

Soil Management Plan

May 2026

DOCUMENT CONTROL

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1	D Cornish	03/06/2025	New Document-draft	J Palich,	08/09/2025
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1 INTRODUCTION

1.1 Purpose and Objectives

The purpose of the Soil Management Plan (**SMP**) is to outline the specific strategies and procedures for the safe and effective management of soils at the BOGP that have the potential to result in an adverse risk to human health and/or ecological receptors if inappropriately managed.

1.2 Regulatory Framework

Mine sites and associated workings are defined in the Hazardous Activities and Industries List (HAIL) under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS). Disturbance of soil associated with developments on potentially contaminated land is a regulated activity under the Resource Management NESCS Regulations 2011 (Ministry for the Environment [MfE], 2012).

The implementation of the NESCS is supported by the MfE's Contaminated Land Management Guideline series (Volumes 1 to 5), which details appropriate strategies for the identification and management of contaminated soils.

1.3 Description of Facilities

The BOGP site is located approximately 20 km northeast of Cromwell in the Dunstan Mountains, within the Central Otago District Council (CODC) and Otago Regional Council (ORC). The Rise and Shine (RAS) and Come in Time (CIT) gold deposits are located within a ridge between Shepherds Creek to the northeast and Rise and Shine Creek to the southwest. The Srex (SRX) gold deposit is located on the southern slopes of Rise and Shine Valley. Watercourses in both valleys flow from a divide in the southeast to outlets in the northwest.

The BOGP involves mining the identified gold deposits at RAS, CIT, SRX and Srex East (SRE). Both open pit and underground mining methods will be utilised within the project site to access the gold deposits. Infrastructure to support the project will be constructed in the lower Shepherds Creek Valley with non-operational infrastructure located on the adjoining Ardgour Terrace. The BOGP also involves the taking of groundwater from the Bendigo Aquifer for use in mining-related activities and the realignment of Thomson Gorge Road via Ardgour Station; see Figure 1.

The proposed BOGP will include the following components, as relevant to this SMP:

- Open pits, targeting the RAS, SRX, SRE, and CIT deposits.
- An underground mine targeting the RAS deposit.

- Three ex-pit engineered landforms (ELFs) – Shepherds ELF, Western ELF (WELF) and SRE ELF.
- Two in-pit landforms (backfill) – CIT and SRE.
- Temporary and permanent topsoil stockpiles
- Plant and processing area, where CIL 2 extraction technologies will be used as part of the ore recovery process. This includes the Shepherds Creek Fill.
- A tailings storage facility (TSF) and TSF Embankment.
- Other ancillary support services / structures (e.g., roads, water management infrastructure, water treatment plants, etc.). These facilities will be placed in the catchments of Shepherds and Bendigo creeks.

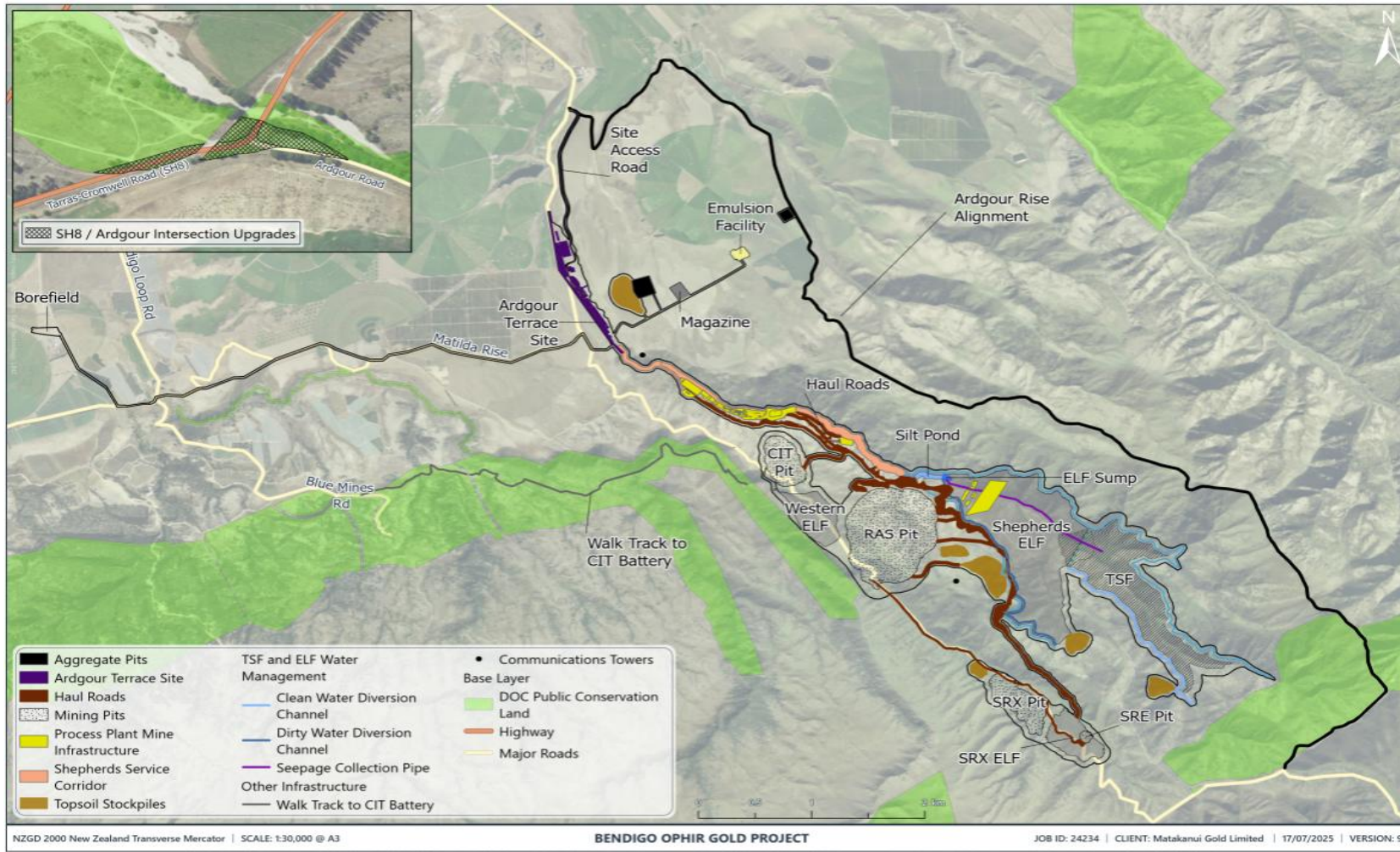


Figure 1. BOGP Site Plan.

1.4 Relationship with Other Management Plans

This plan should be read in conjunction with the following management plans, which together form part of the integrated site management which underpins BOGP’s Environmental Management System:

- BOGP Air Quality Management Plan
- BOGP Erosion and Sediment Control Management Plan
- BOGP Engineered Landform Management Plan
- BOGP Pond and Reservoir Management Plan
- BOGP Water Management Plan
- BOGP Mine Closure Plan

1.5 Management Objectives

The objectives of this SMP are:

1. To ensure the effective management, preservation, and rehabilitation of soil resources, taking into account preexisting soil quality, structure, and fertility.
2. To manage soils in a manner that enables successful future revegetation and long-term ecosystem recovery on disturbed sites.
3. To manage and monitor soils in a way that prevents exposure to harmful contaminants, reduces dust generation, and ensures safe conditions for workers and surrounding communities.
4. To manage soils in a manner that prevents erosion, contamination, and degradation, thereby protecting surrounding ecosystems, water quality, and biodiversity and ensuring long term environmental sustainability.

2 CONSENT CONDITIONS

Soil Management consent conditions are set out in D.01 – Central Otago District Council Land Use Consent and Conditions. Noting, the condition numbering has not been finalised, and will be transposed below when finalised.

Soil stockpiling and protection of stockpiled assets		
Condition X	<p>Soil stockpiles must be constructed with an outer-most layer of stripped vegetation and surface 20 to 30 cm of soil and maintained in ways to promote regeneration of native plant species and minimise erosion.</p> <p>Stockpiles should be constructed with an outer-most layer comprised of the upper 20 to 30 cm of soil (where present) together with (unmulched) live stripped vegetation. This shall be maintained in ways to promote regeneration of native plant species, minimise non-native weed species (as specified in the Biosecurity and Plant Pest Management Plan, refer</p>	From Assessment of Ecological Effects Report.

	<p>Condition 75) and minimise erosion. Rocks less than 30 to 50 cm shall be stripped together with soils and stored within the same stockpiles.</p> <p>Adequate soils and brown rock will be salvaged and stockpiled to deliver the root zones specified in Appendix D of the LERMP.</p>	
Condition X	<p>Soil stockpiles must be treated to protect them from wind erosion if not used within 3 months.</p> <p>The volume of stockpiled assets and their locations must be reported annually and compared against the area and volumes required to rehabilitate open areas:</p> <ol style="list-style-type: none"> a. Soils; b. Wetland soils (i.e. organic enriched); c. Weathered boulders for lizard habitat construction; and d. Brown Rock / weathered fine materials suitable for root zones. <p>The soils stripped from the SRX Open Pit must be reported separately as these soils cannot be used outside the Rise and Shine Creek catchment due to elevated arsenic concentrations in some soils within the catchment.</p>	

Soil Management Plan

Condition X	<p>The Consent Holder must implement the Soil Management Plan (“SMP”) certified as part of the approval of the BOGP pursuant to Section 81 of the Fast-track Approvals Act 2024 (or as amended in accordance with relevant conditions), and which forms part of the consents.</p>	
Condition X	<p>The objective of the SMP is to specify suitable management measures for the safe and effective management of soils at the BOGP Consent Area that have the potential to result in an adverse risk to human health and/or ecological receptors if inappropriately managed. This objective includes:</p> <ol style="list-style-type: none"> a. Ensuring the effective management, preservation, and rehabilitation of soil resources taking into account preexisting soil quality, structure, and fertility; b. Managing soils in a manner that enables successful future revegetation and long-term ecosystem recovery on disturbed sites; c. Managing and monitoring soils in a way that prevents exposure to harmful contaminants, reduces dust generation, and ensures safe conditions for workers and surrounding communities; and d. Managing soils in a manner that prevents erosion, contamination, and degradation, thereby protecting surrounding ecosystems, water quality, and biodiversity and ensuring long term environmental sustainability. 	

Condition X	<p>To achieve the objective set out in Condition 125 above, the SMP must include, as a minimum:</p> <ol style="list-style-type: none"> a. A summary of the known site history, identified Hazardous Activities and Industries List (HAIL) areas and expected contamination conditions as well as the investigation methodology for sampling to be undertaken prior to works commencing in the identified HAIL areas; b. Identification of construction and operational risks associated with key mine sources that have the potential to adversely impact human health or ecological receptors; c. The contaminated land-related soil management requirements; d. Standard soil management requirements, including those for topsoil, dust management, erosion and sediment control; e. Roles and responsibilities; and f. Monitoring, compliance and reporting requirements. 	
Condition X	<p>Any updates to the Soil Management Plan must be prepared by a suitably qualified and experienced professional in accordance with <i>Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand, Ministry for the Environment (revised 2021)</i>.</p>	

3 ROLES AND RESPONSIBILITIES

The responsibility for soil management lies with the Consent Holder.

Key roles and responsibilities that are required for the management of soil are summarised in Table 1.

Table 1. Roles and responsibilities

Role/Responsibility
<p>Mine Manager</p> <ul style="list-style-type: none"> • Overall responsibility for ensuring compliance with relevant environmental and health and safety regulations. • Implementation and compliance of this SMP • Appoints qualified personnel and contractors
<p>Environmental Manager and Environmental Team</p> <ul style="list-style-type: none"> • Develop and implement SMP • Compliance with resource consent conditions • Environmental monitoring and reporting • Ensures environmental controls are in place and effective • Conducts regular inspections and audits
<p>Health & Safety Manager</p> <ul style="list-style-type: none"> • Accesses and manages health risks associated with arsenic exposure

- Develops and enforces personal protective equipment (PPE) requirements
- Trains workers on arsenic hazards, safe handling procedures, and emergency response

Site Supervisor/Construction Manager

- Implements day to day controls on site as per the SMP and other relevant management plans
- Coordinates with contractors and ensures arsenic soil management protocols are followed during earthworks
- Maintains control over stockpiling, segregation and transport

Staff/Contractors

- Follow all SMP procedures for handling, transporting, and disposing of arsenic impacted soil
- Use appropriate PPE and follow safety protocols
- Report any incidents or deviations from the plan to the site supervisor immediately

Regulatory Authority

- Review environmental monitoring reports
- Audit of compliance with resource consent conditions

4 IDENTIFICATION OF ENVIRONMENTAL HAZARDS AND RISKS

4.1 Previous Soil Investigations

Between 2013 and 2024, various field programs were undertaken to determine metals concentrations in near surface soils, comprising the analysis of up to 1,589 samples described as loess, topsoil or outcrop, in the various prospect areas including CIT, RAS, SRX, SRE, and Thompson's Saddle (TSD). An additional investigation targeting the upper portion of Shepherd's Creek valley was undertaken in January 2025. Determination of soil concentrations was undertaken using a portable x-ray fluorescence (pXRF) which provided concentrations for a range of analytes.

Data were reviewed against the following environmental assessment criteria:

- The Standards for Contaminants in Soil (SCS) in an industrial land use scenario from the *Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health* (MfE, 2011) guidelines for the protection of human health in an industrial land use scenario.
- The Ecological Soil Guideline Values (Eco- SGVs) for As, Cd, Cr, Cu, Pb and Zn at three protection levels (95% for non-food production land, 80% for residential/recreational land and 60% for commercial/industrial area) from Landcare Research New Zealand Ltd and Hawke's Bay Regional Council (2023) *Determining background soil concentrations of trace elements across New Zealand*.

The key findings of this review indicated that:

- Only As was present at concentrations above the assessment criteria for the protection of human health.
- Most metals were below the ecological assessment criteria, except for As and Cd, which demonstrated widespread occurrence as presented in Table 2.
- Limited exceedances of Cr, Cu, Pb, and Zn coincided with soils that also exceeded the assessment criteria for As and/or Cd. The mean plus one standard deviation of Cr, Cu, Pb, and Zn were all below all ecological protection levels. As a result, Cr, Cu, Pb and Zn do not require specific management consideration during the project implementation.

Table 2: Arsenic Results

Area	No. of sampling Points	As Concentrations (ppm)	No. of Samples > SCS – Industrial (70 mg/kg)	No. of Samples > Eco-SGV (95%) (20 mg/kg)	No. of Samples > Eco-SGV (80%) (60 mg/kg)	No. of Samples > Eco-SGV (60%) (150 mg/kg)
SRE Pit	8	12 - 407	4	7	4	2
SRX Pit	106	11 - 8700	62	98	65	52
CIT Pit	78	7.8 – 10,000	19	42	20	15
RAS Pit	59	6 - 1229	5	21	6	4
Western ELF	40	8 - 83	2	29	3	0
SRX ELF	69	9 - 1050	12	55	13	9
Processing Plant Mine Infrastructure	31	4 - 1085	9	21	10	6

Table 3: Cadmium Results

Area	No. of sampling Points	Cd Concentrations (ppm)	No. of Samples > SCS – Industrial (1,300 mg/kg)	No. of Samples > Eco-SGV (95%) (1.5 mg/kg)	No. of Samples > Eco-SGV (80%) (12 mg/kg)	No. of Samples > Eco-SGV (60%) (33 mg/kg)
SRE Pit	8	0.08 - 6.2	0	4	0	0
SRX Pit	53	0.09 - 9	0	20	0	0
CIT Pit	21	0.2 - 10.7	0	6	0	0
RAS Pit	23	0.14 - 7.2	0	11	0	0
Western ELF	4	0.68 - 3.1	0	2	0	0
SRX ELF	57	0.13 - 11.1	0	24	0	0
Processing Plant Mine Infrastructure	24	1 - 9.7	0	10	0	0

* negative values were excluded from data ranges

In consideration of the soil results, historic land use and proposed site development, the key environmental hazard to the project is associated with the exposure and movement As and Cd impacted soil.

4.2 Arsenic Bearing Soils

Arsenic (As) is a main pathfinder element for gold mineralisation, and therefore, is expected to be naturally present in elevated concentrations within the Project area. However, elevated As concentrations may also be present due to the historic alluvial mining practices.

As can be released to the environment through air or water, while the primary risk to human health is through soil ingestion (MfE, 2011).

For the purpose of this SMP, and in accordance with the preliminary soil investigation (PSI), As concentrations over 70 parts per million (ppm) are considered to be high and require management. This threshold was adopted to capture soils that may pose a risk to human health in an industrial land use setting. Additionally, it ensures management of soils that exceed 60% Eco-SGVs (i.e. those soils that may pose a risk to ecological values in an industrial land use setting), and the majority of soils that exceed 80% Eco-SGVs.

As-bearing soils were identified at the following locations:

- The western and central portion of the SRE Pit
- Across most of the SRX Pit, but remains un-delineated within the north and eastern portion¹
- The southwestern portion of the CIT Pit¹
- The southern portion of the RAS Pit¹
- Several locations of the Western ELF - one to the north, one to the south and one to the west¹
- The central portion of the SRX ELF
- The central portion of the processing plant mine infrastructure

Areas of As-bearing soils are largely naturally occurring, however two areas are potentially associated with identified mining activities defined under the HAIL that may represent areas of historic process waste, which may have differing soil behaviour due to historic activities. These two areas are:

- G41/277: RAS Mine, battery and sluicing area located within the proposed footprint of the RAS Pit.

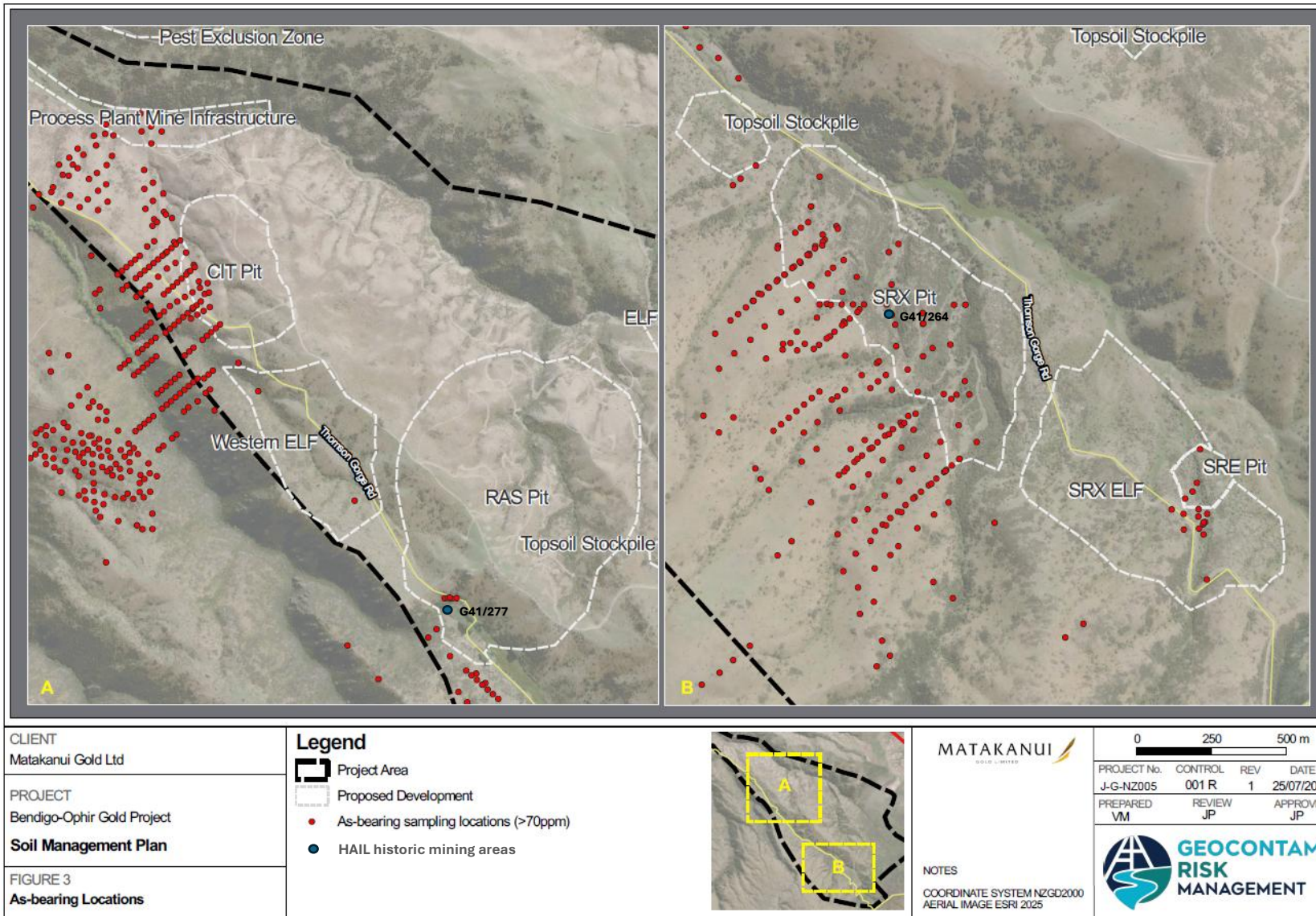
¹ These locations included exceedances of the 95% and 80% Eco-SVGs.

- G41/264: Area of historic gold workings, water race, dam, adit, and tailings located within the proposed footprint of the SRX Pit.

Soils from these two areas will require a detailed site investigation (DSI) prior to disturbance to determine whether soil in these areas are suitable for onsite reuse as future topsoil or should be managed as part of the waste stream.

Figure 3 below demonstrates the distribution of As-bearing soils (>70ppm) with respect to the project footprint.

Figure 2: As-Bearing Locations



4.3 Cadmium Bearing Soils

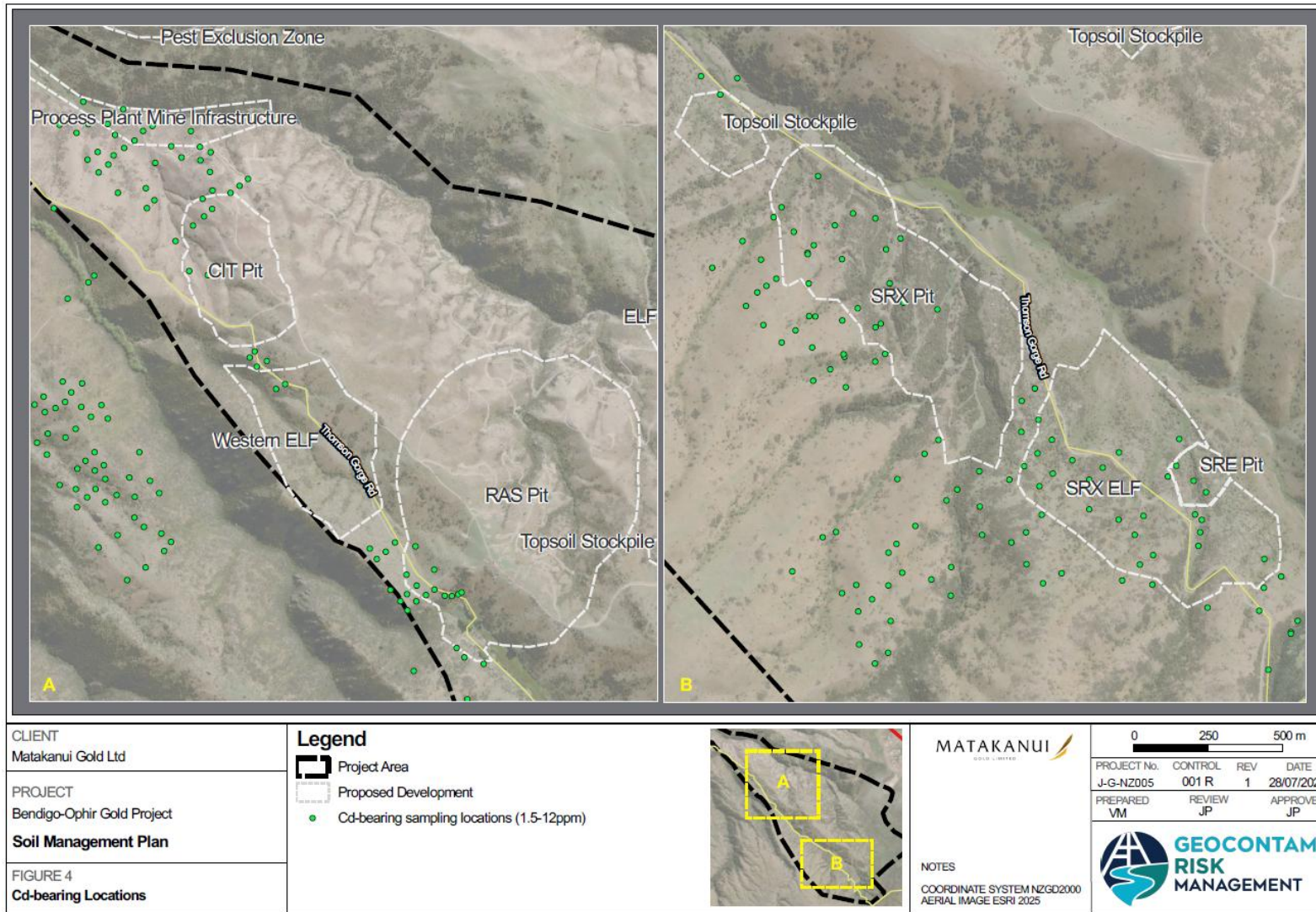
Cadmium (Cd) is not typically associated with gold mineralisation in the Otago Schist. Within the Project area, elevated cadmium concentrations in soils may be related to historical mining activity, where disturbance and oxidation of mineralised rock and mine waste may have mobilised trace metals into the surrounding environment. Although Cd poses less direct risk to human health via soil contact compared to As, Cd can pose long term ecological risks through uptake by plants and aquatic organisms and can be transported via leaching into surface or groundwater systems.

Cd concentrations were reported above the Eco-SGV (95%) threshold for non-productive land use, but did not exceed the relevant human health criteria or the lower Eco-SGV thresholds (80% and 60%). However, several recorded concentrations were near the 80% Eco-SGV threshold. Given the relatively low sampling density, there remains a possibility that higher Cd concentrations may be present but undetected. Elevated Cd levels were generally co-located with arsenic (As)-bearing soils, indicating a potential spatial correlation between the two contaminants, except for the following additional areas, where there appears to only be elevated Cd levels:

- Northern portion of the SRX Pit only
- The northern portion of the CIT Pit only
- Northern portion of the Western ELF
- Western portion of the SRX ELF

Figure 4 below demonstrates the distribution of Cd-bearing soils (>1.5 ppm) in the Rise and Shine Valley with respect to the project footprint, in particular the locations of the above-mentioned pits and ELF.

Figure 3: Cd-Bearing Locations



4.4 Arsenic and Cadmium Hazards

During the proposed development of the mine, vegetation removal and land disturbance will occur across the proposed pits, ELF, and infrastructure areas, which has the potential to expose and release As and Cd from soil and rock into the surrounding environment.

During the project, As and Cd can be released/mobilised through:

- Disturbance and removal of topsoil particularly in areas with elevated background concentrations, which may expose contaminated soils to erosion and runoff
- Dust generation from vehicle movement, excavation, and wind erosion, which can result in the airborne transport of fine particulates containing As, posing inhalation and deposition risks to workers and the surrounding environment.
- Surface water runoff potentially transporting soluble metals into adjacent land or water bodies.
- Stockpiling and handling of As and Cd-impacted soils.
- Mining and excavation activities, which will result in the disturbance and stockpiling of topsoil.
- Replacement of As and Cd impacted topsoil as rehabilitation material.

The primary human health risk is through soil ingestion or inhalation, particularly for workers and future land users, while ecological risks include uptake by plants and exposure of invertebrates and aquatic species to potentially toxic concentrations.

Table 4 summarises the key hazards and risks associated with the project that will require management.

Table 4: Summary of environmental hazards and risks

Hazard	Human Health Risk	Environmental Risk	Project Activity
Disturbance/removal of As and Cd impacted topsoil	<ul style="list-style-type: none"> • Ingestion of impacted soil • Inhalation of airborne As particulate • Dermal contact 	<ul style="list-style-type: none"> • Bioaccumulation in future rehabilitation areas • Leaching into surface water or groundwater 	<ul style="list-style-type: none"> • Clearing/removal of vegetation • Topsoil stripping • Excavation of pits and overburden • Haul road construction • Earthworks in ELF and

Hazard	Human Health Risk	Environmental Risk	Project Activity
			infrastructure areas
Dust generation	<ul style="list-style-type: none"> Inhalation of airborne As particulate 	<ul style="list-style-type: none"> Airborne dispersion As and Cd bearing particulates Dust deposition on surrounding land, vegetation, and water bodies 	<ul style="list-style-type: none"> Haul road construction and operation Clearing/ removal of vegetation Excavation of pits and overburden Earthworks in ELF and infrastructure areas Stockpiling of As and Cd bearing soil
Surface water runoff containing dissolved As and Cd	<ul style="list-style-type: none"> Impacts on downstream users 	<ul style="list-style-type: none"> Transport of metals into nearby waterways Impacts on aquatic ecosystems 	<ul style="list-style-type: none"> Inadequate drainage Rainfall
Stockpiling of As and Cd bearing material	<ul style="list-style-type: none"> Inhalation of airborne As particulate Dermal contact Ingestion of impacted soil 	<ul style="list-style-type: none"> Leaching into soil and groundwater 	<ul style="list-style-type: none"> Earthworks (i.e., material movement associated with cut and fill activities) Construction of waste rock dumps or ELF Stockpiling of As and Cd bearing soil

5 MANAGEMENT OF RISKS

This section provides management options for As- and Cd-bearing soil. Effective management of these materials is essential to minimise environmental and human health risks associated with their disturbance and potential mobilisation.

Further delineation may be required to accurately define the extent and distribution of high As- and Cd-bearing soils. If required, this will be undertaken at the point of disturbance or decision-making, particularly in higher-risk or sensitive areas, and/or triggered through an unexpected contamination protocol during works, where additional investigation would be undertaken to delineate and manage any contamination encountered.

5.1 As- and Cd-Bearing Soil Management

The presence of As-bearing soils poses potential risks to human health and the environment, and therefore effective management is essential to minimise these risks and ensure compliance with environmental standards and land use objectives.

Table 5 presents the proposed management options for As- and Cd-bearing soil in the pits and infrastructure areas. All topsoil stockpile areas should be divided between high As- and Cd-bearing and low As- and Cd-bearing soil. The low As- and Cd-bearing soil being the non-impacted soil that does not require specific management.

Table 5: Management Options for As- and Cd-bearing soils

Area	Management Option
SRE Pit	As-bearing soil are located next to Cd-bearing soil across most of the SRE Pit, hence all shallow soil shall be removed and transported to the SRX ELF or to a dedicated high As- and Cd-bearing soil stockpile.
SRX Pit	As-bearing soil is located across most of the SRX Pit but remains undelineated within the north and eastern portion. Additional pXRF sampling shall be undertaken in these areas to delineate the extent of As-bearing soils prior to ground disturbance/earthworks. Cd-bearing soil is located across the northern portion of the SRX Pit only. Some of the high-As and Cd-bearing topsoil may be the result of historic mining activities and will require a detailed site investigation to confirm its suitability for reuse. Once characterised, unsuitable topsoil will be disposed within the SRX ELF. All other impacted soil will be stripped prior to mining and transferred to the adjacent high As- and Cd-bearing topsoil stockpile.
CIT Pit	As-bearing soil are located across the western portion of the CIT Pit only whilst Cd-bearing soil are located across the northern portion of the CIT Pit only. The CIT pit will have its own dedicated impacted soil stockpile area. The shallow soil to the east and south (low As- and Cd-bearing) will be reused.
RAS Pit	Arsenic levels in the RAS Pit are located in isolated hotspots whilst Cd-bearing soils are located in the southern portion. Some of the high-As and Cd-bearing topsoil may be the result of historic mining activities and will require a detailed site investigation to confirm its suitability for inclusion in the high As- and Cd- bearing stockpiles.

	Once characterised, materials deemed suitable for reuse will be removed and transported to the adjacent topsoil stockpile into a dedicated high-As and Cd-bearing area. The rest of the shallow soil (low As- and Cd-bearing) will be reused. Non-suitable topsoil will be disposed within the Western ELF.
Western ELF	High As- and Cd-bearing soil can be moved within the Western ELF into a dedicated area or left in-situ
SRX ELF	High As- and Cd-bearing soil can be moved within the SRX ELF into a dedicated area or left in-situ
Processing Plant Mine Infrastructure	High As- and Cd-bearing soil are located in the central portion of the processing plant mine infrastructure. The soil shall be transported to the closest ELF or impacted soil stockpile area.

5.2 As and Cd Mitigation Measures

In addition to the above management measures for the proposed soil disturbance area, *Table 6* below outlines the additional mitigation measures to manage these soils, which will be employed at the BOGP. These measures should be adopted in conjunction with other standard soil management practices.

Table 6: Mitigation Measures for As- and Cd- bearing soils

Mitigation Measure	Applicable to:	Detail
Delineation	SRE Pit SRX Pit CIT Pit RAS Pit	<ul style="list-style-type: none"> In areas where impacts were not previously delineated (north and eastern portion of SRX Pit), implement a 40m grid screening using a pXRF. Targeted field screening using a pXRF at the edge of known impacted zones with a finer-resolution sampling grid (e.g. 10 m in areas of known variability). An area will be considered delineated when all perimeter results are below the trigger levels detailed in Table 9. Soils in these areas that are above the trigger levels (Table 7) will require management as per the additional mitigation measures detailed in this table.
Segregation	Stockpiles Topsoil-management ELFs	<ul style="list-style-type: none"> During topsoil stripping and earthwork, real-time readings to be taken using a pXRF. Minimum of 1 sample/reading per 100 to 200 m³ of soil stripped to be taken via pXRF to provide statistically defensible results. As- and Cd- bearing soils will be identified and kept separate from non As- and Cd-bearing

Mitigation Measure	Applicable to:	Detail
		<p>topsoil during reclaim, storage, and placement.</p> <ul style="list-style-type: none"> Refer to Table 9 for the trigger levels. No mixing of As- and Cd-bearing soil with non-As- and Cd-bearing soils during stockpiling.
Validation	Stockpiles Topsoil-management	<ul style="list-style-type: none"> Validation sampling to be undertaken on the surface under the footprint of the high As- and Cd-bearing stockpile once removed. Validation field screening using a pXRF. Minimum of 5-10 validation samples depending on the size of stockpile compared to the trigger levels (Table 7).
Rehabilitation	Rehabilitation areas	<ul style="list-style-type: none"> As- and Cd-bearing topsoil can be used to rehabilitate areas with naturally elevated levels of these elements. However, the rehabilitation areas where this material is used must align with the site's pre-existing natural background levels. Where there are insufficient volumes of As- and Cd-bearing soils to complete rehabilitation to an acceptable natural background level, non As- and Cd-bearing topsoil may be used once high As- and Cd-bearing topsoil supplies are exhausted. This approach will prevent new locations becoming contaminated unnecessarily, and ensure the rehabilitation process does not perpetuate or remediate the site back to an unacceptably contaminated condition.
Recordkeeping	Stockpiles Topsoil-management ELFs	Recordkeeping of As- and Cd-bearing topsoil volumes reclaimed, stored and placed shall be conducted. Records will include location and quantity of soil.
Vegetative cover	Stockpiles Topsoil-management ELFs	Establish a vegetative cover on a stockpile surface which is resistant to wind erosion to reduce dust and soil erosion.
Dust suppression	Stockpiles Topsoil-management ELFs	Dampen the surface of soil in response to any soil dust blowing over the site boundary.
Erosion	Stockpiles	Ensure that any As- and Cd-bearing stockpiles have erosion and sediment controls in place.

Mitigation Measure	Applicable to:	Detail
	Topsoil-management ELFs	These controls direct any run-off to dedicated sediment ponds, separate from the main ponds on site.
Time	Stockpiles Topsoil-management	Minimise the time topsoil is stockpiled. Where practical direct transfer As- and Cd-bearing soils to rehabilitation areas. This reduces the risk of contamination through temporary stockpiling.

5.3 Performance Criteria/Trigger Levels

The pXRF results obtained during delineation, segregation, and validation shall be compared to the assessment criteria presented in *Table 7* below:

Table 7: Performance Criteria/Trigger Levels

Activity	Analyte	Trigger Level	Performance Criteria
Delineation	As	SCS Industrial: 70 mg/kg Eco-SGV 60% (industrial): 150 mg/kg	Delineation required until all As concentrations at the perimeter of the investigation area are < 70 mg/kg.
	Cd	SCS – Industrial: 1,300 mg/kg Eco-SGV: 60% (industrial): 33 mg/kg	Delineation required until all Cd concentrations at the perimeter of the investigation area are <33 mg/kg.
Segregation	As	SCS Industrial: 70 mg/kg Eco-SGV 60% (industrial): 150 mg/kg	As-bearing soil > 70 mg/kg to be sent to high As- and Cd-bearing stockpile or ELF.
	Cd	SCS – Industrial: 1,300 mg/kg Eco-SGV 80% (recreational): 12 mg/kg Eco-SGV: 60% (industrial): 33 mg/kg	Cd-bearing soil >33 mg/kg to be sent to high As- and Cd-bearing stockpile or ELF.
Validation	As	SCS Industrial: 70 mg/kg Eco-SGV 60% (industrial): 150 mg/kg	All As concentrations are <70 mg/kg. Additional soil to be removed from beneath the topsoil stockpile areas if concentrations are >70 mg/kg.
	Cd	SCS – Industrial: 1,300 mg/kg Eco-SGV 60% (industrial): 33 mg/kg	All Cd concentrations are <33 mg/kg. Additional soil to be removed from beneath the topsoil stockpile areas if concentrations are >33 mg/kg.

6 TOPSOIL MANAGEMENT PRINCIPLES

Topsoil is the uppermost layer of soil, rich in organic matter and nutrients essential for supporting plant growth and maintaining healthy ecosystems. Effective topsoil management is critical in land development and environmental restoration projects. The following principles for topsoil management aim to minimise degradation and ensure the sustainable re-use of this valuable resource.

Topsoil management at BOGP will consist of the following principles:

- Minimise areas of topsoil disturbance.
- Within areas of disturbance, maximise volumes of topsoil reclaimed during clearing activities.
- Reclaimed topsoil will be stored in appropriate temporary stockpiles.
- Stored topsoil will be emplaced during rehabilitation of disturbed surfaces.
- Record keeping of topsoil volumes reclaimed, stored and emplaced shall be maintained.
- As- and Cd-bearing topsoil will be identified and kept separate from non As- and Cd-bearing topsoil during reclamation, storage and placement.
- Ensure SMP integrates with the associated requirements of other BOGP management plans.

6.1 Topsoil Stockpile Management

Stockpile management involves careful handling, storage and preservation of topsoil and subsoils (e.g. alluvium, colluvium, loess) following land disturbance. The goal is to maintain the soil quality for future re-use in rehabilitation while minimising risks to human and environmental health. Key aspects of effective stockpile management include:

- Site selection and preparation
 - Choose stable, well drained areas away from permanent watercourses (>10m), wetlands or slopes to prevent erosion and runoff. Where set-off distances cannot be achieved, provide bunding and drainage that migrates away from the watercourse.
 - Install sediment and erosion controls around the stockpile area before placement (in accordance with site-specific (ESCMPs) discussed above).
- Soil stripping and segregation
 - Topsoil and subsoil to be stockpiled separately.
 - Clearly record and separate stockpiles of high As- and Cd-bearing soil from non As- and Cd-bearing soil to prevent mixing.
- Stockpile construction
 - Where possible, limit stockpile height to <30m
 - Shape piles to a stable angle and avoid overly steep sides to reduce erosion risk

- Vegetation or covering
 - Where practical, vegetate stockpile to reduce erosion, prevent dust and maintain soil biology
 - If necessary, use chemical dust suppressants, such as polymers, to create a surface crust and prevent dust generation
- Drainage and run-off control
 - Divert surface water away from stockpiles using bunds and channels (in accordance with site-specific ESCMPs)
 - Collect runoff in sediment retention ponds in accordance with site specific ESCMPs
- Monitoring and maintenance
 - Inspect stockpiles weekly and after rainfall for signs of erosion, or structural issues
 - Record observations and undertake corrective actions as required
- Reuse and rehabilitation
 - Use topsoil and subsoil in the reverse order they were stripped during site rehabilitation
 - As- and Cd-bearing topsoil/overburden used to rehabilitate areas with naturally elevated levels of As, ensuring rehabilitation process does not perpetuate or remediate the site back to an unacceptably contaminated condition.
- Validation Sampling
 - Validation sampling to be undertaken on the ground surface under the footprint of the high As- and Cd bearing stockpile once removed. A minimum of 5 validation samples to be collected with a general sampling rate of 1:50 m².

7 DUST MANAGEMENT – TOPSOIL

Dust management aims to minimise airborne dust generated during land disturbance activities such as excavation, earthworks and transport. Excessive dust can lead to health risks, visibility issues, environmental damage and regulatory non-compliance.

The following tables outline good practices and dust mitigation strategies which are applicable to the high As- and Cd-bearing soils. For full details on air quality management, please refer to the BOGP Air Quality Management Plan (AQMP).

Table 8: Dust Mitigation Measures

Mitigation and Design	Description
Design and location of	Topsoil stockpiles have been located at a suitable distance away from sensitive receptors.

Mitigation and Design	Description
dust-generating activities	
Management	The BOGP AQMP will be followed. This includes recording of all dust and air quality complaints, identification of cause(s), appropriate measures taken to reduce emissions in a timely manner, and record of the measures taken.
Provision for water supply	Planning and design of the scheme has made provision for water supply to meet the site demand for dust mitigation and dampening.
Equipment and vehicles	The site has been designed to minimise haul route distances and to locate haul routes away from sensitive receptors.
Planting	Topsoil stockpiles will have surfaces stabilised to minimise dust generation by planting of vegetation.
Training	MGL will provide training to the site personnel on dust mitigation. Training will also cover 'emergency preparedness plans' to react quickly in case of any failure of the planned dust mitigation.
Monitoring	An appropriate monitoring scheme will be implemented, as documented in the BOGP AQMP. This includes a range of monitoring methods from visual inspections, wind monitoring and real-time PM ₁₀ continuous monitoring locations. MGL will undertake regular on-site inspections, audit the monitoring programme, carry out regular site inspections to monitor compliance with the AQMP and adjust the frequency of site inspections according to dust risk (higher frequency in dry and windy conditions)
Communication	MGL will maintain good communication with local communities.
Planning of activities	As discussed in the BOGP AQMP, dust generating activities, if possible, should be undertaken during favourable weather conditions and where possible, be avoided during extended periods of dry and windy conditions. If unavoidable, mitigations as per the BOGP AQMP will be undertaken. Excavation of topsoil will cease if winds are greater than 7.5 m/s and/or when dust can be seen blowing over the site boundary.

Table 9: Pit dust generating activities and dust mitigation strategies

Activity	Dust generation method	Mitigation measures
Soil overburden removal	Soil scraping by tracked dozer. Soil loaded into dump truck by	<ul style="list-style-type: none"> Not undertaking soil overburden removal when windspeeds are greater than 7.5 m/s and toward sensitive receptors within 500 m of the

	backhoe excavator or wheeled front end loader.	<p>site boundary and when dust is seen blowing over the site boundary.</p> <ul style="list-style-type: none"> • Minimising drop heights from excavator to dump truck. • Dampen surface of soil where dry soil is seen to be causing dust discharges. • Maintain adequate buffer distance (500 m) to sensitive receptors.
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Table 10: Topsoil stockpile dust generating activities and dust mitigation strategies

Activity	Dust generation method	Mitigation measures
Soil overburden	Dumping soil from dump truck Shaping soil stockpile by backhoe excavator or tracked dozer. Wind erosion on unconsolidated surfaces.	<ul style="list-style-type: none"> • Targeting the topsoil stockpile building or disturbance for when the soil moisture and/or wind conditions are such that dust plumes are unlikely to be blown across the site boundary. • Minimising drop heights from excavator and dump truck. • Dampen surface of soil in response to any soil dust blowing over the site boundary. • Maintain adequate buffer distance, as per the BOGP AQMP, to sensitive receptors. • Where practical, establish vegetative cover on stockpile surface which is resistant to wind erosion.
Elevated As and Cd soil overburden		<ul style="list-style-type: none"> • Keep elevated As and Cd soil overburden separated in the stockpile from other topsoil stockpiles. • Document the location and quantity of soil within the topsoil stockpiles. • Do not mix with uncontaminated topsoil. • Establish a vegetative cover on a stockpile surface which is resistant to wind erosion. • Locate topsoil stockpiles in locations which reduce the risk of dust blowing over boundaries • Dampen the surface of soil in response to any soil dust blowing over the site boundary. • Minimise time topsoil is stockpiled. Where practical direct transfer As- and Cd-bearing soils to rehabilitation areas.

8 EROSION AND SEDIMENT CONTROL

Erosion and sediment control (ESC) measures are designed to prevent soil loss and protect surrounding environments during and after land disturbance activities. These controls minimise the movement of soil particles by water or wind, reducing sedimentation in waterways, protecting soil structure, and ensuring regulatory compliance. For full ESC measures refer to the BOGP Erosion Sediment Control Management Plan (EGL. 2025).

Key components of effective ESC include:

- Minimise soil disturbance- only disturb areas necessary for the activity and limit the duration of exposure to the elements to reduce erosion risk.
- Preserve existing vegetation where possible to stabilise soil and reduce run-off
- Surface stabilisation of exposed soils as soon as possible to prevent run-off
- Control water flow across site by the use of diversion drains, contour banks, swales etc.
- Keep clean water (i.e., water that is collected and diverted before reaching areas of land disturbance) separated from dirty water (i.e., water that has been transported through operational/disturbed areas with potential contamination sources)
- Minimise water velocity using check dams, rock aprons or vegetation to prevent erosion and allow sediment to settle.
- Capture and contain sediment using silt fences or sediment retention ponds to prevent sediment leaving the site. Dirty water from earthworks will flow to a sediment retention bund or pond prior to discharge to a watercourse.
- Weather monitoring to check that ESC devices and controls are set-up and ready for a rain event.
- Maintain and inspect controls on a regular basis, especially after a rain event. Repair or replace when required.
- Coordinate erosion and sediment control with other site practices like stockpile management, vehicle access and rehabilitation.

Site Specific Erosion Sediment Control Plan's (ESCP's)

- Site specific ESCP's are to be developed for each main area and approved by a suitably qualified experienced person (SQEP) in accordance with design methodologies set out in BOGP ESC MP (EGL. 2025).
- This SMP should be read and implemented in conjunction with the BOGP ESCMP, and site specific ESCP's.

ESC Device Design Methodology

- All sediment detention ponds, and clean and dirty water diversion channels shall be designed in accordance with the International Erosion Control Association (IECA) ‘Best practice Erosion and Sediment Control’ dated November 2008.
- All other ESC devices shall be designed in accordance with ‘Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region’ referenced GD06, dated June 2016.

9 MONITORING AND ADAPTIVE MANAGEMENT

The following monitoring and adaptive management activities will be undertaken:

- Routine site inspections to be carried out to check that management measures are correctly installed, maintained and functioning as intended, and in accordance with this SMP.
- The Construction Manager/Supervising Manager is responsible for ensuring compliance with this SMP and addressing any issues that arise.
- Dust deposition monitoring sites have been installed to collect dust data, assess and manage the impact of dust discharged from BOGP. Please refer to the BOGP AQMP for more details on air quality monitoring programme.
- Compliance with any relevant consent conditions.
- Accurate records must be kept of inspections, incidents, complaints, and any corrective actions. These records provide accountability and support reporting obligations.
- Incidents, near misses, or breaches must be promptly reported, investigated and documented.
- When non-compliance is identified, immediate corrective actions must be taken. Lessons learned should inform updates to this SMP and onsite practices.
- All contractors and workers must follow MGL protocols. Violations may be addressed through site disciplinary procedures.
- This SMP should allow for updates based on monitoring findings, stakeholder feedback, weather conditions, or changes in site activities. Flexibility ensures continued safety and effectiveness.

10 SITE AND EMERGENCY CONTACTS

Site and emergency contacts are detailed in Table 11

Table 11: Site and Emergency Contacts

Role/Responsibility	Name	Phone	Email/address
General Manager	Paul Miles		pmiles@santanaminerals.com

Construction Manager	Dave Stretch	027 211 1197	dstretch@santanaminerals.com
Environmental Manager	Cheryl Low	021 990 963	clow@santanaminerals.com
Health and Safety Manager	Mel Dunstan	027 558 6248	mdunstan@santanaminerals.com
Site Supervisor	TBC		
Otago Regional Council	TBC	0800 474 082	consent.enquiries@orc.govt.nz
Central Otago District Council	TBC	03 440 0056	monitoring@codc.govt.nz
Medical	Cromwell Medical Centre	03 445 1119	192 Waenga Drive, Cromwell
Hospital	Dunstan Hospital	03 440 4300	29 Hospital Street, Clyde
Emergency Services	Police, fire and ambulance services	111	
Police- non-emergency	Cromwell Police	105	157 Waenga Drive, Cromwell

11 DOCUMENT CONTROL

This SMP is intended to be a live document and will be reviewed and updated as required throughout the duration of the project.

As site conditions, construction activities and surrounding environments evolve, this plan will be adjusted to ensure continued safety, compliance with regulatory requirements, and effective soil management. Updates may be triggered by changes in work staging, stakeholder feedback, incidents, audits or directions from local authorities.

All revisions to the SMP will be documented, dated, and communicated to relevant parties, including site personnel, contractors, and regulatory bodies. The most current version will be maintained on-site and made available upon request.

The following table will be used to record changes.

Item	Section	Summary of change	Reason for change	Complexity of change	Date
1.				<input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Major	
2.				<input type="checkbox"/> Minor	

				<input type="checkbox"/> Moderate <input type="checkbox"/> Major	
3.				<input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Major	
4.				<input type="checkbox"/> Minor <input type="checkbox"/> Moderate <input type="checkbox"/> Major	