Report

Oceana Gold (NZ) Limited Phase III Development Assessment of Environmental Effects of Air Discharges

Prepared for Oceana Gold (NZ) Limited

By Beca Infrastructure Ltd (Beca)

7 April 2011

Revision History

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1 Introduction

Oceana Gold (NZ) Limited (OceanaGold) operates a large open cast and underground gold mining operation at Macraes Flat in East Otago. Gold reserves in the existing mine areas are nearing depletion and OceanaGold now wishes to extend mining activities. The new activities will include the following:

- A new tailings storage facility (to be known as Top Tipperary Tailings Storage Facility) (TTTSF) will be constructed. It will result in an increase of 51Mt of total consented tailings storage capacity (from 81Mt currently to 132Mt).
- Reclamation of tailings from within the current SP11 tailings storage facility. The tailings will be relocated to a stack within the footprint of the existing Mixed Tailings Impoundment (MTI) with any residual tails being stored within the new TTTSF.
- New waste rock stacks (WRS) and extensions to existing rock stacks will be constructed, increasing the total consented tonnage from 850Mt to 1180Mt. The existing Back Road WRS will be substantially expanded to the east of the Round Hill/Southern Pit locations. Frasers East and Frasers West WRSs will be linked by a new WRS called Frasers South WRS and an extension added to the north of Frasers East WRS called Frasers North WRS.
- Macraes-Dunback Road will be realigned near Hocking Road following the legal (but unformed) road alignment north before turning west to run along the divide between the Deepdell and Tipperary catchments and rejoining the current alignment adjacent to Innes Mills Pit (near the old Golden Bar haul road traffic lights).
- Golden Bar Road will be aligned for the last 2.5km before rejoining Macraes-Dunback Road.
- Expansion of existing pits to include the following; Frasers Stage VI, Round Hill Extension, Southern Pit and Innes Mills Stage V.
- Continued down dip (northeasterly) development of Frasers Underground mine.
- A new fresh water storage dam in Camp Creek (a tributary of Deepdell Creek) that will be filled from flood flows. The dam will result in a permanent residual flow in Camp Creek.
- Surface water on the expanded mining infrastructure will be managed with diversion drains and new silt control dams.
- A revised closure plan which will comprise:two lakes formed from the pit excavations; maintenance of the current artworks and infrastructure; a renovated Stanley's hotel; bicycle trails connecting artworks and the hotel; and a fund to support local community initiatives and encourage business development.

The processing rate will be similar to current operations and the intensity of operations on site will also be similar to that at present. The project is expected to continue until 2020.

This document has been prepared on behalf of Oceana Gold NZ Limited to provide an Assessment of Environmental Effects (AEE) to accompany the application to the Otago Regional Council for resource consent to discharge contaminants to air. It has been prepared in accordance with Sections 88 and the Fourth Schedule of the Resource Management Act (RMA) and the relevant provisions of the Regional Plan: Air for Otago (Air Plan).

OceanaGold holds two resource consents for the discharges to air from the gold mine (96785_V4 and 2006.689). The proposed new activities will be outside the scope of the existing resource consents and are not activities which are permitted in the Air Plan. Hence a new resource consent is required for the air discharges that will result from the new mining activities.

2 Limitations

This report has been prepared by Beca for OceanaGold. Beca has relied upon the information provided by OceanaGold in completing this document. Unless otherwise stated, Beca has not sought to independently verify this information as provided. This report is, therefore, based upon the accuracy and completeness of the information provided at the time of the review, and Beca cannot be held responsible for any misrepresentations, incompleteness, or inaccuracies provided within that information. Should any other information become available, this report will need to be reviewed accordingly.

This report should not be used for any purpose other than was originally intended and may not be reproduced, except in full, without the written consent of the signatories or a director of Beca. Should there be any doubt as to the applicability of this report for any other purpose, it is essential that the issues be discussed with the authors before proceeding with any work based upon this report.

3 Background

OceanaGold began mining at Macraes Flat in 1990. Since 1990, mining has been undertaken in a number of different pits. Large WRSs have been built and three TSFs created. Mining has been completed in many areas and a number of WRSs have been fully rehabilitated. Others are in the process of being rehabilitated. In 2006 underground mining began in the vicinity of Frasers Pit. OceanaGold now wishes to extend the mining activities into some new areas and construct a new TSF. The existing MTI will be rehabilitated. Three of the existing WRSs will be extended to provide more storage capacity for waste rock. New infrastructure will be required in association with the mine developments such as the realignment of two roads and the building of a new fresh water dam and several sediment control dams.

OceanaGold holds two resource consents for discharges to air. Consent 96785_V4 relates to the majority of the mining activity. Consent 2006.689 relates to the discharges to air from the underground mining activity at Frasers.

Rules 16.3.5.3 and 16.3.5.9 of the Air Plan classify the discharges to air from mineral extraction and processing that exceed an extraction rate of 20,000 cubic metres per month and 100,000 cubic metres per year as a discretionary activity. The discharge is not provided for in Section 15 of the RMA and hence consent is required for the proposed new mining activities.

4 Site

4.1 Site and Locality Description

The OceanaGold mine is located in a rural area that is dominated by the existing mining activity and low intensity pastoral farming. Macraes Flat Village is located to the west of the mining area. It is a small village that includes approximately 20 houses and an historic hotel.

The existing mining area extends to the north and south of Macraes Road. Initially the mining operations were all to the north of Macraes Road. In more recent times mining has been developed to the south of the road into Frasers Pit and Golden Bar Pit. Mining has been completed in the pits located to the north of the road; however, part of this proposal is to remine areas of Round Hill Pit, Southern Pit and Innes Mills Pit. Mining has currently been completed at Golden Bar. The processing plant and TSFs are located to the north of the road.

The new TTTSF and extensions to the Back Road WRS proposed in this development will be located to the east of the present mining activity. The proposed Frasers South WRS will be located to the south of Frasers Pit and will link the existing Frasers West and Frasers East WRS's. An extension to Frasers East WRS will be constructed to the north of the existing WRS. A map showing the locations of the existing and proposed mine features is shown in Figure 4.1.

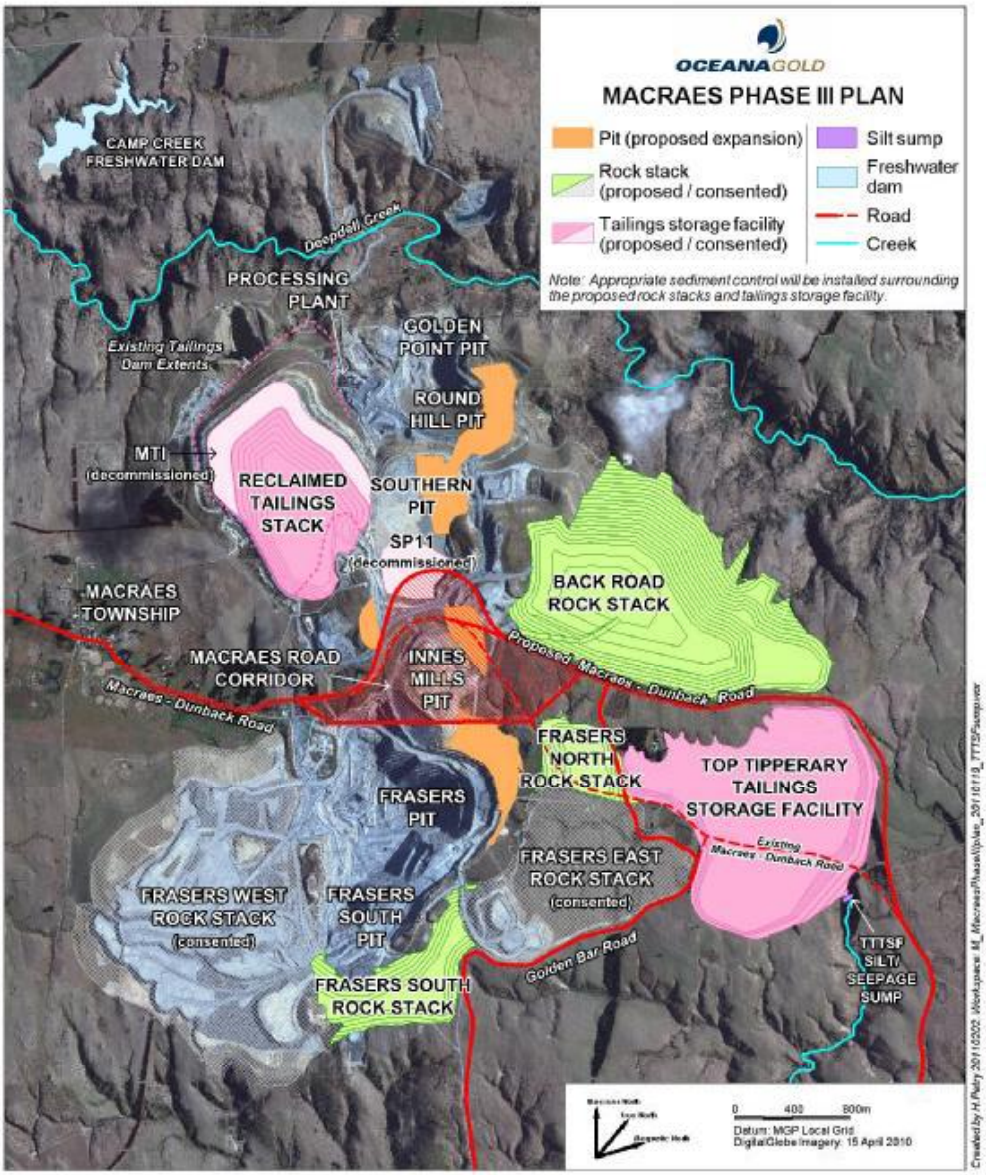

Figure 4.1 Map of Existing and Proposed Mine Features

The land in the vicinity of the proposed new mine activities is rural and is of a similar character to the land surrounding the existing mine. The topography of the area is dominated by the large WRSs and mine pits. With the exception of the Camp Creek Reservoir, all the land to be mined is owned by OceanaGold.

Figure 4.2 shows the areas of land in the vicinity of the mine which are owned or leased by OceanaGold and the boundaries of land owned by neighbours. The map also shows the locations of the existing and proposed mine activities and demonstrates the distances from the mining activities to the boundaries with neighbouring properties.

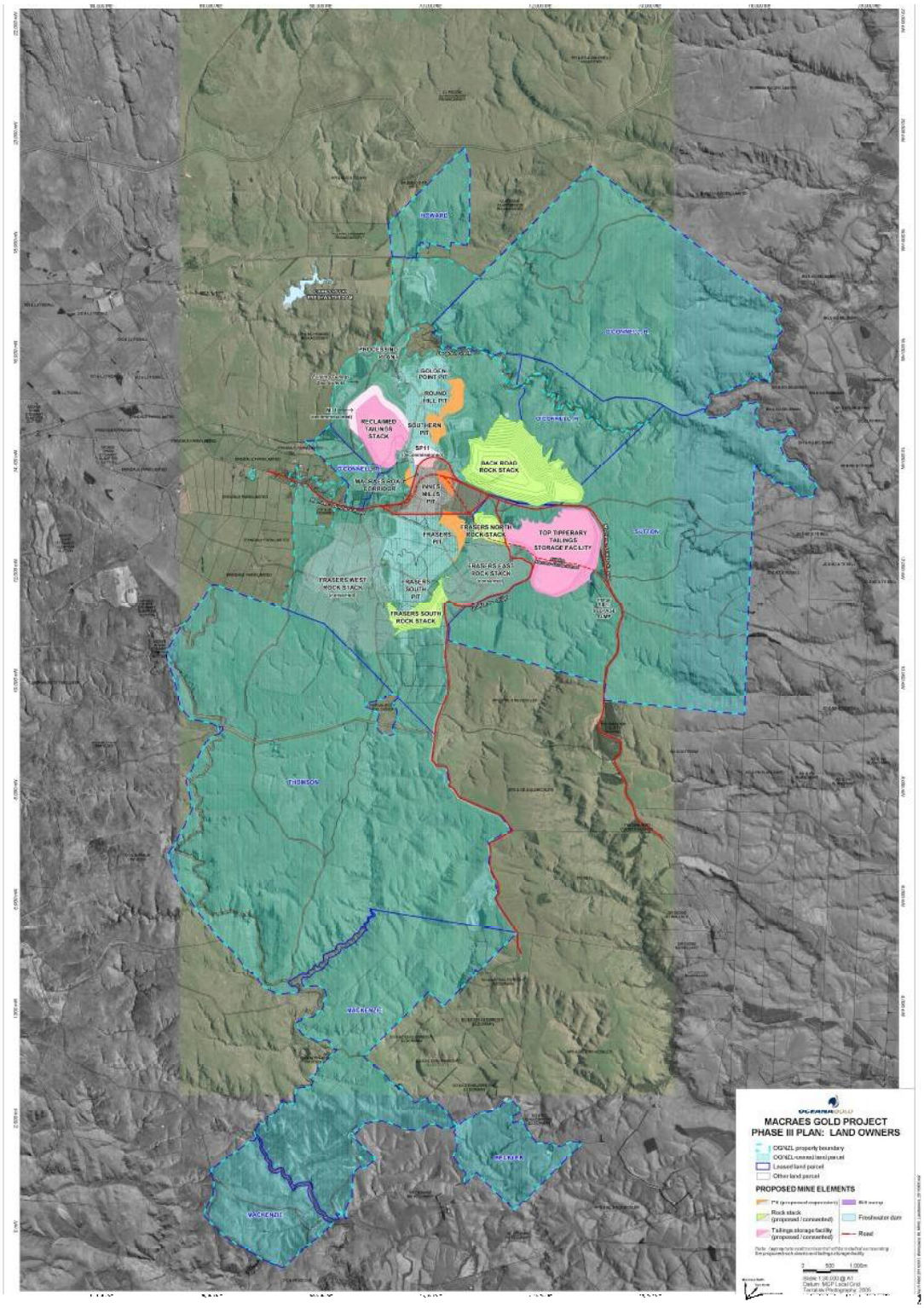

Figure 4.2 Map Showing Land Owned and Leased by OceanaGold and Locations of Neighbouring Landowners.

There are very few houses in the area. A map showing the locations of the nearest houses to the development is shown in Figure 4.3. Macraes Flat Village is located approximately 2.5km to the southwest of the proposed extended Back Road WRS and approximately 3.3km to the southwest of the proposed TTTSF. The house located at Glendale (also known as Suttons), to the northeast of Frasers pit, will be removed as part of the construction of TTTSF. The northern-most extent of the proposed extended Back Road WRS will be approximately 3.5km to the southeast of the Howard property. To the southeast of the proposed TTTSF on Macraes Road are two woolsheds and a house. The closest of these, a woolshed, is approximately 3.6km from the eastern-most extent of the proposed TTTSF and the nearest house will be approximately 5.5km from the TTTSF.

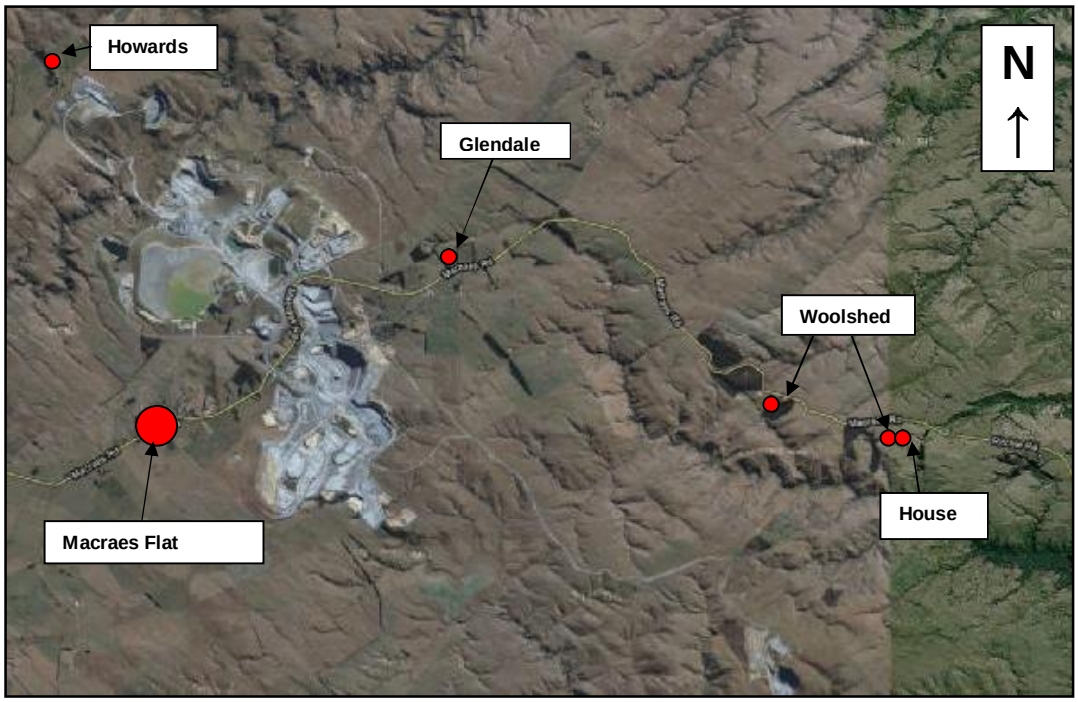

Figure 4.3 Map Showing Locations of Nearest Sensitive Sites

4.2 Meteorology

The main features of the Macraes Flat climate are the relatively low rainfall (site average annual rainfall is 628mm (Golder Associates, November 2010)) and the moderately strong average wind speed of 5.5m/s[1]. These are both climatic features that contribute to the generation and transport of dust. OceanaGold measures the wind speed and wind direction at a climate station located on Golden Point Road. A windrose for the years 2000-2006 is shown in Figure 4.4. Winds tend to blow predominantly from the south and west. The strongest winds also come from these quarters. Winds from the northerly and easterly quarters tend to be lighter and less frequent.

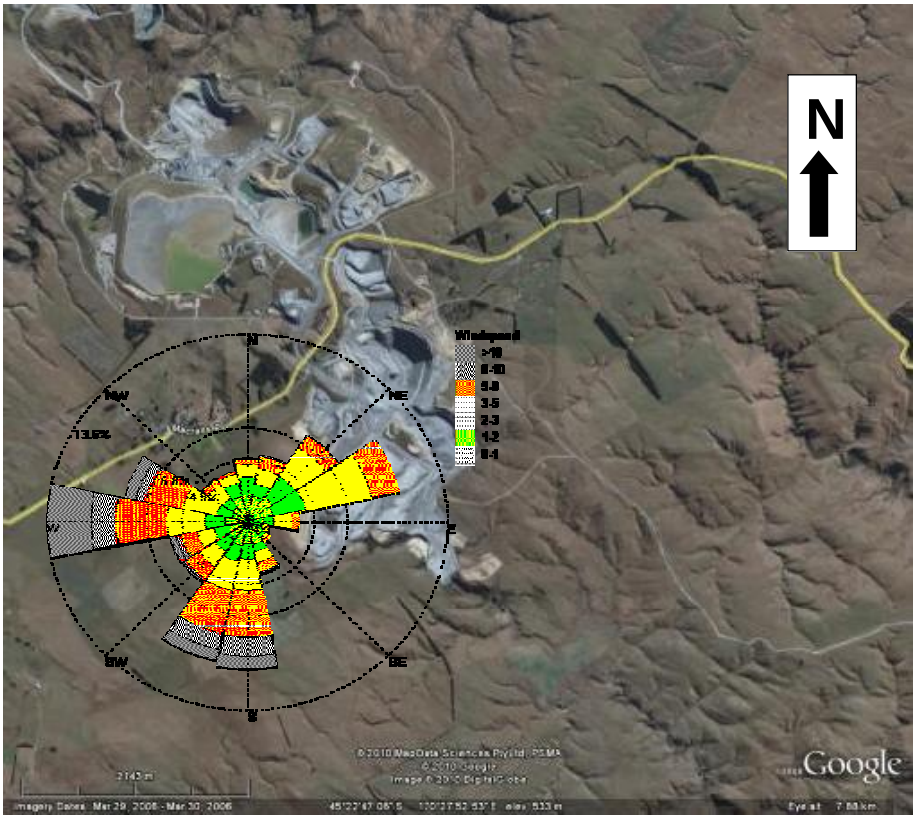

Figure 4.4 Windrose for Macraes Flat 2000-2006

[1] Macraes Mining Company Ltd. Macraes Gold Project Discharges to Air Assessment of Environmental Effects December 1996.

5 Air Quality Standards

In October 2004 the Government introduced five National Environmental Standards (NES) for Ambient Air Quality with two subsequent amendments. There are standards for fine particles (PM_{10}), sulphur dioxide (SO_2), nitrogen oxides (NO_2), carbon monoxide (CO) and ozone (O_3). In effect the standards replace the New Zealand Ambient Air Quality Guidelines (NZAAQG) for these contaminants and set maximum ambient air concentrations to protect human health and the environment. The regulations place a responsibility upon the Regional Councils to meet the air quality standards within their regions. Thus, any consent granted for air discharges should not compromise the attainment of the standards. On 29 January the Minister for the Environment announced some changes to the NES. These changes are expected to be implemented in March 2011 but no definite date has been set. The revisions to the standard extend the timeframes in which Councils have to achieve ambient air quality within their regions and removes the restrictions on the granting of resource consents to industry in airsheds which do not comply with the NES for PM_{10}.

The standard of relevance to this application is the NES for PM_{10}. The PM_{10} standard allows a maximum of one exceedance per year of a PM_{10} concentration for 50µg/m^3 (24 hour average).

The Otago Regional Council has gazetted three airsheds in Otago. Macraes Flat is located within Airzone 3 which currently complies with the NES for PM_{10}. The proposed development at Macraes is not expected to result in any significant increase in PM_{10} concentrations in the area, hence consent can be granted under regulation 18 of the NES.

6 Project Description

The Macraes Phase III project (the project) entails a number of different aspects which are interrelated. Overall the project will result in the movement rate of material increasing from the present 54Mt per year to up to 66Mt per year. The fleet of trucks will increase from 17 to 18. Some slightly larger excavators will be required.

Figure 4.1 (see above) shows the proposed new layout for the mine. The individual aspects are described in this section.

6.1 Decommissioning of Tailings Storage Facilities

At OceanaGold there are currently two active tailings storage facilities (TSFs). These are the Mixed Tailings Impoundment (MTI) and the SP11A tailings impoundment. A previous TSF, SP10, sits within the footprint of SP11A. OceanaGold is planning to decommission both of the current TSFs by mid 2012 and commence using a new TSF at the Top Tipperary site. It is envisaged that there will be one final deposition of tailings into the consented SP11A TSF from about January 2011 until June 2011, whilst a final consented lift on the MTI is undertaken. Deposition is currently occurring in the MTI and a planned final deposition period will occur from about June 2011 to May 2012.

Following decommissioning, a process of closure and rehabilitation will commence on both existing TSFs. In the case of SP11A the outer compartment will be mechanically re-handled, once the contents are dry enough, and placed as a reclaimed tailings stack on top of the MTI. Any residual wet tailings that cannot be mechanically rehandled will be slurried and pumped to the new TTTSF. The tailings stored in SP10 above the level of the SP10 wall will be benched into and battered back to a suitable slope and rehabilitated, so that SP10 is effectively reinstated as an existing, decommissioned TSF.

The MTI and SP10 dam embankments will remain in place. The SP11A embankment will be removed in conjunction with the tailings reclamation.

The reclamation of SP11A will involve the use of an excavator, haul trucks, a low ground pressure dozer, and tractor powered scrapers. The tailings will be relocated primarily by the tractor pulled scraper fleet. The scraper fleet will operate on the tailings surface and will excavate the tails from the SP11A impoundment, haul the tailings to the MTI reclaimed tailings stack and deposit the tailings within the reclaimed tailings stack footprint.

The excavator and truck fleet will be restricted to working on the dam embankment or rock substrate. They will be used primarily to remove the SP11A embankment material and facilitate tailings drainage. Embankment material will be taken to a waste rock stack or if suitable re-used for future dam construction. The low ground pressure dozer will be used for re-contouring, final contouring of slopes, rehabilitation and internal ramp construction.

OceanaGold will use rigorous dust management procedures for the handling and placement of the tailings. The tailings will be progressively rehabilitated in accordance with standard rehabilitation techniques and the existing consent conditions.

6.2 Construction of Top Tipperary Tailings Storage Facility

OceanaGold proposes to construct a new TSF to the east of the present mining activity. OceanaGold needs capacity to store an additional 43.5Mt of tailings to take Macraes from mid 2012 through until early 2020 at current processing rates. The final TTTSF footprint (including tailings impoundment) is 155ha and the impoundment volume will be 36,700,000m^3 (49.5Mt at 1.35t/m^3).

The operating height will be 70m (dam crest to downstream toe) at the highest embankment point. OceanaGold needs capacity to store an additional 43.5Mt of tailings to take Macraes from mid 2012 through until early 2020 at current processing rates. The final TTTSF footprint will be 184ha and the impoundment volume will be 38,744,000m^3. The operating height will be 70m high at the highest embankment point.

OceanaGold proposes to pump mixed tailings from the processing plant to the TTTSF via a pipeline. The tailings material from the decommissioned SP11 dam outer section that is not placed on the MTI will be trucked or re-slurried and pumped to the TTTSF. The construction of the TTTSF will be staged. An initial wall will be constructed to hold two to three years capacity of tailings. Subsequent lifts will be made to the main wall, eventually incorporating "wing" walls along the northern and southern flanks. The footprint of the TTTSF will therefore gradually expand, reaching its maximum capacity extent by about 2017.

Preparation for the construction of the TTTSF will commence in early 2011 with the initial construction of the diversion of Macraes Dunback Road. Topsoil will be stripped and the embankment footprint prepared between September 2011 and November 2011. Construction of the main wall will commence in late 2011 and continue until April 2012. The Golden Bar Road realignment will take place in 2014, although a section of the decommissioned Dunback-Macraes Road will be used to link the existing gravel road with the new Macraes-Dunback Road realignment.

When the TTTSF is at full capacity it will be rehabilitated by capping with brown rock and topsoil and re-vegetated with pasture.

6.3 Construction of Expanded and New Waste Rock Stacks

There are currently two main waste rock stacks (WRS) in use at Macraes which are the Frasers West WRS and Frasers East WRS. Other WRSs at Macraes include Deepdell, Western, Northern Gully South, Northern Gully North, Back Road and Golden Bar. There currently remains 176Mt of consented capacity in the current WRSs. Macraes Phase III requires an additional 304Mt WRS capacity. The following expanded WRSs are proposed:

WRS	*Additional capacity provided*
Back Road	228Mt
Frasers South	50Mt
Frasers North	26Mt

The Back Road WRS is located on the eastern edge of Southern and Round Hill Pits. Its expansion will comprise material removed from these two pits along with some material from Innes Mills Pit. The total footprint of the expanded Back Road WRS will be 234ha and the highest point will be 65m above natural ground level.

The Frasers South WRS will be located on the southern edge of Frasers Pit and will connect the consented Frasers East WRS with the Frasers West WRS. This WRS will be constructed to a maximum height of 45m above natural ground level at its highest point.

The Frasers North WRS is an extension to the northern end of the currently consented Frasers East WRS and along with the TTTSF will necessitate the realignment of a 4.5km stretch of the Macraes-Dunback and Golden Bar Roads.

The construction of the expanded WRSs will follow the same processes that are currently used for building the existing WRSs. The site will be prepared and topsoil stripped and either stored or used immediately for rehabilitation works. Dump trucks will deposit the waste rock on the WRSs and dozers will be used to place it in lifts not exceeding 20m in height.

The existing WRSs will continue to be used until mid to late 2012. The extended Back Road WRS will begin to be used from early-mid 2012 till 2015-2016 followed by Frasers South, and North WRS. The average yearly rate of deposition of waste rock into the stacks will be approximately 55Mt.

6.4 New Open Pit Stages

Round Hill, Southern and Innes Mills pits have been partially rehabilitated. OceanaGold proposes to partially remove the backfill material that has been placed in these pits and recommence mining ore remaining in the base of the pits. The recommencement will require the removal of waste rock backfill and tailings. Frasers pit will continue to be mined. OceanaGold has proposed two alternative sequences for mining the pits which are as follows:

Sequence 1

i. Frasers Pit stage V (currently mining until late 2012)

ii. Round Hill – Southern Pit stage II (tailings removal)

iii. Round Hill - Southern Pit stages I and III

iv. Frasers Pit stage VI; and

v. Innes Mills Pit

Sequence 2

i. Frasers Pit stage V

ii. Frasers Pit stage VI

iii. Round Hill – Southern Pit stage II (tailings removal);

iv. Round Hill - Southern Pit and Round Hill stages I and III; and

v. Innes Mills Pit

The total tonnage of material to be mined from all open pits from 1 January 2011 is planned to be approximately 490Mt. This volume includes 55Mt of backfill from Round Hill, 64Mt of backfill from Innes Mills and 18Mt of tailings from the outer section of the decommissioned SP11A TSF.

The mining of Round Hill – Southern Pit will involve the removal of old backfill and the SP11A embankment and tailings. The original SP10 wall and tailings within its impoundment will remain in place. Mining will not remove the MTI embankment.

Open pit mining will be at a rate of 50- 60Mt/year. Ore and waste rock will 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 3-5 times per week during daylight hours. OceanaGold has advised that this will represent little change from current operations.

Hydraulic excavators will load the mixed fleet of Cat 785 (average payload 143t) and Cat 789 (average payload 193t) haulage trucks, which will transport the ore to the run of mine stockpile located at the Macraes processing facility or low grade stockpiles for later re-handling. Waste rock will be transported to one of the WRSs for final deposition. A fleet of support equipment such as bulldozers, graders and water carts will assist the main mining fleet.

The rehandling of previously deposited waste rock from Round Hill and Innes Mills will not require drilling and blasting. The SP11A tailings will be rehandled predominantly by a fleet of tractor pulled scrapers.

In-pit backfill options will be evaluated in terms of life of mine planning and economic factors and where it is viable will be utilised to reduce the impact of surface WRSs. At closure pit lakes will naturally form in the Frasers, Innes Mills and Round Hill Pits. WRSs will be constructed in such a manner that should they not be constructed to fully consented limits they can be rehabilitated in accordance with the final design slopes and contours proposed.

6.5 Underground Mining at Frasers

The underground mining activity at Frasers will continue as part of this project until at least 2014. The air discharges resulting from the underground mining activity will not increase or change location as a result of the project, hence the effects of the discharges will also not change. Therefore the discharges from the underground mining activities on site are not discussed further in this assessment.

6.6 Road Realignment

There are three planned realignments of the Macraes-Dunback Road. Golden Bar Road will also potentially need to be realigned twice.

6.6.1 Macraes Dunback Road

First Realignment of Macraes-Dunback Road

The first realignment of Macraes Dunback Road is required for the construction of the TTTSF. The location of the TTTSF means that both the embankment structure and the impoundment will cross the existing Macraes-Dunback Road. The realigned road is planned to pass around the eastern and northern sides of the TTTSF (see Figure 4.1).

The planned realignment route will start from near Hocking Road following the legal (but unformed) Macraes Back Road alignment north before turning west to run along the divide between the Deepdell and Tipperary catchments and rejoining the current alignment adjacent to Innes Mills Pit, (near the old Golden Bar haul road traffic lights). The total length of the first realignment is approximately 4.6km and is planned to commence in February 2011 and be completed by December 2011.

A connector road will have to be established linking the original Macraes-Dunback Road with the new alignment to maintain the connection with Golden Bar Road. The proposed alignment is located outside the extent of Innes Mills Pit and is approximately 0.4 km long.

Second Realignment of Macraes-Dunback Road

The second realignment of the Macraes-Dunback Road is minor and required to enable mining of the north western portion of the proposed Innes Mills Pit. The current road traverses the backfilled Innes Mills Pit. Prior to removal of this section of the road, a new section of road will be constructed to the south of the existing road. The realignment will be formed through the current Innes Mills Pit backfill material. The second realignment is provisionally planned for early 2016.

Third Realignment of Macraes-Dunback Road

The small north western portion of Innes Mills Pit will be backfilled with material from Round Hill-Southern Pit once completed and the final Macraes-Dunback Road realignment will be constructed

through this area. This will allow the main area of Innes Mills to be mined to completion without further affecting the road.

The final realignment of Macraes-Dunback Road will require construction of a base on top of the decommissioned SP10 TSF. The base will be constructed using mine waste. The road surface will be constructed using Council approved materials. The final realignment of the new road is not expected to require any major section of cut and fill as the topography is relatively gentle.

6.6.2 Golden Bar Road

The northern section of the existing Golden Bar Road and the adjoining Macraes-Dunback Road will initially be covered by the construction of the TTTSF and subsequently by the Frasers North WRS.

First Realignment of Golden Bar Road

The first realignment is planned to re-route the road along the northern face of the Frasers East WRS before rejoining with the original Macraes-Dunback Road. This alignment is planned for 2014.

Second Realignment of Golden Bar Road

The second realignment is required should the Frasers North WRS be constructed to the proposed extent. The realigned section of road would run from the face of the Frasers East WRS up the ridge west of the TTTSF abutment and rejoin the realigned Macraes-Dunback Road. This alignment is planned for 2017.

6.7 Surface Water Management

A fresh water storage dam and new silt control dams will be constructed as part of the project. The construction will involve standard construction techniques and the dams will be relatively small structures compared to the other structures at the mine. The new fresh water dam will be located on Camp Creek to the north of the processing plant.

6.8 Project Timeline

Figure 6.1 shows the major features of the project and their approximate timing. Also included in Figure 6.1 is the estimated quarterly total movement rate for material. This gives an estimate of the likely activity level at the mine in the future.

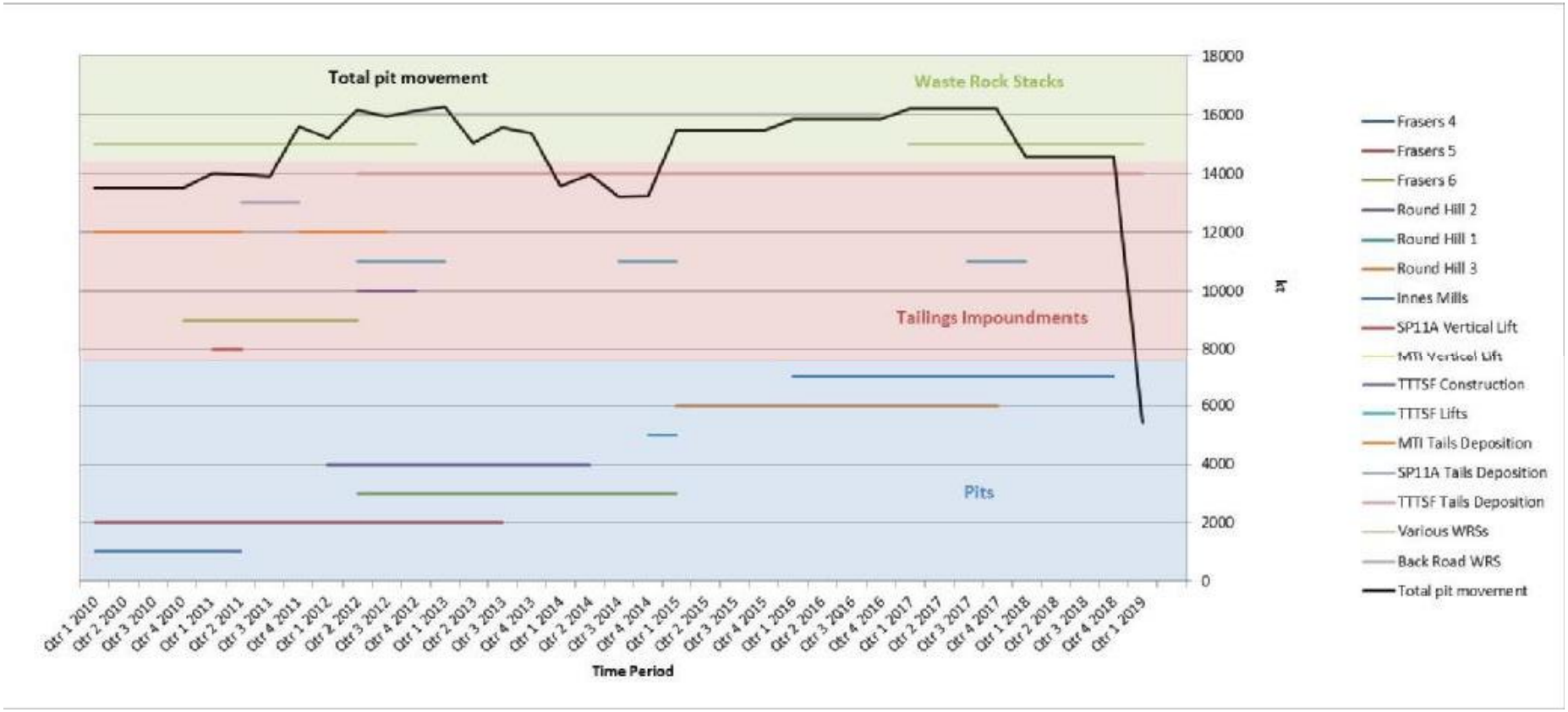

Figure 6.1 Estimated Project Timeline

7 Discharges and Associated Mitigation Methods

7.1 Factors which Influence Dust Generation

The nature of the emissions from the mine will not change as a result of this project as the type of activities carried out will be the same as the activities that are currently undertaken. The potential quantity of emissions may increase due to the increase in the amount of material to be moved; however, the scale of the actual increase in emissions will also be dependent on the effectiveness of the mitigation measures used and the area of ground that is exposed to wind erosion at any time.

The predominant discharge from the proposed project works will be particulate matter. Engine exhaust emissions will also be generated from the mobile equipment used on the site. The emissions from the engines are considered to be relatively minor and expected to be well dispersed prior to reaching sensitive receptors; therefore these emissions are not assessed in this report.

The dust that will be discharged from the project activities will be comprised of a wide variety of size fractions. The larger settleable dust material is generally greater than 50µm in diameter. It has the potential to create a nuisance effect due to soiling of surfaces and by causing irritation to eyes and nose. Because it is relatively large in size, deposited particulate usually falls out of the air within a short distance (approximately 100m) of the source.

The finer material is defined as suspended particulate. It is commonly referred to as Total Suspended Particulate or TSP. It is generally less than 20µm and can travel large distances downwind. The portions of TSP that pose the greatest potential health effect are particulates less that 10µm in diameter (known as PM_{10}) and particulates less than 2.5µm (known as $PM_{2.5}$). PM_{10} is able to penetrate the upper respiratory tract and consequently has the potential to impact on human health. $PM_{2.5}$ can penetrate even further into the lung and is suspected of being the fraction of PM_{10} that is responsible for health impacts that can lead to an increase in morbidity and mortality in particular circumstances.

The particulate generated from processes such as those involved in this project is likely to be predominantly made up of larger size fractions (greater than 10µm). The major source of the finer particulates PM_{10} and $PM_{2.5}$ in the atmosphere is combustion processes. The assessment of effects in this report focuses primarily on the effect of the larger settleable particulates.

The major factors that influence dust emissions from surfaces are:

- Wind speed across the surface – the critical wind speed for pickup of dust from surfaces is 5m/s; above 10m/s pickup increases rapidly[2].
- The percentage of fine particles in the materials on the surface.
- Moisture content of the material on the surface.
- The area of exposed surface.
- Disturbances such as traffic, excavation, loading and unloading of materials.

Dust emissions from material handling and storage can be significant if not controlled. However, if standard dust control techniques are used the emissions can be reduced significantly.

The larger the area of exposed material the more potential there will be for dust emissions. Vehicles travelling over exposed surfaces tend to pulverise any surface particles. Particles are lifted and dropped from rolling wheels and the road surface is exposed to strong air currents due to

[2] Air and Waste Management Association *"Air pollution Engineering Manual"* 2nd edition edited by Wayne T Davis, 2000.

turbulence between the wheels and the surface. Dust is also sucked into the turbulent wake created behind the moving vehicles.

The smaller the particle size of the material on the surface of a road or an exposed surface, the more easily the particles are able to be picked up and entrained in the wind. Moisture binds particles together preventing them from being disturbed by wind or vehicle movements. Therefore one of the main dust mitigation techniques involves water application to surfaces.

It is possible to estimate the potential emissions of particulate matter from construction and mining activities using emission factors developed primarily for the US Environmental Protection Agency (USEPA) and published in a number of publications including the USEPA AP42 database[3]. However, for fugitive dust sources such as those at OceanaGold these emission factors have a large degree of uncertainty. For this assessment no attempt has been made to quantify the emissions from the mine as the degree and location of the dust sources will change constantly throughout the course of the project as new areas are mined and rehabilitated. Instead the assessment method is based on comparing the existing effects of the mine with the potential effects of the new developments, taking into account any changes in the level of operation and the location of the developments in relation to the sensitive receptors.

7.2 Sources of Particulates and Proposed Mitigation Methods

The activities that will take place at the proposed mining sites that may generate discharge to air are:

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

These activities are addressed in the following subsection along with a summary of the proposed mitigation methods OceanaGold has prepared a draft Dust Management Plan which provides details of the mitigation methods. A copy of the draft Dust Management Plan is attached as Appendix A.

7.2.1 Earthworks

The stripping of overburden, soil and rock from surface areas and the spreading of overburden and topsoil on rehabilitated land has the potential to generate significant quantities of dust if the process is not carefully controlled. Similarly, the construction of structures such as roads, dams and WRSs has the potential to generate significant quantities of dust.

To control dust from these activities OceanaGold proposes to continue to use the methods currently utilised at the mine. These include the following methods:

- Keep exposed surface areas to a minimum and re-vegetate exposed areas as soon as practical.
- Plan potentially dusty activities such as stripping and spreading of topsoil for days when weather conditions are predicted to be favourable (as defined in the Dust Control Manual).
- Use water as a dust suppressant to keep un-vegetated surfaces and haul roads damp.

[3] United States Environmental Protection Agency (USEPA) AP42 Emission Factor Database Chapter 13

The National Pollution Inventory for Mining published by the Commonwealth of Australia[4] (NPI Manual) estimates that the use of water to control dust on stripping, hauling and loading and unloading activities can reduce the emissions of dust by 50%. The NPI Manual also estimates that re-vegetation of overburden stockpiles reduces their dust generation capacity by 99%.

7.2.2 Vehicles and Roads

Dust from heavy vehicles on haul roads, heavy vehicle traffic around the proposed TTTSF and WRSs and general traffic around the proposed site works area all have the potential to be significant sources of dust. Dust from roads is controlled primarily by limiting the amount of fine particles exposed to the wind, keeping surfaces damp and controlling vehicle speeds. To achieve this OceanaGold proposes to use the following dust mitigation methods which are used successfully at the mine at present:

- Limit vehicle speeds.
- Minimise haul distances and closing of inactive haul roads
- Keep roads and construction surfaces damp with water carts and/or fixed sprinklers when required.
- Regularly maintain haul roads by grading and laying of fresh rock/gravel.

Speed controls on vehicles have an approximately linear effect on dust emissions[5]. OceanaGold imposes speed limits on all haul roads and other access roads in and around the mine site that are appropriate for their use.

The number of vehicles used on site is expected to increase marginally from 17 to 18 and the size of some of the vehicles may increase. Consequently the vehicle kilometres travelled is also likely to increase slightly. There is therefore the potential for the discharges generated from vehicle movements to increase. However, providing that the management practices currently employed at the mine continue to be carried out diligently the discharges are not expected to increase significantly.

7.2.3 Loading and Unloading

The loading of material onto trucks (and including the subsequent offloading) has the potential to generate dust. Trucks will be loaded with materials from the base of pits and from areas where construction activities are occurring using excavators and loaders. The majority of materials will be unloaded onto WRSs or onto areas that are being rehabilitated. Dust from sources such as these is best controlled by minimising drop heights. OceanaGold currently requires machinery operators to minimise drop heights and will continue to do so. Another dust mitigation method that can be used in similar situations is the use of water to dampen the material being transported. Due to the size of the OceanaGold operation this is impractical.

7.2.4 Exposed Surfaces

Exposed surfaces on stockpiles, WRSs, surfaces of TSFs and pit walls are all potential sources of dust. The primary means of controlling dust from sources such as these is by revegetation wherever practical and keeping surfaces damp. Minimising the quantity of fine particles on the surfaces exposed to the wind also reduces the dust potential.

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[4] Commonwealth of Australia "National Pollutant Inventory Emission Estimation Technique Manual for Mining Version 2.3" 2001.

[5] Supra at 3

At present OceanaGold revegetates all permanent stockpiles of materials as soon as practical and will continue to do so during this development.

OceanaGold progressively revegetates the outer walls of WRSs as each lift is constructed. This will continue to be the practice on the WRSs that will be constructed as part of this project.

During normal operation of the TSFs sections of the tailings are rested whilst other sections continue to receive fresh tailings from the processing plant. The fresh tailings are wet and the placement of them on the surface of the impoundments suppresses the release of dust. The sections of the impoundments that are allowed to rest dry out over time and can become subject to wind erosion.

The surfaces of the TSFs have been a significant source of dust on occasions in the past. In response to these dust events OceanaGold has developed specific dust mitigation methods for the TSFs. These include the following measures:

- Rock mattresses are laid over the outer edge of the tailings as soon as practical after the cessation of deposition of fresh tails. This edge, known as the "tailings beach" is the area with the most potential for dust generation as it dries out most quickly.
- A tailings wetting system is utilised which distributes water onto the areas of the dam not covered by the rock mattress.
- Traffic is limited on the surface of the resting dam to prevent disturbance of the crust that forms naturally on the surface.

The implementation of the methods described above has resulted in a noticeable reduction in dust levels measured at the dust gauge closest to the MTI (gauge 3). OceanaGold will continue to use these techniques to manage the dust from the surface of the TTTSF and during the rehabilitation of the MTI.

The rehabilitation of the MTI will involve very similar processes to the activities that have taken place on the dam during normal operation. Particular care will need to be taken during the rehabilitation of the MTI as the surface of the MTI is very exposed to the wind. If large areas of the surface are spread with fine materials such as topsoil during dry windy conditions there is a potential for dust to have an adverse effect beyond the boundary of the mine. It is therefore recommended that the rehabilitation works are done in small sections and that activities such as the spreading of topsoil are scheduled for times when strong winds are not forecast. It will also be important that sufficient water is available to keep the surfaces damp during these operations.

OceanaGold is currently trialling growing a specific species of grass on the surface of the tailings dams. If successful it is recommended that this grass be grown on all areas of tailings that are resting.

8 Existing Effects

8.1 Nature of Dust and Potential to Cause Adverse Effects

Dust deposition is the settling of dust onto surfaces. The effects of dust deposition can be subjective and are dependent on the sensitivity of the receiving environment. Some people will not be annoyed by dust, others will be annoyed, and some may find it objectionable or offensive. Dust fallout on a road or rural farmland may not be a nuisance even at relatively high deposition rates.

Typically, the most common areas of concern from dust deposition arise at residential properties (or similar sensitive locations such as retail premises or schools) and include the visual soiling of clean surfaces, such as cars, window ledges, and household washing; and dust deposits on vegetation.

The Ministry for the Environment Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (GPG Dust)[6] notes that the potential for a dust discharge to cause an objectionable or offensive effect depends on the following characteristics of the dust fallout:

- The frequency of dust nuisance events
- The intensity of events, as indicated by dust quantity and the degree of nuisance
- The duration of each dust nuisance event
- The offensiveness of the discharge having regard to the nature of the dust
- The location of the dust nuisance, having regard to the sensitivity of the receiving environment.

These factors are known as the FIDOL factors, and are also used in odour assessment to consider whether an odour discharge has caused an offensive or objectionable effect. Essentially, whether a dust discharge leading to dust deposition causes an offensive or objectionable effect depends on how frequent it is and how much dust is deposited.

Dust deposition is typically measured over a period of about 30 days using a dust gauge. However, this does not mean that dust deposition occurs gradually and evenly over that 30 day period. Dust concentrations in the ambient air downwind of a dust discharge vary with the rate of dust emission and the wind conditions. Therefore the rate of dust deposition varies as well. It is quite possible that the majority of the dust deposition measured in a 30 day period by a dust gauge actually occurs during a small number of short, relatively high-rate deposition events. Short term events of relatively high-rate dust fallout are more likely to be noticed by residents as deposits on surfaces, cars and washing.

Total Suspended Particulates (TSP) monitoring measures particles that are suspended in the air. Most monitoring equipment collects particles that vary in size between 0.1µm and about 100µm. The finer fractions can travel large distances downwind before they reach ground level. The larger fractions of TSP can have nuisance effects but the perception of potential for TSP to cause health effects is usually the cause of most concern for nearby residents.

[6] Ministry for the Environment: "Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions" September 2001.

8.2 Dust Monitoring

8.2.1 Methods of Monitoring Dust Deposition

Dust deposition is measured by means of a collection jar or gauge, which simply catches the dust settling over a fixed surface area over a period of time. The measurement equipment typically collects dust particles that are greater than about 10-20µm. The dust is removed from the gauge, filtered and weighed to determine the quantity of insoluble solids in the sample. The filtrate is evaporated and the remaining soluble solids are also weighed. The results are reported in terms of the weight of insoluble and soluble dust collected per unit of surface area over a fixed period of time, e.g. $g/m^2/30days$.

8.2.2 TSP Monitoring

TSP has traditionally been measured using High Volume Samplers and this is the method used by OceanaGold. High Volume Samplers are essentially pumps which draw a measured quantity of air through a pre-weighed filter paper. The mass of particles collected onto the filter paper are weighed and the particulate concentration can be calculated. Samples are collected over a period of 24 hours, often on a one day in six or one day in three basis. This method can provide more immediate information on short term dust events than deposit gauges but cannot provide immediate results, as the filter papers usually need to be weighed off site in a laboratory. Results are therefore not usually available for at least 48 hours after the start of a monitoring period.

8.3 Assessment Criteria for Deposited and Total Suspended Dust

8.3.1 New Zealand and Australia Guidelines

In New Zealand there are no environmental standards or guidelines for deposited dust. However, the GPG Dust recommends a 'trigger' level for deposited dust of not more than $4g/m^2/30$ days above background levels. The GPG Dust notes that deposition rates of more than $4g/m^2/30$ days above background levels in some industrial and sparsely populated areas may not cause nuisance, but conversely in sensitive residential areas in the order of $2g/m^2/30$ days above background levels may cause nuisance.

Other dust guidelines used in Australia are as follows:

New South Wales[7]:	$4g/m^2/30days$ (dispersion modelling guideline). Dust is assessed as insoluble solids. The assessment criteria must be applied at the nearest existing or likely future off-site sensitive receptor.
Queensland[8]:	$120mg/m^2/day$ as an annual average applicable to residential areas (equivalent to $3.4g/m^2/30days$, but averaged over a year rather than a month – the equivalent 30 day limit would be higher than $3.4g/m^2/30$ days.
Victoria[9]:	$4g/m^2/30days$

[7] Department of Environment and Conservation "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", August 2005.

[8] Katestone Environmental "Proposed Wiggins Island Coal Terminal, Supplementary Air Quality Impact Assessment Study" prepared for Connel Hatch, July 2007

[9] EPA Victoria "Consultation Draft Protocol for Environmental Management, Mining and Extractive Industry, June 2006.

Similarly there are no environmental standards or guidelines for Total Suspended Particulates (TSP). The GPG Dust suggests 'trigger' levels for TSP of 80µg/m^3 (24-hour average) for sensitive areas with significant residential development, 100µg/m^3 for areas with moderate sensitivity, and 120µg/m^3 for insensitive areas such as sparsely populated rural areas.

8.3.2 Current Consent Conditions

The current consent (96785_V4) for the mine sets limits for deposited dust and TSP. The limits set in the consent conditions are shown below (with paragraph numbering reflecting condition numbers):

7. Dust deposition rates shall not exceed 3g/m^2/30days above background levels beyond the mine boundaries more than twice in any calendar year. Compliance with this condition shall be demonstrated by the monitoring required in condition 11 of this consent.

8. If any dust deposition rate measurements undertaken at sites 2 and 15 as shown on Figure 1 annexed yield results that exceed 3g/m^2/30days of total dust above background, the consent holder shall undertake an immediate review of dust mitigation methods unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind deposition. This review shall establish the cause of the high results and recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within one month of the high result(s) being received.

9. Total suspended particulate concentrations shall not exceed 150µg/m^3 beyond the mine boundaries, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. Compliance with this condition shall be demonstrated by the monitoring required in conditions 12 and 13 of this consent.

10. If any suspended particulate measurements near Macraes village yield results that exceed 120µg/m^3, the consent holder shall undertake an immediate review of dust mitigation methods, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. This review shall establish the cause of the high results and shall recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within one month of the high result(s) being received.

8.4 OceanaGold Dust Monitoring

OceanaGold has been monitoring deposited dust and TSP concentrations in the vicinity of the mine since 1989 when mining began. The concentrations of fine particulate (PM_{10}) and respirable quartz were also measured for a period. Over the years of monitoring some new monitoring sites have been added to measure the impacts of new areas of the mine and some sites have become redundant.

8.4.1 Deposited Dust

Figure 8.1 shows the locations of the deposited dust monitoring stations. The monitoring sites have been split by OceanaGold into three groups as follows:

- Mine sites (sites 2, 3, 5-7, 14 and 15),
- Expansion sites (11, 12, 13 and 17), and

- Control sites (9 and 10).

The majority of the monitoring sites are located on land that is owned by OceanaGold and within the mine boundary. The monitoring sites that are beyond the mine boundary are sites 2, 7, 9, 10 and 17. These sites are subject to the limit described in condition 7 of the resource consent.

The control sites are located well away from the mine and are used to measure the background concentrations of dust in the area. The expansion sites are the newer sites which have been added to the programme as the mine has expanded and are generally further from the mine than most of the mine sites. Site 13 has been used on occasions as an alternative control site.

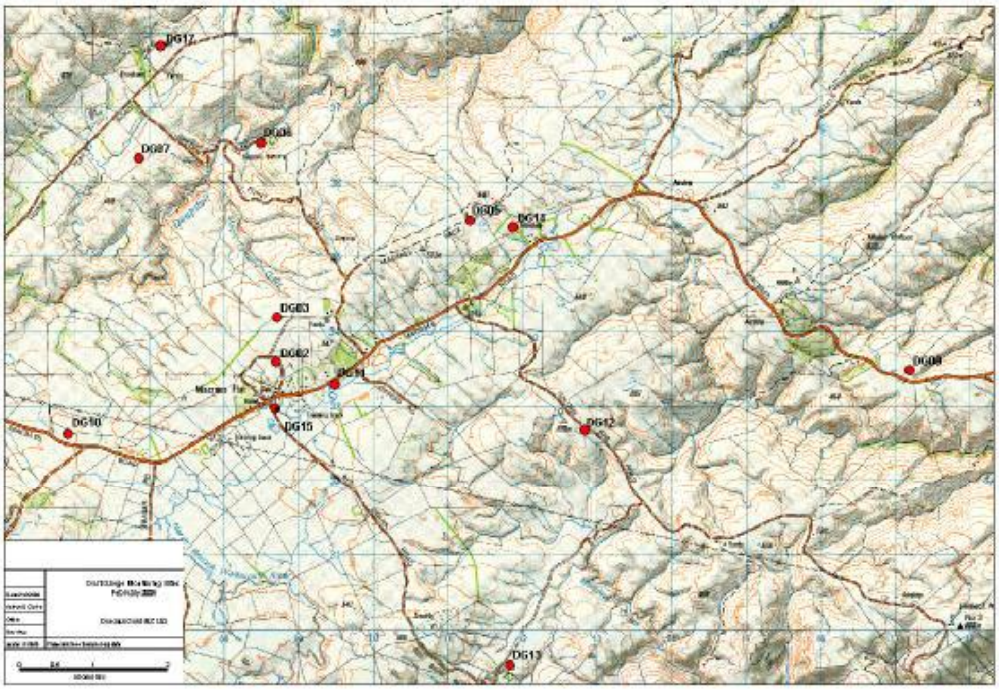

Figure 8.1 Map Showing Locations of Deposited Dust Monitoring Stations

OceanaGold commissioned the University of Otago to prepare annual summary reports of the monitoring results each year between 1990 and 2000. In addition the University has prepared two summary reports which have reported on dustfall trends and analysed the data in more depth. The first summary report[10] focused on the years 1989-1995 and the second[11] on the years 1989-2000. Beca AMEC also prepared a report in 2007 which reviewed the dust monitoring programme at OceanaGold[12]. The last annual report was prepared in May 2009 by Environmental Standards Ltd[13]. Data from 2002 was found to have significant errors in the collection and measuring of the dustfall data[14]. Hence the data for 2002 has been excluded from the analyses undertaken in the annual reports for 2007 and 2008 and from the figures shown in this report. Data for 2009 and 2010 was not available due to errors made by the laboratory.

Since 1989 the overall average total dustfall recorded at all sites is 3.6g/m^2/30days. Figure 8.2 shows the annual average total dustfall recorded for each site for the years 1989-2008. The values shown in Figure 8.2 have not been corrected for background dust levels and include both soluble and insoluble dust.

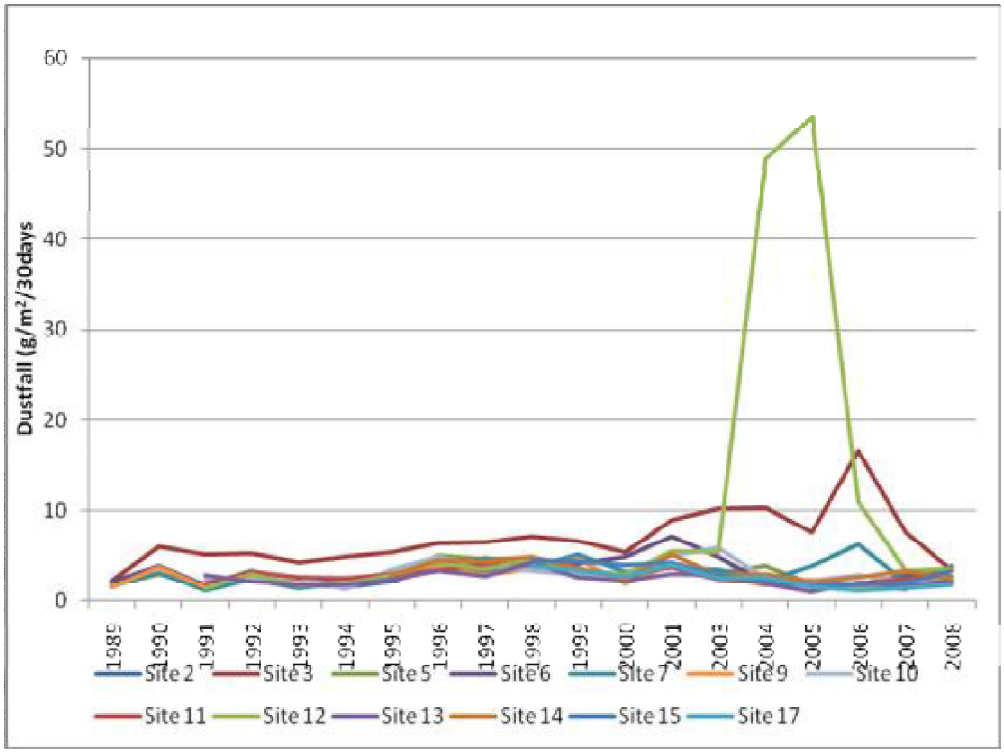

Figure 8.2 Total annual average dustfall for all sites 1989- 2008[15]

[10] Fitzharris and Cole "Review and synthesis of atmospheric dustfall measurements, Macraes gold mine, Otago 1989-1995, University of Otago Consulting Group, 1996.

[11] Fitzharris and Douglas "Summary of dust observations at Macraes gold mine 1989-2000, University of Otago Consulting Group, 2000.

[12] Beca AMEC "Oceana Gold – Review of Dust Monitoring Programme" 2007

[13] Henderson G.E "Atmospheric Dustfall at Macraes, Otago 2008" Annual Report prepared for Oceana Gold NZ Ltd, Environmental Standards Ltd, 2009.

[14] Ibid at 15

[15] Data sourced from Henderson 2008

Figure 8.2 shows that for the majority of the sites the annual average dustfall has remained relatively constant throughout the mining period. The exceptions are sites 3 and 12 and the reasons for these are discussed below.

Figure 8.3 and Figure 8.4 show the annual average total dustfall for the mine sites and the expansion sites when corrected for background values. When background dust levels exceed the dust levels at a monitoring site the dust level has been recorded as zero in the figures.

From Figure 8.3 it can be seen that at most mine sites dust levels are generally below 3g/m^2/30days. The exceptions are discussed below.

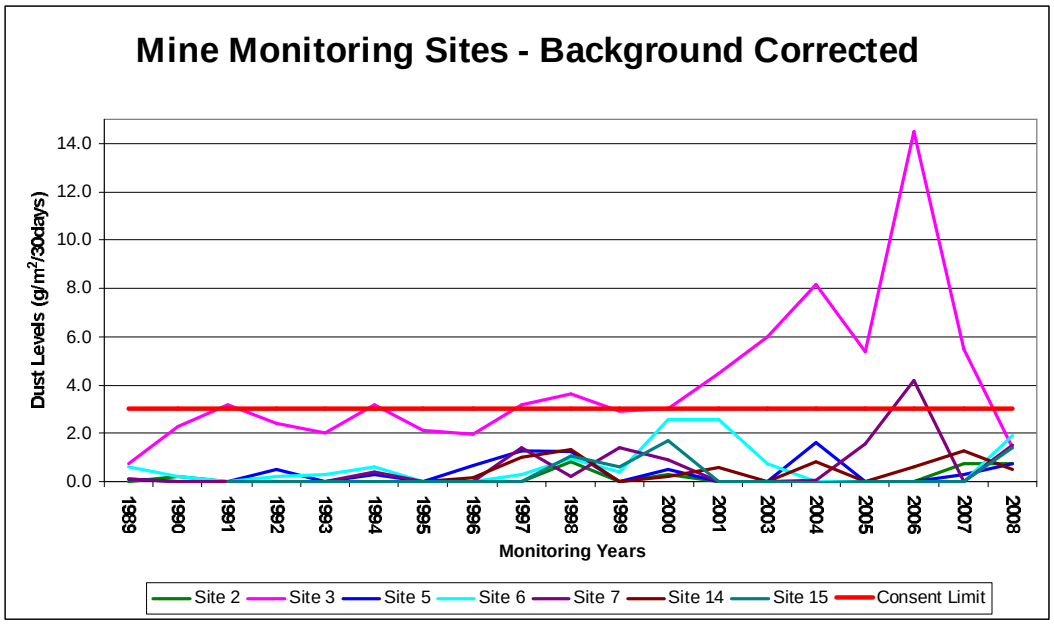

Figure 8.3 Annual average total dustfall corrected for background concentrations for mine sites.

Figure 8.4 demonstrates that dust levels are low at the expansion sites with one exception. High levels were recorded at site 12 during 2004 and 2005. This is discussed below.

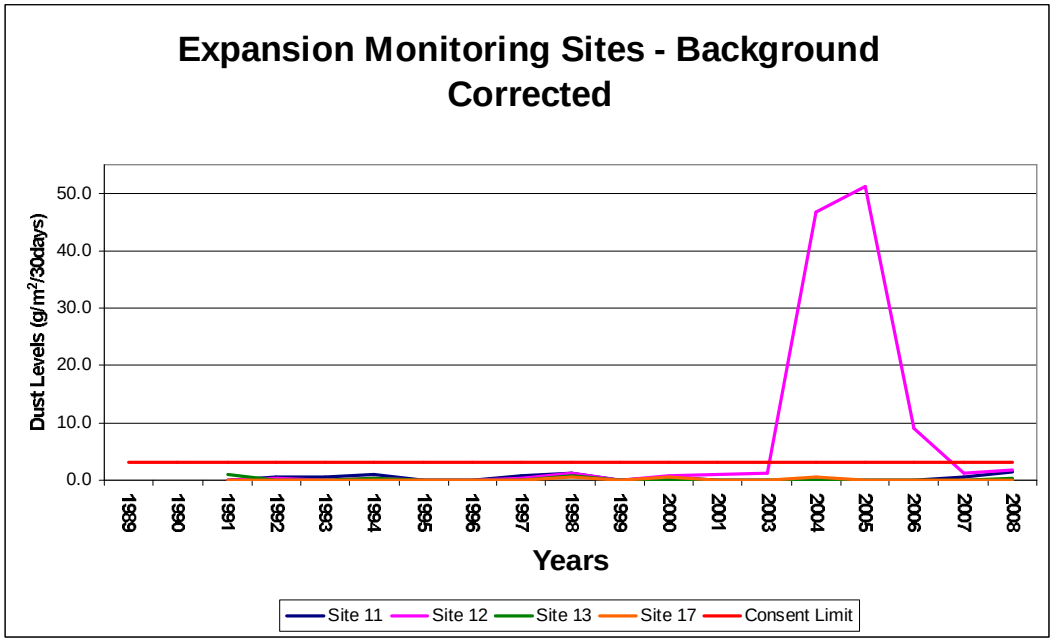

Figure 8.4 Annual average total dustfall corrected for background concentrations for expansion sites

Dust gauges are able to measure both the soluble and insoluble dust that collects in the dust gauge. The GPG Dust recommends that for most sources only the insoluble matter is of interest for assessing nuisance effects. Soluble material would only be of interest downwind of sources that produce water-soluble emissions, such as milk powder from a dairy factory. For OceanaGold the only emissions of any significance are crustal dust particles, which are insoluble in rainwater. However, the historical dust results reported by OceanaGold are reported as total dust levels for most years. For the years 2004-2008 the insoluble dust results above background levels are available and are summarised in Table 8.1. Table 8.1 shows the annual average and annual maximum values recorded at each site plus the number of exceedances above 3g/m^2/30 day. The consent allows no more than 2 exceedances of the 3g/m^2/30 day limit each year beyond the mine boundary. The sites which are beyond the site boundary and subject to the consent condition are highlighted in the table.

Deposited dust above background (g/m^2/30 days)		Mine Monitoring Sites							Expansion Sites				Background Sites		
		2*	3	5	6	7*	14	15	11	12	13	17*	9*	10*	Avg Background
2004	Average	0.1	7.9	1.5	0.2	0.3	1.2	0.2	0.3	46.0	0.1	0.0	0.5	1.2	0.85
	Maximum	0.9	20.4	3.6	0.7	1.1	3.4	0.5	0.9	77.1	0.5	0.1	1.0	2.9	
	Minimum	0.0	1.4	0.0	0.0	0.0	0.2	0.0	0.0	14.9	0.0	0.0	0.1	0.2	
	No. above 3g/m^2/30 days	**0**	**6**	**2**	**0**	**0**	**1**	**0**	**0**	**9**	**0**	**0**	**n/a**	**n/a**	
2005	Average	0.2	5.3	0.2	0.2	0.8	0.6	0.3	0.6	46.4	0.0	0.0	0.5	0.7	0.61
	Maximum	0.6	9.9	1.0	1.0	2.6	2.6	0.6	1.1	105.8	0.1	0.3	1.4	1.7	
	Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.4	0.0	0.0	0.1	0.1	
	No. above 3g/m^2/30 days	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**0**	**n/a**	**n/a**	
2006	Average	0.4	14.5	0.7	0.5	1.3	1.2	0.4	0.8	7.4	0.6	0.0	0.4	0.6	0.51
	Maximum	1.5	41.7	1.7	1.7	4.7	4.3	1.2	1.2	30.1	2.1	0.0	1.0	1.2	NB: Site 13 used to background correct Dec values
	Minimum	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.2	
	No. above 3g/m^2/30 days	**0**	**10**	**0**	**0**	**2**	**1**	**0**	**0**	**6**	**0**	**0**	**n/a**	**n/a**	
2007	Average	0.7	5.7	1.0	0.2	0.2	1.8	0.6	1.1	1.7	0.5	0.0	0.4	0.6	0.49
	Maximum	2.1	15.7	2.3	0.4	1.2	4.0	1.5	1.9	7.6	2.8	0.1	0.9	2.2	
	Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.1	
	No. above 3g/m^2/30 days	**0**	**6**	**0**	**0**	**0**	**3**	**0**	**0**	**1**	**0**	**0**	**n/a**	**n/a**	
2008	Average	1.0	1.4	0.7	1.9	1.9	0.9	1.4	1.5	2.0	0.4	0.5	1.8	1.5	1.62
	Maximum	3.1	4.5	2.9	15.7	10.4	3.2	4.7	4.1	7.0	1.2	3.1	7.9	6.7	
	Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	
	No. above 3g/m^2/30 days	**1**	**1**	**0**	**1**	**3**	**1**	**2**	**1**	**3**	**0**	**1**	**n/a**	**n/a**	

*Denotes monitoring sites that are beyond the boundary of the mine

Table 8.1 Summary of Insoluble Dust Above Background for 2004 – 2008

Site 7 exceeded the allowable number of exceedances of the consent limit during the monitoring period. Dust levels at site 7 recorded two high results in 2006 and exceeded the consent limit in 2008. Site 7 is located 750m south of the intersection of Horse Flat Road and Golden Point Road and to the northwest of the mining activity. The high readings recorded during 2006 were attributed to cultivation of the paddock in which the gauge is located.[16] . Site 7 is downwind of the mine during southeasterly quarter winds which are rare in the area (see Figure 4.4). It is possible that the high readings recorded at site 7 during 2008 are due to other sources of dust in the area.

Elevated levels were also recorded at sites 3, 14 and 12 during the monitoring period. Site 3 is located very close to the MTI and to Golden Point Road which was unsealed. Golden Point Road is the main access road to the mine. The road was sealed in May 2006. Elevated dustfall events continued to occur in 2006 and 2007. OceanaGold identified that this was due to strong wind events generating high levels of dust from the MTI which is approximately 200m from the gauge.

Following the strong wind events in 2006 OceanaGold instituted some additional dust mitigation methods for the MTI and SP11 TSFs which included additional watering of the surface of the dam and the placement of rock mattresses on the outer edges of the tailings (see section 7.2.4). Dust levels reduced in 2008 at site 3. In 2008 there was no construction activity on the MTI. The MTI surface was kept wet during this period with tailings deposition and watering. This is likely to have contributed to the lower than previous dust levels.

Dust levels at site 14 were elevated during 2007. Site 14 is located at Glendale to the east of the mining area. Maximum levels did not exceed 4g/m^2/30 days so were only marginally above the consent limit of 3g/m^2/30 days. The dust gauge is located very close to a large shelter belt of trees and it is likely that the proximity of the shelter belt impacted on the results recorded by the gauge.

There have been ongoing high dust levels recorded at Site 12. Site 12 is located immediately adjacent to Golden Bar Road which is a gravel road that leads to the Golden Bar pit. When this pit was being mined there was a haul road located immediately adjacent to Golden Bar Road. The haul road was located 15m from the dust gauge. Mining has been completed at Golden Bar and the dust levels at site 12 have reduced but still exceed 3g/m^2/30 days on occasions. This is likely to be due to the proximity of the gauge to Golden Bar Road.

Dust levels at sites 2 and 15 which are closest to Macraes Flat Village are generally below 3g/m^2/30days. Site 2 has not exceeded the consent limit since 2004.

The relationship between insoluble and soluble dust is shown in Figure 8.5. Figure 8.5 shows that soluble dust levels at Macraes average approximately 1.5g/m^2/30days. The soluble dust at Macraes Flat is likely to be sourced from windblown sea salt and agricultural fertiliser applications and is present in both the background and mine monitoring samples.

[16] Supra at 12

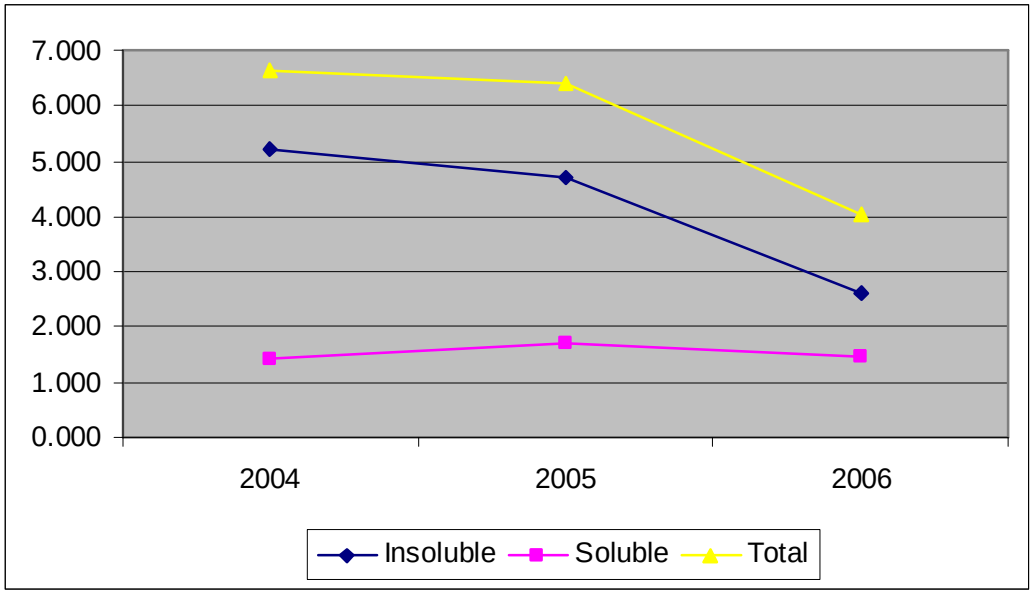

Figure 8.5 Average Annual Dustfall for All Sites (g/m^2/30days) 2004-2006

8.4.2 Summary of Current Effects of Deposited Dust

During the twenty years of mining at Macraes the deposited dust levels measured beyond the mine boundary have been within the consent limits for the majority of the time. Dust levels measured within the mine boundary have also remained below 3g/m^2/30 days for the majority of the time. There have been some high levels recorded at some sites which have been able to be attributed to specific reasons such as extreme wind events and the proximity of busy unpaved roads and agricultural activities. Where problems have been identified, such as the dust events associated with the MTI during 2006 and 2007, OceanaGold has implemented additional dust control measures which have adequately mitigated the problems. Dust levels measured in proximity to Macraes Flat Village have exceeded 3g/m^2/30 days only 3 times between 2004 and 2008.

8.4.3 TSP Results

OceanaGold has been measuring TSP concentrations at three sites since mining began. Monitoring is undertaken on a one day in six basis during the months of November to March inclusive.

Figure 8.6 shows the locations of the TSP monitors.

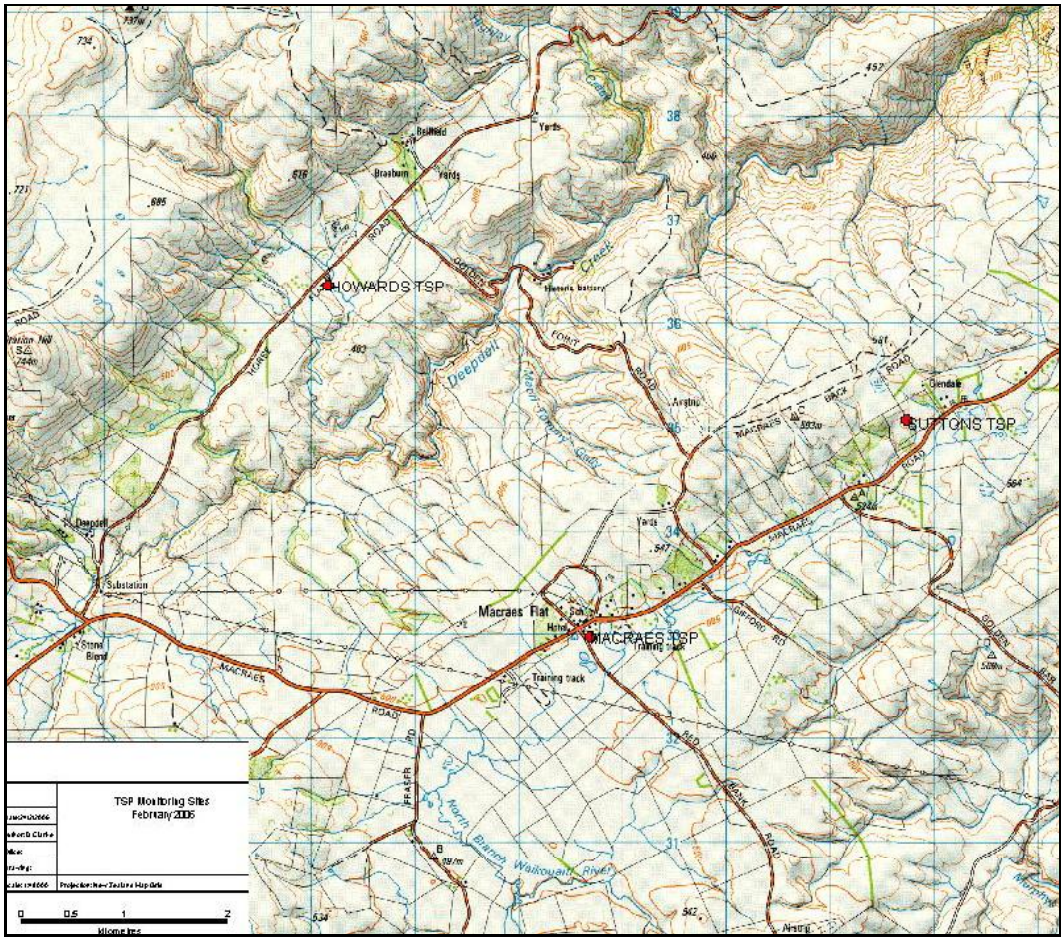

Figure 8.6 Map Showing Locations of TSP Monitors (sites shown as red circles)

Figure 8.7 shows the TSP concentrations measured at the three sites between 2000 and 2008 for the months of November to March inclusive.

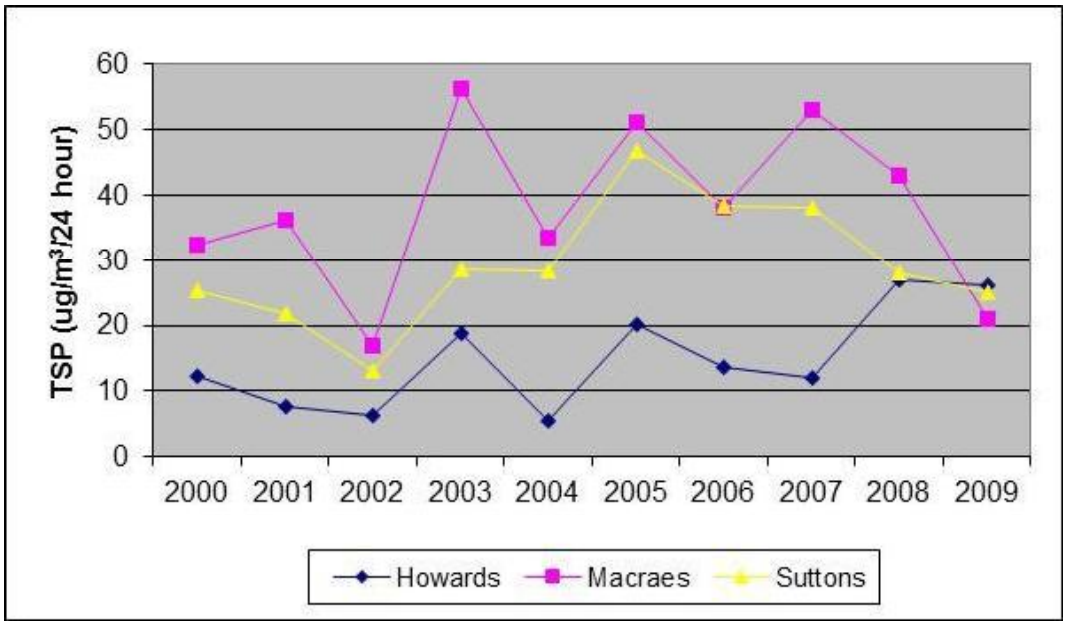

Figure 8.7 Average TSP Concentrations (Summer months only)

The consent conditions include a limit for TSP of 150µg/m^3 (24-hour average) and a review limit of 120µg/m^3 (24 hour average). Table 8.1 shows the average and maximum values recorded at each site for the years 2000-2008.

Table 8.1 TSP Concentrations between 2000 and 2009

Parameter	Howards	Macraes Flat	Suttons
Average TSP concentration (µg/m^3)	15	38	29
Max 24-hour average concentration (µg/m^3)	182	214	137
Number of exceedances of consent limit	1	5	0
Number of exceedances of consent review limit	1	13	2

Through analysis of the wind directions measured at the time of the high readings, the high readings at Suttons and Howards were all demonstrated to be due to sources of dust other than the mining operation as were many of the high readings recorded at Macraes. During 2007 and 2008 the TSP review limit was exceeded only once each year at Macraes Flat and there was no exceedance of the consent limit.

The monitoring shows that generally TSP concentrations are low during the summer months but there are some occasions, when there are windy and dry conditions, that TSP concentrations

exceed both the consent limit and the consent review limit, especially at Macraes Flat Village. However, using analysis of the wind directions measured at the time of the high readings, the monitoring has also demonstrated that there are sources of dust in the area other than the mine (e.g. agricultural sources) that can result in the TSP concentrations exceeding the consent limits

8.4.4 $PM_{10}/PM_{2.5}$ and Respirable Quartz Monitoring

The fine $PM_{10}/PM_{2.5}$ fractions of particulate within the dust emissions from the mine have the potential to impact on human health. Respirable quartz can cause silicosis when people are exposed to high concentrations over extended periods of time. $PM_{10}/PM_{2.5}$ and respirable quartz concentrations were measured at Macraes Flat by OceanaGold during the summer months between 1998 and 2000. Monitoring was undertaken at the three TSP monitoring sites plus an additional site located at Golden Point to the north of the Golden Point pit. The monitoring was undertaken using two high volume samplers at each site, one fitted with a PM_{10} head and the other fitted with a $PM_{2.5}$ head. The particulate collected on the $PM_{2.5}$ filters was analysed for quartz concentrations. Samples were taken once a month at each site in November through to March. $PM_{10}/PM_{2.5}$ and respirable quartz concentrations were all well below the consent limits and national and regional guideline values.

8.4.5 Effects on Vegetation and Agriculture

High levels of dust deposition have the potential to adversely affect vegetation by interfering with plant photosynthesis, promoting weed or disease incidence and impacting on the application of pesticides or fertilisers. Dust may also affect agricultural activity. In addition to potentially impacting on vegetation, dust can promote disease or health problems in animals.

The agricultural land immediately surrounding the mine is all owned by OceanaGold. As discussed in Section 7 dust deposition generally occurs close to the source. Oceana Gold advises that they have not experienced any adverse effects on vegetation or animal health on the land that OceanaGold farms surrounding the mine. OceanaGold is also not aware of any problems being reported by the neighbouring farmers regarding effects on vegetation.

8.4.6 Recorded Complaints

ORC and OceanaGold both record complaints received from the public regarding dust discharges from the site. ORC has provided information from their complaints database for OceanaGold for 2009 and 2010. Data for earlier years was not available. The complaints recorded by ORC for the 2009-2010 period are shown in Table 8.2. The complaints recorded by OceanaGold for the 2006-2010 period are shown in Table 8.3.

Table 8.2 Complaints Reported to the ORC

Year	Number of Complaints Reported to ORC	Commentary
2010 (to1 October)	2	Occurred in January and March, both related to dust coming from the construction of the MTI containment bund.
2009	3	All occurred in November, one complaint related to dust from the MTI, the other two related to burning in outdoor fires.

Table 8.3 Complaints Recorded By Oceana 2006-2010

Year	Number of Complaints Recorded by OceanaGold	Commentary
2006	5	Occurred in July, August, September and December. One related to dust specifically from the MTI, the others noted dusty conditions experienced during extreme winds. One complaint related to dust generated from Golden Bar Road
2007	4	Occurred in February, April, May, September and October. All related to dust from the MTI and 2 occurred during gale force winds.
2008	1	Occurred in September and related to the MTI
2009	1	Occurred in November and related to dust from the MTI
2010	3	Occurred in January and March and all related to the MTI.

The complaints recorded by OceanaGold and ORC should include the same incidents, however it is apparent from the data that some complaints recorded by OceanaGold are not always reported to ORC and vice versa. It is also likely that OceanaGold may record a single incident as two complaints when they are contacted anonymously by the complainant and then contacted again by the ORC. OceanaGold often has no way of knowing whether the same incident is being reported more than once.

The complaints clearly demonstrate that the MTI is the largest source of complaints regarding dust and those complaints often occur during times of high winds. Complaints tend to occur most frequently in the spring, summer and autumn months.

8.5 Summary of Existing Effects

The following observations summarise the information presented in Section 8 regarding existing effects:

- The operation of the mine has resulted in deposited dust levels in the area increasing in comparison to background values. However, at the majority of locations levels have not increased more than permitted in the current resource consent. At locations near to where people live such as in Macraes Flat Village (sites 2 and 15) deposited dust levels are consistently below the consent limit.
- TSP concentrations are generally below the consent limits but on occasions relatively high concentrations have been recorded. The high results have not always been found to be due to mining activity. The cause of the high results cannot always be determined, but agricultural activities such as cultivation and spreading of fertiliser have been implicated on occasions.
- PM_{10} and respirable quartz concentrations are low and likely to be typical of rural areas.
- There have been no reported incidences of adverse effects on vegetation or animal health in the vicinity of the mine.
- The number of complaints reported to the ORC is low.

Taking all of these factors into consideration, it is considered that the discharges to air from the existing mining activity results in effects on the environment that are no more than minor.

9 Potential Effects on the Environment of Proposed Development

9.1 Approach

A common method of assessing the effects of a new activity is to measure or estimate the potential emissions from the site and to then calculate the likely downwind concentrations of contaminants using dispersion modelling. The modelling predictions are then compared with air quality standards and guidelines in order to determine if an adverse effect is likely to occur. As discussed in Section 7.1 it is very difficult to estimate the emissions from fugitive dust sources such as the mine and it is also very difficult to model the emissions as the locations and scale of the sources will change frequently as will the local topography. Consequently, qualitative methods must be used.

For this assessment the effects of the existing activity have been assessed by analysing the available environmental monitoring data. The potential effects of the planned development have been estimated based on the existing effects and the likely changes to the scale and location of the emissions and the proposed mitigation methods.

9.2 Potential Effects

9.2.1 Downwind Distances with Potential for Dust Deposition

As described in Section 8.1, dust discharges from earthworks and mining activities typically fall into the larger particle sizes. As a class of material, such particles have minimal physical health impact (particles have only limited penetration into the respiratory tract), but may cause nuisance in sensitive areas due to soiling. In addition to consideration of dust sources and factors that may influence dust generation, any assessment of effects of dust must consider the distance that any dust may travel from the sources. In general, although mining activities can generate dust from a wide range of particle sizes, it is the larger particles that tend to be associated with 'dust nuisance' from mining activities. However, the larger the particle size, the less distance it will travel in light to moderate winds. The GPG Dust states:

When dust particles are released into the air they tend to fall back to ground at the rate proportional to their size. This is called the settling velocity. For a particle 10 microns in diameter, the settling velocity is about 0.5 cm/sec, while for a particle 100 microns in diameter it is about 45 cm/sec, in still air. To put this into a practical context, consider the generation of a dust cloud at a height of one metre above the ground. Any particles 100 microns in size will take just over 2 seconds to fall to the ground, while those 10 microns in size will take more than 200 seconds. In a 10-knot wind (5m/sec), the 100-micron particles would be blown about 10 metres away from the source while the 10-micron particles have the potential to travel about a kilometre. Fine particles can therefore be widely dispersed, while the larger particles simply settle out in the immediate vicinity of the source".

Dust particles generated by mining activities generally fall into the larger size fractions, with an aerodynamic diameter of 100µm or greater. In steady wind conditions, with average wind speeds of less than 10m/s (typical of Macraes), without vehicle movements, such particles would travel only a few tens of metres from the source. However, this theoretical calculation takes no account of re-entrainment of dust or of the effects of turbulent flow or the elevation of the discharge point.

There have been a number of studies undertaken using field measurements of suspended particulate at different distances from road sources[17,18]. Overall, the conclusions from these studies appear to be that dust travels much further under unstable atmospheric conditions than in stable conditions. These conclusions emphasise the need for effective mitigation to be applied, especially during hot, dry weather.

Based on the discussion regarding particle size in the GPG Dust and the results of research into dust entrainment, only locations within approximately 100-200m of significant dust sources are usually considered to be potentially sensitive receptors for assessing the effects of dust as a general rule of thumb. However, in some circumstances, where there are unusual meteorological features such as high average wind speeds or complex topography this will not apply. In this case the average wind speed is relatively high, the terrain is complex and the area over which the operation takes place is large. For discharges from elevated sources (such as from the surfaces of elevated WRSs or TSFs) particles will be able to travel proportionally further before reaching ground level. Hence for an area such as Macraes Flat where there are a number of large and elevated potential dust sources and windspeeds can be high it is expected that sources within approximately 1-2km of the site may be potentially affected by dust under worst case conditions.

The closest sensitive receptors and the receptors at most risk of being subject to nuisance effects from the proposed project works are the properties in Macraes Flat Village and the properties to the southeast of the mine on Macraes-Dunback Road..

9.2.2 Decommissioning of Tailings Storage Facilities

The residences in Macraes Flat Village are potentially most affected by the reclamation of the MTI and the rehandling of the material in SP11 as these are the activities that will take place closest to the village. The village is located approximately 1km from the MTI. The rehabilitation of the MTI and the excavation of SP11 will involve essentially the same types and scale of activities as those which have occurred during previous operation of the TSFs. Consequently the effects of the rehabilitation and excavation of the MTI and SP11 are expected to also be similar to the current effects.

Dust discharges from the surface of the MTI and SP11 have caused “dust events” in the past and are cited in the majority of the recent complaints as the source of nuisance dust. These events have occurred during periods of particularly strong winds. The strongest winds at Macraes tend to come from the westerly and southwesterly quarters. These winds blow dust from the MTI and SP11 towards the east and north of the mine. Winds from the north and northeast, which blow dust from the MTI and SP11 towards the village are not as frequent or as strong as those from the west and southwest. However, winds greater than 5m/s (the critical wind speed for dust generation) do occur from the northeasterly quarter and in these conditions Macraes Flat Village has the potential to be affected. Particular care will therefore need to be taken when sections of these TSFs are dried out and when the surface of the MTI is spread with topsoil prior to re-vegetation. It is recommended that topsoil spreading is done in sections and that the surfaces of the TSFs are kept damp. Areas where the surface material is fine and vehicles are tracking across it will need particular attention.

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[17] Cowheard, C Jr, Grelinger, M.A., and Gebhart, D.L., 2006, *“Development of an Emission Reduction Term for Near Source Depletion” 15th International Emission Inventory Conference “Reinventing Inventories – New Ideas in New Orleans”.* US Environmental Protection Agency, May 2006.

[18] Etymezian, V., Ahonen, S., Nikolic, D., Giillies, J., Kuhns, Gilletter, D. and Veranth, J., 2004. *“Deposition and Removal of Fugitive Dust in the Arid Southwestern United States: Measurements and Modal Results”* Journal of Air and Waste Management Association 54:1099-1111, 2004.

Activities that have a high potential for causing dust emissions should be planned for times of least vulnerability for the residents in Macraes Flat village.

The residents to the southeast of the mine are not expected to be affected by the rehabilitation of the TSFs as they are located approximately 9km from these mining areas.

Providing the recommended mitigation methods are carried out diligently it is expected that the rehabilitation of the TSFs will not result in any significant increase in dust levels in the surrounding area. It is also expected that once these TSFs have been rehabilitated that dust levels in Macraes Village should reduce.

9.2.3 Construction of New Top Tipperary Tailings Storage Facility (TTTSF) and Extended Waste Rock Stacks.

The TTTSF and the extended WRSs will be located on the eastern side of the mine and approximately 2.5km from Macraes Flat Village. The village will be downwind of the new structures under northeasterly quarter winds. However, the village is sheltered from these winds by the terrain between the planned locations of the TTTSF and WRSs and it is considered unlikely that the village will be adversely affected by the construction of the TTTSF and extended WRSs.

The TTTSF and extended WRSs will be upwind of the residences located to the southeast of the mine during northwesterly quarter winds. Northwesterly quarter winds are relatively frequent and can be strong. The construction of these new structures will bring mining operations closer to the locations to the southeast of the mine. Hence there is a risk that the sensitive locations to the southeast of the mine may be more impacted by mine activities than at present. However, the nearest house will be approximately 5.5km from the eastern-most extent of the new works and even in windy dry conditions it is expected that the nearest residence will be beyond the distance where dust may create adverse effects. Nevertheless it will be important that OceanaGold continues to use best practice methods for controlling dust when constructing and using these new structures as they will both be potentially large sources of dust emissions if not well managed.

9.2.4 New Pit Stages

The mining of Round Hill, Southern and Innes Mills Pits and the continuation of mining at Frasers is not expected to have any significant effects that are greater than the existing effects of the mine. The planned activities are the same as the current activities taking place at the mine. The pits are all located within established areas of the mine. The majority of the mining activity will continue to take place within the pits and below ground level. The pit walls shelter the activities from wind and contain the dust produced within the pit.

9.2.5 Road Realignments

The construction of the road realignments will involve earthworks and construction activities that are no different to road construction activities elsewhere. The earthworks involved will be relatively small scale in comparison to the other earthworks activities undertaken at the mine on a daily basis. Consequently the effects of the road realignments are not expected to be significant.

9.2.6 Potential Cumulative Dust Effects

The scale of the activity is planned to increase as a result of this development. The movement rate of materials, which is a general indicator of the level of activity at the mine, is expected to increase from approximately 14,000kt per quarter at present to a maximum of 16,000kt per quarter (refer to Figure 6.1) Hence the dust discharges associated with vehicle movement and loading and unloading of materials has the potential to increase. The locations of the discharges will be spread over the entire area of the mine, as is the case at present, but will progressively move more towards the eastern side of the mine as the TTTSF and Back Road WRSs are constructed and used.

When the MTI is being rehabilitated and the new TTTSF is under construction there may be times when the area of exposed ground is greater than it has been previously. OceanaGold intends to rehabilitate the MTI in small sections hence the increase in the area of exposed ground should be kept to a minimum. Once the surface of the MTI is revegetated the area of exposed ground at the mine site should return to previous levels.

OceanaGold proposes to continue to use the dust control methods that have been successfully used to date at the mine. Providing these measures are diligently carried out any increases in the discharges from the mine should be minimised and adequately mitigated. Due to the wide dispersal of the discharges over the mine site any increases in the effects of the dust discharges beyond the boundary of the mine site and at sensitive locations are expected to be no more than minor. As the mining activity moves more towards the east and the MTI is rehabilitated the effects on the nearest sensitive receptors in Macraes Flat village may decrease.

9.3 Vegetation Effects

The nearest neighbouring land owned or leased by parties other than OceanaGold is approximately 3km from the proposed new TTTSF and Back Road WRS. It is expected that dust levels at the boundary of OceanaGold controlled land will be no more than the dust levels that are currently experienced in the local rural environment and in the vicinity of gravel roads. Hence there are not expected to be any adverse effects on vegetation in the area that are more than minor.

9.4 Effects on Littoral Zone of Camp Creek

The construction of a dam on Camp Creek will generate some dust which may settle onto the margins of the creek. This has the potential to affect the ecology of the river banks if dust deposition levels were high. However providing standard dust control methods are used the levels of dust depositing on the banks of the creek are not expected to be significant, especially when compared to the likely effects of sediments produced by the construction of the dam in the bed of the creek. It is therefore considered that the dust generated in the course of constructing the dam on Camp Creek will not have any significant effects on the littoral zone of the creek.

9.5 Potential Health Effects

Fine particles such as PM_{10} and $PM_{2.5}$ are the contaminants which have the potential to cause adverse health effects downwind of the mine. The major sources of fine particulates at the mine are the vehicle exhausts. The monitoring undertaken by OceanaGold of PM_{10} and $PM_{2.5}$ concentrations demonstrated that concentrations in the vicinity of the mining operation were low and below national standard and regional guideline values. OceanaGold plans to increase the number of vehicles used on site from 17 to 18 and some of the vehicles used will increase in size. Hence the emissions generated from vehicles on site are expected to increase. The emissions from the vehicles are spread over the whole site and are widely dispersed even before they reach the boundary of the site and dispersed further before the contaminants reach sensitive locations downwind of the mine. It is expected that, even though the scale of the emissions of PM_{10} and $PM_{2.5}$ from the site will

increase, the concentrations of contaminants downwind of the site will not change significantly and no adverse effects on health that are more than minor should result.

9.6 Summary of Potential Effects

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 and local weather conditions. The effects of the discharges are also directly proportional to the quantity of the dust emissions.

The proposed development at OceanaGold will not change the nature of the activities carried out but the scale of the activity is expected to increase. The source of the majority of the dust emissions from the mine is likely to move as the MTI is rehabilitated and the new TTTSF and WRSs are developed. The focus of activity at the mine will move further towards the east and away from Macraes Flat Village. Hence the areas potentially affected by mine activities are also likely to move further towards the eastern side of the mine.

The results of monitoring, complaints and audit records demonstrate that the existing effects of the mine are no more than minor and within the limits set by the current resource consent. 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. It is considered that providing particular care is taken with the remediation of the TSFs and the construction of the extended WRSs and TTTSF that the effects of the proposed Phase III project should not be significantly more than the current consented effects and should not result in any adverse effects downwind of the site that are more than minor.

10 Monitoring

OceanaGold proposes to continue to use similar monitoring techniques to those that are currently employed with some alterations. OceanaGold proposes some changes to the locations of the monitoring sites as some monitoring sites (5 and 14) will need to be removed when the Back Road WRS and TTTSF are constructed and others are no longer relevant. The proposed monitoring is discussed below

10.1 TSP Monitoring

Since the first consent was granted to OceanaGold monitoring techniques for TSP have improved and there are now cost effective continuous monitors available which have significant advantages over High Volume Samplers. Real time dust monitors combined with wind sensors provide instantaneous measurements of dust concentrations and the direction from which the dust is coming. Continuous dust monitors can also be used by plant operators to modify operations if dust levels are high and to trigger the operation of dust mitigation systems.

OceanaGold proposes to remove all three High Volume Samplers from use and install a continuous TSP sampler at site 15 in Macraes Flat Village. OceanaGold has not finalised an instrument but it is likely to be a nephelometer. Nephelometers are able to provide instantaneous real time measurements of particulates, but they do have some limitations. The main limitation is that the instrument response depends on both the particle size distribution and the number of particles, rather than the total mass of airborne particulate. Hence they cannot be used for measuring ambient concentrations of PM_{10} for comparison with the NES. For this application the measurements of TSP will not need to be compared to a national standard so this should not be a problem. The limitation can be overcome to some extent by carrying out periodic calibrations of the instrument using manual filter sampling.

Nephelometers are available that include their own filter sampling system to enable periodic gravimetric measurements to be made. The filter samples taken can be used to provide a correlation between the continuous instrumental results and the total mass of particulate collected by the filter paper. The particulate collected on the filter paper can also be used for analysis if required. If OceanaGold does install a nephelometer at site 15 OceanaGold will operate the new instrument adjacent to the existing High Volume sampler for a period of twelve months so that a correlation can be developed between the new instrument's readings and the existing High Volume sampler readings.

It is proposed that at site 15 in Macraes Flat Village instruments are installed to replace the High Volume sampler that can measure and calculate the following statistics:

a) Hourly average TSP concentrations;

b) 24 hour average TSP concentrations;

c) Meteorological data such as wind speed, wind direction and rainfall; and

d) Results of correlations between continuous measurements and nephelometer gravimetric filter samples, if a nephelometer is used to measure TSP.

The TSP High Volume sampler at Howards has recorded consistently low TSP concentrations with the exception of one occasion when unusually high results were recorded in January 2005. This reading was significantly higher than all other 24-hour averages and may have been due to dust sources other than the mine. The site is located more than 1km northwest of active mining areas

and winds from the southeast, which would carry dust from the mine to this site, are infrequent. Furthermore the new mining activities proposed in this application will move active mine areas further from the Howards site. It is therefore considered appropriate to cease monitoring TSP at this site.

The TSP monitoring site located at Suttons will be engulfed by the new mining activities and will need to be removed. OceanaGold has considered establishing a new TSP monitoring site to the southeast of the new mining activities. However, the nearest house will be approximately 6.8km from the eastern-most extent of the new works and unlikely to be affected by dust from the mine. Consequently it is considered unnecessary to monitor for TSP to the southeast of the mine.

10.2 Deposited Dust Monitoring

The areas of active mining have changed since the original consent was issued for the site and if this proposal is approved the active mining areas will move more towards the east. Consequently some monitoring sites are no longer relevant and some new sites may be required. Sites 5 and 14 will be engulfed by the new works if they are approved.

It is proposed to retain the monitoring sites that are located in close proximity to Macraes Flat Village (sites 2, 11 and 15). These gauges are located in the area that is most sensitive to dust emissions.

Sites 17, 7 and 6 are located to the northwest of the active mining area. Low dust levels have been recorded at these sites and mining activities will move further to the east if this proposal proceeds. It is recommended that the number of sites in this area is reduced to two. It is recommended that site 17 is retained as it provides information regarding dustfall in the vicinity of residential premises and provides a good measure of background dust levels. It is also recommended that Site 7 retained. It is located in close proximity to the proposed Camp Creek reservoir. Site 7 will provide a measure of the effects that may arise during construction of the reservoir.

Site 12 is located adjacent to Golden Bar Road and it is most likely that vehicle movements on this road impact on the dustfall recorded at this site. It is recommended therefore that site 12 is disestablished.

Site 13 is located to the south of Frasers West WRS. It is recommended that this site remain as a measure of dustfall to the south of the mine. This site has at times been used by OceanaGold to calculate background concentrations when data from sites 9 and 10 were not available. As this site is approximately 500m from active mining areas this is not recommended.

OceanaGold proposes to install four new dust gauge sites to the east, south and northeast of the Back Road WRS and the TTTSF. They will be numbers 18, 19, 20 and 21.

It is recommended that background concentrations should be determined by calculating the mean dustfall at sites 9, 10 and 17. Where one of these sites is unavailable (as a result of contamination) the mean background dust concentration should be calculated from the remaining available background sites.

A map showing the location of the modified monitoring site locations is shown in Figure 10.1.

10.2.1 Meteorological Monitoring

OceanaGold intends to continue to monitor meteorological conditions at the climate station located on Golden Point Road. In addition OceanaGold will establish a climate station in association with the continuous TSP monitor proposed for site 15.

The Golden Point Road climate station measures wind speed, wind direction, temperature, rainfall and solar radiation. The climate station proposed for site 15 will measure wind speed, wind direction, temperature and rainfall.

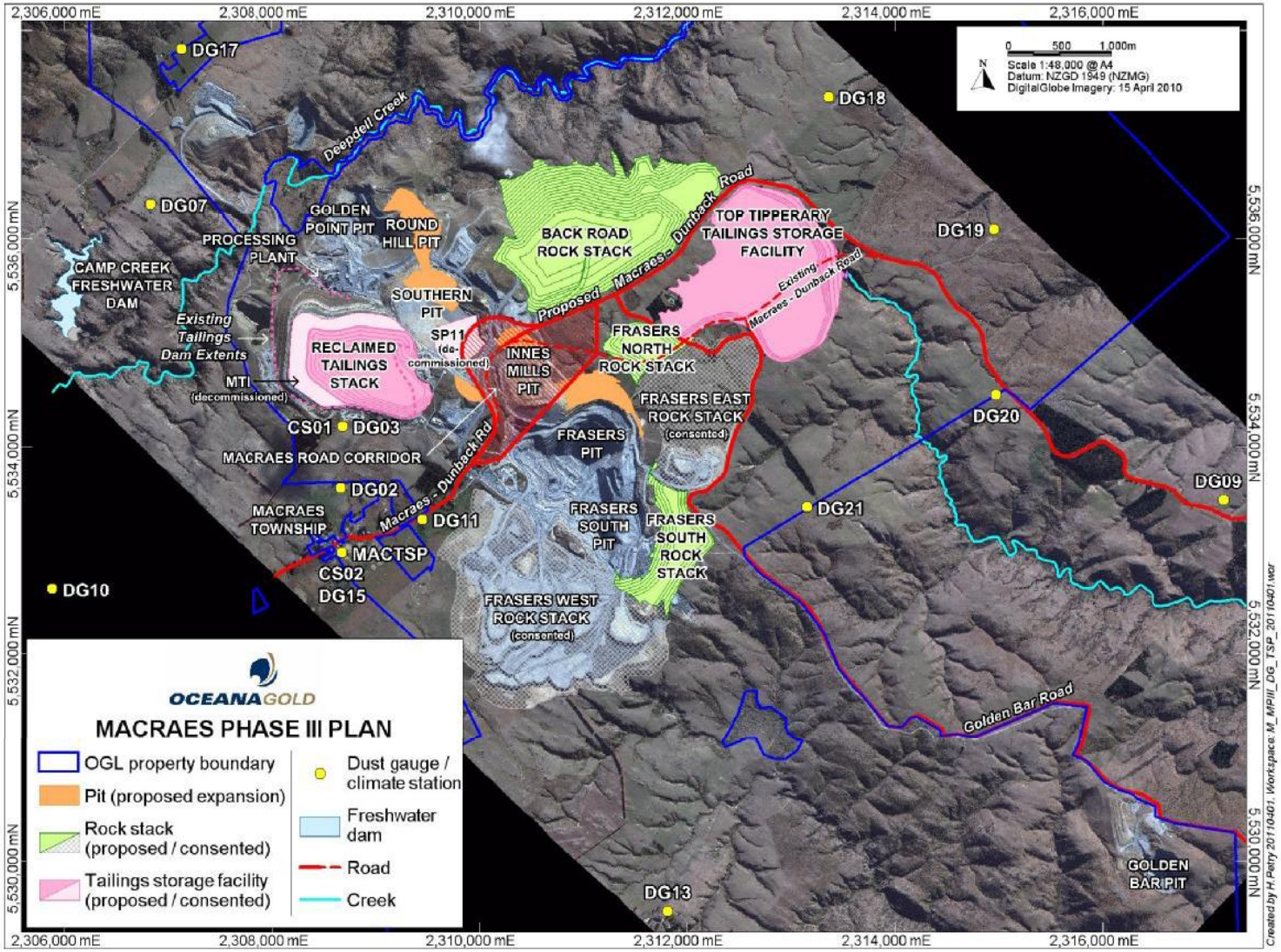

Figure 10.1 Map Showing Locations of New Monitoring Sites

11 Statutory Matters

11.1 Resource Management Act 1991

The Resource Management Act 1991 (RMA) provides the framework for all resources used in New Zealand. The overriding purpose of the RMA is *"to promote the sustainable management of natural and physical resources"* (s.5, RMA). The broader principles (s.6 to s.8) are a guide to considerations of any resource consent, development or protection.

An activity can be authorised by a rule, either in the Regional or District Plan, or through a resource consent. Part 3 of the RMA has the following section that is considered relevant to the activities sought in this application.

11.1.1 Section 15 – Discharges

Section 15(1)(c) of the RMA states that:

> *"No person may discharge any –*
>
> *(b) Contaminant from any industrial of trade premises into air;*
>
> *……..*
>
> *Unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.*

The proposed project works will involve discharges of contaminants to air (dust); therefore the discharge of contaminants into air needs to be expressly allowed by a rule in a regional plan and any relevant proposed plan or resource consent.

11.2 Relevant Planning Instruments

11.2.1 Otago Regional Policy Statement

The Regional Policy Statement for Otago (RPS) provides an overview of resource management issues in the region and directs how the resources of Otago are to be managed. The policy statement is an umbrella document that provides the framework for the Regional Plans.

The primary objectives of the RPS with regard to air quality are to promote the protection of high ambient air quality, the enhancement of degraded air quality and the maintenance of good air quality by avoiding, remedying or mitigating the adverse effects of the discharge of contaminants to air.

Otago's air quality is generally very good, with poor air quality usually only experienced in towns with specific topography and climate. Whilst the proposed activity will not result in any improvements in ambient air quality it is expected that the discharges from the proposed activity will not have a significant adverse effect on the local air quality or the overall air quality within Air Zone 3 in regard to NES and Air Plan requirements.

In summary, the proposal is considered to be consistent with the provisions of the RPS.

11.2.2 Regional Plan: Air for Otago

Objectives and Policies

The relevant Objectives and Policies of the Regional Plan: Air for Otago (Operative in 2003, and including amendments 2006 & 2009)(Air Plan) are discussed below.

The proposal is considered consistent with the following objectives:

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.

Section 9 of this report discusses the effects of the proposed activities on the environment. There are not expected to be any adverse effects on the local environment, including health effects, amenity values and ecosystems that are more than minor. The proposal will not enhance ambient air quality but neither is it expected to result in any significant degradation of ambient air quality.

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.

OceanaGold has discussed the proposal with Kai Tahu. The Phase III project is a continuation of the present mining activity and is not expected to result in any significant additional adverse effects that will impact on the air resource. 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 PM_{10} in the vicinity of the mine has found that concentrations are well below the NES and Otago Goal Levels. The Phase III development is not expected to result in any significant increase in local concentrations of PM_{10}.

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 effects of the current mining operation and the potential effects of the proposed mining operation have been discussed in sections 8 and 9. The actual, potential and cumulative effects of the proposal on human health, ecosystems, amenity values and cultural and heritage values are considered to be no more than minor.

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

The proposed mining operation will be very similar to the current operation and will generate similar discharges. OceanaGold proposes to continue to use the dust mitigation methods that are being used successfully at present. The effects of the proposed operation are also expected to be very similar to the effects of the current operation. The current operation has not caused any effects to date that have been considered to be noxious, dangerous, offensive or objectionable. It is therefore expected that the discharges from the proposed Phase III development will not result in discharges that are 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 plan to continue to use the best practice dust mitigation methods that they currently employ.

Rules

Rule 16.3.5.3 – Discharges from mineral extraction and processing – permitted activity

The discharge of contaminants into air from:

1) *The extraction of minerals from the surface or from an open pit at a rate less than 20,000 cubic metres per month and 100,000 cubic metres per year; or*

2) *The crushing and screening of minerals at a rate less than 200 tonnes an hour; or*

3) *The drying or heating of minerals from single activities or a combination of activities on one site with equipment that has a heat generation capacity of less than 500 kW; or*

4) *The making of refractory, bricks or ceramic products at a rate less than 200 kg/hr of products;*

*is a **permitted activity**, providing*

a) *The mineral extraction, crushing and screening activities are located in Air Zone 3; and*

b) *In the case of equipment installed after 28 February 1998, any chimney complies with Schedule 6 ("Determination of Chimney Heights"); and*

c) *Any discharge of smoke, odour or particulate matter is not noxious, dangerous, offensive or objectionable at or beyond the boundary of the property.*

The OceanaGold operation exceeds the processing rates included in Rule 16.3.5.3. Hence Rule 16.3.5.9 applies.

Rule 16.3.5.9 – Other discharges from industrial or trade processes – discretionary activity

Except as provided for by Rules 16.3.5.1 to 16.3.5.8 and 16.3.6.1, 16.3.6.2, 16.3.7.1, 16.3.9.2, 16.3.10.2, 16.3.11.1, 16.3.13.1 and 16.3.13.2, or prohibited by Rule 16.3.3.1, the discharge of contaminants into air from industrial or trade processes is a ***discretionary activity****.*

Rule 16.3.15.4 – Discharges of PM_{10} in an airshed before 1 September 2013, where the ambient air quality standard for PM_{10} is not breached – discretionary activity.

Except as provided for by the permitted activity rules in this Plan or prohibited by Rules 16.3.1.1, 16.3.3.1, 16.3.12.1 and 16.3.15.1, the discharge of PM_{10} to air in an airshed before 1 September 2013, where the concentration of PM_{10} in the airshed does not breach its ambient air quality standard;

is a ***discretionary activity****, providing the discharge to be permitted by the resource consent is not likely, at any time, to cause an airshed to exceed the ambient air quality standard for PM_{10}.*

The discharge of PM_{10} from this proposal is not expected to increase the ambient concentrations of PM_{10} in the airshed significantly nor is it expected to result in the airshed exceeding the ambient air quality standard for PM_{10}.

12 Alternatives

The Fourth Schedule of the RMA requires that an assessment of environmental effects include a description of any alternative methods or locations where it is likely that the proposed activity will result in a significant adverse environmental effect. As the effects of the proposed activity from OceanaGold are not considered to have any significant adverse effects, an assessment of alternatives is not required. Nevertheless there are no alternative locations for the mining operation and OceanaGold is proposing to use all of the relevant best practice techniques to control dust from the proposed operation.

13 Proposed Conditions of Resource Consents

OceanaGold proposes that the current conditions of consent 96785_V4 are included in the new consent with some minor changes. Monitoring condition 11 needs to be changed to incorporate the changes to the number and locations of the monitoring sites described in Section 10. Condition 12 which refers to the requirement for TSP monitoring needs to be changed to reflect the proposal to replace the three existing High Volume samplers with one continuous sampler Condition 13, which refers to the requirement to undertake respirable particulate monitoring, is now redundant, as all the respirable particulate monitoring results were below the limits set in the condition. It is therefore recommended that condition 13 be removed from the new consent conditions.

Deposited dust is made of up soluble and insoluble fractions. The fraction of interest for emission sources such as OceanaGold is the insoluble fraction. The consent limit imposed in consent 96785_V4 for deposited dust refers to total dust above background levels. The soluble dust fraction levels recorded at Macraes Flat are variable and can confound the deposited dust results. This has led on occasions to false exceedances of the consent limit which have needed to be explained by OceanaGold. It is therefore recommended that the consent limit in the new consent refer only to insoluble dust.

There is an error in condition 8. Condition 8 refers to sites 2 and 16. Site 16 no longer exists and the condition should refer to site 15.

The proposed rewording of the conditions that need to be changed is as follows

Condition 7

Insoluble dust deposition rates shall not exceed 3g/m^2/30days above background levels beyond the mine boundaries (taken as the boundary of land owned by the consent holder) more than twice in any calendar year. Compliance with this condition shall be demonstrated by the monitoring required in condition 11 of this consent. Background concentrations shall be calculated by averaging the dust deposition rates measured at sites 9, 10 and 17. In the event that values from one of these sites is unavailable the background concentration shall be calculated from the remaining site values.

Condition 8

If any dust deposition rate measurements undertaken at sites 2 and 15 as shown on Figure 1 annexed yield results that exceed 3g/m^2/30days of insoluble dust above background, the consent holder shall undertake an immediate review of dust mitigation methods unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind deposition. This review shall establish the cause of the high results and recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

Condition 10.

If any 24-hour average suspended particulate measurements at Site 15 near Macraes village yield results that exceed 120µg/m^3, the consent holder shall undertake an immediate review of dust mitigation methods, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. This review shall establish the cause of the high results and shall recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

Condition 11

The consent holder shall monitor dust deposition rates at monthly intervals in accordance with draft ISO Standard ISO/SIS 4222.2 ("Air Quality Measurement of Atmospheric Dustfall – Horizontal Deposit Gauge Method" 1980), or another method approved by the Consent Authority. The monitoring shall be undertaken at the sites specified in the application and on the attached map.

Condition 12

a) *The consent holder shall monitor total suspended particulate at monitoring site 15 as specified in the application and the attached map in accordance with Australian Standard AS 2724.3 (Determination of Total Suspended Particulates [TSP] High Volume Sampler Gravimetric Method 1984), or another method approved by the Consent Authority. Twenty four hour measurements shall be taken every six days for a minimum period of twelve months.*

b) *The consent holder shall monitor real time total suspended particulate concentrations at monitoring site 15 as specified in the application and the attached map. The monitoring shall be undertaken using a nephelometer, or other instrument as agreed in writing by the consent authority.*

c) *Results of all total suspended particulate monitoring shall be reported to the Consent Authority on an annual basis. The parameters to be reported shall include but not be limited to;*

    i. *Daily minimum, maximum and average, hourly average TSP concentrations as measured by the instruments installed in compliance with condition 12(b)*

    ii. *24-hour average TSP concentrations, as measured by the instruments installed in compliance with conditions 12(a) and 12(b)*

    iii. *Correlation results between the instruments installed in compliance with conditions 12(a) and 12(b).*

Condition 14

a) *Meteorological conditions shall be continuously monitored and recorded at Site 3 on Golden Point Road. As a minimum, the meteorological data collected shall include wind speed, wind direction, temperature and rainfall. Sufficient information shall also be measured to allow an estimate of atmospheric stability. These estimates shall be obtained from measurements of solar radiation and temperature at two heights above ground level, or other parameters as approved by the Consent Authority.*

b) *Meteorological conditions shall be continuously monitored and recorded at site 15 as specified in the application and the attached map. As a minimum, the meteorological data collected shall include wind speed, wind direction, temperature and rainfall.*

14 Conclusion

OceanaGold is proposing a further phase of mining at the existing gold mine at Macraes Flat. New WRSs, water storage dams, roads and a new TSF will be constructed. The existing TSFs will be decommissioned and rehabilitated and some areas of the mine that have been partially rehabilitated will be reworked.

The nature of the proposed activities will be the same as the activities currently undertaken on site. The scale of the proposed activities will be very similar to the scale of the current operation and consequently the effects of the operation are not expected to be significantly different from the current situation. The location of the new WRSs and TSF will be towards the eastern side of the current mine and approximately 2.5km from the nearest residences in Macraes Flat Village.

Overall it is considered that the Phase III development at the mine will result in effects that are very similar to the effects that are currently consented at the mine. OceanaGold intends to continue to operate to and comply with the current consent limits.

It is therefore considered that, providing the proposed mitigation methods are diligently carried out the discharge of dust from the proposed development should be adequately avoided, remedied and mitigated. The effects of the discharges of dust on the environment should be no more than minor.

Appendix A

Draft Dust Control Manual

OCEANAGOLD

DUST MANAGEMENT PLAN

Macraes Mine

March 2011

Revision History

Revision Nº	Prepared By	Description	Date
A	Debbie Clarke	Initial Draft	4 March 2011
B	Jenny Autridge	Amendments to Draft A	18 March 2011
C			
D			

Table of Contents

Appendices

1 Purpose

1.1 Background

This Management Plan has been prepared as part of Oceana Gold (New Zealand) Limited's (OceanaGold) consent application for the mine expansion called Macraes Phase III (MPIII). The proposed expansion includes a new tailing storage facility, expansion of the existing Back Road Waste Rock Stack and additions to Frasers East and West Waste Rock Stacks, along with expansion of Frasers, Innes Mills, Southern and Round Hill Pits. The existing Southern Pit 11 Tailings Impoundment will be decommissioned and the tailings relocated to the Mixed Tailings Impoundment in the form of a reclaimed tailings stack. A freshwater reservoir to support long term water quality in the Deepdell catchment is proposed for Camp Creek and appropriate silt control facilities will be establishment around the new mine features.

The purpose of this Dust Management Plan (DMP) is:

To facilitate the avoidance, remediation and mitigation of any adverse effects of dust discharges generated from mining activities and to promote proactive solutions to the control of dust discharges from the site.

The DMP includes information on the following

- The sources of dust at Macraes Gold Project
- Dust mitigation and prevention measures
- Monitoring methods
- Mechanisms for remediation of adverse effects (should this be required)
- Methods for managing complaints regarding dust and keeping records related to compliance
- Key personnel responsible for implementing the DMP.

The DMP is intended to be a working document and as such information included is expected to be regularly reviewed and revised as quarry activities occur. Any revisions will be forwarded to the Otago Regional Council.

1.2 Objectives

The objectives of this management plan are:

- To describe current and proposed dust management methods and procedures.
- To enable OceanaGold to operate in full compliance with resource consent requirements.
- To describe the dust monitoring regime and reporting of results.

2 Background

2.1 Description of Activity

The key features of the MPIII proposal that are relevant to the Dust Management Plan are provided here.

More detailed information on the MPIII project is contained in the Assessment of Environmental Effects – Macraes Phase III and associated technical reports submitted with the consent application.

Of particular relevance is the Assessment of Environmental Effects of Air Discharges, March 2011 prepared by Beca Infrastructure Ltd.

The main features of the MPIII Project are:

- A new tailings storage facility (called Top Tipperary Tailings Storage Facility (TTTSF)) will be constructed in the upper Tipperary catchment basin. It will result in an increase of 51Mt of total consented tailings storage capacity (from 81Mt currently to 132Mt);
- Reclamation of tailings from within the current SP11 tailings storage facility. The tailings will be relocated to a stack within the footprint of the existing Mixed Tailings Impoundment with any residual tails being stored within the new Top Tipperary Tailings Storage Facility;
- New rock stacks and extensions to existing rock stacks will be constructed, increasing the total consented tonnage from 850Mt to 1,180Mt. The existing Back Road Rock Stack will be substantially expanded to the east of the Round Hill/Southern Pit locations. Frasers East and Frasers West Rock Stacks will be linked by a new rock stack called Frasers South Rock Stack and an extension added to the north of Frasers East Rock Stack called Frasers North Rock Stack;
- Macraes-Dunback Road will be realigned from near Hocking Road following the legal (but unformed) Macraes Back Road alignment north before turning west to run along the divide between the Deepdell and Tipperary catchments and rejoining the current alignment adjacent to Innes Mills Pit, (near the old Golden Bar haul road traffic lights);
- Golden Bar Road will be realigned for the last 2.5km before rejoining Macraes-Dunback Road;
- Expansion of existing pits to include the following; Frasers Stage VI, Round Hill – Southern Pit Extension, and Innes Mills Stage V;
- Continued down dip (North Easterly) development of Frasers Underground mine;
- A new fresh water storage dam in Camp Creek (a tributary of Deepdell Creek) that will be filled from flood flows. The dam will result in a permanent residual flow in Deepdell Creek;
- Surface water on the expanded mining infrastructure will be managed with diversions and new silt control dams;
- The processing rate will be similar to current operations and the intensity of operations on site will be similar to that currently; and
- A revised closure plan which, subject to approval, which will comprise: 2 lakes formed from the pit excavations; maintenance of the current artworks and infrastructure; a renovated

Stanley's hotel; bicycle trails connecting artworks and the hotel, and a fund to support local community initiatives and encourage business development.

2.2 Description of Site and Local Environment

2.2.1 Site Description

The OceanaGold mine is located in a rural area that is dominated by the existing mining activity and low intensity pastoral farming. Macraes Flat Village, a small village that includes approximately 20 houses and an historic hotel is located to the west of the mining area.

The existing mining area extends to the north and south of Macraes-Dunback Road. Initially the mining operations were all to the north of Macraes Road. In more recent times mining has been developed to the south of the road into Frasers Pit and Golden Bar Pit. Mining has been completed in the pits located to the north of the road; however, part of the MPIII proposal is to re-mine areas of Round Hill Pit, Southern Pit and Innes Mills Pit. Mining has currently been completed at Golden Bar. The processing plant and TSFs are located to the north of the road.

The new TTTSF and extensions to the Back Road WRS proposed in this development will be located to the east of the present mining activity. The proposed Frasers South WRS will be located to the south of Frasers Pit and will link the existing Frasers West and Frasers East WRS. An extension to Frasers East WRS will be added to the north, called Frasers North WRS. A map showing the locations of the existing and proposed mine features is shown in Figure 1.

The minesite occupies an area of land of approximately 1500 hectares.

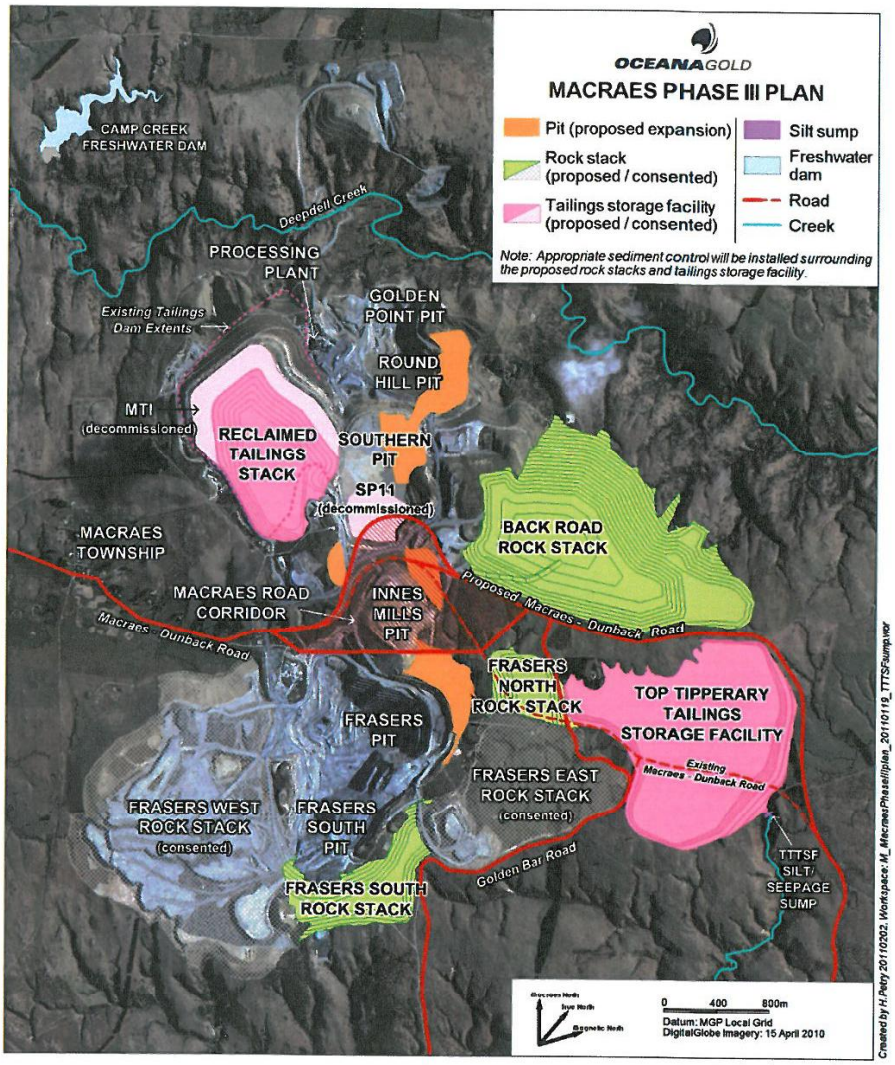

Figure 1 Map showing existing mine and proposed MPIII features.

2.2.2 Local Environment

The land in the vicinity of the proposed new mine activities is rural and is of a similar character to the land surrounding the existing mine. The topography of the area is dominated by the large WRSs and mine pits. The land to be mined is all owned by OceanaGold with the exception of the Camp Creek Reservoir site.

Figure 2 shows the areas of land in the vicinity of the mine which are owned by OceanaGold, including areas of land leased and the boundaries of land owned by neighbours. The map also shows the locations of the existing and proposed mine activities and demonstrates the distances from the mining activities to the boundaries with neighbouring properties.

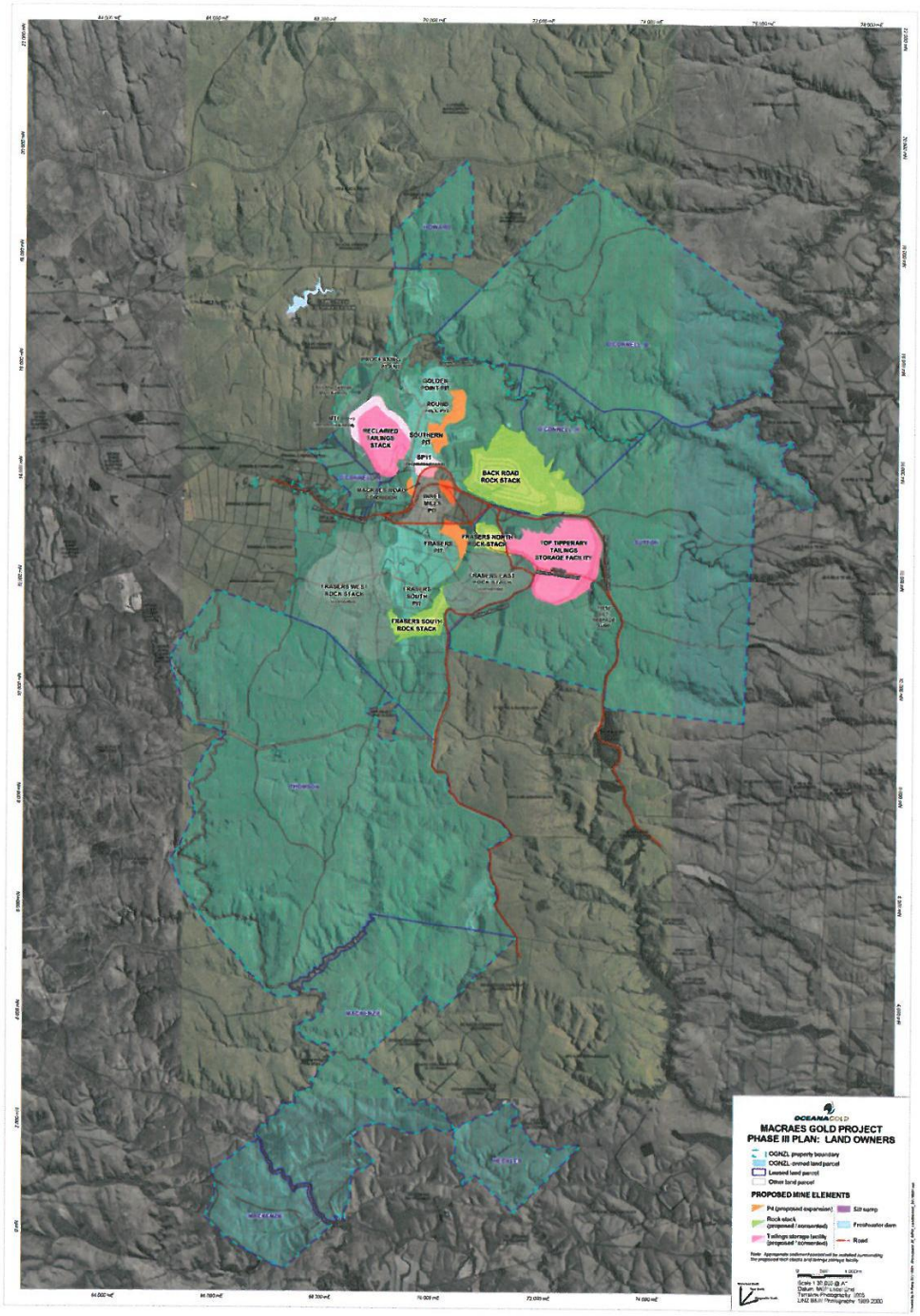

Figure 2 Map Showing Land Owned and Leased by OceanaGold and Locations of Neighbouring Landowners.

March 2011

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2.2.3 Site Weather Conditions

The main features of the Macraes Flat climate are the relatively low rainfall (site average annual rainfall is 628mm (Golder Associates, November 2010)) and the moderately strong average wind speed of 5.5m/s[1]. These are both climatic features that contribute to the generation and transport of dust. OceanaGold measures the wind speed and wind direction at a climate station located on Golden Point Road. A windrose for the years 2000-2006 is shown in Figure 3. Winds tend to blow predominantly from the south and west. The strongest winds also come from these quarters. Winds from the northerly and easterly quarters tend to be lighter and less frequent.

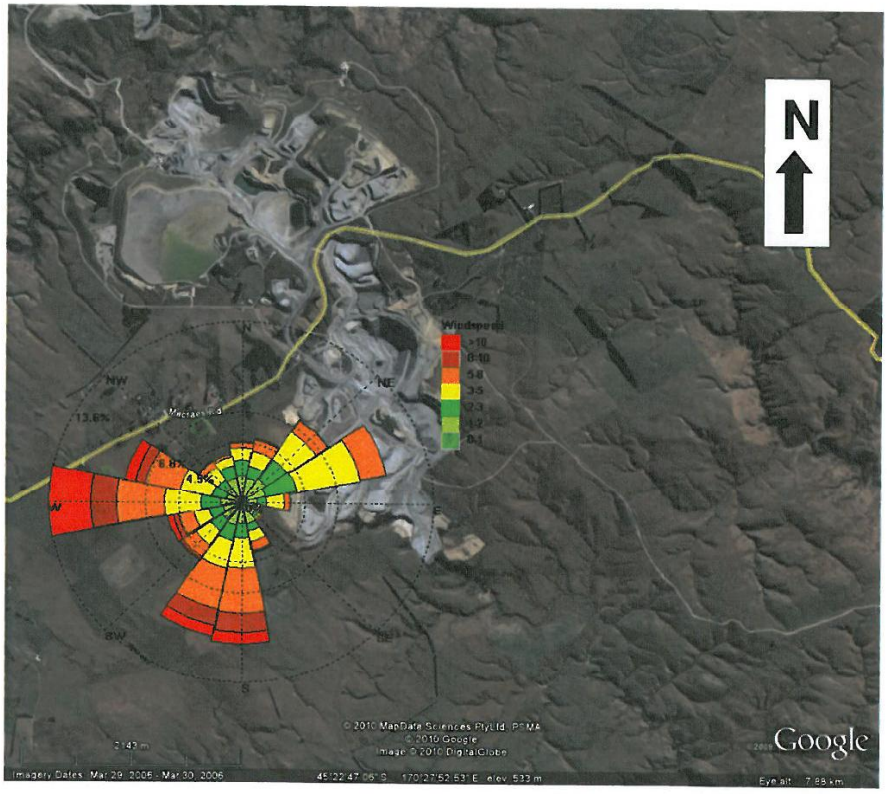


Figure 3: Macraes windrose based on data from the Golden Point weather station 2000 to 2006.

[1] Macraes Mining Company Ltd. Macraes Gold Project Discharges to Air Assessment of Environmental Effects December 1996.

3 Dust Sources and Generation

3.1 Potential Dust Sources

The following activities have the potential to generate dust:

- Blasting of rock
- Excavation, including stripping of overburden and topsoil
- Vehicle movements on unpaved surfaces (i.e. haul roads)
- Loading and unloading of materials
- Wind generated dust from dry exposed surfaces such as stockpiles, tailings impoundment surfaces and non rehabilitated surfaces
- Crushing of materials

Dust emissions from exposed surfaces generally increase with increasing wind speed. However, dust pick up by wind is only significant at wind speeds above 5 m/s. The smaller the particle size of the material on an exposed surface, the more easily the particles are able to be picked up and entrained in the wind. Moisture binds particles together preventing them from being disturbed by winds or vehicle movements. Similarly vegetated surfaces are less prone to wind erosion than bare surfaces. The larger the areas of exposed surfaces the more potential there will be for dust emissions.

Vehicles travelling over exposed surfaces (i.e. haul roads) tend to pulverise any surface particles. Particles are lifted and dropped from rolling wheels and the surface. Dust is also sucked into the turbulent wake created behind moving vehicles.

The discharge of dust from haul roads has the potential to have effects on two scales. The first is individually from a source where the effects are localised in the immediate area surrounding the activity. Secondly, cumulative effects may be observed where the dust generated from all of the nearby dust sources (such as machinery operating in the pit and adjacent haul roads) combine to affect the air quality of the area as a whole. Therefore, it is important that all dust sources be minimised as far as practical, including those well separated from sensitive locations, as all dust generated will have an effect on the overall air quality in the area.

3.2 Factors Influencing Dust Generation

There are five major factors which influence the potential for dust to be generated from the site. These are:

- Wind speed across the surface
- The percentage of fine particles in the material on the surface
- Moisture content of the material
- The area of exposed surface
- Disturbances such as traffic, excavation, loading and unloading of materials and blasting.

Systems for controlling dust emissions need to include methods that modify the condition of the materials so that it has a lesser tendency to lift with the wind or disturbances such as vehicle movements, and methods that reduce the velocity of the wind at the surface.

Watering of exposed surfaces and materials that may be disturbed is a primary method of control. As a general guide, the typical water requirements for most parts of New Zealand are up to 1 litre per square meter per hour.

The dust prevention methods detailed in Section 4 are the methods that have found to be effective over the last 20 years of operation at the Macraes minesite. They can be used alone or in combination depending on the circumstances.

4 Dust Mitigation Measures and Procedures

The following measures and procedures are implemented as necessary. Where relevant, the measures and procedures are also incorporated into contractors responsibilities.

Unpaved Surfaces (haul roads, waste rock stacks, tailings impoundment surfaces, pits)

- Limit the amount of exposed surfaces as much as possible.
- Retain as much vegetation as possible.
- Keep tailings impoundment, pit and haul road maintenance up to date, such as repair of pot holes and the laying of fresh gravel.
- Keep haul road and exposed surfaces damp during dry conditions with water carts or fixed sprinklers.
- Cover exposed fine fill materials with coarse materials where practicable.

Vehicles (light vehicles, dump trucks, earthmoving machinery)

- Minimise traffic movements and control vehicle speeds to a maximum of 60 km/hr on haul roads.
- Adhere to load sizes to avoid spillages.
- Minimise travel distances through appropriate site layout and design.

Stockpiles (topsoil, brown rock, waste rock)

- Limit the height and slope of stockpiles to reduce wind entrainment.
- Orientate stockpiles to maximise wind sheltering.
- Minimise drop heights.
- Vegetate any stockpiles of materials that are to be left undisturbed for more than three months.
- Maximise shelter from winds as practicable.

Miscellaneous

- Revegetate exposed soil with appropriate vegetation as soon as practical.
- Install wind fences where practicable and appropriate.
- Minimise the area of surfaces covered with fine materials.
- Remove topsoil and loose material covering rock prior to blasting.
- Schedule potentially dusty operations where possible to avoid times of the day and year when conditions are likely to be particularly dry and windy.
- Schedule blasts to take into account wind conditions.

In addition to the above measures, specific dust mitigation methods exist for the tailings impoundment surfaces. These mitigation methods are detailed in the *Southern Pit 11 and Mixed Tailings Impoundment Dust Control Manual presented in Appendix B.* Specifically, the measures outlined in the Tailings Dust Control Manual include:

Tailings Discharge

- Tailings deposition to be sequentially moved around the dam, restricting the likelihood of windborne dust generation created by the tailings beach drying out.

Rock Mattress Cover

- If feasible mitigate dust generation from the tailings beach via construction of a rock mattress. A rock mattress to be laid out over the outer 120m and 90m of the tailings beach for the Mixed Tailings and Southern Pit 11 Tailings Impoundments respectively.
- Rock mattress construction will commence as soon as practicable after cessation of tailings deposition for impoundments constructed using upstream construction methods.

Tailings Wetting System

- For impoundments constructed using upstream construction methods a tailings wetting system is to be established following rockfill mattress construction to enable distribution of either water or tails onto the inner surface of the impoundment surface not covered by the rock mattress.
- Tailings wetting system to have the capacity to be operational at all times when the impoundment is not active or resting.
- Limit traffic on the tailings surface when impoundment inactive in order to preserve the crust.
- Ensure tailings wetting system can be mobilised to other areas of the impoundment where necessary to mitigate dust generation.

5 Monitoring

OceanaGold currently holds two air discharge consents, Consent No 96785_V4 covering general mining and processing operations and Consent No 2006.689 for the purpose of ventilating the underground mine. Copies of these consents are presented in Appendix B.

Under air discharge Consent No 96785_V4 the following monitoring is completed:

- Dust deposition rates at monthly intervals at 13 sites (96785_V4, condition 11);
- Total suspended particulates at 3 sites (approval to downscale monitoring programme to once in every 6 days from November to March given by the Consent Authority in 2001) (96785_V4, condition 12).
- Respirable particulate (PM10) and particles less than 2.5 microns at 4 sites (approval to cease this monitoring given by the Consent Authority in 2001) (96785_V4, condition 13).
- Continuous meteorological monitoring of conditions at a representative location on-site (96785_V4, condition 14).
- Daily record kept of water used for dust suppression (96785_V4, condition 15).

In addition to the resource consent monitoring OceanaGold has a process of checking weather forecasts and advising key operational personnel if strong winds are forecast. This process is set out in the *Southern Pit 11 and Mixed Tailings Impoundment Dust Control Manual*, included as Appendix B.

To ensure that measures are implemented and are effective in minimising dust emissions OceanaGold monitors weather conditions, the condition of potential dust generating areas and undertakes depositional dust and total suspended particulate monitoring.

Table 5.1 below outlines the existing dust monitoring programme.

Table 5.1 – Existing Dust Monitoring Programme

Monitoring Activities	Frequency
Check weather forecasts for strong winds and send electronic alerts to key personnel	Daily
Observe weather conditions, wind via observations (Beaufort Scale)[2].	Daily and as conditions change.
Inspect all haul road surfaces for dampness and general condition	Daily and as conditions change
Inspect all exposed surfaces for dampness and to ensure that surface exposure is minimised.	Daily and as conditions change.
Inspect tailings impoundment surfaces for dampness.	Daily and as conditions change
Inspect tailings impoundment dust suppression systems	Twice daily during extended periods of no deposition

[2] A description of the Beaufort Scale can be found in Appendix C

Monitoring Activities	Frequency
Monitor dust deposition rates in 13 gauges surrounding the minesite	Monthly
Monitor Total Suspended Particulate (TSP) levels	Every 6 days from November to March inclusive, with the Macraes TSP operating every 3 days
Monitor meteorological conditions at Dust Site 3	Continuously

Subject to the issue of expansion mining resource consents for the MPIII Project, the following changes to air discharge monitoring are proposed;

Condition 7

Insoluble dust deposition rates shall not exceed 3g/m^2/30days above background levels beyond the mine boundaries (taken as the boundary of land owned by the consent holder) more than twice in any calendar year. Compliance with this condition shall be demonstrated by the monitoring required in condition 11 of this consent. Background concentrations shall be calculated by averaging the dust deposition rates measured at sites 9, 10 and 17. In the event that values from one of these sites is unavailable the background concentration shall be calculated from the remaining site values.

Condition 8

If any dust deposition rate measurements undertaken at sites 2 and 15 as shown on Figure 1 annexed yield results that exceed 3g/m^2/30days of insoluble dust above background, the consent holder shall undertake an immediate review of dust mitigation methods unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind deposition. This review shall establish the cause of the high results and recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

Condition 10.

If any 24-hour average suspended particulate measurements at Site 15 near Macraes village yield results that exceed 120µg/m^3, the consent holder shall undertake an immediate review of dust mitigation methods, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. This review shall establish the cause of the high results and shall recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

Condition 11

The consent holder shall monitor dust deposition rates at monthly intervals in accordance with draft ISO Standard ISO/SIS 4222.2 ("Air Quality Measurement of Atmospheric Dustfall – Horizontal Deposit Gauge Method" 1980), or another method approved by the Consent Authority. The monitoring shall be undertaken at 13 sites as specified in the application and the attached map.

Condition 12

a) *The consent holder shall monitor total suspended particulate at monitoring site 15 as specified in the application and the attached map in accordance with Australian Standard AS 2724.3 (Determination of Total Suspended Particulates [TSP] High Volume Sampler Gravimetric Method 1984), or another method approved by the Consent Authority. Twenty four hour measurements shall be taken every six days for a minimum period of twelve months.*

b) *The consent holder shall monitor real time total suspended particulate concentrations at monitoring site 15 as specified in the application and the attached map. The monitoring shall be undertaken using a nephelometer, or other instrument as agreed in writing by the consent authority.*

c) *Results of all total suspended particulate monitoring shall be reported to the Consent Authority on an annual basis. The parameters to be reported shall include but not be limited to;*

   i. *Daily minimum, maximum and average, hourly average TSP concentrations as measured by the instruments installed in compliance with condition 12(b)*

   ii. *24-hour average TSP concentrations, as measured by the instruments installed in compliance with conditions 12(a) and 12(b)*

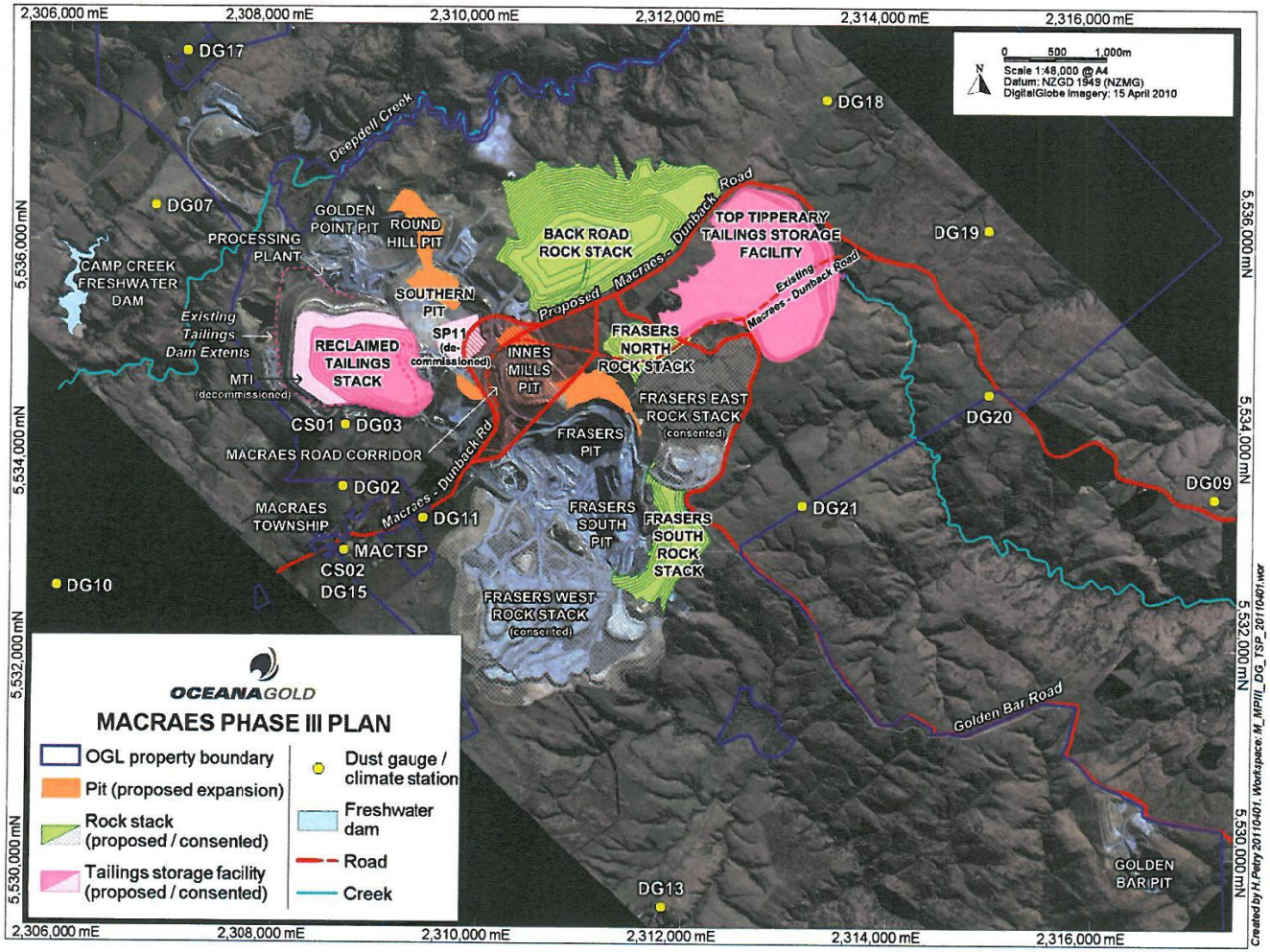
   iii. *Correlation results between the instruments installed in compliance with conditions 12(a) and 12(b).*

Condition 14

a) *Meteorological conditions shall be continuously monitored and recorded at a representative location within the mine site on Golden Point Road. As a minimum, the meteorological data collected shall include wind speed, wind direction, temperature and rainfall. Sufficient information shall also be measured to allow an estimate of atmospheric stability. These estimates shall be obtained from measurements of solar radiation and temperature at two heights above ground level, or other parameters as approved by the Consent Authority.*

b) *Meteorological conditions shall be continuously monitored and recorded at site 15 as specified in the application and the attached map. As a minimum, the meteorological data collected shall include wind speed, wind direction, temperature and rainfall.*

The location of the proposed monitoring sites is shown in Figure 4.


2,306,000 mE
2,308,000 mE
2,310,000 mE
2,312,000 mE
2,314,000 mE
2,316,000 mE
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5,534,000 mN
5,532,000 mN
5,530,000 mN
0 500 1,000m
N
Scale 1:48,000 @ A4
Datum: NZGD 1949 (NZMG)
DigitalGlobe Imagery: 15 April 2010
DG17
DG18
DG19
DG20
DG21
DG09
DG07
DG03
DG02
DG11
DG10
DG15
DG13
CS01
CS02
MACTSP
Deepdell Creek
GOLDEN POINT PIT
ROUND HILL PIT
PROCESSING PLANT
CAMP CREEK FRESHWATER DAM
SOUTHERN PIT
Existing Tailings Dam Extents
RECLAIMED TAILINGS STACK
MTI (decommissioned)
SP11 (de-commissioned)
INNES MILLS PIT
BACK ROAD ROCK STACK
Proposed Macraes - Dunback Road
TOP TIPPERARY TAILINGS STORAGE FACILITY
Existing Macraes - Dunback Road
FRASERS NORTH ROCK STACK
FRASERS EAST ROCK STACK (consented)
FRASERS PIT
MACRAES ROAD CORRIDOR
Macraes - Dunback Rd
MACRAES TOWNSHIP
FRASERS SOUTH PIT
FRASERS SOUTH ROCK STACK
FRASERS WEST ROCK STACK (consented)
Golden Bar Road
GOLDEN BAR PIT
OCEANAGOLD
MACRAES PHASE III PLAN
OGL property boundary
Pit (proposed expansion)
Rock stack (proposed / consented)
Tailings storage facility (proposed / consented)
Dust gauge / climate station
Freshwater dam
Road
Creek
Created by H.Petry 20110401. Workspace: M_MPIII_DG_SP_20110401.mxd

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6 Complaints

Complaints may be referred by one or more of the regulatory authorities, a member of the public or an OceanaGold employee or contractor. It is the responsibility of the Environmental Supervisor to respond to and follow up all complaints regarding dust. The Environmental Supervisor is responsible for ensuring suitably qualified personnel are available to respond to complaints at all times.

Actions to be taken as soon as possible by the Environmental Supervisor

- Fill out an Environmental Incident Report form.
- Note the time, date, identity and contact details of complainant. Wind direction and strength and weather conditions are recorded. Note if complaint has been referred from a Consent Authority.
- Ask the complainant to describe the dust emission; whether it is constant or intermittent, how long it has been going on for, is it worse at any time of day, does it come from an identifiable source.
- As soon as possible after receipt of a complaint undertake a site inspection. Note all dust producing activities taking place, which staff member or contractor is responsible for the site and the dust mitigation methods that are being used. Order any remedial action necessary. If complaint was related to an event in the recent past, note any dust producing activities that were underway at that time, if possible.
- As soon as practical (preferably within two hours) visit the area from where the complaint originated to ascertain if dust is still a problem.
- If it becomes apparent that there may be a source of dust other than activities at Macraes Gold Project causing the dust nuisance it is important to verify this. Photograph and document the source and emissions.
- As soon as possible after the initial investigations have been completed contact the complainant to explain any problems found and remedial actions taken.
- If necessary update any relevant procedures to prevent any recurrence of problems.
- Complete complaint form and file on complaint register.

Follow up actions

- Advise the Otago Regional Council as soon as practical that a complaint has been received and what the findings of the investigation were and any remedial actions taken.

7 Responsibilities

OceanaGold is the holder of the consent for Macraes Gold Mine site and has the ultimate responsibility to ensure that all statutory requirements and conditions of consent are complied with and mining activities are carried out in accordance with the DMP.

Specifically, the following roles share operational responsibility for ensuring mining activities are carried out in accordance with the DMP:

The General Manager Macraes Operation

The Open Pit Mine Manager

The Process Manager

These roles will have the following responsibilities:

- Overall responsibility at the site for ensuring that the dust control and mitigation measures and procedures outlined in section 4 of the DMP are implemented effectively.
- Overall responsibility to ensure that dust emissions are avoided and mitigated as far as is practicable.

The Environmental Supervisor will have the following associated responsibilities:

- Responsibility to ensure that the dust monitoring programme is carried out as required.
- Responsibility to ensure that complaints are received and investigated as outlined in section 6 of the DMP.
- Responsibility to ensure the DMP is current and reviewed at least annually.

All contractors and staff working on site are to ensure that their activities comply with the requirements of the DMP.

8 Consultation

8.1 Neighbours

OceanaGold will consult with the Macraes Community Incorporated (MCI) regularly, as part of the bi-monthly meeting process, to inform them of any issues regarding dust control at the Macraes Gold Mine site that may be of interest to the community and to obtain feedback from the community.

OceanaGold will advise the Macraes Community through MCI of the contact phone numbers to be used to advise OceanaGold of a dust complaint.

The contact phone numbers and email addresses to be used for registering a complaint are included in **Appendix D**.

8.2 Regional and District Councils

OceanaGold will maintain a regular and formal reporting regime with ORC and WDC to inform them of any issues regarding dust control at the site that may be of interest to them and to obtain feedback on compliance and performance.

OceanaGold will provide ORC and WDC with contact numbers to be used to advise OceanaGold of a dust complaint. The contact phone numbers and email addresses to be used for registering a complaint are included in **Appendix D**.

9 Reporting

OceanaGold to Regulatory Authorities

OceanaGold will inform the Otago Regional Council (ORC) of the following:

- Any complaints received regarding dust to as soon as practical after receipt of the complaint.
- Of any non-compliances with monitoring as outlined in Section 5.
- Provide ORC with a copy of the DMP if any significant revisions of the DMP are made during the year.

Otago Regional Council to OceanaGold

OceanaGold has requested that ORC advise of any complaints they receive regarding dust from the Macraes Gold Mine site immediately after a complaint has been lodged.

10 DMP Review Procedure

The DMP shall be reviewed regularly and at least annually preferably during the winter period and prior to the next dry season.

11 Excessive Dust Action Plan

In the event that personnel are unable to control dust adequately on the mine site and additional measures are required in order for OceanaGold to comply with the provisions of the resource consents OceanaGold shall initiate an emergency action plan. OceanaGold will maintain an up-to-date register of persons and contractors who have suitable equipment and personnel available that can be contacted at short notice in the event of a dust emergency occurring.

The emergency procedures may include, but are not limited to, the following:

- The use of additional water carts and irrigation systems
- Stopping work on areas of the site that are sources of excessive dust, where practical.

The emergency contacts register is included in **Appendix D.**

Appendix A

Resource Consents Held for Air Discharges

Otago Regional Council

ORIGINAL

Consent No. 2006.689

DISCHARGE PERMIT

Pursuant to Section 104B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Oceana Gold (New Zealand) Limited

Address: Simpson Grierson, Barristers & Solicitors, Level 24, HSBC Tower, 195 Lambton Quay, Wellington

To discharge contaminants to air

for the purpose of ventilating Frasers Underground Mine

for a term expiring on 31 August 2032 or on completion of the rehabilitation of the underground mine, whichever occurs earlier

Location of activity: Frasers Underground Mine, immediately east of Frasers Pit, and approximately 2.6 kilometres northeast of the Macraes Flat township, Macraes Flat, East Otago.

Legal description of land: Sec 27 Blk II Highlay Survey District

Map grid reference: NZMS 260 I42:114-334

Conditions

1. This consent shall be exercised in accordance with the application for resource consent dated 2 October 2006, including the Assessment of Environmental Effects and all supporting documents.

2. There shall be no discharge of contaminants resulting from the consent holder's activities that, in the opinion of an enforcement officer of the Consent Authority, is offensive or objectionable at or beyond the boundary of the consent holder's premises.

3. The Consent Authority may, in accordance with sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent for the purpose of:
   (a) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the consent; or

Otago Regional Council

(b) ensuring the conditions of this consent are consistent with any National Environmental Standards; or

(c) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this consent.

Issued at Dunedin this 14th day of February 2007

Christopher P Shaw
Manager Consents
j g:\sl2\j\oceanagold1.doc

DISCHARGE PERMIT

Pursuant to Section 105 of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: *Oceana Gold (New Zealand) Limited*
~~GRD Macraes Limited~~
~~Macraes Mining Company Limited, PO Box 84, Palmerston~~

Address: C/- Simpson Grierson, Level 24, HSBC Building,
195 Lambton Quay, Wellington
~~C/o Anderson Lloyd, Private Bag 1959, Dunedin~~

to discharge contaminants from mining operations and post mining rehabilitation to air in the vicinity of Macraes Flat at the site shown on Map A annexed.

Description of consent location: Mine Boundaries

Map reference centre of activity: NZMS 260 I42:105-335

Commencement of Consent: This consent shall commence when:
(i) The provisions of Section 116 Resource Management Act 1991 are satisfied.
(ii) The consent authority has accepted the surrender under S138 of the Resource Management Act 1991 of discharge permit 95787.

Expiry of Consent: This consent shall expire on 31 August 2032 or on the completion of rehabilitation to the satisfaction of the consent authority at the site shown on Map A annexed, whichever occurs earlier.

Conditions

1. This consent shall not be exercised until air discharge permit number 95787 is surrendered in accordance with Section 138 of the Act.

2. This consent shall be exercised together with land use consents 96/98 and 96/99 issued by the Waitaki District Council.

3. This consent shall be exercised in accordance with:

   (i) the application for resource consent dated December 1996 including the Assessment of Environmental Effects and all supporting documents (which are deemed to be incorporated in, and form part of this consent);

   (ii) *the application for a change in conditions of consent 96785_V1 dated May 2001 (and supporting documents);*

(iii) *the application for a change in conditions of consent 96785_V2 dated April 2004 (and supporting documents) that is relevant only to the construction of the decline;*

(iv) *the application for a change in conditions of consent 96785_V4 dated May 2005 (and supporting documents);*

except to the extent that any condition in this consent is inconsistent with such material. If there is an inconsistency the conditions and terms of this consent shall prevail.

4. This discharge shall occur in the area shown on Map A annexed and in Figure 1 annexed.

5. The consent holder shall minimise any adverse effect on the environment resulting from the discharge of dust. The methods shall include the following :

a) Minimising the areas of disturbed ground.

b) Watering, with water trucks and fixed sprinklers.

c) Avoiding as far a possible, ground disturbance when wind may cause dust nuisance.

d) Taking wind conditions into account in planning and carrying out work to minimise dust dispersion.

e) Ensuring materials being moved are kept in a coarse state.

f) Covering materials.

g) Replanting disturbed ground as soon as possible, including temporary planting if necessary.

Dust Limits

6. There shall be no emission of visible dust from the mining activities that, in the opinion of an enforcement officer, is offensive or objectionable to such an extent that it has an adverse effect on the environment.

7. Dust deposition rates shall not exceed $3g/m^2/30$ days above background levels beyond the mine boundaries more than twice in any calendar year. Compliance with this condition shall be demonstrated by the monitoring required in condition 11 of this consent.

8. If any dust deposition rate measurements undertaken at sites 2 and 16 as shown on Figure 1 annexed yield results that exceed $3g/m^2/30$days of total dust above background, the consent holder shall undertake an immediate review of dust mitigation methods unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind deposition. This review shall establish the cause of the high results and recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

9. Total suspended particulate concentrations shall not exceed 150μg/m^3 beyond the mine boundaries, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. Compliance with this condition shall be demonstrated by the monitoring required in condition 12 and 13 of this consent.

10. If any suspended particulate measurements near Macraes village yield results that exceed 120μg/m^3, the consent holder shall undertake an immediate review of dust mitigation methods, unless it can be demonstrated that sources other than the mine have contributed to the majority of downwind suspended particulate. This review shall establish the cause of the high results and shall recommend measures to improve the level of dust mitigation. A report outlining the findings of this review shall be provided to the Consent Authority within 1 month of the high result(s) being received.

Monitoring

11. The consent holder shall monitor dust deposition rates at monthly intervals in accordance with the draft ISO Standard ISO/SIS 4222.2, ("Air Quality Measurement of Atmospheric Dustfall - Horizontal Deposit Gauge Method" 1980), or another method approved by the Consent Authority. The monitoring shall be undertaken at 13 sites as specified in the application (Figure 1).

12. The consent holder shall monitor total suspended particulate at three sites in accordance with Australian Standard AS 2724.3 ("Determination of Total Suspended Particulates [TSP] High Volume Sampler Gravimetric Method" 1984), or another method approved by the consent authority. Twenty-four hour measurements shall be taken every six days during winter and every three days during the months November through to March inclusive for two years. Thereafter 24 hour measurements shall be taken every six days during the months November through to March inclusive. The specific location of sites shall be approved by the Consent Authority.

13. The consent holder shall measure respirable particulate (PM_{10}) and particles less than 2.5 microns at four sites. Collected particulate shall also be analysed for respirable quartz. The method of measurement shall involve a dichotomous high volume sampler or another method approved by the consent authority. Twenty-four hour measurements shall be taken at least once per month during November through to March inclusive. Monitoring may cease at any site if all quartz results at that site are below 6μg/m^3 and all respirable particulate results are below 50μg/m^3 for two consecutive summers.(ie November-March). The specific location of sites shall be approved by the Consent Authority.

14. Meteorological conditions shall be continuously monitored and recorded at a representative location within the mine site. As a minimum, the meteorological data collected shall include wind speed, wind direction, temperature and rain fall. Sufficient information shall also be measured to allow an estimate of atmospheric stability. These estimates shall be obtained from measurements of solar radiation and temperature at two heights above ground level, or other parameters as approved by the Consent Authority.

15. The consent holder shall keep a daily record of water used for dust suppression. Included in this record shall be an estimate of the total area over which water is applied.

Monitoring reports and quality assurance

16. Results of all dust deposition rate monitoring and all other monitoring shall be reported to the Consent Authority as set out in the ~~General Provisions of Schedule II~~ ***Standard Conditions attached as Appendix I.***

17. The consent holder shall commission an independent consultant to undertake an annual review and assessment of all dust monitoring data, and if the consent holder must initiate a review of dust mitigation measures to comply with condition 8 and 10 of this consent. The reviewers report shall include :

    a) The name, qualifications, and experience of the reviewer.

    b) The methods used and the investigations undertaken for the review

    c) Interpretation of the monitoring data reviewed

    d) An assessment of the quality of the monitoring data

    e) An assessment of the monitoring regime

    f) A description and evaluation of each of the dust mitigation measures used by the consent holder.

    g) Recommendations on whether:

        i) The monitoring of dust is adequate or should be changed, and if changed the changes that are recommended.

        ii) The dust mitigation measures used by the consent holder are adequate, or should be changed, and the changes that are recommended.

        iii) Any changes should be made to the conditions of this consent.

    h) Any other matters which the reviewer considers should be drawn to the attention of the consent holder or the Consent Authority

18. The consent holder shall carry out the recommendation in the report unless any recommendation is inconsistent with any condition of this consent. If there is any inconsistency, the consent holder may, within 3 months of the date of the report, apply to the Consent Authority under Section 127(1)(a) of the Act to change or cancel any inconsistent condition.

    Evidence of compliance with the recommendation shall be contained in the Annual Work and Rehabilitation Programme.

19. The review reports shall be provided to the Consent Authority every 12 months, unless otherwise agreed in writing before the anniversary of the commencement of this consent.

20. The consent holder shall record details of any complaints received about odour generated from mining operations. The name of the complainant, their address, the time, duration and location of the odour event shall be recorded. A record of the complaint setting out the details as in this condition shall be forwarded to the Consent Authority as soon as is practicable.

21. The conditions of this consent may be reviewed by the Consent Authority giving notice in accordance with Section 129 of the Act within 3 months of:

    (a) Receiving the Annual Work and Rehabilitation Programme.

    (b) Receiving any monitoring information relating to the exercise (including the review reports required by conditions 10, 17 and 18 of this consent).

    (c) Any material change in circumstances (including, but without limitation, change in expansion, or cessation of the mining operations to which this consent relates)

    for the purposes of:

    (i) Dealing with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage.

    (ii) Requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.

    (iii) Ensuring the conditions of this consent are appropriate.

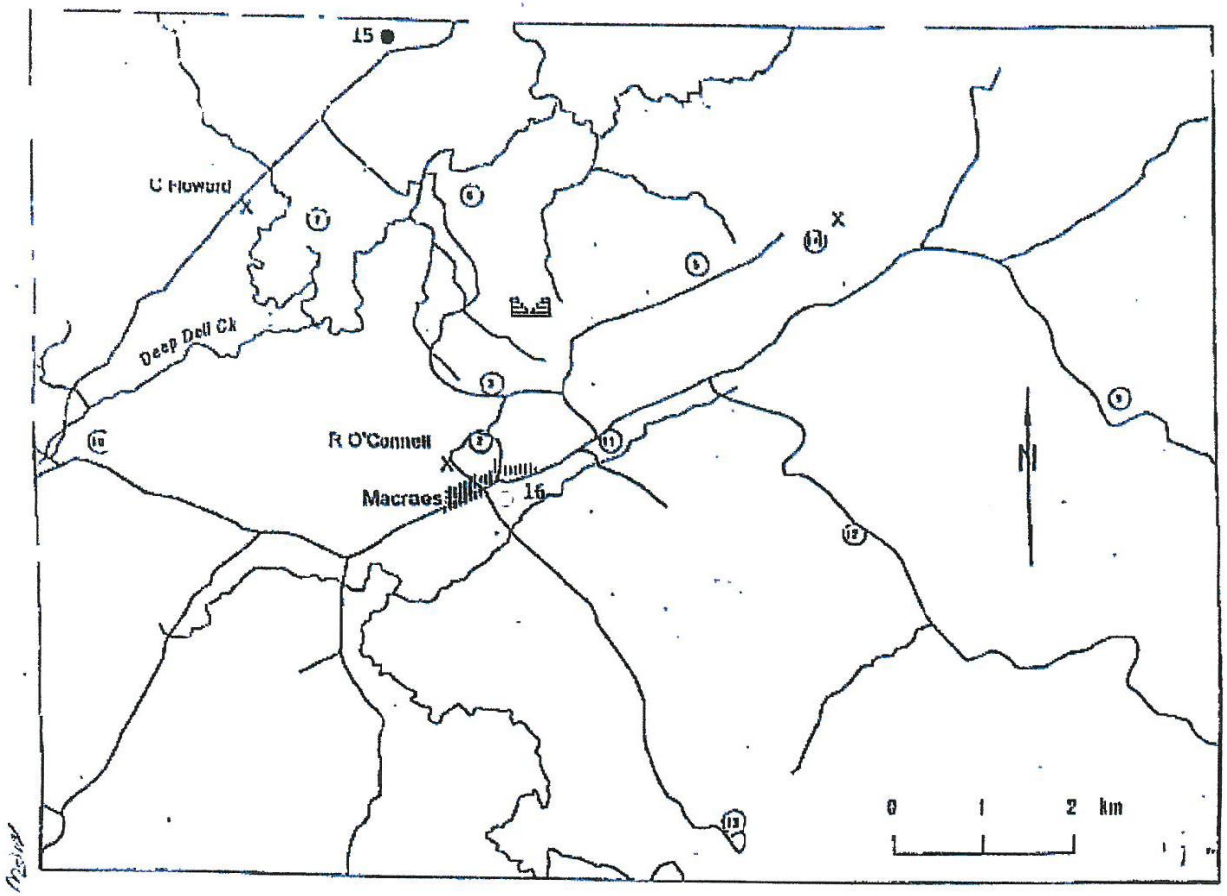
22. This consent shall be exercised in accordance with and be subject to the standard conditions of the Macraes gold mine expansion project annexed as Appendix 1.

Issued at Dunedin this 4th day of March 1998
Reissued at Dunedin on this 10th day of January 2003 with changes to the standard conditions (Additions underlined and italicised, deletions struck out).
Reissued at Dunedin on this 16th day of June 2004, to reflect a name change, and changes to condition 3 (additions underlined and italicised, deletions struck out).
Reissued at Dunedin on this **11th day of October 2005**, to reflect changes to the standard conditions (additions underlined and italicised, deletions struck out).

Reissued at Dunedin on this 27th day of October 2005, to reflect changes to condition 3 (additions underlined and italicised, deletions struck out).

Christopher P Shaw
Manager Consents
JULIEP C:\Documents and Settings\juliep\Local Settings\Temporary Internet Files\OLK1\consent_V4 - .doc


MAP "A"
MINE BOUNDARIES
Cape Breton Regional Council
GOLDEN TWIST PIT
FRASERS WEST WASTE ROCK STACK
FRASERS EAST WASTE ROCK STACK
UPPER TIPPERARY TAILINGS DAM
TIPPERARY WATER STORAGE DAM
LOWER TIPPERARY TAILINGS DAM



Otago Regional Council

Figure 1

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AIR DISCHARGE PERMIT

Location of dust deposition monitoring sites 1 to 16.

Monitoring shall be undertaken at all sites with the exception of sites 1,4 and 8. This comprises 13 sites.

Appendix 1 Standard Conditions

1. General Review

1.1 The conditions of this consent may be reviewed by the Consent Authority giving notice in accordance with section 129 of the Act, within three months of receiving an Annual Work and Rehabilitation Programme, or a Project Works and Rehabilitation Programme for the purposes of:-

a) Dealing with any adverse effect on the environment which may arise from the exercise of the consent which is appropriate to deal with at a later stage; and/or

b) Ensuring the conditions of this consent are appropriate; and/or

c) If this consent is a discharge permit, requiring the consent holder to adopt the best practicable options to remove or reduce any adverse effect on the environment; and/or

d) Ensuring that rehabilitation is completed in accordance with the rehabilitation objectives and terms of this consent.

2. At least 12 months prior to the expiry or surrender of this consent, the consent holder shall submit to the consent authority an updated detailed site rehabilitation plan which shall include everything necessary to complete compliance with the conditions of this consent. The consent holder shall obtain any necessary consents to rehabilitate the site in sufficient time for this to not affect rehabilitation.

3. The consent holder shall pay the Consent Authority an annual administration charge pursuant to Section 36 of the Resource Management Act 1991 for the carrying out by the consent authority of its functions in monitoring, enforcing and administering this consent. The reasonable costs of compliance of all requirements and conditions of this consent shall be met by the consent holder.

4. Any function ascribed to the Consent Authority in any condition of this consent may be performed by an appropriately authorised officer of the Consent Authority.

5. The consent holder shall notify in writing the Consent Authority immediately of the first exercise of this consent.

6. Work and Rehabilitation Programmes

6.1 Before exercising this consent the consent holder shall submit to the Consent Authority

(a) a Project Work and Rehabilitation Programme and
(b) an Annual Work and Rehabilitation Programme.

6.2 **The Project Work and Rehabilitation Programme** shall provide an overview of the project for the duration of the consent and shall include:

a) a statement of mining objectives,
b) a description of mining operations for the duration of the consent including the methods and form of all mining operations,
c) the intended mining programme, including a timeframe and the sequence of all operations,
d) a plan showing the location and footprints of all existing and proposed structures and impoundments,

e) a plan showing the contours for all existing and proposed structures and impoundments,

f) a description of all adverse effects on the environment which will or may arise from the exercise of the consent,

g) the precautionary measures which the consent holder will adopt to prevent adverse effects on the environment,

h) a description of how the consent holder will give effect to the objectives and conditions of this consent,

i) the sequence and form of the mitigation measures the consent holder will adopt to remove or reduce adverse effects on the environment,

j) the monitoring and reporting programme which the consent holder will adopt to detect adverse effects on the environment and to monitor compliance with consent conditions,

k) a full statement of how the consent holder intends to satisfy the rehabilitation conditions of this consent,

l) a description of rehabilitation undertaken during the term of the consent including the methods and success of rehabilitation,

m) the intended rehabilitation programme including a time frame and the sequence of rehabilitation,

n) the provision (including financial provision) made by the consent holder for dealing with any adverse effect on the environment which may arise from the exercise of the consent. The consent holder shall set out the principles and methods by which the costs of dealing with adverse effects may be calculated annually during this consent.

o) the provision (including financial provision) made by the consent holder for complying with all rehabilitation conditions of this consent - the consent holder shall set out the principles and methods by which the costs of complying with the rehabilitation conditions may be calculated annually during this consent.

p) the provision (including financial provision) made by the consent holder for carrying out the monitoring required by the conditions of this consent - the consent holder shall set out the principles and methods by which the costs of complying with the monitoring conditions may be calculated annually during this consent.

q) a description and analysis of all contingencies which may affect compliance with the conditions of consent.

r) any information required by any other condition of this consent.

s) the consent holders recommendations for rehabilitation maintenance, monitoring, inventory and reporting when mining operations and rehabilitation have been completed.

6.3 The Project Work and Rehabilitation Programme shall be reviewed and updated annually. The reviewed Project Work and Rehabilitation Programme shall be included in the Annual Work and Rehabilitation Programme together with a statement identifying and explaining all the amendments to the Project Work and Rehabilitation Programme as a result of the latest review.

6.4 The Annual Work and Rehabilitation Programme shall be consistent with the Project Work and Rehabilitation Programme.

6.5 **The Annual Work and Rehabilitation Programme** shall include:

a) a detailed description (including sequence, method and form) of all the mining operations, mitigation measures, rehabilitation, monitoring and reporting carried out in the last 12 months

b) an explanation of any departure in the last 12 months from the previous Annual Work and Rehabilitation Programme or The Project Work and Rehabilitation Programme.

c) a detailed description (including sequence, method and form) of all mining operations, mitigation measures, rehabilitation, monitoring and reporting intended to be carried out in the next 12 months

d) an explanation of any intended departure from any previous Project Work and Rehabilitation Programme in the next 12 months

e) a description and analysis of any unexpected adverse effect on the environment that has arisen as a result of the exercise of the consent in the last 12 months and the steps taken to deal with it and the results of those steps.

f) a full report describing and evaluating the mitigation measures used in the last 12 months

g) a full report on the rehabilitation undertaken during the exercise of the consent and the results of these measures.

h) plans showing the actual footprints of all works and structures and any proposed changes at the end of the next 12 months.

i) plans showing the actual contours of all works and structures and any proposed changes in contours at 5 metre intervals at the end of the next 12 months.

j) an up to date and detailed calculation of the cost of dealing with any adverse effects on the environment arising or which may arise from the exercise of this consent.

k) an up to date and detailed calculation of the costs of complying with all rehabilitation conditions of this consent.

l) an up to date and detailed calculation of the costs of the monitoring required by the conditions of this consent and until the consent expires.

m) an up to date mine closure plan describing in detail the steps that would need to be taken if mining operations stopped in the next 12 months, how the consent holder proposes to comply with the conditions of this consent on closure and an up to date and detailed calculation of the costs of complying with all conditions of consent if mining were to stop in the next 12 months.

n) any other information required by any other condition of this consent.

6.6 The consent holder shall provide the Consent Authority with any further information, or report, which the consent authority may request after reconsidering any project work and rehabilitation programme, or any annual work and rehabilitation programme. This information or report shall be provided in the time and manner required by the Consent Authority.

6.7 The consent holder shall exercise the consent in accordance with the Annual Work and Rehabilitation Programme and Project Work and Rehabilitation Programme.

6.8 The consent holder must submit an Annual Work and Rehabilitation Programme to the Consent Authority on or before each anniversary of the commencement of the consent. The consent holder may, at any time, submit to the Consent Authority an amended Annual Work and Rehabilitation Programme.

6.9 The consent holder shall provide the Chairperson of Macraes Community Incorporation with a copy of each Annual Work and Rehabilitation Programme and the initial Project Work and Rehabilitation Programme.

6.11 The Annual Work and Rehabilitation Programme for this consent may be combined with an annual work and rehabilitation programme required by any other consent held by the consent holder for mining operations at Macraes Flat.

6.12 Rehabilitation

1. **Objectives**

*The objective of the Heritage and Art Park to be achieved by the consent holder, as part of the rehabilitation of the site, is to create, manage and sustain an **environmentally sound** visitor destination that provides future growth and development of options for the community once mining has ceased, by carrying out the following:*

I. To promote and develop the Heritage and Art Park as a recreational resource for the public.

II. To create land art works by artists with significant reputation, to be part of the visitor experience.

III. To retain workings and structures from the present mining operation, and integrate these features in the Heritage and Art Park, to be part of the visitor experience.

IV. To preserve heritage/historic features located in the site, and integrate these features in the Heritage and Art Park, to be part of the visitor experience.

V. The revegetation of rock stacks, pits, tailings impoundments, and the banks of water bodies with indigenous tussocks, shrubs, or indigenous or exotic trees as part of the restoration of the ground cover and shelter, and which provides for and enhances the visitor experience.

VI. To provide the necessary infrastructure that provides for and enhances the visitor experience, while taking all reasonable steps on matters relating to visitor safety.

VII. To visually integrate finished structures, landforms and vegetation into the surrounding landscape so they appear to be naturally occurring features, except for specific works authorised by this consent .

VIII. To ensure that all aspects of the Heritage and Art Park do not compromise the environmental integrity of the site, in particular the integrity of the tailings dam(s), pits and waste rock stacks, including the water quality associated with any water bodies on the site, and the quality of the water discharged either as pore water or runoff from the aforementioned features.

The rehabilitation objectives to be achieved by the consent holder are:-

a. To ensure short and long term stability of all structures and works and their surrounds.

b. To avoid maintenance after completion of rehabilitation requirements.

c. To protect water and soil.

d. To restore all disturbed water bodies, including their banks and beds, to a natural and stable condition.

e. To return land as closely as possible to its original productive potential or to another appropriate use, specified in the detailed rehabilitation plan.

f. To visually integrate finished structures, land-forms and vegetation into the surrounding landscape so they appear to be naturally occurring features.

g. To remove all temporary buildings and all plant and equipment.

The following conditions on rehabilitation are to be carried out in conjunction with resource consent LRC 01/21 held by the consent holder, which sets out the conditions to establish and operate the Macraes Heritage and Art Park, which forms part of the rehabilitation for the mine site.

Specific rehabilitation methods authorised by the conditions set out in resource consent LRC 01/21 (Heritage and Art Park) override the rehabilitation conditions set out below only to the extent that:

a) the structures, vegetation, water bodies or earthworks are directly associated with the Heritage and Art Park; and

b) the conditions in LRC 01/21 are inconsistent with the rehabilitation conditions below.

Any structures, plantings or earthworks, not directly associated with those conditions set out in LRC 01/21, must comply with the following rehabilitation conditions.

2. **Soil**

The consent holder shall, as far as practicable, stockpile soil from any disturbed ground, unless the soil is required to be left in place to protect water and soil values. All salvaged soil shall be used for rehabilitation purposes.

3. **Waste Rock Stacks**

When constructing waste rock stacks, objective *VII* shall be achieved by applying the following principles:-

a. Slopes shall be suitably concave or convex in cross-profile to match nearby natural slopes.

b. Slope gradients shall be no steeper than nearby natural surfaces.

c. Transitions between natural and formed surfaces shall be rounded and naturalised.

d. Contours should be curvilinear in plan form, in keeping with original natural contours in that area.

e. The skyline shall be variable and curved, according to natural skylines.

f. New landforms shall be aligned and located so they seem to continue, not cut across, existing landscape patterns.

g. All possible waste rock shall be backfilled into pits in order to minimise the size of waste rock stacks.

h. Tree planting and revegetation shall usually be of a species and location similar to vegetation already in the district.

4. **Earth Shaping and Visual**

The following requirements shall apply to the rehabilitation of permanent earthworks:-

a. The consent holder shall design and construct all permanent earthworks to the form shown in the detailed rehabilitation plan.

b. Except with the written approval of the consent authority, the consent holder shall locate, form and shape all earthworks so that their profiles, contours, skylines and transitions closely resemble and blend with the surrounding natural landforms.

c. If the consent authority accepts that earthworks cannot be fully naturalised, the consent holder shall minimise the extent of their visibility and maximise their visual interest and visual integration into their surroundings.

5. **Vegetation**

a As mining operations or other works are completed in any area, the consent holder shall carry out land rehabilitation as follows:-

i) Either into improved pasture with plantings of appropriate shelter trees, provided that no trees or shrubs shall be planted on any tailings impoundment cap; or

ii) With indigenous species which visually blend into the surroundings.

b Rehabilitation by planting shall be carried out progressively as land becomes available.

c The consent holder shall maintain vegetation cover until the expiry of the consent and ensure that the vegetation will be self-sustaining after expiry.

6 **Buildings**

a Before the expiry of the consent the consent holder shall remove all buildings, plant and equipment (whether attached to the land or not) associated with the exercise of this consent.

b This condition does not apply to

i) Any waste rock stack, permanent earthworks, tailings impoundment, water storage reservoir, water body, road or other work and any associated plant and equipment which under this or any other resource consent is permitted or required to remain after this consent expires

ii) Any rehabilitation required by this or any other resource consent.

iii) Any monitoring structure required by this or any other resource consent to remain after the expiry of this consent.

6.13 Detailed Rehabilitation Plan

As part of the Annual Work and Rehabilitation Programme, the consent holder shall prepare a detailed Rehabilitation Plan containing:

a. An overall rehabilitation programme for the next five years.

b. A description of final rehabilitation.

c. The details of the location, design (including shape form and contour) and construction of all permanent structures.

d. Details of all topsoil to be stripped and stockpiled in the coming year and of surface pre-treatment and re-use of topsoil on finished areas.

e. Drainage details for disturbed and rehabilitated areas.

f. Details of any vegetation rehabilitation planned for the next 12 month period, including the areas to be rehabilitated, methods proposed, time results of previous trials and rehabilitation work, any further trials proposed, and any vegetation or rehabilitation problems encountered and the steps being taken to resolve these.

g. Details of the management of all areas previously rehabilitated.

h. Details of all proposed rehabilitation for the next 12 months.

i. Details of actual contours to an accuracy of 5 metres of all existing pits, backfill, dams, tailings impoundments, and waste rock stacks.

6.14 Final Site Rehabilitation Plan

a. ~~Within five years of the first exercise of this consent,~~ The consent holder shall submit to the consent authority in the Annual Work and Rehabilitation Programme, a Final Site Rehabilitation Plan *by August 2010.*

b. The Plan shall be prepared in consultation with Macraes Community Incorporated and Takata Whenua of the area, and any other interest groups identified by the consent authority, *and shall also comprise all the planned components of the Heritage Art Park, as required by resource consent LRC 01/21.*

c. The Final Site Rehabilitation Plan shall demonstrate compliance with the objectives and terms of the rehabilitation conditions of this consent.

d. The Final Site Rehabilitation Plan shall describe in detail the consent holder's proposals for the completion of rehabilitation.

e. The Final Site Rehabilitation Plan shall include:-

i The final design of all works and structures.

ii A plan of the intended final contours, drawn at five metre contour intervals, of all permanent structures and works, including pits, dam embankments, tailings impoundments, waste rock stacks and roads.

iii. A plan showing intended final footprints for all works and structures

iv Details of proposed vegetation rehabilitation.

v. Details of management, maintenance, monitoring and reporting proposed by the consent holder for the completion of rehabilitation.

7. Bonds

7.1 Types of Bonds

The consent holder shall provide and maintain in favour of the consent authority one or more bonds comprising:

a. A performance bond to secure the completion of rehabilitation in accordance with the conditions of this consent, and

b. A monitoring bond to ensure the performance of the monitoring obligations (if any) of the consent holder of this consent.

7.2. Form of Bonds

The performance and monitoring bonds shall be in a form approved by the consent authority and shall, subject to this condition, be on the terms and conditions required by the Consent Authority.

7.3 Content of Bonds

a. The performance bond shall provide that the consent holder remains liable under the Act for any breach of the conditions of the consents listed in schedule 1 that occurs before the expiry of the consent and for any adverse effect on the environment which becomes apparent during or after the expiry of the consent.

b. The monitoring bond shall provide that the consent holder remains liable under the Act for any breach of the monitoring conditions of the consents listed in schedule 2 that occurs before the expiry of the consent, and for the monitoring for and of any adverse effect on the environment which becomes apparent during or after the expiry of the consent.

7.4 Guarantee

a. The performance by the consent holder of all the conditions of each bond shall be guaranteed by a guarantor acceptable to the consent authority.

b. The guarantor shall, in each bond, bind itself to pay for the carrying out and completion of any conditions in the consents which are the subject of the bond, in the event of any default of the consent holder, or any occurrence of any adverse environmental effect requiring remedy.

7.5 Amount

a. The amount of each bond shall be fixed annually by the consent authority which shall take into account any calculations and other matters submitted by the consent holder relevant to the determination of the amount in the Annual Work and Rehabilitation Programme, or otherwise.

b. The amount of the performance bond shall include:-

i) The estimated costs of complete rehabilitation in accordance with the conditions of the consents, on completion of the mining operations proposed for the next year and described in the Annual Work and Rehabilitation Programme; and

ii) Any further sum which the Consent Authority considers necessary to allow for remedying any adverse effect on the environment that may arise from the exercise of the consents.

c. The amount of the monitoring bond shall include:-

i) The estimated costs of monitoring, in accordance with the monitoring conditions of the consent until the consent expires: and

ii) Any further sum which the consent authority considers necessary for monitoring any adverse effect on the environment that may arise from the exercise of the consent including monitoring anything which is done to remedy or mitigate an adverse effect.

7.6 If, on review, the amount of a bond to be provided by the consent holder is greater than the sum secured by the current bond, the consent holder and guarantor shall execute and lodge with the Consent Authority, a new bond for the amount fixed on review by the Consent Authority, within one month of the consent holder being given notice of the new amount to be secured by the bond. The consent holder shall not exercise this consent, if the new bond is not provided in accordance with this condition.

7.7. General
Any bond may be varied, cancelled or renewed at any time by agreement between the consent holder, guarantor and Consent Authority.

7.8 Costs
The costs of providing any bond shall be paid by the consent holder.

7.9 Expiry of Consents
Before the expiry or surrender of the consents, the consent holder shall provide in favour of the Consent Authority, performance and monitoring bonds in accordance with this condition, for a period of 20 years from the expiry or surrender of the consent.

The amount of the bond provided shall include:

a. The estimated costs of dealing with any adverse effect on the environment which may become apparent after the surrender or expiry of the consent; this sum may include (without limitation) provision to deal with structural instability or failure, land and water contamination, and failure of rehabilitation in terms of the rehabilitation objectives and terms of this consent.

b. The estimated costs shall include the costs of:
- investigation
- prevention,
- remediation

of any adverse effect.

c. The estimated costs of monitoring for and of any adverse effect and of measures taken to prevent or remedy any adverse effect.

d. Provision for contingencies.

7.10 The consent shall not be exercised until performance and monitoring bonds have been executed by the consent holder and any guarantor and lodged with the Consent Authority.

8. Landscape
The consent holder shall use a landscape architect to help in the planning and design of all permanent earthworks and structures.

9 Lapse of Consents

a. For the purposes of section 125(1) of the Act, this consent shall lapse on the expiry of five years after the date of commencement of the consent.

b. This standard condition is subject to any other consent condition which expressly provides otherwise.

10. **Cessation of mining.**
Any mining and any other activity authorised by this consent relating to the taking, winning, extraction, transport, treatment, processing and separation of any mineral, shall cease no later than 31 August 2012.

Definitions

"Act" means the Resource Management Act 1991, and includes all amendments to the Act, and any enactments made in substitution for the Act.

"Annual Work and Rehabilitation Programme" means the Annual Work and Rehabilitation Programme required by standard condition 6

"Building Work" means work for or in connection with the construction, operation, demolition or removal of a building and includes sitework.

"Building" means any temporary or permanent structure.

"Consent Authority" means the Otago Regional Council and includes its successors, and also includes any person to whom the Consent Authority delegates or transfers any of its functions, powers and duties as a Consent Authority under the Act.

"Exploration" means any activity undertaken for the purpose of identifying mineral deposits or occurrences and evaluating the feasibility of mining particular deposits or occurrences of one or more minerals; and includes any drilling, dredging, or excavations (whether surface or sub-surface) that are reasonably necessary to determine the nature and size of a mineral deposit or occurrence; and "to explore" has a corresponding meaning.

"Landscape Architect" means a corporate member of the New Zealand Institute of Landscape Architects Inc or equivalent body.

"Mining" means to take, win, or extract, by whatever means, a mineral existing in its natural state in land, or a chemical substance from that mineral, for the purpose of obtaining the mineral or chemical substance; but does not include prospecting or exploration; and "to mine" has a corresponding meaning.

"Mine Boundaries" for the purposes of this consent the mine boundaries are drawn on Map B.

"Mining Operations" means operations in connection with mining, exploring, or prospecting for any gold, including -

a. The extraction, transport, treatment, processing, and separation of any gold; and
b. The construction, maintenance, and operation of any works, structures, and other land improvements, and of any machinery, and equipment, connected with such operations; and
c. The removal of overburden by mechanical or other means, and the stacking, deposit, storage, and treatment of any substance considered to contain any mineral; and
d. The deposit or discharge of any mineral, material, debris, tailings, refuse, or wastewater produced from or consequent on, any such operations; and
e. The doing of all lawful acts incidental or conducive to any such operations -

when carried out at or near the site where the mining, exploration, or prospecting is carried out.

"Prospecting" means any activity undertaken for the purpose of identifying land likely to contain exploitable mineral deposits or occurrences; and includes -

a Geological, geochemical, and geophysical surveys; and
b The taking of samples by hand or hand held methods; and
c Aerial surveys, -
and "to prospect" has a corresponding meaning.

"Sitework" means work on a building site, including earthworks, preparatory to or associated with the construction, alteration, demolition or removal of a building.

"Specific condition" means the conditions that are set out in each consent.

"Standard condition" means the standard conditions set out in Appendix I. The standard conditions of the consent are subject to the specific conditions of the consent. If there is any inconsistency between the specific and standard conditions, the specific conditions prevail.

"Structure" includes a dam and a waste rock stack, a tailings dam, a water storage impoundment and a silt pond.

"The conditions" of the consent are the specific conditions set out for the consent, the standard conditions, and, where conditions provide, the provisions of schedules I and II.

"WDC" means the Waitaki District Council and includes its successors, and also includes any person to whom the council delegates or transfers any of its functions, powers and duties under the Act.

"Supporting documents" means the supporting documents listed at p110-112 of the Macraes Mining Company Limited, Macraes Gold Project Expansion, Assessment of Environmental Effects, December 1998, and also includes all other material (including statements of evidence and submissions) provided by the applicant to the Consent Authority in support of the application for the consent ***or in support of any subsequent variations to consent conditions applied for under section 127 of the Act.***

"Rehabilitation objectives and terms" means the rehabilitation, objectives and terms set out in standard condition 6.

A consent is first exercised when anything is done to give effect to the consent, including anything which is done to comply with any consent condition which must be satisfied before any activity authorised by the consent may begin.

~~Schedule I — Water Quality Standards~~

~~**(a) Narrative Standard**~~

~~The waters of Deepdell Creek, Battery Creek, Murphys Creek, the North Branch of the Waikouaiti River, Tipperary Creek, and all their tributaries, shall at all times be free of contaminants attributable to mineral processing and associated activities in concentrations which adversely affect directly or indirectly water uses or which adversely affect humans, animals, plants or aquatic life.~~

~~**(b) Numerical Standards**~~

~~***(i) Tipperary Creek Tailings Dams*** ***96795 97202***~~

~~Groundwater quality at the Seepage Compliance Points at the lower ends of the side gullies of Tipperary Creek where the Upper and Lower Tipperary Creek Tailings Dams are located shall not exceed the following standards (where the metals standards are all soluble determinations):~~

Constituent	Standard (g/m^3)
$cyanide_{WAD}$	0.1
arsenic	0.19
copper [1]	0.011
iron	2.1
lead [1]	0.0025
pH (range)	6.0 – 9.5

(ii) Round Hill Pit Compliance Points 96821

Groundwater quality at the compliance points in Battery Creek and between the Golden Point Pit and Deepdell Creek, shall not exceed the following standards (where the metals standards are all soluble determinations). These standards are the same as for Maori Tommy Gully.

Constituent	Standard (g/m^3)
$cyanide_{WAD}$	0.18
arsenic	6.5
copper [1]	0.2
iron	21
lead [1]	0.04
pH (range)	6.0 – 9.5

(iii) Pit Lake (Frasers and Innes Mills Pit) 96812, 96814, 96815, 96816

Pit Lake and lake overflow water quality shall not exceed the following standards. All metals standards are soluble determinations.

Constituent	Standard (g/m^3)
Arsenic	0.19
Copper [1]	0.011
Lead [1]	0.0025
pH (range)	6.0 – 9.5

Note [1]

Copper and lead standards shall be hardness related limits in accordance with the following. A hardness has been assumed of $100 g/m^3$ as $CaCO_3$ in the table above.

$$\text{Copper Limit } (g.m^{-3}) = \frac{0.96.e^{0.8545.\text{Ln (hardness)} - 1.465}}{1{,}000}$$

$$\text{Lead Limit } (g.m^{-3}) = \frac{(1.496 - 0.145.\text{Ln } (\textit{hardness})).e^{1.273.\text{Ln (hardness)} - 4.705}}{1{,}000}$$

(c) Reporting of Non-compliance

Any non-compliance with any standard in Schedule I shall be reported to the Otago Regional Council within 24 hours of the non-compliance first being detected.

Schedule II – Monitoring and Sampling Programmes

General Provisions

1. This schedule describes monitoring and sampling required pursuant to consent numbers 96784, 96793, 96795, 96799, 96803, 96807, 96811, 96812, 96813, 96815, 96816, 96819, 96821, 96821, 96823 and 97202 in addition to monitoring specified in those consents.
2. The design of all monitoring and sampling programmes shall be to the satisfaction of the consent authority. Where the consent to which the monitoring programme relates, directs that a Work and Rehabilitation programme, or an Investigations, Work and Rehabilitation programme, shall be prepared then the monitoring programme shall be incorporated in that plan.
3. The parameters analysed, site locations and frequency of sampling shall be reviewed as part of the annual review of the management plan for the consent(s) to which this monitoring relates. New parameters, sites and frequencies may be approved by the consent authority under an application by the consent holder for a change of conditions for monitoring made pursuant to S127 of the Act.
4. All sampling and analyses undertaken pursuant to any part of this schedule shall be performed at a Telarc registered laboratory or ISO 9001 accredited procedures or otherwise as specifically approved by the Otago Regional Council.
5. Reporting shall be quarterly unless specified otherwise. A quarterly consolidated report containing all sampling and monitoring results shall be submitted to the Consent Authority within one month of the end of the quarter being reported. This report shall highlight any particular features arising from monitoring and sampling and shall provide appropriate commentary on such features.

Detailed Monitoring and Sampling Programmes

(a) Phreatic Surface — 96795, 96821, 96813, 97202

The consent holder shall establish a network of groundwater bores at locations to the approval of the Consent Authority and measure and record the groundwater level about all tailings impoundments and about all pits while such pits are dewatered, at three monthly intervals. The water levels in all tailings impoundments and in all dewatered pits shall be recorded on the same day.

(b) Detection Bores — 96795, 96821, 97202

The consent holder shall collect representative samples of groundwater at the seepage Detection Points downstream of the Upper and Lower Tipperary tailings at or about map references I42 137344 and I42 138343 respectively, between the Tipperary Creek tailings dam catchments and surrounding catchments, on the saddle between Round Hill and Golden Point pits, and on the saddle between Round Hill Pit and Battery Creek catchment, at monthly intervals.

Samples shall be analysed for:

- Major cations: calcium, magnesium, potassium and sodium
- Major anions: bicarbonate, carbonate, chloride and sulphate
- pH
- conductivity

At monthly intervals for three months, quarterly intervals for nine months thereafter, and then at six monthly intervals, the samples shall also be analysed for:

- Cyanide
- Arsenic
- Copper

- Iron
- Lead
- Total inorganic nitrogen

(c) Compliance Bores **96795, 96821, 97202**

Compliance bores shall be those located:

(i) At the compliance point at the lower end of Upper Tipperary Creek tailings dam gully at or about map reference NZMS 260 I42:138344 (Consent No. 96795).

(ii) At the compliance point at the lower end of the Lower Tipperary Creek tailings dam gully at or about map reference I42:083364 (Consent No 97202).

(iii) In Battery Creek at a location below all ground disturbance and above the confluence of Battery Creek with Deepdell Creek at or about map reference I42:088363 (Consent No. 96821).

(iv) Between Golden Point Pit and Deepdell Creek at or about map reference NZMS 260 I42:086365 (Consent No. 96821).

The consent holder shall collect representative samples of groundwater from the compliance bores at monthly intervals.

Samples shall be analysed for:

- Major cations: calcium, magnesium, potassium, and sodium
- Major anions: bicarbonate, carbonate, chloride, and sulphate
- pH
- conductivity

At monthly intervals for three months, quarterly intervals for nine months thereafter, and then at six monthly intervals, the samples shall also be analysed for:

- Cyanide
- Arsenic
- Copper
- Iron
- Lead
- Total inorganic nitrogen

(d) Tailings **96795, 96821, 97202**

The consent holder shall collect a representative sample of tailings being deposited into each tailings impoundment and shall determine its acid neutralising capacity (ANC) and its maximum potential acidity (MPA) at monthly intervals and shall report the RL of the beach of the deposit sampled and its ANC/MPA ratio to the Consent Authority.

The MPA shall be determined on the sample as collected, ie the test shall include any process added chemicals.

The ANC shall be determined on the sample after washing to remove any process added chemicals.

(e) Pit Water Quality **96812, 96815, 96816**

The consent holder shall undertake the following minimum surface water monitoring to refine and confirm the geochemical modelling predictions of post mining lake water quality.

Sites:

a) North Branch of the Waikouaiti River immediately upstream of Frasers pit.

b) Runoff from mineralised and non mineralised rock on Frasers pit wall during mine operation. [1]

c) Remnant Frasers pit lake (post mining).

d) North Branch of the Waikouaiti River immediately upstream of Macraes Ponds.

e) North Branch of the Waikouaiti River immediately upstream of Red Bank Ponds.

f) Murphys Creek down catchment of the process plant and Murphys Creek silt pond.

Note

For site ii, sampling sites will move as the mining proceeds. Therefore, sampling locations and pit wall rock type at and above the sampling site shall be recorded for each sample.

Frequency: Quarterly for two years and biannually thereafter.

Parameters: Suspended solids
Total hardness
Major cations - calcium, magnesium, potassium, sodium
Major anions - bicarbonate, carbonate, chloride, sulphate
Total nitrogen
Arsenic
Copper
Iron
Lead

(f) Murphys Creek Silt Pond 96799

The Consent holder shall, at monthly intervals, or such other frequency as the Consent Authority may agree, collect representative samples of water from the Murphys Creek silt pond. Samples shall be analysed for:

- pH
- Cyanide (WAD)

(g) Silt Pond Discharges

Tipperary Creek 96793
Murphys Creek 96799
Northern Gully East 96803
Frasers East 96807
Frasers West 96811

The Consent holder shall, at 3 monthly intervals, or such other frequency as the Consent Authority may agree, collect representative samples of water from the silt ponds. Samples shall be analysed for:

- Major cations: calcium, magnesium, potassium, sodium
- Major anions: bicarbonate, carbonate, chloride, sulphate
- pH
- conductivity

On one occasion each year, the following parameters in each sample shall also be analysed:

- arsenic
- copper
- iron
- lead
- total inorganic nitrogen

(h) Surrounding Groundwater (Tailings Impoundments) 96795, 96821, 97202

The Consent holder shall collect representative samples of groundwater at three monthly intervals from not fewer than five boreholes, at locations agreed by the Consent Authority, at least one of which shall be a control bore away from each of the following, but not within the respective catchments, any possible influence from mining activities. The water level in the bores at the time of sampling shall be recorded.

(i) The catchment of the Upper Tipperary Tailings Dam.
(ii) The catchment of the Lower Tipperary Tailings Dam.
(iii) Round Hill Pit.

- Major cations: calcium, magnesium, potassium, sodium

- Major anions: bicarbonate, carbonate, chloride, sulphate
- pH
- conductivity

On one occasion each year, the following parameters in each sample shall also be analysed:

- arsenic
- copper
- iron
- lead
- total inorganic nitrogen

(i) **Surrounding Groundwater (Waste Rock Stacks)** **96822, 96823**

The Consent holder shall collect representative samples of groundwater at 3 monthly intervals, from not fewer than 5 bores surrounding the waste rock stack, one of which shall be a control bore away from any possible influence from mining activities. The water level in the bores at the time of sampling shall be recorded. The samples shall be analysed for:

- Major cations: calcium, magnesium, potassium, sodium
- Major anions: bicarbonate, carbonate, chloride, sulphate
- pH
- conductivity

On one occasion each year, the following parameters in each sample shall also be analysed:

- arsenic
- copper
- iron
- lead

(j) **Surface Water Quality** **96795, 96793, 96799, 96807, 96811, 96814, 96819, 96822, 96823, 97202**

The Consent holder shall collect representative samples of water from Tipperary Creek, Murphys Creek, the North Branch of the Waikouaiti River, McCormicks Creek and Battery Creek, at sites as depicted in the accompanying map.

Sampling shall be undertaken four times each year at each site and shall be timed to coincide with low flows as far as practicable.

Samples shall be analysed for:

- Major cations: calcium, magnesium, potassium, sodium
- Major anions: bicarbonate, carbonate, chloride, sulphate
- pH
- conductivity

On one occasion each year, the following parameters in each sample shall also be analysed:

- arsenic
- copper
- iron
- lead
- total inorganic nitrogen

(k) **Surrounding Groundwater (Waste Rock Stacks)** **96822, 96823**

The Consent holder shall collect representative samples of groundwater at 3 monthly intervals, from not fewer than 5 bores surrounding the waste rock stack, one of which shall be a control bore away from any possible influence from mining activities. The water level in the bores at the time of sampling shall be recorded. The samples shall be analysed for:

- Major cations: calcium, magnesium, potassium, sodium
- Major anions: bicarbonate, carbonate, chloride, sulphate

- pH
- conductivity

On one occasion each year, the following parameters in each sample shall also be analysed:

- arsenic
- copper
- iron
- lead

(l) **Water Storage Dam**

The Consent Holder shall, at monthly intervals:

(i) Measure and record piezometric levels within the central core using piezometers installed on the maximum dam section at the downstream side of the crest within Zone A (the central low permeability core) and in the downstream rockfill at midslope and at the embankment toe.

(ii) Measure and record embankment deformations using settlement markers installed on the dam and on ground outside the dam influence area.

(m) AQUATIC BIOLOGICAL MONITORING – 96783, 96785, 96814, 97202

The consent holder shall retain a suitably qualified and experienced freshwater biologist to design and undertake an aquatic biological monitoring programme to verify that the narrative standard specified in a) above is satisfied.

Monitoring shall occur at the following sites (as depicted in the accompanying map):

- Tipperary Creek immediately upstream of the confluence with the "Lower Tipperary Tailings Dam sub-catchment" I42:147332.
- McCormicks Creek at approximately 100 metres downstream of the confluence with the "Lower Tipperary Tailings Dam sub-catchment".
- McCormicks Creek at approximately I42 : 182324.
- Murphys Creek at approximately 100 metres downstream of all mining activities.
- Murphys Creek at approximately I42 : 129312.
- Waikouaiti North Branch at Red Bank Road at approximately I42 : 089326.
- Waikouaiti North Branch at Ross Ford at approximately I42 : 109289.

Monitoring of macro-invertebrates and periphyton shall be carried out on one occasion during each of the following periods each year that the right is exercised:

- December to February inclusive
- March to May inclusive.
- June to August inclusive.
- September to November inclusive.

Except at sites when flows are insufficient to support any significant aquatic community.

An annual electric fishing survey shall be carried out at each of the Biological Monitoring sites (unless there are insufficient flows) during the period December to February inclusive.

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

Components to be Monitored

1. **Benthic macro-invertebrates**

The taxonomic composition and abundances shall be monitored at all sites.

2. **Fish**

The taxonomic composition and abundances of fish shall be monitored by an electric fishing survey at all of the biological monitoring sites.

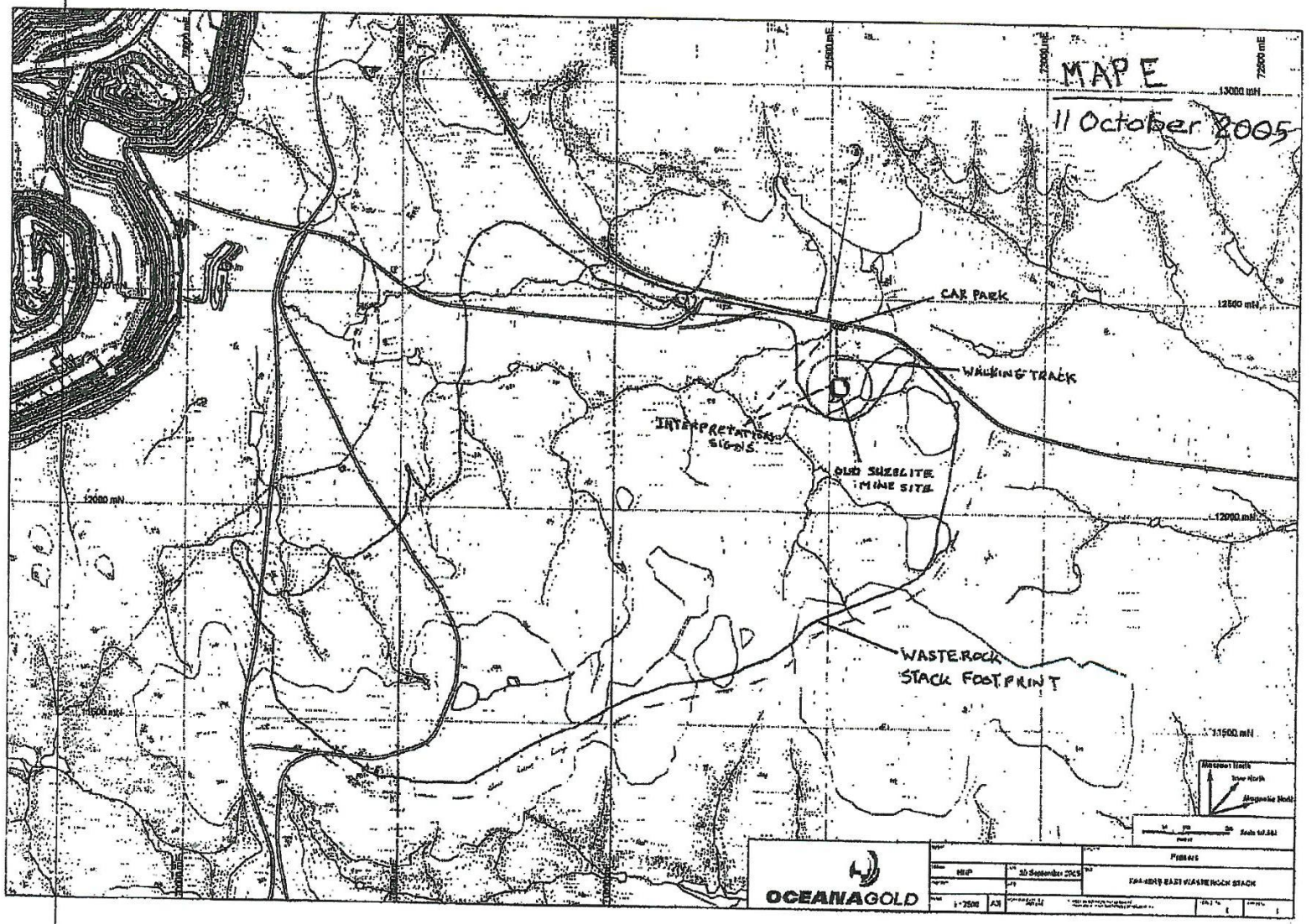
3. **Benthic Algae**

A qualitative assessment of the height and percentage cover of dominant species of benthic algae shall be made at all of the biological monitoring sites.

APPENDIX 2

Table 2-1: Underground Mining Terms - Glossary

Term	Explanation
Adit	A horizontal to slightly sloping (uphill) underground working into a hill, driven for the purpose of (a) intersecting or mining an ore body, (b) intersecting a shaft for the purpose of dewatering.
Cross cut	A horizontal opening driven from a shaft and at right angles to the strike of an orebody
Decline	A sloping underground opening, usually driven at a grade of about 15% to 20%, for machine access from the surface to the orebody (or from level to level within the mine); also called a ramp.
Drift	A horizontal opening that follows along the length of an orebody.
Drive	An underground excavation
Haulage level	Any underground entry or passageway that is designed for transport of mined material, personnel, or equipment, usually by the installation of track or belt conveyor.
Jack Leg Drill	A percussion drill used for drifting or stopping that is mounted on a telescopic leg which has an extension of about 2.5 m. The leg and machine are hinged so that the drill need not be in the same direction as the leg.
Jumbo Drill	A large rock drill used in underground mining. The holes made by this drill are filled with explosives. Most of the drilling done for mining ore, however, is done using smaller "jack leg" drills.
Level	A horizontal tunnel or drift in an underground mine
Panel	A mining block that generally comprises one operating unit.
Portal	The surface entrance to a decline, or the structure surrounding the immediate entrance to a mine.
Raise / Rise	A vertical or inclined underground working that has been excavated from the bottom upward.
Shaft	A vertical or steeply inclined excavation for the purpose of opening and servicing a mine. It is usually equipped with a hoist at the top, which lowers and raises a conveyance for handling personnel and materials.
Stope	An underground working area where ore is mined
Tunnel	A horizontal excavation with an opening (entry) at each end.
Underground station	An enlargement of an underground working where stationary electrical equipment is installed. This includes pump rooms, compressor rooms, hoist rooms, battery-charging rooms, etc.


MAP E
11 October 2005
CAR PARK
WALKING TRACK
INTERPRETATION SIGNS
OLD SUBSLITE MINE SITE
WASTE ROCK STACK FOOTPRINT
OCEANAGOLD

Map E

Label on Map E	Associated Conditions
Carpark	Car and bus parking shall be sited generally in accordance with the location shown on the map and shall be: i Designed so that it can accommodate at least one bus and 10 cars at a time. ii Designed, constructed and maintained to a suitable standard for the public. iii Formed to a minimum 150 mm sub-base and a base course of 100mm AP40 with a wearing course of AP20. iv Landscaped in the following manner: • The perimeter of the carpark, other than that part needed for access onto the Macraes-Dunback Road, shall be fenced. • A gate shall be installed to enable people to use the walking track linking the carpark with the old sheelite mine. • Inside the fence there shall be a 1m wide landscape strip consisting of a mix of *Chionochloa rigida* or *Chionochloa rubra* and Native Shrubs/Perennial listed under the specific rehabilitation Condition 57, relating to the Heritage and Art Park - set out in Appendix A of this consent. These plantings shall be not further than 1m apart. Design and construction, including landscaping, details shall be lodged with the District Council before construction commences on the carpark.
Walking Track	A track shall be sited generally in accordance with the location shown on the map and shall be designed, formed and maintained to a standard in order for the public to walk from the carpark to the old sheelite mine site. Design and construction details shall be lodged with the District Council before construction commences on the track.
Interpretation Signs	Interpretation signs shall be sited at the carpark and at the old sheelite mine site respectively as shown on the map and shall be designed, formed and maintained in order to inform the public about the historic sheelite mining at the site and its connection to Gay Ian's cottage. Design and interpretation details shall be lodged with the District Council before the signs are erected.
Old Sheelite Mine Site	The horse whim shall be kept at the old sheelite mine site. (This should assist the public understand how the mining was conducted and completed at the site.)

Appendix B

Southern Pit and Mixed Tailings Impoundment Dust Control Manual

Southern Pit 11 and Mixed Tailings Impoundments Dust Control Manual

1. Introduction

This manual details dust control procedures that are to be undertaken during operation of the Southern Pit 11 and Mixed Tailings Impoundments.

The design of the impoundment was carried out by Engineering Geology Ltd (EGL) and a description of the embankment design and operation is contained in the Design Report for each impoundment and reference should be made to these as required.

Details of the operation, maintenance and surveillance of both impoundments can be found in the respective Operation, Maintenance and Surveillance Manuals.

2. Responsibilities

Oceana Gold Ltd (OGL), as owners of the tailings impoundment are ultimately responsible for the control of dust on these impoundments.

Supervision and monitoring of the quality of construction is undertaken by OGL as is regular monitoring, maintenance and surveillance as details in the respective Manuals.

The installation of dust control systems is the responsibility of the Projects Superintendent.

The operation of dust control systems and the tailings distribution system is the responsibility of the Process Superintendent. A Daily Decision Tree (attached) is available to assist with operation of dust control systems.

3. Environmental Conditions

During Spring the Macraes District is frequently subjected to strong dry winds from the west and west-northwest direction. Wind gusts in excess of 100km/hr are not uncommon and the winds can continue for several days without let up.

The worst of the winds are generally experienced between August and October although strong winds at other times are not uncommon.

To assist with predicting times of high winds a weather forecasting service is provided at www.metconnect.co.nz, Login: Oceana, Password: auweather.

4. Methods of Dust Control

4.1 Tailings Discharge

During and immediately following periods of active tailings discharge the tailings beach surface remains sufficiently damp that the potential for windborne dust generation is very low.

This is because tailings deposition is sequentially moved around the dam and therefore the majority of the tailings beach does not have time to fully dry out. Dust is controlled on active impoundments by tailings deposition alone.

4.2 Rock Mattress Cover

Experience has shown that the area of the tailings beach with the potential for dust generation is the area adjacent to the embankment crest.

Future lifts of the tailings embankment require a rock mattress to be laid out over the outer 120m and 90m of the tailings beach for the Mixed and Southern Pit 11 Tailings Impoundments respectively.

Commencement of rock mattress construction will be as soon as practical after cessation of deposition. This will normally be within one month of the cessation of discharge.

The placement of a rock mattress needs to be timed to ensure its in place prior to 1st July to ensure the outer sections of the impoundment surface are protected prior to the commencement of the windy season.

For details of the rock mattress refer to the design documents for each impoundment. On non-active impoundments the rock mattress will cover the main outer area prone to dust generation.

4.3 Tailings Wetting System

A tailings wetting system will be established following rockfill mattress construction to enable the distribution of either water or tails onto the inner surface not covered by the rock mattress. This system needs to be operational from August to October each year however it is prudent to continue to have this system in place for all months that the impoundment is not active or resting.

The wetting system generally consists of an outer pipeline feeding soak hoses or sprinklers laid out over the tailings surface however various combinations and open pipe discharges can be utilised as necessary to ensure good coverage and wetting.

The tailings wetting system is to be installed and commissioned by 15th July each year on the inactive or resting impoundment to ensure adequate dust prevention on areas of the dam not covered by the rock mattress.

Preservation of the crust on the dam surface is to be maximised by limiting the traffic on the tailings surface whenever tailings discharge is not active.

Whilst depositing in one impoundment or section of an impoundment, should an area(s) become dry and have the potential to generate dust in windy conditions then subject to construction and operational requirements the tailings distribution network can be used to wet these areas either with tailings or water.

5. Operation

The tailings distribution system is operated by the Processing Superintendent and follows plans from the Project Superintendent and EGL.

A site specific model that predicts hourly wind speed, direction and rainfall (provided by the MetService) is to be used to assist in the prediction of wind events (note – if heavy rain or rainfall warnings are indicated for Fiordland and the West Coast this will often indicate strong winds on the East Coast). It is the responsibility of the Processing Superintendent to initiate action in accordance with the Model predictions.

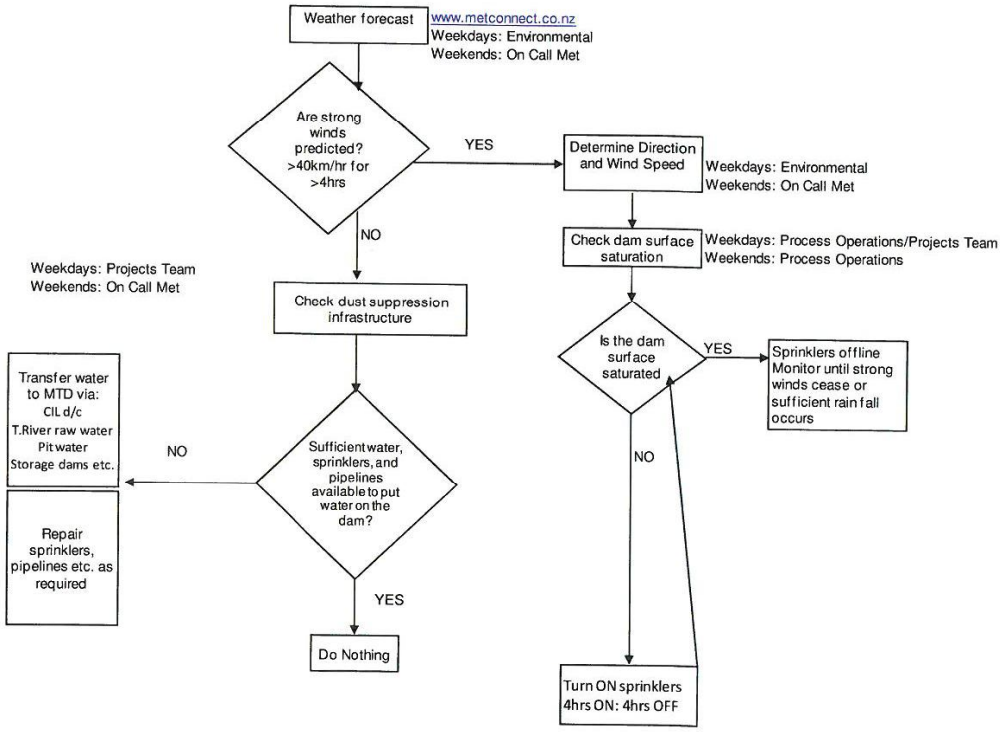
The tailings or water dampening system is to be used 12 hours prior to an anticipated high wind event (defined as an event of greater than 40km/hr winds for greater than 4 hours from a west or northwest direction).

Should wind speeds increase without warning then the system will be activated as required by process operations personnel and the Processing Superintendent will be notified.

6. Maintenance

The installation and commissioning of any tailings or water distribution system for dust control is the responsibility of the Project Superintendent who once commissioned hands it over to the Processing Superintendent. Thereafter inspections, monitoring and maintenance activities are the responsibility of operational personnel.

7. Dust Suppression Daily Decision Tree



Appendix C

Beaufort Wind Scale

The Beaufort Wind Scale
(Land)

The Beaufort scale was long in use as a system for estimating wind speeds. It was introduced in 1806 by Admiral Sir Francis Beaufort (1774-1857) of the British navy to describe wind effects on a fully rigged man-o-war sailing vessel, and it was later extended to include descriptions of effects on land features as well. Today the accepted international practice is to report wind speed in knots (1 knot equals about 1.85 km, or 1.15 mi, per hour).

The Beaufort scale is divided into a series of values, from 0 for calm winds to 12 and above for hurricanes. Each value represents a specific range and classification of wind speeds with accompanying descriptions of the effects on surface features, as follows:

Beaufort	Avg miles per hour	Avg km per hour	Knots	Surroundings
0 (calm)	0	0	0 – 1	Smoke rises vertically.
1 (light air)	1 – 3	2 – 5	1 – 3	Smoke drift indicates wind direction.
2 (light breeze)	4 – 7	6 – 12	4 – 6	Wind felt on face; leaves rustle.
3 (gentle breeze)	8 – 12	13 – 20	7 – 10	Leaves, small twigs in constant motion.
4 (moderate breeze)	13 – 18	21 – 30	11 – 16	Dust and leaves raised up, branches move.
5 (fresh breeze)	19 – 25	31 – 40	17 – 21	Small trees begin to sway.
6 (strong breeze)	26 – 31	41 – 50	22 – 27	Large branches of trees in motion/
7 (moderate gale)	32 – 38	51 – 61	28 – 33	Whole trees in motion; resistance felt walking against wind.
8 (fresh gale)	39 – 46	62 – 74	34 – 40	Twigs and small branches break from trees.
9 (strong gale)	47 – 55	75 – 89	41 – 47	Larger branches break from trees.
10 (whole gale)	56 – 64	90 – 103	48 – 55	Trees broken and uprooted.
11 (storm)	65 – 74	104 – 119	56 – 63	Widespread damage.
12 (hurricane)	75+	120+	64+	Violence and destruction.

from http://www.kites.org/jo/beaufort.html
and http://www.mountwashington.org/discovery/arcade/wind/beaufort.html

Appendix D

Site Personnel Contact Details

Site Personnel Contact Phone Numbers (Complaints and Emergencies)

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