Policy 13.5.9). The potential adverse effects from the disposal of waste rock at the Coronation North Project have been assessed and mitigation measures proposed. Overall the application is considered to be consistent with the purpose and principles of Chapter 13.

7.4.1.8 *Monitoring*

In Chapter 14, a policy requires the effects of resource consents to be monitored (Policy 14.5.5). OceanaGold has undertaken monitoring of the effects of activities at MGP for 26 years. The monitoring programmes have been updated and extended to take into account the additional area that could be affected by the Coronation North Project activities. Monitoring of the Mare Burn for water quality, quantity and aquatic biology is already in place under the Coronation consents, and this monitoring will continue. Accordingly it is considered that the application is consistent with the purpose and principles of Chapter 14 of the RPS.

7.4.2 Proposed RPS

Policy 1.2.1 is to manage the natural environment to support Kai Tahu wellbeing whilst Policy 1.2.3 of the Proposed RPS seeks to protect important site and values of cultural significance to Kai Tahu. As discussed above, the Cultural Impact Assessment ensures there are appropriate procedures in place in the event any important sites are discovered and the CIA also helps support Kai Tahu wellbeing.

Policy 2.1.1 seeks to manage freshwater and Policy 2.1.2 seeks to manage the values of beds of rivers and lakes, wetlands and their margins in a variety of ways such as maintaining good water quality, maintaining ecosystem health and indigenous biodiversity, maintaining or enhancing natural character and mitigating the adverse effects of natural hazards. An Erosion and Sediment Control Plan will be developed to manage and control sediment and erosion and Coal Creek dam may be constructed to achieve compliance with consented water quality limits.

Policy 2.1.4 is managing for air quality values by maintaining good ambient air quality and protecting air quality values. Emissions to air will result in a minimal level of effects in addition to those currently consented at the mine. Continuing with the current operation and carrying out the proposed mitigation will ensure adverse effects are avoided, remedied and mitigated.

Under Policy 2.1.5 soil values are to be recognised and managed, including to maintain those values, to retain soil resources for primary production and to avoid soil contamination. All activities at the MGP are rehabilitated and upon mine closure it is likely that the land will be returned to rural pastoral activity, thus the project is not inconsistent with this policy.

Policy 2.1.6 seeks to manage land for ecosystem and indigenous biodiversity values. Managing significant indigenous vegetation and significant habitats of indigenous fauna is provided for under Policy 2.2.2. Managing outstanding water bodies and wetlands is addressed in Policy 2.2.13. Where adverse effects upon these values cannot be avoided, because mining is a locationally constrained activity and cannot be directed to areas where adverse effects are more acceptable, OceanaGold has offered remediation and mitigation.

Policies 2.3.1, 2.3.2 and 2.3.3 respectively apply an integrated management approach among resources (recognising that a resource may extend beyond the immediate or directly adjacent area of interest), within a resource (seeking consistency across Council boundaries) and for freshwater catchments. Recognition of interconnectedness is inherent in this application.

Objective 3.1 and Policy 3.1.1 recognise natural and physical environmental constraints. Mining activities and the use of the mineral resource are constrained by the location of the resource. There is a functional necessity for the activity to be located in the project area.

Objective 3.2 and its associated policies deal with natural hazards and identifying and assessing them and managing them to avoid increased risks. This project, and the MGP as a whole, addresses these matters in the design and construction of mine elements.

Objective 3.9 says that *"Hazardous substances and waste material do not harm human health or the quality of the environment in Otago"*. A new waste rock stack will be constructed and will not harm human health or the quality of the environment as it will be well managed and any unavoidable adverse effects, for instance on water quality, will be mitigated. The storage of hazardous substances will continue to be carried out in accordance with accepted HSNO standards. Policy 3.9.5 seeks to avoid the creation of new contaminated land. OceanaGold has submitted in opposition to this policy. The expansion of existing mining operations, like the Coronation North project, which is an activity on the Hazardous Activities and Industries List (HAIL) is effectively prohibited by this policy.

In terms of managing historic heritage, Policy 4.2.3 states that the values of places and areas of historic heritage can be protected and enhanced by remediating or mitigating when adverse effects on other values cannot be avoided. The Coronation North project mitigation for impacted heritage values is consistent with that approach.

Managing land for rural activities (Policy 4.3.1) does not specifically acknowledge mining although (e) does identify that there may be activities, other than farming, which have a functional need to locate in rural areas. Due to the site specific nature of mining there is a functional need to locate in rural areas. Policy 4.3.6 specifically addresses mining and states:

Managing locational needs for mineral and gas exploration, extraction and processing

Recognise the needs of mineral exploration, extraction and processing activities to locate where the resource exists, and manage them by:

a) Giving preference to avoiding their location in:

i. Areas of significant indigenous vegetation and significant habitats of indigenous fauna;

or

ii. Outstanding natural features, landscapes and seascapes; or

iii. Areas of outstanding natural character; or

iv. Outstanding water bodies; or

v. Areas subject to significant natural hazard risk; and

b) Restricting the establishment of those activities in areas used for mineral and gas exploration, extraction and processing that may result in reverse sensitivity effects.

The project Area is identified in the operative DCC District Plan as within a Rural Zone, located in a High Country Outstanding Landscape Area. However in the DCC's proposed 2GP it would be a Rural High Country Zone without any special landscape overlay. Policy 4.3.6 itself says to "give preference to avoiding" and contemplates situations where mitigation may be an appropriate alternative. Due to the location of the mineral resource there is no alternative location for the Project, however the visual effects of the Project on the outstanding landscape will be mitigated by careful design of the form of the waste rock stack to integrate it with the existing landform character of the area, progressive rehabilitation, restoration of areas disturbed around the margins of the Project and removal and restoration of haul roads.

Policy 4.3.2 seeks to manage land use in dry catchments, for instance by minimising the conversion of tussock grasslands to other species. Rehabilitation of the Coronation WRS has been designed to return the land to pasture but with tussock species included in the revegetation process and it is proposed this would be extended to Coronation North WRS. Policy 4.4.3 encourages environmental enhancement and the mitigation proposed by OceanaGold endeavours to achieve this.

Objective 4.4 is to "make the most of the natural and built resources available for use" and objective 4.5 seeks to minimise the adverse effects of using Otago's natural environment. The current proposal makes use of the natural mineral resource whilst minimising potential adverse effects. Policy 4.4.1 seeks to ensure an efficient allocation and use of water and the Coal Creek Dam proposal will achieve that. It will also improve water quality and potentially improve the health and resilience of ecosystem services in the catchment which supports indigenous aquatic ecology, in accordance with Policy 4.4.3 (encouraging environmental enhancement).

Objectionable discharges are to be avoided (Policy 4.5.1) and there will be no objectionable discharges arising from this Project that cannot be appropriately mitigated. Policy 4.5.2 promotes adaptive management approaches to address adverse effects, and that approach was adopted for Coronation project and is also likely to be applied to Coronation North Project. Soil erosion is to be minimised through use of appropriate controls and practices as outlined in the Erosion and Sediment Control Report and this is consistent with Policy 4.5.4. OceanaGold already controls the introduction and spread of pest plants and animals in accordance with Policy 4.5.5 and this may be extended to mitigate the Coronation North Project.

Policy 4.5.6 says:

Managing adverse effects from mineral and gas exploration, extraction and processing

Minimise adverse effects from the exploration, extraction and processing of minerals, by:

a) Giving preference to avoiding their location in:

i. Areas of significant indigenous vegetation and significant habitats of indigenous fauna; and

ii. Outstanding natural features, landscapes and seascapes; and

- iii. Areas of outstanding natural character; and
- iv. Outstanding water bodies; and
- v. Areas subject to significant natural hazard risk;
- b) Where it is not possible to avoid locating in the areas listed in a) above, avoiding significant adverse effects of the activity on those values that contribute to the significant or outstanding nature of those areas; and
- c) Avoiding adverse effects on the health and safety of the community; and
- d) Remedying or mitigating adverse effects on other values; and
- e) Assessing the significance of adverse effects on those values, as detailed in Schedule 3; and,
- f) Reducing unavoidable adverse effects by
 - i. Staging development for longer term activities; and
 - ii. Progressively rehabilitating the site, where possible.
- g) Considering the use of offsetting, or compensatory measures, for residual adverse effects; and
- h) Applying a precautionary approach to assessing the effects of the activity, where there is scientific uncertainty, and potentially significant or irreversible adverse effects.

OceanaGold notes that because the location of the mineral resource is fixed it is not always possible to "avoid" locations where there may be outstanding areas or areas of significance such as is the case here where the current operative DCC District Plan has the Project area within a Rural Zone High Country Outstanding Landscape Area. Adverse effects on health and safety will be avoided and other potential adverse effects can be remedied or mitigated or compensated. The site will be progressively rehabilitated to reduce the amount of disturbed land.

Overall the proposal is generally consistent with the proposed RPS.

7.5 Regional Plan: Water for Otago (RPW)

Proposed Plan Change 2 (Regionally Significant Wetlands) became operative on 1 October 2013. The wetlands affected by the Coronation North Project are not listed in Schedule 9 of the RPW, are not located in a wetland management area identified in Schedule 9, and are not located more than 800 metres above sea level, therefore they are not regionally significant wetlands (policy 10.4.1A).

Objective 10.3.1 seeks to maintain and enhance Otago's wetlands and their individual and collective values for present and future generations. Policy 10.4.6 seeks to promote the conservation, creation and reinstatement of wetland areas and enhancement of individual and collective wetland values. Overall the Coronation North Project is not inconsistent with this objective and policy because appropriate mitigation will be provided for the loss of wetlands within the project area.

The following policies from Chapter 5 (Natural and Human Use Values), Chapter 6 (Water Quantity), Chapter 7 (Water Quality), Chapter 8 (The Beds and Margins of Lakes and Rivers) and Chapter 9 (Ground Water) of the RPW are relevant to the Coronation North Project applications.

In terms of Chapter 5:

- Policy 5.4.3
- Policy 5.4.8
- Policy 5.4.9
- Policy 5.4.10

Overall the Coronation North Project applications are considered to be consistent with Chapter 5 of the RPW. The proposed activities will have an effect on surface and ground water values but proposed conditions of consent will ensure that these effects are avoided and mitigated as far as practically possible. Existing lawful uses or priorities for the use of water will be avoided (Policy 5.4.3). Because the takes are from the open pits, as opposed to directly from a watercourse, there are no features or values of the watercourses that need to be had regard to (Policies 5.4.8, 5.4.9 and 5.4.10).

The following policies in Chapter 6 are relevant:

- Policy 6.4.0
- Policy 6.4.0A
- Policy 6.4.0C
- Policy 6.4.1A
- Policy 6.4.10A3(d)
- Policy 6.4.16
- Policy 6.4.19
- Policy 6.5.6

The Coronation North Project water takes are necessary to manage groundwater that collects in open pits as opposed to being a water take that is directly from a water course. Accordingly there are no instream values that will be affected by the takes. Pit dewatering for hard rock mining activities is provided for in Policy 6.4.10A3(d) when the aquifer is not mapped in the C-series of the RPW, and this aquifer is not mapped. Overall it is considered that the Coronation North Project applications are consistent with the purpose and principles of Chapter 6.

The following policies are relevant from Chapter 7 of the RPW:

- Policy 7.B.2
- Policy 7.B.6
- Policy 7.B.8
- Policy 7.C.2
- Policy 7.C.3

OceanaGold has undertaken water modelling to understand the potential extent of adverse effects of the Coronation North Project in terms of discharges of contaminants. Compliance limits for contaminants in water that have applied for the MGP to date will also be applied for the Coronation North Project. It is proposed that any runoff of silt and sediment from the proposed activities will be managed under an erosion and sediment control plan. To ensure water quality compliance limits (particularly sulphate) are met, the construction of Coal Creek Fresh Water Dam has been proposed and it is expected the characteristics of good quality water in Schedule 15 of the RPW will be met, possibly with a small zone for physical mixing. Policy 7.B.8 encourages adaptive management and innovation to reduce contaminant levels in discharges, and OceanaGold will be employing both methods to identify (in a BPO report) and implement measures for managing sulphate levels prior to discharge. Overall the application is considered to be consistent with the purpose and principles in Chapter 7 of the RPW.

The following policies from Chapter 8 of the RPW are relevant to the Coronation North Project:

- Policy 8.4.2
- Policy 8.5.3
- Policy 8.6.1
- Policy 8.6.2
- Policy 8.8.1
- Policy 8.8.2

OceanaGold will operate erosion and sediment control plans to ensure the effects of activities adjacent to water courses are controlled and to minimise any reduction in water clarity caused by bed disturbance. Proposed conditions of consent will ensure that any adverse effects of the Coal Creek Dam are mitigated, and there remains potential that OceanaGold's BPO report will identify other water quality mitigation measures and the dam will not be constructed, or will be reduced in scale (or if OceanaGold acquires more land that the dam could be constructed elsewhere). There are no practical alternatives to the proposed reclamation of water courses if the Coronation North WRS and Coronation North Pit are to be constructed. Waste rock, rather than clean fill, will be used in the reclamation of water courses but, other than in that respect, the applications are considered overall to be consistent with Chapter 8 of the RPW.

Schedule 1A of the RPW lists the Mare Burn as having the following natural values:

- the provision of areas for salmonid spawning and juvenile development,
- the presence of riparian vegetation of significance to aquatic habitats.

The RPW also identifies that some tributaries of the Taieri River contain significant habitat for flathead galaxiid. Flathead galaxiids are classified as 'Threatened – nationally vulnerable' using the New Zealand Threat Classification System (NZTCS) criteria, with a moderate population (with population trend that is declining) and the qualifier 'Conservation Dependent'.

7.6 Regional Plan: Waste for Otago (RP Waste)

The following policies from Chapter 5 (Contaminated Sites) and Chapter 6 (Hazardous Substances and Waste) of the RP Waste are relevant to the Coronation North Project applications:

- Policy 5.4.3
- Policy 5.4.4
- Policy 6.4.1
- Policy 6.4.4

Contaminated sites are created through the deposition of waste rock. However, once rehabilitated the site will be suitable for the proposed end land use, namely pasture with some tussock. OceanaGold already has in place operations, maintenance and surveillance manuals and other management plans to identify potential hazards and determine adequate control measures to be adopted. OceanaGold submits project overview and annual work and rehabilitation plans to the local authorities which should enable the councils to become aware of any potential effects from waste rock. Appropriate control measures will be put in place. Overall it is considered the applications are consistent with Chapters 5 and 6 of the RP Waste.

7.7 Regional Plan: Air for Otago (RPA)

The RP became operative in 2003 and was amended in 2006 and 2009.

Objectives 6.1.1, 6.1.2 and 6.1.3 provide:

Objective 6.1.1 – To maintain ambient air quality in parts of Otago that have high air quality and enhance ambient air quality in places where it has been degraded

Objective 6.1.2 – To avoid adverse localised effects of contaminant discharges into air on:

- Human health;
- Cultural, heritage and amenity values;
- Ecosystems and the plants and animals within them; and
- The life-supporting capacity of air.

Objective 6.1.3 – To allow for sustainable use of Otago's air resource.

The proposal is considered consistent with these objectives.

Policy 7.1.1 – To recognise and provide for the relationship Kai Tahu have with the air resource through procedures that enable Kai Tahu to participate in management of the air resources.

The proposal should not result in adverse effects on the relationship that Kai Tahu, as Kaitiaki, have with the air resource or affect the ability of Kai Tahu to participate in the management of the air resource.

Policy 8.1.1 – To have regard to the Otago Goal Levels identified in Schedule 1 and comply with the Resource Management (National Environmental Standard Relating to Certain Air Pollutants, Dioxins and Other Toxics) regulations (2004) in managing the regions ambient air resource.

Monitoring of PM₁₀ in the vicinity of the current Macraes Gold Project mining activity has found that concentrations are well below the NES and Otago Goal Levels.

Policy 8.2.3 – In the consideration of any application to discharge contaminants into air, Council will have;

- a) Particular regard to avoiding adverse effects including cumulative effects on:

- i. Values of significance to Kai Tahu*
- ii. The health and functioning of ecosystems, plants and animals*
- iii. Cultural, heritage and amenity values*
- iv. Human health*
- v. Ambient air quality of any airshed; and*

b) Regard to any existing discharge from the site, into air, and its effects

The actual, potential and cumulative effects of the proposal on human health, ecosystems, amenity values and cultural and heritage values are considered to be less than minor.

Policy 8.2.8 – To avoid discharges to air being noxious, dangerous, offensive or objectionable on the surrounding local environment.

The effects of the proposed Coronation North Project are expected to be very similar to the effects of the current Coronation Project. The current operation has not caused any effects to date that have been considered to be noxious, dangerous, offensive or objectionable and similarly it is expected that the discharges from the proposed Coronation North Project will not be noxious, dangerous, offensive or objectionable.

Policy 10.1.1 – The Otago Regional Council will encourage:

- a) People undertaking land use activities to adopt management practices to avoid, remedy or mitigate any adverse effects of dust beyond the boundary of the property; and*
- b) City and District councils to use land use planning mechanisms and other land management techniques to manage land use activities which have the potential to result in dust beyond the boundary of the property.*

OceanaGold currently employs dust mitigation methods which have been demonstrated to be effective, and these will continue to be used.

Overall, the discharges to air from the proposed expansion of mining activities are considered to be consistent with the policies and objectives of the Air Plan.

7.8 Waitaki District Plan (WDP)

Rural Zone

Section 16 of the WDP sets out the issues and objectives for the Rural Zone and discusses mineral extraction.

Objective 16.4.1 is to sustain the life-supporting capacity of high country soils.

16.5.1 Objective 4 - Rural Amenity provides:

A level of rural amenity that is consistent with the range of activities anticipated in the rural area, but which does not create unacceptably unpleasant living or working conditions for the District's residents and visitors, nor a significant deterioration of the quality of the rural environment.

The amenity is consistent with an area which is already mined.

Objective 6 and the associated policies are set out below:

16.7.1 Objective 6

Extractive industries are given the ability to access minerals but in a way that avoids, remedies or mitigates adverse effects on the environment.

16.7.2 Policies 6

1 To acknowledge the importance of known mineral deposits in the District by, where appropriate, discouraging the establishment of future activities or developments that are likely to compromise access to these mineral deposits.

2 To recognise the potential adverse effects of extractive operations, including mineral exploration, on the rural environment, and to control such operations in order that an assessment may be made as to the sensitivity of an existing area and the degree to which an operation will avoid, remedy or mitigate any adverse effects on the amenity and environment of the rural area.

3 To provide for a mining zone at Macraes Flat in recognition of the scale and intensity of the mining operation while ensuring the adverse effects of mining operation are avoided, remedied or mitigated.

4 To ensure that after mining, sites are rehabilitated sufficiently to enable the establishment of activities appropriate to the area.

5 To avoid, remedy or mitigate adverse effects on the rural amenity and environment by, where appropriate, encouraging extractive industries to continue in existing locations.

Objective 6 and policies 1 – 5 acknowledge the presence of important mineral resources in the region whilst recognising the need to ensure that any adverse effects arising from their extraction are avoided, remedied or mitigated as appropriate.

The existing area is already subject to activities associated with the operations at Macraes mine and consent conditions are currently in place to ensure that potential adverse effects are avoided, remedied or mitigated. These consent conditions and the associated mitigation will continue.

The project is consistent with Policy 4. Once mining concludes, the area will be rehabilitated to pasture with the pits becoming lakes.

Policy 5 encourages extractive industries to continue in existing locations as a way of avoiding, remedying or mitigating adverse effects on rural amenity and the environment. This is consistent with OceanaGold's proposal as it is an expansion of the existing Coronation operations. As such, the environment and amenity of the area have already been modified.

Policies 1 and 3 are not relevant to this application.

The protection and enhancement of natural features and landscapes within the district is one of the District's objectives (Objective 16.8.2).

7.8.1 Nature Conservation Values

Policies relating to the management of conservation values under Issue 8 of the WDP apply to the Coronation North Project. The WDP has an objective to maintain biological diversity, nature conservation values and ecosystem functioning by protecting section 6(c) RMA areas and maintaining other areas with particular nature conservation values (Objective 16.9.3(1)). Another objective focuses on the maintenance or enhancement of the quality of water, wetlands, and rivers and their margins and the protection of them from inappropriate development (Objective 16.9.2(2)). Further, a policy recognises that areas, other than section 6(c) areas, may have conservation values in terms of maintaining connectivity and providing important habitat for species reliant on patchworks of indigenous vegetation (e.g. birds and lizards) (Policy 16.9.3(4)). Other policies include those seeking to manage the effects of use and development on the natural character of wetlands, rivers and lakes and their margins, and those noting that the WDC takes the opportunity to promote the retention of indigenous vegetation and habitat when considering resource consent applications (Policy 16.9.3(7), (9) and (10)).

The Project will have some unavoidable effects on terrestrial ecology and wetland values. The scale of the effects have been assessed in the context of an existing operating mine, and the broader

environment. Appropriate mitigation has been proposed to address these effects on nature conservation values.

Under the WDP district wide policies on heritage an objective is to seek the conservation and enhancement of the heritage values of the district, including historic places, waahi tapu sites, and archaeological sites, in order to preserve and manage the character and history of the district (Objective 2.3.1(A)). However the associated policies focus on identifying and protecting important heritage items in the WDP and there are no heritage items listed in Appendix B of the WDP that are proposed to be modified by the Coronation North Project.

Another policy in the WDP seeks to ensure that all development proposals in the vicinity of recorded waahi tapu and archaeological sites are notified to the tangata whenua and Heritage New Zealand (Policy 2.3.2(2)). As OceanaGold has consulted with both local iwi and Heritage New Zealand on the Coronation North Project it has satisfied the intent of this policy.

7.8.2 Natural Hazards

Part II, section 4 of the WDP addresses the issue of seismic risk. Expert reports consider that the issue of seismic risk can be addressed through appropriate conditions of consent, therefore it is considered that the Coronation North Project is consistent with the policies in this part of the WDP.

7.8.3 Transport

Part III, section 12 of the WDP contains transport and car parking rules which seek to achieve safe and efficient transport systems within the district. There is adequate car parking, loading and vehicle access provided for the Coronation North Project in the current Macraes Gold Project site. The WDP identifies "vehicle oriented commercial facilities" as including any site that generates "60 vehicle movements per day", which will include the Coronation North project. The WDP regulates vehicle crossings by specifying the maximum length (i.e. 9 metres - Table 3, page 257) and by setting minimum sight distances (Table 5, page 260). Like the Coronation Project, the Coronation North Project does not meet these two technical requirements. However the Assessment Matters that fall to be considered under 12.4.2(d) focus on whether there will be any measurable effect on the safe and efficient movement of traffic, and it has been assessed that there will not. OceanaGold will operate a vehicle crossing traffic management plan to achieve the WDP's objective of safe transportation. This approach was consented in the Coronation Project and remains appropriate for the Coronation North Project.

7.8.4 Hazardous Substances

An objective within the WDP is to avoid or mitigate adverse environmental effects arising from storage, transportation and disposal of hazardous substances (Objective 12.2.2). Policy 12.2.3(2) is relevant to this application. The MGP has been operating for over 26 years and there have not been any significant issues over the use, transport or storage of hazardous substances on the site. The HSNO Act requires a range of safety and environmental standards to be met at the site, which OceanaGold does. Accordingly, it is considered that the Coronation North Project is consistent with the objectives and policies of this part of the WDP.

7.8.5 Farming Activity

Relevant to the permitted baseline, it is noteworthy that farming activities are permitted activities in both the MMP Mineral Zone and Rural Scenic Zone. There is no restriction on stock grazing in either Zone. In the Rural Scenic Zone a farmer would be entitled to clear up to 5000 square metres of indigenous vegetation as permitted activity (any clearance within 20m of any river, stream or wetland or within any wetland, and indigenous vegetation clearance over 5000 square metres, or more than 1000 square metres of tall tussock grassland communities of the genus *Chionochloa* would require resource consent).

7.9 Dunedin District Plan

7.9.1 Landscape

Chapter 14 of the Dunedin City District Plan (DDP) records objectives and policies to identify and protect the important characteristics of Dunedin's outstanding landscapes. This includes the High Country Outstanding Landscape Area ("HCOLA") outlined in 14.5.1(b) (page 14:13), where part of the Coronation North Project will be located. The features to be protected in the HCOLA include: "the highly coherent natural landform under an apparently largely unmodified grassland vegetative cover; the very limited visual impact of any human imposed element; the rock outcrops which give rise to a dramatic skyline and create particular visual interest generally; the large scale, open, expansive, remote wilderness character; the vegetation patterns which reinforce and reflect landform character; the fragile ecosystems." The principal threats to visual quality, which are controlled by rules in the DDP, are considered to be: "roads and tracks; and excavations – inappropriate siting and scale of ... excavations such that they become visually dominant focal points." Other threats to visual quality, which are covered by design guidelines that operate in conjunction with the DDP, include: "structures - inappropriate siting, design, scale and finish of structures such that they become visually dominant from public viewpoints; areas of indigenous vegetation – removal or diminution of significant natural features such as areas of indigenous vegetation."

Since there are no specific rules for mining activity in the HCOLA the activity is classified as discretionary according to the underlying Rural zone, rule 6.5.6(v). Assessment matters in section 6.7 of the DDP include: sustainability; manawhenua; amenity values; cumulative effect; intensity of activities; noise; glare and lighting; visual impact; clearance of vegetation; archaeological sites; indigenous vegetation and habitats; hazards; landscape; conflict and reverse sensitivity.

7.9.2 Hazards

Chapter 17 of the DDP addresses the issue of seismic risk. As already mentioned, expert reports consider that the issue of seismic risk can be addressed through appropriate conditions of consent, therefore it is considered that the Coronation North Project is consistent with the objectives and policies in this part of the DDP.

Hazardous substances are also covered in Chapter 17. An objective within the DDP is to prevent or mitigate adverse environmental effects arising from facilities and activities involving the storage, use, disposal or transportation of hazardous substances (Objective 17.2.2). Policy 17.3.8 is relevant to this application, as is rule 17.5.4. As already mentioned, the MGP has been operating for over 26 years and there have not been any significant issues over the use, transport or storage of hazardous substances on the site. The HSNO Act requires a range of safety and environmental standards to be met at the site, which OceanaGold does. Accordingly, it is considered that the Coronation North Project is consistent with the objectives and policies of this part of the DDP.

Earthworks are controlled in Dunedin according to their location and scale: policy 17.3.9. This means resource consent is only required where the scale and/or location of earthworks are such that adverse effects are likely. If resource consent is required the range of effects assessed is tailored to the scale and location of the earthworks.

7.9.3 Indigenous Vegetation and Fauna

Chapter 16 of the DDP contains objectives and policies to promote retention of remaining areas of indigenous vegetation and habitats of indigenous fauna. The Coronation North Project is not located in an area of 'significant conservation value listed in Schedule 25.4'. Vegetation clearance and earthworks (including deposit of fill in wetlands) requires discretionary activity consent under rule 16.6.2.

7.9.4 Manawhenua

The DDP recognises that manawhenua have specific resource management concerns which require consultation in order to achieve the sustainable management of the city's resources in accordance with the principles of the Treaty of Waitangi. Further, waahi tapu and waahi taoka require protection

and sensitive management. The objectives and policies contained in Chapter 5 have been observed by OceanaGold's initial consultation with manawhenua and commissioning of a CIA to be prepared by KTKO. OceanaGold also propose a review condition that will enable any concerns raised by the CIA to be addressed at a later date (if they are not first raised and addressed at a hearing of this application).

7.9.5 Sustainability

Objectives and policies in Chapter 4 of the DDP seek to achieve the sustainable management of the city's resources, in accordance with the purpose of the RMA. Overall, taking into account the proposed conditions of consent, it is considered that the Coronation North Project satisfies this purpose.

7.9.6 Farming Activity

Relevant to the permitted baseline, it is noteworthy that stock grazing is a permitted activity in the Rural Zone. Vegetation clearance associated with farming activity is also permitted, although clearance of a wetland where the vegetation is not totally separated from other indigenous vegetation, is more than 5 hectares in area and includes a threatened species listed in Appendix 16A of the Plan (for instance *Olearia bullata* or *Chionochloa rubra subsp. Cuprea*) would be a discretionary activity that required resource consent.

7.10 DCC Proposed 2GP

The Dunedin City Council's proposed 2GP was notified on 26 September 2015. The submission period has closed and hearings commence in late May 2016. The objectives and policies of the proposed 2GP need to be considered alongside the objectives and policies of the operative DCC Plan and given appropriate weight depending on how far through the Schedule 1 process the 2GP has progressed.

The Coronation North Waste Rock Stack and Coronation North Pit are entirely within the DCC High Country Rural Zone. Potential adverse effects of mining on the amenity of residential activities on surrounding properties are to be avoided or, if avoidance is not possible, adequately mitigated (Policy 16.2.2.5) and reverse sensitivity effects are to be avoided, or if that is not possible, should be no more than minor (Policy 16.2.2.6). Adverse effects on residential amenity will be avoided. The nearest non-OceanaGold owned residences are 2.0 km (Howards), 4.8 km (Vanderley) and 2.4 km (O'Neil). The Assessment of Effects of Discharges to Air – **Appendix 3**, has found that with appropriate mitigation any adverse effects downwind of the site are expected to be less than minor.

Under Policy 16.2.3.4 mining is only to be allowed where there is reasonable certainty that land will be restored to an acceptable standard in terms of landform and productive potential. The site will be progressively rehabilitated as appropriate and Coronation North pit lake will be formed on closure.

Mining is only to be allowed where there are no significant adverse effects from large scale development on rural character and visual amenity (Policy 16.2.3.5).

Policy 16.2.3.9 requires activities to be designed and operated to ensure that adverse effects from light spill on rural character and amenity, and the ability of people to view the night sky, would be insignificant.

Objective 6.2.5 aims for approved earthworks to avoid or adequately mitigate any adverse effects on visual amenity and character; the stability of land, buildings, and structures; and surrounding properties.

Section 10 of the 2GP deals with the natural environment and as one of its objectives seeks to maintain and enhance areas of indigenous vegetation and the habitats of indigenous fauna. Specific policies concern mining activity and require restoration of indigenous vegetation where it was cleared for mining (Policy 10.2.1.7) and only allow mining where there is certainty that cleared indigenous vegetation will be restored (Policy 10.2.1.8). Policy 10.2.5.10 provides that mining should only be allowed where adverse effects on identified ridgelines can be avoided or, if avoidance is not possible,

would be insignificant. Policy 10.2.2 and 10.2.2.3 require buildings, structures, storage and use of hazardous substances, and earthworks - large scale and vegetation clearance to be set back from water bodies an adequate distance to enable the biodiversity and natural character values of coastal and riparian margins to be maintained or enhanced and to minimise erosion.

Relevant to the permitted baseline, when compared to the operative DDP there is nothing that indicates the 2GP has been changed to make farming activities significantly more restrictive in the High Country Rural Zone and the Rural Zone (section 16). Both stock grazing and farming are promoted by policies and objectives and are permitted activities. Vegetation clearance is a permitted activity but must be in accordance with the Vegetation Clearance Standards (for example, 10.3.2.3: clearance must not occur within 20m of any wetland identified in Appendix A1.2). Indigenous vegetation clearance is permitted and must also be in accordance with the Vegetation Clearance Standards (for example, rule 10.3.2.2 maximum area of clearance for High Country Rural Zone is 500m² for non-tussock species, and 10,000m² (1 ha) for tussock species).

7.11 KTKO NRMP 2005

It is recognised that manawhenua have both a spiritual and physical relationship with the natural environment and that traditional Maori values are closely linked to the environment. Accordingly, OceanaGold has consulted with Kai Tahu ki Otago Ltd (KTKO), as representative of all affected manawhenua, and commissioned a cultural impact assessment (CIA) on the Coronation North Project. It is expected that the CIA will address all of the relevant assessment matters raised within the KTKO Natural Resource Management Plan 2005 (NRMP).

The NRMP has been developed to:

- Provide the principal planning document for Kai Tahu ki Otago;
- Provide information, direction and a framework to achieve a greater understanding of the natural resource values, concerns and issues of Kai Tahu ki Otago;
- Provide a basis from which the management of the natural, physical and historic resources of Otago is further developed.
- Provide the basis, but not substitute, for consultation and outline the consultation expectations of Kai Tahu ki Otago.

The sections of the KTKO NRMP relevant to the Coronation North Project address:

- Preventing deterioration of water quality;
- The effect of dams on cultural values;
- Ensuring only the minimum amount of water is abstracted;
- Managing instream works to protect nohoanga, mahika kai, fish passage, habitat values;
- Protecting wetlands;
- Encouraging re-vegetation of high altitude ecosystems using indigenous flora of local origin;
- Promotion of Accidental Discovery protocols and other measures to ensure protection of waahi tapu;
- Protection of cultural landscapes.

The relevant provisions from the NRMP (extracts) are attached as **Appendix 1**.

Overall, the Coronation North Project applications are considered to be generally consistent with the policies of the NRMP.

8 THE MINERAL RESOURCE

8.1 Mining History

The earliest alluvial mining in the district commenced at Murphys Flat in 1862, with Macraes Flat, Deepdell and some parts of Horse Flat being worked soon after. Murphys Creek was the major early alluvial workings and there is evidence that all of its tributaries were being worked in the 1860's. The Murphys Creek alluvial workings are reasonably well preserved and are considered to be of historic significance.

Lode quartz mining commenced in the 1860's, but the scale of operations was very small. The Golden Point/Round Hill lode system was not discovered until 1889. Development of Golden Point commenced in 1889 and it became established as a significant scheelite and gold producer. From 1890 to 1933, it produced an estimated 13,000 ounces of gold and 800 tons of scheelite. Other nearby areas mined included Maritana, Golden Bell and Deepdell but quantities were small.

Some areas continued to be mined after 1939 as tungsten was in demand during the Second World War but gold prices were sharply reduced during this time. The scale of operations at this time was small and work was discontinuous, as a result records of production of ore at this time are poor.

The first lode worked in the Macraes field was probably the Duke of Edinburgh, described by Ulrich (1875). In 1888, the Highlay Reef was discovered on the Mare Burn, and the lode was soon traced to Golden Point, where it was opened out in 1889. Further prospecting soon resulted in the opening of other mines along the lode, some of them, however, being little more than surface workings.

The historical mines that have been worked, given in order eastward, are Mount Highlay, New Zealand Gold and Tungsten, Coronation, Golden Bell, Maritana, Deepdell, Golden Point, Round Hill, Innes Mills, Griffins, Golden Ridge, Ounce and Golden Bar (**Figure 8–1**).

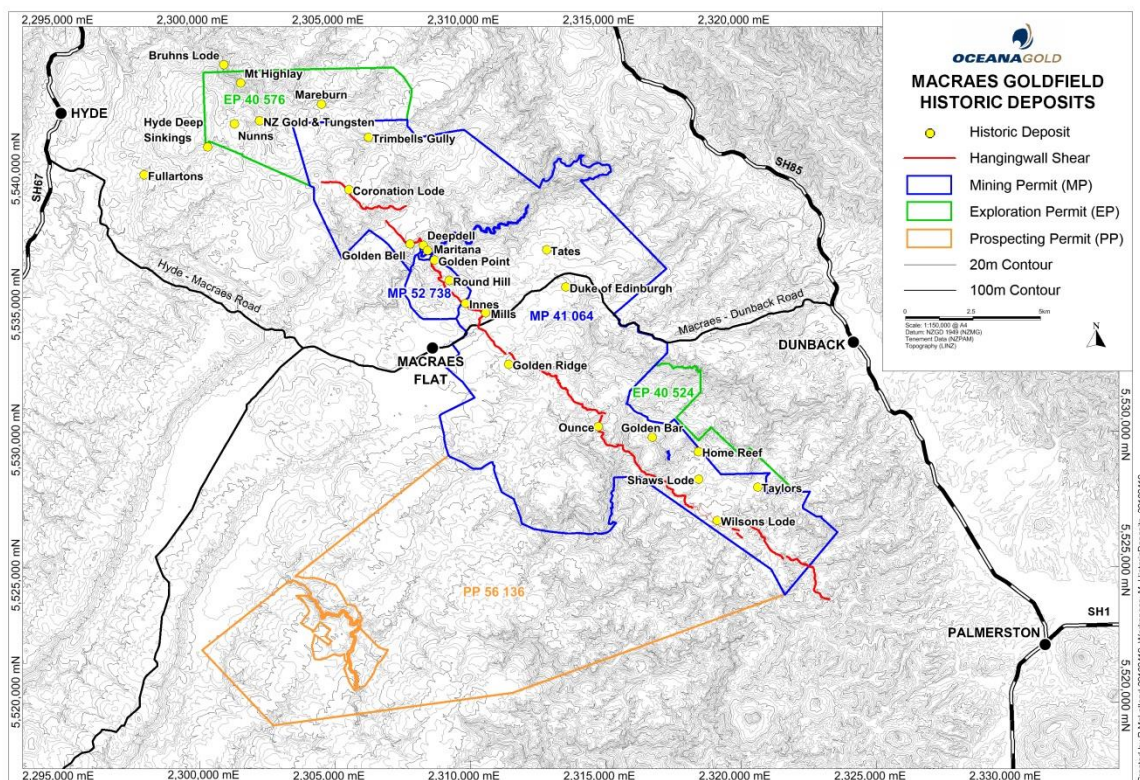


Figure 8–1 Macraes Historical Mining Areas

The modern era tenements at the Macraes Mine were initially owned by Golden Point Mining Limited and BHP Gold Mines (New Zealand) Limited, a subsidiary of BHP Gold Mines Limited. During December 1989, Macraes Mining Company Limited (MMCL) obtained 100% ownership of these tenements. On May 14, 1999, Macraes Mining Company Limited changed its name to Gold and Resource Developments (New Zealand) Limited and again to GRD Macraes Limited on June 30, 2000. Finally on May 18, 2004, the name was changed to Oceana Gold (New Zealand) Limited.

Mining at Macraes by OceanaGold commenced in 1990 and included the commissioning of a process plant capable of processing 1.5 million tonnes of ore per year. Successive upgrades over the last 20 years have resulted in an increase in throughput rate to nearly 6 million tonnes per annum. The first open pit to be mined was Round Hill in 1990, thereafter followed over the next 20 years by Southern, Innes Mills, Frasers, Golden Point, Golden Bar and Deepdell North and South pits.

Underground operations at Frasers commenced in 2006 using a contractor. Since July 2010, underground operations have been undertaken using OceanaGold's own work force.

The processing plant includes an autoclave for pressure oxidation of the ore. Since 2007, flotation concentrate from the company's Reefion Gold Mine has been transported by rail and road and processed through the Macraes autoclave as an integral part of the Reefion operations, until care and maintenance was implemented at Reefion in March 2016.

8.2 Geology and Mineral Resources

Mineral resources and reserves are updated annually. The most recent estimate for the Coronation North Project was undertaken as at 31 December 2015. In simple terms, a resource is an estimate of material (in this case, gold) that has a reasonable prospect of economic extraction. Reserves are a subset of these resources and have been estimated from a detailed economic analysis in accordance with established and accepted international standards to determine their economic viability having regard to all known factors (e.g. financial, mining, metallurgical, environmental, governmental, legal).

8.3 Rationale for the Coronation North Project

Ongoing exploration for new gold discoveries over the life of the mine has defined the Coronation North Project as an area of economic interest. Consenting of the Coronation North Project will lengthen the MGP life by approximately three years.

9 EXISTING ENVIRONMENT

9.1 Landscape

Macraes Flat sits within a rural upland landscape of rolling hills with moderate relief and with characteristic broad ridge crests.

Pastoral farming is the broad land use in the area, with gold mining being the dominant land use within the area covered by OceanaGold's mining permits. Macraes Flat is located on the eastern edge of the schist country and the broader historic goldfields of Central Otago. The presence of the relatively large scale Macraes Mine is a noticeable and culturally interesting element in the current landscape.

The long term local cultural landscape feature of Macraes Flat is the township itself with its hotel, school, churches and clusters of houses and various outbuildings and shelterbelts. There are a number of historic buildings and features which also form part of the landscape. These relate to the history of the area as a centre for both farming and mining.

The proposed Coronation North project will be located on the Taieri Ridge, in the headwaters of Maori Hen Creek, Mare Burn Creek and Trimbells Gully Creek (Taieri River catchment).

The project will be located to the north of the current Frasers Pit which is one of the most publicly visible features of the Macraes Mine.

Very approximately, about a third of the Coronation North Project footprint, plus the haul road, will be within the Macraes Mining Project Mineral Zone ("MMP Mineral Zone") or Rural Scenic Zone of the Waitaki District. Approximately two-thirds of the footprint of the Project will be on Rural Zone land within a High Country Outstanding Landscape Area ("High Country OLA") within the Dunedin City.

The landscape of the Project area is steep to rolling country, rising steeply from the north-west side of Horse Flat Road to a relatively flat plateau on the Taieri Ridge, adjacent to the Sister Peak. The southern flank of the Project area drains to one main north-south oriented gully – Camp Creek – which in turn is fed by numerous other small gullies to the east and west. Camp Creek then drains to Deepdell Creek. The northern flank of the Project area drains to Coal Creek, Maori Hen Creek and Trimbells Gully; all of which drain to the Mare Burn and ultimately to the Taieri River.

Portions of the Project area, along with the ridge tops of the west side of Camp Creek, are covered in mature pine plantation; some of the pine plantation within the Project area was accidentally burnt through in July 2012 and most of the burnt-out plantation has now been removed as part of the Coronation project. The remaining land is generally grazed, modified tussock grassland.

In terms of natural character and visual amenity value, it is assessed that the Taieri Ridge forms a distinct skyline and visual backdrop to the Macraes Flat area to the south and eastern extent of the Middlemarch-Hyde basin to the north. Its block faulted ridgeline with frequent outcrops of schist is distinctive and its various incised gullies that drain to Deepdell Creek to the south and Mare Burn to the north give the ridge a rugged character. The visual amenity of the Taieri Ridge is further defined by its predominant vegetation cover of tussock grassland, which has been maintained by extensive pastoral farming practices and its elevation and isolation.

The section of the Taieri Ridge that contains the Project is defined by the Sister Peaks promontories, the active Coronation Mine, the incised, upper catchment of Camp Creek to the west and south and the more gentle slopes of the upper Mare Burn catchment to the north.

9.2 Climate

The presence of the Southern Alps, extending the length of the South Island, has a major effect on the climate of the Otago region, as does the ocean, and produces distinct climatic contrasts from west to east.

Rainfall at the Macraes Mine is slightly seasonal, with the greatest rainfall occurring during the summer months of December and January. Throughout the remainder of the year the rainfall is relatively consistent. Rainfall data for the period 1959-2015 for Macraes Flat, compiled from Glendale and more recently Golden Point Road rain gauges was used to establish a statistical distribution for rainfall. The mean rainfall was 634 mm/year with a standard deviation of 122 mm/year.

From previous hydrological studies carried out at the MGP it is estimated that about 80% of the mean rainfall is lost from the area through evaporative process. These processes include evaporation from surface water features (e.g. streams and ponds) and the soil capillary fringe, as well as transpiration (refer **Appendix 21**, section 3.2).

9.3 Regional Geology

The eastern area of Otago is underlain principally by Mesozoic age schist of the Torlesse Terrane. Weathering and erosion over a long period formed the distinctive low relief of the Otago peneplain. The landscape in the Macraes area comprises widespread outcrops of schist and thin cover soils.

The Hyde-Macraes Shear Zone, which is the gold bearing structure mined by OceanaGold, dips gently (-15°C) to the east.

9.4 Topography and Soils

The topography of the Macraes Flat area is that of an ancient erosional surface, or peneplain, which has been bisected by Deepdell Creek, Camp Creek to the south and Maori Hen Creek and Trimbells Gully to the north. Deepdell Creek, which flows toward the northeast discharges into the Shag River. Maori Hen Creek and Trimbells Gully discharge into the Taieri River.

Exploratory and geotechnical drilling and landform comparison indicates that a thin layer of loess covers much of the Macraes Mine area. The loess soils comprise a very stiff, light yellow grey silt, sandy silt or silty fine sand. Subsurface investigations identified a surficial cover of loess, colluviums and topsoil.

Colluvium has accumulated at the base of steep slopes around the Coronation North Project site. Colluvium mainly comprises fine angular schist gravel in a sandy or silty matrix, with the matrix mainly derived from reworked loess.

The soils are directly underlain by schist comprising well foliated, fine grained pelite to coarser grained psammite.

9.5 Groundwater, Surface Water and Hydrogeology

9.5.1 Introduction

The proposed Coronation North Project is situated on the ridgeline along the Shag River and Taieri River catchment divide. Surface runoff and groundwater will report to Coal Creek, Maori Hen Creek, and Trimbells Gully Creek which all contribute to the Mare Burn within the Taieri River catchment.

The Coronation North Project is situated entirely within the Mare Burn catchment. The estimated catchment area is dependent on where the compliance point is located, as seen in **Table 9.1**. A new water compliance monitoring point (MB02) is proposed downstream from the current compliance monitoring point of MB01 as the Project will affect water quality downstream from MB01. It is proposed that MB02 will become the compliance point for the Coronation North Project.

Table 9.1 Estimated catchment areas of Coronation North Project elements.

Stage	Catchment	Area (ha)	Total Area (ha)	Comments
Baseline	Undisturbed	1,384	1,384	Areas calculated to existing compliance point at MB01
Pre-mining	Undisturbed	2,930	2,930	Areas calculated to existing compliance point at MB02
Mining Coronation North	Impacted	127	2,987	Areas calculated to proposed compliance point at MB02
	WRS	234		
	Undisturbed	2,626		
Post closure	Impacted	180	2,987	Areas calculated to proposed compliance point at MB02
	WRS	234		
	Undisturbed	2,573		

During the consenting process for the MPIII expansion, it was identified that if the Back Road waste rock stack was built there was potential for sulphate concentrations in Deepdell Creek to exceed the stock water limit of 1000 mg/L at the DC08 compliance point during periods of low flow, post closure. To avoid this possibility OceanaGold proposed to construct a freshwater reservoir named Camp Creek Freshwater Dam to store fresh water and manage its release during periods of low flow to dilute the sulphate concentrations and prevent exceeding the stock water limit. The MPIII expansion was granted consent in 2011, which requires the construction of Camp Creek freshwater dam if the Back Road waste rock stack is constructed.

Water quality in Deepdell Creek is monitored at a compliance point known as DC08. The compliance point was at another location upstream known as DC07 prior to 2012, however it was moved downstream when the MPIII expansion was consented in order to capture any effects from the consented, but the not yet constructed, Back Road waste rock stack.

Water quality in the Mare Burn is currently monitored at a compliance point known as MB01. It is proposed that this compliance point will be superseded by another compliance point downstream to be known as MB02. This is in order to capture any downstream effects of the Coronation North Project.

Deepdell Creek flow has been monitored at the Deepdell Creek flow gauge at Golden Point weir since 1985 (site number 72627). Rainfall records have been monitored at the same location since 1991. There are some gaps in the flow record, so rainfall data was used to fill the gaps in the flow record and produce a modified flow record for use in the water modelling for this project. The methodology is explained in the Golder report *Coronation North Project -Surface Water Modelling* at **Appendix 4**. The actual and modelled flow data is shown in **Table 9.2 –& Table 9.3**.

Table 9.2 – Deepdell Creek flow statistics.

Parameters	Min	Lower Quartile	Median	Average	Upper Quartile	Maximum
Instantaneous (L/s)	0.0	10.7	28.1	110.1	83.5	73,695
Daily Average (L/s)	0.0	10.7	28.7	108.2	85.0	44,220
Instantaneous (L/s/km ²)	0.00	0.26	0.69	2.70	2.05	1,806
Daily average (L/s/km ²)	0.00	0.26	0.70	2.65	2.08	1,084

Given the climate, geology and elevation of the Mare Burn catchment, it is likely to be hydrologically similar to the Deepdell Creek. For the purposes of understanding the likely flow regime of the Mare Burn, specific flow data from the Deepdell Creek has been utilised and scaled to the Mare Burn catchment area upstream from MB01 compliance site (14.4km²) and the proposed MB02 site (29.3km²). The derived flow statistics are presented in Table 9.2 and can be used as an indication of likely flow at the respective sites.

Table 9.3 – Mare Burn derived flow statistics

	Min	Lower Quartile	Median	Average	Upper Quartile	Maximum
MB01 Daily average (L/s)	0.0	3.6	9.7	36.6	28.8	14,960
MB02 Daily average (L/s)	0.0	7.7	20.6	77.7	61.0	31,760

9.5.2 Existing Water Quality & Compliance Levels

9.5.2.1 Surface Water

The Macraes Gold Project operates under water and discharge permits issued by the Otago Regional Council. The consents include a requirement that sulphate concentrations must not exceed 1000 mg/L in any one of the monthly samples at the DC08 and MB01 (MB02 proposed) compliance points.

9.5.2.2 Mare Burn and Taieri River

Surface water quality downstream of the Coronation North Project within the Mare Burn is currently monitored at a number of locations. The compliance point MB01 is located on the Trimbell's Gully tributary of the Mare Burn. Data presented in Table 9.4 was collected between December 2014 and November 2015.

Previously consented mine developments (Coronation Pit and WRS) within the Mare Burn catchment commenced in late 2014. The data presented in Table 9.4 may therefore not represent baseline water quality within the Mare Burn. For that reason baseline water quality utilised for the MPIII project was compared to the MB01 data. The comparison with the MPIII baseline data indicated that the water quality presented in Table 9.4 would also be representative of baseline conditions as adopted in the MPIII project. In addition there is no indication of decreasing water quality or rising concentrations for any of the parameters during the reviewed period. Therefore the Mare Burn water quality data from the MB01 compliance monitoring site for the period December 2014 to November 2015 has been adopted as the baseline water quality for the Coronation North Project.

Table 9.4 - Summary of water quality monitoring data from MB01 (Dec 2014 – Nov 2015).

Parameter	Minimum	Mean	95 th Percentile	Maximum	Number of samples
Arsenic	0.0010	0.0019	0.0050	0.0050	12
Sulphate	1.3	6.4	11.1	11.6	12
Cyanide _{WAD}	0.001	0.0012	0.0015	0.0016	4
Copper	0.0006	0.0009	0.0014	0.0016	12
Iron	0.08	0.24	0.54	0.54	12
Lead	0.0001	0.0002	0.0010	0.0018	12
Sodium	5.5	9.3	13.3	13.5	12
Potassium	0.4	1.7	4.7	6.2	12

Calcium	4.0	11.3	19.2	19.2	12
Magnesium	1.2	2.8	4.4	4.4	12
Zinc	0.001	0.002	0.005	0.006	5
Chloride	3.9	5.3	7.7	8.8	12

9.5.2.3 Compliance Limits

Existing compliance criteria for the current Coronation Project compliance point MB01 are presented in **Table 9.5** along with the consented Deepdell Creek compliance criteria for comparison. These proposed criteria have been compared to New Zealand Drinking Water Standard NZDWS 2008 and the ANZEC stock water standards.

Table 9.5 Water quality compliance criteria.

Parameter	Existing at MB01	Deepdell Creek at DC07	ANZEC 2000 (stock water)	NZDWS 2008
pH (unitless)	6.0-9.5	6.0-9.5	-	7.0-8.5
Sulphate	1,000	1,000	1,000	250
Cyanide _{WAD}	0.1	0.1	N/A	0.08
Arsenic	0.15	0.15	0.5	0.01
Copper ⁽¹⁾	0.009	0.009	0.5	2
Iron	1.0	1.0	N/A	0.2
Lead ⁽¹⁾	0.0025	0.0025	0.1	0.01
Zinc ⁽¹⁾	0.12	0.12	20	-

Notes: All units in g/m³ unless otherwise stated.

(1) Copper, lead and zinc standards are hardness related.

$$a) \text{ Copper Limit (g/m}^3\text{)} = \frac{0.96 \cdot e^{0.8545[\ln(\text{hardness})] - 1.702}}{1000}$$

$$b) \text{ Lead Limit (g/m}^3\text{)} = \frac{(1.46203 - [\ln(\text{hardness})(0.145712)]) \cdot e^{1.273[\ln(\text{hardness})] - 4.705}}{1000}$$

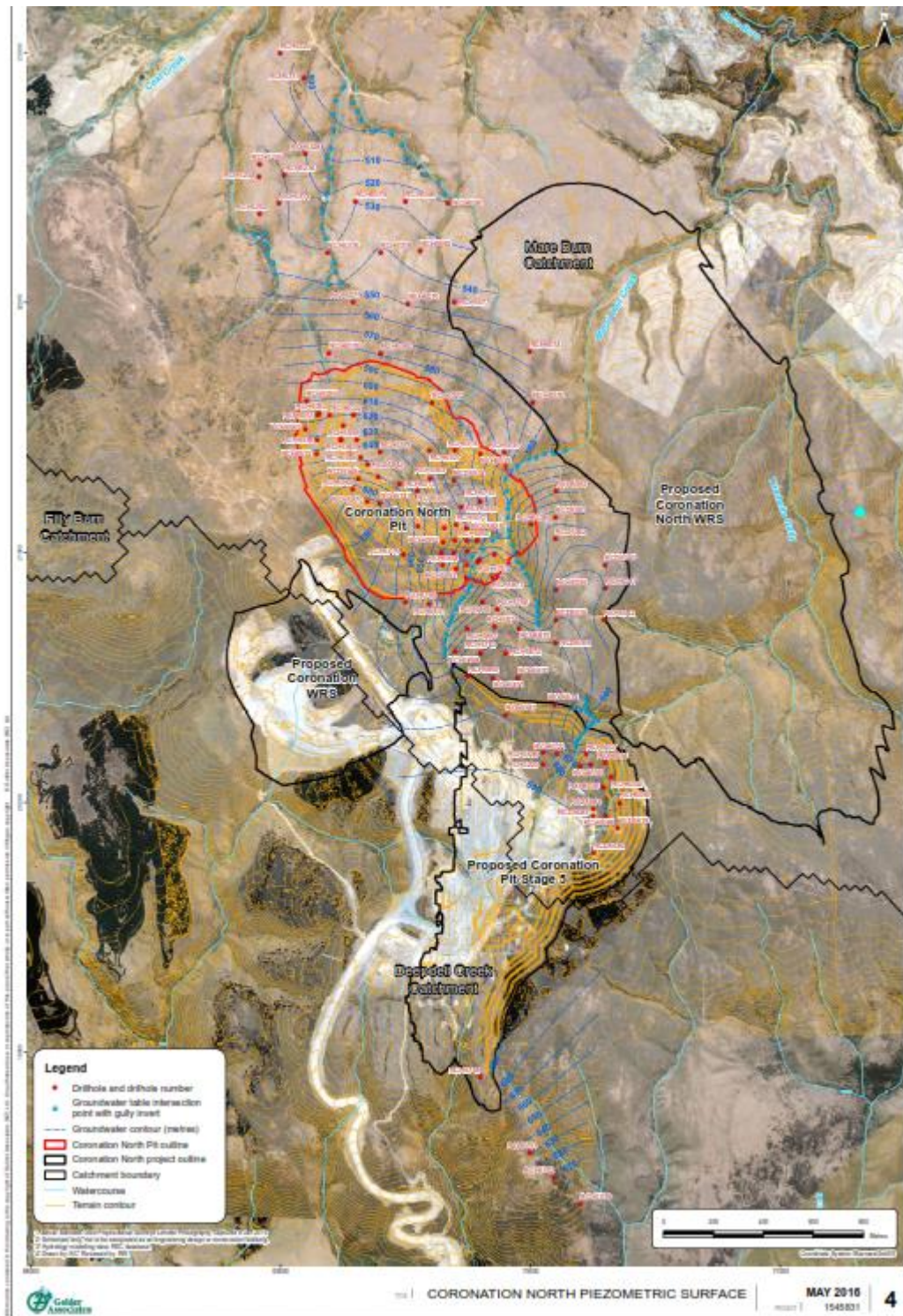
$$c) \text{ Zinc Limit (g/m}^3\text{)} = \frac{0.986 \cdot e^{0.8473[\ln(\text{hardness})] + 0.884}}{1000}$$

9.5.2.4 Summary

Surface runoff from the Coronation North Project will report to the Mare Burn catchment. The existing compliance point in Mare Burn is located at MB01. The existing water quality compliance limits are based on the existing use of that water body for stock watering. Water quality data is based on a small collection of data from December 2014 to November 2015 and is deemed to be representative of the Mare Burn catchment.

9.5.3 Groundwater

The baseline piezometric surface in the area of the Coronation North Pit and part of the Coronation North WRS is presented in “Coronation North Project - Groundwater Assessment” Figure 4, at **Appendix 5**.



The schist rock mass at the MGP has been subjected to an extended period of weathering, combined with the removal of large overburden loads through erosion. As a result the apertures of fractures and the foliation are greater close to the ground surface than they are at depth. This trend is reflected in decreasing rock mass hydraulic conductivity with increasing depth below ground. The schist rock mass in the Coronation North Project area is not expected to be significantly different structurally from that in other areas of the MGP and will behave hydraulically in a manner similar to the wider MGP area. The structural pattern of the rock mass is not isotropic and the hydraulic conductivity of the schist is therefore also anisotropic.

The calculated regional groundwater recharge rate (based on an average annual rainfall of 607mm/year across the entire MGP site, an average annual evaporation of 1,092mm and an average annual open water evaporation of 764mm) was assessed at about 32 mm/year.

Groundwater seepage flows associated with the Coronation and Coronation North Projects can be seen in **Appendix 5**. The transport of mining related elements within groundwater has previously been assessed to evaluate transport rates. The elements for the Coronation North Project which are derived from the opencast pits and waste rock stacks will almost entirely discharge to surface water bodies within the Mare Burn catchment upstream from a proposed environmental water quality monitoring and compliance point at MB02.

The development of, and seepages from the Coronation Pits has also been modelled in the “Coronation North Project - Groundwater Assessment” at **Appendix 5**. As the pit lakes approach overflow, small seepage losses through the soils and schist bedrock are expected to develop. These seepage flows are small compared to the inflows to the pit but may affect the rate of pit lake development. Modelling indicates that the Coronation pit lake will take in the order of 160 years to fill and Coronation North pit lake will fill to overflow in around 400 years (refer to **Appendix 4**, Section 6.1, Pit Lake Development).

9.6 Ecology

9.6.1 Macraes Ecological District

The proposed Coronation North Project is situated within the Macraes Ecological District (ED), which is one of the two Ecological Districts that make up the Lammerlaw Ecological Region. Macraes ED is characterised by gently sloping land (mostly below 600m), with higher ridges rising over 800m.

Past vegetation cover of the Macraes ED comprised montane short tussock grading into subalpine tall tussock with areas of hardwood forest (including a podocarp element), Kanuka forest and Coprosma-flax scrub. Destruction of the forest cover began with natural fires around 2500 years ago and was exacerbated by Polynesian (800 to 400 years ago) and European settlement (1840AD). The area has been heavily modified by 120 years of farming. As a result the present vegetation of the Macraes ED is of a highly modified nature with a large amount of the district dominated by improved pastureland.

The wider Macraes Flat area has a high diversity of threatened and uncommon plants and is considered a stronghold for several threatened plant species. These species of interest are widespread in the Macraes ED.

9.6.2 Botanical Features

The technical reports referred to below surveyed a larger potential project footprint than the refined Project footprint, therefore represent a conservative or “worst-case” scenario.

Twelve vegetation communities have been identified within the Coronation North Project Area, including the Coal Creek Freshwater Dam footprint. These have been identified as: gully slope mosaic, basalt contact flush wetlands, ephemeral wetlands, short tussock grassland, narrow-leaved tussock grassland, exotic cultivated pasture, shrub land, disused *Pinus radiata* plantation, pond, seepage, riparian herbfield and sedgeland and bluff vegetation (refer **Appendix 6** and **Appendix 7**).

The project area is representative of the general vegetation patterns in the area of the Macraes Ecological District (ED), although there is a gradient from west to east in this area with some species becoming less, or more, common. The community patterning of narrow-leaved tussock grassland on broad topped spurs and slopes with short tussock grassland in drier and/or heavily grassed areas and where flatter and less rocky areas have been cultivated using ploughing, and with interfingering shallowly to moderately incised drainage systems hosting gully wetlands and bluff vegetation is typical of this area.

The study area has a very high botanical diversity with 162 indigenous species and 79 exotic species. There are 4 threatened plant species, 9 at risk plant species and 5 rare plant species within the Coronation North Project study area. The silver tussock and hard tussock grasslands, basalt contact

flush wetlands and long inundation ephemeral wetlands could be considered as vegetation communities that are rare in the Macraes E.D., mainly due to their limited extent and infrequent representation. Within the Coal Creek Dam footprint there are 2 threatened, 6 at risk, 1 data deficient and 4 rare plant species and 2 morphologically distinct forms.

Overall the vegetation communities within the study areas are assessed as: of high rarity importance, high botanical diversity importance, moderate role in providing a patchwork of natural ecological areas, as having a moderate role in buffering the area for weed incursion and increased sedimentation, having a minor ecosystem support service role in protecting genetic diversity, a minor role in reducing erosion and regulating flood flows, a negligible ecosystem cultural services role, and a minor role in provisioning and providing irrigation water to downstream areas.

9.6.3 Avifauna and Herpetofauna

Bird and herpetofauna communities are relatively depauperate (for the area), with few species at low (bird) or moderate (reptile) population densities. One At Risk bird species and 2 At Risk reptile species are present within, or are likely to occasionally utilise, the Coronation North project area, including the Coal Creek Dam footprint.

9.6.3.1 Birds

Eleven bird species were observed during a 2015 survey of the Coronation North and Coal Creek Dam project area with the majority of species being introduced birds including skylark, chaffinch, redpoll, house sparrow and song thrush. Five native species were observed: pipit, harrier hawk, grey warbler, paradise shelduck and spur-winged plover. Paradise shelducks and harrier hawks are common, widespread and non-threatened. The New Zealand pipit is classified as 'At Risk – Declining'.

Within the Macraes area pipits are widespread, particularly in rough low grassland, although population density varies greatly from site to site. Pipits are mainly present in the Coronation North RAP area where it is estimated, based on encounter rate, that there are between 5 – 12 pairs of birds. Pipits are thought to be occasional visitors to the Coal Creek Dam area.

In September 1994 and 1995 an OceanaGold staff member undertook an informal bird count on the Western waste rock stack and adjacent paddock. In 1994 7 pipits were observed on the waste rock stack and 2 in the paddock. In 1995 9 pipits were observed on the waste rock stack and 0 in the paddock. The inference that may be drawn from this survey is that the habitat on the waste rock stack appeared no less suitable, and potentially more suitable for pipits than the grazed pasture adjacent (J Bywater pers. comm.).

9.6.3.2 Reptiles and Amphibians

The Coronation North Project area contains a moderate amount of suitable lizard habitat, with many rocky outcrops surrounded by tussock land and pasture. Three reptile species were recorded in the area: the McCann's skink *Oligosoma maccanni*, the southern grass skink *Oligosoma polychroma* and gecko *Woodworthia* "Otago large" (the latter two species are classified as 'At Risk - Declining').

Both grand skink *Oligosoma grande* and Otago skink *Oligosoma atagense* have been recorded historically from about 1km north of the project area. They were not seen in or near the area during the survey and as the habitat for these large skink species is scarce in the project area it is considered highly unlikely that these two species are present. Green skinks *Oligosoma chloronoton* were present to the east of the project area in the 1960's but there have been no recent records of this species from anywhere within the OceanaGold operational area, even during a ten day species-specific survey in 2015. It is considered unlikely that this species is present within the project area. Cryptic skinks *Oligosoma inconspicuum* inhabit some gully-bottom habitats in the area but none were detected and most of the area consists of unsuitable habitat due to a shortage of stream-fringing fruit-bearing shrub and vine species. However, it is possible that a small number of individuals may be present.

No amphibians were recorded in the Coronation North area but the exotic whistling frog *Litoria ewingii* was recorded in the Coal Creek Dam area.

9.6.4 Aquatic Values

The Coronation North Project area lies in the upper catchment of Coal Creek and Maori Hen Creek, the Mare Burn and Trimbells Gully Creek which are tributaries of the Taieri River.

9.6.5 Benthic macroinvertebrate communities

The tributaries of the Mare Burn that have been surveyed contain a surprising number of benthic invertebrate taxa given they are probably impacted by a lack of surface flow at times in most years and their habitats are not protected from grazing stock. None of the taxa identified are uncommon, indeed all are commonly found throughout large areas of the country. However, diversity is relatively high in these tributaries given there appears to be nothing particularly unique about their instream character.

No other rare or threatened macroinvertebrate taxa were identified.

9.6.6 Fish Communities

Freshwater crayfish, which are classified by the New Zealand Threat Classification System (NZTCS) as 'At Risk – Declining', are widespread and relatively common in Maori Hen Creek, Trimbells Gully tributary and mainstem and Coal Creek within the potentially affected area.

Flathead galaxiids, which are classified by the NZTCS as 'Threatened – Nationally Vulnerable', are present in the tributaries of the Mare Burn from Coal Creek up to the confluence with Trimbells Gully.

Assessments by Ryder Consulting over recent years have not identified the presence of any suitable salmonid spawning habitat, nor have any salmonids been caught in Mare Burn tributaries. It is likely that this type of habitat is located further downstream in the catchment and well outside of the proposed Project area. Barriers to upstream passage are also likely to restrict the presence of salmonids in the upper Mare Burn catchment.

Eel abundance in the vicinity of the tributaries subject to existing and proposed mining operations is very low to non-existent, with only one eel having been observed (at TC01) since surveying began in 2012. Therefore, significant eel populations are not at risk from existing or proposed mining operations associated with the Coronation North Project.

9.7 Human Environment

9.7.1 Community

The Macraes Mine is located within a relatively remote rural part of the Waitaki District. Other than mining, the area supports typical farming activities dominated by sheep and cattle grazing, and some areas of plantation forestry and deer farming. The Macraes Mine is by far the dominant economic activity in the area. The nearby township of Macraes provides a focal point for the local community, including people associated with the mine who live locally. The township comprises a small number of dwellings, a primary school, hotel, church and mine visitor centre (the last two owned by OceanaGold).

9.7.2 Heritage Values

The Macraes district consists of a complex and extensive heritage landscape. There are a variety of historic site types, representing farming, alluvial and quartz mining operations. Since the early 1990s a vast amount of archaeological and heritage assessments and inventory work has been undertaken.

Currently OceanaGold uses the OceanaGold Heritage Management Plan to assist it in identifying and protecting significant archaeological sites. The Management Plan was completed in 2012 and is currently being updated to take into account the Coronation Project. The Management Plan was developed with the objective of ensuring that *"identified heritage sites (including archaeological sites both pre- and post- 1900 in origin) would only be modified or destroyed where no other reasonable options exists"*. Within the Management Plan criteria for the assessment of archaeological and heritage values are outlined.

Origin Consultants have carried out a thorough archaeological survey of all areas to be affected by works associated with the proposed Coronation North Project. The *"Coronation Mine North Macraes-Archaeological Assessment"* is attached as **Appendix 9**.

The results of the field survey have been separated into geographic locations, linked with proposed activities associated with the Coronation North Project. They are as follows:

9.7.2.1 Coronation North Waste Rock Stack

The proposed Coronation North Waste Rock Stack will disturb a series of water races in Trimbells Gully and sites in Maori Hen Creek.

9.7.2.2 Coronation North Pit

The proposed Coronation North Pit will not directly impact upon any identified sites.

9.7.2.3 Coronation North Roads and Infrastructure

The proposed pit infrastructure will not directly impact upon any identified sites.

9.7.2.4 Coal Creek Freshwater Dam

There are multiple features located in Coal Creek. These include; alluvial workings, stone revetments, water races, changes to waterways, and possibly a stamper battery site.

9.7.3 Summary of Tangata Whenua Values

9.7.3.1 Iwi or Hapu Exercising Mana Whenua over the Area

The Coronation North Project is situated within the takiwās of Kāti Huirapa Runaka Ki Puketeraki, Moeraki and Otakou.

In recognition of Kāti Huirapa Runaka's special affinity with the area OceanaGold entered into a Memorandum of Understanding with Kāti Huirapa Runaka on 6 December 2004. A copy of the Memorandum of Understanding is attached as **Appendix 10**.

The objective of the Memorandum of Understanding was to establish an effective and efficient working relationship between OceanaGold and Kāti Huirapa Runaka in relation to their specific interests in the area, and in particular to:

- Manage the effects of mining and other related activities so as to take into account and have regard to the spiritual and cultural values and customary rights of mana whenua as they apply to the use and management of natural and physical resources;
- Ensure the effects of mining are remedied, avoided or mitigated as required by the Resource Management Act 1991 and having regard to the interests of Kati Huirapa Runaka;

- Manage the effects of mining as far as practicable, so as to specifically avoid, remedy or mitigate any adverse effects on waahu tapu, mahika kai and waahi taoka;
- Ensure timely consideration by Kāti Huirapa Rūnaka of any proposals for resource consents made by OceanaGold, and to ensure that wherever possible Kāti Huirapa Runaka provides its written approval to such consent applications;
- Provide necessary and other relevant information to ensure effective and informed consultation as outlined in the terms and reference;
- Develop and maintain an ongoing and meaningful consultative process between mana whenua and OceanaGold; and
- Establish a Trust with mana whenua representation responsible for the future development and monitoring of Macraes Mine beyond mine life.

OceanaGold is interested in completing a similar MOU with Moeraki and Otakou.

The effects of the Coronation North Project on tangata whenua values are addressed at section 12.2 of this AEE.

9.7.4 Iwi Archaeology

An assessment has been completed of the Coronation North Project area. The Assessment is included at **Appendix 11**. No features of significance to iwi have been identified within the footprint of the Coronation North Pit. Within the footprint of the Coronation North Waste Rock Stack there were sites identified that may be rock shelters, a possible umu pit, and a possible urupa (burial site). The latter site may be able to be avoided by re-designing the rock stack, and if that is not practicable further site examination is recommended. Within the Coal Creek Dam footprint there are further potential rock shelter sites.

9.8 Existing Economic and Social Environment

Mike Copeland of Brown, Copeland & Co Ltd provided an *Assessment of Economic Impacts* ("AEI Report") for the Coronation North Project ("the Project") dated April 2016, attached as **Appendix 2**.

The Macraes Gold Project ("MGP") head office, located in Dunedin, and the mine have helped to diversify and sustain the Otago Regional economy, particularly the north-East Otago community. The MGP site is located largely within the Waitaki District however the Coronation and Coronation North Projects extend into Dunedin City. Employees at the mine reside in a number of centres stretching from Oamaru to Dunedin, so the "local" economic impacts in north-east Otago includes the Waitaki District and the nearby north Dunedin City towns of Waikouaiti, Hyde and Middlesmarch.

9.8.1 Population

Statistics New Zealand data shows that the population of the Waitaki District in 2006 was estimated at 20,700 and by 2015 had grown to 21,900 – i.e. an increase of 5.8%.

Dunedin City's population has grown from 122,300 in 2006 to 125,800 in 2015, an increase of only 2.9%.

Over this same period Otago's population has grown from 199,800 to 215,000, an increase of 7.6%, whilst in comparison New Zealand's population has grown by 9.8%.

Statistics New Zealand is forecasting little change in the Waitaki District and Dunedin City's populations over the next 20 years. Projections have the District and City populations increasing by just 0.1% average annual growth over the period 2015-2043.

For the Otago region, the population is projected to experience 0.4% average annual growth over the period 2015-2043.

The comparative figures for New Zealand show a projected increase in population averaging 0.7% per annum over the same 28 year period.

9.8.2 Employment

Statistics New Zealand 2015 industry employment data highlight the Waitaki District's reliance on the primary sector, in particular agriculture which accounted for 1,460 jobs or 15.1% of the labour force against a national percentage share for this industry group of only 5.7%. Other significant sectors within the Waitaki labour force are retail trade (1,010 jobs or 10.4% of the total labour force), healthcare and social assistance (990 jobs or 10.2% of the total labour force), accommodation and food services (810 jobs or 8.4% of the total labour force) and construction (690 jobs or 7.1% of the total labour force).

Total employment in the Waitaki District grew by 6.2% over the period 2006 to 2015, as compared to employment growth for New Zealand of 8.2%.

For Dunedin City, the key sectors are healthcare and social assistance (8,720 jobs in 2015 or 16.0% of the total labour force), education and training (7,520 jobs or 13.8% of the total labour force), retail trade (6,060 jobs or 11.1% of the total labour force), accommodation and food services (4,640 jobs or 8.5% of the total labour force), construction (3,900 jobs or 7.1% of the total labour force) and manufacturing (3,770 jobs or 6.9% of the total labour force).

Total employment in Dunedin City fell by 3.3% over the period 2006 to 2015.

For the Otago region as a whole, employment data suggest the most significant sectors are accommodation and food services (12,280 jobs in 2015 or 11.8% of the region's workforce), healthcare and social assistance (11,400 jobs or 11.0% of the region's workforce), retail trade (11,080 jobs or 10.6% of the region's workforce), education and training (9,990 jobs or 9.6% of the region's work force), agriculture, forestry and fishing (9,820 jobs or 9.4% of the region's workforce), manufacturing (8,360 jobs or 8.0% of the region's workforce) and construction (7,990 jobs or 7.7% of the region's workforce).

Total employment in the Otago region grew by 6.7% over the period 2006 to 2015.

The MGP has helped to diversify the Otago regional economy and especially the Waitaki District economy and the north-east Otago sub-region, which remain heavily dependent upon agriculture and the processing of agricultural products. The mine helps to offset periodic downturns in the agricultural sector in the Waitaki District and has also helped to sustain Dunedin City's economy through the location of OceanaGold's head office in Dunedin and the city's businesses providing goods and services to the mine, its employees and other businesses supplying the mine. The MGP also provides some diversity to the Dunedin City economy, although in proportionate terms the MGP has greater impact in the smaller and less diversified north-east Otago sub-region.

9.9 Road Network

There is a network of district roads within the vicinity of the MGP and the Coronation Projects, including Macraes-Dunback Road, Macraes Back Road, Golden Bar Road and Golden Point Road (refer to Transportation Assessment, **Appendix 12**). The small settlement of Macraes Village lies some 2.2 kilometres to the west of MGP.

The MGP is located on Macraes-Dunback Road approximately mid-way between Dunback and Hyde. **Figure 9-2** shows roads within the MGP area and **Figure 9-2** shows the local road network.

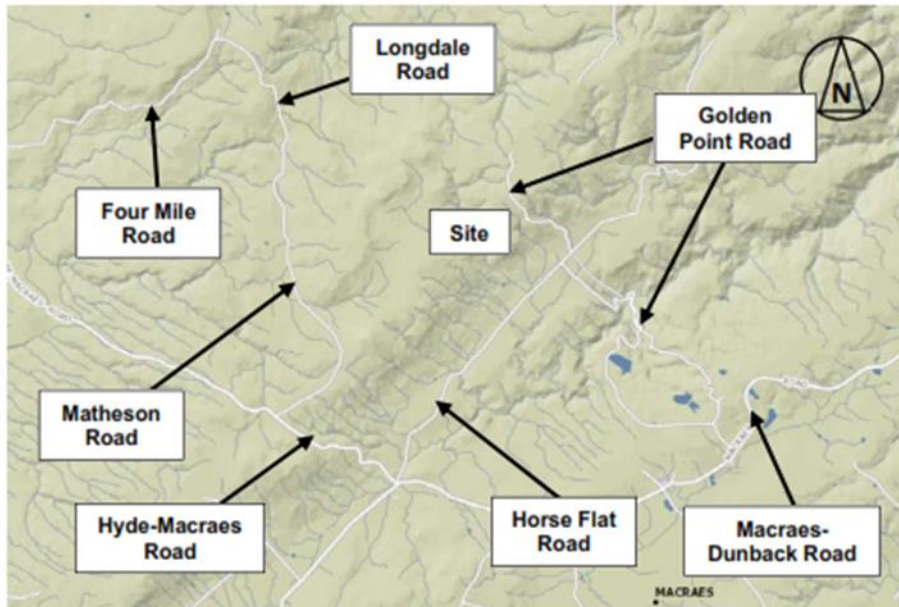


Figure 9-1 Roads within the MGP area

In the vicinity of MGP Macraes-Dunback Road provides one lane traffic of 3.5m width in each direction plus a sealed shoulder of approximately 1m. Macraes-Dunback Road is classified as District Arterial within the Waitaki District Plan roading hierarchy, and as such it is a 'strategic link of district importance'. The road has in recent years been re-aligned to the north to allow expansion of the MGP on the southern side of Macraes-Dunback Road.

All other roads in the immediate area are Local Roads, which under the roading hierarchy are expected to serve adjacent land use activities.

Golden Point Road passes around the western edge of the MGP area on the northern side of Macraes-Dunback Road. It provides the main access to the MGP offices and to the processing plant. Golden Point Road meets Macraes-Dunback Road at a "Stop" controlled intersection which includes sufficient widening for a left and a right turning vehicle to wait side by side at the stop line. Sight distances at the intersection are excellent and exceed 250m in each direction.

Horse Flat Road has a metalled carriageway that varies in width between 4 and 5m and serves a small number of rural properties.

Some 2.5km northwest of the Hyde-Macraes Road/Horse Flat Road intersection Matheson Road meets Hyde-Macraes Road. Although a legal road Matheson Road is unsealed with a carriageway of about 4m wide.

Around 1.7km northeast of Hyde-Macraes Road, it meets Longdale Road, another unsealed road with a 4m carriageway. This runs northwards for around 4.7km whereupon it meets Four Mile Road, another minor district road.

In practice, although they are public roads, Longdale Road and Horse Flat Road will operate as though they are private accessways. They connect only private residences or agricultural activities, and so will typically be used only by those that are living or working in the immediate area rather than the general public.

None of the roads in the immediate area of the MGP have specific infrastructure for walking, cycling or public transport. This is commensurate with the highly rural nature of the Project environs. Use of these roads by pedestrians and cyclists is expected to be very low. There are no public transport services that operate in the area.

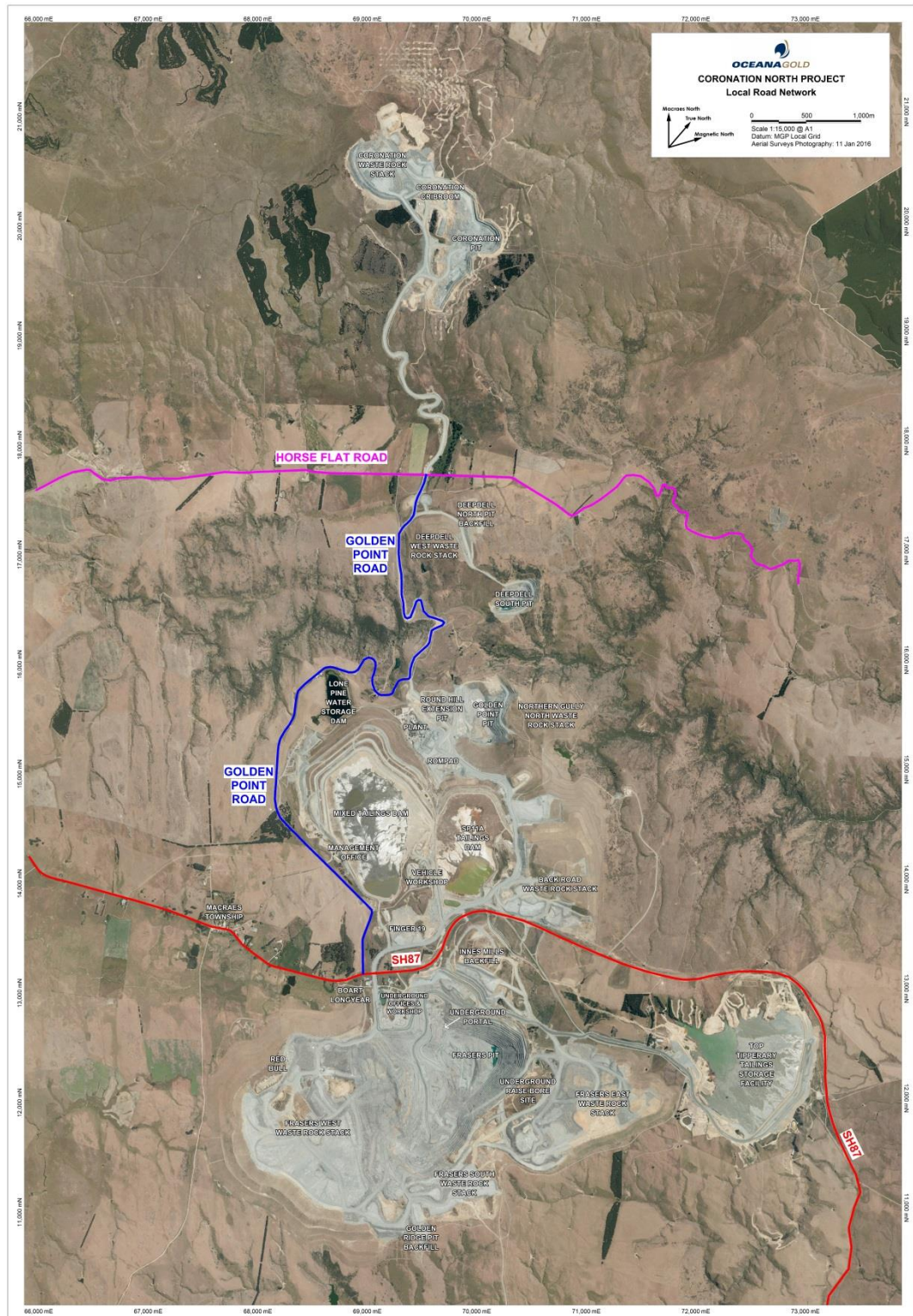


Figure 9–2 Local road network

Existing daily traffic volumes, which are extremely low, are identified in **Table 9.6** below.

Table 9.6 Daily Traffic Volumes

Location	Average Daily Traffic (Two-way)
Macraes-Dunback Road (east of Horse Flat Road)	465
Macraes-Dunback Road (west of State Highway 85)	430
Longdale Road (east of Four Mile Road)	25
Longdale Road (north of Hyde-Macraes Road)	10
Horse Flat Road	20
Golden Point Road (near Horse Flat Road)	10
Golden Point Road (north of Macraes-Dunback Road)	130

Six 'loss of control' accidents have been recorded in the vicinity of the MGP over the last decade, all of which occurred on Macraes-Dunback Road with no accidents recorded on Longdale Road, Horse Flat Road or Golden Point Road. All accidents have had driver-related contributing factors, such as driver inattention, fatigue or intoxication. It is not considered that there are any underlying road safety issues on the roading network in this area.

9.10 Noise

Noise measurements were taken around the MGP site and Macraes Flat township in 1988 before any mining activities commenced. They showed the background sound (L_{95}) in calm conditions dropped to a low of 27dBA in the afternoon with the lowest L_{10} level during the day at a measured 37dBA. At night time the background sound dropped to a low of 25dBA with the L_{10} down to 28dBA in calm weather conditions. A 1987 New Zealand Meteorological Service report showed there was less than 1% calm conditions in the area and as the wind increased the noise environment would quickly increase by 5-10dBA or more (refer **Appendix 13**).

10 DETAILED PROJECT DESCRIPTION

10.1 Overview

The Coronation North Project is an extension to the existing consented Coronation project at the MGP. The main elements of the Project are:

- The Project continues to be located on the ridgeline located to the north of Horse Flat Road along the Shag River and Taieri River catchment divide and is situated between the features known as Sister Peaks and Highlay Hill.
- Development will continue to be within the upper reaches of Maori Hen Creek, the Mare Burn and Trimbells Gully Creek (Taieri Catchment).
- The estimated duration of the operation and rehabilitation phases of the Project will be approximately 5 years and the project will add approximately 3 years to the overall Macraes mine life.
- Mining operations will occur 24 hours a day, seven days a week.
- The existing Coronation Pit, which is currently consented to cover an area of about 62 Ha, will be extended primarily to the south. The existing pit was estimated to contain approximately 5Mt of ore, and exploration activity has confirmed additional ore is present. The estimated ore contained in the revised pit (including that which has already been processed) is approximately 8.5Mt. A pit lake, similar to that currently consented, will remain on closure.
- A resource has been identified within the area of the consented Coronation Waste Rock Stack which will be mined, and a new open pit - Coronation North Pit - will be developed. The Coronation North Pit is estimated to contain approximately 9Mt of ore (for total additional ore stocks comprised in this application on 12.5Mt) and will cover an area of about 63 Ha. The Coronation North Pit will be opportunistically partially backfilled where practicable and will be closed as a pit lake.
- The ore mining rate for the Pits will be approximately 5Mt per annum or 20Mt of material excavated per pit, per annum.
- The existing Coronation Waste Rock Stack will not be constructed to the fully consented extent. The total volume of waste rock will reduce from a currently consented 94Mt (an area of approximately 105 hectares) to approximately 29Mt (an area of approximately 41 hectares). This is a reduction of approximately 65Mt (and 64 hectares in area). The consented maximum height of the Coronation Waste Rock Stack will remain 730 mRL.
- A new waste rock stack (Coronation North Waste Rock Stack) will be constructed to the north east of the consented Coronation Waste Rock Stack. The waste rock stack design is capable of containing the total excavated waste material from Coronation North Pit and the Coronation Pit expansion (about 280Mt). It is designed to a maximum height of 695 mRL and a maximum potential area of 230 Ha. With the potential for opportunistic backfill placement within the Coronation pits, the size of the waste rock stacks may reduce in proportion to the amount of backfill placed in the pits. There will be no change in maximum height of the currently consented Coronation waste rock stack (730 mRL).
- All water from the Coronation North Pit and Coronation North Waste Rock Stack is expected to report to the Mare Burn catchment, a tributary of the Taieri River. Overflow from the expanded Coronation Pit Lake will also report to the Mare Burn catchment.
- A freshwater dam may be constructed within Coal Creek catchment. The proposed dam will consist of an embankment with an approximate height of 27m behind which about 685 million litres of water will be stored when at full capacity. This dam will provide a constant water

supply downstream, of about 5 litres per second, to supplement naturally occurring low flows in Coal Creek and Mare Burn for water quality purposes.

- The existing haul road will be extended by about 2km to the north to reach the Coronation North Pit. Ore will be hauled from the Pits to the Macraes processing plant via the existing haul road across Horse Flat Road and along the Golden Point Road alignment to the Processing Plant. In most other respects the roading will remain the same as for the consented Coronation project.
- Coronation Project consent conditions provide for unformed Matheson Road to be realigned and unformed public access (15 metres wide) to be provided around the consented Coronation pit and waste rock stack when mining operations cease. Since the footprints of the Coronation North Pit and Coronation North Waste Rock Stack overlap the consented realignment OceanaGold will identify an alternative route for the realigned Matheson Road and apply to vary the Coronation land use consent.
- Surface water runoff around the pits, waste rock stack(s) and haul road will be managed with diversion drains and silt control dams located in gullies downstream of disturbed areas. Sediment control will be installed prior to any disturbance within each catchment area.
- Surface water and groundwater collected in the pits during operations will be pumped out to a water sump adjacent to the pits. Water from the sump will be used for dust control and any surplus water will be discharged via a silt pond.
- The portable diesel storage and refuelling facility installed adjacent to Coronation Pit will remain and be utilised for the Project. Temporary buildings (including toilet facilities and crib room) will remain in place beside Coronation Pit and may also be located adjacent to Coronation North Pit.
- The processing rate at the Macraes processing plant of about 6Mt per annum will be unchanged by the Project.
- The closure plan will comprise progressive rehabilitation of the Coronation and Coronation North Waste Rock Stacks, opportunistic backfilling of the pits during operations, formation of pit lakes within both Pits, removal of any buildings and other temporary structures, decommissioning of the silt ponds to become stock water ponds, removal of the haul road crossing over Horse Flat Road, rehabilitation of the main haul road from the pits and waste rock stack(s) to Horse Flat Road and reinstatement of Matheson Road on a new alignment. On the completion of mining and rehabilitation Golden Point Road will be reopened for public access.

10.2 Environmental Issues to be addressed

The principal mining related environmental issues to be addressed are as follows:

- Noise: from works associated with the Coronation pit expansion, Coronation North Pit, construction of the Coronation North WRS, and roading.
- Dust: created by earthworks (including stripping of overburden and topsoil, mining, construction of roads and silt ponds, formation of the WRS and rehabilitation), vehicle movements on unpaved surfaces, loading and unloading of materials, and wind generated dust from dry exposed surfaces such as roads and stockpiles.
- Airblast and Vibration: from the proposed pit on the nearest houses to the proposed operation not owned by OceanaGold.
- Stability: the structural integrity of the Coronation North WRS.
- Archaeology: Archaeological and heritage resources that have been identified within areas proposed for the Project.
- Ecology: potential effects (aquatic, avifauna and herpetofauna, and botanical) of the WRS and the Coronation open pits on ecological values.

- **Water Quality:** the construction of a new pit and WRS will result in contaminant losses which have the potential to affect water quality in the wider catchment.
- **Landscape and Visual:** potential effects from the construction and operation of the Project on landscape and visual effects.
- **Cultural Values:** the maintenance of natural landscapes, protection of waahi tapu and waahi taonga for taonga species and impacts on the mauri of the land, water and air are all of cultural importance.

These issues are addressed in detail in sections 11 and 12 of this AEE.

10.3 The Mine

For over 26 years OceanaGold has successfully mined open cut pits at the Macraes Gold Project. The Macraes Gold Project is centred on the Hyde Macraes Shear Zone ("HMSZ"). Since open pit mining commenced at the Macraes Gold Project, a series of conventional open pits have been developed along the north-west trending (mine grid north) HMSZ. Gold mineralisation is variably distributed along the hangingwall shear as well as along a number of erratic, concordant shears, located below the hangingwall shear. Zones of sheeted, and variously orientated, quartz veins within the intrashear schist also carry some mineralisation. The footwall schists are typically barren.

The hangingwall shear dips at 15-20° to the east (mine grid east) with a mineralised width of 5-30m. The structure has been mined over a strike length of 6km and, in the Frasers area, is known to be mineralised to depths in excess of 500m.

Mining operations commenced in 1990. Ore mining at Macraes Mine has come from eleven pits, comprising, from north to south, Coronation, Deepdell North, Deepdell South, Northwest, Golden Point, Round Hill, Southern, Innes Mills, Frasers North and South, Golden Ridge and Golden Bar Pits.

All of these pits have been either fully or partially backfilled with mine waste rock apart from Deepdell South and Golden Bar (where lakes have been formed), Frasers (which is currently being actively mined and also consented to be a lake once complete) and Coronation Pit which is also currently being mined.

10.4 Environmental Engineering and Management Details

Open pit mining at the Coronation North Pit will use standard blasting and ripping methods used at the Macraes Gold Project since operations commenced, and will typically be at a rate of 20Mt per year using a diesel powered mobile fleet of equipment.

Ore and waste rock will continue to be drilled and blasted in tonnages usually of 100,000 to 1,000,000 tonnes of rock per blast. Blasting will be done on average 3 to 5 times per week during daylight hours. In practice this will represent little change from current Macraes Gold Project operations.

Hydraulic excavators will then load the fleet of dump trucks, which will transport the ore to the run of mine (ROM) stock-piles located at the Macraes Gold Project processing facility or low grade stockpiles for later re-handling. Waste rock will be hauled to the nearby Coronation North WRS for final deposition. A fleet of support equipment such as bulldozers, graders and water carts will assist the main mining fleet.

10.5 Construction Phase

The construction phase of the Coronation North Project will commence with the establishment of light and heavy vehicle access, and appropriate sediment controls. Stripping and stockpiling of topsoil from the footprint of the Coronation North Pit and WRS will take place, with the stripped areas kept to the minimum necessary to mine the Pit and deposit waste.

10.6 Ore Processing

Ore from the Coronation North Project will be processed at the Macraes Gold Project processing plant. Ore processing has been undertaken at the same processing facility since inception in 1990. The processing plant capacity has been increased over the years from an original capacity of 1.5 million tonnes per annum to its current processing rate of 6 million tonnes per annum.

A number of processing improvements have occurred throughout the life of the mine including the addition of more milling and flotation capacity. An autoclave was added in 1999 and is used to oxidise under pressure the ore that is concentrated during the flotation process (currently including Reefion ore concentrate).

The Macraes Process Plant recovers gold by concentrating the metal into a relatively small fraction of flotation concentrate, oxidising the reground concentrate in a pressure oxidation autoclave, washing the oxidised residue and then utilising a carbon-in-leach process to recover gold from the residue.

10.7 Waste Rock Disposal

10.7.1 Overview

The Coronation North Project will require a new WRS to be constructed to take about 280Mt of waste rock excavated from the Coronation North Project Pits.

OceanaGold has much experience in constructing and rehabilitating WRSs - a number of waste rock stacks have been constructed and progressively rehabilitated over the Macraes Gold Project mine life to date.

10.7.2 Description of Stacks

The Coronation North WRS lies within the DCC boundary, with a surface area of approximately 230ha. The WRS will have a maximum height of 695m RL and will be contoured to blend in with the surrounding natural topography. WRS slopes have been designed both to ensure stability and to mirror similar slopes as occur naturally in the area. The Coronation North WRS will be contained within the Taieri catchment.

10.7.3 Environmental Engineering & Management Details

The construction process for the Coronation North WRS will generally be the same as currently employed for the construction of other waste rock stacks at the Macraes Gold Project and will include:

- i) Involvement of a landscape architect in the design phase;
- ii) Fencing and making the area;
- iii) Topsoil stripping and storage or if available, direct relocation to another rehabilitation ready area;
- iv) Construction of a perimeter safety bund, to protect from rolling rocks;
- v) Direct mine truck dumping and pushing by dozers in vertical lifts not exceeding 20m.

The average yearly rate of deposition will be approximately 40 million tonnes.

See section 12.8 for details on the structural integrity of the WRS.

Rehabilitation of the WRS will be undertaken by mining equipment on a progressive basis, meaning that rehabilitation occurs once a section of a WRS is complete rather than waiting until the whole stack is completed.

Once final profiles are achieved in a section of the WRS a 300 mm layer of brown rock (highly weathered schist) will be placed over the fresh waste rock and track rolled down with a dozer. A 200 mm layer of topsoil will be placed on top of the brown rock layer. Fertilising and seeding of vegetation

shall then be undertaken, with use of both native plants and exotic pasture seed that is compatible with existing vegetation patterns on the site, to return the ground to agricultural pasture. In addition, large rocks could be placed on the sides and top of the Coronation North WRS to support the return of lizard populations to the rehabilitated ground.

10.8 General Ground & Surface Water Management

10.8.1 Overview

Engineering Geology Ltd (EGL) has prepared a report outlining the proposed concepts for erosion and sediment control. The *Oceana Gold (New Zealand) Ltd, Macraes Gold Project Coronation North Project – Erosion and Sediment Control* report is attached as **Appendix 14**. The report identifies practices and procedures to minimise erosion and sedimentation, and the treatment of runoff prior to discharge into the adjacent tributaries.

Runoff from the pit is captured in the base of the pit and is pumped back to a pit sump for use in dust control, so no specific sediment control is required.

10.8.2 Treatment Method Options

The areas of disturbed land associated with the Coronation North Project that will require erosion and sediment control are:

- Coronation North WRS
- Coronation North Pit perimeters
- Coronation Pit perimeters
- Haul roads.

Prior to commencement of construction of Coronation North Pit and WRS Erosion and Sediment Control Plans will be prepared (ESCP). The ESCP's will detail the design of specific erosion and sediment control devices, responsibilities for implementation, construction details and standards, construction timetable, maintenance, monitoring and reporting procedures, response to storm events and contingency measures. The Plans will incorporate modern erosion and sediment control practices that are documented in the Environment Canterbury Guidelines except that site specific design criteria will be adopted for sizing silt ponds that are based on experience at the site. In general terms the design of erosion and sediment control measures will follow existing practice. Specific erosion and sediment control measures will include:

- clean water diversion drains with small dams located in gullies where necessary to divert runoff into the diversion drains.
- silt ponds downstream of disturbed areas. Permanent silt ponds will be designed according to existing criteria. The sizing depends on the catchment area and runoff coefficient. Decants similar to those currently on site will be adopted. Service and emergency spillways will be provided and designed to pass the flows from 10 year and 100 year return period rainfall events.
- shoulders of the WRS are progressively rehabilitated and will have benches every 20m vertical height to control runoff.
- perimeter surface water drains located around the perimeter of the WRS and Pit where appropriate, to ensure runoff is conveyed to the base of gullies without erosion.
- progressive stripping of the WRS footprint, with shaping only undertaken in dry weather conditions.

Temporary diversion drains will be constructed on the upstream catchment side of the haul road and the water directed to the natural drainage gullies. Where the haul road crosses gullies, culverts will be constructed in the bottom of the fill to allow the continued flow of storm water runoff down the gully. Silt ponds will be constructed along the length of the haul road to collect storm water runoff from the haul road surface in accordance with Environment Canterbury Guidelines.

The proposed silt ponds will not breach any of the permitted standards in the Regional Plan: Water (Rule 12.3.2.1) and therefore will not require any resource consents. The standards that will be met include: the size of the catchment upstream of the ponds is no more than 50ha in area, the volume of water stored by the ponds will be less than 20,000m³ and the water in the ponds will be no more than 3m deep. Infiltration of water into the ponds will follow natural ground contours and water will report to silt ponds within the same tributary as it originated from. No significant wetlands or wetlands 800m above sea level will be adversely affected by the ponds, no flooding will be caused to any other people's property, no erosion, land instability, sedimentation or property damage will be caused.

When mining is completed in the area the silt ponds could be retained as permanent stock water ponds or perhaps as wetlands.

Groundwater bores will be located around the perimeter of the Coronation North WRS for in-house monitoring of the groundwater movement and chemical constituents to the Mare Burn catchment. This data will be used to refine the groundwater model and to refine the model of pit lake formation.

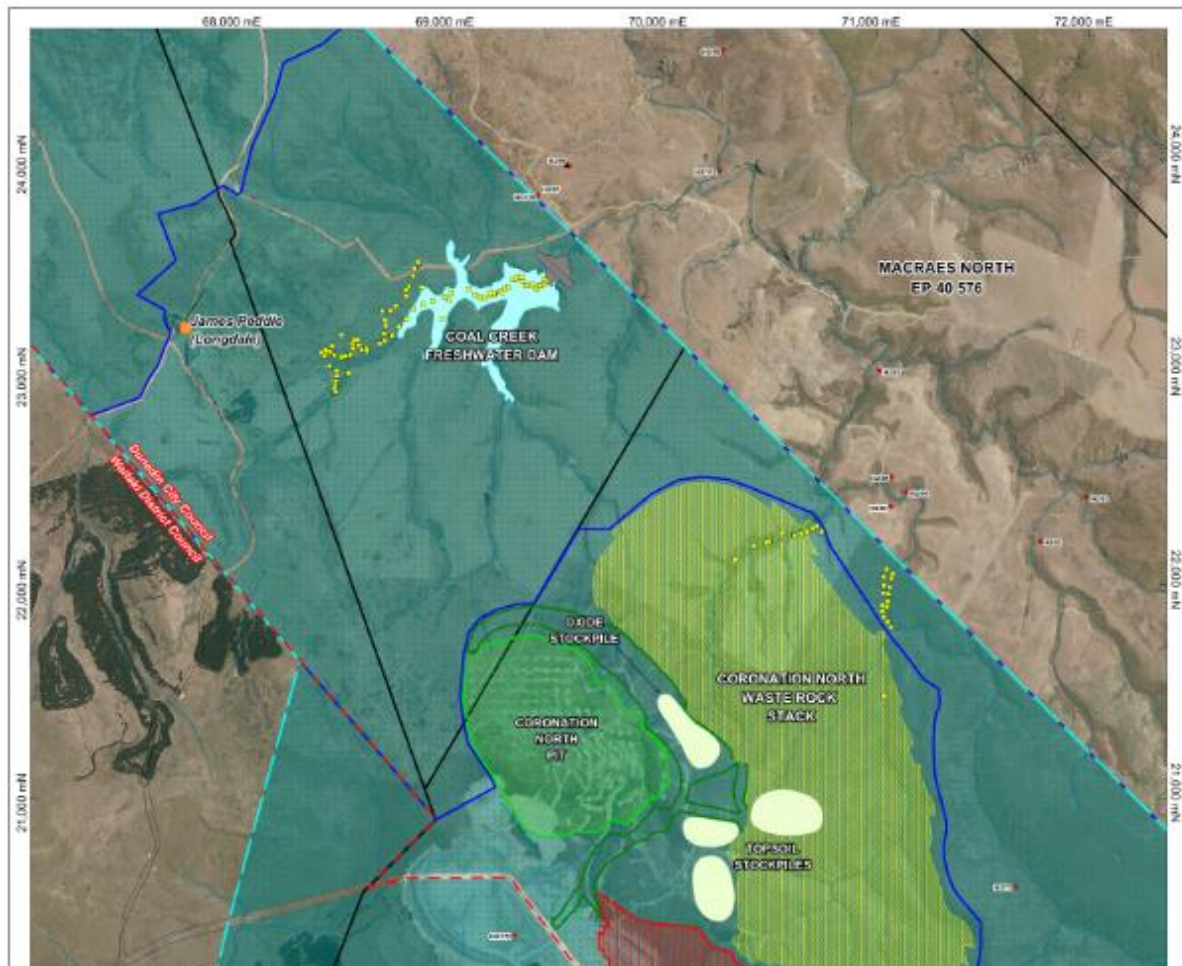
10.8.3 Coal Creek Freshwater Dam

Modelling of future water quality has been undertaken to assess the impact of mining-related surface water flows. These studies have shown there is a potential deterioration in some of the water quality for these creeks unless management strategies are put in place.

A number of mitigation options are potentially available for improving water quality including the construction of a freshwater dam to discharge fresh water into the waterways to dilute contaminants, in particular sulphate. Augmentation of water may be required to ensure water quality standards are met for the Mare Burn catchment. Therefore the environmental effects of the location of a storage dam in the Coal Creek catchment have been assessed.

OceanaGold has determined that the construction of a freshwater dam in Coal Creek is presently the most appropriate option to supplement low flows in the Mare Burn to reduce sulphate concentration, therefore is seeking to consent the dam. However the dam may not ultimately be required, or may only be required on a reduced scale. OceanaGold intends to commission a best practice options ("BPO") report to clarify mitigation options that may be utilised together with, or instead of, the dam. OceanaGold will share the BPO report with the consent authorities. The dam will not be constructed before this process is completed. Should a decision be made to implement any of the alternative mitigation options identified in the BPO report OceanaGold will apply for necessary consents or consent variations. As the need for the dam to maintain downstream water quality is not likely to be required during operations, and is most likely to arise post closure, OceanaGold is confident that it has time to explore and implement appropriate contingency mitigation, provided consent for the dam is sufficiently flexible to enable it to be constructed at a defined point in the future.

Coal Creek lies to the immediate west of Maori Hen Creek and has a catchment of 700 hectares. It flows into the Mare Burn before flowing into the Taieri River about 7.5km downstream of the proposed dam site. The dam would be located on OceanaGold's private land in the general area depicted in **Figure 4-2** (extract below).



Construction of Coal Creek Water Storage Dam with an embankment that is approximately 27 metres high will provide water storage of approximately 685,000m³ and a reservoir area at normal top water level of about 9.3 hectares.

EGL has assessed the feasibility of the Coal Creek Dam and prepared a Technical Report. The "Coronation North Project Coal Creek Freshwater Dam Technical Report" is attached as **Appendix 21**.

A preliminary geotechnical investigation indicates the site is a suitable dam site and that locally derived material should be suitable for constructing the dam. Preliminary stability analyses show that the embankment meets normally accepted standards for both static and seismic conditions, but further analyses is recommended at the final design stage. Design concepts for the proposed dam have been developed. It is recommended that the embankment be a zoned earthfill/rockfill structure with the crest at RL487 with a 1m wide vertical chimney drain. Two spillways (primary and auxiliary) are recommended, with spillway size to be finalised during detailed design in accordance with detailed dam breach analyses. Final design of the embankment will be in accordance with the New Zealand Society on Large Dams (NZSOLD) Guidelines.

The Coal Creek Dam will take between two and five years to fill and the filling rate is weather dependent. Water quality modelling by Golder has shown that the Coal Creek Dam will store sufficient water to enable Mare Burn creek flow supplementation at a constant rate of 5 litres per second to ensure water quality standards are met.

10.9 Access, Site Roads, Public Roads

Once Coronation North Pit is operational, it is expected that there will be about 50 vehicle movements per day on the haul road between the Coronation North pit and the MGP processing plant. This represents about 100 two-way vehicle movements per day. Existing consent conditions, which are proposed to be extended to Coronation North Project, allow ore to be transported over a 24 hour period and this means on average four vehicles will cross Horse Flat Road per hour.

Access to the Coronation North Project from the Macraes Gold Project processing plant will continue to be via the Deepdell haul road, which is currently being used to access the Coronation Pit. A 2km extension of this road to the north will join up to the Coronation North Project area.

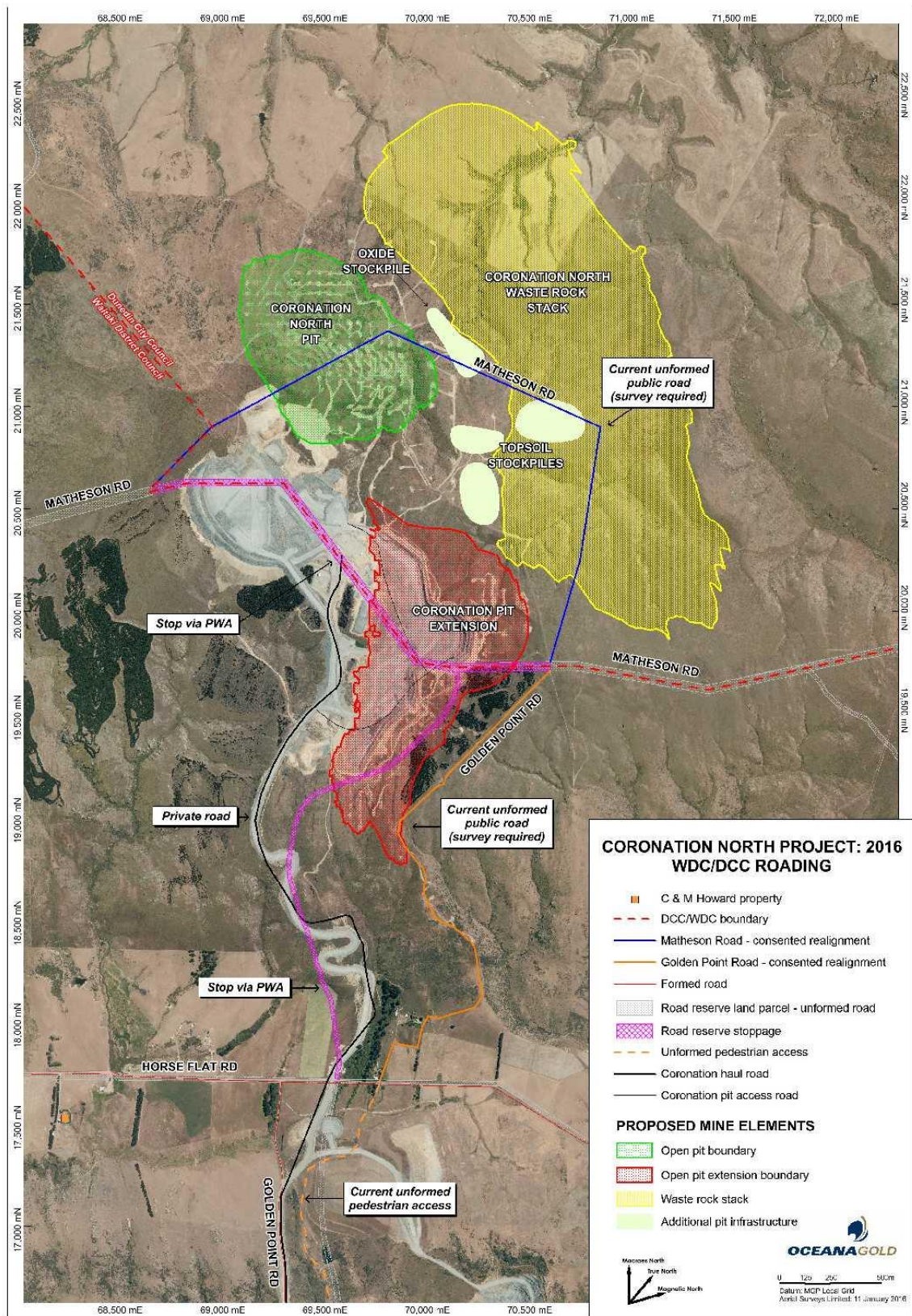
Since mining at Deepdell ceased, and until the Coronation Project began, the haul road between a point just south of Horse Flat Road and the turnoff to the Golden Point Historic Reserve was available for public use. It is not practical or safe for public vehicles to share the haul road with the mining equipment and ore haulage trucks that are used for Coronation project and will be used for Coronation North project. Therefore for the period of operations at Coronation North the haul road will need to be closed to public traffic, as was the case when mining was occurring at Deepdell. OceanaGold owns the land upon which this formed road is located. Although the road is known as 'Golden Point Road' in fact the road is not public between Horse Flat Road and the turnoff to the reserve – it does not follow the legal road corridor.

The access road to the Golden Point Historic Reserve and Horse Flat Road itself will both remain open to the public during the Project, so the public will continue to have vehicular access along Golden Point Road to the Battery and Reserve. 'Golden Point Road' will be temporarily closed. When the haul road is no longer needed for mining purposes it will be formed to the appropriate rural road standard and provided to the WDC to vest as legal road.

Coronation Project consent conditions provide for unformed Matheson Road to be realigned and unformed public access, 15 metres wide – a fine-weather track, to be provided around the consented Coronation pit and waste rock stack when mining operations cease. As is shown in **Figure 10-1** the footprints of the Coronation North Pit and Coronation North Waste Rock Stack overlap the blue line of the consented realignment. Accordingly OceanaGold will identify an alternative route for the realigned Matheson Road and apply to vary the Coronation land use consent. Discussions are underway with relevant stakeholders as to an appropriate final realignment corridor. If the final size and shape of the Coronation open pit allow, the realignment will, as far as practical, move South and West from the consented blue line shown on **Figure 10-1** and follow the final perimeter of the constructed pit boundary. If it is considered necessary for the duration of the Project, temporary access could be provided on an existing farm track around the outer extent of the proposed Coronation North Waste Rock Stack and Coronation North Pit footprints.

OceanaGold will deal directly with the relevant consent authorities for any temporary road closures or construction zones for the Coronation North Project and any regulatory processes involved in establishing the varied realignment of Matheson Road.

Figure 10-1 Consented realignment of Matheson Road



10.10 Utilities

10.10.1 Power Supply

During the Coronation Project any power required for the temporary buildings, lighting and mining activities will be generated by mobile diesel generators on site. No utility infrastructure is required.

10.10.2 Post Mining Phase

Post closure and on completion of rehabilitation the generators will be removed.

10.11 Infrastructure and Ancillary Features

10.11.1 Fencing

A number of stock fences affected by the Project footprint will need to be dismantled and re-erected to keep stock away from the mine workings.

Existing fencing adjacent to the haul road will be modified to keep stock off the haul road. Upon mine closure, fencing will be erected around Coronation Pit lakes. This is for safety reasons to prevent human and/or stock access to this lake, and is consistent with OceanaGold's existing closure obligations.

10.11.2 Fuel and Chemicals Storage

There are two main existing fuel facilities at the MGP which will be used for the Coronation North Project:

- The original bunded tank farm for diesel adjacent to the Gough's Heavy Vehicle Workshop located to the east of the MGP Mixed Tailings Impoundment.
- A 150,000 litre fuel farm adjacent to Frasers Pit to service the mining fleet in the Frasers area. Appropriate consents and licences have been obtained for this.

Fuel for the mining fleet is either delivered from the fuel farms to the mobile equipment in the mine areas by self-contained fuel and service trucks or mining equipment can be refuelled directly from the fuel farms. Fuel for light vehicles is obtained from a dedicated fuel bowser at the Heavy Vehicle Workshop fuel facility.

There are no changes proposed to fuel storage for the Coronation North Project.

Explosives are currently supplied by RedBull Mining Services. Blast holes are loaded with an emulsion explosive (an emulsified blend of ammonium nitrate, calcium nitrate and fuel oil). The emulsion blend will be slightly altered for dry holes. Some pre-packaged explosive is used.

Initiation of blast holes will be by either electronic or non-electric down hole detonators.

Bulk explosives are transported to the drill holes in explosives trucks (Mobile Mixing Units), and pumped down the drill holes.

The bulk explosives become sensitised within the blast hole using a gassing agent. It usually takes 15 minutes for the explosive to become sensitised in this manner.

The unsensitised emulsion is manufactured and stored at the local batching plant. The batching plant has storage facilities for ammonium nitrate in a prilled form and for ammonium and calcium nitrates in

powder form. The emulsion phase imparts waterproofing qualities, which enables the product to be effective in wet blast holes.

Chemical and explosives storage (including blasting accessories such as detonators, primers, detonating cord and surface delays) which comply with the relevant standards set out in both the WDP and DDP will remain established close to the Coronation Pit. The handling of explosives and the method of firing is expected to continue in much the same manner as has been employed at the MGP previously.

Flammable liquid, namely diesel, exceeding 3,000 litres in volume, as well as explosives in quantities exceeding 2.5 kilograms will be transported to the Coronation North Project Area, stored and used there during mining activities. OceanaGold operates an Emergency Action Plan to address spills and hazardous substances.

Diesel will continue to be stored near Coronation Pit in above ground, 60,000 litre, double-skinned temporary storage tanks which will be removed after mining operations cease. The diesel will be transported from either the nearby Goughs workshop tanks or the MGP Frasers Open Pit bulk tanks via a mobile fuel truck along the haul road route. The mobile fuel truck is a BP fuel tanker with a maximum capacity of approximately 30,000 litres. The diesel will be used in mobile generators and mining equipment at the site.

An assessment of the site development standards (16.2(1)) and assessment matters (16.4.2) for hazardous substances in the WDP identifies the following main points that are already implemented at the MGP, and will be implemented for the Coronation North Project:

1. Explosives must be stored in primary and secondary containment systems where the volume of the secondary containment system shall be 100% of the maximum volume of the explosives (for roofed storage); the secondary containment system must be designed to ensure containment of spills and leakage; the primary and secondary containment systems will be sealed with impervious materials; and the integrity of the systems will be maintained.
2. People using hazardous substances will be certified under the Hazardous Substances and New Organisms Act 1996 ("HSNO Act").
3. OceanaGold holds relevant location certificates and stationary containment certificates for hazardous substances at the site under the HSNO Act.
4. Material safety data sheets are held and the electronic database "ChemAlert" is used.
5. Bunding is used for all bulk hazardous substance storage. The majority of bunds have sump pumps fitted to recover any spillages.
6. Spill kits, fire extinguishers and other safety equipment are available and signage is in place.
7. A trained emergency response team is in place in case of accidents and fires.
8. The location of hazardous substance storage at the Coronation North Project is located well away from neighbouring residences and is planned to be located to avoid the nearest watercourses.

There have been no major spillage events at the MGP, and OceanaGold operates:

- a Risk Management Plan dated August 2015, Version 01 to address any health and safety risks to personnel.
- a Hazardous Substances Management Plan, May 2012, Version 1, for the MGP site which will be updated to incorporate requirements for the Coronation North Project.
- an Emergency Management Control Plan dated July 2015, Version 4.

Copies of these documents can be provided to each local authority upon request.

The *Aquatic Ecology Assessment* (**Appendix 8**, section 5.4) identifies the following risks: "The presence of construction machinery in and around waterways presents a risk of contaminants entering watercourses with the potential to harm aquatic life." As mentioned above, appropriate on-site contaminant management plans operate to address these issues. Refuelling of machinery will take place away from watercourses.

Accordingly it is considered that current practices at MGP are adequate to deal with any potential effects of hazardous substances being transported, used and stored for the Coronation North Project

and no conditions of consent are required for existing practices to continue during the Coronation North Project.

10.11.3 Temporary Buildings

The Coronation North Project will use temporary buildings that provide sanitary services and crib room facilities established for the Coronation Project. These are similar to temporary buildings used elsewhere at the MGP (e.g. container-style buildings, about 10m x 6m). Sewage is managed via either portable toilet facilities or by sewage tank systems, which will be removed after mining ceases. Restoration work will involve removal of all buildings at closure.

10.12 Workforce

The existing workforce at MGP will be retained during the Coronation North Project and as this project will add three years to the overall MGP life. This will extend employment at the MGP correspondingly.

10.13 Rehabilitation

Rehabilitation is an integral part of the mining operation and a key issue considered in all mine planning.

The approach to rehabilitation taken for the Coronation North Project is largely in accordance with current MGP consents. It includes the following features:

- The surface area disturbed at any one time is the minimum necessary compatible with day to day operations.
- All statutory obligations are met.
- The sites are rehabilitated as soon as possible to a safe and stable condition.
- All contaminants on site are contained and treated in such a manner that they do not pose a long term safety or environmental hazard.
- A suitable sustainable post-mining land use is achieved.

Rehabilitation will be undertaken progressively in order to minimise areas of disturbance. As areas are rehabilitated one of the objectives that must be achieved is that they are left safe and stable.

WDP requires vegetation on finished areas to be visually integrated into the landscape (18.2) and for the land to be returned to its original productive capacity where appropriate. Elsewhere at MGP, pasture plant species are sown (e.g. browntop, rye). In the first few years of grass establishment, young grasses are green, followed by a period of maturation when pasture appears brown and blends well with the surrounding environment.

The Coronation North Project area will be rehabilitated with use of both native plants and exotic pasture seed that is compatible with existing vegetation patterns on the site, to return the ground to agricultural pasture. In addition, large rocks could be placed on the sides and top of the Coronation North WRS to support the return of lizard populations to the rehabilitated ground.

OceanaGold will not plant the following exotic species on site because they are prohibited in the Waitaki District's Rural Scenic Zone under rule 4.4.7:

- Lodgepole pine
- Scots pine
- Corsican pine
- Dwarf mountain pine
- Mountain pine
- Douglas fir
- All larches, alders and willows
- Sycamore *Acer pseudoplatanus*.

The DDP is concerned about the establishment and spread of wilding trees and weeds such as hieracium, gorse and broom in the High Country OLA (Chapter 14). OceanaGold will extend its programme of weed management in place at the MGP to include the Coronation North Project area.

10.14 Mine Closure

10.14.1 Overview

The Coronation North Project closure involves completing rehabilitation with native and pasture vegetation, undertaking such drainage works as will accelerate filling of Coronation Pit Lakes, construction of an engineered overflow on the Pit rims, re-opening Golden Point Road to the public and rehabilitation of the haul roads leaving a single lane vehicle access track.

In-pit backfill options will be evaluated over the life of the Coronation North Project along with economic factors and, where it is viable, will be utilised to reduce the size of the Coronation North WRS. At closure, a pit lake will naturally form in the Coronation and Coronation North Pits (the Coronation pit lake is predicted to take in the order of 160 years to fill, the Coronation North pit lake is predicted to take around 400 years.)

The Coronation North WRS will be constructed in such a manner that should it not be constructed to fully consented limits it can be rehabilitated in accordance with the final design slopes and contours proposed.

As part of mine closure the Coal Creek Dam impoundment will remain in place and will provide water fowl habitat.

OceanaGold's existing closure obligations in relation to the MGP will not be changed by the Project.

In the DDP, assessment matter 6.7.26 considers the extent to which the proposal adversely affects the ability of existing rural activities to continue to operate, and the extent to which the proposed activity may result in conflict with existing rural activities. It is considered that the Coronation North Project will not prevent existing rural activities from continuing or be in conflict with those activities. The MGP has successfully co-existed with rural activities for over 26 years and the Coronation North Project will not alter that position. Following complete closure of the MGP it is planned that the land of the Coronation North Project area and wider MGP area will revert to rural activity, which is entirely consistent with the existing rural activities in the surrounding area.

11 IMPACT ASSESSMENT: NATURAL ENVIRONMENT

OceanaGold is committed to responsible environmental management in order to fully comply with all applicable statutory requirements. OceanaGold aims to identify and mitigate all environmental impacts associated with its activities and maintain an environmental management system aligned with leading company practice. OceanaGold undertakes responsible operations and closure planning.

11.1 Water Quality

Based on experience from operating the Macraes Gold Project mine site, waste rock stack seepage is likely to demonstrate elevated sulphate concentrations. Without forward planning there is potential to exceed stock water compliance limits in receiving waters over time. The primary water quality issue identified is a need to manage sulphate concentrations in receiving surface water bodies, as sulphate is conservatively transported in water.

Golder Associates (NZ) Limited (Golder) was commissioned to undertake an assessment of downstream water quality associated with the Coronation North waste rock stack. Golder developed a water and sulphate balance for the Coronation North Project to allow prediction of effects on surface water quality and to recommend appropriate water management methods. Golder also assessed the formation of a pit lake post closure including a water balance and predictions of lake water quality. The *Golder Coronation North Project- Surface Water Modelling* is at **Appendix 4** and the *Golder Coronation North Project- Groundwater Assessment* report is at **Appendix 5**. The Groundwater report also outlines the pit lake development and overflow.

11.1.1 Surface Water Quality

11.1.1.1 Modelling Inputs and Assumptions

A site water balance model was established in GoldSim software package. A sulphate mass balance model was created using an auxiliary to the water balance model. The objective of the modelling was to predict in-stream sulphate concentrations across a range of flows (low/medium/high) and across the life of the Coronation North Project development, and assess the cumulative effects of adding the Coronation North Project discharge to the existing mine site discharges.

The model was built to:

- Operate on a daily time step;
- Incorporate discharges from the greater Macraes Gold Project site;
- Account for changes in catchments associated with construction of pits;
- Account for surface water and seepage contributions to flow;
- Account for variation in sulphate levels in surface waters and seepage from WRS's allowing modelling of three scenarios:
 1. A model of the Mare Burn catchment incorporating currently consented operations including the Coronation Pit and Coronation WRS;
 2. A model of the Mare Burn catchment incorporating the structures and waste storage associated with both the fully developed Coronation Pit and Coronation North Pit. It is assumed that only the Coronation North Pit and WRS are operational. The Coronation WRS is not included in this model as a new plan has excluded it from the Mare Burn catchment. The Coronation Pit lake is assumed to be developing; and
 3. A model of the Mare Burn catchment incorporating the structures and waste storage associated with both the fully developed Coronation Stage 5 and Coronation North Pits post closure. It is assumed the WRS's are rehabilitated;
- Estimate sulphate levels at two monitoring points – one at MB01, and one at the MB02.

The water balance model was based on the inputs and assumptions as detailed in section 5.4 of the *Golder Coronation North Project- Surface Water Model* report, at **Appendix 4**, and briefly described here.

During the consenting phase of the Coronation North Project, Golder Associates modelled that if the WRS is constructed within the Mare Burn catchment the sulphate concentrations at MB02 over the long term (150 years) were likely to exceed the 1000 mg/L stock water compliance standard at times of low flow. The mitigation proposed is to construct the Coal Creek Freshwater Dam in the lower reaches of the Coal Creek catchment, which would allow the contribution of a constant 5 L/sec flow, effectively lifting the minimum flow of the creek and preventing the modelled sulphate exceedance. This has not been included in the Golder model for Stage 3 predictions as seen in **Appendix 4**.

Surface water flow has been estimated using the modified Deepdell Creek flow record as discussed in the Golder Surface Water Modelling report section 3. A site wide constant groundwater flow rate of 32 mm/year has been adopted based on the regional recharge rate for the area reported by Golder Associates in **Appendix 4**.

OceanaGold mapping and topographical data was analysed to estimate the catchment areas of relevant sections of the mine site. The estimate catchment areas were used with the modified flow record to estimate runoff and seepage flow rates from these areas.

The approach for modelling was to adopt baseline water quality data at the Mare Burn compliance point (MB01 and proposed MB02) and then estimate the cumulative impact of the development of the Coronation North Project. The Coronation North Project is located within the Mare Burn catchment and so the Golder investigation has not reviewed baseline data for Deepdell Creek.

Sulphate mass balance modelling was based on available recent water quality data and represents baseline conditions. There is a correlation between low flows and high sulphate levels measured across the MGP. Because of this relationship, Golder used the historic water sampling data to predict the 99th percentile sulphate load of water discharged from the Waste Rock Stacks.

11.1.1.2 Model outputs – sulphate concentration

The estimated sulphate concentrations at each of the compliance points for the Coronation North scenarios are shown in **Table 11.1**.

Table 11.1 Estimated 95th percentile sulphate concentrations at Mare Burn compliance point MB02.

No.	Scenario Name	Estimated 95 th Percentile Sulphate Concentration (mg/L)
		Compliance Point
1	Stage 1 (MB01)	601
2	Stage 2	481
3	Stage 3	2293

Sulphate issues are directly related to WRS seepage and the highest sulphate concentrations in mine waters will come from monitoring of the existing WRS's. The concentrations are high relative to the compliance limits.

The distribution of results for the various stages and sulphate concentrations are shown in **Table 11.2**.

Table 11.2 Sulphate concentration during various mining stages.

	Water Quality Concentrations at MB01 (mg/L)					
	Minimum	Mean	95 th percentile	Maximum	Compliance Limit	Exceedances
Current Water	1.3	6.4	11.1	11.6	1,000	NO

Quality at MB01						
Current Estimates (Stage 1)	7.0	145	439	601	1,000	NO
Coronation North Operation (Stage 2)	7.1	173	481	605	1,000	NO
Post Closure (Stage 3)	7.3	739	2,293	2,863	1,000	YES
Post Closure (Stage 3) with Coal Creek Freshwater Dam	5.7	443	876	928	1,000	NO

The data in **Table 11.2** above shows that sulphate concentrations at the water quality monitoring and compliance point MB01, the current compliance limits will be exceeded without the addition of the Coal Creek Freshwater Dam. The construction and operation of the Coal Creek Freshwater Dam will reduce the maximum potential sulphate load in the water to levels below the proposed compliance limits.

11.1.2 Pit Lake Water Quality Modelling

The flooding of the Coronation Pits on cessation of mining is expected to occur as a function of inflowing water sourced from groundwater, direct rainfall, and runoff from the pit walls. The proposed pit lake will be designed to discharge to the Mare Burn (part of the Taieri River catchment) via a low point on the north eastern rim of the pit.

Figure 11-1 shows the proposed pit lakes.

A lake water balance model was developed to predict the time of lake filling, and potential discharge rates to the Mare Burn catchment as the lakes overflow. A contaminant mass balance model was also developed to predict the water quality at the time of initial discharge to the Mare Burn and 100 years following cessation of mining.

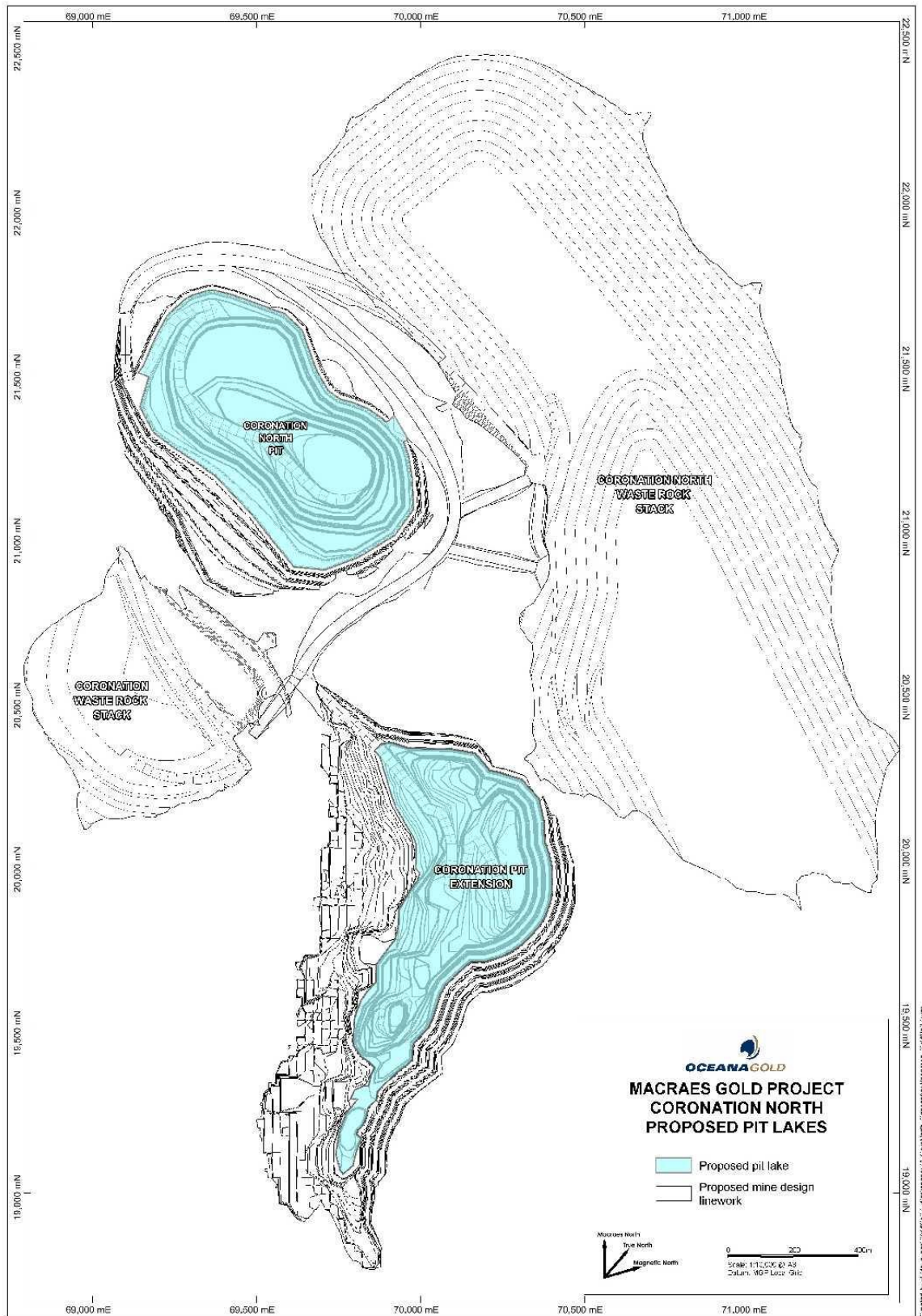
The Coronation pit lake is expected to have a final lake level at 632.5mRL and overflow after 160 years. The Coronation North pit lake is expected to have a final lake level of 580mRL and overflow after 400 years.

The water balance included the following sources as contributing to lake filling:

- Direct lake rainfall
- Groundwater seepage from surrounding catchments
- Runoff from pit walls
- Reporting catchment runoff.

The Golder technical report *Coronation North Project – Surface Water Model*, is included at **Appendix 4**.

Figure 11–1 Coronation North Proposed Pit Lakes



11.1.2.1 Pit and Pit Lake Water Quality

For the purposes of modelling, pit wall run-off and groundwater seepage water quality that reports to pits has not been modelled separately. Instead a fixed water quality for pit sump water has been assumed based on pit water quality data from samples obtained from Frasers Pit and Golden Bar Pit during operational mining and closure periods. It is recognised that the relative exposure of mineralised to non-mineralised rock in each opencast pit is different.

The Frasers pit data has been analysed over the operational mining period between 1998 and 2008 and has been used to represent operational mining water quality. Golden Bar pit water quality data was analysed between 2010 and 2015 and has been used to represent closure pit water quality.

The main contaminant of concern (elevated levels when compared with compliance limits) within pit water is arsenic and iron. Both Frasers and Golden Bar pits have arsenic and iron levels that exceed the compliance criteria in receiving waters, as such if these are released to the environment during low flows, compliance criteria can be exceeded.

Pit water quality assumptions are presented in **Table 11.3**. These values represent the 95th percentile values over the operational and closure periods of mining.

Table 11.3 Pit Water Quality Assumptions

Parameter	Pit sump (operational mining)	Pit sump (closure)
Arsenic	0.54	0.29
Sulphate	301	3025
Cyanide _{WAD}	0.010	0.001
Copper	0.002	0.001
Iron	0.85	0.13
Lead	0.001	0.0002
Sodium	54.7	14.6
Potassium	15.8	4.8
Calcium	89.7	82.3
Magnesium	51.0	76.1
Zinc	0.04	0.0009
Chloride	18.9	7.0

11.1.2.2 Pit Lake Discharge Water Quality

Overflow from the lake will discharge to the ephemeral upper reaches of the Mare Burn and will contribute flow to the Taieri River. Attenuation of contaminants such as arsenic is expected to occur as a function of increased contaminant adsorption to sediment and iron-hydroxide minerals introduced from other water sources and a move towards more aerobic conditions.

The influence of overflow discharge from the proposed Coronation North pit lake on surface water quality compliance was investigated by Golder in their report *Coronation North Project – Surface Water Model*, included at **Appendix 4**.

The modelling undertaken showed that the estimated water quality at Mare Burn compliance point at the time of initial lake overflow and post closure would not exceed the proposed surface water quality compliance criteria based on stock water standards (**Table 11.**).

Table 11.4 Estimated pit water quality assumptions.

Parameter	Pit sump (Stage 2 – Operational)	Pit sump (Stage 3 – closure)	Proposed surface water quality compliance criteria (mg/L)
			Stock watering
As	0.54	0.29	0.15
Ca	89.7	82.3	
Cu	0.002	0.001	0.0014
Fe	0.85	0.13	1
K	15.8	4.8	
Mg	51.0	76.1	
Na	54.7	14.6	
Pb	0.001	0.0002	0.0025
SO ₄	301	302	1000
Cl	18.9	7.0	
Zn	0.04	0.0009	

The pit lake assessment has found that the pit lake water quality is likely to be similar to Deepdell South and Golden Bar pit lakes. The overflow from the Coronation pit lakes initially and at 160 years from cessation of mining is predicted to remain below stock water quality standards.

11.1.2.3 Water Quality Compliance

It is proposed to monitor surface water quality at MB01 under the existing MGP compliance limits, and establish a new monitoring location at MB02 under the same stock water quality standards and the same monitoring frequency as MB01.

11.1.3 Coal Creek Freshwater Dam

The *Coronation North Project Water Quality Mitigation – Freshwater Dam Scenario* report by Golder is attached at **Appendix 15**. It summarises the effects of the Project on water quality in the Mare Burn, where these effects may require mitigation, and assesses the dam mitigation option. The construction of a small freshwater dam will mitigate non-point source water quality issues by providing greater

base flow reliability in Mare Burn. Modelling indicates a reliable discharge of 5 litres/second would ensure OceanaGold would meet compliance criteria at MB02. Modelling also indicates operation of a dam with a reservoir capacity of 677 ML could provide a continuous release of 7 l/s, and this excess capacity could enable release of water from the reservoir for periodic flushing flows. Dam filling time to capacity is predicted to be:

- About 2 years, if during filling there are no planned releases of water from the dam
- Up to 3 years, if during filling a managed release of 5l/s is adopted.

Ryder Consulting's *Coronation North Project Aquatic Ecology Assessment* at **Appendix 8** discusses stratification of the dam reservoir. Reservoirs can stratify into layers of markedly different temperatures during the warmer months of the year. Cold water entering the reservoir from the river sinks to the bottom. During warm summer months, the sun warms the upper layer and that layer becomes warmer than the reservoir as a whole. Eventually the reservoir water divides: warm water (called the epilimnion) floating above the cold water (called the hypolimnion) resting below. Between these two layers is a transitional layer (called the metalimnion) in which temperature decreases rapidly as one moves deeper. This 'thermocline' is important to the biology and water quality of a reservoir. It acts as a barrier to the movement of dissolved oxygen and dissolved materials (e.g., bioavailable nutrients) and the distribution of heat between the epilimnion and the hypolimnion.

It is predicted that the Coal Creek Dam reservoir, when full, would have an average depth of about 0.5m. A significant proportion of it would be very shallow. The predicted epilimnion depth of 4.84m is much greater than the average reservoir depth, but towards the dam embankment the water depth deepens significantly, reaching up to 20m. This suggests there is a small risk that water in the lower end of the reservoir could vertically stratify at times of the year and in doing so potentially create a layer of low oxygen water in the deeper part of the reservoir. This water would be discharged to the lower section of Coal Creek, however, the discharge system can be engineered to ensure the released water gets as much aeration as possible.

Given the current state of tributaries in the catchment, reservoir water quality may initially be enriched with nutrients and sediment due to farming practices. If practicable, retiring the upper catchment from stock would improve the quality of water entering the dam as well as improve the quality of habitat in the upstream tributaries which are currently significantly impacted by farming activities.

11.2 Aquatic Ecology – Effects and Mitigation

11.2.1 Introduction

The *Coronation North Project Aquatic Ecology Assessment* by Ryder Consulting is attached at **Appendix 8**. The report presents ecological assessments for each aspect of the proposed development. The assessment is based on a review of published and unpublished literature and relevant databases as well as surveys of aquatic communities within the project area undertaken in November 2012, November and December 2015, and February and April 2016.

Many areas in the vicinity of the proposed development have been extensively modified by past and existing farming activities. These activities, together with the fact many catchments are small, ephemeral and provide minimal surface water features, contribute to the limited aquatic values present in most of the areas likely to be affected by mine development. However, the middle and lower reaches of the affected catchments have higher quality aquatic values, with healthier invertebrate and fish communities. The use of silt ponds, other sediment control measures and mitigation to ensure compliance with water quality standards, will minimise any effects of the developments on these lower catchment environments.

11.2.2 Coal Creek Catchment

The ORC RPW Schedule 1 does not identify any human use or natural values for Coal Creek. Coal Creek is not included in Schedule 6 as a water body where damming is prohibited. Assessment has identified habitat for flathead galaxiid and koura (see below). Overall invertebrate community health index scores for Coal Creek were assessed as low. The catchment suffers from heavily degraded

physical habitat (due to stock influences) and water quality characterised by elevated sediment loads and nutrient concentrations.

11.2.3 Mare Burn catchment

Significant aquatic values of the Mare Burn catchment identified in Schedule 1A of the ORC RPW are the provision of areas for salmonid spawning and juvenile development, and the presence of riparian vegetation of significance to aquatic habitats. However assessment did not identify the presence of any suitable salmonid spawning habitat nor were any salmonids caught in Mare Burn tributaries within the affected area. Records on fish communities in the Mare Burn mostly relate to the mainstem of the Mare Burn within 2km of the Taieri River confluence, therefore well downstream of the project area of influence.

The ORC RPW also identifies that some tributaries of the Taieri River contain significant habitat for flathead galaxiid and this was confirmed by Ryder Consulting's assessment, which found a population of flathead galaxiids in a tributary of Trimbells Gully, Coal Creek and Maori Hen Creek.. Flathead galaxiids are classified as 'Threatened – nationally vulnerable' using the New Zealand Threat Classification System (NZTCS) criteria, with a moderate population (with population trend that is declining) and the qualifier 'Conservation Dependent'.

Freshwater crayfish or Koura which, whilst widespread and relatively common, are classified by NZTCS as 'At risk – declining', were present in Maori Hen Creek, Coal Creek and Trimbells Gully mainstem and tributary within the potentially affected area. Existing habitat quality (as determined from average SQMCI scores) was indicative of 'fair' to 'poor' habitat quality from six sites (in the Trimbells Gully tributary and mainstem and Maori Hen Creek). Aside from freshwater crayfish no other rare or threatened macroinvertebrate taxa were identified.

11.2.4 Mitigation

11.2.4.1 Aquatic habitat

The proposed Coronation North Project will result in the loss of aquatic habitat in the headwaters of the Mare Burn and Camp Creek catchments through excavation associated with the Coronation North Pit works, deposition associated with the disposal of waste rock within the WRS area, construction of silt ponds and/or construction of Pit infrastructure. It is estimated that approximately 4.4 km of small stream galaxiid habitat will be lost, that is about 8.7 to 11% of the galaxiid habitat which potentially exists in the Mare Burn. Mitigation is therefore recommended to minimize this loss.

The Coal Creek dam reservoir would result in the loss of about 1.5 to 2km of relatively poor quality stream habitat, and a change to lake habitat. This loss of stream habitat may be mitigated by the potential benefit of an augmented flow in the creeks. The continual release of water from the Coal Creek dam is a potential benefit to approximately 860 metres of downstream galaxiid and invertebrate populations in Coal Creek and a significantly greater length of the Mare Burn, as the frequency and duration of low flow periods would be reduced. Higher river flows would prevent extreme low flow periods and minimise potential population declines. The risk of trout invasion would not be increased because the Mare Burn has natural trout barriers downstream that would not be affected by the modest flow increase. The temperature of the reservoir water may differ from that in the creek. However the effect of this on downstream fish, crayfish and benthic invertebrates is unlikely to be significant as these are accustomed to a range of temperatures. Potentially cooler water discharged in summer will benefit downstream stream communities provided it is sufficiently oxygenated. Introducing oxygen back into the discharge can be achieved by engineering the discharge to fall and dissipate across roughened media prior to entering the downstream channel of the creek.

Further the new lake will provide habitat for crayfish and benthic invertebrates taxa that prefer still water. The new lake will not provide suitable habitat for galaxiids. However flathead galaxias are found throughout the Macraes area, and the loss of creek habitat associated with the dam is considered minor relative to the wider galaxiid population.

In terms of mitigation, for the Coronation Project Ryder Consulting suggested the transfer of fish and crayfish where their habitat was likely to be lost or significantly affected by mining. However this approach is not recommended for the Coronation North Project. Instead the best form of mitigation for loss of habitat is proposed for consideration as follows:

- Habitat creation and protection in areas that already support flathead galaxiid populations. The population has a limited distribution and is under threat from invasive fish, particularly brown trout. This threat can be reduced through the establishment of trout barriers.
- Protection of existing strongholds of flathead galaxiid populations may also involve measures to enhance riparian protection through stock exclusion and other measures to enhance riparian vegetation, instream and water quality. Fencing with appropriate setbacks is the obvious method that is employed to achieve such outcomes. Such measures would have benefits to tributaries within the Mare Burn catchment, particularly in the Coal Creek catchment, however, if this is not possible, there may be opportunity to explore such initiatives elsewhere.
- The Coal Creek freshwater reservoir be fenced from stock and the development of ungrazed riparian margin encouraged. This will assist in the filtering of sediment and nutrients prior to reaching the reservoir.
- Galaxiid habitat in the lower Coal Creek catchment, and in the Mare Burn downstream of the Coal Creek confluence, may benefit from the proposed minimum flow of 5 litres/second released from the proposed Coal Creek reservoir. Providing water quality is reasonable (in particular dissolved oxygen levels are adequate to support fish life stages), the additional water should result in a more stable fish population less affected by a loss of habitat (quality and quantity) and associated stress under summer-autumn low flow periods.
- Consideration should be given to off-site mitigation in the form of enhancement and/or protection measures of other endangered non-migratory Otago galaxiid populations, such as roundhead galaxias. This species has a shorter life-span than the Taieri flathead galaxias and some stronghold populations are at risk from trout invasion.
- Koura and flathead galaxiids appear to co-exist quite well in tributaries of the Mare Burn, and so the mitigation measures recommended above for galaxiids are likely to have benefits for local Koura populations as well. Koura populations can be maintained and enhanced through habitat creation (e.g. man-made ponds), as has shown to be successful in the South Island. A number of small ponds already exist in the Coal Creek catchment. These could be protected and enhanced to improve habitat for Koura. De-stocking the catchment would have significant benefits to pond and stream habitat. Such measures would also act to improve downstream water quality.

11.2.4.2 *Nuisance aquatic weed/algae introduction*

Machinery and personnel involved in construction could potentially transfer nuisance weeds/algae such as *Didymosphenia geminata* – didymo to local watercourses. Didymo has been recorded in the Shag catchment, but not the Taieri River catchment. Although many watercourses within the mining area may not be suitable for didymo establishment, if didymo was to enter these streams it may be able to travel downstream to establish at more suitable locations in the Taieri River. Accordingly, equipment and other items used in or near waterways will be first inspected and if necessary cleaned prior to use. This approach is already used for the Coronation Project and will also be applied to the Coronation North Project.

11.2.4.3 *Sediment mobilisation and run-off*

Fine sediment is already present in most reaches of the tributaries which were assessed, however excessive cover is usually detrimental to stream communities, particularly if flow variability is insufficient to regularly flush the excessive cover away. Therefore, an expanded mining operation poses some risk to downstream communities unless measures are implemented to avoid the

introduction and downstream transportation of sediment. Such measures are routinely employed at the MGP and can include:

- Manage surface water runoff around the pit, waste rock stack and haul road with diversion drains and silt control dams. Locate permanent silt ponds as close as possible to the disturbed area to minimize effects on downstream aquatic habitats. Service and emergency spillways may be required to pass large flow events. Sediment control should be installed prior to any disturbance within each catchment area,
- Shoulders of waste rock stacks should have benches designed to control runoff,
- Install perimeter surface water drains around waste rock stacks to ensure runoff is conveyed to the base of gullies without erosion. Such drains may need to be lined where necessary and energy dissipation provided at high energy locations,
- Surface water and groundwater collected in the pit during operations may need to be pumped out to a surplus water sump and used for dust control. Any surplus water may need to be discharged to watercourses via silt ponds. Water quality testing of this water is recommended prior to discharge to ensure it meets water quality guidelines that protect stream biota.

In long-term experience of monitoring surface waters associated with the Macraes mine, the ecological effects of sediment runoff are minor. The Coronation North Project is not expected to change this.

11.2.4.4 *Accidental Contaminant Spills*

The presence of construction machinery in and around waterways always presents a risk of contaminants (e.g. diesel, lubricants) entering watercourses with the potential to harm aquatic life. These issues can be addressed by way of an appropriate on-site contaminant management plan. As a general rule, any possible contaminants stored on site should be kept away from watercourses and bunded. Refuelling of machinery should also take place away from watercourses. Such measures are routinely employed by OceanaGold at the MGP and are addressed by consent conditions for the Coronation Project which will be replicated for the Coronation North Project.

11.2.4.5 *Aquatic Mitigation Summary*

OceanaGold will adopt an appropriate suite of mitigation measures from the recommendations outlined above. OceanaGold is consulting with key stakeholders regarding the final form of mitigation.

11.3 Terrestrial Ecology

The impact of the Coronation North Project on terrestrial ecology was assessed by ERA Ecology NZ Ltd in the *Oceana Gold (New Zealand) Ltd Coronation North - Ecological Assessment- Vegetation, Avifauna & Herpetofauna* at **Appendix 6** and the report *Ecological Impact of Proposed Coal Creek Water Storage Dam* at **Appendix 7**. The survey area for these reports was broader than the May 2016 revised Project footprints that consent applications are being made for. Therefore the information provided below, which is based on those reports, is conservative.

11.3.1 *Botanical Features*

11.3.1.1 *Description of vegetation communities*

The proposed Coronation North Project would remove approximately 979.3ha of existing vegetation. There are ten vegetation communities within the Coronation North Project's wider area. These vegetation communities are set out in **Table 11.4**.

The vegetation of the project area is typical of that in the general Macraes Ecological District – namely of a highly modified nature with a large amount of improved pastureland. The majority of this area is narrow-leaved tussock grassland and exotic pasture. The level of modification is evident in that the tussock land has been burnt numerous times in order to help the exotic grasses establish and grow.

The vegetation community patterning of narrow-leaved tussock grassland on broad-topped spurs and slopes with short tussock grassland in drier and/or heavier grazed areas and where flatter and less-rocky areas have been cultivated using ploughing, and with interfingering shallowly- to moderately-incised drainage systems hosting riparian herbfield & sedgeland and bluff vegetation is typical of this area.

Of the 979.3 ha of existing vegetation, 193.5ha are not considered to be indigenous vegetation (**Table 11.**). Under the Dunedin City Council's District Plan, 'indigenous vegetation' is defined as "plant communities dominated by species that are native to New Zealand".

Table 11.5 Vegetation types, areas and percentages within the proposed development areas of the Coronation North Project Area

Vegetation Type	Area (ha)	Percentage
Gully wetlands	11.7	1.19
Basalt contact flush wetlands	4.3	0.43
Ephemeral wetlands	4.0	0.41
Short tussock grassland	153	15.62
Narrow-leaved tussock grassland	595.8	60.83
Exotic pasture	170.7	17.43
Shrubland	13.0	1.33
Disused <i>Pinus radiata</i> plantation	22.8	2.33
Bluff vegetation	4.3	0.43
Total	979.3	

Note: derived from the Coronation North Ecological Impact Assessment.

Eleven plant species that occur within the Coal Creek Dam area are either currently classified as Threatened, At Risk or Data Deficient, or are listed as 'Threatened Plants' in Appendix 16A of the operative DCC District Plan, or are thought to be rare in the Macraes E.D. based on the survey author's observations.

Within the Project area, and specifically within the DCC boundary, there are no areas of significant conservation value that are listed as significant in Schedule 25.4 of the operative DCC District Plan.

11.3.1.2 *Wetlands*

The Coronation North Project Area does not contain any wetlands of National Importance or Ramsar sites. There are no wetlands identified by the ORC as Regionally Significant within the Coronation North Area

11.3.1.3 *Clarifications*

Included at **Appendix 6** is another report by ERA Ecology *Clarifications regarding Coronation North (0219-04) and Coal Creek Dam (0219-08) Ecological Impact Assessments* which provides an update on the ecological impacts of the Project, based on the revised May footprint areas.

The areas of the vegetation types within the revised Coronation North impact area are detailed in **Table 11.6** below:

Table 11.6 Vegetation types in revised Project area

Vegetation type	Area (ha) where vegetation loss is expected to be total	Area (ha) within 100m buffer where some impact may occur on vegetation
Basalt contact flush wetlands	4.2	0
Bluff	7.3	1.3
Cultivated	46.8	18.3
Ephemeral wetlands	0.2	1.2
Gully slope mosaic	20.7	92.0
Narrow-leaved tussock grasslands	163.4	54.9
Pine (disused)	2.9	1.6
Pond	0.0	0.0
Riparian herbfield & sedgeland	6.1	1.0
Seepage	0.1	0.1
Short tussock grassland	59.8	26.6
Shrubland	3.5	5.6
SUM EXOTIC VEGETATION	49.7	19.9
SUM NATURAL VEGETATION	265.3	183.8
TOTAL AREA	315	203.7

11.3.2 Botanical features – effects and mitigation

11.3.2.1 Indigenous Vegetation

Mitigation for impacted indigenous vegetation has been recommended in *Coronation North Project, Impact Management of Project Ecological Effects* by ERA Ecology NZ Ltd at **Appendix 22**. A range of tools are available and OceanaGold proposes to follow a high-quality and appropriate approach using an implementation hierarchy of: avoid where possible, then remedy, minimise, offset, and finally undertake ecological compensation activities.

Mining, by its very nature, makes it difficult to avoid an ecological feature where it overlays the targeted resource. For this reason, opportunities to avoid ecological features overlying the proposed extent of the Coronation North pit are not possible. However, there may be opportunities to avoid impacts arising from some mine activities, for instance:

- by re-configuring waste rock stack (WRS) margins and/or by delineating any ecological features that fall within 20m of the proposed WRS margin and identifying the tip-point to notify the relevant operator of the need to unload carefully.
- by selecting a dam access route that, where practicable, avoids ecological features.

There is opportunity to undertake some rehabilitation in the Coal Creek dam, on the WRS margin, and at the completed mine pit:

- The Coal Creek dam will create two new habitats that could be eco-engineered to support both seasonally-dry riparian sedgeland (when pond is full) and ephemeral herbfield (when pond is drawn down) plant communities. Both of these communities could provide habitat for waterfowl and indigenous plant species. The ephemeral herbfield could provide important habitat for some highly endangered plant species that inhabit natural examples of this habitat type nearby.

- There is some opportunity to rehabilitate the WRS margin to provide habitat for lizards by depositing only larger aggregate and boulders in some areas on the outer margin. Experience demonstrates that these will be naturally colonised by lizards from the surrounding area, and the population density at these sites should increase as habitat quality increases with plant growth, particularly if this includes fruit-bearing plants. There is also opportunity for some of the south facing WRS slopes, if stock is excluded, to provide habitat for rare plants such as the daisy *Celmisia hookeri* and shrubs *Carmichaelia crassicaulis* and *Coprosma intertexta*.
- If practicable given expected pit filling times, the Coronation North pit could be eco-engineered to create a permanently wet riparian margin and lacustrine plant habitat. Both of these communities would provide habitat for waterfowl and indigenous plant species that are rare in this area because of the paucity of open water sites.

The impact of the Project may be minimized by use of:

- dust suppression,
- weed surveillance (regular [every two years] inspection of the area around mine operations for new weed species),
- fire response (a site fire avoidance protocol and rapid response to any suspected fires)
- rescue of ecological features (removing them [or propagating parts of them such as seeds or cuttings] and establishing them in a new location. A rescue plan would be required, the new location would have to be suitable and have consideration of changing biogeographic patterns and gene flow, as well as the impacts on the recipient site).

An evaluation of the ability to offset the Project's ecological impacts concluded that, due to there being no availability of an offset site (or sites) with 'like for like' biodiversity features, a formal biodiversity offset is not achievable. For these reasons the use of a formal biodiversity offset is not proposed.

Ecological compensation is viewed as the primary option for impact management of the Coronation North Project, including Coal Creek. Compensation involves undertaking activities off-site that will result in a gain in ecological value. A range of compensatory activities can be undertaken, either separately or in combination, to address Project impacts, ranging from: legal covenanting, enhancing habitat through weed or pest control, research to better understand how to manage ecological features, habitat creation, education and interpretation, supporting community-led biodiversity projects, and undertaking activities that protect rare species. For example:

- **Enhancing habitat** of plants or wildlife (usually through either pest or weed control) can provide benefit to both a habitat and its inhabitants, by removing predators that are limiting populations and removing weed species that are displacing their preferred habitat.
- **Protecting rare or important habitats** in the Macraes Ecological District (E.D.) such as saline salt lakes and ephemeral wetlands which are considered Critically Endangered, and seepages and flushes which are considered Endangered. Other important communities are the schist bluff communities, dryland shrubland (grey scrub) and riparian margin vegetation as these are of limited extent and host a number of rare species. Without conservation attention these habitats and communities will be lost. DOC has recently undergone a process of identifying Ecological Management Units (EMU) - sites where conservation work would provide the most conservation gain. The Macraes DOC reserves and Mt Watkins are two EMU that are close to the Project area. Activities within those habitats might include:
 - Environmental weed control - instigating a weed surveillance programme together with the capacity to remove newly-arrived weed species would have benefit to protecting both biodiversity areas and agricultural areas.
 - Restoring ephemeral wetlands - a programme of restoring ephemeral wetlands by removing the exotic weeds (as far as practicable) and re-introducing missing rare

species under a habitat management plan would result in a huge benefit to the ephemeral wetlands and their inhabitants.

- Dryland forest rehabilitation - dryland forest could be rehabilitated under a restoration plan that included the cultivation of dryland forest species and replanting into a regenerating shrubland. This project could also include cultivation of rare shrub and tree species together with the delicate understory herbs and grasses, many of which are now very rare.
- **Protecting rare species** within the Macraes E.D. and the adjacent Strath Taieri area of the Maniototo E.D., which are known to contain the highest diversity of rare plants of any site in New Zealand, in addition to the last wild populations of grand and Otago skinks. The Macraes area, and the wider Otago Region, has extensive potential for plant species-focussed conservation programmes using specific tools such as cultivation and replanting in order to enhance populations, and to protect populations through controlling weeds, browsing mammals, and pest insects.
- **Research** - in the Macraes area there is an opportunity to build on past research projects as well as build research into the adaptive management component of other compensatory activities.
- **Education and Interpretation** - on conservation issues, particularly biodiversity management in a mine environment, is important to keep people informed on what is being done to alleviate the environmental impacts of an operating mine.
- **Supporting community-led biodiversity projects** – for instance the Landscape Connections Trust is planning pest control activities in the east Otago area and the Central Otago Ecological Trust runs a lizard conservation project centred on the Mokomoko Dryland Sanctuary near Alexandra. There are no active biodiversity conservation groups in the Macraes area.

Mitigation options are currently being discussed with the Department of Conservation and other key stakeholders. The mitigation measures recommended to OceanaGold have been tabled to the Department and ongoing consultation alongside the consenting process will help refine a final mitigation strategy.

11.3.2.2 *Wetlands*

OceanaGold notes that silt ponds associated with the Coronation North Project will remain in place long-term and are likely to become stock water ponds, which could also potentially enhance general wetland habitat in the area.

11.3.3 *Avifauna and Herpetofauna – Effects and Mitigation*

The development of the Coronation North Project Area will remove all existing avian habitat from the proposed construction areas. Bird species diversity and abundance is low in the Macraes area, and this makes more intensive survey efforts such as distance sampling or 5 minute bird counts of limited utility. For the survey of the Coronation North Area, a record was made of all birds seen or heard during the walkthrough flora survey, and the locations of species of interest were recorded.

The current avian habitat is typical of that of the surrounding environs and habitat values are moderate-low due to the already modified nature of the farmland. Eleven bird species were recorded from within the Coronation North Project area, of which five are indigenous. The five indigenous species are likely to be playing some ecological role within the area but are likely to disperse into the surrounding farmland and disruption should be temporary and less than minor. Of the five indigenous species, one has a species classification of at risk. This is the pipit (*Anthus novaeseelandiae* Gremlin subsp). Pipits are currently classified as declining on the basis of a population less than 100,000 which is predicted to decline by 10-70%. This decline is mainly due to the conversion of rough grassland to pasture and predation. Within the Macraes area, pipits are widespread and there are estimated to be 5-12 pairs within the Coronation North Project area. Overall, all bird species resident within the Coronation Project Area are expected to relocate to adjacent areas.

Three reptile species were found within the Coronation North and Coal Creek Dam Project area. These were the McCann's skink, Southern Grass skink, and the Korero gecko. It is considered highly unlikely that the Grand, Otago, Green and cryptic skinks are present within the study area due to the scarcity of suitable habitat. There was one amphibian recorded during the survey - the exotic frog *Litoria ewingii* – a species which is increasingly widespread in the South Island and southern North Island. The ecological importance of the lizard populations within the Coronation North Project area is categorized as moderate on the basis of; the presence of two at risk species, the presence of genetically distinct lineages, the role they are likely to be playing in ecosystem function, and the low species diversity and abundance.

Investigations have demonstrated that existing WRS at the MGP provide habitat for lizards and skinks. Historic surveys of lizards using habitat on the waste rock stacks showed lizard abundance, based on lizard per hour counts, was similar to or higher than comparative surveys at areas undisturbed by mining. This is despite the fact that the rehabilitation of the WRS's to date have not specifically targeted the establishment of lizard habitat.

Mitigation approaches are currently being discussed with the Department of Conservation and other key stakeholders. The mitigation measures recommended to OceanaGold have been tabled to the Department and ongoing consultation alongside the consenting process will help develop a mitigation strategy. Proposed mitigation is currently taking into consideration all effects on vegetation, avifauna and herpetofauna.

12 IMPACT ASSESSMENT: HUMAN ENVIRONMENT

12.1 Economic Effects

Mike Copeland of Brown, Copeland & Co Ltd provided an *Assessment of Economic Impacts* ("AEI Report") for the Coronation North Project ("the Project") dated April 2016, attached as **Appendix 2**.

The Macraes Gold Project ("MGP") head office, located in Dunedin, and the mine have helped to diversify and sustain the Otago Regional economy, particularly the north-East Otago community. The AEI Report used the view-point of North-East Otago residents and businesses, including those in Dunedin, to assess the economic impacts of the Project pursuant to the Resource Management Act 1991.

12.1.1 Retention of Employment, Wages & Salaries & other Expenditure

The Project will add approximately three years to the overall MGP's mine life. This means the reduction in economic activity as the mining operations wind down will be delayed by three years. This also means that approximately 257¹ jobs for local residents at the Macraes Flat site, with \$20.6 million wage and salary payments to employees and an expenditure of \$13.1 million in the north-east Otago area² will be retained for the duration of the project. For the rest of the Otago region, there will be the retention for an extra three years of 465 jobs, with \$45.7 million in payments to employees and other expenditures of \$44.6 million. These are some of the direct impacts on the economy.

Indirect impacts will include effects on the suppliers of goods and services to the Project, its employees and its contractors. Using the conservative district multiplier³ of 1.5 for incomes and 2.0 for employment implies that the total economic impacts of the Project for north-east Otago in the three year period of extension are that 386 jobs will be retained; \$30.9 million in retained incomes; and retained other expenditures of \$19.7 million. Using regional multipliers described in the AEI Report, total regional economic impacts (i.e. direct plus indirect impacts) in the three year extension are estimated to be:

- 930 retained jobs;
- \$91.4 million retained incomes; and
- Retained other expenditures of \$89.2 million.

For metropolitan Dunedin (i.e. the city centre and surrounding suburbs) the economic impacts will be largely the difference between the Otago regional economic impacts and those estimated for north-east Otago. On this basis the direct plus indirect economic impacts of the Project for metropolitan Dunedin in the 3 year period of extension are:

544 retained jobs;
\$60.5 million retained wages and salaries; and
Retained other expenditure of \$69.5 million.

The Government will also continue to draw royalty payments for an additional three years, estimated to be worth about \$2.5 million per annum. For an extra 3 years the New Zealand economy will benefit from higher gross domestic product (GDP) and exports.

¹ As at March 2016, 440 jobs in total on site but reduced by 41.7% to account for the employees who reside in metropolitan Dunedin.

² This includes the Waitaki District (including Macraes Flat, Oamaru, Dunback and Palmerston) and the northern part of Dunedin City (including Waikouaiti, Hyde and Middlesmarch)

³ Multipliers can be estimated to gauge the size of indirect effects, the size of the multiplier is a function of the extent to which a district is self-sufficient and the proximity to alternative sources of supply

12.1.2 Economic Benefits from Increased Economic Activity

It is reasonable to presume that the retention of the MGP for an extra three years will give rise to one or more of the following four welfare enhancing economic benefits:

- Increased economies of scale;
- Increased competition;
- Reduced unemployment and underemployment of resources; and
- Increased quality of central government provided services.

The Project will also provide greater diversity and balance to the north-east Otago economy by retaining employment opportunities and incomes less dependent upon returns to the agricultural sector. This will help strengthen the local economy's resilience to agricultural commodity price cycles. Economic resilience is further supported (in a modest way) by the contribution MGP plays as a tourist destination for the local tourism industry.

OceanaGold will continue to pay rates for an extra 3 years to the Waitaki District Council ("the Council") which because of the economies of scale is likely to be greater than the increase of costs to the Council as a result of gold mining on the site compared to pastoral farming. Additionally OceanaGold will continue to pay rates to the Otago Regional Council and the Dunedin City Council, although at lower rates levels which means it is unlikely that there is a significant surplus for other ratepayers from economies of scale.

OceanaGold also contributes to a number of initiatives at the community level, donating over \$350,000 during the previous two years. The staff and their families also contribute to the 'social fabric' of the north-east Otago community by joining clubs and other voluntary organizations as well as providing community emergency services.

12.1.3 Potential Economic Costs of the Project

The direct and indirect economic impacts of gold mining at the site will significantly outweigh any reductions in economic activity from any displaced farming. Additionally there will be no external costs to the local or central government for the operation of the Project. Issues of congestion at the site and to the local roads will be safely and efficiently accommodated.

12.1.4 Conclusions

The Project will extend the MGP for an extra three years. This will enhance the economic well-being of Otago communities by:

- Maintaining significant level of employment and expenditure;
- Maintaining population levels which will maintain the quality welfare enhancing economic benefits such as government provided services;
- Supporting local school rolls;
- Extending the period of time for the community to benefit from greater diversity and resilience of the local economy; and
- Extending the period of time the mine's workforce will contribute to the local community.

The Project will improve resource use efficiency by retaining economic activity for an additional three years. Additionally the Project will not give rise to economic externality costs.

12.2 Effects on Tangata Whenua Values

The maintenance of natural landscapes, protection of waahi tapu and waahi taonga, for taonga species and impacts on the mauri of the land, water and air are all of cultural importance. A Cultural Impact Assessment is being undertaken by Kai Tahu Ki Otakau and OceanaGold has volunteered a review condition to take into account the findings of that CIA.

12.2.1 Culturally Important Landscape Features

Previous consultation and assessments undertaken in the vicinity of the Macraes Mine have not identified any culturally important landscape features. Some aspects of the Coronation North Project will have an impact on skylines and ridgelines. OceanaGold will be in consultation with DoC as to what mitigation is required to minimise any potential effects. It is unlikely there will be adverse effects on culturally important landscape features.

12.2.2 Taonga Species

Taonga species are native birds, plants and animals of special significance and importance to iwi and it is important that these resources are treated with care.

In Appendix 4 of the NRMP the following are identified as 'taoka species'. Some of these species are present at the Coronation North Project site, as identified below:

Avifauna

- Kahu - Australasian harrier – not threatened [present in the project area].
- Kararea – New Zealand Falcon – 'Threatened – Nationally Vulnerable'.
- Koau - Black Shag – 'At Risk- Naturally Uncommon'.
- Koau - Little Shag – 'At Risk – Naturally Uncommon'.
- Kōparapara/ Korimako - Bellbird – not threatened.
- Kōtare – Kingfisher – not threatened.
- Karoro - Black-backed gull – not threatened.
- Kūkupa/Kererū - New Zealand wood pigeon – not threatened.
- Kuruwhengu/ Kuruwhengi - New Zealand shoveller – not threatened.
- Miromiro - South Island tomtit – not threatened.
- Pākura/Pūkeko - Swamp hen/ Pūkeko – not threatened.
- Pārera - Grey duck.
- Pihoihoi – New Zealand pipit – 'At Risk – Declining' [present in the project area].
- Pīpīwharau - Shining cuckoo – not threatened.
- Pīwakawaka - South Island fantail – not threatened.
- Poaka - Pied stilt – 'At Risk – Declining'.
- Putakitaki – Paradise Shelduck – common, widespread and non-threatened [present in the project area].
- Riroriro - Grey warbler – not threatened [present in the project area].
- Tete - Grey teal – not threatened.

Plants

- Aruhe - Fernroot (bracken) – abundant.
- Pātōtara - Dwarf mingimingi – abundant.
- Taramea - Speargrass, Spaniard – abundant [present in project area].
- Wī - Silver tussock – frequent [present in the project area].
- Wīwī – Rushes- frequent [present in the project area].

An aquatic ecological assessment has been undertaken in the area by Ryder Consulting attached as **Appendix 8**, and terrestrial ecology assessments have been undertaken by ERA Environmental Solutions attached as **Appendix 6, 7 and 22**. These surveys assessed existing terrestrial and aquatic ecological values and the significance of those values, identified potential adverse effects of the Coronation North Project upon those values and recommended mitigation. These matters have been addressed in more detail elsewhere in this AEE so are not repeated here. However in summary, OceanaGold will undertake appropriate mitigation to minimise effects on the values identified within the Coronation North Project area and accordingly the project is considered to be in accordance with the policies, objectives and priorities of the RMA, the Waitaki and Dunedin City District Plans, the New Zealand Biodiversity Strategy and the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land.

Therefore it is considered that the Coronation North Project will treat the resources identified in the NRMP sustainably, and with an appropriate level of care.

12.2.3 Sites of Significance, Waahi Tapu and Waahi Taonga

OceanaGold has commissioned extensive archaeological surveys of its entire project area since commencement of exploration and mining in the area. While it is acknowledged that early Maori could have occupied the area no direct evidence of areas of significant interest was found within the footprints of mine infrastructure at the Coronation North Project area. A copy of the survey done by B J Allingham in 2016 is attached as **Appendix 11**.

It is therefore unlikely the project will impact on any site of significance. However, it is possible that an unrecorded or unknown site may exist within the area and to that end OceanaGold has an established procedure communicated to all staff on dealing with such accidental discoveries.

The current land use consents for Coronation (WDC 201.2013.360 and DCC LUC-2013-225) contain an Accidental Discovery Protocol and it is recommended by the report writer that a similar Accidental Discovery Protocol should apply to Coronation North. Further, archaeological authorities should be sought from Heritage NZ to disturb the sites and consultation should be undertaken with local iwi. OceanaGold is committed to adopting these mitigation measures.

12.2.4 Water

The protection and enhancement of the mauri of water is a primary natural resource management principle. Diversion, mixing of waters from different catchments and contamination are activities that negatively impact on the mauri of some waterways.

Mitigation will be undertaken by OceanaGold to ensure that the Coronation North Project operates through to the end of mine life, and in post closure phase, and within the proposed compliance criteria for the Mare Burn that have previously been accepted by iwi.

The Coronation North Project is not expected to have any discernible effect on flow rates in the Taieri River. There will not be any mixing of waters from different catchments.

12.2.5 Air

Dust effects will continue to be regulated by OceanaGold's discharge to air consent requirements, with standard dust suppression requirements and appropriate dust monitoring (refer **Appendix 3**). Therefore it is envisaged that the Coronation North Project will not have any adverse air quality effects that are more than minor.

12.2.6 Conclusion

While this application is processed and decided upon, a Cultural Impact Assessment will be prepared by KTKO. In order to take into account the findings of this formal CIA OceanaGold offers the following review condition to ensure the Councils can initiate a review of the mitigation conditions based on the findings of the final CIA:

"The Council may, within 6 months of receipt of the Cultural Impact Assessment; serve notice of its intention to review the conditions of this consent for the purpose of amending or adding conditions to address mitigation of the effect of the Coronation North Project on cultural values and associations".

If the CIA concludes there are adverse effects of the Coronation North Project on ancestral landscapes, awa (rivers), taonga, indigenous vegetation and habitats of indigenous fauna that have not been mitigated, they can be mitigated through the process of reviewing the consent conditions, if it is appropriate to do so, in order to ensure the Coronation North Project promotes sustainable management. The review process would be at the consent holder's expense. The same condition is included in the MPIII and Coronation consents.

12.3 Amenity Effects

12.3.1 Introduction

OceanaGold has undertaken assessments on the landscape and visual effects, noise and blasting effects and traffic effects of the Coronation North Project. The results of the assessments are set out in the next section.

12.3.2 Landscape and Visual Assessment

Macraes Flat sits within a rural upland landscape of fluviially dissected rolling hills of moderate relief. The presence of the relatively large scale Macraes Gold Project, and its effect relative to landscape change is now a major feature contributing to the local landscape context.

The landscape assessment (attached as **Appendix 16**) describes, with photo-simulations, a number of salient and common public viewpoints. The assessment related to the various 'viewpoints' focuses on an objective description of the degree of change to the status quo that a viewer will experience from each particular photo point rather than whether the change represents an adverse or a positive effect. The fact that the Coronation North Project proposal will be visible from some locations and will change aspects of the character of the existing landscape does not necessarily mean that its effects will be adverse, inappropriate or unacceptable. Visual sensitivity is a measure of how visibility changes to a landscape will be regarded and depends upon a range of viewer and view characteristics.

In this landscape and visual assessment, it has been found that relative to the Waitaki District Plan, the effect on visual amenity values that will arise from the Coronation North Project are minor relative to those effects already consented for the existing MGP and Coronation Project and accepted as contributing to the central landscape identity for the Macraes Land Unit. Relative to the operative Dunedin City District Plan, the Coronation Project will affect a small portion of the Taieri Ridge section of the Rural Zone, High Country Outstanding Landscape Area and what will be Rural High Country Zone under the proposed 2GP.

Once the final shaping and revegetation of the proposed Coronation North Waste Rock Stack that the photo-simulations illustrate, has been completed, the general shape, slopes and colour of the completed and revegetated landforms will be in sympathy with the natural slopes of the area. The final shaping of the WRS will be undertaken in consultation with a landscape architect.

Twelve salient and common public viewpoints were considered. Aspects of the Project were not visible from five of these viewpoints (viewpoints 4, 5, 7, 10 and 11). The potential visual effect was negligible from a further three viewpoints (viewpoints 1, 6 and 9). From a further three viewpoints the potential visual effect would be low (viewpoints 2, 3 and 8). All of these viewpoints are either in the Macraes Flat area (viewpoints 1 to 9) or on the Hyde Hill section of the Macraes-Hyde Road (viewpoints 10 and 11).

From viewpoint 12 on Longdale Road, the effect will be high in the short term as the operation will be directly visible in the background of the view. Some of the upper pit walls of the Coronation North open pit, sections of the haul road, and both waste rock stacks will be seen from this viewpoint. Neither the Coronation Pit extension nor the Coal Creek Freshwater Dam will be visible. There is, however, only a short section on Longdale Road (about 800m) where the operations will be visible. In time the visual effects will be countered to some degree by rehabilitation of the rock stacks and haul roads, and will reduce to moderate-high to moderate.

As night lighting is essential for the safe operation of 24 hour a day mining the potential visual effect of night lighting has been considered. The potential amount of light emitted from the Coronation North site will be less than the consented and more active parts of the MGP site within the lower Macraes Flat area. The distance between the site and the main 'public views' from Macraes Road will limit the potential effect of night lighting. The nearest private residences to the site were assessed and it was concluded that there will be no adverse impacts arising from night lighting:

- At the gateway of the Howard residence there may be a view of a small aspect of the extended Coronation Pit, however the activity within the pit will be enclosed within the pit itself and not visible from the homestead, which is set back by about 200m from the gateway.
- The Mount Highlay homestead has intervening landform that will entirely obscure the Project site.

OceanaGold will operate in accordance with existing consent conditions, whereby lighting that could potentially cause glare nuisance or a traffic hazard will be fitted with shields and, as far as practicable, be directed away from residences and traffic. Compliance with existing night light conditions will adequately mitigate any effects of night lighting.

Overall for the majority of viewpoints considered the potential visual effect does not exceed what is considered to be a low effect. In the one instance where the effect in the short term is high the viewpoint, on Longdale Road, is considered to be quite isolated on a small local road that is infrequently used. In terms of the overall cumulative landscape and visual effect of the Project the effect will be low to negligible when seen from the southern of Macraes Flat side of the Taieri Ridge. From the north side of the ridge the cumulative effect will be high, but will become moderate with time.

12.3.3 Landscape and Visual Assessment - Mitigation

Mitigation measures have been incorporated into the Coronation North Project from the outset. These include:

- careful design of the form of the waste rock stack to integrate it with the existing landform character of the area;
- progressive rehabilitation of the waste rock stack;
- restoration of the areas disturbed around the margins of the Project;
- removal and restoration of the haul roads used during construction of the Project following the cessation of mining.

These proven measures have been effective in mitigating potential visual effects of the MGP.

The Coronation North Project is an extension of previously consented activity, is not unexpected and will be seen in this landscape context as a continuation of the existing mining operation.

12.4 Traffic

12.4.1 Effects on the Macraes transportation network

The effects of the Coronation Project are detailed in the Transportation Assessment at **Appendix 12**.

The activities at the Coronation North Project will not require any additional staff and no changes are expected to the existing staff travel patterns. Therefore there will not be additional traffic movements on the public road network arising from the Project.

It has been assessed that the Coronation North Project will:

- Have negligible effect on Macraes-Dunback Road as there will not be any increase in traffic levels on the road.
- Have no more effect on traffic flows on Horse Flat Road than is already consented for the Coronation project. Accordingly no specific traffic management measures are required to address movement of staff during shift changes.
- Continue effective active management of the interface between public and mine traffic at the haul road crossing at Horse Flat Road. Priority is usually given to public vehicles on the road.

Both the volume of traffic on the road and the number of haul trucks crossing the road are low, therefore the potential for delay to public traffic is minimal.

- Extend by 2 years the current arrangement whereby Golden Point Road between Horse Flat Road and the processing plant may be closed to the public. Horse Flat Road provides a suitable alternative route.
- Not have any adverse effect on non-car modes of transport.
- Not give rise to any adverse road safety effects. The site will be lit at night but distances to roads mean it is highly unlikely there will be light spill onto the public roading network. Proposed consent conditions address this by requiring flood lighting that may cause a traffic hazard to be shielded and directed away from traffic. Any lighting at the haul road crossing can be addressed in the Traffic Management Plan.
- Not give rise to any new non-compliance with the transportation policies and rules in the relevant district plans. The existing non-compliance with rule 12.2.2(d) and (h) of the Waitaki District Plan has already been consented and addressed with appropriate conditions in the Coronation project.

Overall the Coronation North Project will maintain levels of traffic that already exist for the Coronation Project for another 2 years.

12.5 Noise

Hegley Acoustic Consultants have prepared a detailed assessment of the noise effects of the Coronation North Project. The report "*Coronation North Project Assessment of Noise Effects*" is attached as **Appendix 13**.

The assessment adopts the current consent conditions for the Coronation Project (Waitaki District Council Reference 201.2013.360 and Dunedin City Council LRC 2013.225), and the relevant noise rules in the Waitaki District Plan (WDP) and Dunedin District Plan (DDP), as reasonable levels against which to assess future activities. The proposed consent conditions (refer **Appendix 23**) will update the current conditions to incorporate reference to the Coronation North Project.

There is a slight difference between the existing consent conditions and the District Plan requirements, with the WDP adopting the MMP Mining Zone as the relevant boundary while the consent conditions adopt the notional boundary of any dwelling in the Rural Scenic Zone with the notional boundary set at 20m from a dwelling. The operative DDP also adopts the notional boundary, which is set as the line 50m from the façade of any dwelling, except that, if the dwelling is located closer than 50m to the site boundary the notional boundary is the site boundary. However, the Dunedin 2GP adopts the notional boundary with an additional control using an increased level at the site boundary.

Further, the existing consent conditions adopt 55dB/40dB LAeq for the day/night limits, the WDP and Dunedin 2GP 55dB/40dB LAeq for the day/night limits, and the Operative DDP 50dBA/40dBA L10 within 50m of a residence. In addition 2GP also sets a site boundary level of 60dB LAeq 24 hours of the day. All conditions include a night time L_{max} level although in every case if the L10 or LAeq level is complied with the relevant night time L_{max} will also be complied with. As mining is a 24 hours a day operation the lower night time limit will control the noise levels.

Noise from the proposed Coronation North Project has been predicted based on field measurements of the equipment that is to be used (rock drill, dump trucks, excavators) during the proposed work and calculated noise contours. Noise has been conservatively predicted at the commencement of the mining phase, which is when equipment is less likely to be screened and hence gives maximum exposure to neighbours. Noise has been assessed at the nearest privately owned houses – in particular the Howard and O'Neil residences.

The assessment is conservative because:

- It assumes that two areas of the Coronation North Project will be worked at the same time. In fact this is not likely to occur.

- It assumes that all noise generating activities are taking place at the original ground surface level plus on the Coronation North WRS at half the height of the final elevation. In fact as Coronation North Pit is excavated and the mining surface goes lower noise levels from within the Pit will reduce by 10-12 dBA (a 10dBA reduction is equivalent to a perceived halving of the noise levels). As the WRS height increases the cumulative noise resulting from equipment on the higher WRS and the reduced noise of equipment within the lower pit will still be less than if the equipment was working at original ground level.
- Noise levels from the noisiest plant have been applied.
- Since ground contours do not extend to the houses to the north of the Coronation North Project it has been assumed that the ground is level for this additional distance, which will give a higher result than in reality since terrain will provide a screening effect.
- The noise contour spot levels have been calculated at 1.2m above ground level at the notional boundary of each of the nearest residences to provide a higher level of accuracy and avoid a 'smoothing of the levels' that can otherwise result from the contouring exercise.

The assessment demonstrates that even during busy mining periods using the noisiest equipment, and with the other conservative factors listed above included, the noise level at all privately owned houses in proximity to the Coronation North Project will remain well within the proposed consent condition limits by a minimum of 11dBA L₁₀. As a guide, a reduction of 10dBA is a perceived halving of the noise level.

The result of these predictions with mining plant at the surface of the area being worked plus trucks on the haul roads, which is the noisiest phase of the project, is:

- | | |
|----------------|-----------|
| • C & M Howard | 29dBA L10 |
| • P & D O'Neil | 24dBA L10 |

From the above it can be seen that the highest predicted noise level experienced at the notional boundary of the closer houses is 29dBA L10, which is well within lower night time noise limit of 40dBA L10 as set out in the existing consent conditions, the Waitaki District Plan and Dunedin City District Plan. This level of 29dBA L10 at the Howard residence, which is the closest dwelling to the haul road, includes the noise effects of trucks along the haul road.

A sound with a special audible characteristic (e.g. tonality or impulsiveness) will attract a 5dBA penalty in the assessment of that sound. The rock drill has potential to attract an adjustment, however field measurements show that the noise from this equipment does not exceed 18dBA at any notional boundary of the nearest private houses. At this level there will not be any special audible characteristic to the sound and, further, given the distance to the nearest houses the existing noise environment will mask the sound it produces.

Although the noise environment in the area of the Coronation North Project, without any effects of mining, is relatively low, predicted noise levels arising from the project are also low. It is considered that for the majority of the time, except for the calm and close to calm weather conditions that occur only 1% of the time, predicted noise from the Coronation North Project will be at or below the original noise environment levels. Even at night time, when background sound is lowest, there will be no adverse noise effects for the nearest private neighbours because with winds generally over about 2m/s, and distance from the project site, for the majority of the time noise from the Coronation North Project will be below the existing noise environment.

Based on these predictions, noise effects of the proposed Coronation North Project will be less than minor.

This same prediction was made for the Coronation Project and there have been no recorded noise complaints relating to that project.

12.6 Blasting

A review assessment of vibration and blasting effects of the Coronation North Project was undertaken by techNick Consultants, and the report is given at **Appendix 17**.

Blasting requires relatively light powder factors compared with other operations due to the relatively weak and fractured rock mass. Ore is blasted in 7.5m high benches and excavated in three, nominally 2.5m high flitches. Waste is blasted in 15m benches and excavated in four flitches.

This successful process will be followed during the Coronation North Project.

12.6.1 Sensitive Areas

There are two privately owned residences near the proposed Coronation North project, and one residence owned by OceanaGold. This AEE considers the effects of the project upon the privately owned residences. The closest of the privately owned homes is owned by Mr Howard, and is located about 2 kilometres from the project area. The second residence, O'Neil's residence, is located about 3.5km from the project area. For the purposes of assessing the impact of blasting vibration these two properties have been considered as 'sensitive areas'.

12.6.2 Blast Requirements

The blasting programme and methods that will operate at Coronation North Pit will be similar in nature to that which already operate at the Macraes Gold Project and Coronation.

Typical blast design parameters and explosives charge weights per hole, and per delay interval (Maximum Instantaneous Charge) for the blasting at the Coronation North Project are outlined in **Table 12.1**.

Table 12.1 Typical blast design parameters.

	Ore	Waste
Diameter (mm)	102	200
Explos/hole (kg)	50	450
Explos MIC (kg) to 3 holes/delay	200	1350

12.6.3 Predictions - Blast Induced Vibrations

The AS / NZ Standard AS/NZ 2187.2 (2006) for blast vibrations states that a ground vibration level of 5 mm/s is acceptable for human comfort and well below any level of damage to housing. At the closest residences the predicted level of vibration is 1.9 mm/s (Howard residence) and >1.0mm/s (O'Neill residence). This is well below the acceptable 5 mm/s level for 95% of blasts.

12.6.4 Predictions – Airblast

An airblast level of 115 to 120 dBL is acceptable for human comfort and well below any level of damage to housing. At the closest residences the predicted maximum level of airblast is 108 dBL (Howard residence) and 104dBL (O'Neill residence). This is less than the acceptable 115 to 120 dBL level.

12.6.5 Potential Blasting Hazards

Other consequences of blasting from the Coronation North Project, such as flyrock and dust generation, will be managed so as to avoid creating any nuisance to the nearest residences. Potential hazards can be adequately addressed by implementing best practice along with suitable elimination measures.

12.6.6 Conditions of Consent

OceanaGold will volunteer conditions of consent that mirror those that it operates under for the Macraes Gold Project and Coronation Project. They include a restriction on blasting hours, and parameters for blast vibration and airblast overpressure (refer to **Appendix 23**, Proposed Conditions of Consent).

12.6.7 Blasting/Vibration Summary

In summary, there are no environmental impacts of the proposed blasting program for the Coronation North Project that are likely to cause adverse effects or discomfort to nearby 'sensitive' privately owned residences.

12.7 Dust

A detailed assessment of the effects of air discharges has been undertaken by Beca Infrastructure Limited. The "*OceanaGold Coronation North- Assessment of Environmental Effects of Discharges to Air*" is attached as **Appendix 3**.

OceanaGold currently holds four resource consents for the discharges to air from the Macraes Gold Project mining operation at Macraes Flat (RM 12.378.15 for discharge to air from the Coronation project, RM10.351.52 for discharges to air from the MPIII project; 96785_v4 for discharges to air from the main mine area; and 2006.689 for discharges to air from underground mining at Frasers). While the new Coronation North Project activities are of the same nature as those currently authorised, they will be outside the area covered by the existing resource consents and are not activities which are permitted by Rule 16.3.5.3 of the Regional Plan: Air for Otago ("the Air Plan") because they exceed a mineral extraction rate of 20,000 cubic metres per month and 100,000 m³ per year. Accordingly, under Rule 16.3.5.9 of the Air Plan, a new resource consent is required for the 'discretionary activity' air discharges that will result from the Coronation North Project.

The Coronation North Project activities that have potential to generate discharges to air include:

- Earthworks, including stripping of overburden and topsoil, mining, construction of roads and dam structures and formation of the waste rock stack and stockpiles;
- Blasting;
- Vehicle movements on unpaved surfaces;
- Loading and unloading of materials;
- Wind generated dust from dry exposed surfaces such as roads and stockpiles.

The Coronation North Project site is located some distance from the closest neighbouring houses in the area. OceanaGold owns one house within 1 kilometre of the site but the assessment of air discharge effects has focussed on the nearest privately owned houses, considered 'sensitive receptors'. The Howard residence is about 2.5 km to the south of the Coronation Pit and about 1.2km to the west and southwest of the haul road, and the O'Neill Residence is about 3.5 km to the northwest of the proposed Coronation North waste rock stack. •

The 2004 National Environmental Standards for Ambient Air Quality (NESAQ) regulations are designed to address the health effects caused by poor air quality. The standard of relevance to the Coronation North Project is the NES for fine particles (PM₁₀). The PM₁₀ standard allows a maximum of one exceedance per year of a PM₁₀ concentration of 50ug/m³ (24 hour average). Regulation 17 restricts the granting of resource consents for discharges of PM₁₀ where that discharge would be likely to increase off-site 24 hour average PM₁₀ concentration in "polluted" airsheds by more than 2.5 ug/m³ at any time. The Coronation North Project does not fall within the four gazetted airsheds within the Otago region, instead it is located within the airshed comprised of all other areas within the Otago region. There is no meaningful PM₁₀ concentration data available for this airshed and therefore it does not meet the NESAQ definition of "polluted". Accordingly there are no restrictions under Regulation 17 to the granting of this resource consent.

The Coronation North Project is consistent with the relevant objectives of the Air Plan:

- It is expected that the air discharges from the Coronation North Project will not have a significant adverse effect on the local air quality or the overall air quality within Air Zone 3. Although the proposal will not enhance ambient air quality neither is it expected to result in any significant degradation of ambient air quality;
- The Coronation North Project is consistent with objectives 6.1.1 (to maintain or enhance ambient air quality), 6.1.2 (to avoid adverse localised effects of air discharges on human health, cultural, heritage and amenity values, ecosystems and the plants and animals within them, and the life-supporting capacity of air) and 6.1.3 (sustainable use of the air resource);
- There are not expected to be any adverse effects on the local environment that are more than minor.

The Coronation North Project is consistent with the relevant policies of the Air Plan:

- Policy 7.1.1 - the Coronation North Project should not result in adverse effects on the relationship that Kai Tahu, as Kaitiaki, have with the air resource;
- Policy 8.1.1 - the Coronation North Project is not expected to result in any significant increase in local concentrations of PM₁₀;
- Policy 8.2.3 - the actual, potential and cumulative effects of the proposal on human health, ecosystems, amenity values and cultural and heritage values are considered to be less than minor;
- Policy 8.2.8 – the Coronation North Project will be very similar to the existing Macraes Gold Project and will generate similar discharges with similar effects. OceanaGold proposes to continue to use the same dust mitigation methods that are being successfully used at present.
- Policy 10.1.1 – OceanaGold will continue to use best practice dust mitigation methods to avoid, remedy or mitigate any adverse effects of dust beyond the boundary of the Coronation North Project site.

OceanaGold has volunteered conditions of consent for the Coronation North Project that are based on the relevant conditions of existing consent RM12.378.15, which include limits set for deposited dust and Total Suspended Particulates (TSP).

Monitoring of dust discharges during 26 years of mining at Macraes Gold Project has demonstrated that:

- For the majority of the time deposited dust levels beyond the mine boundary have been within the consent limits, and within the mine boundary have also remained below the limit of 3g/m²/30 days. Some exceedances have been attributed to extreme wind events and factors beyond OceanaGold's control (such as the proximity of busy unpaved roads and agricultural activities).
- Deposited dust levels have increased in comparison to background values, however at the majority of locations levels have not increased more than the existing resource consent allows, and levels at locations near to where people live are consistently below the consent limit.
- TSP concentrations are generally below the consent limits. On occasion high concentrations have been recorded but the high results are not always attributable to mining activity (agricultural activities like cultivation and spreading of fertiliser have been implicated).
- PM₁₀ and respirable quartz concentrations are low and likely to be typical of rural areas.
- There have not been any reported incidences of adverse effects on vegetation or human health.
- The number of complaints reported to the ORC is low (5 since 2009 - all related to dust from the Mixed Tailings Impoundment at Macraes Gold Project, which has since been mitigated with implementation of additional dust control measures).
- Overall, discharges to air from the existing Macraes Gold Project activities results in effects on the environment that are no more than minor.

The proposed conditions of consent also require OceanaGold to provide the consent authority with a comprehensive Dust Management Plan that will be updated to incorporate the Coronation North Project activities. The mitigation methods prescribed in the Dust Management Plan have been effective at controlling dust generated at the Macraes Gold Project and should also be an effective management tool for controlling dust emissions at the Coronation North Project.

The quantity and frequency of dust discharges from the site are directly related to the amount of material that is moved and processed, the area of open ground, the dust control measures employed and local weather conditions. The effects of the discharges are also directly proportional to the quantity of the dust emissions. In comparison to the current mining activity at Macraes Gold Project, the Coronation North project will be relatively small and will take place over a short period of time. The activities are similar in nature but on a smaller scale. The nature of effects from the Coronation North Project will also be similar.

The results of monitoring, complaints and audit records demonstrate that the existing dust effects of the mine are no more than minor and within the limits set by the current resource consents. OceanaGold intends to continue to operate within the current consent limits and continue to use the dust mitigation techniques that have been used successfully to date. Provided these measures are diligently carried out any cumulative dust effects arising from the combination of dust from the Coronation North Project with discharges to air from the Macraes Gold Project should be minimised and adequately mitigated. Given the relatively small scale of the mining activities associated with the Coronation North Project any increase in the nature and scale of effects of dust emissions from the project is expected to be minimal. Provided particular care is taken with the construction of the WRS, topsoil stockpile and haul road the discharge of dust from the Coronation North Project will be adequately mitigated and any adverse effects downwind of the site are expected to be less than minor.

12.8 Seismic/Stability

12.8.1 Waste rock stack stability

The "*Macraes Gold Project – Coronation North Waste Rock Stack Design Report*" by Engineering Geology Limited is attached as **Appendix 18**. The report presents results of geotechnical analysis in relation to the general stability of the proposed Coronation North WRS. It concludes that the WRS has a static factor of safety against instability exceeding 1.5 for the expected water levels. Under earthquake loading no critical yield is expected under an Operating Basis Earthquake with a recurring interval of 150 years, and displacements for the Maximum Design Earthquake with a recurrence interval of 2500 years are negligible. Accordingly, the stability of the Coronation North WRS in static and earthquake conditions is considered acceptable and in line with what is typical for waste rock stacks of this type. It will be suitable for the intended long term use of pastoral farming post rehabilitation and mine closure.

12.8.2 Impact of WRSs on Open Pits

Pells Sullivan Meynink completed a report "*Impact of the Coronation and Coronation North Waste Rock Stack on Open Pits*" at **Appendix 19**. The report concluded that due to the relatively shallow pit depths in Coronation Pit relative to the WRS offsets (125m from Coronation WRS toe to pit crest; 80m from Coronation North WRS toe to pit crest) the two WRSs will not compromise stability of the Coronation pit slopes.

Further Coronation North WRS toe is offset at least 180m from the Coronation North Pit crest therefore the WRS will not compromise stability of the Coronation North pit slopes.

Finally, the report recommends that the toe of the Coronation WRS be moved south to avoid extending into the Coronation North Pit.

OceanaGold will take into account the report's recommendations when completing the final design of the Coronation WRS.

12.8.3 Coronation North Pit Slope Design

Pells Sullivan Meynink completed a geotechnical report "*Coronation North Pit – slope design angles*" at **Appendix 20** to confirm pit wall slope design.

The Coronation North WRS is located to the northeast of the pit but at its closest point (during Stage 4 of mining) it is approximately 200m away and this separation is wide enough for the stack not to adversely impact on pit wall stability.

A simple slope design is recommended (refer to Figure 12 of report) and will be implemented. It is also recommended that there is ongoing development of the Coronation North geological model, in particular to better understand the north-south trending fault inferred from the steep gorge at the eastern end of the proposed pit, and the basalt and underlying sediments.

Due to the degree to which the rock mass is fractured it would be impossible to mine the Hyde-Macraes Shear Zone without any pit slope failure, and at stage 4 of development the pit will be proximate to the Footwall Fault. However the report acknowledges that OceanaGold has successfully managed mining 10 other open pits at Macraes Mine which have experienced numerous batter and multiple-batter scale failures. Movement of the south western pit wall in response to mining and, as the pit deepens, in response to rainfall can be managed as it has been in other pits, for instance by monitoring and stop/start mining.

12.8.4 The Coal Creek Freshwater Dam

The "*Macraes Gold Project – Coal Creek Freshwater Dam Assessment*" by Engineering Geology Limited is attached as **Appendix 21**. The report assesses the feasibility of constructing a dam in Coal Creek with a maximum height (crest to downstream toe) of about 27m, a crest level of RL487, a reservoir area at normal top water level (RL484) of about 9.3ha, and a storage volume of approximately 685,000m³.

If construction of the dam proceeds a detailed hypothetical dam breach study will be undertaken and the final dam design will be documented in a later design report that is used to support an application for a building consent.

For the purposes of the report a conservative approach has been adopted and a Medium Potential Impact Classification (PIC), rather than Low PIC, has been applied.

The geological conditions at the proposed dam site are expected to be similar to those elsewhere at the MGP where existing water retention dams, silt ponds and tailings storage facilities have been constructed and have performed successfully for years. The MGP site is located in an area of relatively low historic seismic activity, however there are some nearby faults which are capable of generating large earthquakes. The dam would be located east of the Footwall Fault and the major east trending fault closest to the dam would be the northern segment of the Taieri Ridge Fault that runs along the foothills 11 km east of the dam site.

To ensure stability the dam will be designed and constructed in accordance with the New Zealand Society of Large Dams (NZSOLD) Dam Safety Guidelines. Embankment stability will be analysed during detailed design and will apply conventional factors of safety of $F \geq 1.5$ and $F \geq 1.2$, and an Operating Basis Earthquake based on a 150 year return period and, for a Medium PIC dam, a Safety Evaluation Earthquake based on a 2,500 year return period. Construction of the dam embankment will be under OceanaGold's direct supervision, assisted by surveyors and the dam designer, drawing from experience gained during the successful construction of the existing facilities at MGP, for example the recently constructed Tipperary Freshwater Dam. An Operation, Maintenance and Surveillance Manual will be prepared to ensure the ongoing safety of the dam, with regular monitoring and inspections.

On this basis it is considered a stable dam can be constructed in Coal Creek.

12.9 Heritage features

12.9.1 Introduction

The effects on heritage features are detailed in **Appendix 9 Coronation North - Archaeological Assessment**.

Five sites fall within the Coronation North Project Area and will be affected by the works:

- The upper Mare Burn race which is located in Trimbells Gully and Maori Hen Creek,
- Two sites associated with the NZ Gold & Tungsten mine. This area consists of stone revetting, a tramline, stone platforms, races and other discrete features,
- Alluvial workings within Coal Creek, and
- The potential remains of a miner's house associated with alluvial workings.

Five other sites exist within the Project Area but should not be impacted by mining activity.

12.9.2 Summary of archaeological values

The five impacted sites are considered to be in a condition ranging from fair (features of the site remain visible but there has been modification resulting in some of these being destroyed) to good (original features and fabric associated with the site remain and are clearly visible; there is some evidence of disturbance or modification). There is evidence of natural, and possibly stock induced, erosion processes at all sites and several of the sites appear to have been impacted on by past farming activities.

12.9.3 General Heritage Mitigation

An application will be made to HNZ for all work within the Coronation North Project Area. It will cover the five sites that will be adversely affected, as well as any sites that might be uncovered as work proceeds.

The five sites that are present within the Project Area but will not be affected by works will be clearly identified in project documentation and, where practicable, identified in the field so that they will not be physically impacted during the works.

Before any work that might impact on archaeological features commences a plan and photographic record of the sites will be completed.

An archaeological procedure will be developed that outlines the steps that will be taken for the management of any underground archaeological features that may be revealed during work.

OceanaGold is discussing with HNZ potential mitigation options that could be adopted at a later time, should the Coal Creek Freshwater Dam be constructed.

12.9.4 Summary

The Coronation North Project will affect five of the ten historic sites in the Coronation North Project Area. These affected sites have fair to good archaeological values. The development proposal has been completed with the aim of protecting as many of the identified historic features as possible within the practical and economic requirements of the project.

All of the five sites being destroyed are unavoidable because of the location of the ore resource or freshwater supply (I42/86, I42/97, I42/98, I42/221 and I42/222).

Where effects on features cannot be avoided OceanaGold will take appropriate steps to mitigate any effect. Mitigation will include recording, sampling and analysing features in accordance with accepted archaeological best practice. Sites that are subject to destruction will be surveyed and investigated in detail in accordance with any Authority that may be issued by HNZ.

13 AFFECTED PERSON/CONSULTATION

13.1 Affected Residences

Houses that are owned by OceanaGold and therefore are not affected have been discussed in section 4.2.

Non OceanaGold owned residences in the near vicinity of the Coronation North Project include:

- C and M Howard residence – Bellfield homestead – Horse Flat Road – situated about 2 km from the Project area
- R and M O'Connell residence – situated at the end of the road past the school (past the village) about 7km from the Project area
- O'Neil residence – Mount Highlay homestead about 3.5km from the Project area
- Roy residence – situated just over 5km from the Project area

This AEE has taken into account the effects of the Coronation North Project on these residences.

13.2 Consultation Undertaken

OceanaGold has identified the following parties as potentially being affected by the proposed Coronation North Project. OceanaGold has consulted with these parties during the course of its evaluation of options and alternatives. OceanaGold has met with these parties and supplied them with the relevant information to enable them to understand how they are impacted by the Coronation North Project.

13.2.1 Local Community

OceanaGold has discussed the Coronation North Project with a number of local community members. These include representatives of Macraes Community Incorporated (MCI) and several persons living near to the project. These persons include: Colin Howard who leases land from OceanaGold on the northern side of Horse Flat Road; James Peddie, who currently farms the Longdale Station where the project will be developed; Craig and Erin Howard who live near the existing haul road; Neil Roy who appealed against grant of consent for the Coronation Project on the topic of roading; and Tony Richards who farms downstream of the Project and takes stock water from the Mare Burn. There were no apparent major issues or concerns arising from these consultations.

13.2.2 Heritage New Zealand (HNZ)

OceanaGold briefed HNZ on the Coronation North Project once the archaeological assessment had been undertaken and at that time no major archaeological issues were raised. OceanaGold met HNZ on site in March 2016 to inspect heritage sites potentially affected, or that could be protected in perpetuity as part of the wider mitigation strategy related to the Heritage Management Plan.

Within 6 months of receiving Coronation North consents OceanaGold will provide a revised Heritage Management Plan.

There has been further consultation in May 2016 to discuss potential heritage mitigation measures. Those mitigation discussions are ongoing.

OceanaGold will separately, but in parallel to these resource consent applications, lodge an application with HNZ for an archaeological authority to modify and/or destroy archaeological sites under the Heritage New Zealand Pouhere Taonga Act.

13.2.3 Department of Conservation (DoC)

OceanaGold has provided DoC staff with a general overview of the Coronation North Project and supplied copies of the technical assessments of terrestrial and aquatic ecology for their review. DoC will be provided with a copy of OceanaGold's applications and this AEE upon lodgement.

OceanaGold plans to meet with DoC staff in May 2016 in particular to discuss ecological matters and proposed mitigation. OceanaGold has invited DoC staff to attend a site visit and would welcome this if it can be arranged.

OceanaGold will continue to consult with DoC on issues that are of interest to them relating to the Project.

OceanaGold will separately, but in parallel to these resource consent applications, lodge an application with DoC to disturb wildlife (native birds, lizards) under the Wildlife Act.

13.2.4 Kati Huirapa ki Puketeraki, Moeraki and Otakou

13.2.4.1 Past Consultation

The Runaka have been consulted on all of OceanaGold's previous major developments at the MGP (including 1993 – Macraes Extension; 1996 – Macraes Gold Project Expansion; 2001 – Heritage and Art Park; 2002 – Golden Bar Pit Development; 2005 – Frasers East WRS, 2011 MPIII and 2012 Coronation Project). In the past the Runaka have acknowledged that the MGP does not give rise to significant cultural issues and does not directly affect the Runangas' interests.

In 2003 Te Runaka o Otakou submitted in opposition to OceanaGold's application to increase the footprint and height of the Frasers West Waste Rock Stack (FWWRS). It requested that a Cultural Impact Assessment ("CIA") be undertaken by OceanaGold. In response OceanaGold prepared a cultural assessment to provide the ORC with an understanding of the cultural effects of the proposed FWWRs consents. The assessment concluded that the proposed variation would not impact on tangata whenua's cultural, spiritual or historical association with the land and water. This assessment was accepted by the ORC.

13.2.4.2 Coronation North Project Consultation

Representatives of KTKO (Kathryn Gale) and Kati Huirapa ki Puketeraki (Lyn Carter & Dr Katharina Ruckstuhl) undertook a site visit on 27 April 2016. Representatives of the other two runanga were invited but were unable to attend. OceanaGold discussed the Coronation North Project with Runaka representatives during the site visit. The Runaka indicated that it wanted to prepare an addendum to the Coronation CIA to incorporate reference to the Coronation North Project. However the time period required to complete an addendum would mean a delay in OceanaGold lodging this application.

OceanaGold propose to adopt the same approach as was considered suitable for the Coronation Project and proved successful. The Runaka will be invited to undertake the CIA while the Coronation North Project applications are being processed. In order to take into account the findings of the CIA OceanaGold offers the following review condition, to be undertaken at the consent holder's cost, to ensure the Councils can initiate a review of the mitigation conditions based on the findings of the final CIA:

'The Councils may, within 6 months of receipt of the Cultural Impact Assessment prepared by KTKO for the Coronation North Project; serve notice of its intention to review the conditions of this consent for the purpose of amending or adding conditions to address mitigation of the effect of the Coronation North Project on cultural values and associations'.

If the CIA concludes there are adverse effects of the Coronation North Project on ancestral landscapes, awa (rivers), taonga, indigenous vegetation and habitats of indigenous fauna that have not been mitigated, they can be mitigated through the process of reviewing the consent conditions, if it is appropriate to do so in order to ensure the Coronation North Project promotes sustainable management.

OceanaGold will seek written confirmation from the Runaka that this approach and the proposed review conditions are satisfactory for the Coronation North Project. When confirmation is received from the Runaka it will be forwarded to the consent authorities.

KTKO will be provided with a copy of OceanaGold's applications and this AEE upon lodgement, for review. OceanaGold will invite the Runaka to provide feedback on the applications and engage in further consultation regarding the Project.

13.2.5 Otago Fish and Game Council

OceanaGold has provided Council staff with a general overview of the Coronation North Project. No immediate concerns were identified. The Council will be provided with a copy of OceanaGold's applications and this AEE upon lodgement.

14 MONITORING

14.1 Existing Monitoring

OceanaGold has an extensive environmental monitoring programme which includes compliance monitoring as required by resource consents and additional in-house monitoring. The monitoring undertaken by OceanaGold has resulted in a large amount of environmental data which has informed the technical assessments supporting these applications. This same information is also reported to the consent authorities as required by existing resource consents. In some cases records extend over 20 years. Over this period OceanaGold has reported a small number of exceedances. These have generally been of a minor nature or related to a technical non-compliance. Examples of this are where duplicate compliance limits exist for the same site or where compliance limits have been set for sites that have historically been above the limit for certain parameters. No enforcement or abatement action has ever been taken in relation to the MGP. There has been no material offsite environmental impact.

14.2 Proposed Monitoring

Monitoring proposed as part of the Coronation North Project is consistent with monitoring already undertaken at the MGP.

14.2.1 Surface Water

The proposed surface water quality compliance points are outlined in Table 14.1.

The existing DC08 compliance point in the Shag River catchment and the proposed new Mare Burn compliance point in the Taieri catchment (MB02) will be used to monitor water quality in the receiving surface waters for the Coronation North Project.

Table 14.1 Proposed surface water quality compliance limits.

Compliance Point		Deepdell Creek (DC08) ⁽¹⁾	Mare Burn (MB02)	ANZECC (2000) stock water guideline
Potential Usage		Stock watering	Stock watering	
pH (unitless)	current	6-9.5	-	-
	proposed	no change	6-9.5	
Arsenic	current	0.15	-	0.5
	proposed	no change	0.15	
Cyanide WAD	current	0.1	-	n/a
	proposed	no change	0.1	
Copper ⁽²⁾	current	0.009	-	0.5
	proposed	no change	0.009	(for sheep)
Iron	current	1	-	n/a
	proposed	no change	1	
Lead ⁽²⁾	current	0.0025	-	0.1
	proposed	no change	0.0025	
Zinc ⁽²⁾	current	0.12	-	20

	proposed	no change	0.12	
Sulphate	current	1000	-	1000
	proposed	no change	1000	

Notes: All units in g/m³ unless otherwise stated.

(1) Current compliance standards from ORC Resource Consent RM10.351.04.

(2) Copper, lead and zinc standards shall be hardness related limits in accordance with the following. Values given in the tables above assume a hardness of 100g/m³ CaCO₃.

$$a) \text{ Copper Limit (g/m}^3\text{)} = \frac{0.96.e^{0.8545[\ln(\text{hardness})] - 1.702}}{1000}$$

$$b) \text{ Lead Limit (g/m}^3\text{)} = \frac{(1.46203 - [\ln(\text{hardness})(0.145712)])e^{1.273[\ln(\text{hardness})] - 4.705}}{1000}$$

$$c) \text{ Zinc Limit (g/m}^3\text{)} = \frac{0.986.e^{0.8473[\ln(\text{hardness})] + 0.884}}{1000}$$

14.2.2 Ground Water

No new monitoring bores are proposed for the Coronation North Project. It is considered to be more beneficial to monitor any seepage from waste rock stacks and other associated features. The flow rates and water quality from any Waste Rock Stack seepages will be monitored and analysed on a regular basis in consultation with the Otago Regional Council. Results of monitoring will be used to verify and refine the Coronation North Project water models. This will assist to identify the final extent of the Coal Creek dam, if it is in fact required.

14.2.3 Aquatic Biology

OceanaGold proposes to continue the aquatic biology monitoring programme that has been undertaken to date at the MGP. Quarterly monitoring of macro-invertebrates and periphyton, along with an annual summer electric fishing survey at a series of control and impact sites has been completed since 1990. The results of each year's monitoring are compiled into an annual report.

No new monitoring sites will be created for the Coronation North project.

Like the MGP, the monitoring programme for the Coronation North Project will include:

- surface water monitoring to monitor the effects of the Coronation North Project construction and ongoing mining operations on freshwater ecology and water quality.
- biological monitoring at the specified sites, provided suitable habitat is available for sampling.
- monitoring of macroinvertebrates and periphyton at each of the specified sites on one occasion during each quarter (unless there are insufficient flows to support any significant aquatic community). A flow reading shall be completed on each monitoring occasion.
- an annual electric fishing survey carried out at each of the specified monitoring sites (unless there are insufficient flows) during the period 1 February to 31 March inclusive. A flow reading will be completed at each site.

All aquatic biology monitoring will be undertaken during low or stable flows.

The following components will be monitored at all specified sites:

- Benthic macroinvertebrates – the taxonomic composition and abundances.
- Fish – the taxonomic composition and abundances.
- Benthic Algae – a qualitative assessment of the height and percentage cover of dominant species.

No additional biological monitoring is considered necessary for the Coronation North Project.

14.2.4 Dust

OceanaGold proposes to continue to use the monitoring methods that are currently employed at the MGP, but with one dust monitoring site change which will be monitored for the duration of the Coronation North Project.

A map showing the general location of the proposed new monitoring site is shown in **Figure 14-1**, with the proposed gauge marked in pink. The decommissioning of dust gauge DG23 will be reinstalled as DG25. The purpose of this is to remove DG23 from the active mine areas footprint.

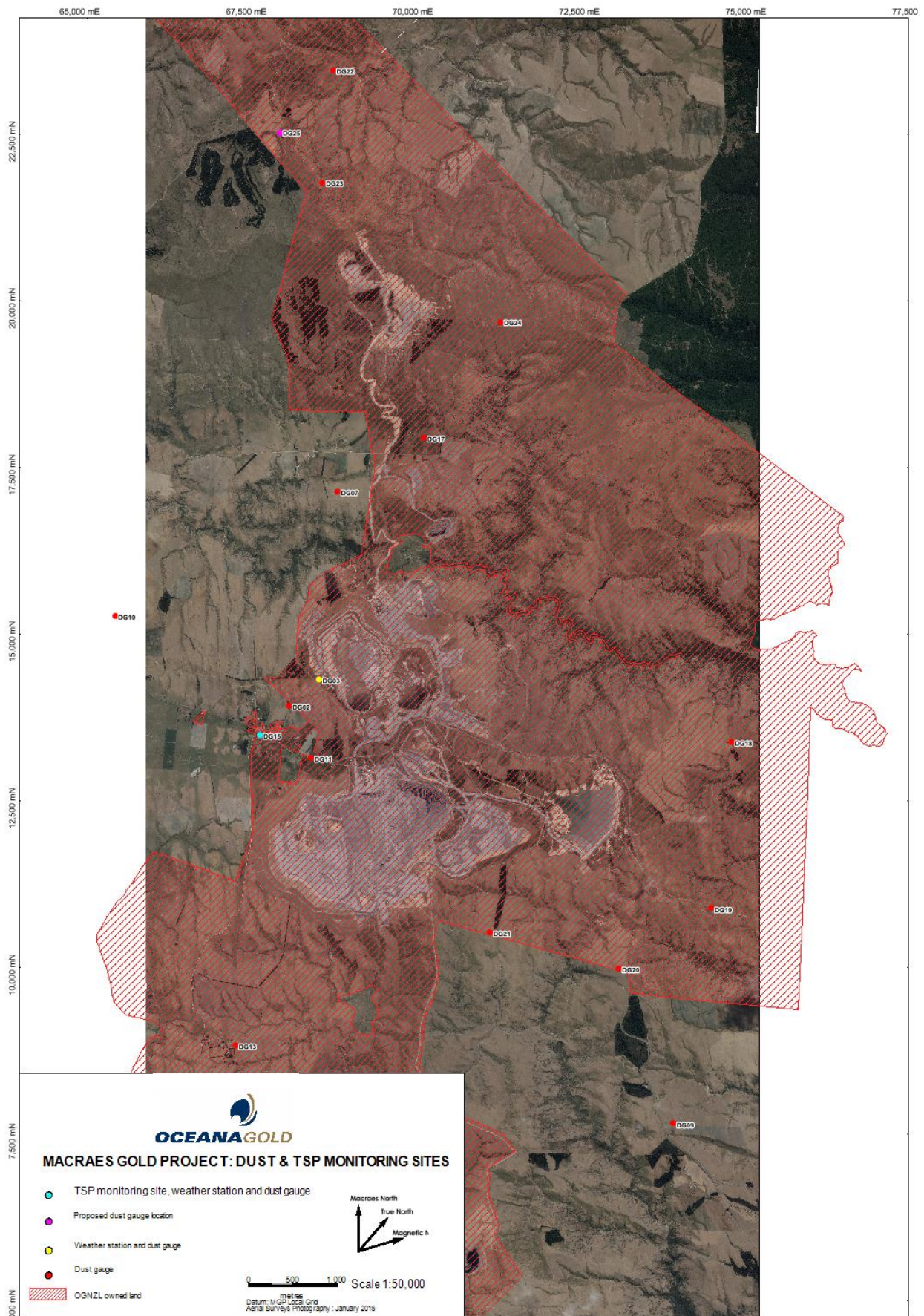


Figure 14–1 Proposed Dust Monitoring Site Locations

14.2.5 Noise

Monitoring of noise impacts arising from the Coronation North Project is proposed to be consistent with current consent conditions for the Macraes Gold Project (LRC 201.2011.35) and Coronation Project (WDC Reference: 201.2013.360, DCC Reference: LUC-2013-225).

In the Waitaki District noise will be measured at any point within the boundary of the Township Zone of Macraes; or at the notional boundary of any dwelling, not owned by OceanaGold, in the Rural Scenic Zone. In the Dunedin City District noise will be measured at the notional boundary of any dwelling, not owned by OceanaGold, in the Rural Zone High Country OLA. In the WDP the notional boundary is defined as a line 20 metres from the exterior wall of any rural dwelling or the legal boundary where this is closer to the dwelling. In the DDP the notional boundary has the same definition except that instead of 20m, 50m is applied. The proposed consent conditions for the Coronation North Project adopt the more conservative 20m measurement.

Noise monitoring will be undertaken monthly at the Howard and O'Neil residences.

Noise limits will be as follows:

- On any day between 7 am to 9 pm (daytime): 50 dBA L_{eq} ;
- On any day between 9.00 pm to 7.00am the following day (night-time): 40 dBA L_{eq} and/or 70 dBA L_{max} .

Where relevant, sound levels will be measured and assessed in accordance with the provisions of NZS 6801:2008 Acoustics - *Measurement of Environmental Sound* and NZS 6802:2008 Acoustics – Environmental Noise.

14.2.6 Blasting

Vibration and airblast overpressure monitoring will be conducted at the O'Neill Residence and the Howards residence (refer to section 4.2). These are residences that are currently not owned by OceanaGold and are located outside of the Macraes Mining Project Mineral Zone. Monitoring will be conducted on a monthly basis and, due to an extensive history of low blast monitoring results, will mainly target larger blasts.

Blasting shall be restricted to within the following hours:

- Monday-Friday 9am to 5.30pm
- Saturday and Sunday 10am to 4.30pm

Details of blasting method, strength of the blast and time of blast shall be entered into a record book kept for that purpose and shall be available to the Councils on request.

Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Council's District Plan shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.

Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Council's District Plan, shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.

The notional boundary is defined as a line 20 metres from the exterior wall of any rural dwelling or the legal boundary where this is closer to the dwelling.

14.2.7 Seismic/stability

It is proposed to monitor the stability of the Coronation North WRS in accordance with the current suite of consent conditions and monitoring practices that are in place for the waste rock stack at the MGP.

14.2.8 Dam Monitoring

Prior to construction of the Coal Creek Dam, an Operation, Maintenance and Surveillance Manual will be prepared. This will set out the operational and maintenance requirements necessary to ensure the ongoing safety of the dam. Monitoring and inspections are a fundamental part of the dam safety process. These range from routine regular inspections to more comprehensive reviews at longer periods.

Operational activities will include clearing debris that may accumulate around spillway inlets and channel, clearing any rockfalls within the secondary spillway and ensuring unobstructed discharge of the seepage drains and outlet water pipe.

Maintenance activities will include repairing any erosion around the perimeter of the reservoir, maintaining riprap on the upstream shoulder, removing weeds or trees from the upstream and downstream shoulders or crest of the dam, maintaining the grass cover on the downstream shoulder and dam crest and maintenance of the valve.

To ensure the safety of the dam regular inspections are to be undertaken. More detailed inspections will be required on first filling. Thereafter inspections will be undertaken on a monthly basis and during periods of heavy rain.

OceanaGold proposes a comprehensive suite of consent conditions which provide for plans and reports to manage and monitor the Dam. They are similar to conditions that have been approved by the WDC and ORC for other dams at the MGP, like the recently constructed Tipperary Freshwater Dam.

14.2.9 Restoration/Rehabilitation

Existing MGP consents require three yearly rehabilitation reviews to be completed which include ground cover, species components, plant nutrition status, soil organic matter and concentrations of exchangeable nutrients in the soil at pre-selected sites.

It is currently proposed to continue this monitoring during the Coronation North Project and for the life of the Macraes Gold Project.

15 ASSESSMENT OF ALTERNATIVES

The plans for the Coronation North Project have been modified to improve the environmental outcomes of the project as the project has developed.

It is not considered viable to store waste rock from the Coronation North Pit in alternative waste rock stacks at the MGP site, by expanding those stacks. Proximity to the Coronation North Pit produces economic efficiencies, haul costs are reduced, and greenhouse gas emissions associated with haulage are minimised. Similarly, the additional haul road is located in the most direct and therefore efficient route.

Use of existing infrastructure at the MGP processing plant, and utilisation of existing vehicle fleets, mining equipment and personnel from the MGP is an efficient use of resources.

It was not possible to contain the Coronation North Project to a location within the Macraes Mining Project Mineral Zone, or to avoid the Rural Scenic Zone in Waitaki District or the High Country OLA in Dunedin City, because the mineral resource is located within those areas. There is a functional necessity to locate operations in the proposed locations.

The location of the Coal Creek Freshwater Dam has been chosen in preference to other locations (for instance Trimbells Gully) because it provides the following advantages:

- It is located on land owned by OceanaGold so that it is readily accessible for construction, monitoring and maintenance
- It is upstream of the Project area and provides natural drainage of water through the catchment where it is needed
- Coal Creek has an upstream catchment yield sufficient to provide the volume of water required for storage
- The dam will have negligible visual impact on neighbouring properties or public places because it is situated within a gully
- The 'borrow areas' that are needed for sourcing the fill material can be contained within the dam footprint
- The natural topography has a natural constriction point that allows for a 27 metre embankment which provides good storage capacity and makes an efficient impoundment/embankment ratio, thereby reducing potential for greater land disturbance.

16 CONDITIONS

OceanaGold expects any conditions of these resource consents to mirror, or be very similar to, those that are already in place for existing open cut pits, WRS and associated infrastructure at the MGP and in particular the Coronation Project. OceanaGold welcomes variations to existing Coronation consents where practicable, rather than the introduction of new consents.

A range of proposed draft consent conditions is being prepared and will be provided to the consent authorities for consideration, and can be inserted at **Appendix 23**.

17 CONCLUSION

This assessment of environmental effects has identified and evaluated potential effects on the environment of the proposed Coronation North Project and demonstrated that the Project is able to be undertaken with minimal adverse environmental effects, subject to appropriate conditions.

In reaching this conclusion OceanaGold has been guided by the expert technical reports that are submitted in support of these applications.

The activities for which resource consents are sought are consistent with the purpose and principles of the Resource Management Act 1991 and will promote sustainable management of resources. Accordingly, it is considered that resource consents should be granted for the Coronation North Project activities.