

Technical Review

To:	Alexandra Smith	Date:	19/11/2024
Authority:	Environment Southland	Ref:	24116_2B
Consent:	Waikaka Gold Mines LTD		
From	Role in Audit	Internal Reviewer	
Scott Fellers	Contaminated Land Review	Simon Beardmore	

1 Project Summary

Waikaka Gold Mines Limited (WGML) proposes to establish and operate a gold mine near the Waikaka Stream in Southland and has applied for resource consents to Environment Southland (ES) and the Gore District Council (GDC). ES have engaged e3Scientific Limited (e3s) to complete a Preliminary Site Investigation audit of the contaminated land aspects of the application.

1.1 Activity

The applicant proposes to mine gold from a 95 ha site located near 972 Waikaka Road. The site's surface water features comprise the Waikaka Stream, Shepherds Creek and unnamed ditches and ponds. The applicant proposes to disturb the land, take water, discharge to water and divert the Waikaka Stream as part of the gold mining operation.

2 Contaminated Land

2.1 PSI Summary

A Preliminary Site Investigation (PSI) was commissioned by WGML to investigate land on the corner of Waikaka Road and North Chatton Waikaka Road for the presence

of contaminants (Geosciences Limited, 2022). The primary purpose of the PSI was to provide an assessment of actual and potential soil contamination risks in respect to WGML commencing an alluvial gold mining operation on site.

The PSI included an assessment of site history based on:

- Anecdotal evidence from the current site owner
- Historic aerial images
- A site inspection
- Review of property file and contamination registers
- Review of historical mining operations

Based on this information, the following HAIL activities were found to have occurred on the site under investigation:

- Potential HAIL Item E7 - Mining industries (excluding gravel extraction) including exposure of faces or release of groundwater containing hazardous contaminants, or the storage of hazardous wastes including waste dumps or dam tailings
- Confirmed HAIL Item G3 – Landfill Sites

The report notes that the mining that has occurred on the site in the early 1900s and the early 2000s. The report states gravel was dredged, and gold was removed through mechanical sorting as opposed to through chemical extraction, though reference for this information is not included in the report. The report states it is possible that this style of mining could be closer associated with gravel extraction, which is specifically excluded from HAIL E7. This is likely an appropriate assessment as the gravel extraction for mining at the site is likely low risk.

The historical landfill is not within the footprint of the proposed mine; though, it is noted as being approximately 20 m away from the proposed realignment of the Waikaka Stream.

As part of the PSI, a small number of samples were collected from the site. Eight broadacre samples were composited into two samples (Comp 1 and Comp 2), two sediment samples (Sed 1 and Sed 2) were collected from the foot of the landfill and two targeted samples (SS9 and SS10) were collected from the old yard area associated with mining activities from the early 2000s.

All samples were analysed for heavy metals (arsenic, cadmium, copper, mercury and lead). Landfill samples additionally analysed for polyaromatic hydrocarbons (PAH) and organochlorine pesticides (OCP). The targeted samples were additionally tested for total petroleum hydrocarbons (TPH).

The PSI assessed the proposed mining activity being comparable to the outdoor commercial/industrial worker soil contaminant standard which would be appropriate for the works. All results showed analytes far below commercial/industrial standard with no organochlorine pesticides or total petroleum hydrocarbons detected over laboratory limit of reporting.

Heavy metal results from the broadacre testing show relatively similar results across the two samples, and from the toe of the landfill are generally similar to results from the broadacre sampling.

The targeted samples also showed similar heavy metal results to the rest of the sample locations. PAH results showed Benzo(a)pyrene at or below the laboratory limit of detection.

The report concludes that from the investigation that the site does not meet Environment Southland's definition of land that is contaminated and that it does not pose a risk to future land users and to the environment and is therefore suitable for the proposed WKGL development.

2.2 PSI Peer Review Comments

The site investigation was generally conducted in accordance with the Ministry for the Environment's Contaminated Land Management Guideline No.5: Site Investigation and Analysis of Soils (2021 A) and reported in general accordance with Contaminated Land Management Guideline No.1: Reporting on Contaminated Sites (2021 B).

The site history described in the report is relatively in depth. It provides a reasonable basis for developing the sampling and analysis plan but does overlook an area in the southwest part of the site that may have had additional activities occurring.

The 1946 historical aerial image shows a rectangular area partially enclosed by shelter belts adjacent to Waikaka Road in the southwest part of the site. This area appears to possibly have had buildings present and later imagery shows that sheep pens have

been present. No mention of this area has been made in the PSI report. Sheep pens can be associated with livestock dips or spray races, and historical buildings may have been constructed with hazardous materials or stored farm chemicals.

The number, location, and depth of samples provides a reasonable but limited characterisation of contaminant conditions within the piece of land proposed for development. This level of sampling is acceptable for a PSI report; though, additional sampling would be required for a Detailed Site Investigation (DSI).

The suite of contaminants analysed was generally appropriate for assessing contaminants of concern relating to site activities though there are three additional analytes that may have been appropriate to assess. These are discussed below:

- For completeness, it could have been appropriate for the broadacre samples to have been analysed for OCPs given the historical broadacre usage of DDT and other pesticides across the Southland region. Based on past reporting broadacre OCPs are often detectable but at concentrations far below human health standards, so this oversight is likely not critical to the conclusions of the report.
- Farm or rural landfills are often found to have asbestos in the form of asbestos containing building materials (AMC). While asbestos would be unlikely to migrate far from the landfill, it would have been an appropriate analyte if the landfill is disturbed in the future, then additional testing, including asbestos, should be completed.
- Zinc was excluded from the suite of heavy metals. While zinc is of low risk to human health, it can have a negative impact on aquatic life. Given the proximity of the landfill to Shepherds Creek it would have been appropriate to assess zinc within the landfill samples from an ecological perspective, but the omission of zinc is unlikely to change the report conclusions regarding impacts to human health.

Samples collected from the landfill area were collected within the upper 75 mm of sediment which may not have been deep enough to intercept sediment impacted from landfill contaminants leaching through the soil. The results do indicate that impact at surface is likely to be low.

Standard field quality control protocols are described in the report. No duplicate samples were collected. It would generally be an industry best practice to collect at least one duplicate to measure the contaminant concentration difference between

the two samples because of soil heterogeneity, the variability or error within the laboratory analysis and the variability or error related to field sampling technique. It is noted that based on a brief review of the results, samples show low variability, indicating fairly homogeneous soil site, and that sampling was completed on a preliminary basis, rather than for detailed risk assessment. No outliers are present to indicate that there has been a quality control issue within soil sampling.

Despite the few minor notes above the PSI report has generally been completed to an industry standard and does an appropriate job of evaluating the site history. The assessment of the identified HAIL activities' impact on the proposed future mining activity is reasonable. If the one outstanding question outlined in Section 3 below can be addressed, the report should give confidence that contaminated land is likely a low risk to future or current site works.

3 Audit Questions

The rectangular part of the site partially enclosed by shelter belts adjacent to Waikaka Road in the southwest part of the site has not been assessed in the PSI.

If soils in this part of the site are proposed to be disturbed, we recommend that additional information is provided regarding the presence or absence of HAIL activities at this location, along with the likelihood of any soil contamination being present.

4 Proposed Conditions

The PSI has identified a historical landfill on the larger allotment immediately east of Shepherd's stream. The PSI states that there is no plan to disturb the landfill material and that Shepherd's stream will be diverted away from the landfill and the reroute will be located 20 m west from the landfill. Section 2 of the Proposed Conditions of Consent should include a condition detailing how the landfill will be identified during the site works and what measures will be implemented to ensure the landfill material is not disturbed during site works.

Condition 73 within the GDC Specific Conditions specifies a contaminated land accidental discovery protocol for establishing and operating the gold mine at Waikaka Road. The advice within the condition is appropriate but I would recommend it would be more appropriate to move this up to Section One Master Condition Set section as contaminated land could be found at any point during the construction and operation.