Planning Submission Housing Land Supply Act Land at the intersection of Howard Road and Goodwood Road, Goodwood



Date October 2021

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Introduction

The following submission has been prepared by All Urban Planning Pty Ltd for Communities Tasmania in support of a housing land supply order under the *Housing Land Supply Act 2018* (HLSA). The proposed order is to rezone an area of land (the site) to the south west of the junction of Goodwood and Howard Road, Goodwood from Utilities to General Residential under the *Tasmanian Planning Scheme – Glenorchy Local Provisions Schedule (planning scheme).*

1. PART 1 – DETAILS OF THE LAND

1.1. Site information

The proposal relates to Crown land managed by the Department of Primary Industries, Parks, Water and Environment adjacent to the intersection of Goodwood and Howard Roads, Goodwood.

Address	Certificate of Title	Site Area	Owner
N/A	N/A	1438m ²	The Crown (DPIPWE)



Figure 1 – The land (source: Rogerson & Birch)

The land is located within the municipality of the City of Glenorchy and is subject to the *Tasmanian Planning Scheme – Glenorchy Local Provisions Schedule (planning scheme).*

The site exists as a grass mound that sits between a small cul-de-sac, providing access to the properties at 148-158 Howard Road, and the intersection of Howard Road and Goodwood Road. Goodwood Road is a category 3 road that connects the Brooker Highway with the Bowen Bridge and the East Derwent Highway. Goodwood Park is opposite the site to the east on the other side of Howard Road.

The site and the surroundings are described in the plan in Figure 1 and the photos in Figures 2 -4 below.



Figure 2 – View from the top of the mound on the site facing north east towards the intersection of Goodwood and Howard Roads. The southeastern spur of Mount Direction is visible in the distance



Figure 3 – View from the northern end of the site looking south southeast. The grass mound of the site is apparent as is the culdesec of Howard Road and the detached dwellings along Howard Road to the west (right of picture).



Figure 4 -View from the mound at the top of the site looking east towards Goodwood Park on the opposite side of Howard Road



Figure 5 - Existing Zoning (Source: theList)

As shown in Figure 5, the site is currently zoned Utilities. The land to the south within Goodwood is zoned General Residential.

1.2. Description of Housing Land Supply Order

It is proposed that the Minister make a housing supply order under the HLSA:

- 1. to declare the subject land housing supply land in accordance with Section 4(1); and
- 2. include an order in accordance with Section 6 to declare the area of land shown in the site plan in Appendix A to be zoned General Residential under the Glenorchy Local Provisions Schedule.

2. PART 2 – CONSIDERATION OF THE LAND

2.1. Government land (Section 5(1) HLSA)

The land is eligible government land pursuant to Section 5(1) of the Act in that:

- it is government land owned by the Crown and managed by the Department of Primary Industries, Parks, Water and Environment
- the land was government land on the commencement date of the HLSA 20 July 2018.

And the land is not:

- reserved land under the Nature Conservation Act 2002;
- managed under the National Parks and Reserves Management Act 2002;

- managed under the Wellington Park Act 1993;
- permanent timber production zone land, within the meaning of the *Forest Management Act 2013*; or
- future potential production forest land, within the meaning of the *Forestry (Rebuilding the Forest Industry) Act 2014.*

And not more than 5 years has elapsed since the commencement day of the Act, 20 July 2018.

2.2. Need for the land (Sections 5(2)a) HLSA)

Consistent with the Purpose under s.2(a) of the Homes Act 1935 there is a need for the land to be made available to enable the provision of housing assistance to eligible persons.

As at 30 June 2021, there were 646 applicants (15.6 per cent) on the Housing Register seeking accommodation in the Glenorchy LGA as the first preference. Additionally, 40.9 per cent of the Housing Register (1696 applicants) have indicated that they would reside in Glenorchy LGA as either their first of second preference. This data demonstrates the high demand for social and affordable housing in Glenorchy.

It is intended that the land will be developed to provide new social and affordable housing outcomes. This will include new home ownership opportunities consistent with Tasmania's Affordable Housing Strategy 2015-2025 and Action Plans.

2.3. Suitability of the land (Section 5(2)b) HLSA)

The land fulfills the requirements of ss.5(2)(b) of the HLSA in that it is located in close proximity to commercial and employment services of Greater Hobart as shown in Figure 6 including the following:

- 300m to the Prince of Wales Bay Marine Industrial Precinct to the southeast
- 500m to the Tasmanian Technopark to the east
- 700m to the Goodwood neighbourhood shopping centre to the south at Stradbroke Road
- 1.5km to commercial and employment services of Derwent Park to the south
- 2km to the Glenorchy CBD to the south west
- 7km to CBD of Hobart.



Figure 6 - Proximity to Commercial and Employment Services

2.4. Accessibility to Public Transport (Section 5(2)b) HLSA)

The land has direct frontage to the Metro, public transport bus routes 530 on Goodwood Road and Routes 560 and 561 that run through Goodwood. Bus stop Nos. 4043 and 30 are each located within 100m of the site and provide convenient transport to the Glenorchy CBD. See Figure 7 below.



Figure 7 - The site is located on Metro bus routes 530, 560 and 561 (Source: theList)

2.5. Owners Consent (Section 5(3) & (4) HLSA)

The submission is accompanied by the following consents in Appendix B:

- Secretary for the Department of Primary Industries, Parks, Water and Environment
- Minister for Crown Land

Consent from the Director of Housing also accompanies the submission in Appendix B.

2.6. The proposal is consistent with State Policies and the Southern Tasmania Regional Land Use Strategy (Section 6(1)a) HLSA)

The proposed zoning is considered consistent with State Policies and the relevant Regional Land Use Strategy as set out in the following sections:

2.6.1. State Policies

The following State Policies are made under the State Policies and Projects Act 1993:

- State Policy on the Protection of Agricultural Land 2009;
- State Policy on Water Quality Management 1997; and
- Tasmanian State Coastal Policy 1996.

The National Environmental Protection Measures are automatically adopted as State Policies under the State Policies and Projects Act 1993.

The following section examines the State Policies as they apply to this proposal.

2.6.2. State Policy on the Protection of Agricultural Land 2009

The purpose of the State Policy on the Protection of Agricultural Land 2009 is:

"to conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land".

Comment

The proposal does not involve agricultural land and does not conflict with this Policy.

2.6.3. State Coastal Policy 1996

The State Coastal Policy 1996 is created under the State Policies and Projects Act 1993.

Comment

The Policy applies in that the site is located within the coastal zone approximately 250m of the shore of Prince of Wales Bay.

The proposed infill development within an established settlement is consistent with the desired Outcomes for *Urban and Residential Development* under the *State Coastal Policy* and in particular Outcome 2.4.2 that:

Urban and residential development in the coastal zone will be based on existing towns and townships. Compact and contained planned urban and residential development will be encouraged in order to avoid ribbon development and unrelated cluster developments along the coast.

2.6.4. State Policy on Water Quality Management 1997

The State Policy on Water Quality Management is concerned with achieving 'sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of Tasmania's Resource management and Planning System'.

Comment

The zoning will allow for suitable stormwater treatment to be incorporated in future development as required by the Planning Scheme and Urban Drainage Act 2013. Such measures will ensure the long term quality of stormwater runoff is efficiently managed to protect water quality consistent with this Policy.

2.6.5. National Environment Protection Measures

The National Environmental Protection Measures relate to:

- Ambient air quality;
- Ambient marine, estuarine and fresh water quality;
- The protection of amenity in relation to noise;
- General guidelines for assessment of site contamination;
- Environmental impacts associated with hazardous wastes; and
- The re-use and recycling of used materials.

Comment

Other than consideration of the potential for land contamination and the protection of amenity in relation to noise as discussed below, the listed NEPMs do not raise specific matters that are relevant to the proposed zoning.

Potential for land contamination

The Department of Communities engaged Geo Environmental Solutions to prepare an Environmental Site Assessment to assess the potential for contamination on this mounded site that appears likely to include some fill. There are also a number of potentially contaminating activities in the vicinity of the site including underground storage tanks at the Elwick Racecourse and Derwent Barracks. The report is provided in full as Attachment C and concludes that there were no exceedances to human health guidelines. Based on the assessment including soil sampling, no risk to human receptors from potential contamination have been identified.

The protection of amenity in relation to noise

The land is located adjacent to Goodwood Road which is a Category 3 State Road with a speed limit of 80km per hour. It is therefore within a *road or railway attenuation* area as defined under Clause C3.3 of the State Planning Provisions (SPPs).

Future development on the land for residential use will be subject to consideration under Clause C3.6.1 of the Road and Railway Assets Code of the SPPs and in particular Clause C3.6.1 *Habitable buildings for sensitive uses within a road or railway attenuation area*. It is likely that future development on the land would satisfy Acceptable Solution A1a) of this standard as a continuation of the row of residential buildings on this southern side of Goodwood Road. As shown in Figure 8 below the row of existing dwellings to the west have a consistent setback of approximately 5m from the front boundary with the road reserve.



Figure 8 - Setback of existing row of residential buildings from Goodwood Road

2.6.6. Southern Tasmania Regional Land Use Strategy

The Southern Tasmanian Regional Land Use Strategy 2010-2035 (STRLUS) addresses the relevant issues in regard to the need for new residential growth and infill across the region as well as the provision of high quality social and community facilities to meet the education, health care and needs of the community. The proposal is considered consistent with the key regional policies that deal with these matters as follows:

Residential infill

The land is located within the Urban Growth Boundary of the Southern Tasmanian Regional Land Use Strategy (STRLUS) and is surrounded by the urban residential areas of Goodwood as shown in Figure 9 below.

The Dwelling Yield Analysis that underpinned the STRLUS investigated the potential dwelling yields of existing residentially zoned land for the Greater Hobart area. The Demographic Change Advisory Council and the Residential Advisory Council of Australia indicated that over the next 25 years, an additional 30,000 houses will be required in the Greater Hobart area due to population growth. This analysis provided an indication of the capacity of the existing zoned areas to meet the required additional dwellings.

The STRLUS includes a range of policies to manage residential growth for Greater Hobart through 50% infill development and 50% greenfield development to ensure that land is released and developed to make best use of available infrastructure and at efficient densities.

The proposed rezoning would further the objective for 50% of residential growth to be met through infill development on unconstrained land.

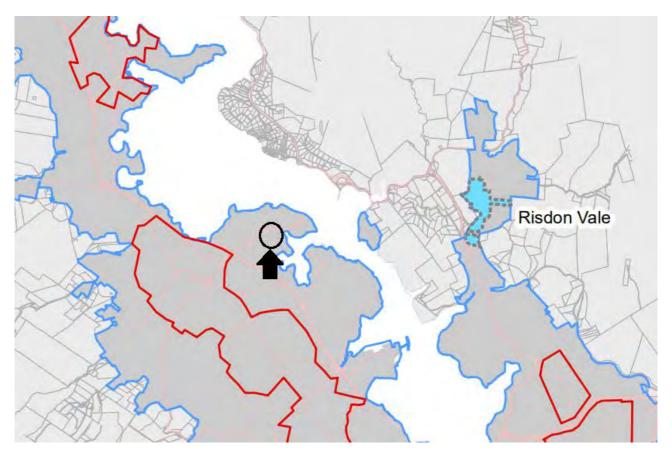


Figure 9 - Extract from Map 10 Residential Strategy for Greater Hobart, Southern Tasmania Regional Land Use Strategy 2013.

The proposal will provide for infill residential development and increased supply of affordable housing consistent with the Regional Settlement Strategy and in particular Regional Policies, SRD1.1, SRD 2.1, SRD 2.7 and SRD 2.11 of STRLUS.

Social Infrastructure

The site is in close proximity to the community services of Glenorchy within 2km of the site.

2.7. The site is not significantly restricted by any code that applies to the land –(Section 6(1)b) HLSA)

The site of the proposed zoning is not subject to any code overlay under the planning scheme. As discussed in section 2.6.5 above future development on the site is likely to be able to comply with the Acceptable Solution for sensitive uses within a road attenuation area under Clause C3.6.1, A1a of the Road and Railway Assets Code of the SPPs.

2.8. The Intended zoning would further the objectives of Schedule 1 of LUPAA (Section 6(1)c) HLSA)

The proposed zoning is considered to further the objectives of Schedule 1 of the Act as follows:

Part 1 Objectives

(a) To promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity;

Comment

The proposal promotes the objectives for sustainable development of land through allowing for the efficient use of existing urban zoned land for residential use and development within the Urban Growth Boundary under the Regional Strategy. The site relates to a cleared grass area and will not require vegetation clearing or impact on ecological processes. It is considered to further this Objective.

(b) To provide for the fair, orderly and sustainable use and development of air, land and water;

Comment

The proposal for infill development to support affordable housing outcomes on this underutilised site is considered fair, orderly and sustainable use and development and will further this objective.

(c) To encourage public involvement in resource management and planning;

Comment

Consideration of the proposal will involve notice to interested persons and the right to make submissions for consideration by the Minister before the proposed order is laid before both Houses of Parliament. The proposal will encourage public involvement consistent with the processes set out under the HLSA and will further this objective.

(d) To facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c) above.

Comment

As stated above, the proposal represents consolidated urban development with access to existing road, reticulated and community infrastructure. It avoids sensitive environmental areas and will facilitate affordable housing and economic development outcomes. Rezoning of the land for residential purposes allows for economic development including the construction phase of site development and by providing affordable housing options. For these reasons the proposal is considered to further this Objective.

(e) To promote sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.

Comment

The proposal will be referred to interested persons for comment including Council, TasWater, Aboriginal Heritage Tasmania and as well as the Heads of relevant Agencies as required by s.11 of the HLSA. The proposal is considered to further this Objective.

2.8.1. Schedule 1 Part 2

(a) To require sound strategic planning and co-ordinated action by State and local Government;

Comment

As demonstrated throughout this assessment the proposal is consistent with the STRLUS and represents sound strategic planning that will further this Objective.

(b) To establish a system of planning instruments to be the principal way of setting objectives, policies and controls for the use, development and protection of land;

Comment

The proposal will apply a new zone under the planning scheme that will set the objectives, policies and controls for the site consistent with this Objective.

(c) To ensure the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land;

Comment

The proposal is considered to further this Objective in that it relates to cleared urban land that will avoid significant environmental values. It will also contribute to broader social, environmental and economic benefits as a result of the proposed urban consolidation.

An environmental site assessment confirms that no risk to human receptors from potential soil contamination have been identified.

(d) To require land use and development planning and policy to be easily integrated with environmental, social, economic, conservation and resource management policies at State, regional, and municipal levels;

Comment

As discussed above the proposal will further strategic planning policies and is consistent with this Objective.

(e) To provide for the consolidation of approvals for land use or development and related matters, and to co-ordinate planning approvals with related approvals;

Comment

The proposal does not conflict with this objective.

(f) To secure a pleasant, efficient and safe working, living and recreational environment for all Tasmanians and visitors to Tasmania;

Comment

The proposal will assist in the provision of a diversity of affordable housing outcomes within close proximity to surrounding services. It furthers this objective.

(g) To conserve those buildings, areas or other places which are of scientific, aesthetics, architectural or historical interest, or otherwise of special cultural value;

Comment

There are no listed historic or cultural values on the site that would be affected by the proposal. There are a number of heritage listed places in the vicinity of the site including an existing house at 150 Howard Road opposite the site within the cul-de-sac and the Elwick Racecourse further to the west. It is considered that the development standards for the proposed General Residential zoning will ensure that the scale of future development will be compatible with the character of the area and will therefore not have an unacceptable impact on the historic cultural heritage values of these nearby places.

(*h*) To protect public infrastructure and other assets and enable the orderly provision and co-ordination of public utilities and other facilities for the benefit of the community;

Comment

The land is within an existing serviced area and will be referred to TasWater for comment pursuant to Section 11(c) of the HLSA. Consultation with the Department of State Growth and Glenorchy Council has confirmed that the land is not required as part of the road network. The proposal will further affordable housing outcomes for the benefit of the community consistent with this Objective.

(i) To provide a planning framework which fully considers land capability;

Comment

The proposal relates to land in an established residential area. The land is not subject to any mapped hazard overlays under the planning scheme.

It is considered appropriate for future residential use and development subject to the normal planning scheme considerations of the General Residential Zone and the provisions of the relevant Codes of the planning scheme.

2.9. The proposed zoning is consistent with the Purpose of the General Residential Zone and the section 8A guidelines of the Land Use Planning and Approvals Act (Section 6(1)d) HLSA)

The proposal to rezone the land to General Residential is consistent with the Purpose of the General Residential Zone in that:

- To provide for residential use or development that accommodates a range of dwelling types where full infrastructure services are available or can be provided.
- To provide for the efficient utilisation of available social, transport and other service infrastructure.
- To provide for non-residential use that:
 - o primarily serves the local community; and
 - does not cause an unreasonable loss of amenity through scale, intensity, noise, activity outside of business hours, traffic generation and movement, or other off site impacts.
- To provide for Visitor Accommodation that is compatible with residential character.

The proposal is assessed against the Section 8A Zone Application Guidelines of the Local Provisions Schedule of the Tasmanian Planning Scheme as follows:

GRZ 1 The General Residential Zone should be applied to the main urban residential areas within each municipal area which:

(a) are not targeted for higher densities (see Inner Residential Zone); and

(b) are connected, or intended to be connected, to a reticulated water supply service and a reticulated sewerage system.

Assessment

Reticulated water, sewer and storm water services are available to the site.

GRZ 2 The General Residential Zone may be applied to green-field, brown-field or grey-field areas that have been identified for future urban residential use and development if:

(a) within the General Residential Zone in an interim planning scheme;

(b) within an equivalent zone under a section 29 planning scheme; or

(c) justified in accordance with the relevant regional land use strategy, or supported by more detailed local strategic analysis consistent with the relevant regional land use strategy and endorsed by the relevant council; and

(d) is currently connected, or the intention is for the future lots to be connected, to a reticulated water supply service and a reticulated sewerage system,

Assessment

The existing vacant land zoned Utilities is surplus to the needs of the transport network and is best described as a greyfield site under the STRLUS meaning an underutilised, derelict or vacant residential or commercial site in an urban environment that are not contaminated.¹

The proposal will provide for infill residential development and increased supply of affordable housing consistent with the Regional Settlement Strategy and in particular Regional Policies, SRD1.1, SRD 2.1, SRD 2.7 and SRD 2.11 of STRLUS.

GRZ 3 The General Residential Zone should not be applied to land that is highly constrained by hazards, natural values (i.e. threatened vegetation communities) or other impediments to developing the land consistent with the zone purpose of the General Residential Zone, except where those issues have been taken into account and appropriate management put into place during the rezoning process

Assessment

Reticulated water and sewer are available to service the site. As discussed above, the site is not subject to any mapped hazard overlays under the planning scheme.

2.10. Consideration of any environmental, economic and social impacts (Section 6(1)e) HLSA)

The intended General Residential Zone would not prevent consideration of environmental impacts on the land as required under the Planning Scheme.

¹ Glossary, P102 of the Southern Tasmania Regional Land Use Strategy 2010-2035.

The rezoning of the land will allow for residential development which would facilitate affordable housing and associated economic development including an increase in housing stock.

Positive social impacts from the proposal include an increase in the supply of affordable residential land, which contributes to avoiding homelessness and housing stress. The General Residential Zone includes high standards of development and residential amenity.

The proposal will further objectives for urban consolidation and affordable housing that will contribute to broader social, environmental and economic benefits consistent with this requirement.

2.11. Consideration of the effect on Aboriginal and cultural heritage (Section 6(1)e) HLSA)

The proposal relates to vacant land in an established urban area. It will be referred to Aboriginal Heritage Council for comment pursuant to ss.11(g) of the HLSA.

2.12. Consideration of land use conflict on the site and on land adjacent to the site (Section 6(1)f) HLSA)

The proposed rezoning is consistent with the existing General Residential zoning surrounding the site.

There are no industrial or other uses with the potential to cause environmental harm in the vicinity of the site.

The site is adjacent to Goodwood Road which connects with the Bowen Bridge and Brooker Highway which is a category 3 road with and 80km/h speed limit. As discussed above in section 2.6.5 future residential use on the site is likely to comply with the Acceptable Solutions of the Road and Railway Assets Code confirming that any potential noise impacts from passing traffic noise will be acceptable.

2.13. Dwelling and lot density conformity to suburban density (Section 6(2)a HLSA)

The proposal will apply the provisions for the General Residential Zone under the State Planning Provisions.

2.14. Other zones intended for the site (Section 6(2)b) HLSA)

The circumstances of this land do not require the application of any other complimentary zones. It is considered appropriate that the General Residential Zone apply across the full extent of the land and that the Utilities Zone remain for the surrounding areas of road reservation.

2.15. Modified planning provisions (Section 7(1) & (2) HLSA)

It is not considered that the circumstances of this land warrant modification of a relevant housing provision.

2.16. Consultation with interested persons(Section 10 HLSA)

Interested persons (s.10 - s.12)

The interested persons in the case of this land are considered to be:

- Glenorchy City Council
- Heads of Agency that have an interest in whether or the manner in which the land ought be used and or developed including the Department of State Growth;
- TasWater;
- Tas Networks;

- the owners and occupiers of the residential properties at 146, 148, 150, 152, 154, 156, 158 Howard Road and 45 Goodwood Road, Goodwood
- Tasmania Fire Service;
- Tasmanian Heritage Council;
- Aboriginal Heritage Council

Contact details of the suggested interested persons are provided in Appendix D.

Appendix A

Site Plan



UNIT 1, 2 KENNEDY DRIVE CAMBRIDGE 7170 PHONE: (03)6248 5898 EMAIL: admin@rbsurveyors.com WEB: www.rbsurveyors.com This plan has been prepared only for the purpose of obtaining preliminary subdivisional approval from the local authority and is subject to that approval.

All measurements and areas are subject to the final survey.

Base image by TASMAP (www.tasmap.tas.gov.au), © State of Tasmania Base data from the LIST (www.thelist.tas.gov.au), © State of Tasmania



	No.152					5		
			1	No.150			50	
E D					OWNER:	The Crown	Proposed	Subdivision
C B					TITLE REFERENCE: LOCATION:	n/a Howard Road (near Goodwood Park)	Date: 4-10-2021	Reference: COTAS03 13751-01
A REV	AMENDMENTS	DRAWN	DATE	APPR.	LUCATION.	GOODWOOD	Scale: 1:300 (A3)	Municipality: Glenorchy

Appendix B

Consents

Minister for Parks Minister for the Prevention of Family Violence Minister for Police, Fire and Emergency Management



Level 5, Parliament Square 4 Salamanca Place, HOBART TAS 7001 Australia GPO BOX 123, HOBART TAS 7001 Ph: (03) 61657770 Email: <u>minister.petrusma@dpac.tas.gov.au</u>

RECEIVED 2 6 NOV 2021 3Y:

Director of Housing GPO Box 65 HOBART TAS 7001

Consent from the Minister administering the Crown Lands Act 1976 pursuant to s.5(3)(a) of the Housing Land Supply Act 2018

Pursuant to s.5(3)(a) of the Housing Land Supply Act 2018, as the Minister administering the Crown Lands Act 1976, I hereby provide consent for the land listed in the table below, to be the subject of an Order under the Housing Land Supply Act 2018.

Title Reference	Street Address	Suburb	Authority
CT 108441/1, CT 781001/1	William Street	Brighton	DSG
CT 62700/15	18A Lester Road	Penguin	DSG
N/A	Land at the intersection of Howard Road and Goodwood Road	Glenorchy	DPIPWE

Yours sincerely

Hon Jacquie Petrusma MP Minister for Parks

Appendix C

Environmental Site Assessment



SOLUTIONS



ENVIRONMENTAL SITE ASSESSMENT – Version 2 Corner of Goodwood Road and Howard Road, Goodwood March 2021

For Department of Communities

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Point, 7004. Ph 6223 1839 E: Office@geosolutions.net.au

DOCUMENT CONTROL

Title	Version	Date	Author	Reviewed By
Environmental Site Assessment: Goodwood Road and Howard Road, Goodwood, Tasmania	Version 1	9 th March 2021	Sarah Joyce	JP Cumming
Environmental Site Assessment: Goodwood Road and Howard Road, Goodwood, Tasmania	Version 2	31 st March 2021	Sarah Joyce	JP Cumming

EXECUTIVE SUMMARY

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) on the vacant land on the corner of Goodwood Road and Howard Road, Goodwood, Tasmania. GES was commissioned by Department of Communities, to conduct the site assessment.

The Department of Communities Tasmania is proposing unit style housing development with a mediumdensity residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

This ESA has been prepared by a suitably qualified and experienced practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 2013).

The following information was gathered during the desktop investigation:

- The site is zoned *Utility* but is proposed to be rezoned as *General Residential* under the *Glenorchy City Councils Interim Planning Scheme of 2015.*
- The geology of the site is man-made sediments of sand and clays derived from most like basalt and dolerite weathered soils from the Goodwood Road upgrade.
- An EPA Tasmanian search confirmed that historical underground petroleum storage system (UPSS) was present at both Elwick Racecourse & Derwent Barracks. The current investigation confirmed no soil hydrocarbon impact was detected.
- The EPA also confirmed that there was an active UPSS at Linen Services Tasmania at 34-36 Negara Crescent, Goodwood in 2011. GES have been ruled out as the property as potentially impacting the site as it is 250m down gradient from the site.
- WorkSafe Tasmania (WST) confirmed that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.
- Historical aerial photograph review revealed that the site was sandy mudflats almost beach like in appearance in 1957, since then the area has been slowly infilled. It has never house potentially contaminating activities except for the acquisition of uncontrolled fill over time.
- Groundwater is inferred to be converging on the site and then the water migrates east towards Prince of Wales Bay, where it enters the bay 250m from the site; the bay is part of the River Derwent.
- There is the potential for Acid Sulfate Soils (ASS) to be present at the site due to the proximity to the waters of the River Derwent, however for the following reasons ASS is ruled out; 1) field pH was above 5; 2) there was no evidence of water logging or associated odour and 3) there was no blue gley staining of material.
- Potentially contaminating activities in the vicinity of the site include uncontrolled fill, fallout from operating highway, former underground fuel storage and proximity to the zinc works.
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and heavy metals and / or Asbestos.

From the soil assessment, it is concluded that:

- No asbestos fibres or sheeting were identified in the fill on site and therefore the presence of asbestos has been ruled out.
- No visual evidence of water logging or aromatic evidence of a reduced oxygen environment which may have indicated the presence of Acid Sulfate Soils or detection from the field pH testing as pH values ranged 5.6 to 7.4. Therefore, the presence of ASS has been ruled out.

- <u>Human Health:</u> There were no human health guideline exceedances for dermal contact or for dust inhalation and soil ingestion. There were no indoor vapour risks or trench worker vapour risks identified. Therefore, no risk to human receptors from potential soil contamination have been identified.
- <u>Environment:</u> The River Derwent has been identified as an ecological receptor. There were three EIL exceedance for zinc in material at BH01 and BH03 soil bore locations.
- <u>Excavated Soil Management:</u> In terms of *IB105*; 8 of the 10 primary soil samples, are considered Level 2 Material (Low Level Contaminated Soil) due to elevated levels of chromium, manganese, nickel, and zinc.

The following conclusions and recommendations were made:

There were no exceedances to human health guidelines. Based on the current assessment no risk to human receptors from potential soil contamination have been identified.

There were ecological exceedances identified at the site and every effort possible should be made to minimise sediment runoff from the site into the River Derwent. GES recommends the following protection measures:

- A Soil and Water Management Plan (SWMP) should be written and implemented prior to any earthworks being undertaken on the site.
- All contractors working on site should be made aware of this plan.

GES recommends the following:

• In terms of soil disposal, the soil in the areas tested on site is classified as Level 2 Material. Any excavated material for offsite must be managed in accordance with the EPA Tasmanians *IB105* and the controlled waste transport regulations.

Statement of Suitability

Based on the current results of the Environmental Site Assessment, providing the recommended protection measures are put in place then the planned excavation works will not adversely impact on human health or the environment. No further remediation and/or protection measures are required.

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ABREVIATIONS				
AEC	Areas of Environmental Concern			
AHD	Australian Height Datum			
ALS	Analytical Laboratory Services			
ANZECC	Australia and New Zealand Environment and Conservation Council			
BGS	Below Ground Surface			
BH	Borehole			
BTEXN	Benzene Toluene Ethylbenzene Xylene Naphthalene			
COA	Certificate of Analysis			
COC	Chain of Custody			
COPC	Contaminant of Potential Concern			
CRC CARE	Corporative Research Centre for Contamination Assessment and Remediation of the Environment			
CSM	Conceptual Site Model			
DQO	Data Quality Objectives			
EOH	End Of Hole			
EIL	Ecological Investigation Levels			
ESL	Ecological Screening Levels			
EPA	Environmental Protection Authority			
ESA	Environmental Site Assessment			
GDA94	Geocentric Datum of Australia 1994			
GES	Geo-Environmental Solutions Pty. Ltd.			
HIL	Health Investigation Levels			
HSL	Health Screening Levels			
IL	Investigation Levels			
LOR	Limits of Reporting			
MDL	Mean Detection Limit			
NATA	National Association of Testing Authorities			
NEPM ASC	National Environmental Protection (Assessment of Site Contamination) Measure			
NHMRC	National Health and Medical Research Council			
NL	Non Limiting			
NRMMC	Natural Resource Management Ministerial Council			
РАН	Polynuclear Aromatic Hydrocarbons			
РСР	Physico-Chemical Parameters			
PHC	Petroleum Hydrocarbons			
PID	Photo-Ionisation Detector			
PPA	Preferential (PVI) Pathways Assessment			
PVI	Petroleum Vapour Intrusion			
TPH	Total Petroleum Hydrocarbons			
TRH	Total Recoverable Hydrocarbons			
USCS	Unified Soil Classification System			

1 INTRODUCTION

1.1 General

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) on the vacant land on the corner of Goodwood Road and Howard Road, Goodwood, Tasmania. GES was commissioned by Department of Communities, to conduct the site assessment.

The Department of Communities Tasmania is proposing unit style housing development with a mediumdensity residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

This ESA has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 2013) guidelines and key regulations and policies identified in the References section of this document. Personnel engaged in preparing this ESA are listed in Appendix 1 along with their relevant qualifications and years of experience.



Figure 1 Site Location (Image C/O The LIST)

1.2 Site Layout

An aerial image of the existing site layout is presented in Figure 2.

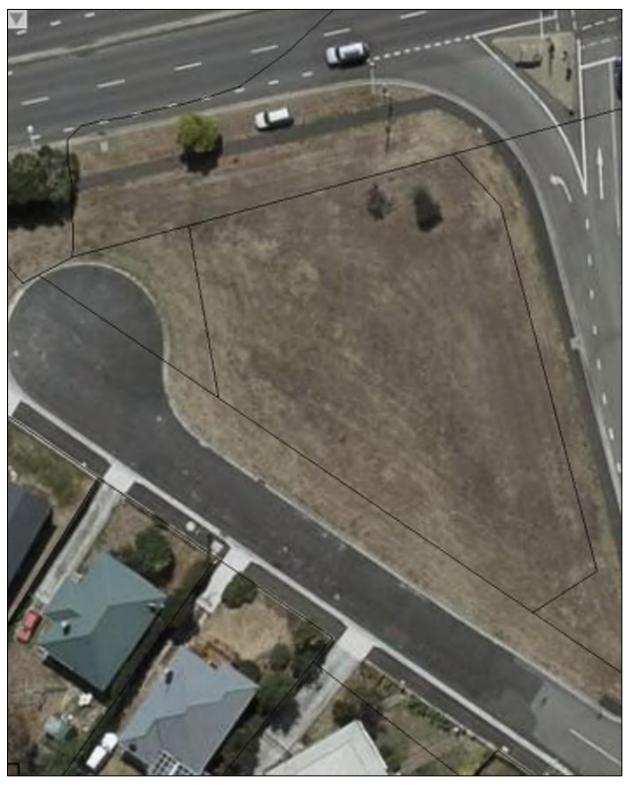


Figure 2 Existing Site Layout (Image C/O The LIST)

1.3 Site Details

Site details are presented in Table 1.

Table 1 Site Details

SITE LOCATION:

Goodwood Road and Howard Road, Goodwood, Tasmania

INVESTIGATION AREA

The investigation area is the vacant land east of the Howard Road cul-de-sac vehicle turning area.

SITE ELEVATION & GRADIENT

Approximately 4m ASL, with slight fall to the east

SITE SURFACING

The site surface in the investigation area is grass and typical of cleared vacant land adjacent to a major road.

TITLE REFERENCES

Information not available.

SITE OWNER Crown Land

PREVIOUS LANDUSE Vacant Land and Reclaimed land; originally mud flats

SITE SURROUNDING LAND ZONING

Glenorchy Interim Planning Scheme 2015 – Utility to be rezoned General Residential

SITE LAND USE

Vacant Land adjacent to Goodwood Road, the major road that connected Goodwood to Old Beach and Rison Vale via the Bowen Bridge.

PROPOSED LAND USE Residential Dwelling

1.4 Investigation Objectives

The objective of this ESA was to investigate the site for contamination and to ensure the excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

1.5 Scope of Works

The scope of work for this ESA was to:

- Conduct a desktop and an invasive soil investigation at the site.
- Drill five (5) soil bores and collect ten (10) primary soil samples.
- The samples were sent for analysis of total recoverable hydrocarbons (TRH) Benzene Toluene Ethylbenzene Xylene Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAH), and a suite of fifteen (15) metals plus pH was testing in a select number of samples.
- Samples were sent to a National Association of Testing Authorities (NATA) accredited laboratory.
- Samples were sent with quality assurance/ quality control (QA/QC) samples including one rinsate blank and one duplicate split sample.
- Determine the absence or presence and if present the level of site contamination and compare soil results against the relevant guidelines.
- Conduct a risk assessment, known as a Conceptual Site Model; and
- Report findings in an Environmental Site Assessment report, detailing specific onsite human health or environmental risk which may source from potentially detected contamination.

2 PLANNING

2.1 Overview

The Department of Communities is proposing unit style housing development with a medium-density residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

2.2 Permit

Currently there is no planning permit for the proposed development. However, in anticipation of excavation work greater than $1m^2$, the following has been considered

2.2.1 PCL1

Confirmation that no more than $1m^2$ of land (to any depth) is being disturbed. If more than $1m^2$ of land is being disturbed, please provide the information required under PCL2.

2.2.2 Excavation Works E2.6.2 P1

As there is proposed excavation works at the site, there are no acceptable solutions to proposed works, E2.6.2 P1 performance criteria are to be addressed. The objective of the performance criteria is to identify that the excavation works must not adversely impact on health and the environment, having regard to:

- (a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or
- (b) a plan to manage contamination and associated risk to human health and the environment that includes:
 - i. an environmental site assessment;
 - ii. any specific remediation and protection measures required to be implemented before excavation commences; and
 - iii. a statement that the excavation does not adversely impact on human health or the environment.

2.2.3 Remediation and Protection Measures

If the Environmental Site Assessment report concludes that remediation and/or protection measures are necessary to avoid risks to human health or the environment, a proposed remediation and/or management plan must be submitted.

Any remediation or management plan involving soil disturbance must include a detailed soil and water management plan to prevent offsite transfer of potentially contaminated soil or stormwater.

2.2.4 Statement of Suitability

A statement based on the results of the Environmental Site Assessment that the excavation as part of the planned works will not adversely impact on human health or the environment is to be provided (subject to implementation of any identified remediation and/or protection measures as required).

3 DESKTOP STUDY

3.1 Site Zoning

The site is zoned *Utility* but is proposed to be rezoned *General Residential* under the Glenorchy City Councils Interim Planning Scheme of 2015. The land use surrounding the site is predominantly *General Residential, Community Purpose, Recreation and Utilities*, see Figure 3. The site is therefore to be assessed against land use Class A for low density Residential land use and Recreational land use.

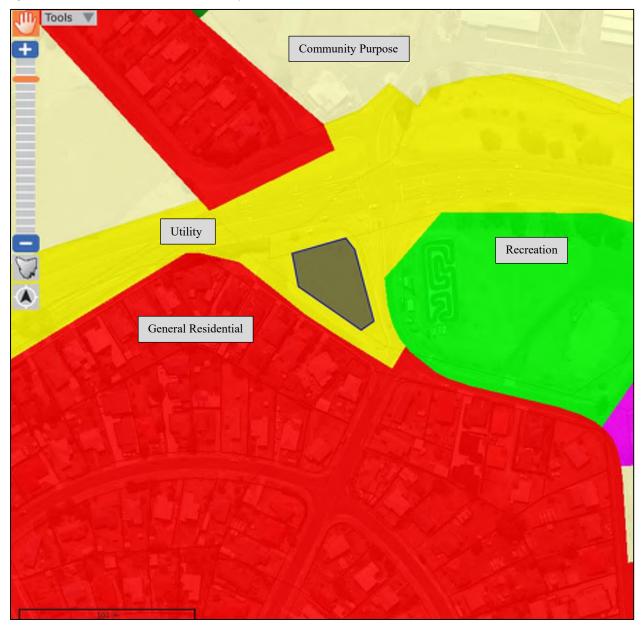


Figure 3 Glenorchy City Councils Interim Planning Scheme Zones (2015)

3.2 Site Walkover

A site walkover was completed by GES staff on the 24th February 2021. No obvious signs of contamination such as staining, or odour plus asbestos fibres were observed. Images are presented in Appendix 2.

3.3 MRT Geology Mapping

The geology of the site has been mapped by Mineral Resources Tasmania, see Figure 4. The site is inferred to be underlain with man-made deposits over Quaternary sediments. The surrounding area is a mix of Jurassic dolerite and Cainozoic basalt.

Geological descriptions follow:

Qhmm – man made deposits over Quaternary sediments *Tbr* - Cenozoic cover sequences – Transitional olivine basalt. *Tbi* - Inferred basalt beneath soil or Cainozoic deposits. *Jd* – Jurassic dolerite and related rocks

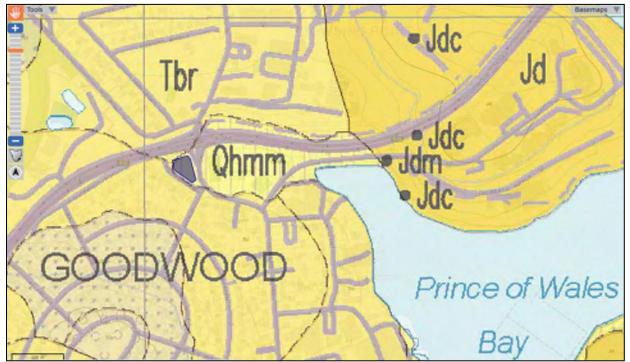


Figure 4 Mineral Resources Tasmania 1:25000 Scale Mapping (The LIST).

3.4 EPA Tasmania

An EPA Archive and Document Search form was submitted on the 16th February 2021 to Environmental Protection Authority (EPA) Tasmania. Due to time constraints the original report was finalised prior to receiving the search results. The search results were provided to GES on the 22 March 2021 and is included in Appendix 3 of this report. The finding from the EPA included the following:

- **2B** Goodwood Road, Dowsing Point; Derwent Barracks in 2000 the EPA were advised of a diesel spill from a leaking fuel line with contaminated soil being removed to Port Latter, in 2001 an underground petroleum storage system (UPSS) was found to be leaking and removed, 2007 additional contaminated soil was removed and in 2014 decommissioned tanks were removed.
- **34-36 Negara Crescent, Goodwood,** Linen Services Tasmania had an active 5000L tank in January 2011
- 2-6 Goodwood Road Elwick Racecourse; in October 2011, an abandoned UPSS was decommissioned.

The data available on the EPA Tasmania Regulated Premises layer on The LIST has been consulted. It shows the following information regarding under UPSS; as illustrated in Figure 5:

- Active: Linen Services Tasmania; 36 Negara Crescent, Goodwood 250m east of the site, similar elevation, potential impact unlikely due to the tidal fluctuations of the River Derwent at this location.
- Abandonded: Elwick Racecourse; 2-6 Goodwood Road, 500m west of the site, potentially contaminated water may impact the site.
- Permanently Decommissioned: Derwent Barracks 2B Goodwood Road, Dowsing Point 300m north from the site; potentially contaminated water may impact the site.



Figure 5 EPA Regulated Premises and UPSS (Source The LIST)

3.5 WorkSafe Tasmania Dangerous Goods Files

Even though the site has been a vacant block of land since it was infilled in the 1960s, WorkSafe Tasmanian (WST) was contacted. WST confirmed on the 22nd March 2021 that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.

3.6 Historical Aerial Photography Interpretation

Historical aerial photographs of the site and surrounding areas were provided by the Department of Primary Industries, Parks, Water and Environment (DPIPWE) and Google Earth. The individual aerial photos are presented in Appendix 4. In summary:

- In 1957 the site was sandy mudflats almost beach like in appearance which provided a path for drainage to enter Prince of Wales Bay. Howard road cul-de-sac was the main through foreshore road
- By 1973 the site had been filled and the land where Goodwood Park is located was created. Howard Road remained the main access road.
- By 1992 Howard Road cul-de-sac had been created as well as a more formal Goodwood Road, and Innovation Drive. The earth mound on the investigation area had been created.
- Little has changed on the site since 1992, except for the removal of three small shrubs.

There are no obvious signs of contaminating activities observed in historical aerial photographs.

Year	Photograph Reference
2019	Plate 1 Historical Aerial Photograph, 12 April 2019 (C/O Google Earth)
2015	Plate 2 Historical Aerial Photograph, 12 June 2015 (C/O Google Earth)
2003	Plate 3 Historical Aerial Photograph, 14 October 2003, (C/O Google Earth)
1992	Plate 4 Historical Aerial Photograph, 1992 The Site and surrounding land (c/o DPIPWE)
1973	Plate 5 Historical Aerial Photograph, 1973 The Site and surrounding suburbs (c/o DPIPWE)
1857	Plate 6 Historical Aerial Photograph, 1957 The Site and surrounding land (c/o DPIPWE)

Table 2 Historical Photograph Log

3.7 Site Topography, Drainage & Hydrogeology

The site sits at approximately 4m above sea level (ASL) and is gently sloping to the southeast. The surface topography and inferred groundwater is illustrated in Figure 6. Based on broad scale topographic trends, groundwater and surface water is inferred to be converging on the site. The waters migrate east towards Prince of Wales Bay, and enter the bay 250m from the site; the a bay is part of the River Derwent.



Figure 6 Contour Elevations and Inferred Surface and Groundwater Flow Direction

3.8 Groundwater

3.8.1 Potential Up-Gradient Contamination Sources

The following up-gradient sources have been considered as potential sources of contamination but discounted:

- Abandonded underground tank at Elwick Racecourse at 2-6 Goodwood Road,
- Permanently Decommissioned: Derwent Barracks at 2B Goodwood Road, Dowsing Point
- General rainfall runoff maybe channelled towards the site if not intercepted by stormwater infrastructure.

3.8.2 Downgradient Ecosystem Receptors

The closest ecological receptor is the River Derwent at Prince of Wales Bay, approximately 0.25 km east of the site.

3.8.3 Acid sulfate soils

According to the Land Information Service Tasmania (LIST) database, thought there are patches of acid sulfate soils (ASS) near to the site the site is not mapped to poses ASS; thus there is a low probability of acid sulfate soils being present at the site.

No signs of water logging during the site visit which would indicate ASS.



Figure 7 Acid Sulfate Soils Mapping (C/O the LIST)

<u>Orange- Low (Costal Acid Sulfate Soils (0-20m AHD):</u> Low probability of occurance (6-70% chance of occurrence in mapping unit). Disturbed ASS terrain, ASS material present below urban development, or present in former tidal zones inside bund walls e.g dredge spoil etc. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available but confidence is fair, based on a knowledge of similar soils in similar environments.

<u>Dark Blue – High (Subtidal)- (Marine Subaqueous / Intertidal Acid Sulfate Soil):</u> Marine Subaqueous / Intertidal Acid Sulfate Soil : High probability of occurance (>70% chance of occurrence in mapping unit). Subaqueous material in subtidal wetland, PASS material and/or MBO. Often seagrasses. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). Analytical data are incomplete but are sufficient to classify the soil with a reasonable degree of confidence.

3.9 Potential Contamination Issues

3.9.1 Areas of Potential Concern

The entire site is considered an area of potential concern due to the following <u>potential</u> contamination influences.

- Fill from the reclaimed land process.
- Exhaust fumes and general road run off from the road surface of Goodwood Road.
- Historical fuel leaks from underground fuel storage tanks at Elwick Racecourse & Derwent Barracks. The active UPSS at Linen Services Tasmania have been ruled out as the property is 250m down gradient from the site.
- Dust fall out from zinc works operation at NyrStar, 1.5km south east of the site.

These potential contamination pathways apply to the entire site, hence the entire site has been identified as an area of potential concern.

3.9.2 Contaminants of Potential Concern

Potential contaminants of potential concern (COPC) that have been considered include the following:

- Total Petroleum/Recoverable Hydrocarbons (TPH/TRH)
- Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN)
- Polynuclear Aromatic Hydrocarbons (PAHs)
- A suite of 15 Heavy Metals and
- Asbestos.

4 FIELD INVESTIGATION PROCEDURES

4.1 Works Summary

Site investigation works comprised of soil bore hand auguring which is summarised in Table 3, Figure 8. GES investigated the areas where soil excavation and soil disturbance are most likely to occur.

Table 3	Summary	of Site	Investigation	Work Dates
I able 5	Summary	or she	investigation	WOIK Dates

	, or sive in , estigation		
Scope	Data	Lab Report	Details
Hang auger Sample collection	23 rd February 2021	EM2103194	11 Primary soil samples were collected and 10 were selected for analysis from 5 bore holes
			1 Duplicate sample and 1 Rinsate sample were collected.



Figure 8 Borehole Plan displayed on aerial photograph

4.2 Soil Investigation

4.2.1 Borehole Drilling

A total of five (5) 65 mm diameter soil bores were hand augured for assessing site geology and sampling for contamination impact.

4.2.2 Soil Sampling

Soil sampling was conducted per the National Environmental Protection Measure (NEPM ASC 2013) and AS4482 sampling guidelines. Table 4 presents a summary of the soil assessment methodology adopted at the site.

Activity	Details / Comments
Drilling Method	Test holes were dug with a 65mm hand auger
Soil Logging	Logging the soil was conducted in accordance with the unified soil classification system (USCS) as detailed in AS1726 (1993).
Decontamination of Sampling Equipment	Quantum Clean Laboratory Detergent (R213) was used to decontaminate reusable sampling equipment (hand auger) between each borehole sampling event.
Soil Screening	In accordance with AS4482.2. Individual soil samples were collected where possible at 0.5 intervals below ground surface (bgs) and/or change in geology. Hydrocarbon odour was not discernible, and hence screening samples for volatile fractions using a Photoionisation Detector (PID) was deemed to be not necessary.
Laboratory Soil Sample Collection	In accordance with AS4482.2. All samples were collected using disposable nitrile gloves. Samples were selected for laboratory analysis at 0.2-0.3m, 0.9-1.1 and 1.5-1.6m below ground surface (bgs). A minimum number of samples were carefully selected which would provide enough information to delineate soil contamination.
Sample preservation	Soil samples were placed into a jar for laboratory analysis. Soil jars were placed in a pre- chilled cool box with ice bricks.
Sample holding times	Sample holding times were within acceptable range (based on NEPM ASC B3-2013) from collection to extraction.

 Table 4 Summary of Soil Sampling Methods

4.2.3 Sample Analysis

Primary and QC samples were submitted to Analytical Laboratory Services (ALS), Springvale, Melbourne for analysis. A total of 10 samples were selected for analysis. Chain of Custody (COC) documentation was completed and is provided in Appendix 5 along with the Sample Receipt Notification (SRN) for each batch. Table 5 presents a summary of the laboratory analyses undertaken.

Analytes	Primary Soil Samples	Duplicate Soil Samples ^a	Rinse Blank ^b
TRH	10	1	1
BTEXN	10	1	1
РАН	10	1	1
Suite 15 Metals	10	1	1
pН	5	1	-

 Table 5 Overview of Soil and Groundwater Analysis and Quality Control

Sampling Quality Control Standards (AS4482):

a - Duplicate and Inter-Laboratory Split samples, one (1) in twenty (20) primary samples

b- Single rinse sample per piece of equipment per day

Given metals were analysed, there was a requirement to assess the following soil physical properties to determine soil threshold investigation levels: Soil grain class (sand/silt or clay); % Clay content; Cation exchange capacity (CEC); and Soil pH. The soil physical properties were based on knowledge of similar soil types encountered around the greater Hobart area.

5 QUALITY CONTROL

All Field and laboratory Quality Assurance and Quality Control (QA/QC) details and outputs are presented in Appendix 6.

5.1 Field

It is standard to expect up to 10% error in field duplication and up to 10% laboratory error. Therefore, in theory up to 20% error can be assumed on duplicate analysis. Some variation may exist in soil and groundwater because even though all efforts are made to split samples homogeneously, fragments of materials may bias samples in certain elements.

Relative Percentage Differences (RPDs) for the duplicate and triplicate samples where applicable are calculated using the method outlined below.

The acceptance criteria used for the RPDs depend on the levels of contaminants detected and the laboratory's Method Detection Limits. The closer the levels detected are to the MDL the greater the acceptable RPD. RPDs are calculated as follows:

- RPD <50% for low level results (<20 * MDL)
- RPD <30% for medium level results (20-100 * MDL)
- RPD <15% for high level results (>100 * MDL)
- No limit applies at <2 * MDL (Method Detection Limit)

Field QA/QC procedures and compliance are summarised in Table 6.

QA/QC Requirement	Compliance	Comments
Appropriate sampling strategy used and representative samples collected	Yes	Sampling program was undertaken in accordance with AS4482.1-2005
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Decontamination	Yes	Appropriate decontamination such as cleaning tools before sampling and between sample locations was undertaken
Chain-of-custody documentation completed	Yes	COC were completed in accordance with NEPM ASC Schedule B2, Section 5.4.5 and transported under strict COC procedures. The signed COC documents are included in this report, which includes the condition report on arrival of samples to the Laboratory, cross checking of sample identification and paperwork and preservation method.
Required number of splits: Duplicate; 1 per 20 primary samples	Yes	One duplicate sample collected and tested, for 10 primary samples analysed, as per AS4482.1-2005.
Required number of splits: inter-lab splits: 1 per 20 primary samples	No	No inter-lab split samples were collected.
QA/QC samples reported RPD's within indicated MDL guidelines.	Yes	For BH02 0.2-0.3 and Dup pairs, 98% of analytes complied.
Required numbers of rinse blank samples collected with no laboratory detections?	Yes	One rinse blank was collected, as per AS4482.1-2005.
Trip blanks collected with no laboratory detections?	NA	According to AS4482.2-1999, soil trip blanks are required where volatile hydrocarbons are discernible. This was not required.
Field blanks collected with no laboratory detections?	NA	According to Australian Standards, there is no requirement to collect field blanks, unless there is concern with cross contamination risks.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

Table 6 Soil Field QA/QC procedures and Compliance

5.2 Laboratory

Soil laboratory QA/QC procedures and compliance are summarised in Table 7.

QA/QC Requirement	Compliance	Comments
All analyses NATA accredited	Yes	ALS Laboratories is NATA Accredited. Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM ASC 2013. Acceptable laboratory limits of reporting (LORs) adopted.
Arrival Temperature; recommended below 6°C	Yes	Sample arrival temperature was recorded at 3.1°C, attempt to chill was evident as it was noted that ice brick were sent in the eski with the samples.
Method Blanks: zero to <practical limit<br="" quantitation="">(PQL)</practical>	Yes	There were no method blank value outliers in the QCI report.
Laboratory Control Samples: 70% to 130% recovery for soil.	Yes	There were no laboratory control outliers in the QCI report.
Matrix spikes: 70% to 130% recovery for organics or 80%- 120% recovery for inorganics	Yes	There were no Matrix spike control outliers in the QCI report.
Duplicate Samples: 0% to <20% RPD.	Yes	There were no duplicate outliers in the QCI report.
Surrogates: 70% to 130% recovery	Yes	There were no surrogate recovery outliers in the QCI report.
Analysis holding time outliers	Yes	No hold-time outliers exist for any of the QCI reports.
Quality Control Sample Frequency Outliers	No	There were Quality Control Sample Frequency Outliers for waters for TRH Semivolatile fractions for Laboratory Duplicates and Matrix Spikes. NEPM ASC 2013 B3 & ALS QC Standard.

Table 7 Soil Laboratory QA/QC Procedures and Compliance

6 FIELD INVESTIGATION FINDINGS

6.1 Soil Bores

6.1.1 Geological Interpretation

Borehole logs are attached in Appendix 7. Our test holes yielded dry greyish brown sandy soils overlying dark brown clays of weathered basalt and or dolerite with small rock inclusions. These deposits are man made from natural materials most likely derived from Goodwood Road upgrade.

6.1.2 Grain & Depth Class Interpretation

Grain size classifications are applied to all soils at the site to determine threshold screening level concentrations for hydrocarbons (and chromium) to assess soil ecological and human health risks.

Grain class threshold values are determined based on either the:

- sample grain size (in the case of ecological screening levels or chromium limits); or
- average grain class overlying the sample point (when assessing petroleum vapour screening levels) relative to the proposed finished floor level.

Table 8 provides a summary of the grain class averages for material overlying the sample.

	Red	<u>۔</u>		Soil Grain Size Class Averaging Above Soil Sample						Att	enua	tion	HSL												
Sample	Footing Excavation Depth^ - Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	GW	GP	GΜ	GC	sw	SP	SM	sc	ML	CL	OL	мн	СН	он	СІ	Rock (R)	Existing Pavement (P)	Crawl Space Thickness (m)	Proposed CONCRETE (CH)	Crawl Space	Biodegradation	Petroleum Vapour Intrusion Grain Class*	SAMPLE USCS
BH01 0.2-0.3	2.0	<																		NA	0.1	1.0	1.0	CLAY	СН
BH01 0.8-0.9	2.0	<																		NA	0.1	1.0	1.0	CLAY	СН
BH01 1.5-1.6	2.0	<																		NA	0.1	1.0	1.0	CLAY	СН
BH02 0.2-0.3	2.0	<																		NA	0.1	1.0	1.0	CLAY	SW
BH02 1.0-1.2	2.0	<																		NA	0.1	1.0	1.0	CLAY	GC
BH03 0.2-0.3	1.7	<																		NA	0.1	1.0	1.0	CLAY	SW
BH03 0.8-0.9	1.7	<																		NA	0.1	1.0	1.0	CLAY	СН
BH04 0.2-0.3	0.4	0.2					0.1													NA	0.1	1.0	1.0	CLAY	СН
BH04 0.4-0.5	0.4	0.4					0.1								0.2					NA	0.1	1.0	1.0	CLAY	СН
BH05 0.2-0.3	0.4	0.2					0.1													NA	0.1	1.0	1.0	CLAY	СН

Table 8 Summary of Grain Class Based on USCS Classification

Footnotes:

* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)

< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in PVI risk assessment

^ Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design

6.1.3 Soil Contamination Observations

No staining or odour consistent with hydrocarbon contamination were observed during the site visit.

7 SOIL ECOLOGICAL IMPACT ASSESSMENT

7.1 Protected Environmental Values

The requirement for protecting soil from contaminated activities in Tasmania is managed under the Environmental Management and Pollution Control Act 1994 (EMPCA) which states in Part 5A:

(2) An area of land is a contaminated site if -

(a) there is in, on or under that area of land a pollutant in a concentration that –

(i) is above the background concentration; and

(ii) is causing or is likely to be causing serious or material environmental harm or environmental nuisance, or is likely to cause serious or material environmental harm or environmental nuisance in the future if not appropriately managed.

Potential soil impact at the site is assessed through application of the following environmental investigation guidelines.

7.2 NEPM ASC (2013) Guidelines

The following ecological investigation guidelines are to be addressed to assess acceptable levels of risk to terrestrial ecosystems:

- NEPM ASC (2013) Ecological Investigation Levels (EIL's) have been developed for selected metal and organic substances. EIL's depend on specific soil and physicochemical properties and land use scenarios and generally apply to the top two (2) metres of the soil profile (NEPM ASC 2013);
- NEPM ASC (2013) Ecological Screening Levels (ESL's) have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions. ESL's broadly apply to coarse- and fine-grained soils and various land use scenarios within the top two (2) metres of the soil profile (NEPM ASC 2013).

Soil analytical results are compared against Ecological Screening Levels (ESL's) and EIL's limits presented in Table 9.

	Analytes In	Analytes Investigated													
Investigation Levels (IL)	Hydrocarbo	ons		Metals											
	BTEX	TRH (F1 to F4)	Benzo(a) pyrene (PAH)	Naphthalene (PAH)	Zn, Cu, Cr(III), Ni & As	Lead	DDT								
ESL's	Analysed	Analysed	Analysed			\geq									
EIL's				Analysed	Analysed	Analysed	Not Analysed								

Table 9 Summary of Soil Contaminates Considered as part of this investigation, based on NEPM (2013) ASC

7.3 Guidelines

7.3.1 Ecological Screening Levels

The following compounds were compared against NEPM ASC (2013) Ecological Screening Levels (ESL's):

- BTEX
- F1 to F4 TRH and
- Benzo(a)pyrene (PAH)

Selection of ESL threshold investigation limits are set out in the NEPM ASC (2013) guidelines and require classification of the soil according to:

- Land use sensitivity:
 - Areas of ecological significance
 - Urban residential and public open space; and
 - Commercial and industrial.
- Dominant particle size passing through a 2 mm sieve into:
 - Coarse sand sizes and greater; and
 - Fine clay and silt sizes.

Adopted NEPM ASC (2013) soil and land use classifications are presented below.

7.3.2 Ecological Investigation Levels

The following compounds were compared against Environmental Investigation Levels:

- Lead;
- Nickel;
- Chromium;
- Zinc;
- Copper;
- Arsenic; and
- Naphthalene.

There was a requirement to classify the soil according to physicochemical properties to develop investigation limits for the above listed compounds. Adopted physicochemical parameters are presented in the results tables.

Selection of EIL threshold investigation limits are set out in the NEPM ASC (2013) guidelines and require classification of the soil per specific soil and physicochemical properties which are presented in the results tables. The adopted land use scenarios presented in Table 10.

Table 10 Adopted Land Use Scenario for the Soil Bores

Land Use Scenario	Applicable Soil Bores
Areas of Ecological Significance	
Urban Residential & Public Open Space	All soil bores
Commercial & Industrial	

Based on a preliminary assessment of site soil conditions, the following physicochemical properties are applied to assess guideline EIL's:

- Clay content consistent with field observations.
- A soil pH and cation exchange capacity (CEC) consistent with Table 11.

USCS	Clay %	CEC	рН
R	100.00	10.00	6.0
GW	0.00	10.00	6.0
GP	0.00	10.00	6.0
GM	10.00	15.00	6.0
GC	30.00	20.00	6.0
SW	0.00	10.00	6.0
SP	0.00	10.00	6.0
SM	10.00	15.00	6.0
SC	20.00	20.00	6.0
ML	30.00	20.00	6.0
CL	100.00	35.00	6.0
OL	50.00	35.00	6.0
MH	30.00	35.00	6.0
СН	100.00	45.00	6.0
ОН	100.00	60.00	6.0
PT	100.00	80.00	6.0
Р	0.00	0.00	6.0
СМ	100.00	35.00	6.0
СМ	100.00	35.00	6.0
Rock	0.00	10.00	6.0

Table 11 Cation Exchange and Clay content, Adopted for the Site

7.4 Findings

7.4.1 Ecological Screening Levels

Laboratory analytical results are presented in Appendix 8. Table 12 compares soil analytical results against relevant NEPM ASC (2013) ESL's. Concentrations which exceeded laboratory limit of reporting (LOR) would be in bold, and ESL exceedances are highlighted with a coloured cell. No risk to ecological receptors were identified.

NEPM Ecological S	Screening Level	ls for So	il		BT	ΈX		PAH		TRH					
Bold - Indicates LC X - Indicates San			ated			e		rene	((C16)	G34)	C40)			
Colour Shading - >1 x, * 2-5 x, ** 5				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - (F3 (>C16 - (F4 (>C34 - (
₽	Date	· Class Irse)	se	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			
Sample ID	Sample Date	Soil Texture Clas (fine /coarse)	Land Use	LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100			
BH01 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH01 0.8-0.9 X	24/2/21	F	URBAN	<0.2	< 0.5	< 0.5	< 0.5	< 0.5	<10	<50	<100	<100			
BH01 1.5-1.6 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH02 0.2-0.3 X	24/2/21	С	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH02 1.0-1.2 X	24/2/21	С	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH03 0.2-0.3 X	24/2/21	С	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH03 0.8-0.9 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			
BH04 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100 <100			
BH04 0.4-0.5	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10						
BH05 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100			

7.4.2 Ecological Investigation Levels

Laboratory analytical results are presented in Appendix 8. Table 13 compares soil analytical results against relevant EIL's. Concentrations which exceeded laboratory LOR are reported in the table, EIL exceedances are highlighted with a coloured cell.

There was three EIL exceedance for zinc for residential land use in BH01 at 0.8-0.9m bgs, in BH03 at 0.2-0.3mbgs and 0.8-0.9mbgs.

NEPM Ecological	Investigati	on Levels fo	or Soil										
Bold - Indicates L X - Indicates Sa			d Exca v	ation									
Colour Shading >1 x, * 2-5 x, **													
Q	Date	ElL Land Use Sensitivity Class	CEC (cmolc/kg)		exture Class /coarse)	Copper (CEC)	Copper (pH)	Nickel	Zinc	Chromium III	Lead	Arsenic	Naphthalene
Sample ID	Sample Date	EIL Land Use Sensitivity Cl	Soil CEC	Soil pH	Soil Texture (fine /coarse	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01 0.2-0.3 X	24/2/21	URBAN	45	6 (3)	F	37	37	122	84	127	8	<5	<1
BH01 0.8-0.9 X	24/2/21	URBAN	45	6 (3)	F	30	30	47	399	63	56	<5	<1
BH01 1.5-1.6 X	24/2/21	URBAN	45	6.6 (1)	F	26	26	97	53	84	7	<5	<1
BH02 0.2-0.3 X	24/2/21	URBAN	10	5.7 (1)	С	6	6	5	45	8	17	<5	<1
BH02 1.0-1.2 X	24/2/21	URBAN	20	6 (3)	С	42	42	138	280	106	29	<5	<1
BH03 0.2-0.3 X	24/2/21	URBAN	10	6 (3)	С	17	17	10	395	12	60	<5	<1
BH03 0.8-0.9 X	24/2/21	URBAN	45	6 (3)	F	40	40	41	461	53	70	<5	<1
BH04 0.2-0.3 X	24/2/21	URBAN	45	7.3 (1)	F	61	61	43	66	38	<5	<5	<1
BH04 0.4-0.5	24/2/21	URBAN	45	7.4 (1)	F	69	69	32	101	28	13	<5	<1
BH05 0.2-0.3 X	24/2/21	URBAN	45	5.6 (1)	F	59	59	29	176	28	20	<5	<1

Table 13 Soil Analytical Results Com	nnared Against Ecological Investi	igation Levels for residential land use
Tuble 10 Son Amary clear Results Com	iparea rigamst Beological myest	gation Devels for restaction fand use

pH Designation:

(1) Using 0.01M CaCl2 extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.

(2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the CaCl2 method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.

(3) Classified in accordance with parent material typical soil pH as per the Tasmanian soils database

8 SOIL HUMAN HEALTH DIRECT CONTACT ASSESSMENT

8.1 Guidelines

Guidelines presented are based on potential exposure of human receptors to soil impact which may include:

- Trench workers repairing or building services (typically to 1 m bgs). This classification is not dependent on the land use class.
- Onsite workers which may be exposed to potential shallow soil impact in non-paved areas of the site; and
- Onsite excavation works which may include basement carparks and deep foundations.

8.1.1 Land Use Classification

The NEPM ASC (2013) guidelines have been referenced to ensure that the correct land use and density category has been adopted for the site and the surrounding properties (where applicable). As per NEPM ASC 2013 guidelines, the adopted land use class is dependent on the building density and the opportunity for soil access by site occupants (exposure to potentially impacted soil). Aspects needing to be considered include:

- Whether the site is of sensitive land use such as a childcare centre, preschool, primary school or aged care facility in which case land use Class A is applicable.
- The percentage of paved area to determine direct contact exposure risk and therefore classification as low or high density; and
- Classification based on residential, recreational, or commercial/industrial setting.

8.1.2 Adopted Land Use Classification

The adopted land use class is presented in Table 14. Land use class is based on the opportunity for soil access as per NEPM ASC 2013 guidelines. There is negligible soil access anticipated on the site, and this investigation is to determine potential contamination. For the sake of the report we will investigate future hypothetical site developments and the access to soil excavated from such potential developments, these include future potential site workers, potential construction workers, and potential trenchworks on site.

Soil Bores	Construction Phase	Location	Land Use	Pathway	Land Use Class
	During	Site	Construction worker and trench workers	ALL	D and trench worker specific
	During	Offsite	Neighbouring residence	ALL	А
All soil		Site	Future trench workers	ALL	D and trench worker specific
	Post	Sile	Residence	ALL	А
		Offsite	Neighbouring residence	ALL	А

Table 14	Summary of Lan	d Use Setting and Densi	ty for Determining Expo	nsure Risk
1 abic 14	Summary of Lan	u Use setting and Densi	ty for Determining Expo	JSUI C INISK

DC – Dermal Contact - Trench Worker Guidelines (CRC CARE 2013); DI – Dust Inhalation - HIL Guidelines (NEPM ASC 2013); SI – Soil Ingestion - HIL Guidelines (NEPM ASC 2013) or ALL – All of above

8.1.3 Health Investigation & Screening Levels

The main exposure pathways and methods for assessing heath risk from contaminated soils are presented in Table 15.

Table 15 Summ	ary of Exposure Path	ways and Prelim	inary (Tier 1) Mo	ethods for Assess	sing Human Exposure
Risk					

Exposure Scenario	Contaminant Type	Tier 1 Assessment Method	Reference				
Vapour Inhalation – Indoor (PVI)		HSL's	NEPM ASC (2013)				
Vapour Inhalation – Trench (PVI)	Petroleum Hydrocarbons	(addressed in PVI sections)	CRC CARE (Friebel				
Dermal Contact	Trydroeuroons	HSL's	& Nadebaum, 2011)				
Dust Inhalation	Metals		NEDM ASC (2012)				
Soil Ingestion	PAH's	Health Investigation Levels (HIL's)	NEPM ASC (2013)				

PVI – Petroleum Vapour Intrusion

8.2 Findings

8.2.1 Dermal Contact - Petroleum Hydrocarbons

Laboratory analytical results are presented in Appendix 8. Table 16 presents soil hydrocarbon analytical results compared against CRC CARE (Friebel & Nadebaum, 2011) HSL guidelines for assessing dermal contact risk. Concentrations which exceeded laboratory LOR would be marked in bold, HSL exceedances would be highlighted with a coloured cell indicating the highest HSL land used class which is exceeded.

There were no hydrocarbon guideline exceedances for dermal contact. No dermal contact risk has been identified.

Table 16 Soil Analytical Results Compared Against CRC CARE (Friebel & Nadebaum, 2011) Guidelines f	or
Dermal Contact	

	us shik Courses in a		EP	080: BTE)	KN			EP080/	071: TRH	
Dermal Conta	Health Screening Level act Hazard from Soil rocarbons'	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL A Low De	nsity Residential	100	14000	4500	12000	1400	4400	3300	4500	6300
HSL C Recreat	tional	120	18000	5300	15000	1900	5100	3800	5300	7400
	ercial/Industrial	430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Mai	ntenance Worker	1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
24/02/2021	BH01 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH01 0.8-0.9 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH01 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH02 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH02 1.0-1.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH03 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH03 0.8-0.9 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH04 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH04 0.4-0.5	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH05 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

8.2.2 Dust Inhalation & Soil Ingestion

Laboratory analytical results are presented in Appendix 8. Soil analytical results are compared against combined dust inhalation and soil ingestion risk is assessed through the application of NEPM ASC (2013) Health Investigation Levels (HILs) for exposure to soil contaminants are presented in Table 17.

Concentrations which exceeded laboratory LOR would be highlight in bold (except for the metals), and HIL exceedances would be highlighted with a coloured cell indicating the highest HIL land used class which is exceeded.

There were no guideline exceedance for dust inhalation and soil ingestion at commercial/industrial land use, and no dust inhalation and soil ingestion risks identified.

Bold - Indicates LOR Exceedance Metalic Compounds	ce in Non	EA002 : pH (Soils)	EA055: Moisture Content	EG005T	: Total N	Vietals	by ICP-A	ES										EG035T: Total Recoverable Mercury by FIMS	EP07	′5(SIN	<u>И)В: Ро</u>	olynuc	lear A	romat	tic Hy	droca	arbon	s								
NEPM Health Investigation Lev	els (HIL's)																																			(o
Dust Inhalation and Soil Ing Assessment	estion		tent						Total											ne	0		0				cene		anthene	anthene	e	.cd)pyrene	thracene	erylene		he TEQ (WH
X - Indicates Sample Within P Excavation Zone	roposed	pH Value	Moisture Conten	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium To	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluor anthene	e	Indeno(1.2.3.	Dibenz(a.h)anthr	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units		pH Unit	*	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg			mg/kg		mg/kg		mg/kg
LOR		0.1	1	5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5 0).5 (0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential	HIL A			100		60	4500	20		100	6000	300	3800	400	200		7400	40																	300	3
HIL C Recreational	🗹 HIL C			300		90	20000	90		300	17000	600	19000	1200	700		30000	80																	300	3
HILD Commerial/Industrial	HIL D			3000		500	300000	900		4000	240000	1500	60000	6000	10000		400000	730																4	1000	40
Sample date: Sample ID																																				
24/02/2021 BH01 0.2-0.3 X			22	<5	180	<1	<50	<1	127	30	37	8	583	122	<5	92	84	<0.1			-									<0.5 <0		_			<0.5	<0.5
24/02/2021 BH01 0.8-0.9 X			17.8	<5	280	<1	<50	2	63	35	30	56	538	47	<5	55	399	0.3			_									<0.5 <0				0.5	<0.5	<0.5
24/02/2021 BH01 1.5-1.6 X		6.6	25.5	<5	280	<1	<50	<1	84	68	26	7	1330	97	<5	70	53	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0	0.5 <	<0.5 <	<0.5 <	0.5	<0.5	<0.5
24/02/2021 BH02 0.2-0.3 X		5.7	5.3	<5	60	<1	<50	<1	8	6	6	17	201	5	<5	21	45	<0.1	<0.5		_									<0.5 <0			<0.5 <	0.5	<0.5	<0.5
24/02/2021 BH02 1.0-1.2 X			14.9	<5	120	<1	<50	2	106	38	42	29	672	138	<5	83	280	<0.1	<0.5	-	-									<0.5 <0				0.5	<0.5	<0.5
24/02/2021 BH03 0.2-0.3 X			6.4	<5	60	<1	<50	2	12	8	17	60	211	10	<5	24	395	<0.1	<0.5											<0.5 <0					<0.5	<0.5
24/02/2021 BH03 0.8-0.9 X			11.7	<5	170	<1	<50	2	53	26	40	70	562	41	<5	61	461	0.2			-									<0.5 <0					<0.5	<0.5
24/02/2021 BH04 0.2-0.3 X		7.3	19.3	<5	170	<1	<50	<1	38	28	61	<5	537	43	<5	104	66	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0	0.5 <	<0.5 <	<0.5 <	0.5	<0.5	<0.5
24/02/2021 BH04 0.4-0.5		7.4	18.6	<5	170	<1	<50	<1	28	36	69	13	500	32	<5	135	101	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0	0.5 <	<0.5 <	<0.5 <	0.5	<0.5	<0.5
24/02/2021 BH05 0.2-0.3 X		5.6	15.7	<5	150	<1	<50	<1	28	29	59	20	550	29	<5	131	176	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <	0.5 <	<0.5 <	<0.5 <	0.5	<0.5	<0.5

Table 17 Soil Analytical Results Compared Against NEPM ASC (2013) Health Investigation Levels Guidelines

9 INDOOR INHABITANT PVI ASSESSMENT – HSL's

This PVI assessment has been conducted in accordance with relevant CRC CARE Technical Documentation and NEPM ASC 2013 guidelines presented in references section of this report. The HSL assessment approach is generally the first (Tier 1) investigation phase adopted for assessing PVI risk at petroleum hydrocarbon (PHC) impacted sites. HSL guidelines have been applied for samples collected from the site to account for risks that may be associated with volatile hydrocarbon vapour intrusion into confined spaces where there may be an inhalation risk through longer term exposure. This does not constitute a full vapour risk assessment but provides additional information from which to further quantify any risk.

A detailed investigation (Tier 2 to 3) is recommended over an HSL assessment where an acute risk has been identified at the site (CRC CARE 2013) because of:

- Migrating product on surface soils beneath buildings;
- Strong PHC odours;
- Flammable risk in confined spaces; and/or
- Health complaints from occupants.

Based on the site visits, none of the above conditions have been identified at the site. If the outcome of this Tier 1 assessment reveals HSL exceedances for hydrocarbon vapour intrusion, a more detailed (Tier 2) assessment will be required to further evaluate the human health risk.

PVI risk is initially interpreted through the development of HSL threshold limits from the following classifications:

- The geology and or hydrogeology of the investigation point; and
- Land use sensitivity:

The resulting HSL threshold limits are compared with laboratory analytical results.

9.1 Selected Media for Assessing PVI Risk

Table 18 presents a summary of the preferred HSL approach to assessing PVI risk. In this case, all soil investigated was within the excavation zone and within the water table.

Media Analysed	Method	Limitations	Order of Preference
Soil Gas	Concentrations of a soil gas through a soil vapor probe	This approach provides the most reliable data in interpreting PVI risk, although direct modelling should be applied if concentrations exceed HSL threshold limits.	Primary
Groundwater	Concentrations of PHC in groundwater through deployment of monitoring wells	 More robust and reliable that soil in determining onsite and in particular, offsite risks. Determining PVI risk based on groundwater is inherently conservative when interpreting vapour risk to account for not readily discernible preferential pathways. Reference may be drawn to alternative assessment approaches: Application of site-specific conditions to the CRC CARE model for assessing PVI risk Soil gas interpretation for areas where a PVI risk is identified from groundwater analysis. 	Secondary
Soil	Concentrations of PHC in soil	Concentrations in soil may be subject variability due to soil moisture, organic content and oxygen ingress all which create significant bias in threshold values. Reliance is place on utilizing groundwater analysis over soil. Soil results provide localised information.	Tertiary

Table 18	Preferred Methods for	· Determining Site PVI Risk
I able I o	I I CICITICA MICHIOUS IOI	Deter mining site i vi i tusk

9.2 Land Use Class

For surrounding properties, the potential PVI risk is characterized through application of CRC CARE HSL's for each individual property based on their existing land use (NEPM ASC 2013; Friebel & Nadebaum 2010). The CRC CARE guidelines have been referenced to ensure that the correct land use and density category has been adopted for surrounding land use to ensure health risks are consistent with the HSL models. Aspects considered include the:

- Sensitivity of the existing or potential land use;
- Percentage of paved area for defining potential vapour migration risk;
- Type of basement garage which may influence the confinement of PHC vapors;
- Presence of a slab or cavity for discerning vapour intrusion risk.

If hydrocarbon impacted soil is discerned at the site, consideration is given to downgradient receptors. Where applicable, land use class therefore considers:

- Downgradient receptors where onsite HSL exceedances have been identified in soil; and
- Variations in land use for different parts of the proposed development.

The following land use classes are applied:

• HSL A for Low Density Residential

9.3 Soil Assessment

Laboratory analytical results are presented in Appendix 8. Table 19 presents the results against a potential indoor vapour risk. Concentrations which exceeded laboratory LOR would be highlighted in bold. HSL exceedances would be highlighted with a coloured cell.

There was no indoor vapour risk identified.

Soil Hydrocarbo Intrusion (NEPN Soil Sample Ana	1 2013)	sessing Indoor		EP	EP080/071: TRH						
Bold - Indicates LC	R Exceedances	e	0	nzene	/lenes	alene					
Colour Shading - >1 x, * 2-5 x, **	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2				
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sumpre ib					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH01 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	А	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 0.8-0.9	24/02/2021	>SLAB/CUT RL	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	24/02/2021	>SLAB/CUT RL	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.2	24/02/2021	>SLAB/CUT RL	CLAY	А	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	А	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.8-0.9	24/02/2021	>SLAB/CUT RL	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.2-0.3	24/02/2021	0 - 1	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.4-0.5	24/02/2021	0 - 1	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.2-0.3	24/02/2021	0 - 1	CLAY	Α	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

Table 19 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk

10 TRENCH WORKER PVI ASSESSMENT - HSL's

10.1 Classification

The following Health Screening Assessment is based on hydrocarbon vapour intrusion risk to subsurface excavation workers within excavations. This is assessed through analysis of vapours from soil and soil vapours. Land use classes are not applicable when assessing vapour intrusion into trenches.

Soil and soil vapour HSL's for assessing hydrocarbon risk to maintenance workers are based on CRC CARE Technical Report 10 guidelines (Friebel & Nadebaum 2011) and the following variables:

- Dominant grain size class of material at the soil sample depth or based on the dominant grain class of the backfill material based on US Agriculture Soil Classification System (SCS) and partitioning into either sand, silt or clay; and
- Classifying soil according to depth ranges: 0 to 2 m; 2 to 4 m; 4 to 8 m; and greater than 8 m;

10.2 Findings

Laboratory analytical results are presented in Appendix 8. Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers are presented in Table 20. Concentrations that exceeded laboratory LOR would be marked in bold, and if there were any HSL exceedances they would be highlighted with a coloured cell. There were no exceedances of the CRC CARE HSL guidelines for Assessing PVI Risk to Trench Workers and no risk identified.

Table 20	Summary of Soil	Analytical Result	s Compared	against HSL's f	or Assessing PVI Ris	sk to Trench
Workers						

CRC CARE Health Screer for PHC Inhalation Risk Soil Sample Analysis	-			EP	EP080/071: TRH					
Bold - Indicates LOR Exc Dark Grey Shading - Ind >1 x, * 2-5 x, ** 5-20 x, *	Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction			
Sample ID	Sample Date	Depth	Grain	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SampleID	Sample Bate	Class	Class	LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH01 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 0.8-0.9	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.2	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.8-0.9	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.2-0.3	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.4-0.5	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.2-0.3	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

11 SOIL DISPOSAL ASSESSSMENT

11.1 Guidelines

Soil which is excavated from the site for landfill disposal is to be assessed against the Environmental Protection Authority Tasmania's Information Bulletin 105 (*IB105*) for Classification and Management of Contaminated Soil for Disposal. The EPA Tasmania uses four categories to classify contaminated soil as per Table 21:

- (Level 1) Fill Material
- (Level 2) Low Level Contaminated Soil
- (Level 3) Contaminated Soil and
- (Level 4) Contaminated Soil for Remediation

Fixed numerical values are presented for soil concentrations and leachable fraction concentrations.

Table 21 Summary of IB105 Classification Guidelines

	Classification (with reference to Table 2)	Controlled Waste ¹	Comments
Fill Material ² (Level 1)	Soil that exhibits levels of contaminants below the limits defined under <i>Fill Material</i> in Table 2.	Unlikely	Soil classified as <i>Fill Material</i> can still be a 'pollutant' under the <i>Environmental Management and</i> <i>Pollution Control Act 1994</i> and needs to be responsibly managed.
Low Level Contaminated Soil (Level 2)	Soil that exhibits levels of contaminants above the limits defined under <i>Fill Material</i> but below the limits defined under <i>Low Level Contaminated Soil</i> in Table 2.	Likely	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil (Level 3)	Soil that exhibits levels of contaminants above the limits defined under <i>Low Level Contaminated Soil</i> but below the limits defined under <i>Contaminated Soil</i> in Table 2.	Yes	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil for Remediation (Level 4)	Soil that exhibits levels of contaminants above the limits defined under <i>Contaminated Soil</i> in Table 2 (regardless of the maximum total concentrations) is generally not considered acceptable for off-site disposal without prior treatment.	Yes	Soil that contains contaminants that do not have criteria for leachable concentrations (<i>e.g.</i> petroleum hydrocarbons), and the levels of contaminants exceed the maximum total concentrations listed in <i>Contaminated Soil</i> , are generally classified as <i>Contaminated Soil for</i> <i>Remediation</i> .

² Criteria for *Fill Material* are the limits set by the Director for the purposes of R.9(2)(a)(ii) in the *Regulations*.

11.2 Findings

The soil samples have been compared against IB105 guidelines for potential future soil disposal, see Table 22. The following conclusions can be made:

- A total of 2 of the 10 samples tested returned classification of Level 1 Material.
- A total of 8 of the 10 samples tested returned classification of Level 2 Material (Low Level Contaminated Soil) due to elevated levels of heavy metals including chromium, manganese, nickel and zinc.

Table 22 Soil Analytical Results Compared Against IB105 Investigation Limits for soil Disposal

		<u>r</u>	8			8																
Classificati	nation Bulletin 105 on and Management of nated Soil For Disposal	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a) pyr en e	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kį	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR	T	5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation I	evel Selected																					
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4	-	750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
/ /													_									
24/02/2021	BH01 0.2-0.3 X	<5	180	<1	<1	127	37	30	8	583	<0.1	122	<5	84	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH01 0.8-0.9 X	<5	280	<1	2	63	30	35	56	538	0.3	47	<5	399	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH01 1.5-1.6 X	<5	280	<1	<1	84	26	68	7	1330	<0.1	97	<5	53	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH02 0.2-0.3 X	<5	60	<1	<1	8	6	6	17	201	<0.1	5	<5	45	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH02 1.0-1.2 X	<5	120	<1	2	106	42	38	29	672	<0.1	138	<5	280	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH03 0.2-0.3 X	<5	60	<1	2	12	17	8	60	211	<0.1	10	<5	395	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH03 0.8-0.9 X	<5	170	<1	2	53	40	26	70	562	0.2	41	<5	461	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH04 0.2-0.3 X	<5	170	<1	<1	38	61	28	<5	537	<0.1	43	<5	66	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH04 0.4-0.5 X	<5	170	<1	<1	28	69	36	13	500	<0.1	32	<5	101	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH05 0.2-0.3 X	<5	150	<1	<1	28	59	29	20	550	<0.1	29	<5	176	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5

12 CONCEPTUAL SITE MODEL

Figure 9 illustrates potential risks that may be associated with potential site contamination. Potential pathways have been identified and where possible ruled out in the Conceptual Site Model.

12.1 Potential Contaminants

The potential contaminants include; Total Petroleum/Recoverable Hydrocarbons (TPH/TRH), Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAHs), a suite of 15 Heavy Metals and Asbestos.

12.2 Potential Sources of Contamination

The site is vacant land adjacent to residential properties. The site was formally the shoreline of Prince of Wales Bay which has been infilled overtime. The most recently added fill is likely to have been derived from Goodwood Road and Howard Road upgrade. The following contaminating activities on neighbouring properties may have impacted the site:

- Surface contamination from the proximity to Goodwood Road.
- Underground fuel storage tanks at Elwick Racecourse & Derwent Barracks
- Dust fall out from zinc works operation at NyrStar, 1.5km south east of the site.

12.3 Potential Human Receptors

The potential human receptors considered during this investigation are the construction workers (commercial land users / trench worker specific) during the site redevelopment, future trench and maintenance workers plus current and future neighbouring residence and recreational users of Goodwood Park plus future residences on the site.

12.4 Potential Ecological Receptors

The closest ecological receptor is the River Derwent at Prince of Wales Bay, approximately 0.25 km east of the site.

12.5 Identified Receptors and Known Contamination

12.5.1 Identified Human Receptors

No NEPM ASC (2013) human Health Investigation Limits or CRC CARE (2011) Health Screening Levels were found to be exceeded, hence no human health risks have been identified.

12.5.2 Identified Ecological Receptors

The River Derwent has been identified as an ecological receptor as there were the following exceedances:

• There were a total of three (3) EIL exceedance for zinc for residential land use in material at BH01 and BH03 locations.

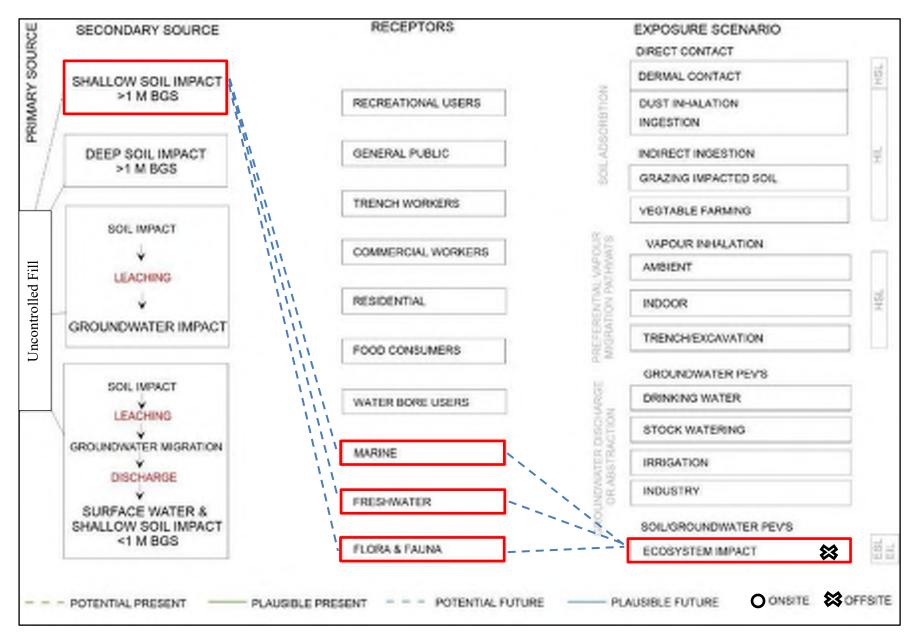


Figure 9 Conceptual Site Mode

Geo Environmental Solutions – GES

13 CONCLUSIONS & RECOMMENDIATIONS

13.1 Desktop Assessment

The following information was gathered during the desktop investigation:

- The site is zoned *Utility* but is proposed to be rezoned as *General Residential* under the *Glenorchy City Councils Interim Planning Scheme of 2015.*
- The geology of the site is man-made sediments of sand and clays derived from most like basalt and dolerite weathered soils from the Goodwood Road upgrade.
- An EPA Tasmanian search confirmed that historical underground petroleum storage system (UPSS) was present at both Elwick Racecourse & Derwent Barracks. The current investigation confirmed no soil hydrocarbon impact was detected.
- The EPA also confirmed that there was an active UPSS at Linen Services Tasmania at 34-36 Negara Crescent, Goodwood in 2011. GES have been ruled out as the property as potentially impacting the site as it is 250m down gradient from the site.
- WorkSafe Tasmania (WST) confirmed that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.
- Historical aerial photograph review revealed that the site was sandy mudflats almost beach like in appearance in 1957, since then the area has been slowly infilled. It has never house potentially contaminating activities except for the acquisition of uncontrolled fill over time.
- Groundwater is inferred to be converging on the site and then the water migrates east towards Prince of Wales Bay, where it enters the bay 250m from the site; the bay is part of the River Derwent.
- There is the potential for Acid Sulfate Soils (ASS) to be present at the site due to the proximity to the waters of the River Derwent, however for the following reasons ASS is ruled out; 1) field pH was above 5; 2) there was no evidence of water logging or associated odour and 3) there was no blue gley staining of material.
- Potentially contaminating activities in the vicinity of the site include uncontrolled fill, fallout from operating highway, former underground fuel storage and proximity to the zinc works.
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and heavy metals and / or Asbestos.

13.2 Soil Assessment

From the soil assessment, it is concluded that:

- No asbestos fibres or sheeting were identified in the fill on site and therefore the presence of asbestos has been ruled out.
- No visual evidence of water logging or aromatic evidence of a reduced oxygen environment which may have indicated the presence of Acid Sulfate Soils or detection from the field pH testing as pH values ranged 5.6 to 7.4. Therefore, the presence of ASS has been ruled out.
- <u>Human Health:</u> There were no human health guideline exceedances for dermal contact or for dust inhalation and soil ingestion. There were no indoor vapour risks or trench worker vapour risks identified. Therefore, no risk to human receptors from potential soil contamination have been identified.
- <u>Environment:</u> The River Derwent has been identified as an ecological receptor. There were three EIL exceedance for zinc in material at BH01 and BH03 soil bore locations.

• <u>Excavated Soil Management:</u> In terms of *IB105*; 8 of the 10 primary soil samples, are considered Level 2 Material (Low Level Contaminated Soil) due to elevated levels of chromium, manganese, nickel, and zinc.

13.3 Conclusions

13.3.1 Human Health

There were no exceedances to human health guidelines. Based on the current assessment no risk to human receptors from potential soil contamination have been identified.

13.3.2 Environmental Protection Measures

There were ecological exceedances identified at the site and every effort possible should be made to minimise sediment runoff from the site into the River Derwent. GES recommends the following protection measures:

- A Soil and Water Management Plan (SWMP) should be written and implemented prior to any earthworks being undertaken on the site.
- All contractors working on site should be made aware of this plan.

13.3.3 Soil Disposal Recommendations

GES recommends the following:

• In terms of soil disposal, the soil in the areas tested on site is classified as Level 2 Material. Any excavated material for offsite must be managed in accordance with the EPA Tasmanians *IB105* and the controlled waste transport regulations.

13.3.4 Statement of Suitability

Based on the current results of the Environmental Site Assessment, providing the recommended protection measures are put in place then any planned excavation works associated with the site redevelopment will not adversely impact on human health or the environment. No further remediation and/or protection measures are required.

Yours faithfully,

Sarah Joyce BSc (Hons) Senior Environmental Scientist

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LIMITATIONS STATEMENT

This *Environmental Site Assessment* Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and by the Department of Communities Tasmania ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site at that point in time. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

Appendix 1 GES Staff

Geo-Environmental Solutions (GES) is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

Geo Environmental Solutions Pty Ltd:

- ACN 115 004 834
- ABN 24 115 004 834

GES STAFF - ENGAGED IN SITE INVESTIGATION WORKS

Dr John Paul Cumming B.Agr.Sc (Hons) Phd CPSS GAICD

- Principle Author and Principle Environmental Consultant
- PhD in Environmental Soil Chemistry from the University of Tasmania in 2007
- 18 years' experience in environmental contamination assessment and site remediation.

Ms Sarah Joyce BSc (Hons)

- Senior Environmental Scientist
- Honours in Geography and Environmental Science at the University of Tasmania in 2003;
- Undergraduate Degree Double Major in Geology and Geography & Environmental Science
- 15 years professional work experience and 8 years contaminated site assessment
- Attendance to recent relevant workshops by ALGA Risk Assessment 101 (May 2018); Vapour Intrusion Workshop (Part A) Petroleum Hydrocarbons (July 2017)

Mr Mark Downie B.Agr.Sc

- Soil Scientist with 15 years professional experience
- 8 Year experience in contamination assessment and reporting of soils and groundwater.

GES STAFF - CONTAMINATED SITES EXPERIENCE

Dr Sam Rees B.Agr.Sc (Phd)

- Soil & Environmental Scientist
- 6 years' experience in hydrocarbon and heavy metal contamination assessment and reporting of soils and groundwater.

Mr Aaron Plummer (Cert. IV)

- Soil Technician
- 6 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

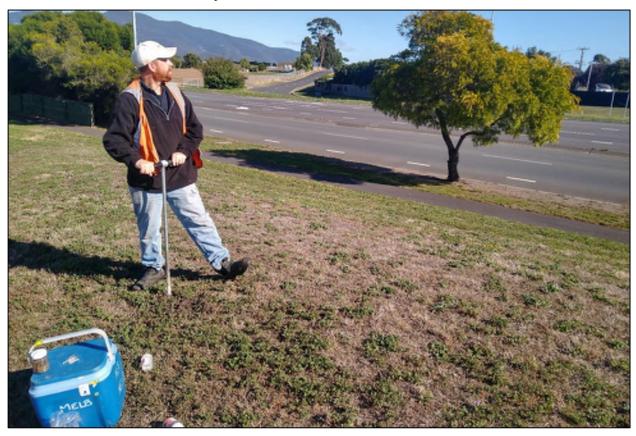
Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 10 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Appendix 2 Site Photographs



View of the site south east towards junction of Howard Road and Barron Avenue



BH01 Location



View east towards Goodwood Park from BH01



View southwest towards 154 Howard road from BH01



View west to the cul-de-sac area of Howard Road



View east along the footpath of Goodwood Road



View across the site to the northwest to BH01



Soil sample BH01 – 1.5-1.6



BH01 Sample location



Sample location of BH02



Sample location of BH02



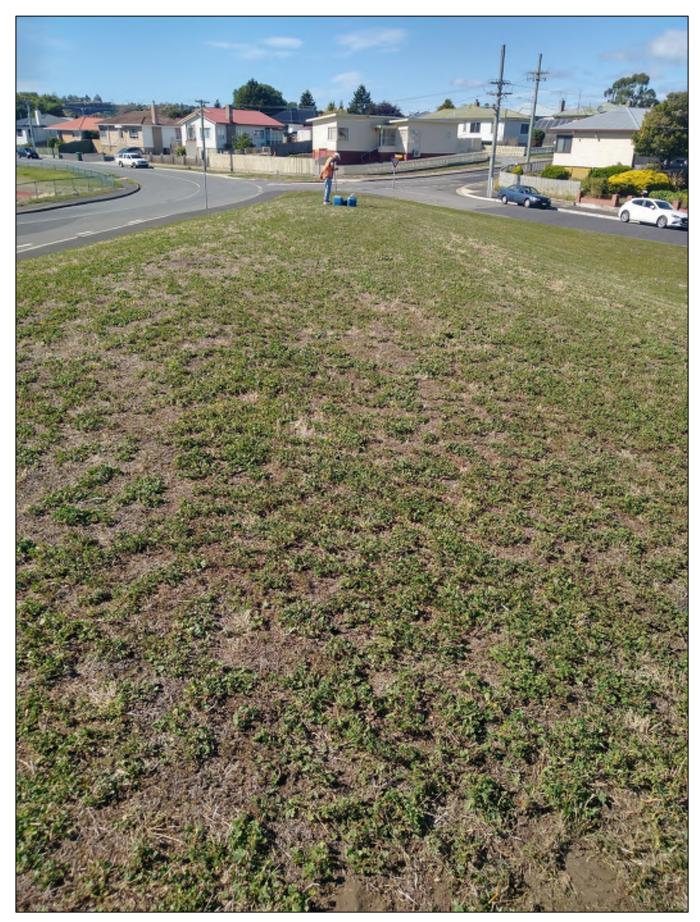
Sample BH02-0.2-0.3



Sample BH02-1.0-1.2



BH02 sample location along Howard Road to the intersection on Goodwood Road



Sample location of BH03, corner of Howard Road and Barron Avenue



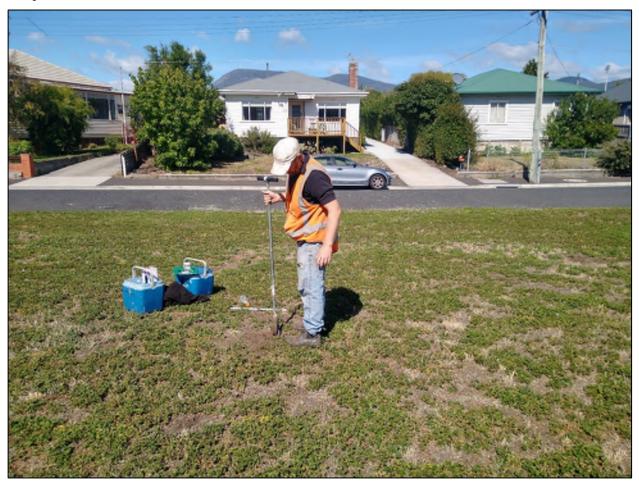
Sample BH03-0.2-0.3



Sample BH03-0.8-0.9



Sample location of BH04, view to the northwest



Sample location of BH04, view to the southwest & 152 Howard Road





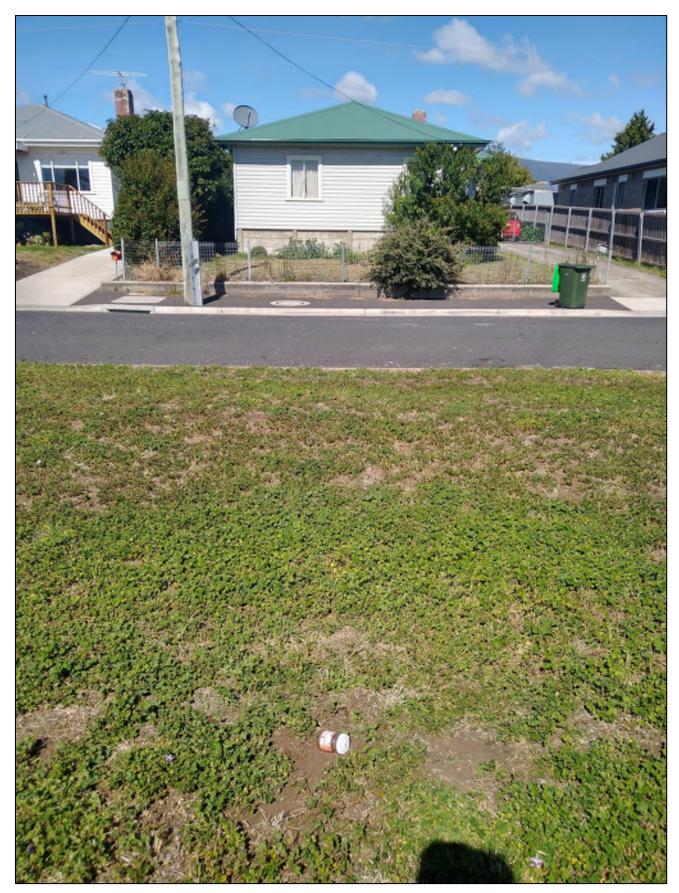
Sample BH04-0.4-0.5



Sample BH05-0.2-0.3



Sample location of BH05, view to the southeast



Sample location of BH05, view to the southwest & 154 Howard Road

Appendix 3 EPA PIR Search Results

Environment Protection Authority

GPO Box 1550 HOBART TAS 7001 Australia

Enquiries: Contaminated Sites Unit Phone: +61 3 6165 4599 Email: <u>contaminated sites@npa tas.gov.au</u> Web: www.epa.tas.gov.au Our Ref: (21/404: D21-27019)



22 March 2021

Ms Sarah Joyce Geo Environmental Solutions 29 Kirksway Place BATTERY POINT TAS 7004

Email: sjoyce@geosolutions.net.au

Dear Ms Joyce

PROPERTY INFORMATION REQUEST Crown land at Cnr Howard and Goodwood Road, Goodwood

On 16 February 2021, the Contaminated Sites Unit received your Property Information Request relating to the land referred to above ('the Site'). A search of relevant databases and records has been undertaken.

No records relating to contamination or potentially contaminating activities on the Site were found, however records relating to properties within 250m of the site were found.



from LIST Map

2B Goodwood Road, Dowsing Point

May 2000, EPA received notification of a diesel spill at the Site; the source was identified as a leaking
fuel line from an above ground storage tank. A report Derwent Barracks- Diesel Spill - Report on Site
investigations and Remediation, dated June 2000 and prepared by GHD, summarised the work
undertaken to delineate the extent of the contamination and remediate the Site. Proposed works

included the removal of the leaking bowser and the transport of 580 tonnes of contaminated soil to the Port Latta Landfill.

- In June 2001 EPA were advised that further contamination was identified when a petrol underground petroleum storage system (UPSS) was removed.
- In June 2007, EPA approved the disposal of 5m³ of low-level contaminated soil (Cr and Ni) to the Copping Waste Depot. The waste was generated when groundwater wells were installed.
- In March 2014, EPA received documents regarding the removal and decommissioning of an abandoned UPSS at the Site. The letter from EPA dated 10 April 2014 to the landowner states:

"The submission of the form fulfils the requirements of regulation 31(3) of the Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2010 (UPSS Regulations).

Please note that:

- the decommissioning form and report must be kept by the landowner for a period of 10 years and if the site is sold, they must be delivered to the new landowner; and
- the Decommissioning Assessment Report does not necessarily represent an environmental site assessment for the whole parcel of land, as it is only required to address the area in the immediate vicinity of the UPSS. If redevelopment or a change of use of the site is proposed, the Council may require an environmental site assessment of the whole site to be undertaken."

The Department of Defence and/or The Australian Government Department of Environment and Energy may hold additional records of potentially contaminating activities and/or known contamination issues that may be relevant to the Derwent Barracks.

34-36 Negara Crescent - an underground petroleum storage system (UPSS) total capacity of 5000L was registered as Active in January 2011.

2-6 Goodwood Road - EPA received advice in October 2011 that an abandoned UPSS was present at the Elwick Racecourse; no records relating to decommissioning have been received.

Whilst no record of contamination at either site was found during the search, the storage of fuel is considered a potentially contaminating activity.

Historical WorkSafe Tasmania File 0760 (1956-1990) refers to the storage of dangerous goods in underground storage tanks (UST) at the former Department of Transport & Construction, Dowsings Point Works Depot; however, the street address is incomplete.

Historical WorkSafe EPA records indicate that a smallgoods facility at **40-42 Negara Crescent** was the subject of a Notice of Registration circa 1991. Under Environmental Management and Pollution Control Act 1994 (EMPCA) the premise was determined to be level 1, therefore regulation by EPA would have ceased. WST may have records regarding the storage of dangerous goods at this premise.

No other records relating to contamination or potentially contaminating activities at the adjacent properties were found.

The search of records is restricted to those held by EPA and includes records relating to: The Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020; Industrial Sites (which are or have been regulated by EPA); historical landfills; and contamination issues reported to the Contaminated Sites Unit. In addition, the Incidents and Complaints database and records relating to the historical storage of dangerous goods (as detailed below) are searched.

Please note that the dangerous goods licensing records referred to by EPA are for sites with underground storage tanks that ceased holding Dangerous Goods Licences prior to 1993. WorkSafe Tasmania hold the records for these Licences after 1993.

The following additional sources of contaminated sites information may also be helpful to you

The LIST Map layers available. <u>https://epa.tas.gov.au/regulation/site-information</u>

- 'EPA Regulated Premises' identifies the location of Level 2 regulated premises as well as contaminated sites which are currently regulated. Regulatory documents related to each premises are available from this layer
- 'EPA Underground Petroleum Storage Systems' shows sites where EPA has received notification of the registration, temporary decommissioning or permanent decommissioning of underground petroleum storage systems (UPSS) under the Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020 (UPSS Regulations).
- Local councils issue Development Approvals under the Land Use Planning and Approvals Act 1993, Environment Protection Notices and Environmental Infringement Notices, and record complaints. They may hold additional information that may be relevant to a potentially contaminated site.
- WorkSafe Tasmania (1300 366 322 or <u>wstinfo@justice.tas.gov.au</u>) may have issued dangerous goods licences and/or may hold relevant records for the Site and adjoining properties. As the storage of dangerous goods/fuels is an environmentally relevant activity, you may wish to contact them for further information.

EPA does not hold records on all sites that are or may be contaminated. You should consider obtaining a site history to determine the likelihood of contamination. If contamination on the Site or an adjacent property is considered likely, further assessment by a competent environmental assessment practitioner is recommended. Site assessments should be conducted in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, National Environment Protection Council (or as varied). https://epa.tas.gov.au/regulation/contaminated-sites/identification-and-assessment-of-contaminated-land/contaminated-site-assessment

Please note since I July 2015, the Director requires all environmental site assessments and reports, submitted to the Contaminated Sites Unit for consideration, to be prepared by a person certified as a specialist contaminated sites consultant under a scheme approved by the Director.

Effective 30 June 2018, the endorsed scheme is operated by Certified Environmental Practitioners (CEnvP). Consultants certified under this scheme are approved to use the seal CEnvP Site Contamination. https://www.cenvp.org.

Further details are available at: https://epa.tas.gov.au/regulation/contaminated-sites/identification-andassessment-of-contaminated-land/engaging-a-contaminated-site-assessment-consultant

The Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020 contain requirements relating to the registration, operation and decommissioning of underground fuel tanks. Information is available at: <u>https://epa.tas.gov.au/regulation/underground-fuel-tanks</u> All underground petroleum storage systems in use after 30 March 2010 are required to be registered

Under the Right to Information Act 2009 (RTI Act), you are entitled to apply for any records mentioned within this letter such as reports, letters, or other relevant documents. For further information on how the RTI process works and how to request information under the RTI Act please visit the Department of Primary Industries, Parks, Water and Environment website or https://dpipwe.tas.gov.au/about-the-department/governance-policies-and-legislation/right-to-information

If you are purchasing a property, you should consider Part 5A of the Environmental Management and Pollution Control Act 1994 (EMPCA) which defines and specifies requirements for managing contaminated sites. If there is reason to believe the site is, or is likely to be, contaminated there are certain requirements that you must meet (e.g. notification of a likely contaminated site to the Director, EPA as outlined in section 74B of the EMPCA).

Although all due care has been taken in the preparation of this letter, the Crown gives no warranty, express or implied, as to the accuracy or completeness of the information provided. The Crown and its servants or agents accept no responsibility for any loss or damage arising from reliance upon this letter, and any person relying on the letter does so at their own risk absolutely. If you have any queries in relation to the matters above, please contact the Contaminated Sites Unit using the details at the head of this correspondence or refer to the EPA website at www.epa.tas.gov.au and click on 'Regulation to locate information on Underground Fuel Tanks and Contaminated Sites.

As you are aware, property searches incur a charge of \$364.50. An invoice will be emailed as instructed. If you require this letter and invoice posted, please advise the Contaminated Sites Unit.

Yours sincerely

banny

Liz Canning SENIOR ENVIRONMENTAL OFFICER - CONTAMINATED SITES

Email: Miran@geosolutions.net.au

Attachment: Invoice

Appendix 4 Historical Photographs



Plate 1 Historical Aerial Photograph, 12 April 2019 (C/O Google Earth)



Plate 2 Historical Aerial Photograph, 12 June 2015 (C/O Google Earth)



Plate 3 Historical Aerial Photograph, 14 October 2003, (C/O Google Earth)



Plate 4 Historical Aerial Photograph, 1992 The Site and surrounding land (c/o DPIPWE)



Plate 5 Historical Aerial Photograph, 1973 The Site and surrounding suburbs (c/o DPIPWE)

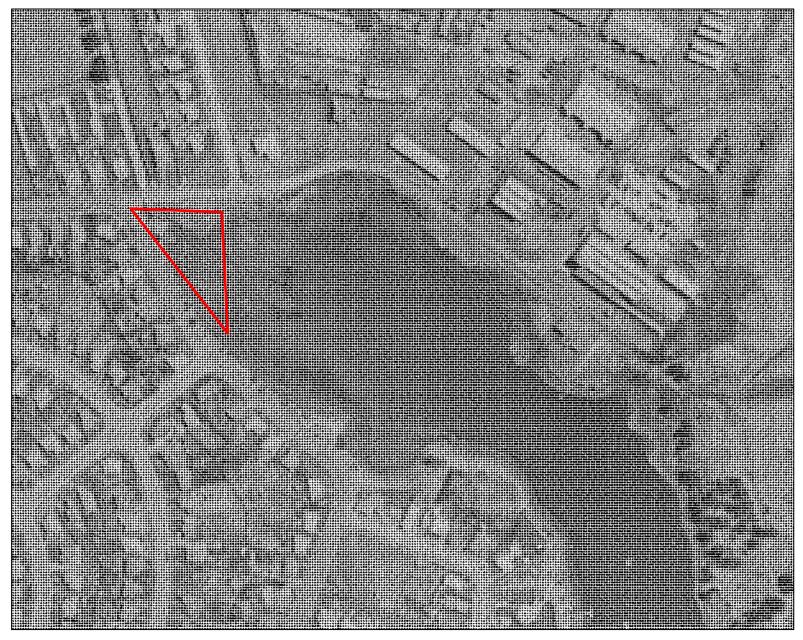


Plate 6 Historical Aerial Photograph, 1957 The Site and surrounding land (c/o DPIPWE)

Appendix 5 Chain of Custody (COC) and Sample Receipt Notification (SRN)



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	EM2103194		
Client Contact Address	GEO-ENVIRONMENTAL SOLUTIONS DR JOHN PAUL CUMMING 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Contact Pr Address 4	tvironmental Division Melbourne eter Ravlic Westall Rd Springvale VIC Australia 171
Telephone	jcumming@geosolutions.net.au +61 03 6223 1839 +61 03 6223 4539	Telephone : +6	eter.ravlic@alsglobal.com 5138549 9645 51-3-8549 9626
Order number C-O-C number Site	G Wood MD, SJ	Quote number : El	of 3 82017GEOENVSOL0001 (EN/222) EPM 2013 B3 & ALS QC Standard
Dates Date Samples Received Client Requested Due Date	: 26-Feb-2021 22:35 : 05-Mar-2021	Issue Date Scheduled Reporting Date	27-Feb-2021 05-Mar-2021
Delivery Details Mode of Delivery No. of coolers/boxes Receipt Detail	Carrier	Security Seal Temperature No. of samples received / a	: Intact. : 3.1 - Ice Bricks present nalysed : 13 / 12

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- Please direct any queries related to sample condition / numbering / breakages to Client Services.
- Sample Disposal Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- Analytical work for this work order will be conducted at ALS Springvale.
- Please refer to the Proactive Holding Time Report table below which summarises breaches of
 recommended holding times that have occurred prior to samples/instructions being received at
 the laboratory. The absence of this summary table indicates that all samples have been received
 within the recommended holding times for the analysis requested.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical
 analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this
 temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS
 recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

RIGHT SOLUTIONS | RIGHT PARTNER

Client	: GEO-ENVIRONMENTAL SOLUTIONS
Page Work Order	2 of 3 EM2103194 Amendment 0
Issue Date	: 27-Feb-2021



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

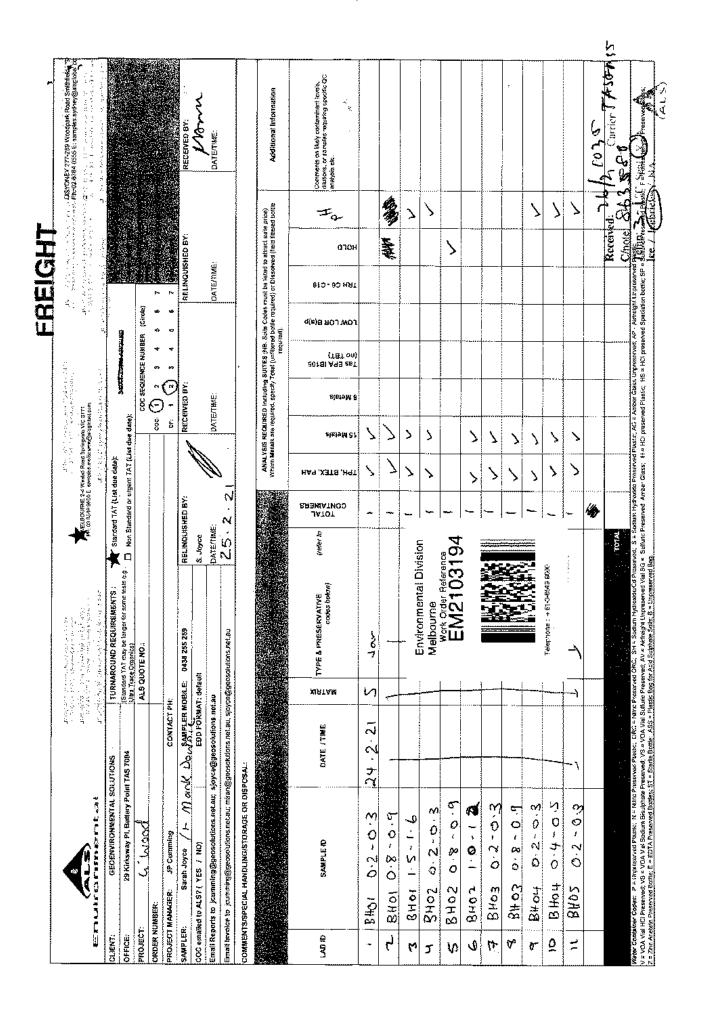
Laboratory sample	Sampling date /	Sample ID	On Hold) SOIL to analysis requested	SOL-EAOI	SOL - EAGE-52) Addane Contert	SOL - S-03 S Metally (NEPN 2013 Salte - Incl. Digestori)	SOL - S-07 TRHBTEXMPAH (SM)
	Feb-2021 00:00	BH01 0.2-0.3	-		1	1	1
EM2103194-002 244	Feb-2021 00:00	BH01 0.8-0.9			1	1	1
EM2103194-003 244	Feb-2021 00:00	BH01 1.5-1.6		1	1	1	1
EM2103194-004 244	Feb-2021 00:00	BH02 0.2-0.3		1	1	1	1
EM2103194-005 244	Feb-2021 00:00	BH02 0.8-0.9	1				
EM2103194-006 244	Feb-2021 00:00	BH02 1.0-1.2			1	1	1
EM2103194-007 24-	Feb-2021 00:00	8H03 0.2-0.3			1	1	1
EM2103194-008 244	Feb-2021 00:00	BH03 0.8-0.9			1	1	1
EM2103194-009 244	Feb-2021 00:00	BH04 0.2-0.3		1	1	1	1
EM2103194-010 24-	Feb-2021 00:00	BH04 0.4-0.5		1	1	1	1
EM2103194-011 24-	Feb-2021 00:00	BH05 0.2-0.3		1	1	1	1
EM2103194-012 244	Feb-2021 00:00	Dup		1	1	1	1

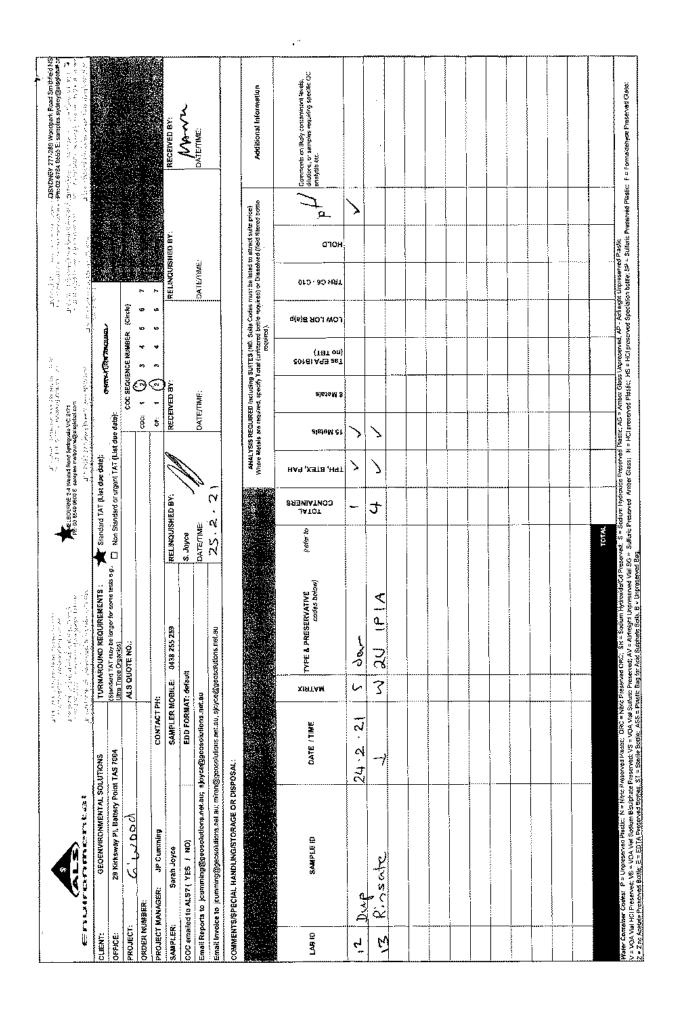
Matrix: WATER	Sampling data	/ Sample ID	ATER - W-00 Metals (NEPM Sube)	ATER - W-07 DHBTEXMPAH
1D	time		S st	18.5
EM2103194-013	24-Feb-2021 00:00	Rinsate	1	1

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Issue Date Paga Work Order Client	27-Feb-2021 3 of 3 EM2103194 Amendment 0 GEO-ENVIRONMENTAL SOLUTIONS		
Requested	Deliverables		
All Invoices			
- A4 - AU Tao	(Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CU	UMMING		
- "AU Certific	ate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- "AU Interpre	etive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- "AU QC Re	port - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sar	mple Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tao	(Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Cu	stody (CoC) (COC)	Email	jcumming@geosolutions.net.au
 EDI Format 	- ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format	- ESDAT (ESDAT)	Email	jcumming@geosolutions.net.au
MIRAN			
- A4 - AU Tao	k Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE			
- "AU Certific	ate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- "AU Interpre	etive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- "AU QC Re	port - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sar	mple Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tao	(Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Cu	istody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format	- ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format	- ESDAT (ESDAT)	Email	sjoyce@geosolutions.net.au





Appendix 6 Quality Assurance and Quality Control

Duplicate Comparrison	Sample	Arsenic	Barlum	Beryllium Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Zinc Marrury	Naphthalene	Acena phthylene	Acena phthene	F luore ne	Phenanthrene	Anthracene	F luora nthene	Pyrene Renzfalanthra.come	Chrysene	Benzo(b)fluoranthene	B enzo(k) fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene Banzola h ilvandona	Sum of polycyclic aromatic hydro	Benzo(a)pyrene TEQ (WHO)	Benzene	Toluene	curyioenzene meta- & para-Xvlene	ortho-Xylene	Sum of BTEX	Total Xylenes Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>c.tu - c.40 Fraction (sum) F.2	Benzo(a)pyrene TEQ (half LOR)	Benzo(a)pyrene TEQ (LOR)
Unit		mg/kg	ng/kg n	ng/kg mg	/kg mg/k	g mg/kg	, mg/kg	mg/kg	mg/kg	ng/kg m	g/kg mg	'kg mg/k	g mg/kg	mg/kg	mg/kg	mg/kg	mg/kg n	ng/kg m	g/kg mg	/kg mg/	/kg mg/kg	g mg/kg	mg/kg	mg/kg n	ng/kg mg	kg mg/l	kg mg/kg	g mg/kg	mg/kg mg	/kg mg/	kg mg/kg	mg/kg m	g/kg mg/	'kg mg/k	g mg/kg	mg/kg	mg/kg	mg/kg	mg/kg mg	g/kg mg	g/kg n	ng/kg m	g/kg m	/kg mg/k	g mg/k	g mg/kg
LOR		5	10	1 1	2	2	5	5	5	2	5 0.	1 0.5	0.5	0.5	0.5	0.5	0.5	0.5 ().5 0.	5 0.	5 0.5	0.5	0.5	0.5	0.5 0.	5 0.5	0.5	0.2	0.5 0	.5 0.5	5 0.5	0.2 ().5 1	10	50	100	100	50	10 1	10 5	50	100 1	.00	0 50	0.5	0.5
24/02/2021	BH02 0.2-0.3	<5	60	<1 <	1 8	6	6	17	201	5	45 <0	.1 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <	0.5 <0	.5 <0	.5 <0.5	<0.5	<0.5	<0.5	<0.5 <0	5 <0.5	5 <0.5	<0.2	<0.5 <0).5 <0.	5 <0.5	<0.2 <	0.5 <1	<10	<50	<100	<100	<50	<10 <	10 <	<50 <	<100 <	100 <	50 <50	0.6	1.2
24/02/2021	Dup	-																					1 1												50	400	400	50	40	10	<50 <	<100 <	100	50 <50	0.0	1.2
24/02/2021	Dup	<5	60	<1 <	1 /	9	6	19	322	6	53 <0	1 <0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <	0.5 <0	.5 <0	.5 <0.5	<0.5	<0.5	<0.5	<0.5 <0	5 < 0.5	5 <0.5	<0.2	<0.5 <0	0.5 <0.	5 <0.5	<0.2 <	0.5 <1	. <10	<50	<100	<100	<50	<10 <	10 \	50	100 \.	100	-50	0.6	
Relative Percentage Difference (RPI		<5 NA	60 0.0	<1 <	A 13.3	9 40.0	6 0.0	19 11.1		6 18.2 1		.1 <0.5 A NA	<0.5 NA	<0.5 NA	<0.5 NA	<0.5 NA			0.5 <0 NA N	_	_	<0.5 NA			<0.5 <0 NA N	_	_	<0.2 NA	<0.5 <0	0.5 <0. IA NA	_	<0.2 <		_	<50 NA	<100 NA	<100 NA	<50 NA				NA I		IA NA		0.0
		-	60 0.0 50	<1 < NA N NA N		9 40.0 50	6 0.0 NA	19 11.1 50	46.3	18.2 1		A NA	NA			_	NA	NA		A N	A NA			NA		A NA	_	<0.2 NA NA		IA N/	A NA	NA		A NA	-	<100 NA NA			NA N	NA N						_
Relative Percentage Difference (RPI		NA	0.0		A 50	9 40.0 50 40		19 11.1 50 100	46.3	18.2 1 50	6.3 N	A NA A NA	NA NA	NA	NA	NA	NA	NA I NA I	NA N	A N	A NA A NA	NA	NA	NA NA	NA N	A NA	NA NA	<0.2 NA NA NA		_	A NA A NA	NA I NA I	NA N/	A NA A NA	NA	NA	NA	NA	NA N	NA NA	NA	NA I		IA NA	0.0	50
Relative Percentage Difference (RPI RPD Compliance Limit %)) %	NA NA NA	0.0 50 200	NA N	A 50 A 40	50 40	NA NA	50	46.3 30 500	18.2 1 50 5 40 1	6.3 N 50 N 100 N	A NA A NA A NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA I NA I NA I	NA N NA N NA N	A NA A NA	A NA A NA	NA NA NA	NA NA NA	NA NA NA	NA N NA N	A NA A NA A NA	NA NA NA	NA NA NA		IA NA	A NA A NA A NA	NA I NA I NA I	NA NA NA NA	A NA A NA A NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA N NA N NA N	1 AV 1 AV 1 AV	NA NA NA	NA I NA I NA I	NA I NA I NA I	IA NA	0.0 NA NA	50 10

For BH02 0.2-0.3 and Dup pairs, 98% of analytes complied.

Quality Control Blanks	Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	fead	Manganese	Nickel	Selenium	vanaqıum Zinc	Boron	Mercury	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene Total Xylenes	Sum of BTEX	Naphthalene	C6 - C9 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum) C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>CLU - CLb Fraction minus Naphthalene (F2) Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene Fluoranthene	riuoi anunene Pyrene	Benz(a) anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo (k)fluoranthene Benzo (albvrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)an thracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons Benzo(a)pyrene TEQ (zero)	
Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L m	ng/L m	g/L mg/	'L mg/l	L mg/L	μg/l	μg/L	μg/L	μg/L μ	g/L µg/	'L μg/L	. μg/L	ug/L μg	/L μg/L	μg/L μ	ıg/L μg	/L μg/L	L μg/L	μg/L μ	μg/L μ	ug/L με	g/L μg/	/L μg/L	.μg/L	μg/L μ	μg/L μg	g/L μg	g/L μg/	L μg/L	μg/L	μg/L μ	ιg/L μg/	/L μg/L	μg/L	μg/L μ	μg/L μg/	/L
LOR	0.001	0.001	0.001	0.0001						0.001 0				0.0001		2		2	2 2	1	5	20 5	100		50 20			100 1		100 10		1	1	1	1 1	1 1	1 1	1	1	1	1 0.		1	1	0.5 0.5	5
Date Sample																																														
24/02/2021 Rinsate	<0.001	<0.001	< 0.001	<0.0001	< 0.001	<0.001	< 0.001	< 0.001	<0.001	<0.001 <0	0.01 <0.	.01 <0.00	0.05	5 <0.0001	<1	<2	<2 <	2 <2	<2	<1	<5	20 <5) <100	<50 <	:50 <20	0 <20	<100	<100 <	<100 <	100 <1	00 <1.0	0 <1.0	<1.0	<1.0 <	1.0 <1	.0 <1.	.0 <1.0	<1.0	<1.0	<1.0 <	1.0 <0.	5 <1.0	<1.0	<1.0 <	(0.5 < 0.5	5



RIGHT SOLUTIONS | RIGHT PARTNER

Page Wurk Order	2 of 12 (Md)100164	A
Client	GEO-ENVIRONMENTAL SOLUTIONS	
Project	G Wood	(ALS)

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APKA, AS and NEPAL. In house developed procedures are fully validated and are often at the client request.

Where worklure determination has been performed, results are reported on a dry weight basis

Where a reported less than (+) result is higher than the LOR, this may be due to primary sample estisch/dipedate dubon and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high Key:

Anonymous = Refers to samples which are not specifically part of this work order but formed part of the GC process for CAS Number = CAS registry number from delabase maintained by Chemical Abstracts Services. The Chemical Abstract LOR = Limit of reporting Its Service is a division of the American Chevrical Society

RPD = Relative Percentage Difference

- Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected initiationatory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Ratabase Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method CMM-EN/38 and are dependent on the magnitude of results in comparison to the lawet of reporting. Result < 10 times LDR: No Limit Desult between 10 and 23 times LDR: VS. - 50%; Result > 20 times LDR: VS. - 20%. Г Laboratory Duplicate (DLP) Report Sub-Marris BOS

CONTRACTOR OF A									
Laboratory sample ID	Sample ID	Wathout Commonand	CAS Humber	4.09	(Init	Original Presit	Diplicate Result	890.00	Persona Limits (%
CG605(ED093)/T: Te	tal Metals by ICP-AES	(QC Lot: 3536527)							
EM2103184-001	Anonymous	EG0057: Beryllum	7640-61-7	1	mgikg	1	1	0.00	No Limit
		EG0057: Cadmium	7443-43-9	1	mgikg	<t 1<="" td=""><td><t 1<="" td=""><td>6.00</td><td>No Limit</td></t></td></t>	<t 1<="" td=""><td>6.00</td><td>No Limit</td></t>	6.00	No Limit
		EG0057 Barlum	7440-39-3	90	maika	30	40	0.00	No Limit
		E0001T Chrismian	7440-47-3	2	malka	46	47	0.00	0% - 20%
		ECCOTT: Cabat	7443-48-4	2	mgikg	17	20	12.3	No Limit
		EG005T: Noter	T640-02-0	2	mglkg	29	30	0.00	0%-50%
		EG005T: Americ	7640-58-2	6	mghg	-6	-6	0.00	No Limit
		EG0057: Copper	7640-50-8	5	mphp	13	54	8.86	No Limit
		EG0057: Load	7439-92-1	5	mghg	13	13	0.00	No Limit
		EG005T: Manganese	7429-96-5	5	inging	211	227	7.29	0% - 20%
		EG005T: Selenium	7782-49-2	5	mgikg	-6	-6	6.00	No Limit
		EG005T Vanadum	7440-62-2	5	maika	62	63	0.00	0% - 50%
		EG001T ZHE	7440-56-6	5	malka	26	26	0.00	No Limit
		EG0017: Boron	7443-42-8	50	malka	+50	×80	0.00	No Limit
EM2103194-007	8H0302-03	EG0057: Berytlum	7640-41-7	1	mgikg	<1 ×1		0.00	No Limit
		EG005T: Cadmium	7643-83-9	1	mphp	2	2	0.00	No Limit
		EG0057: Barlum	7640-39-3	10	maha	60	60	0.00	No Limit
		EG0057: Chromum	7640-67-3	2	mghg	12	12	0.00	No Limit
		EG005T: Cebail	7440-48-4	2	maka		7	8.00	No Limit
		EG0097: Nekel	7440-02-0	2	maka	10	50	6.00	No Limit
		EG001T Assenic	7440-38-2	5	maika	-5	-15	0.00	No Limit
		EGIOST: Capper	7440-50-8	5	maika	17	85	13.0	No Limit
		EG0057: Land	7430-02-1	5	mgikg	60	66	8.77	0% - 50%
		EG005T: Manganese	TK30-06-5	8	mghg	211	183	8.74	0% - 20%
		EG005T: Selenium	7782-49-2	6	mphp	-0	-6	0.00	Notinit

hspe Vurk Onder Slenit Voject	3-of 12 EM21031M GEO-ENVIRONME O Wood	NTAL SOLUTIONS							ALS
up-Marik: 505			1			Laboratory	Deplicate 201P1 Propert		
Laboratory sample ID	Eample ID	Method: Compound	CAS Number	1.08	Qinil	Driphal Pasal ?	Deplicate Result	890.00	Persentry Limits /52
GROMEDOSSOT: To	tel Metals by ICP-AES	IQC Lot: 3538527) + centimed							
M2103194-007	BH031203	EG005T: Vanadum	7640-62-2		maha	24	24	0.00	NoLinit
		EG005T: Zinc	7643-66-6	6	mghg	395	371	6.14	016 - 2016
		EG005T: Boron	7643-42-8	50	mghg	+50	<\$0	0.00	No-Limit
Abot: pH in soil or	sing 0.01M CaCl extrac	1 (OC Lot: 353(846)							
EM2103173-010	Averaments	EA001: pH (CwCQ)		0.1	art unit	6.6	6.6	0.00	0%+20%
M2103173-019	Avariantes	EA001: pH (CuCl2)		0.1	pH Unit	63	6.3	0.00	016 - 2016
Abot: eH in sell or	sing 0.01M CaCl extrac					1			
M2103194-009	8404 0 2 0 3	EADD1: pH (CuCI2)		0.1	attuna	7.3	72	1.38	0% - 20%
EM2103228-006	Anarumans	EADT: pH (CaD2)		0.1	attuni	6.6	6.6	0.00	016 - 2016
		9"G) (OC Let 3539872)		4.1					4.4 - 6414
EM2103182-024	Anorymous	EADS Million Context		0.1		16.4	17.1	415	0%-50%
EM2103194-008	84030808	EADS Molture Content		0.1		11.2	13.0	10.2	0% - 50%
C-1211010-010	0.01010	MS ICC Let 3535126		0.1		102	100	17.6	0.00.0000
EM2103184-001			7/20 07 0			10.1	-0.1		No. Com
EM2103194-001	Anonymous BH03.0.2.0.3	EGIOST: Menory	T430-07-6 T430-07-6	0.1	maka	40.1	10.1	8.00	No Limit No Limit
C - X - 110 - 17 - 111-	0.0112.010	EGC05T: Mercury	1439-01-6	0.1	mgikg	40.1	90.1	8.00	Net-Land
		ocarbons (QC Lot: 3538778)							
EM2103194-001	BH010.2-0.3	EP075(SIM) Naphthalene	91-20-3	0.5	ngkg	+0.5	+0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	malka	-0.5	+0.6	0.00	No Limit
		EP075(SIM): Acesaphthene	83-32-8	0.8	mphg	-0.5	+0.6	0.00	No Limit
		EP075(SIM): Fluorene	86.73.7	0.8	mghg	-0.5	-0.8	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mghg	-0.5	-0.6	0.00	No Limit
		EP075(SIM): Anthracene	130-13-7	0.5	mghg	-0.5	-0.5	6.00	No Limit
		EP015(SM): Puoranthene	206-44-0	0.5	ingkg	-0.5		6.00	No-Limit
		EP075(SM) Pyrene	129-00-0	0.5	mgikg	+0.5	10.5	8.00	NoLimit
		EP075(SIM) Benzia(eriPriscene	58-55-3 218-01-8	0.5	maka	10.5	10.5	0.00	No Limit No Limit
		EP015(SIM) Chrysene	205-99-2	0.5	mgikg mgikg	40.5	40.6	8.00	No Limit
		EP075(SIM): Ben2o(I+)/fuoranthene	205-09-2 205-82-3	0.5	mging	-97.5	90.5	8.00	NO LINK
		EP075(SM); Benzolc/luoranthene	207-08-8	0.5	maika	+0.5	-0.5	6.00	NoLimit
		EP075(SIM) Benot(alpyrene	50-32-8	0.5	maka	+0.5	-0.5	0.00	NoLimit
		EP075(30M) Indexx(1.2.3 of pyrene	193-39-5	0.5	maka	10.5	10.5	0.00	Nelimit
		EP075(30M) Diseruia Vanifyacene	53-76-3	0.5	malka	10.5	10.6	0.00	Netimi
		EP075(SIM): Berzo(g.h./perylene	191-24.2	0.8	maha	10.5	10.6	0.00	No Limit
M2103194-012	Dup	EP075(SIM): Nachthalwre	85-20-3	0.5	maha	-0.5	+0.6	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	maha	-0.5	+0.5	0.00	No Limit
		EP075(5Mz Acenaphthene	83-32-9	0.5	maha	-0.5	-0.5	0.00	No-Limit
		EP075(SM); Fluorene	65-73-7	0.5	maka	-0.5	40.5	8.00	No-Limit
		EP075(SM) Phenanilyrene	85-01-8	0.5	maka	=0.5	-0.5	8.00	No-Limit
		EP015/SMI Anthrasene	129-12-7	0.5	maka	+0.5	+0.5	0.00	No Limit

hige Wurk Onder Stent hispect	4 of 12 EM2100194 GEO-ENVIRONME G Wood	INTAL SOLUTIONS							ALS
ub-Marik: 50L						Laboratory	Deploan 25PI Report	_	
Laboratory sample ID	Sample ID	Notical Company	CAS Number	1.08	Ginil	Driphal Pesalt	Deployer Result	BPD /GJ	Persona Limits /52
EPOTSISIMIS: Polyn	nuclear Anomatic Hydr	ocarbona (QC Lot: 3538778) + continued							
EM2103194-012	Dup	EP075(SIM): Fluoranthene	206-64-0	0.8	maha	<0.5	+0.8	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mghg	<0.5	<0.6	0.00	No Limit
		EP075(SIM): Benzialenthracene	58-55-3	0.5	maha	-0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	maika	-0.5	40.5	0.00	No Limit
		EP075(SIM) Benzo(k+)/fuoranthene	205-09-2 205-03-3	0.5	ngikg	40.5	-0.5	6.00	No Limit
		EP075(SIM): Denzo(k)fuoranthene	207-08-9	0.5	maha	-0.5	-0.5	0.00	No Limit
		EP075/SIM/ Benzolejpyrene	50-32-8	0.5	maha	-0.5	10.5	0.00	No Limit
		EP075(SiM): Indeno(12.3.odjpyrene	193-39-5	0.5	maika	10.5	-0.5	6.00	No Limit
		EP075(SM) Obenzia kianihyacene	53-76-3	0.5	maika	+0.5	+0.5	6.00	Notimit
		EP075(SIM) Benzo(p.h.(perylene	191-24-2	0.5	maka	+0.5	10.5	0.00	No Limit
COMMUTAL Tatal Pa	troleum Hydrocarbon								
EM2103015-001	Anonemous	EPOID: C5 - C9 Fraction		10	maika	60	53	13.1	Notimit
EM2100194-008	010325-0.9	EPOID C6 - C9 Fraction		10	maka	+10	<10	8.00	NoLimit
	stroleum Hydrocarbon					- 14	-14		The Local
EM210011M-001	8H0182-03			100	mathe	+100	+100	8.00	Notimit
EM210311H-001	84010.240.3	EP071: C15 - C28 Praction		100	ingikg	+100	4100	6.00	No.Limit
		EP071: C29 - C36 Praction		50	mgikg	+50	+50	8.00	No-Limit
		EP071: C10 - C14 Fraction		50	mgikg	*50	+50	8.00	No Limit
EM2103194-012	Dup	EP071 C10 - C36 Fraction (sum)		500	mgikg mgikg	+100	*300	6.00	NoLimit
EM2100194-012	MP	EP071: C15 - C28 Fraction		100		<100	<100	0.00	Netimi
		EP071: C29 - C36 Fraction		50	mgikg	<50	<10	0.00	Netime
		EP071: C10 - C14 Fraction		50	nghg	<50	<10	0.00	Netimit
		EP071: C10 - C56 Fraction (sum)		90	mghg	430	-40	1.00	Ne Links
		orvs - NEPM 2013 Frastions (QC Lot 3536346)							
EM2103015-001	Anonymous	EP080: C6 - C10 Fraction	C6,C10	99	maha	117	106	8.92	0% - 50%
EM2103194-008	8H0318-0.9	EP080: C6 - C10 Fraction	C6_C10	10	mghg	<10	<10	8.00	No Limit
		ons - NEPM 2013 Practions (QC Lot: 3538778)							
EM2103194-001	BH0102-03	EP071: HC16 - C34 Exaction	-	100	maika	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction		100	mghg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction		50	mghg	<50	<\$0	0.00	Netimit
		EP071: >C10 - C40 Fraction (sum)		50	mghg	<50	<10	0.00	No Limit
EM2103194-012	Dup	EP071: +C15 - C34 Fraction	-	100	mghg	<100	<100	0.00	No Limit
		EP071: >C34 - G40 Praction		100	nghg	<100	<100	6.00	No Limit
		EP071: >C10 - C15 Praction		50	ngikg	*50	+50	8.00	No Limit
		EP071: >C13 - C43 Fraction (sum)	-	50	maika	*50	+50	0.00	No Limit
PODE: BTEXN (QC									
EM2103015-001	Anonymous	EPOID: Benzene	71-43-2	0.2	maka	<0.2	40.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	maika	1.5	1.3	94.0	No Limit
		EPOID EPoberame	100-41-4	0.5	maka	3.2	2.8	11.7	No Limit

hspe Vark, Onder Slenit Vspect	5 of 12 EM2100194 GEO-ENVIRONME G Wood	MTAL SOLUTIONS							ALS
ub-Marix: 505			[Laboratory	Deplicate (DLP) Prepart	_	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	108	Onli	Driphal Result	Deplicate Result	890.00	Percentry Limits /52
EPOSE BTEXN (OC	Lot: 3536346) + conti								
EM2103018-001	Anonymous	EP080: meta- & para-Xylene	108-08-3 108-42-3	0.5	mghg	16.2	13.6	10.8	0% - 20%
		EP080: ortho-Xylene	95-47-6	0.5	mgikg	5.6	5.1	90.2	0% - 50%
		EPO80: Naphthalene	91-20-3	1	maika	3	3	8.00	NoLimit
EM2103194-008	8H0318-0.9	EPORO: Bercone	71-43-2	9.2	mphp	<0.2	<0.2	0.00	Netimit
		EP080: Toluene	108-88-3	0.8	mghg	<0.5	+0.8	0.00	No Limit
		EP080: Ethylberzene	100-61-6	0.5	mghg	<0.5	<0.5	0.00	Notimit
		EP080: meta- & para-Xylone	108-38-3 108-42-3	0.5	mghg	-0.5	40.5	6.00	NoLimit
		EP080: ortho-Xylene	95-47-6	0.6	mphp	<0.5	+0.6	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mghg	<1		0.00	No Limit
INTER WATER						Laboratory	Inglicate 304P3 Report		
Laboratory sample ID	Sample (D	Method: Compound	CAS Runder	4.09	Quid	Drighal Pasall	Deployer Result	RPD (U)	Personal Linds (%)
	Metals by ICP-MS_(Q)								
M2103255-001	Averyments	EG020A-F: Cadmium	7640-43-9	0.0001	mg5	+0.0001	+0.0001	0.00	No Linit
		EG025A-F: Americ	7640-58-2	0.001	mg5	0.263	0.284	2.51	016 - 2016
		EG020A-F: Beylium	7640-61-7	0.001	mgt.	+0.001	40.001	0.00	No Limit
		EG020A-F: Barlum	Te40-39-3	0.001	mgt.	0.005	0.005	6.00	No-Limit
		EG020A-F Oversium	7640-47-3	0.001	mpt.	=0.001	+0.005	8.00	No Limit
		ECC20A-F College	7440-48-4	0.001	nol	=0.001	+0.001	0.00	No Limit
		E0020A-F: Copper	7440-50-8	0.001	mpl.	0.003	0.003	0.00	No Limit
		EGC21A-F: Lead	7430-02-1	0.001	mail.	0.002	0.002	0.00	No Limit
		ECIC20A-F: Manganese	7433-06-5	0.001	mpt.	0.009	0.009	0.00	Netanit
		EG020A-F: Nickel	7640-02-0	0.001	mgt,	0.006	0.006	0.00	No Limit
		EG02IA-F: Zinc	7643-66-6	0.005	mgt.	0.006	0.009	39.0	No-Limit
		EG020A-F: Selenium	7782-49-2	0.01	mgt.	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadum	T640-63-2	0.21	mpt.	+0.01	<0.21	8.00	No Limit
		EG020A-P Beren	T440-43-8	0.05	mpt.	0.09	6.06	0.00	No Limit
LM2103144-001	Anonymous	E0020A-F Cadmium	7440-43-9	0.0001	mpl.	0.0001	+0.0001	0.00	No Limit
		EGC20A-F: Antenio	7440-58-2	0.001	mg/L	0.001	0.001	0.00	NoLimit
		EGC20A-F: Berytium	7440-41-7	0.001	mg/L	+0.001	<0.001	0.00	Netimit
		EG0264-F: Barium	7640-39-3	0.001	mg5,	0.123	0.124	0.00	0% - 20%
		EG0264-F: Chromium	7640-67-3	0.001	mg5,	+0.001	<0.001	0.00	Notivet
		EG025A-F: Cobalt	7640-48-4	0.001	ngt,	0.026	0.026	8.00	016 - 2016
		EG026A-F: Copper	7640-50-8	0.001	mgt.	0.007	0.006	0.00	No-Limit
		EG020A-F Lead	7439-92-1	0.001	mgt,	+0.001	+0.001	8.00	No-Limit
		ECC20A-F Manganese	7439-96-5	0.001	mpl.	0.291	0.292	0.553	0% - 20%
		E0020A.F. Nickel	7440-02-0	0.001	mpl	0.074	0.074	0.00	0% - 20%
		EG020A-F: Zinc	7440-56-5	0.005	mp%	0.112	0.115	2.77	0% - 20%
		ECC21A-F: Salarium	7782-48-2	0.01	mañ.	<0.01	<0.01	0.00	No Limit

	ALS
890 (14	Because Links /N

6 of 12 EM21001M GEO-ENVIRONMENTAL SOLUTIONS

Ud-Matrix: WKTER						Laboratory	Insticate (DLP) Paper		
Laboratory sample ID	Earrain ID	Method: Comenced	CAS Number	108	Ginil	Driphal Result	Deployer Result	870.00	Receivery Links /h
CERCEP: Dissolved	Metals by ICP-MS_(Q)	C Lot: 3541788) + continued	And in case of the local division of the						
EM2103164-001	Avorymous	EG020A-F: Vanadium	7640-62-2	0.01	mg5,	<0.01	<0.01	0.00	No.Limit
		EG026A-F: Boron	7640-42-8	0.05	mg5	<0.05	<0.05	0.00	No Limit
Editable: Dissolved	Mensury by FMIS (QC								
EM2103311-001	Avenuments	EG005F: Mercury	7633-07-4	0.0001	mgi	10.0001	+0.0001	0.00	Netleni
EM2103144-001	Averaments	EG005F: Mercury	7639-97-6	0.0001	ngs	10.0001	+0.0001	0.00	No Lind
E-811011111111		veators (QC Lot 3541075)	1411114		- 41				the group
EM2103188-001	Anonumous		60-32-8	0.5	-	10.5	10.5	0.00	Netlenit
EWSIOUISEOUI	Average	EP075(SIM): Benzo(a)pyrene	91-20-3	1	Jqu Jqu	10	41.0	6.00	No Limit
		EP075(SIM): Naphthalane	208-96-8	1	104	<1.0	41.0	0.00	No Limit
		EP075(SIM): Acenaphthylene	83-32-9	1	101	1.0	41.0	6.00	No Limit
		EP075(SIM): Acenaphthene	86-73-7	1	491	10	41.0	6.00	No Limit
		EP075(SIM): Fluorene	85-01-8	4		41.0	41.0	6.00	No-Limit
		EP075(SM) Phenanthrane	129-12-7	4	ppt	*1.0	*1.0	6.00	No Limit
		EP075(SIM) Anthracene	and the second	1	upt	41.0	41.0		
		EP075(SIM) Fluoranthene	205-64-0	4	upt	10	11.0	8.00	No Limit
		EP075(SIM): Pyrene	129-00-0	1	Jou	10	11.0	0.00	NoLimit
		EP075(SIM): Benzia(anthracene	56-55-3	1	Jay				No Limit
		EP075(SIM): Chrysene	218-01-9		Joy.	<1.0	+1.0	0.00	No Limit
		EP075(SIM): Benzo(b+()fuoranthene	205-99-2	1	99L	<1.0	41,0	0.00	No Limit
			205-82-3	1		+1.0	+1.0	0.00	AL. 23-0
		EP075(SIM) Benzo(k)fluoranthene	207-08-8	1	upl	10	10		NoLimit
		EP075(SIM): Indeno(1.2.3.od)pyrene	193-39-5 53-70-3	1	Joy	10	11.0	8.00	No Limit
		EP075(SIM): Oberz(a.t)anthracene		1	Pot	10	41.0	6.00	No Linit No Linit
		EP075(SIM): Benzo(g.h./(perylene	191-24-2	1	1991	\$1,0	41.0	0.00	Ne Lint
	troleum Hydrocarbon								
EM2103220-001	Anonymous	EP080: C6 - C9 Fraction		20	Jou	80	80	0.00	No Limit
EM2103121-002	Averymeus	EP080: C6 - C9 Fraction		20	104	1730	1780	2.76	0% - 20%
EPOBRIZTI: Talel Re	coverable Hydrocarb	ons - NEPM 2013 Practions (QC Lat. 3535968)							
EM2103220-001	Anonymous	EP080: C8 - C10 Fraction	C6_C10	20	Jou	80	70	0.00	NoLimit
EM2103121-002	Avorigmous	EP080: C6 - C10 Fraction	C6_C10	20	.7qu	1560	1710	3.34	0% - 20%
EPOID: BTEXN (QC	Lot: 3535968)								
EM2103121-002	Anonymous	EPOID Barcana	71-43-2	1	Jou.	812	798	1.67	0% - 20%
EM2103220-001	Anonymous	EPOID: Bargane	71-43-2	1	Jou.	*1	41	0.00	NoLimit
		EPOIO: Toluene	108-88-3	2	104	4	4	0.00	No Limit
		EP080: Ethyberzene	100-41-4	2	yot	4	4	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	M91.	4	4	8.00	Notinit
		EPOID ortho-Xylene	9547.6	2	Joy	-9	-9	0.00	Netimit
		EPoto Naphthalwaw	91-20-3	6	104		-6	0.00	No Limit
EM2103121-002	Averyments	EPOIl: Toluene	108-88-3	2	104	1	1	0.00	No Limit

Page Wurk Order Client Project	7 of 12 EM21001M GEO-ENVIRONME G Wood	INTIAL BOLUTIONS							ALS
ub-Marik: WK/IER						Laboratory	Deplicate (DLP) Report		
Laboratory sample ID	Eample ID	Method: Compound	CAS Number	1.08	Qinili	Driphal Result	Deplicate Result	890.00	Receivery Limits /NJ
EPOID BTEXN (OC	Lot: 3535968) + conti	inved							
EM2103121-002	Avorymous	EP080: Ethylberuwne	100-41-4	2	104	4	4	0.00	No.Limit
		EP080: meta- & para-Xylene	108-36-3 108-42-3	2	1997.	2	2	8.00	Notimit
		EPOID: ortho-Xylene	95-47-6	2	Jou	3	3	0.00	No Limit
		EPOIl0: Naphthalene	91-20-3	8.	104	-5	-6	0.00	Netimit

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	7	
A	L	S)

Method Blank (MB) and Laboratory Control Spike (LCS) Report

8-of 12 EM210011H GEO-ENVIRONMENTAL SOLUTIONS G Wood

The quality sortion term file/bod / Laboratory Black refers to an analyte free matrix to which all respects are added in the same volumes or proportions as used in standard sample preparation. The purpose of this OC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LOS) refers to a confiled reference material, or a known interference free matrix spiked with target analytes. The purpose of this OC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Resource Limits are based on statistical evaluation of processed LCS.

Nervice SOL				Method Blank (MB)		Laboratory Control Spille (LC)		
				Aspert	Spike	Spike Recovery (%)	Pecovery	Links (%)
Nethod: Compound	CAS Number	LOR	Unit	Penult	Concentration	1.05	Low	199
EG005/ED093/T: Total Metals by ICP-AES (QC	Lot: 3538527)							
DG005T: Anwric	7440-38-2		mg/kg	-45	123 mg/kg	101	72.0	13
DG005T: Barium	7640-39-3	10	mg/kg	<10	99.3 mg/kg	95.7	72.0	53
EG005T: Beryllum	7640-41-7	1	mg/kg	-41	0.67 mg%g	95.6	72.0	53
D0005T: Boron	7640-42-8	50	make	<50				-
EG005T: Cadmium	7640-43-9	1	maka	.45	1.23 mg/kg	65.2	58.0	53
EG005T Chromium	7640-47-3	2	maka	*2	20.2 mg/kg	108	76.0	53
EGROST Cobell	7440-48-6	2	mg%p	*2	11.2 mg/kg	\$5.6	78.0	53
EG005T Copper	7440-50-8	5	mpkp	*5	55.9 mg/kg	96.2	78.0	53
EGOOST: Laad	7439-92-1	5	mpkp	=5	62.4 mg/kg	\$5.7	72.0	53
EG005T: Manganese	7439-95-5	5	maika	<5	590 mp/kg	94.2	72.0	52
DG005T: Nickal	7440-02-0	2	maile	Q	15.4 mg/kg	103	72.0	50
DG005T: Selenium	7792-49-2	8	maha	-6	100	-	-	-
D0005T: Vanadium	7640-62-2	6	mg/kg	-4	61.3 mg/kg	104	72.0	53
00005T: Zinc	7440-68-6	5	make	-45	162 mg/kg	28.6	72.0	53
EG035T: Total Recoverable Mercury by FIMS	(OCLot: 3538526)							
EGGISST: Mercury	7439-97-6	0.1	make	-0.1	Dist make	88.3	72.0	1.1
EP075rSIMER: Polynuclear Aromatic Hydrocan	NAME ADDRESS ASSESSME							
DP075(5IM): Naphthalene	91-20-3	0.5	wole	-0.5	3 mg/kg	108	85.7	10
DP075(58M): Acenaphthelene	208-99-8	0.5	make	-0.5	3.mg/kg	100.0	81.0	50
DP075(5IM): Acenaphthene	83-32-9	0.5	make	-25	3.mg%p	104	83.6	5
DP075(5M): Fluorene	86-73-7	0.5	maka	42.5	3 mg/kg	94.8	81.2	
EP075/55M/: Phenanthrene	85-01-8	0.5	maka	+2.5	3 moko	104	78.4	- 5
EPO75(SBA) Antivacene	120-12-7	0.5	molko	+0.5	3 molto	108	017	
EP075(SBI): Fluoranthene	206-44-0	0.5	moko	=1.5	3 moko	100	78.0	50
(P076/304) Pyrane	129-00-0	0.5	molko	+0.5	3-make	108	79.9	
PO?Scittl: Berglater/Ivacene	56-55-3	8.5	molko	+2.5	3-mg/kg	101	76.9	10
EP075climt: Chrysene	218.01.9	4.5	mole	+0.5	3 mg/kg	107	80.9	13
EP075climt: Berguit+;ituoranthene	205-99-2	45	mole	+2.5	3.mg/kg	85.1	78.0	13
a sustained an and a long a state	205-82-3							
P075/SIM/ Benzik/Ausranthene	217-08-9	0.5	moko	+8.5	3-moko	90.4	82.4	53
(P075/SIM) Benandopurene	50-32-8	0.5	maka	+1.5	3-molto	81.0	70.2	53
EPONSIMI Interact 2.3 of pyrene	193-39-5	0.5	malka	+0.5	3-maika	78.4	67.9	10
EP075climt: Diberula Northracene	53-70-3	0.5	make	42.5	3-mg/kg	76.0	65.8	53
EPO?Scimt: Exerusig h (perylene	191-36-2	4.5	molic	+0.5	3 mg/kg	83.0	65.8	12

Page Wurk Order Dient Project	9-of 12 EXCTOTH GOO-ENVICOMENTAL BOLUTIONS G Wood							AL
Sub-Maria SOL				Method Blank (MB)		Laboratory Control Spille (LC)	Q Asport	
				Asport	Spike	Spike Recovery (%)	Percentry	Links (%)
Nettor, Compound	CAS Number	LOR	Unit	Prest	Concentration	4.09	Low	reigh
EPOBOIO71: Total P	etroleure Hydrocarbons (QCLoc 3536346)							
EP080: O6 - C8 Fract	00	10	magina	<10	36 mg/hg	109	58.8	131
EPOBOIO71: Total P	etroleure Hydrocarbona (OCLat: 1538779)							
EP071: C18 - C14 Fit	ction	50	majia	<10	900 mphg	96.0	75.0	138
EP071: C15 - C28 Fm	ction	100	mg/kg	<100	3030 mg/kg	96.4	82.0	133
EP071: 029 - 036 Pri	ction	100	mghg	<100	1520 mp/kg	96.6	82.4	121
EP071: 010 - 036 Pri	ction (sum)	50	mgkg	<50			-	
EP0801071: Total R	ecoverable Hydrocarbons - NEPM 2013 Fractions 100	Lot 35363461						
EP080: C6 - C10 Frac	tion 06_019	10	make	<10	45 mg/hg	101	68.3	128
EP6601071: Total P	ecoverable Hydrocarbons - NEPM 2013 Fractions 100	Lot: 35387791						
EP071: >010 - 016 F		50	make	<60	1100 mp/kg	101	77.0	130
EP071: +016 - C34 F		100	maka	<100	4020 mp/kp	96.9	#1.5	120
EP071: +C34 - C40 P	action	100	maika	<100	280 mg/kg	96.0	73.3	532
EP071: >C10 - C40 F	action (sum)	50	maika	<50	-	-		-
EPORC BTEXN (D	Lat: 15163461							
EPOBO Bennene	7143-2	6.2	molto	+8.2	2 mg/kg	95.5	61.6	517
EPOBO Taluene	108-88-3	0.5	moko	+2.5	2 mg/kg	515	65.8	125
EPOBO Elhybenzene	100-41-4	0.5	molko	+8.5	2 molto	106	65.8	524
EPOBO mela & para-	Xplene 108-38-3 106-42-3	0.5	mpikp	=8.5	4 mg/kg	113	64.8	534
EP080: ortho-Xylene	95474	0.5	maika	+2.5	2.mg%g	109	68.7	132
EP080: Naphthalene	91-39-3	1	maika	-11	0.5 mg/kg	99.8	61.8	123
AND MARKE WATER				Motived Blank (MB)		Laboratory Control Spille (LC)	R Report	
ALCONTRACTOR INCOME				Report	Spike .	Spike Researcy (%)		Câmite (%)
Method Command	CAS Render	LOW	Unit	Presid	Concentration	468	Low	Nigh
	Metals by ICP-MIS_IDCLet: 35417881							
CO20A F Americ	7440-38-2	0.001	mgL	+0.001	0.1 mg/L	100	69.0	595
0020A.F. Berylum	7440-45-7	0.001	mgL	=0.001	0.1 mpl	109	85.0	512
EG020A-F: Barlum	7440-39-3	0.001	mgL	+0.001	0.1 mpl	106	83.6	513
EG020A F: Cadmium	7440-43-9	0.0001	mgL	<0.0001	0.1 mpl.	106	83.5	515
E0020A-F: Chromium	7440.47-3	0.001	mgil	×0.001	Jom 1.0	96.4	83.2	109
EG020A-F: Cubet	7440-48-4	0.001	mg1,	<0.001	0.1 mgl.	102	84.3	510
DG020A-F: Copper	7440.00.8	0.001	mgt,	<0.001	0.1 mg/l,	100	83.1	107
DG020A-F: Lead	7439-92-1	0.001	.mgt.	<0.001	0.1 mgl.	100	84.6	108
DG020A-F: Manganer		0.001	mgt.	<0.001	0.1 mgt.	96.1	84.8	110
DG020A-F: Nickel	7440-02-0	0.001	mgt.	<0.001	0.1 mg/L	100	84.3	110
DG020A-F: Selenium	7782-49-2	0.01	mgt	<0.01	0.1 mgL	104	82.3	113
EG022A-F: Vanadum		0.01	mgt	+0.01	0.1 mg/L	99.3	03.7	110
EGG20A.F. Zee	7440-66-6	0.005	mgL	=0.005	0.1 mg/L	167	66.3	512

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Wark Onder	EM210311H
Client	GEO-ENVIRONMENTAL SOLUTIONS
Project	· G Wood

Matrix WRITER				Method Blank (NB)		Laboratory Control Spile (LC)		
				Asport	Spike	Spike Recovery (%)	Percentry	Limits (%)
Nettod: Compound	GAS Number	LOR	Unit	Prest	Concentration	4.69	Low	Nig
CO22F: Dissolved Metals by ICP-MS (OCLut	3541788) - continued							
EG020A-F: Boron	2440-42-8	0.05	mgt.	+0.05	Jum 2.0	108	85.4	111
C0035F: Dissolved Mercury by FIMS (QCLot:)	2541790)							
EG035F: Mercury	2439-97-6	0.0001	mgt.	<0.0001	0.01 mgt.	89.1	71.6	116
EPENSIBILE: Polynoclear Aromatic Hydrocart	Lons 10CLot 35419751							
DP075:SIMI: Naphthalene	91-20-3	1	704	<1.0	5 μαλ.	89.2	42.8	114
DP075c5IIht: Acenaphthylene	208-96-8	1	194	<1.0	5 995.	82.4	48.8	110
DP075(5Iht): Acenaphthene	83-32-9	1	204	<1.0	5 995	95.1	47.0	117
DP075(5IM): Fluorene	86-73-7	1	. Agu	+1.0	5 yest.	87.0	49.5	110
EP075(SIM): Phonanthrone	85-01-8	1	upt.	41.0	5 µgt.	87.4	49.4	525
EP076(SIM): Anthracene	120-12-7		upt.	<1.0	5 µpt.	95.8	48.4	5,22
DP075(SIM): Fluoranthene	206-44-0	,	ugit.	41.0	5 µg/L	96.2	50.3	12
EP076(SIM): Pyrene	129-00-0	1	up/L	=1.0	5 µpL	96.0	58.0	526
EP075(SIM) Benzsajanthracene	96-65-3	1	upl.	=1.0	5 upl.	\$7.8	49.4	52
EP075(SIM) Chrysene	218-01-9	5	upl.	*1.0	5 upl.	99.8	48.7	- 52
(PO?5clitte): Benzo(k+)/fuoranthene	205-99-2 205-82-3	,	upl.	*1.0	5 µpl.	47.7	54.5	134
(P075(SIM): Benzo(k)fuoranthene	217-05-9	1	upt.	41.0	5 µpt.	97.2	56.1	534
(P076(SIM) Benzeückgerene	50-32-8	0.5	ug/L	+2.5	5 µpL	97.8	55.6	130
(P075(SIM) Indens(1.2.3-cd)pyrene	193-39-5	5	up/L	=1.0	5 µpL	99.2	54.4	526
(P075(SIM) Dibena(a-h)anthracene	\$5-70-0		upl.	*1.0	5 µpL	99.7	54.5	528
EP075(Stht): Benzeigh (perylene	191-24-2	1	upl.	+1.0	5 upl.	99.4	54.4	128
P0501071: Total Petroleum Hydrocarbons (D	CLot 35359481							
P080. O5 - C8 Fraction		29	upl.	*29	360 µgL	96.0	66.2	534
P0801071: Total Petroleum Hydrocarbons (D	CLet 3541976							
EP071 C10 - C14 Frantion		50	ug/L	+50	5430 µgL	99.4	44.2	540
EP071: C15 - C28 Frantion		100	Jup/L	×100	Apu 00087	115	46.9	527
EP071: C29 - C36 Fraction		50	JugA.	+50	9560 µg/L	113	47.4	125
EP071: C10 - C36 Fraction (sum)			Japa.		33800 µgA	112	70.0	130
P050071 Total Recoverable Hydrocarbons -	NEPM 2013 Fractions (QCL)	C 3531068)						
EPOBO: C6 - C10 Fraction	C6_C10	20	April	<20	450 µg1.	94.0	66.2	532
P0801071 Total Receiverable Hydrocarbons -	ARPM 2013 Fractions (DCL)	4 3541976						
P021 >C10 - C16 Fraction		100	Jan J	<100	7190 µg/L	104	43.0	127
P0P1:>C16+C34 Fraction		100	Vev.	<100	25100 µgA	110	48.6	129
0P021: >C34 - C40 Fraction		100	1494	<100	1790 µg4	123	42.2	133
EP071: >C10 - C40 Fraction (sum)	100	1000	1994		34100 µg/,	109	72.0	130
EPORD BTEXN (QCLAR 3535968)								
EP080: Benzene	71:43:2	,	1494	-13	20,491	83.3	68.8	123
DP080: Taluene	108-88-3	2	Jaki	-12	20 yet	102	72.9	121

Page Wurk Onder Dierst Project	11 of 12 EMITOTIN DES-ENVIRONMENTAL SOLUTIONS 0 Wood								AL
Sub-Matrix WRITER					Method Blank (NB)		Laboratory Control Spike (LC)	C Report	
					Asport	Spike	Spike Recovery (%)	Pecovary	Limits (%)
Netted: Compound		CAS Number	LOR	Unit	Prest	Concentration	4.09	Low	nigh
EPODO: DTEXN (Q	CLot 3535968) - continued								
EP080: Ethylbergene		100-41-4	2	. Apu	-2	20,495	98.3	71.7	130
EP080: meta- & para	-Xylane	108-38-3 106-42-3	2	.7gk	4	40.49L	109	72.3	138
EPOBD ortho-Xylana		95-47-6	2	Jup/L	-2	Jou's	106	75.9	134
EPOID: Naphthalene		91-29-3	5	Jak.	-45	5 μα1.	87.7	68.3	131

Matrix Spike (MS) Report

The quality correct term Matrix Spike (MS) refers to an initializentory spit sample spiked with a representative set of target analyter. The purpose of this QC parameter is to monitor potential matrix effects on analyte recovery. Salto Recovery Limits as per laboratory Data Quality Objectives (DQOs), Initial recovery ranges stated may be waived in the event of sample matrix interference.

Sub Matrix Spike (MS) Report

an ever a source							
				Spike	SpikeRecovery(%)	Recovery	Limits (NV
aboratory sample ID	Sangra (D	Method: Compound	CR3 Number	Concentration	MI	Line	High
EGROS(EDOSS)T)	Tetal Metals by ICP-AES (OCLot: 35385	27)					
EM2103184-002	Anonymous	EG0005T: Arsenic	7440-30-2	50 mg/kg	80.5	76.0	124
		EG009T Cadmium	7440-43-9	50 mpkp	\$7.4	79.7	195
		EG005T: Chromium	7440-47-3	50 mg/kg	\$6.7	79.0	121
		EG005T: Copper	PMD-50-8	250.mg%g	98.3	80.0	120
		E0005T: Lead	7439-82-1	250 mg/kg	95.5	80.3	120
		EG005T Noted	7440-02-0	50 mpkp	96.8	76.0	100
		E0005T: Zinc	7440-66-6	250 mg/kg	95.7	80.0	120
EGESST: Total R	ecoverable Mercury by FMS (QCLot 35	(18529)					
EM2103184-002	Anonymous	EGESST Mercury	7439-87-6	0.5 mg/kg	96.8	76.0	195
EPOTS SIMPLE PE	lynuclear Aromatic Hydrocarbons (QCL	e4: 3838778)					
EN/2103154-002	BH010.8-0.9	EP075(584): Acenaphthene	83-32-9	3 mg/kg	104	77.2	198
		EPC75(SM) Pyrene	129-00-0	3 mg/kg	106	65.5	136
EPOBORTI: Total	Petroleum Hydrocarbons (QCLot: 3538	346)					
ENG103154-001	BH0102-03	EP080: C6 - C9 Praction		28 mg/kg	100	33.4	124
EPOBLUTI: Total	Petroleum Hydrocarbona (QCLot: 3538	779)					
EM2103194-005	84011.51.6	EP0P1: C13 - C14 Fraction		500-mg%g	99.8	71.2	125
		EP071: C15 - C29 Fraction		3030 mg/hg	82.4	26.6	122
		EP071: G29 - G36 Praction	-	1520 mg/kg	90.6	76.0	100
EPOBBIGTI: Total	Recoverable Hydrocarbons - NEPM 281	3 Fractions (QCLot: 3538346)					
EN2103194-001	BH010203	EP680: O6 - Cri0 Fraction	C8_C10	33 mg/kg	102	30.8	120
EPOBB/UT1: Total	Recoverable Hydrocarbons - NEPM 281	3 Fractions (QCLot: 3538779)					
EN2103194-005	84011516	EP071 >C10 - C16 Fraction		1160 mg/kg	165	72.2	128
		EP071: >C16 - C34 Fraction		4020 mg/kg	87.6	76.5	119

isge Vurk Onder Xent Voject	12 of 12 EMPTOTEM GEO-ENVIRONMENTAL SOLUTIONS G Wood						AL
ub-Mark: SOL					abir Zathe (M2) Report		
				Spike	SpikeRecevery(%)	Recovery	Limits (%)
Aboratory sample ID	fample /0	Method: Compound	EAS Number	Concertration	M9	Low	High
EPOBRUTI: Total I	Recoverable Hydrocarbons - NEPM 2013 Fraction	(QCLot: 3538779) - continued					
EM2103/94-003	BH011.5-1.6	EP071 >C34 - C40 Fraction		290 mg/kp	95.6	66.8	138
EPOSE BTEXN (0	CLot: 3536346						
EN/2103154-001	BH0102-03	EP080 Bencene	71-43-2	2 mpkg	99.4	54.4	127
		EP080 Talvene	108-88-3	2 mp/kp	108	57.1	535
United WATER					able Spike (MS) Report		
				Spike	SpikeRecovery(%)	Recovery	Limits (N/
Laboratory sample ID	Jampin (D	Method: Compound	CR3 Number	Concerdrative	MS	Low	Hoys
EGE20F: Dissolve	4 Metals by ICP-MB (QCLot) 3541788)						
EM2103144-001	Anonymous	EQ020A-F: Americ	7440-30-2	6.2 mg/L	510	76.6	124
		EQ030A-F Beryllum	7440-41-7	0.2 mpl.	100	73.0	120
		EG025A-F: Barlum	7440-39-3	0.2 mg/L	96.0	76.0	127
		EG(2)A-F: Cadmium	7440-43-9	0.05 mg/L	102	74.6	118
		E0020A-F: Chromium	7440-47-3	02mpt	92.6	71.0	135
		E0020A-F Called	7440-45-4	0.2 mpl.	106	76.0	132
		EG020A-F: Capper	7440-50-8	0.2 mpl.	105	76.0	130
		EG829A-F: Lead	N39-82-1	0.2 mp5	64.1	76.0	133
		EG020A-P: Manganese	7439-96-5 7440-32-0	6.2 mpl. 6.2 mpl.	86.0	64.0	536
		EG020A-F: Notel EG020A-F: Vanadum	7440-62-2	0.2 mpl.	95.8	73.0	131
		E0020A-F Zec	7440-66-6	02 mg/L	106	76.0	131
DAMAGE: Nanohor	d Mercury by FMS (OCLoc 3541798)	and are a second second					
ENQ103145-001		EGENF: Mercury	7439-87-6	0.01 mpl.	81.6	70.0	120
			1477-51-0	alle mpt.	11.0	10.0	
	ynuclear Aromatic Hydrocarbons (OCLot: 35410)						1
EM2103191-001	Anonymous	EPC75(SIM) Asenaphihene	83-32-9	10 µg/L	75.3	39.3 44.0	125
		EP075(SBI): Pyrene	129-00-0	10 µg1,	80.9	44.9	124
	Petroleum Hydrocarbons (QCLot: 3535968)						
EM2103144-001	Anonymous	EP080. C6 - C8 Praction	-	200 µg/L	96.8	33.9	106
EPOBBUTI: Total I	Recoverable Hydrocarbons - NEPM 2013 Fraction	(QCLot: 3535968)					
EN2103144-001	Anonymous	EP680: C6 - C10 Fraction	C8_C10	330 yg4,	94.0	34.0	122
EPONE BTEXN (C	CLot: 1535960)						
ENQ103144-001	Anorumous	EPOID, Bergane	7143-2	20 pages	109	56.3	133
		EPótió: Takene	108-88-3	20 µg/L	113	60.4	132

ALS	Environmental								
(ACS)		liance Assessm	ent to assis	t with C	Juality Rev	view			
Work Order	EM2103194		Page		1 of 9				
Olient	GEO-ENVIRONMENTAL SOLUTIONS		Laboratory		Environmental Divi	sion Melbou			
Contact Project	: DR JOHN PAUL CUMMING : G Wood		Totophone Date Samples Re		+6138549 9645 25-Feb-2021				
Silte	:		Issue Date	:0	04-Mar-2021				
Sampler Order number	: MD. BJ		No. of samples re No. of samples at						
reporting highlight	matically generated by the ALS LIMS through I to any non-conformances, facilitates faster and to the overall DQO assessment and reporting fo	i more accurate data validation							
Brief method summ	varies and references are also provided to assist	in traceability.							_
Summary of	fOutliers								
	iity Control Samples								
<u>NO</u> Method <u>NO</u> Duplice	outiers flagged in the Quality Control (DC) Report. Blank value outliers occur. de outliers occur. lary Control outliers occur.								
	ŝpike autilens occur. Ilar sample matrices, <u>NO</u> surrogate recovery o	utilem occur.							
	lysis Holding Time Compliance								
 NO Analysi 	is Holding Time Outliers exist.								
Outliers : Freq	quency of Quality Control Samples								
 Quality Cor 	ntrol Sample Frequency Outliers exist - please	see following pages for full de	calls.						
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Page Wurk Order Client Project	3 of 9 BROTESTIN GEO-ENVIRONMENTAL SOLUTIONS G Wood							ALS
Antix: SOL					Evaluatio	n: • • Holding Sine	breach ; 🗹 = Milth	in holding tir
Million		Sample Date		kinedon / Preparation			Analysis	
Container / Climit Sa	engele (D(s)		Outs extracted	Due for extraction	Evaluation	Oute analysed	Due for analysis.	Evaluation
COULT: Telel Rev	overable Mercury by FIMS							
oli Glass Jar - Unp	reserved (EG0357)	10.000	1					
EH01 0.2-0.3,	BH01 0.8-018,	24-Feb-2021	83-Mar-2021	24-Mar-2021	1	04-Mar-2821	24-Mer-2021	1
BH011.5-1.6.	89402 0.2-0.3.							
BH02 1.0-1.2,	89403 0.2-0.3,							
EH03 0.8-0.9.	8H04 0.2-0.3.							
EH04 0.4-3.5,	8H05 0.3-0.3,							
Dup								
INCOME: Poly	nuclear Arsmatic Hydrocarbona							
oil Glass Jar - Uno	reserved (EP075(SIM)	in the second				and the second second		
BH01 0.2-0.3.	8H01 0.8-0 R	24-Feb-2021	82-Mar-2021	10-Mar-2021	1	02-Mat-2821	15-Apr-2021	1
EH405 1.5-5.6,	89402 0.3-0.3,							
BH021.0-1.2,	8H03 0.2-0.3,							
E#403 0.8-8.9,	BH04 0.3-0.3,							
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	etroisum Hydrocarbona							
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EH401 0.2-0.3.	BH01 0.8-019.	24-Feb-2021	01-Mar-3021	10-Mar-2021	1	03-Mar-2021	10-Mar-2021	1
BH011.5-1.6,	BH02 0.2-0.3,							
BH021.0-1.2,	8H03 0.2-0 3.							
EP403 0.8-0.9,	BHOI 0.2-0.3,							
EH04 0.4-0.5.	8H05 0.2-0.3							
Dup								-
oll Glass Jar - Unp		and the second se	Concernant and	Contraction of the			the second of	1.1.1
EH01 0.2-8.3,	BH01 0.8-0-9,	24.Feb-2021	82-Mar-2021	10-Mar-2021	1	02-Mar-2821	15.Apr-2021	1
BH011.5-1.6.	8H02 0.2-0-3,							
BH02 1.0-1.2,	BH03 0.2-0 3.							
EH030.8-0.9,	8H04 0.2-0-3,							
BH04 0.4-8.5.	BH05 0.3-0.3,							
Due								

Page Wurk Onder Client Project	A of 9 EMITESTIN GEO-ENVIRONMENTAL SOLUTIONS G Mixed							ALS
Matrix: SOL					Evaluation	Holding Sme	breach ; < = Mith	in holding to
Method	and the second second second	Sample Date	- 0	direction / Proparation			Analysis	
Container / Climit Sam	pik IDN		Outs extracted	Due for extraction	Evaluation	Dute analyzed	Due for analysis	Evaluator
EPOBLO71: Total Rev	overskie Hydrocarkova - NEPM 2013 Frantians							
Ioli Glass Jar - Unpre								
EH01 0.2-0.3,	8H01 0.8-0.9,	24-Feb-2021	81-Mar-2021	10-Mar-2021	1	03-Man-2821	10-Mar-2021	1
BH011.5-1.6.	8H02 0.2-0.3.							
BH02 1.0-1.2,	8H03 0.3-0.3,							
EH03 0.8-0.9.	8H04 0.2-0.3							
EH04 0.4-8.5.	BH05 0.3-0.3.							
Dup								
Soll Glass Jar - Unors	nerved (EPGP1)							
8H01 0.2-0.3.	8H01 0.8-0 B	24-Feb-2021	82-Mar-3021	10-Mar-2021	1	02-Mar-2821	15-Apr-2021	1
EPHO1 1.5-1.6.	BH02 0.3-6 3.							
EH021.0-1.2,	8H03 0.2-0-3,							
E#403 0.8-8.9.	BH04 0.2-0.3.							
EH04 0.4-0.5,	8H05 0.2-0-3,							
Dup								
EPOID DTEXN								
boil Glass Jar - Unors	narved (IPOR)							-
BH01 0.2-0.3.	BH010.8-0:9.	24-Feb-2021	01-Mar-3021	10-Mar-2021	1	03-Mat 2021	10-Mar-2021	1
EH01 1.5-1.6.	8H02 0 3-6 3							
BH021.0-1.2	BH03 0 2-6 3							
EH03 0.8-0.9.	BH0103-63							
EH04 0.4-0.5	8H05 0 2-0 3							
Dup								
AND WATER					Future	· · · · · · · · · · · · · · · · · · ·	breach ; e' = Mar	in helding in
Weihed		Zamult Date		resolution (Preparation	110000		Analysis	
Container / Clevel Sam	pe Kou		Only artracted		Evaluation	Date analysed	Due for analysis	Evaluation
EG030F: Dissolved N	Annual but Mill Alls	and the second						
	Fittered, Lab-acidified (E0030A-F)							-
Finante		24-Feb-2021		-	-	03-Mat 2021	23-Aug-2021	1
DG035F: Dissolved N	ferrouse by FMIS							
	Fitweet: Lab-acidified (E0031F)							
Fireate		24-Feb-2021		-	_	03-Mat-2821	24-Mar-2021	1
ENGLISHED DAMAGE	clear Aramatic Hydrocarbona							
	Unpreserved (EP075(SIME)							-
Fireate	and a second s	24-Feb-2021	83-Mar-3021	03-Mar-2021	1	03-Mat-2821	12-Apr-2021	1
	roieum Hydrocarbona	1						
	Unpreserved (EP071)							-
Fireate	Automatic and (mean of	24-Feb-2021	83-Mar-2021	03-Mar-2021	1	03-Mat-2021	13-Apr-2021	1
wher VOC Vial - Sul	Luic Acia (CPIAN)				-			
Rinsale		24-Feb-2021	01-Mar-2021	10-Mar-2021	1	01-Mat-2821	13-Mar-2021	1

Page Work Order Client Project	S of 9 ENGIGETIN GEO-ENVIRONMENTAL SOLUTIONS G Wood						(ALS
Matter					Evaluation	c = Holding Sme	breach ; < = Mith	in holding time.
Method		Sampin Date	0	draution / Preparation			Analysis	
Container / Climit S	anyok (D(s)		Outs extracted	Due for exhaction	Evaluation	Date analyzed	Due for analysis.	Evaluation
EPOBLO71 Tetal I	Incoverable Hydrocarbons - NEPM 2013 Frantiens							
Amber Glass Bottle Rinsate	- Unpreserved (EP971)	24-Feb-2021	83-Mar-2021	03-Mar-2021	1	03-Mar-2821	12.Apr-2021	1
Amber VOC Vial - 5 Rinsate	wituric Acid (EP980)	24-Feb-2021	81-Mar-2021	10-Mar-2021	1	05-Mar-2821	13-Mar-2021	1
EPOSE STERN	A STATE OF THE OWNER AND							
Amber VOC Vial - 5 Rinsate	Nuturic Acid (EP940)	24-Feb-2021	81-Mar-2021	10-Mar-2021	1	05-Mar-2821	13-Mar-2021	1

Page	of 9
	61 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Work Onder B Client D Project D	SEC-ENVIRONMENTAL SOLUTIONS
Project : C	3 Mood

Aveity Control Sample Type		-	lound		Plate (%2		Quality Control Specification
Inalstical Methods	Method	00	Berniter	Actual	Encected	Evaluation	
aboratory Duplicates (DUP)							
faisture Content	EA355	2	59	10.53	10.00	1	NEPM 2013 83 & ALS GC Standard
WHPhenois (SM)	EPOPS(SM)	2	18	11.11	16.00	1	NEPM 2013 B3 & ALS OC Standard
H in soil using a 0.01M CaCi2 extract	EADOT	4	40	10.00	10.00	1	NEPH 2013 83 & ALS QC Standard
stal Mercury by FIMS	EGCOST	2	20	19.00	16.96	1	NEPM 2013 83 & ALS GC Standard
ital Metals by ICP-AES	EGOOST	2	20	10.00	16.00	1	NEPM 2013 83 & ALS GC Standard
RH - Semivolatile Fraction	EP971	2	18	11.11	10.00	1	NEPM 2013 83 & ALS OC Standard
RH Volatiles/BTEX	EPORO	2	18	11.11	16.90	1	NEPM 2013 83 & ALS-OC Standard
storatory Control Bamples (LCB)							
AHPhenols (SIM)	EP(FS(SM)	1	58	5.56	1.00	1	NEPM 2013 83 & ALS OC Standard
atal Mercury by FIMS	EGCOST	1	20	5.80	5.00	1	NEPM 2013 83 & ALS OC Standard
stal Metals by ICP-AES	EGODIT		20	5.80	5.08	1	NEPM 2013 83 & ALS QC Standard
RH - Semivolable Fraction	EP071	1	18	5.56	5.00	1	NEPM 2013 83 & ALS QC Standard
RH Volaties/BTEX	EP060	1	58	5.56	8.00	1	NEPM 2013 83 & ALS OC Standard
whod Blanks (MB)							
WHIPhenols (SIM)	EP0PS(SM)	1	18	5.56	5.00	1	NEPM 2013 83 & ALS GC Standard
stal Mercury by FIMS	EGOOST	1	20	6.00	5.00	1	NEPM 2013 83 & ALS GC Standard
utal Metals by ICP-AES	EG0057	1	20	5.80	5.00	1	NEPM 2013 83 & ALS OC Standard
RH - Semivolatile Fraction	EPGT1	1	18	5.56	5.00	1	NEPM 2913 83 & ALS OC Standard
TH Volatiles/BTEX	EPORO	1	18	5.56	5.00	1	NEPM 2013 83 & ALS QC Standard
tatris Spikes (MS)							
WHPhenois (SM)	EPCPS(SM)	1	58	5.56	5.08	4	NEPM 2013 83 & ALS OC Standard
stal Mercury by FIMS	EGCOST	1	20	5.80	5.00	~	NEPM 2013 83 & ALS QC Standard
ital Metals by ICP AES	EG0057	1	20	5.00	5.00	1	NEPM 2013 83 & ALS GC Standard
RH - Semivolatile Fraction	EP071	1	58	5.56	5.00	1	NEPM 2013 83 & ALS CC Standard
RH Volatiles/BTEX	EPONO	,	58	5.56	5.08	1	NEPM 2013 83 & ALS GC Standard
INTR: WATER				Evaluatio	r: Quelly Co	nind hequency	not within specification : V = Quality Control frequency within specification
waity Gundro Sample Type		0	ount		Rate (N)		Quality Control Specification
nahitical Methods	Method	00	Regular	Actual.	Expected	Evaluation	
aboratory Duplicates (DUP)							
issolved Mercury by FINIS	ECOSSF	2	- 53	15.30	16.86	1	NEPM 2013 83 & ALS QC Standard
issolved Metals by ICP-MIS - Suite A	EG020A-F	2	20	19.00	16.90	1	NEPM 2013 83 & ALS GC Standard
WHPhenols (OC/M3 - SIM)	EP075(SM)	1	7	14.29	10.00	1	NEPM 2013 83 & ALS QC Standard
RH - Semivolatile Fraction	EP975	0	17	0.80	10.00		NEPM 2013 B3 & ALS QC Standard
TH Volutiles/DTEX	EPORO	3	54	21.45	16.00	1	NEPM 2013 83 & ALS OC Standard

Page Wurk Onder Client	7 of 9 BADTOSTIN GEO-ENVIRONMENTAL SOLUTIONS							
Project	G Mood							AL
AND: WATER					Evaluatio	n: • - Quality Co	etrol frequency	not within specification : Quality Control frequency within specificat
Quality Control Sample	Type		6	lount		Rate (%)		Quality Caretor Specification
Analytical Methods		Method	OC.	Regular	Actual	Expected	Evaluation	
Laboratory Control 1	Samples (LCIS) - Continued							a second s
Dissolved Mercury b	ay Finits	£00097	1	13	7.69	5.00	1	NEPM 2013 83 & ALS QC Standard
Dissolved Metals by	ICP-MS - Suite A	E0030A.F		20	5.80	5.00	1	NEPM 2013 83 & ALS QC Standard
PMHPhenols (OC/M	45 - 8M()	EPOPS(SIM)	1	7	14.29	5.08	1	NEPM 2013 83 & ALS GC Standard
TRH - Semiwolatile R	Fraction	EP075	1	17	5.88	8.00	1	NEPM 2013 83 & ALS QC Standard
TRH Volatileu/BTEX	(EP960		54	7.14	5.00	1	NEPM 2013 B3 & ALS OC Standard
Method Blanks (MB)								
Dissolved Mercury 1	ly Fitts	E G G G SF		13	7.69	5.00	~	NEPM 2013 83 & ALS GC Standard
Cleached Metals by	ICP-MS - Suite A	E0020A-F	1	20	5.00	5.00	1	NEPM 2013 B3 & ALS QC Standard
PAHPhenois (OC/N	A5 - 5(M)	EPCTS(SM)		7	14.29	5.08	1	NEPM 2013 83 & ALS QC Standard
TRH - Semivolatile I	Frection	EP071	1	57	5.88	5.00	1	NEPM 2013 83 & ALS QC Standard
TRH Volalies/BTEX	¢	EP060	1	94	7/54	5.00	1	NEPM 2013 83 & ALS OC Standard
Matrix Spikes (MS)								
Dissolved Mercury b	by PINIS	EGC09F	1	- 13	7.69	5.08	1	NEPM 2013 83 & ALS-QC Standard
Dissolved Metals by	ICP-MS - Suite A	EG020A-F	1	20	5.80	5.00	1	NEPM 2013 83 & ALS-QC Standard
WHPhenels (DC/M	43 - SIM)	EPOPS(SM)	1	7	14.29	5.00	1	NEPM 2013 83 & ALS GC Standard
TRH - Semivolatile I	Fraction	EPG73	0	17	0.50	5.00		NEPM 2013 03 & ALS-QC Standard
TEH Volatiles/BTER	(EFORD	1	54	7.54	5.08	1	NEPM 2013 83 & ALS QC Standard



Brief Method Summaries

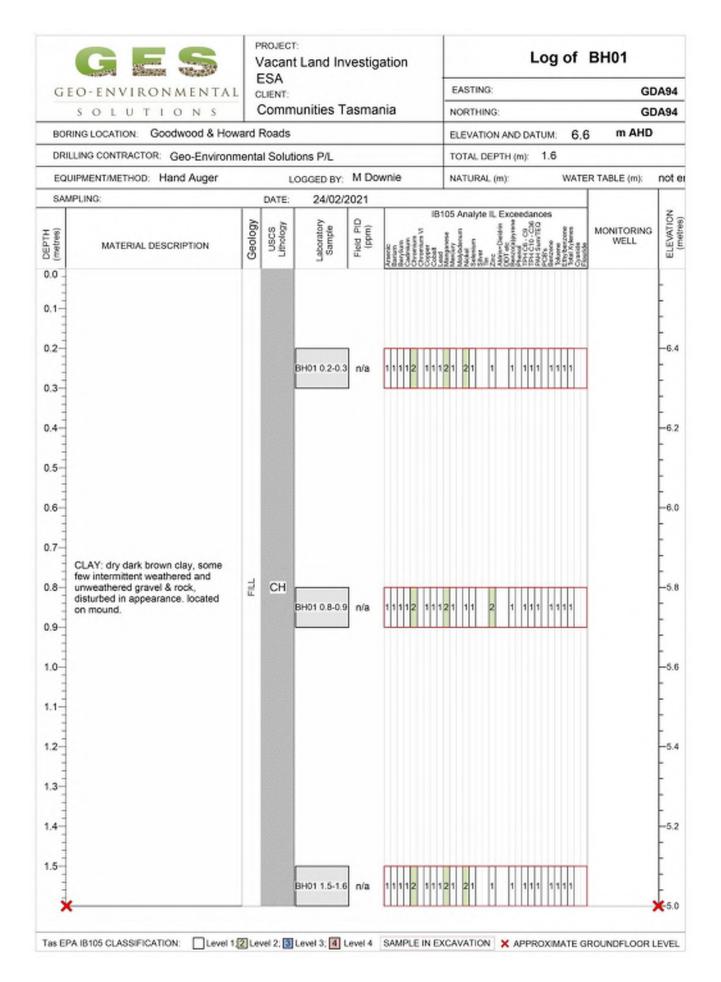
8 of 9 ENDIGINA GEO-ENVIRONMENTAL SOLUTIONS G Wood

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPHI. In house developed procedures are employed in the absence of documented standards or by stend request. The following report provides trial descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Shifted		
pH in soil using a 0.01M CaCl2 extract	EADON	SOL	In house: Referenced to Reyment and Lyons 483 (mod.) or 484 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaC02 and tumbled end over end for 1 hour, pH is measured from the continuous suspension. This method is compliant with NEPM Schedule 8(3).
Moisture Content	EADSS	SOL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule 8(3).
Tatal Metals by ICP-AES	EGO057	SOL	In house: Referenced to APHA 3120; USEPA SW 845 - 6010. Metals are determined following an appropriate acid digestion of the soll. The ICPAES technique ionises samples in a plasma, emiting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This embrd is compliant with NEPHA Schedule 8(3).
Tatal Mercury by FIMS	600357	SOL.	In house: Referenced to AS 3550, APHA 3112 Hg - 8 (Flow-Injection (SnCI2) (Cold Vapour generation) AA5) FIM-AA5 is an automated flameless atomic absorption technique. Mercury in solida are determined following an appropriate acid dipastion. Ionic mercury is reduced online to atomic mercury vapour by SnCI2 which is then purged into a heated quark cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule (CI)
TRH - Servivolatile Fraction	EP071	SOL	In house: Referenced to USEPA SW 846 - 8015. Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule 8(3).
PAHPhenois (SBI)	EP076/846	SOL.	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GCMS in Selective Ion Mode (SM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule 8(3).
TRH Valatiles/BTEX	EPORO	SOL.	In house: Referenced to USEPA 5W 646 - 8250. Extracts are analysed by Purge and Trap, Capillary GCMS. Quartification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(s) amended.
Dissolved Metals by ICP-MS - Suite A	EG020A-P	WATER	In house: Referenced to APHA 3125; USEPA SWIH6 - 6020, ALS QWI-ENEC020. Samples are 0.45pm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their diatinct mass to charge reflos prior to their measurement by a discrete dynobic ion detector.
Dissolved Mercury by Fibb	E00384	WATER	In house: Referenced to AS 3550, APHA 3112 Hg - 8 (Flow-Injection (SnCI2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. I'M-AAS is an automated filameters atomic absorption technique. A bromate/termide reagent is used to actidise any organic mercury compounds in the filtered sample. The fonic mercury is reduced online to atomic mercury vapour by SnCI2 which is then purged into a heated quartz cell. Quartification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule 8(3).
TRH - Servivolatile Fraction	EP071	WATER	In house: Referenced to USEPA 5W 848 - 8015 The sample extract is analysed by Capillary GC/HD and quarkflication is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the GC requirements of NEPM Schedule 8(3)

hage Wwik Onder Slient Hispell	9 of 9 BACIESTIN GEO-ENVIRONMENTA G Wood	L SOLUTIONS		AL
Analytical Methods		Method	Mitte	Mithod Descriptions
PWHPhenois (GCM)	S-SM)	DP075/SAM	WATER	In house: Referenced to USEPA SW 846 - 6270 Sample entracts are analysed by Capillary GCMS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX		EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 'Bister samples are directly purged prior to analysis by Capillary GCMS and quantification is by comparison againvit an established 5 point calibration curve. Atternatively, a sample is equilibrated in a headspace viol and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC inquirements of NEPM Schedule (IG)
Peparation Methods	A COLUMN TWO IS NOT THE	Skihod	Mathi	Method Descriptions
pH in soil using a 0.0	1M CaCl2 extract	EADO-PR	SOL	In house: Referenced to Reyment and Lyons 481, 10 g of soil is mixed with 50 mL of 0.01M CaCt2 and tumbled end ever end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule 803.
Hot Block Digest for r sediments and sludge		ENIO	SOL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochioric acids, then cooled. Percoide is added and samples heated and cooled again before being filtered and builted to volume for analysis. Digest is appropriate for determination of selected metals in sludge. sediments, and solis. This method is compliant with NEW Streaded 8(3).
Methanolic Extraction and Trap	n of Solis for Purge	CREAK	SOL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GCMS.
Tumbler Extraction of		ORG17	SOL.	In house: Mechanical agitation (tumbler), 10g of sample, Na25O4 and surrogate are extracted with 30mL 1:1 DCMM/catione by end over end tumble. The solvert is decarted, dehydrated and concentrated (by KD) to the deshed volume for analysis.
Separatory Funnel E	straction of Liquids	09614	WATER	In house: Referenced to USEPA 5W 846 - 3510 190 mL to 1L of sample is transferred to a separatory funnel and serially extincted three times using DCM for each extinct. The resultant extincts are combined, dehydrated and concentrated for analysis. This method is compilant with NEPM Schedule 8(3). ALS default excludes sediment which may be resident in the container.
Volatiles Water Prepa	aration	ORG16-W	WATER	A 5 ml, aliguet or 5 ml, of a diluted sample is added to a 40 ml, VOC vial for purging.

Appendix 7 Borehole Logs



			acan SA	t Land In	vestig	gation		Log of	BHUZ	
G	EO-ENVIRONMENTAL	CI	LIENT:				EASTIN	G:	GE	A94
	SOLUTIONS	0	Comm	nunities T	asma	ania	NORTHI	NG:	GE	A94
BO	RING LOCATION: Goodwood & How	ard F	Roads				ELEVAT	ION AND DATUM: 6.	6 m AHD	
DR	ILLING CONTRACTOR: Geo-Environm	nenta	I Solut	ions P/L			TOTAL	DEPTH (m): 1.2		
EQ	UIPMENT/METHOD: Hand Auger		L	OGGED BY:	M Do	ownie	NATURA	(m): (m).	ER TABLE (m):	not
SA	MPLING:		DATE:	24/02/	2021				-	
(metres)	MATERIAL DESCRIPTION	Geology	USCS Lifhology	Laboratory Sample	(mqq)	Artento Benfaam Benfaam Oroentaan Oroentaan Oroentaa	Mangarese Mandary Molodonan Setenian Setenian	a IL, Exceedances	MONITORING	ELEVATION
).0).1).2	SAND: dry greyish brown. located on mound.		SW	BH02 0.2-0.3	n/a	11111 111	11 11	1 1 111 1111		
0.6	CLAY: dry dark brown clay, many weathered and unweathered gravel & rock, disturbed in appearance.	111	СН							
1.0	CLAYEY GRAVEL: weathered gravels with 10% clay, dry, beige. REFUSAL ON GRAVELS.		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	BH02 1.0-1.2	2 n/a	11112 111	21 21	2 1 111 1111		-5.

-	Carl Distant Start	1 6	ESA	Land In	1000	jution	EASTIN		g of		
G	EO-ENVIRONMENTAL SOLUTIONS		LIENT:	unities T	asma	ania	NORTHI				A94
BOI		_		unico i	cionic	arma					
								ION AND DATU		III AND	
	LLING CONTRACTOR: Geo-Environn	ienta							.9		
	UIPMENT/METHOD: Hand Auger			GGED BY:		ownie	NATURA	rf (m):	WATE	R TABLE (m):	not e
SAN	/PLING:	1	DATE:	24/02/		IB	105 Analyte	IL Exceedance	s		z.
(metres)	MATERIAL DESCRIPTION	Geology	USCS	Laboratory Sample	(mqq)	Vrsenio Barian Barian Arrenion Arrenion V Orger	denter de la constante de la c	Contraction Dollar-Continues Dollar-Continues President Difference	Berzone Shorre Elty berzone Stal Xylenes Stal Xylenes Statio	MONITORING WELL	ELEVATION
0.0	SAND: dry greyish brown. located on mound.		.SW.	3H03 0.2-0.3	3] n/a	11111 111	1111	2 1 111	1111		6.2
0.4	CLAY: dry dark brown clay, many weathered and unweathered gravel & rock, disturbed in appearance.	FILE	СН	3H03 0.8-0.9	n/a	11112 111	21 11	2 1 111	1 1 1 1		-5.6

GES	1	ROJEC acan ISA	t Land In	vestig	ation			L	og of	BH04	
GEO-ENVIRONMENTAL		LIENT:				EASTI	NG:			G	A94
SOLUTIONS	(Comm	nunities T	asma	nia	NORTH	IING:			G	0A94
BORING LOCATION: Goodwood & How	vard F	Roads				ELEVA	TION /	ND DAT	UM: 5	m AHD	
DRILLING CONTRACTOR: Geo-Environm	nenta	I Solut	ions P/L			TOTAL	DEPT	H (m):	0.5		
EQUIPMENT/METHOD: Hand Auger		L	OGGED BY:	M Do	wnie	NATUR	AL (m):	WATE	R TABLE (m):	not
SAMPLING:		DATE:	24/02/2	2021							
MATERIAL DESCRIPTION	Geology	USCS Lifhology	Laboratory Sample	(mqq)	Americ Bartenic Barylum Chrenken Orrenken V	B105 Analy	in-Dieldin	PHONE CONTRACTOR DECISION	Sere bertone Xylenes tob	MONITORING WELL	ELEVATION
.0 SAND: dry greyish brown. located on flat		SW									4.8
 CLAY: grey/ dark olive brown clay slightly moist, stiff, fine weathered dolerite gravel, common loose rock. REFUSAL ON LOOSE 	THE	СН	BH04 0.2-0.3	n/a	11111	121 11	1	1 111	1111		-
ROCK			BH04 0.4-0.5	n/a	11111 1	1111 11	1	1 111	1111		-4.6
0.5							U				Г
5.4							U				1

SOLUTION Communities Tasmania NORTHING: GDA9 BORING LOCATION: Goodwood & Howard Roads ELEVATION AND DATUM: 5 m AHD DRILLING CONTRACTOR: Geo-Environmental Solutions P/L TOTAL DEPTH (m): 0.3 EQUIPMENT/METHOD: Hand Auger LOGGED BY: M Downie NATURAL (m): WATER TABLE (m): no/ SAMPLING: DATE: 24/02/2021 IB105 Analyte IL Exceedances MONITORING MONITORING MATERIAL DESCRIPTION 0 Songers 1 0 Songers MONITORING 1 5 SAND: dry greyish brown. located on flat 1 SW 1 SW 1	GEO-ENVIRONMENTAL SOLUTION CLIENT: Communities Tasmania EASTING: GDA9 BORING LOCATION: Goodwood & Howard Roads ELEVATION AND DATUM: 5 m AHD BORING LOCATION: Goodwood & Howard Roads ELEVATION AND DATUM: 5 m AHD DRILLING CONTRACTOR: Geo-Environmental Solutions P/L TOTAL DEPTH (m): 0.3 EQUIPMENT/METHOD: Hand Auger LOGGED BY: M Downle NATURAL (m): WATER TABLE (m): not SAMPLING: DATE: 24/02/2021 IB105 Analyte IL Exceedances MONITORING MATERIAL DESCRIPTION OB SSMIPLING: ISSUE SOUTH SUBJECT SOUTH S	GEO-ENVIRONMENTAL SOLUTIONS CLIENT: Communities Tasmania EASTING: GDA9 BORING LOCATION: Goodwood & Howard Roads ELEVATION AND DATUM: 5 m AHD BORING LOCATION: Goodwood & Howard Roads ELEVATION AND DATUM: 5 m AHD DRILLING CONTRACTOR: Geo-Environmental Solutions P/L TOTAL DEPTH (m): 0.3 EQUIPMENT/METHOD: Hand Auger LOGGED BY: M Downie NATURAL (m): WATER TABLE (m): not SAMPLING: DATE: 24/02/2021 IB105 Analyte IL Exceedances MONITORING MATERIAL DESCRIPTION OB SSMOP OB SSMOP ISSOP OF ISSOP OF MONITORING CLAY: dry greyish brown. located on flat ISSOP OF		GES		nt Land Inv	vestig	ation			L	og o	of I	BH05	
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				weathered and unweathered gravel & rock, disturbed in appearance. REFUSAL ON	СН	BH05 0.2-0.3	n/a	11111 11	121 11	1	1 111	111	1		F

Appendix 8 Certificate of Analysis

		CERTIFICA	TE OF ANALYSIS					
Work Order	EM2103194	OLIVITION	Page	1 of 15				
Clerk	GEO-ENVIRONMENTAL SOLUT	DOWE	Laboratory	Environmental Division M	to be sent			
Contact	DR JOHN PALL CUMMING	incres .	Contact	Peter Ravic	Veldourne			
Address	29 KIRKSWAY PLACE		Address	4 Westall Rd Springvale	VIC Australia 3171			
	BATTERY POINT TASMANIA, A	AUSTRALIA 7004	-					
Telephone Project	=61 03 6223 1839 G Wood		Talephone Date Samples Received	=6138549 9645 26 Feb-2021 22:35				
Order number			Date Analysis Commenced	: 05-Mar-2021	NOX.	~		
C-O-C number	1		Issue Date	04-Mar-2021 14:47		NAT		
Sampler	: MD, SJ				Hac-MRA	NAIA		
Site	1.000				Vav			
Quole number No. of samples received	EN/222				N.C. M.	Acceditation No. 6		
No. of samples more and year	13				hoose	Ided for compliance wit ISO/INC 17625 - Testin		
Quality Review and Sam Signatories		and strength of the local strength of the lo			NOR BUT IS			
	electronically signed by the authorize				21 CFR Part 11.			
Signatories	Poste	on Metals Team Leader	Accreditation Categ	nics, Springvale, VIC				
Arenie Vijayaratnam Dilani Fernando		or Inorganic Chemist		nics, springvale, VIC nics, Springvale, VIC				
		Organic Chemiat	Melbourne Inorganica, Springvale, VIC					
Nancy Wang			Melbourne Organics, Springvale, VIC					
Nancy Wang		Depanic Chemiat or Inorganic Instrument Chemiat		nics, Springvale, VIC				
Nancy Hang Nancy Hang Nikki Stepnewski								
Nancy Wang		or Inorganic Instrument Chemist		nics, Springvale, VIC				
Nancy Wang Nikki Stepnewski der 2 of 15 der EM0103 GEO-E	Senio	or Inorganic Instrument Chemist	Melbourne Inorga	nics, Springvale, VIC				
Nancy Wang Nikki Stepniewski der EMU100 GEO-E G Wood	Senio	or Inorganic Instrument Chemist	Melbourne Inorga	nics, Springvale, VIC		4		
Nancy Wang Nikki Stepniewski der 2 of 15 Gene 2 G Wood val Comments	Senio	or Înorganic Instrument Chemist	Melbourne loogs	nice, Springvale, WC		6		
Nancy Wang Nikki Stepniewski der 2 of 15 Gene 2 G Wood val Comments	9 XLS have been developed from a	or Înorganic Instrument Chemist	Melbourne loogs	nice, Springvale, WC	, Ad and NEPM, in h	use developed pr		
Nancy Wang Nikki Stepniewski der EMI190 GEO-E G Vicod ral Convents difical procedures used is validated and are oben at the relative determination has ber	9 ALS have been developed from a deter request.	or Inorganic Instrument Chemist RIGHT SOLUTIO	Melbourne loogs	nice, Springvale, WC FN E R	, Ad and NEPM, In N	use developed pr		
Nancy Wang Nikki Shippinewski der EM2100 Ger EM2100 G Vioo val Comments alptoal procedures used in validated and are offer	Senio NVINORMENTAL SOLUTIONS S ALS have been developed from a client request.	erablehed internationally recognised by weight basis.	Melbourne loogs	nice, Springvale, WC I'N E R uned by the USEPA, APhon yold.	, Ad and NEPM, In to	use developed pr		
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e = ALS is not NATA accredited for these tests. - = Indicates an estimated value.

- Indexes are selected rate.
 EPOIS (SM): Where reported, Berzsin)(opvine Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Patient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence (1:0), Indexo(1:1:3, objected (1:1:3, obje

ork Order E	I of 15 M2100194 REO-ENVIRONMENTAL SOLUTI Wood	ONS						AL
inalytical Results								
lub Matrix: BOB. Matrix: SOIL3			Sample ID	BH01 0.2-0.3	BH01 0.8-0.9	BH011.5-1.6	BH02 0.2-0.3	8H82 1.0-1.2
Matrix: BOIL)		Sampling	y state / time	24-Feb-2021 00.00	24-Feb-2021 00:00	20-Feb-2021 00:00	24-Feb-2021 00:00	26-Feb-2021 00:00
Compound	C45 Number	LOR	Unit	EN(1103134-001	EM2103134-002	EN(1103134-000	EN(2103104-004	EM2103194-006
		100		Result	Read	Real	Fiend	Fernal
EA001: pH in soil using 0	DIM CaCl extract.		-					
pH (CeCi2)	-	0,1	pH Unit		-	6.5	\$7	
EA055: Moisture Content	Dated (0.135-11810)							
Wolsture Content		1.0	N	22.0	17.8	25.5	53	54.9
EGODS/EDOD3/T: Tetal Me	tals by ICP-AES							
Amenic	M40.38-2	6	70%0	*5	-6	-4	-6	-5
Batium	2440-39-3	90	molio	580	280	200	60	120
Beryllium	2440-41-7	1	moko	*1	*1	41	*1	=1
Boron	7440-42-8	50	mgkg	+50	*50	*50	*50	*50
Cadmium	7440-43-9	1	mgkg	+5	2	*1	-	2
Chromium	7440-47-3	2	maka	127	63	84		106
Cobalt	7440-48-4	2	maka	30	35	68	4	28
Copper	7440-50-8	5	maka	37	30	26	4	42
Lead	7439-92-1	5	maka		56	7	17	29
Manganese	7439-96-5	5	marka	583	538	1330	201	673
Nokel	7440-02-0	2	maka	122	67	97	4	138
Belenium	7782-49-2		~9%g	+5	4	4	4	- 4
Vanadium	7440-62-2	. 6	mg%g	65	54	70	21	83
Ziec	7440-66-6		-m030	84	399	\$3	45	260
EG035T: Total Recoveral	ble Mercury by FIMS							
Mercury	7439-97-6	0.1	majia	+0.1	63	40.1	40.1	<0.1
EPSTS(SM)8: Polynuclea	r Aromatic Hydrocarbons							
Naphthalene	81-20-3	0.8	7010	+0.5	40.8	40.8	-0.5	+0.5
Acenephthylene	226-96-8	0.5	molto	+0.5	40.5	\$0.5	-0.5	-0.5
Acenephthese	83-32-9	0.5	maka	+0.5	40.5	40.5	10.5	+0.5
Fluorene	86.73.7	0.5	moko	+0.5	+0.5	40.5	+0.5	+0.5
Phenanthrene	85-01-8	0.5	maka	+0.5	+0.5	+0.5	+0.5	+0.5
Andwacene	120-12-7	0.5	mgkp	=0.5	+0.5	+0.5	+0.5	+0.5
Flooranthene	206-44-0	0.5	mgkg	+0.5	+0.5	+0.5	+0.5	+0.5
Pyrene	129-00-0	0.5	mgkg	+2.5	40.5	-0.5	+0.5	+0.5
Benz()(anthracene	96-65-3	0.5	mgkg	+2.5	40.5	-0.5	40.5	40.5
Chrysete	218-01-9	0.5	mgkg	+0.5	40.5	40.5	40.5	-0.5
Benau(brr)/Researchene	205-09-2 205-62-5	0.5	10980	+0.5	40.5	40.5	<0.5	<0.5
Benao(k)fluoramhene	217-08-9	0.5	.mg%g	+0.5	40.6	<0.5	<0.5	<0.5
Benzo(a)gyrana	50-32-8	0.5	mghg	+0.5	-0.6	40.5	-0.5	<0.5

(ALS)

4 of 15 EM2100104
GEO-ENVIRONMENTAL SOLUTIONS G Wood

ub Matrix: BOB, Matrix: SOIL)			Sample ID	BH01 0.2-0.3	BH01 0.8-0.9	BH011.5-1.6	BH02 0.2-0.3	8H82 1.0-1.2
ware solly		Sampling date / time		24-Feb-2021 00.00	24-Feb-2021 00.00	24-Feb-2021 00:00	24-Feb-2021 00:00	26-Feb-2021 00:0
Compound	CAS Number	LOR	Unit	EM2103194-001	EM2103184-002	EM2103194-000	EN2103194-004	EM2103194-006
				Result	Read	Real	Read	Read
EPeristantil: Polynuclear Aromatic H	ydrocarbons - Cent	ment						
Indeno(1.2.3.odjpyrene	183-39-5	0.8	molto	+0.6	+0.8	40.8	<0.5	-0.5
Dibenc(s.h)anthracene	\$3-70-0	0.5	rolo	+0.5	40.5	10.5	40.5	-0.5
Benzolg h. (perylene	191-06-2	0.5	molito	+0.5	40.5	10.5	+0.5	+0.5
⁴ Sum of polycyclic aromatic hydrocarbor	8	0.5	malka	=0.5	+0.5	40.5	+0.5	+0.5
* Benzola(pynene TEQ (pero)		0.5	molko	=0.5	+0.5	+0.5	+0.5	+0.5
* Benao(a)pyrene TEQ (half LOR)		0.5	mg/kp	0.6	65	6.5	8.6	8.6
* Benzo(a)pyrene TEQ (LDR)		0.5	mg/kp	1.2	1.2	12	12	1.2
EP660/071: Total Petroleum Hydrocar	bons							
C6 - C9 Fraction		90	maka	410	<90	410	+10	410
C18 - C14 Fraction		50	maka	-58	+50	<50	+50	+50
C15 - C28 Fraction		100	marka	<100	4100	4100	<100	<100
C29 - C36 Frastian		100	marka	<100	+100	4100	<100	4100
C10 - C36 Frastian (sam)		50	marka	<50	<50	<50	+50	+50
EP660/071: Total Recoverable Hydroc	arbona - NEPH 201	Fractio						
C6 - C18 Fraillen	C6 C19	10	marka	<10	<10	<10	410	+10
C6 - C18 Fraction minus BTEX	C6_C10-BTEX	10		410	<10	<10	410	410
>C10 - C16 Fraction	- 100	50	maka	+50	+50	+50	*50	+50
xC16 - C34 Fraction		100	maka	*100	+100	*500	+100	+100
>C34 - C48 Fraction		100	maka	<100	#100	4100	+100	#100
* >C10 - C40 Fraction (sum)		50	make	40	+50	<50	+50	+50
*C10 - C16 Fraction minus Naphthalene (F2)	_	50	mgkg	450	-50	<\$0	+50	<50
EPOSO BTEXN			-					
Benne	71-43-2	0.2	malia	+0.2	40.2	10.2	40.2	+0.2
Taluane	106-68-3	0.5	make	+0.5	10.5	10.5	10.5	+0.5
Ethylbendene	100-41-4	0.5	make	+0.5	10.5	10.5	10.5	+0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	maka	=0.5	10.5	+0.5	10.5	+0.5
ortho-Xylana	9547-6	0.5	make	=0.5	10.5	10.5	10.5	+0.5
Sum of BTEX		0.2	make	+8.2	40.2	1.01	+0.2	+0.2
Total Sylenes		0.5	marka	+0.5	10.5	10.5	10.5	10.5
Naphthalana	91-20-3	1	marka	45	d	41	4	41
EPITSISMIS: Phenolic Compound Su		-						
Planol-db	13127-65-3	0.5	5	12.7	17.5	86.4	81.5	90.8
C THE WORLD	13121-68-3	0.9	76	#F.1	11.4	84.4		90.5

Nage Nork Order Stenii Vroject	5 of 15 EM2103194 CEO-ENVIRONMENTAL SOLUTIO G Wood	ONIS						AL
Analytical Result	ts							
Sub-Matrix: SOE, (Matrix: SOE)			Sample ID	8H01 8.2-0.3	BH01 0.8-0.9	BH011.5-1.6	BH02 0.2-0.3	8H82 1.0-1.2
		Sampl	ing state / time	24-Feb-2021 00.00	24-Feb-2021 00.00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Set	EM2103134-001	EM2103134-002	EM2103194-003	EW2103194-004	EM2103194-006
				Result	Read	Rest	Read	Feed
EP275(SIM)5: Phenol	ic Compound Surrogales - Continued							
3-Chierophenel-04	93951-73-6	0.8	N-	89.6	91.8	88.1	96.9	93.6
2.4.6-Tribromophenol	118-79-6	0.5	N	78.4	67.5	64.7	\$5.5	66.9
EPUTOISMIT PAH SA	arogales							
2-Fluorobiphenyl	321-60-8	0.5	5	93.3	\$4.4	92.4	94.7	97.5
Anthracene-d18	1719-06-8	0.5	5	997	189	189	110	112
4-Terphenyl-d14	178.61.0	0.5	5	99.5	100	96.7	101	104
EPOSOS: TPH/V/BTE:	X Surrogeles			and the second second				
1.2-Dichloroethane-D4		0.2	5	61.5	172	86.8	46.2	#5.3
Taluene-D8	2037-28-5	0.2	%	00.1	95.2	91.6	84.8	95.4
4-Exampleurobenzen	450.00.4	0.2	%	91.0	29.8	90.8	88.2	101

lege Vork Order Sent Voject	A of 15 EM210019H GEDEW/IPROMENTAL SOLUTIONS G Visod										
Analytical Result	s										
Sub-Matrix: BOB. (Matrix: SOIL)			Sample ID	BH03 8 2-0.3	BH03 0.8-0.9	BH04 0.2-0.3	BH04 0.4-0.5	8H050.24.3			
		Sampl	ing slate / time	24-Feb-2021 00.00	24-Feb-2021 00.00	24-Feb-2021 00:00	24-Feb-2021 00:00	26-Feb-2021 00:00			
Compound	CAS Number	LOR	Unit	EM2103194-007	EM2103134-008	EM2103194-009	EM2103194-010	EM2103194-011			
				Result	Read	Real	Real	Rend			
EA001: pH in soil usin	g 0.01M CaCl extract										
pH (CeCi2)		0,1	pH Unit		-	7.3	7,4	5.6			
EA055: Moisture Cord	ent (Dried (0:105-118*C)										
Moleture Content	-	1.0	N	6.4	11.2	19.3	18.6	55.7			
EGOOS/EDONT/T: Tetal	Metals by ICP-AES										
Arsenic	7440-38-2	- 5	70%0	45	- 4	-6	4	-45			
Barium	7440-39-3	90	malka	60	170	120	170	150			
Beryllium	2440-41-7	1	moko	*1	×1.	41		*1			
Boron	7440-42-8	50	maka	+50	*50	*50	*50	*50			
Cadmium	7440-43-9	1	maka	2	2			*1			
Chromium	7440-47-3	2	maka	12	53	28	28	28			
Cobalt	7440-45-4	2	maka		26	28	26	29			
Copper	7440-50-8	5	mgkg	17	40	41	69	59			
Lead	7439-92-1	5	maka	60	70	- 6	13	28			
Manganese	7439-96-5	5	mgkg	211	562	637	500	550			
Notel	7440-02-0	- 2	10080	10	41	4	32	29			
Selenium	7782-49-2	. 6		+5	4	4	- 4	- 4			
Vanadium	7640-62-2	. 6	~0%g	34	61	184	138	131			
Zine	7460-66-6	- 5	1010	205	461	66	191	176			
EG015T: Total Recove	vable Mercury by FIMS										
Mercury	7439-97-6	0.1	maha	+0.1	62	40.1	<0,1	<0,1			
EPS75(SM)8: Polynus	lear Aromatic Hydrocarbons										
Naphthalene	81-20-3	0.8	70%0	+0.5	40.8	40.8	<0.5	+0.5			
Acenaphthylene	228-96-8	0.5	molio	+9.6	10.5	40.8	-0.5	+0.5			
Acenephthene	83-32-9	0.5	maka	+9.6	10.5	40.5	40.5	40.5			
Fluorene	86.73.7	0.5	moko	+0.5	+0.5	+0.5	+0.5	+0.5			
Phenanthrene	85-01-8	0.5	maka	=0.5	+0.5	+0.5	+0.5	+0.5			
Anthracene	120-12-7	0.5	mgiko	=0.5	+0.5	+0.5	+0.5	+0.5			
Fluoranthene	206-44-0	0.5	moko	=0.5	+0.5	10.5	+0.5	+0.5			
Pyrene	129-00-0	0.5	maka	+0.5	-0.5	40.5	+0.5	+0.5			
Benz(a)anthracene	56-55-3	0.5	maka	+2.5	40.5	40.5	10.5	40.5			
Chrysete	218-01-9	0.5	mgkg	+0.5	40.5	40.5	-0.5	-0.5			
Benao(k-)/fuoranthene	205-99-2 205-82-5	0.5	mana	+0.5	-0.5	40.5	<0.5	-0.5			
Benau(k)fluoranthene	217-08-9	0.5	mgRg	+0.5	-0.5	<0.5	<0.5	<0.5			
Benzo(a)pyrana	50-32-8	0.5	~9%g	+0.6	-0.6	<0.5	<0.5	<0.5			

	HISTIN D-ENVIRONMENTAL SOLUTI	ONS						AL
Analytical Results								
Sub-Matrix: BOB.			Sample ID	BH03 8 2 4 3	BH03 0.8-0.9	BH040.2-0.3	BH040.4-0.5	8H050.2-0.3
(Matrix: SOIL)								
			g slate / time	24-Feb-2021 00.00	24-Feb-2021 00.00	24-Feb-2021 00:00	24-Feb-2021 00:00	26-Feb-2021.00.0
Compound	CAS Number	LOR	Unit	EM2103194-007	EM2103134-008	EM2103194-009	EM2103194-010	EM2103194-011
		_		Result	Rest	Rest	Real	First
	wematic Hydrocarbons - Centi			12.5	101		40.5	-0.5
Indeno(1.2.3.odjpyrene	183-39-5	0.8	molto			40.8	40.5	40.5
Dibencia hienthracene	\$3-73-3	0.8	molto	+0.5	40.5	40.5	40.5	40.5
Benzolg.h.liperylene	191-36-2	0.5	maka	+0.5	10.5	10.5	10.5	10.5
* Sum of polycyclic aromatic h		0.5		*0.5	10.5	10.5	+0.5	+0.5
* Beruto(a)pynene TEQ (pero)	-	0.5	molko	-0.5	-0.5	+0.5 6.6	10.5	10.5
⁴ Benzolajoyrene TEQ (half LO ⁶ Benzolajoyrene TEQ (LOR)		0.5	maka maka	1.2	12	12	12	12
		0.5	1919	1.1	u	u	u	u
EP660/071: Total Petroleum								
C6 - C9 Fraction		90	mgkg	+10	+10	410	+10	+10
C18 - C14 Fraction		50	mgkg	-58	+50			
C15 - C38 Fraction		100	mg/kg	<100	4100	<100	+100	<100
C29 - C36 Fraction		100	mgkg	<100 e50	+100	<100 <50	4100	4100
^ C12 - C38 Fraction (sum)		50	10990	490	*50	<30	450	+30
	ie Hydrocarbona - NEPM 2013			and the second				
C6 - C13 Fraction	C6_C10	50	10980	<10	<10	<10	<10	410
* C6 - C18 Fraction minus BTE (FT)	K C6_C13-BTEX	10		<10	<10	<10	410	410
>C10 - C16 Fraction		50	maka	+50	*50	=50	*50	=50
>C16 - C54 Fraction		100	mgkp	*100	*100	*500	=100	+100
>C34 - C48 Fraction		100	mgkg	<100	<100	<100	<100	<100
* >C10 - C40 Fraction (oum)		50	mgkg	<50	<50	<50	<50	-50
* >C10 - C16 Fraction minus No (F2)	ephthalene —	50	mgkg	-60	-50	<50	+50	-50
EPOSO: BTEXN								
Benzene	71-43-2	0.2	majia	+0.2	40.2	40.2	40.2	<0.2
Taluene	108-88-3	0.5	maka	+0.5	10.5	40.5	+0.5	+0.5
Ethylbendene	100-41-6	0.5	maka	+0.5	10.5	10.5	+0.5	+0.5
meta-& pera-Xylene	108-38-3 106-42-3	0.5	maka	=0.5	10.5	+0.5	+0.5	+0.5
ortho-Xylene	95-47-6	0.5	maka	=0.5	+0.5	+0.5	+0.5	+0.5
Sum of BTEX		0.2	mgikg	+0.2	40.2	40.2	+0.2	+0.2
* Yotal Sylenes		0.5	mgikg	+0.5	40.5	40.5	+0.5	+0.5
Naphthalene	91-29-3	1	mgkg	45	41	-1		41
EPITSISMIS: Phenolic Com	pound Surrogates							
Phanol-db	13127-68-5	0.5	N	89.2	86.3	87.5	87.6	90.4



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Work	COn	ber.	
Ciari			

8 of 15 EM2100194 GED-ENVIRONMENTAL SOLUTIONS G Wood

Analytical Results								
Sub-Matrix: BDR, (Matrix: SOIL)			Sample ID	BH03 8.2-0.3	BH03 0.8-0.9	BH04 0.2-0.3	BH04 0.4-0.5	8H050.24.3
		Sample	g slate / time	24-Feb-2021 00.00	24-Feb-2021 00.00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EN2103134-007	EM2103134-008	EM2103194-009	EM2103194-010 Fierch	EM2103104-011 Femal
EP275(SIM)5: Phenolic Compose	nd Surrogales - Continued							
2-Chierophenei-04	93951-73-6	0.8	N-	99.5	88.5	87.3	85.0	92.6
2.4.6-Tribromophenol	118-79-6	0.5	5	67,4	67.8	63.1	\$1.5	61.9
EPUTISMIT: PAH Surregales								
2-Fisorobiphenyi	321-60-8	0.5	54	96.3	\$4.4	92.2	92.7	96.5
Anthracene-d18	1719-06-8	0.5	5	100	184	112	112	114
4-Terphenyl-d14	1718-51-0	0.5	%	992	180	181	99.9	104
EPOSOS: TPH/V/BTEX Surrogale								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	60.5	H.I	H2	86.2	81.9
Yaluene-D8	2037-26-5	0.2	%	62.2	86.5	85.7	89.2	87.8
4-Exampluprobenzene	450-00-4	0.2	5	85.6	89.3	91.0	96.9	91.5

brik Order Ienti	9 of 15 EMERSINH GEO-ENVIRONMENTAL BOLUTIONS G Wood										
Analytical Results	0										
Mathie SOL		Sa	mple ID	Dup			-				
		Sampling the	de / time	24-Feb-2021 00.00							
Compound	C45 Number	LOR	Unit	EM2103194-012							
				Result			-				
EA001: pH in soil using	0.01M CaCl extract.										
pH (CeCi2)	-	0,1 pl	H UNE	5.8	-		-	-			
EA655: Moisture Conter	10/Wel (0 105-110*C)		-								
Moisture Content		1.0	N	49	-		-				
EGODS/EDORUT: Tetal N	Autols by ICP-AES			and the second se							
Arsenic	7440-38-2	5 .	090	45			-	-			
Barium	7640-39-3	90 0	ng%p	60		1	-	-			
Beryllium	7640-41-7	1 4	ngko	45	-		-	-			
Boron	7440-42-8		ngkp	+50	-		-	-			
Cadmium	7440-43-9	1 0	ngkg	+5	-		-	-			
Chromium	7440-47-3	2 4	ngko	7	-		-	_			
Cobalt	7440-48-4	2 4	ngkg				-	-			
Copper	7440-50-8	5 8	ngkg		-		-	-			
Lead	7439-92-1	5 4	ngkg	19				-			
Manganese	7439-96-5	5 4	ngkg	322	-	-		-			
Notel	7440-02-0	2 1	vg%g	4	-		-	-			
Selectors	7782-49-2	5 4	1010	-15	-	100		-			
Vanadium	7440-62-2	5 4	ngilig	21				-			
Zine	7440-66-6	5 4	080	63							
EG035T: Total Recover	able Mercury by FIMS										
Mercury	7439-97-6	0.1 0	0101	+0.1			-				
EPS25/SMIR: Polymeric	or Aromatic Hydrocarbons										
Naphthalene	91-20-0	0.8 4	0101	+0.5	-	-		-			
Acenephthylene	208-96-8		noko	+0.5	_		_	-			
Acenaphthene	83-32-9		nako	49.6			-	-			
Fluorene	86.73.7		noko	+0.5	-		-	-			
Phenanthrene	85.01.8		noko	=0.5			-	-			
Anthracene	120-12-7	0.5	nako	=0.5	-	-	-	-			
Fluoranthene	206-44-0	0.5 0	ngkp	+0.5	-		-	-			
Pyrene	129-00-0	and the local division of the local division	ngkg	+0.5			-	-			
Benzistanthracene	56-55-3	and the second se	ngkg	+0.5	-			-			
Chrysene	218-01-9	and the second se	ngkg	+0.5	-		-				
Benau(brijffassanthene	205-99-2 205-62-5	0.5 4	vg%g	+0.5							
Benao(k)fluoranthene	217-08-9	0.5 #	ngkg	+0.5	-			-			
Benzo(a)pyrene	50-32-8	0.5 4	1010	+0.6	-	-	-	-			

Non 10 of 15 Nork Order EM2100194 Dent GEO-EMVIRON Project G Wood	MENTAL SOLUTI	ONS						
Analytical Results								
Sub-Matrix BDR. (Matrix: SOIL)			Sample ID	Dup			-	
		Sampl	ing state / time	24-Feb-2021 00.00		100		
Compound	CAS Number	LOR	Set	EN2103104-012				
				Result			-	
EP275(SM)8: Polynuclear Aromatic Hyd								
Indeno(1.2.3.odjpyrene	193-39-5	0.8		40.6			-	-
Dibenzia.hjanthracene	\$1-70-3	0.5	molto	40.5		-	-	-
Benzolg.h.liperylene	191-26-2	0.5	malka	+0.6			-	
A Sum of polycyclic aromatic hydrocarbona	-	0.5	maka	=0.6				
Benzo(a)pynene TEQ (pero)		0.5	molko	=0.5			-	-
Benab(a)pyrene TEQ (half LOR)		0.5	maka	0.6	-		-	
A Benzo(a)pyrene TEQ (LDR)		0.5	mgkp	1.2	-		-	-
EP660/071: Total Petroleum Hydrocarbo				the second second second second				
C6 - C9 Fraction		90	mgkp	+10	-		-	-
C18 - C14 Fraction		50	mgkp	<50	-		-	-
And . And Excellent		1000	makes	-				

and a state of the		4.4		414				
* Benzo(a)pyrene TEQ (LOR)		0.5	maka	1.2	-		-	-
EP660/071: Total Petroleum Hydrocert	1011							
C6 - C9 Fraction		90	mgiko	410			-	
C18 - C14 Fraction		50	mgkg	<58		-	-	-
C15 - C28 Fraction		100	mg/kg	<100		1000		
C29 - C36 Fraction		100	mg/kg	<100			-	-
C10 - C38 Fraction (sum)	-	50	marka	<50		100		-
EP080/071: Total Recoverable Hydroci	arbona - NEPM 2013	Fraction						
C6 - C10 Frasilies	C6_C10	10	marka	<10	-	100		
CE-C18 Fraction minus BTEX (FT)	C6_C13-BTEX	10		<10	-	-	-	-
>C10 - C16 Fraction	- 100	50	mgkp	+50	-		-	-
>C16 - C54 Fraction		100	mgkp	<100	-		-	-
>C34 - C48 Fraction		100	mgkg	<100	-		-	
>C10 - C48 Fraction (eum)		50	mg/kg	<50			-	-
*C10 - C16 Fraction minus Naphthalene (F2)	-	50	mgkg	-68	-	-	-	-
EPORC RTEXN								
Benzene	71-43-2	0.2	mg/kg	+9.2	-			
Toluone	108-88-3	0.5	malka	+0.5	-	-	-	
Ethylbergene	100-41-6	0.5	malka	=0.5	-	-	-	-
meta-& pora-Xylene	108-38-3 106-42-3	0.5	maka	=0.5	-		-	-
ortho-Xylana	95-47-6	0.5	maka	=0.5				-
Sum of BTEX		0.2	maka	+8.2				-
* Total Sylenes		0.5	marka	+0.5				
Naphthalane	91-29-3	1	molto	45		-		-
EP175(SIM)5: Phenolic Compound Su	mogates							
Phanol-db	13127-88-3	0.5	N	87.0	-			

Vork Order :	11 of 18 EM2100194 GEO-ENVIRONMENTAL SOLUTI G Wood	ONS						AL
Analytical Results								
Sub-Matrix: BOE, (Matrix: SOE)			Sample ID	Dup			-	
		Sampl	ing state / time	24-Feb-2021 00.00		100		-
Compound	C45 Number	LOR	Set	EM2103104-012				
				Result	100	-	-	
EP275(SIM)5: Phenolic I	Compound Surrogates - Continued							
2-Chierophenel-04	93951-73-6	0.8	N-	48.3			-	-
2.4.6-Tribromophenol	118-79-6	0.5	N	65.6	-	-	-	-
EPUTISMIT: PAH Sum	ugates							
2-Fluorobiphenyl	321-60-8	0.5	N	99.9	-		-	-
Anthracene-d18	1719-06-8	0.5	5	909	-		-	-
4-Terphenyl-d14	1718-51-0	0.5	5	99.2	-		-	-
EPOING: TPH/M/BTEX 8	lanogeles							
1.2-Dichloroethane-D4	17060-07-0	0.2	5	60.9	-		-	-
Yaluene-D8	2037-26-5	0.2	%	64.2			-	-
4-Evomofiuprobenzane	450.00.4	0.2	5	68.2				_

ige ork Order enti sjoct	12 of 15 EM2103194 : GEO-ENVIRONMENTAL SOLUT G Wood	IONS						ALS
nalytical Result	s							
ATTAN STRATE		Sar	nple ID	Rinsale			-	
Aublo: MATER		Sampling date	+ / fime	24-Feb-2021 00.00				
ampound	C45 Number		Jož	EN(2103104-013				
(ingloand	Constanting of the second		-	Read				
G022F: Dissolved Me	tale by ICO.MIC							
Arsenic	7440-38-2	0.001 #	. Jpr	+0.001	-		-	
Boron	7440-42-8		ngl.	+0.05			-	
Barium	7440-39-3		ngl	40.001	-		-	-
Beryllium	7440-41-7		ngl.	+0.001			-	-
Cadmium	7440-43-9	0.0001 #	ngiL	+0.0001	-		-	-
Cobalt	7440-48-4		ngL .	+0.001	-		-	-
Chromium	7440.47.5	0.001 //	ngL .	+0.001	-		-	-
Copper	7440-50-5	0.001 //	ngt	+0.001			-	-
Manganese	7439-96-5	0.001 //	ngt	+0.001			-	-
Nickel	7440-02-0	And the second sec	ngt.	40.001			-	-
Lead	7439-92-1	and the second se	ngt.	+0.001	-		-	
Selecture	7782-49-2	0.01 #	ngt.	+0.01	100	100		-
Vanadium	7440-62-2	0.01 //	ngt.	40.01				
Zine	7440-66-6	0.006 /#	ngt.	<0.005				
G035F: Dissolved Me	around by FIMS							
Mersury	7439-97-6	0.0001 #	ngt.	<0.0001				
	lear Aromatic Hydrocarbons							
Naphthalame	91-09-0	1.0 0	.70	41.0		-	-	-
Acenaphthylene	208-96-8		10	41.0	-		-	
Acenaphthene	83-32-9		Age	41.0	-		_	-
Fluorane	86.737		Ja.	+1.0	_		_	-
Phenanthrone	81.01.8		Ja.	*5.0	-		_	-
Anthracene	120.12.7		In In	+1.0			-	-
Fluoranthene	206-44-0		pL.	+1.0	-		-	-
Pyrene	129-00-0		pt.	41.0	-	-	-	-
Benzistanthracene	96-55-3		ot.	45.0			-	-
Chrysene	218-01-9	and the second se	opt.	41.0	-		-	-
Benau(bri)/Researchers		the second se	gt.	41.0	-		-	-
Benau(k)fluoraethene	207-08-9		. 10	41.0	-		-	
Benzolalgyrane	50-32-8		10	+0.5	-	101	-	
Indeno(1.2.3.od/pyrene			10	+1.0	-	100		-
Dibeneja hjanthracene	53-70-0		10	+1.0			-	
Benzolg.h.liperylene	181-06-2		10	+1.0		100	-	
Sum of polycyclic aron			10	+0.5			_	

	109194 D-ENVIRONMENTAL SOLUTIO	ONIS						AL
Analytical Results								
Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Rinsale			-	
		Sample	g date / time	24-Feb-2021 00.00	-			
Compound	CAS Number	LOR	Unit	EN(1103194-013				
			-	Result	100			
EP275(SM)8: Polynuclear A	rematic Hydrocarbons - Centil	-und						
^ Benao(alpyrene TEQ (cero)		0.8	144	+0.6			-	
EPOBOI071: Total Petroleum	Hydrocarbons							
C6 - C9 Fraction		50	Advi	420				-
G18 - C14 Fraction		50	Jup/L	<50				
G15 - C38 Fraction		100	Jqu.	<900	-		-	-
C29 - C36 Fraction		50	upl.	450	-		-	-
^ C18 - C36 Fraction (sum)		50	upl.	-50	-		-	-
EP050/071: Total Receiverabl	ie Hydrocarbons - NEPM 2013	Fraction	15					
C6 - C18 Fraction	CH_C13	20	upt.	+29			-	-
^A C6 - C19 Practice minus BTE3 (F1)	K C6_C13-BTEX	20	µg/L	-29	-	-		-
>C10 . C16 Fraction		100	104	<100	-			
>C% C% C% Fraction		100	104	<100	-			
>C34 - C48 Fraction		100	Add.	<100			_	
* >C10 - C48 Fraction (sum)		100	Joy J	×900.	-		-	
* >C10 - C16 Fraction minus Na (F2)	phihalana	100	NDT	*100	-	-	-	-
EP040: DTEXN	the second s			and the second s				
Benzene	71-43-2	1	Jugit.	-11				
Taluene	106-66-3	2		4		100	-	
Ethylaenzene	100-41-4	2	764	-12	-	100	-	-
meta-& para-Xylene	108-38-3 136-42-3	2	2494	42	-			
ortho-Xylana	95-47-6	2	1494	-2				
^ Total Xylenes		2	1494	12				-
^ Sum of BTEX		1	Advi	45			-	-
Naphtholene	91-20-3	- 6	Vpl.	45	-		-	-
EPETI(SM(5: Phenolic Com	erand Surregales							
Phenol-d6	13127-68-3	1.0	5	17.5	-		_	-
3-Chiorophenoi-04	03951-73-6	1.0	%	92.0	-		-	-
2.4.6-Tribranophenol	118.79-6	1.0	5	100	-	-	-	
EPSTSISMUT: PAH Surroads	**		and the second second	and the second				
3-Fluorobiphenyl	321.60.8	1.0	N	99.2			-	-
Anthracene-d10	1719-06-8	1.0	5	99.3			-	-
4-Terphenyl-d14	1718-51-0	1.0		98.5			-	-

Page Work Order Client Project	54 of 15 EM2100194 GEO-ENVIRONMENTAL SOLU G Wood	TTONS						ALS
Analytical Resu	alts .							
Sub-Matrix: WATER			Sample ID	Rinsale			-	
		Sampl	ing state / time	24-Feb-2021 00.00		100	100	
Compound	CAS Numb	r LOR	Unit	EM2103104-013				
				Result				
EPORG: TPH/M/BT	EX Surrogates							
1.2-Dichloroethane-I	04 17060-07	0 2	N-	94.1	-			-
Taluene-D8	2007-26	6 2	5	94.6	-	-	-	-
4-Eromofiuorobenze	460-00	4 2	5	90.7		-		-

Noni Order EM210019 Noni Order EM210019 Steni OEO-EMV Insect G Wood	IRONMENTAL SOLUTIONS		
Surrogate Control Limits			
Sub-Marin SOL		Recentry	Links /00
Compound	C45 Mumber	Low	righ
EPE75(SIM)5: Phenolic Compound	Surroaites		
Phanoi-di	10127-08-3	54	125
2-Chlorophenol-04	93951-73-6	65	123
2.4.6 Tribromophenol	118-79-6	34	122
EPG75(SMIT: PAH Surrountes			
2-Fluorobiphenyl	301-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-dt4	1718-51-8	67	135
EP0405: TPH/V/BTEX Surrogates			
1.2-Dichlorsethane-04	17963-07-0	84	125
Teluene OB	2037-26-5	85	125
6-Bromofluorobenzene	460-00-4	56	124
ALL-MARK WATER		Recently	Links (N)
Compound	C45 Mumber	Low	raye.
EPE75(SIM(5: Phenolic Compound	Surrogates		
Phenoi-dli	13127-88-3	10	51
2-Chiorophenol-04	93951-73-6	30	154
2.4.6-Tribromophenol	115-79-6	28	133
EPERSON(T) PAH Surregules			
2.Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
6-Terphenyl-dt4	1718-51-0	44	124
EP6605: TPH/V/BTEX Surrogates			
1.3-Dichlorsethane-04	17963-07-0	73	129
Teluene-D8	2037-26-5	30	125
4-Bromofiaorabenzene	460-00-4	71	129



AllUrbanPlanning

Appendix D

Contact details of the suggested interested persons

Appendix D: Contact Details of the suggested interested persons

Property	Owner Name	Postal Address	PID	Title Reference