

Former Edithburgh Waste Depot

Landfill Gas Risk Assessment

Access Planning

June 2014

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a better approach

Document History and Status

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Statement of Limitations

Tonkin Consulting has prepared this landfill gas risk assessment report to provide an assessment of the likely landfill gas issues presented by the site.

The report is based on our interpretation of information gathered during our investigations, undertaken in accordance with good professional practice and current requirements. The results of this process are set out in this report and other reports relied upon and any conclusions we have made must be considered in this light.

The scope of the investigations is in accordance with current standards applied by the relevant authority at the date of the report. It must be recognised that standards for environmental performance are regularly reviewed and the results indicated in the report should therefore be reviewed in light of changing standards.

A qualified person should always be contacted to advice on any matters involving the interpretation of the risk assessment report.

This report was prepared for the client, on the basis of agreed parameters. Tonkin Consulting takes no responsibility for any reliance a third party places on this report or any of its conclusions. If a third party wants to determine the environmental conditions of the site the services of an appropriately qualified expert should be retained.

1 Introduction

Tonkin Consulting has been engaged by Access Planning to complete a landfill gas (LFG) risk assessment (LFGRA) for the former Edithburgh Landfill (the Landfill). This LFGRA provides a summary of existing conditions at the site and is an important document which can be used to assist in managing human health and environmental risks at the site. This is the primary reference document which informs any infrastructure development planning related to LFG management and monitoring.

This assessment and report provides information on the risks associated with possible LFG migration at the site for consideration of the EPA and developers. The preliminary risk assessment concerns potential for lateral migration of LFG and is focused on potential risks to human health and the environment. The risk assessment will require ongoing review following further site investigations when new information is obtained or when site conditions change.

2 Site Overview

2.1 General Site Description

The site is located on Coobowie Rd (CR5760/714) and is bounded by Beach Road to the south, the town cemetery to the east and cropping land to the north and west, refer to the site plan on Figure 2.1. The former landfill is located on the northern edge of the Edithburgh township and has a slight gradient towards the east, refer to the topographic map in Appendix A. The golf course on Beach Rd is the immediate receptor between the former landfill and the township. Three residential houses and sheds are located within 200 m of the site. The closest house and shedding to the site is located approximately 5 m from the northern boundary. Respectively the other residents are located 120 m from the eastern boundary and 180 m from the northern boundary.

2.2 Relevant Site and Waste Filling History

The site was initially developed for quarrying limestone during the 1960s – 1970s. The 1958 aerial photo (Appendix B) shows that the site is undeveloped and most likely used for cropping. Anecdotal information provided by a former Works Overseer with the Yorktown Council indicated that in 1979 a cage had been established onsite made of railway posts and wire netting that was used for people to dump their rubbish into. Once the cage began to reach capacity the waste would be burned. The method of disposal occurred before waste was landfilled at the site. Generally the townspeople and nearby residents carted their own rubbish to the cage and a staff member from Council collected public bins, which were also dumped into the cage.

When Council began collecting domestic rubbish in the towns it is reported that domestic waste was burnt prior to landfilling at the former Edithburgh Waste Depot and at other dump sites in the district. The Edithburgh depot also received hard rubbish including construction and demolition waste, steel, concrete, tree stumps, pipe and possibly asbestos. It is unknown when landfilling commenced in the borrow pit but it is assumed to have occurred in the early 1980s in pits or trenches up to depths of 2-3 m. These landfill pits were unlined. Access Planning advises from discussions with Council that the landfill would have received no more than 500 tonnes of waste over its lifetime and that the pits were likely capped with a 2 m layer of rubble prior to closure in 1988. Refer to Appendix C for anecdotal information.

The landfill site is currently used as a Council depot with an equipment storage shed and as a stockpile area for greenwaste, soil and road base materials. Other areas of the site are covered in grass and volunteer vegetation.

2.3 Additional Desktop Information

The current certificate of title was issued in April 2000 to the Minister for Sustainability and Environment. There were no previous certificates of title, refer to Appendix D.

A dangerous substance licence search was undertaken for the site by Safework SA. According to the records available to Safework SA, the site above has no listed items, refer to Appendix D.

A dial before you dig search was undertaken which showed that there were no services present within the site. However a Telstra cable is shown to be buried in the Coobowie Road reserve adjacent to the site, refer to Appendix E.

2.4 Receptors

Aerial imaging (2012) and survey mapping has been used to overview the site. A site visit was made on 16 May 2014 to view the surrounding land uses, during surface LFG monitoring. Table 3.1 below lists the nearby buildings and structures that may be sensitive receptors for migrating LFG.

Buildings such as sheds may be impacted by the underground migration of LFG. However, the likelihood of LFG being present underground decreases rapidly with increasing distance from the waste fill. The landfill was constructed without an engineered liner so this increases the potential for off-site LFG migration, particularly at points where the waste mass adjoins the site boundary. However the location of the waste mass and extent within the site is not known. The sensitive receptors most likely to be affected by migrating LFG are those either on site or in close proximity to the Landfill, particularly the onsite storage shed and the residence located 5 m north of the site.

2.4.1 On-site

The site is not accessible to the public and vehicle access is restricted to Council workers. An access track leading to an equipment storage shed, containing a slasher, is located in the eastern portion of the site, refer to Figure 2.1. The site is also used to stockpile greenwaste and gravel/soil materials.

2.4.2 Off-site

The site is surrounded (within 500 m of the boundary) by areas of farming land, a golf course and sporting complex, main and secondary roads and residential houses, refer to Figure 2.1. The distances between the nearest sensitive receptors and the edge of site are shown in Table 2–1 below.

Table 2–1 Relative location of receptors to the main waste mass at Edithburgh landfill

Area of Site		Receptors	Distance from waste to nearest receptor
Western portion of site	On-site	Vegetation, site users	0 m
	Off-site	Cropping land	5 m
		Residential houses and shedding	150 m
Northern portion of site	On-site	Vegetation, site users	0 m
	Off-site	Cropping land	5 m
		Residential house and shedding	5 m
Eastern portion of site	On-site	Storage shed and access road	0 m
	Off-site	Cemetery and reserve	20 m
		Coobowie Rd	20 m
		Walking track and beach	50 m
Southern portion of site	On-site	Vegetation, site users	0 m
	Off-site	Beach Road	10 m
		Golf course	20 m
		Sporting Complex	320 m

2.5 Landform

The topographical map for Edithburgh indicates that the site generally has a slight grade (1-2%) towards the north east ranging from approximately 11.5 mAHD at the Beach Road Boundary to 8.4 mAHD near Coobowie Rd, refer Appendix A. The topographic map shows that a depression existed in the middle portion of the site in January 1989. The site visit confirmed that a depression still exists in the middle of the site which contains greenwaste and has the potential for ponding of surface water.

2.6 Meteorological Conditions

According to the Bureau of Meteorology the mean maximum daily temperatures for Edithburgh measured at Edithburgh (BoM Station No 22046), range from 15.0°C (July) to 25.2°C (January) and the average annual rainfall is 374.9 mm measured between 1984 and 2013. Mean rainfall ranges from 11.7 mm in January to 58.2 mm in June.

2.7 Subsurface Conditions

2.7.1 Geology and Soil

There have been no known on site geology or soil profile investigations, however anecdotal information indicates that limestone was quarried from the site.

The Geological Survey of SA mapsheet for Maitland indicates that the area just north of the Edithburgh township and site is underlain by Tertiary Oligo-Miocene deposits comprising of PORT WILLUNGA BEDS. Soft, Bryozal, sandy limestones of the east coast, overlying PORT JULIA GREENSAND¹.

The Geological Map of SA mapsheet for South Australia describes the Edithburgh area as being underlain Tertiary Miocene-Eocene deposits of marine fossiliferous limestone².

A regional drillhole/ groundwater well search was undertaken using the Government of SA Water Connect website³, which showed that 9 wells are located within 1 km of the site. The information from wells located west and north of the site indicates that the site surface would have been underlain by limestone to a depth below ground level of 3 -10 m which overlies a sandstone layer. The closest well south of the site indicates that layers of topsoil and clay are present to a depth below ground level of 6 m overlying a 7 m thick layer of limestone. Refer to the Site Cross Sections in Figure 2.2 which give an indication of the expected subsurface conditions beneath the site and surrounding land.

2.7.2 Groundwater

There are no known groundwater or LFG monitoring wells installed on site. Monitoring well records for the region³ within 1 km of the site indicate the groundwater salinity of the shallow aquifer generally ranges between 16,000 mg/L and 24,000 mg/L total dissolved solids (TDS), which indicates it is unsuitable for drinking water, livestock or irrigation. Groundwater gauging at these wells indicates that the depth to shallow groundwater beneath the site is expected to be between 8 - 9 m below ground level at approximately 0.5 mAHd.

¹ Geological Survey of SA. 1975. *1:250,000 Mapsheet 'Maitland'*. Department of Mines.

² Geological Survey of SA, 2001. *1:2,000,000 Mapland Sheet South Australia*. Department of Primary Industries and Resources, SA.

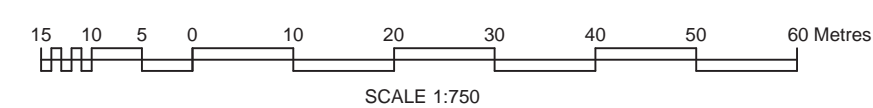
³ Department of Water, Environment and Natural Resources – <https://www.waterconnect.sa.gov.au>

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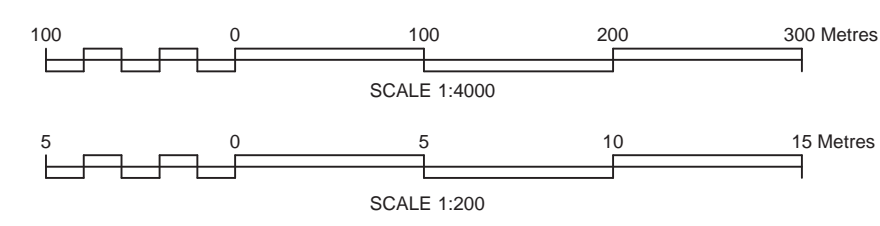
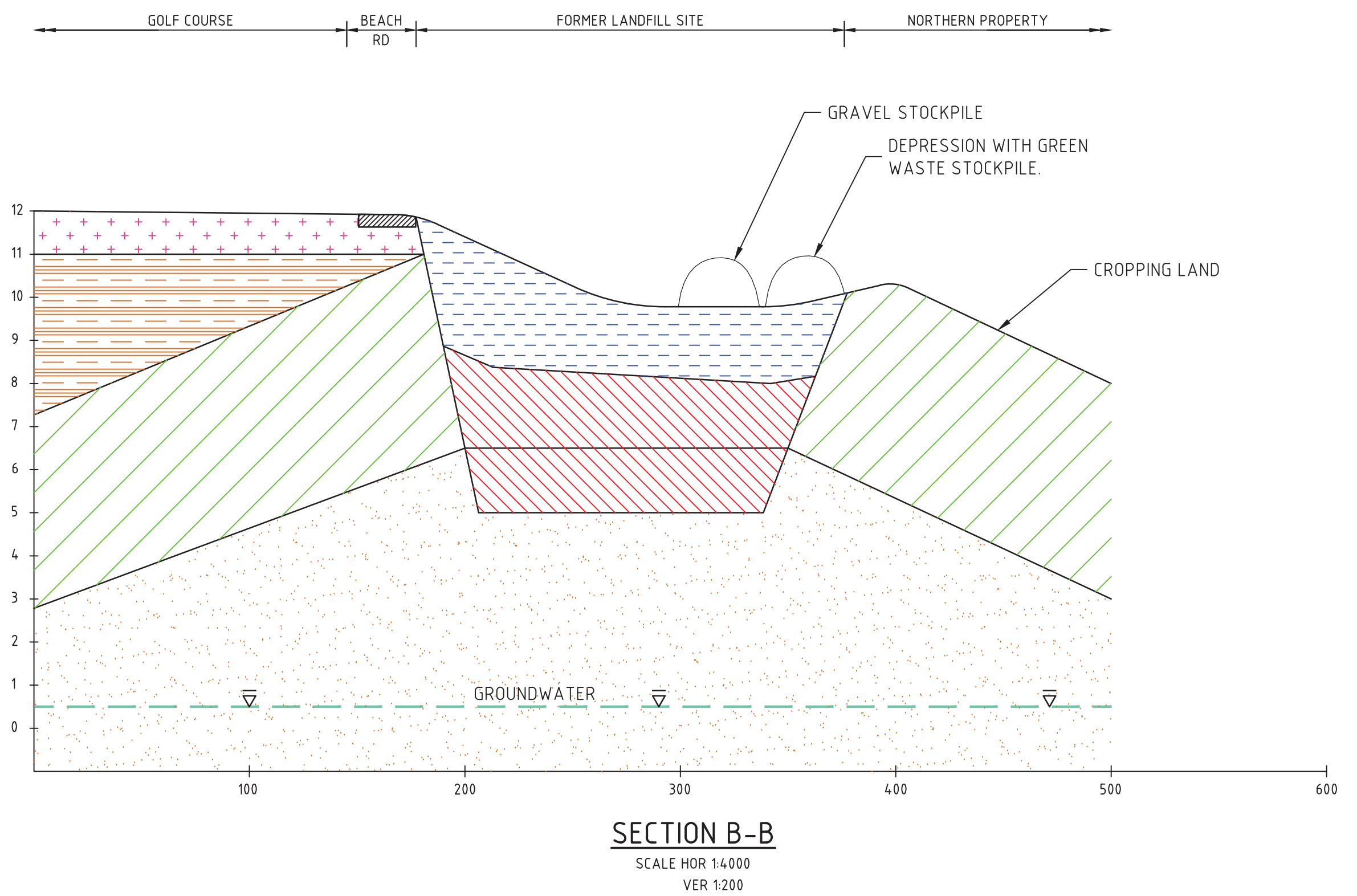
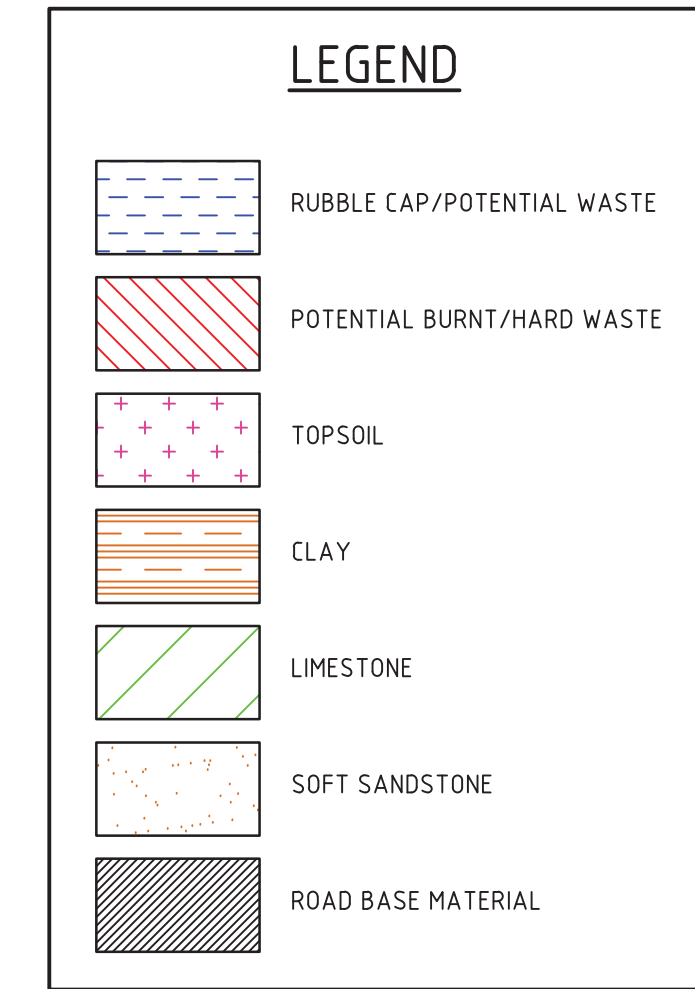
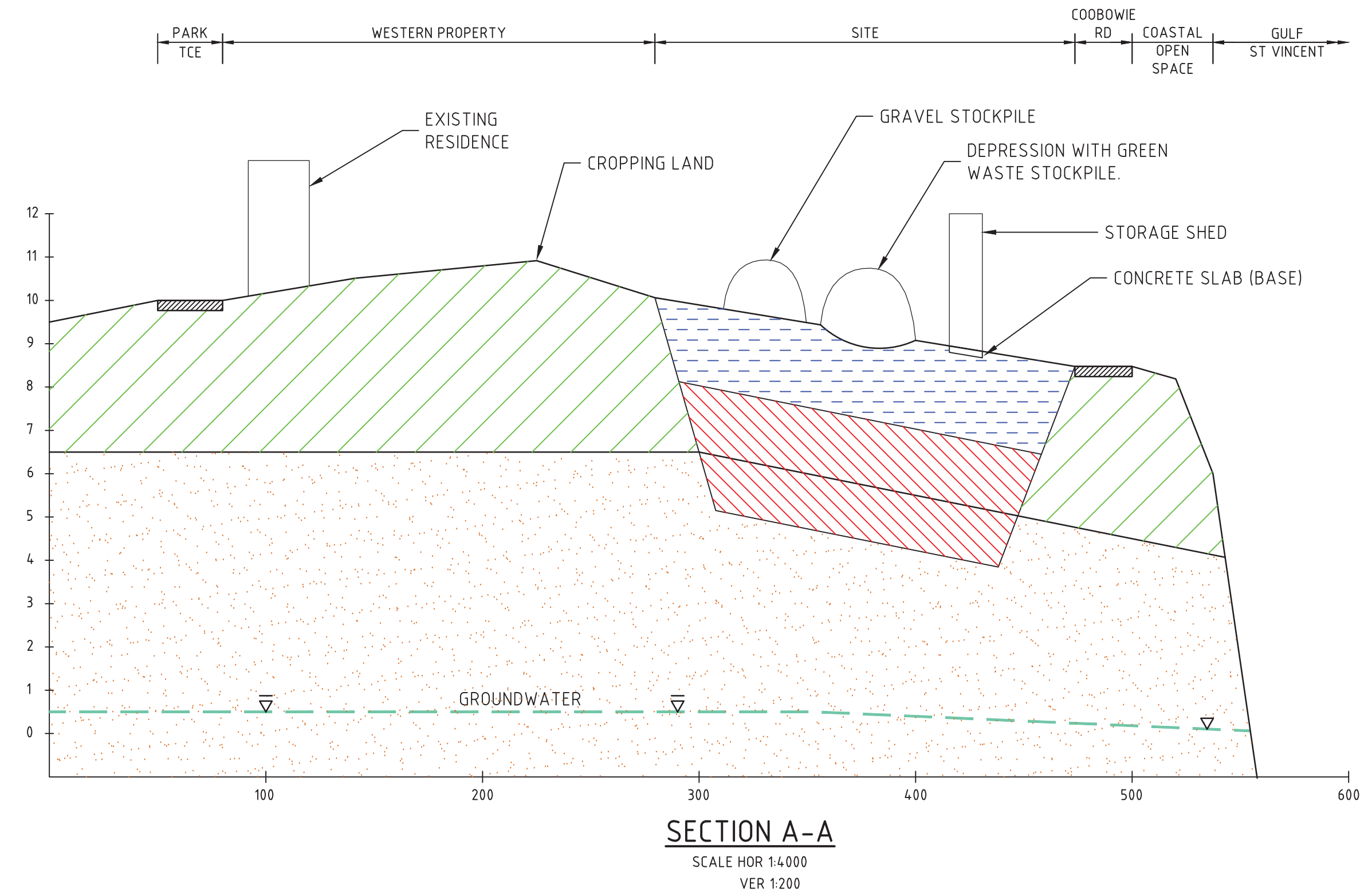
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Figure 2.1

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SITE PLAN

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Figure 2.2

SITE CROSS SECTIONS
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2.8 Monitoring Results

This section details the Tunable Diode Laser (TDL) surface survey of existing cover material undertaken on the 16th of May 2014 at the former Edithburgh Waste Depot. Included is a description of the survey method, results and outcomes of the sampling event.

The purpose of the TDL surface survey investigation was to assist in assessing the potential for LFG to be emitted through the capping layer or at the perimeter of the capping layer (i.e. site perimeter). Based on the site visit and anecdotal information the capping layer / final surface is largely comprised of compacted rubble, soil and construction and demolition materials up to a thickness of approximately 2 m. No surface cracking was evident, however some fox or wombat holes were identified. These penetrations into the capping layer occurred at the southern end of site near Beach Road and were monitored for LFG emissions.

2.8.1 Background

A TDL measures extremely small concentrations of selected trace gas species by using semiconductor laser chips that transmit light through optical fibres. This allows determination of the concentration of methane as a concentration in parts per million (ppm), (equivalent to 0.0001 %).

2.8.2 Guideline Trigger Values

The publication Best Practice Environmental Management; Siting, Design, Operation and Rehabilitation of Landfills, (EPA Victoria Publication 788.1, September 2010) recommends the following landfill gas action levels:

- Methane concentrations of 100 ppm at landfill surface final cover areas and penetrations through it; and
- Methane concentrations of 1000 ppm within immediate vicinity of penetrations through final cover.

These trigger values apply for emissions through the final landfill cap following closure of a cell and are intended to trigger action for further investigation, testing or remediation, if required.

2.8.3 LFG Surface Emissions Survey Method

The surface walkover LFG survey was undertaken to establish the pattern and location (if any) of surface gas (methane) concentrations across the site and boundary.

The LFG surface emissions survey methodology followed procedures outlined in Wilson et al., (2007)⁴ and is summarised below. Prior to commencing the survey, a background concentration was recorded at the site. A low alarm was set on the TDL500 to alert the user when concentrations of methane gas exceeded 20 ppm.

A systematic traverse was designed to ensure a representative and relatively consistent coverage of the selected area that would return an indication of the methane emissions from the surface, if present. Figure 2.3 enclosed with this document shows the approximate traverse pathway across the site which also covered the site boundary. The sampling port of the TDL500 was maintained at a height of less than 5 cm above the ground surface for the duration of the survey. The TDL500 was run continuously for the duration of the survey and takes a measurement at approximately 2 second intervals; however it did not have ability to record measurements. Therefore the survey path was recorded on a site plan and methane concentration noted regularly, particularly at features that may influence LFG emissions such as cracks or penetrations in the cap surface.

⁴ Wilson, S; Oliver, S; Mallett, H; Hutchings, H; Card, G., 2007. Assessing risks posed by hazardous ground gases to buildings. CIRIA C665 Updated © CIRIA 2007 RP711 ISBN: 978-0-86017-665-7.

To compensate for the higher than ideal wind speeds the survey was stalled during windy periods and a rubber shroud was used at the end of the sampling rod to form a seal between the inlet hose and the ground surface to minimise dispersal of gas before entering the sampling rod. All results reported for surface emissions are maximum concentrations observed when measured with the tip of sampling rod being held between 0 and 5 cm from the ground surface (measured during a period of calm wind conditions), unless otherwise specified.

The following site features were targeted during the LFG surface emissions surveys:

- Obvious surface cracking or fissures in sealed or unsealed surfaces,
- Areas of bare ground and surrounding stressed vegetation,
- The side of slopes near roads and drainage lines,
- Edges of the landfilled site, the edge of paved/sealed areas and the exterior walls of buildings or retaining walls,
- Areas where pipe-work and other services may be buried.

No service/utility pits were identified within or near to the site.

Screening of the shed exterior and interior focused on the following areas:

- Ambient concentration at head height in the middle of the shed interior,
- The base of walls, slabs and footings, cracks in concrete,
- Around pipes entering the wall of the building or ground (e.g. stormwater down pipes adjacent to the water tank).

No confined areas were identified within the shed (or site) and no services extend to the shed.

2.8.4 QA/QC

The TDL500 was calibrated successfully prior to monitoring. The TDL500 display was viewed frequently during the survey and methane concentrations noted on fieldforms. The TDL500 low alarm was set to 20 ppm and tested prior to and after completing the walkover surveys to ensure that the alarm was working and audible. Field notes were taken throughout the LFG monitoring event by an environmental scientist experienced in conducting LFG monitoring surveys. Ambient gas concentrations were measured prior to commencing the survey, prior to surveying the interior of the shed and on completion of the survey. The fieldforms and calibration certificate for the monitoring equipment used is provided in Appendix F.

2.8.5 Atmospheric Factors

Weather conditions on the 16th of May for the full site traverse survey, recorded at the Edithburgh weather station (Station Number 022046) were as follows:

- Temperature for the period of survey ranged between 18.5o C and 26.1o C;
- Barometric pressure was 1021 hPa at the start of survey and 1019.2 hPa at the end of survey, therefore falling by 1.8 hPa during the 3.5 hour survey period. Barometric pressure for the 12 hr period prior to the survey increased from 1019.9 hPa to 1021 hPa indicating the trend prior to the TDL investigations was stable;
- Wind conditions during the survey were recorded by the BoM as ranging between 13 and 43 km/hr, and wind conditions recorded onsite using a hand held anemometer during the survey ranged from 11 km/hr (between 9:20 am and 10:30 am) to a maximum speed of gusts 85 km/hr at 12:00 pm.
- Rainfall for the 48 hours prior to the TDL investigations was 0 mm.

2.8.6 Observations and Results

The concentrations of total methane gas measured during the TDL walkover survey ranged between 0.0 and 2.9 ppm (equivalent to 0.0% and 0.00029%). The highest reading was recorded in the storage shed, which does not contain ventilation, refer to the fieldforms located in Appendix F. These results indicate that there were no methane emissions hotspots identified on the surface of the landfill or at onsite receptors.

2.8.7 Discussion

Atmospheric Factors

Wind conditions during the TDL investigation did not remain below the recommended levels of 10 km/h, which is the acceptable level for walkover survey using a TDL device. However during the first 60 minutes of monitoring which covered the site perimeter, average wind speeds were recorded as 11 km/hr, only marginally above the acceptable limit.

Atmospheric pressure can influence release of LFG to the atmosphere. In conditions with low atmospheric pressure or a decreasing 12 hour atmospheric pressure trend, defined by an atmospheric pressure trend decrease greater than 2hPa, the pressure gradient is increased between the buried waste and the atmosphere which can result in increased release of LFG. Likewise a high atmospheric pressure or increasing atmospheric pressure trend can lead to a reduced pressure gradient that may result in a reduced LFG release. Otherwise atmospheric pressure is considered stable for the 12 hour prior to sampling. Therefore if a pressure gradient has developed within the waste as a result of LFG generation, periods of low barometric pressure are most favourable for observing emissions of the LFG at the surface (as long as these conditions don't correspond with significant rainfall events, which can saturate the soil cover and limit LFG emissions).

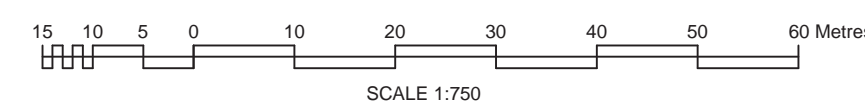
Atmospheric pressure conditions for surveying are generally considered to be ideal when the barometric pressure is low and falling. The 12 hour barometric pressure trend leading up to this monitoring event was steady. This indicates that conditions were conducive to the release of LFG but weren't at the extreme ranges of atmospheric pressure for the site.

The UK LFG Guideline indicates that if capping soils are saturated with water they will be less permeable to LFG which will greatly reduce surface flux of LFG, hence surface surveys should be avoided both during and following periods of unusually heavy rainfall. The survey on 16th of May 2014 was undertaken following no rainfall in the 48 hours prior to monitoring.

Assessment of Survey Results

The low concentrations of methane detected over the site are considered negligible and are consistent with ambient concentrations. The results of this investigation indicate that the likelihood LFG emissions from the capping material is very low, therefore the risk of emissions and lateral migration to on-site or off-site receptors is also very low. Based on these results and considering the age of waste and historical burning practices, it is estimated that LFG production at the site has peaked and the potential for continued LFG generation is considered to be low.

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Figure 2.3

SURFACE WALKOVER PATHWAY
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3 Risk Assessment

The purpose of carrying out an environmental risk assessment is to inform a risk management decision; that is, to determine what risk management measures need to be taken to prevent and control the identified risks⁵. The type and degree of risk is dependent on the nature of the hazard and the level of exposure. As such, the form of land usage significantly influences the assessment of potential risks and type of management measures that can be undertaken to control the potential hazards.

The aim of this risk assessment report is to provide information on the risks to human health and the environment as a result of LFG arising from former landfilling activities at the site.

The results of this assessment are presented below in Table 3.1. This LFGRA has been undertaken in accordance with the principles of AS/NZS ISO 31000:2009 with consideration of a limited number of hazards related to LFG migration while making reference to all factors contributing to overall risk of these specific hazards. The hazards were defined as potential LFG impacts to the nearest receptors in each direction considering human health. Consideration of the risks has been based on the understanding that the site will continue to be used as a Council Depot and that landuse adjacent to the site may change through development.

3.1 Methodology

The type of analysis chosen for this risk assessment is a qualitative risk analysis. Qualitative risk assessments use descriptive scales to describe the magnitude of potential consequences and the likelihood that those consequences will occur. The risk assessment was based on the Source-Pathway-Receptor model as follows:

- LFG emanating from the landfill (Source);
- The potential for migration (Pathway); and
- The presence of human and other receptors (Receptor).

The risk assessment was broken down into contributing factors (risk factors) of relevance to the risk assessment. The Source and Pathway risk factors were investigated and assessed individually to provide information for the rating of level of risk for the Receptors. The contribution to the overall risk of LFG impacts at the receptors were then rated for each risk factor. These contributing factors were not assigned risk levels but rated to clarify the degree to which they affect the overall risk level rating.

After the rating of the risk factors the risk levels of a LFG incident at each receptor were rated for consequences and likelihoods based on consideration of the risk factor ratings.

The rated levels of risk were estimates and reflected Tonkin Consulting's degree of belief that a particular event or outcome could occur having been based on the desktop study, surface survey walkover and anecdotal information on operational activities.

A review of available information was undertaken to assess the LFG generation potential of the site, location of nearby receptors and potential pathways for LFG migration.

The following information was considered during the review:

- Estimates of waste types and quantities over the filling years,
- Landfill capping and lining type and condition,
- Surface water management and infiltration,

⁵ Pollard, S., D. Purchase and S. Herbert, 2000. A practical Guide to Environmental Risk Assessment for Waste Management Facilities. U.K. Environmental Agency

- Groundwater conditions,
- Landfill gas monitoring data of on-site cap (surface emissions walkover surveys),
- Review of geological conditions on-site having regard to the landfill geometry and local topography (to assess potential pathways),
- Location and type of nearest receptors.

Significant factors which have affected the assessed level of risk for the site are:

- Low volumes of waste received. It is estimated that a maximum of 500 tonnes of household and hard waste was received, burnt and buried in shallow trenches or pits over the life of the landfill.
- The age of waste is greater than 25 years as the landfill was closed in 1988. Decomposing buried tree stumps and burnt domestic waste are expected to be a low emission risk. The area receives relatively low rainfall, therefore it is expected that the overall gas generation rate is minimal.
- Surface survey monitoring results indicate negligible concentrations of LFG recorded within site infrastructure, at the boundary and over the capped surface.

3.2 Conceptual Site Model

A conceptual site model presented as cross sections in Figure 2.2 was developed through the interpretation of the desktop information compiled regarding the site, surrounding features, topography and subsurface profile. The conceptual site model shows the potential source of LFG is the waste mass, which could extend to approximately 5 m below the existing surface. The site is underlain by thick bands of limestone and sandstone/sand which may provide a pathway for LFG to migrate laterally from the site. A clay layer to the south of the site is expected to provide a barrier for LFG migration and surface emissions. For migration to occur a confining layer above the layer containing LFG must also be present so that a pressure gradient can be maintained. The landfill cap is unlikely to provide such a confining layer. The sections show potential receptor locations including the onsite storage shed, residence to the west and the golf course.

Given the presence of a thick limestone band to the north and west of the site a clay layer to the south and that limited methane has been detected at the surface and perimeter, it is considered unlikely that LFG is migrating off site from the waste mass or into onsite receptors.

Table 3–1 Risk Assessment Matrix

Risk Issue	Hazard	Source	Pathway	Receptor	Level of Risk	Assessment of Risk / Recommendations
Equipment Shed possibly located over landfilled waste	Asphyxiation/ fire/ explosion	Buried waste	Vertically through waste, capping layers and concrete floor	Staff inside shed	Low	Negligible concentrations of methane detected within shed. Install ventilation within shed to prevent the build up of gases.
Gases affecting personnel working on site.	Human health	Buried waste	Vertically through waste and capping layers	Staff working on site	Low	Monitor health of personnel working on or near the landfill. Company OH&S policies, procedures and training in place. Visual monitoring of surface by Council staff to identify any cracking and exposure of waste, particularly during any earthworks being undertaken. Consistent winds will act to disperse gases.
Gases affecting surrounding users of the cemetery, golf course, farming land or coastal reserve	Human health	Buried waste	Laterally from the waste through the soil profile (predominantly limestone)	Surrounding public / property workers	Low	Low LFG generation potential. Negligible LFG concentrations measured at the surface of the site boundary. Consistent winds will act to disperse gases.
Residential buildings / structures within 150 m from landfilled areas	Asphyxiation / fire / explosion	Buried waste	Laterally from the waste through the soil profile (predominantly limestone)	Surrounding residents / workers	Low	Low LFG generation potential. Peak LFG generation period has long past and no impacts reported. Negligible LFG concentrations measured at the surface of the site boundary. The gas permeability of the soil profile is unknown.

Risk Issue	Hazard	Source	Pathway	Receptor	Level of Risk	Assessment of Risk / Recommendations
Vegetation loss	Final cover vegetation die-off	Buried waste	Vertically through waste and final capping materials	Capping vegetation	Low	A large proportion of the site is not vegetated due to an active hardstand area for stockpiling materials and vehicle access. Vegetation observed onsite was not assessed to be in poor health (no die-back identified). Visual monitoring by Council staff.
	Surrounding cropping or screening vegetation die-off	Buried waste	Laterally from the waste through the soil profile (predominantly limestone)	Crops and screening vegetation	Low	Low LFG generation potential. Negligible LFG concentrations measured at the surface of the site boundary. Visual monitoring by Council staff required, or by landowner.
Emissions to atmosphere. Odour nuisance outside site boundaries	Nuisance / complaints	Buried waste	Vertically through waste and final capping materials to atmosphere	Atmosphere and surrounding residents or workers	Low	Low LFG generation potential. The site was capped with rubble/soil. Construction and demolition materials are present at the surface at the southern end of site. Consistent winds will act to disperse gases. Odour monitoring if complaints are received.

Risk Issue	Hazard	Source	Pathway	Receptor	Level of Risk	Assessment of Risk / Recommendations
Landfill gas generation and impacts to groundwater due to surface water infiltration	Human health	Buried waste	Vertical LFG movement through waste and capping layers or leachate through the underlying soil profile to groundwater	Surrounding residents / workers	Low	A number of depressions exist onsite which increase the potential for groundwater infiltration. It is recommended that these areas are filled with additional capping material and vegetated to reduce infiltration. The storage shed rainwater tank overflow is discharged onto the ground surface. It is recommended that these flows are drained to the roadside stormwater swale on Coobowie Road if sufficient grade exists.

3.3 Conclusions

The risk factors associated with the LFG generation and migration were rated as having a **low** contribution to risk due to:

- High age of waste and previous burning practices that reduces the risk of high LFG production.
- The shallow depth of buried waste in unlined pits or trenches which reduces the likelihood that a sufficient gas pressure gradient exists to drive gas offsite.
- Negligible concentrations of LFG (up to 2.9 ppm) measured in site infrastructure and over the site surface.

With generation and migration risks being low, the inherent risk to on-site receptors is considered to be **low**.

The presence of a rubble /soil (non barrier) cap allows for potential on-site migration and some passive venting and oxidation of fugitive methane emissions in the capping materials.

3.3.1 Data gaps

While the risks of LFG generation and migration are considered to be low there are additional investigations that could be undertaken to provide further certainty regarding LFG risk to eliminate data gaps, these are:

- i) Prove that there is no LFG source – this would require intrusive investigations such as probing or LFG wells or characterisation of waste,
- ii) Show that pathways are incomplete – this would require LFG wells at the site boundary to show that LFG migration is not occurring within the boundary soil profile. Additional surface monitoring would also provide more certainty regarding vertical migration given that the only a single monitoring event has been undertaken when atmospheric conditions were unlikely to show worst case conditions.

3.4 Recommendations

Based on the results of the risk assessment the following is recommended:

In the context of the former Edithburgh Waste Depot, the SA EPA default buffer distance of 500 m to proposed developments⁶ is highly conservative and could be significantly reduced for this site. It is assessed that the level of risk for a surrounding, above-ground development is very low and gas protection measures are unlikely to be necessary. However, if sensitive development was planned to abut the site boundary it is recommended that the data gaps above be considered with the development details to update the risk assessment and provide further certainty regarding LFG risk.

⁶ EPA SA Waste Information Sheet - EPA 969/12. *Landfill Gas and Development near Landfills – advice for planning authorities and developer*. Issued February 2012

Appendix A

Topographic Map



Appendix B

Aerial Photos







Appendix C

Anecdotal Information

Edithburgh Old Landfill – DC Yorketown – Section 714 Hd Melville



Lot no: 714
suburb: EDITHBURGH
Owner Name1:
Owner Name2: Minister for Environment & Conservation







Hi Melissa,

As discussed, I require a quote on behalf of the Yorke Peninsula Council for a landfill risk assessment of the old Edithburgh dump.

As expected Council has minimal information on the dump, however, below is all the information I have at this stage which can hopefully assist with the preparation of the fee proposal:

- The former landfill is located on Section 714, Coobowie Road, Edithburgh (CR 5760/647)
- The dump was closed in 1988
- All rubbish was burnt prior to the closure
- Trenches/pits were likely covered with a 2 metre layer of rubble prior to the closure
- Mainly received household waste and potentially a small amount hard rubbish

I have also attached an aerial photo of the site and a number of site photos.

If you have any questions in relation to the above please let me know.

Regards

Tom Hateley



ACCESS PLANNING (SA) Pty Ltd

200 Kensington Road
MARRYATVILLE SA 5068

Phone: (08) **8130 7222**

Mobile: **0418 838 290**

Facsimile: (08) **8130 7299**

Email : tom@accessplanning.com.au

Hi Dale,

Thank you for providing an update on the anticipated timeframes.

Council has very limited information on the site as reflected by the information I previously provided to Melissa. However, since my initial correspondence with Melissa, I have been advised that the landfill would have received no more than 500 tonnes over its life.

I am not sure how much more information Council can provide, however, the details of the relevant contact person at Council are outlined below:

Roger Brooks
Director of Development Service
8852 0200
Roger.Brooks@yorke.sa.gov.au

If you require any further information please let me know.

Regards

Tom Hateley



ACCESS PLANNING (SA) Pty Ltd
200 Kensington Road
MARRYATVILLE SA 5068
Phone: (08) **8130 7222**
Mobile: **0418 838 290**
Facsimile: (08) **8130 7299**
Email : tom@accessplanning.com.au

Hi Dale,

I've liaised with Graham Newstead this morning who was the former Works Overseer with the old Yorketown Council (prior to amalgamation in 1997) and he's provided a bit more information below.

Some of Grahams old files have been retained in storage at Minlaton which have been found, but unfortunately there isn't anything there which would be of any assistance.

I'll give you a call this afternoon to discuss further.

Cheers

Roger S Brooks
Director Development Services
Yorke Peninsula Council
roger.brooks@yorke.sa.gov.au
www.yorke.sa.gov.au



From: Graham Newstead [<mailto:suengrumpy@gmail.com>]

Sent: Thursday, 1 May 2014 10:43 AM

To: Roger Brooks

Subject: Re: Edithburgh Dump

g'day Roger,

The dump site was an old borrow pit i would think, but Peter Bartram or Leon Russell might know, and in 1979 there was an old "cage" with I think, railway iron posts and wire netting, and an opening to allow people in to dump their rubbish. Bob Hiscock was the dayman at Edithburgh and he did the public bins etc with his landrover and trailer. Generally the townspeople and near residents carted their own rubbish. When the cage got a fair bit in it, Bob, or someone else, would burn it. There was no landfill as the EPA would classify it. When DCY got Bob a tipper (Austin about 3 or 4 ton) the council began collecting domestic rubbish in the towns. Trucks had a cage and the daymen collected bagged garbage and deposited it at the various dump sites in the District. Some hard rubbish was dumped at Edithburgh, and I would guess that the "pit" was about 2 or 3 metres deep in places. Probably some tree stumps were dumped around the middle and north end of the site. Some would have been burned, and quite probably some were just buried. There would be all sorts of crap in there, steel, maybe asbestos sheet and pipe.

There is no survey that I'm aware of, bit there should be a plan of the section, assuming it's all part of the cemetery/depot/dump block, even if you have to go to the LTO. Another possibility is that the land MAY be part of Peter Bartram's property, although I suspect not, as he was never very happy about the dump site, especially if he was cropping the adjacent paddock.

Allan Russell might be worth talking to, he is a Burgh boy.

If the Records section is operating, you might find something in the old DCY files, or give someone a job for a while, I'm pretty sure that Dennis would have had files on the dumps.

Good luck mate!!!!!!!!!!

G

Appendix D

Government of SA Searches



Government of South Australia

Department of Planning,
Transport and Infrastructure[HOME](#) [ABOUT](#) [CONTACT](#) [HELP](#)[Logoff](#)

PropertyAssist - Results

Order No. **20140423295244**

Please record this number for later use.

Customer reference:

PropertyAssist has found the following information based on your query data of :
CR 5760/647

[New Search](#)

PropertyAssist - Historical Search

Title Reference CR 5760/647
Previous Title Reference NONE/
Other Previous Title References NO
Title Status CURRENT
Date of Issue 20 APRIL 2000
Registration NUMBER 2
Authority Document RT 8862508
Other Authority Documents NO

Produced	Completion Date	Document Number	Status	Details
26 JUNE 2012	11 MAY 2013	11780169	REGD	VESTING MINISTER FOR SUSTAINABILITY ENVIRONMENT

Search Date 03:49 PM, Wed 23rd April, 2014

Total Cost for this Order is \$0.00[New Search](#)

PropertyAssist Disclaimer Privacy Statement
Copyright Government of South Australia
03:49:52 PM - 23 Apr 2014

The PropertyAssist application is managed by the
Land Services Group of the Department of Planning, Transport and Infrastructure.



Licensing Unit

Level 4, World Park A,
33 Richmond Road
Keswick SA 5035

GPO Box 465
Adelaide SA 5001

DX 715 Adelaide

Phone (08) 8303 0400

Fax (08) 8303 9903

ABN 50-560-588-327

www.safework.sa.gov.au

23 April 2014

Suzanne Roberts
Tonkin Consulting
Level 2 / 66 Rundle Street
KENT TOWN SA 5067

Dear Suzanne,

DANGEROUS SUBSTANCES LICENCE SEARCH

RE: SECTION 714 COOBOWIE ROAD, EDITHBURGH SA 5583

According to the records available to SafeWork SA, the site listed above has no licenced items.

Yours sincerely

Janet Tieste
**MANAGER
LICENSING UNIT
SAFEWORK SA**

Appendix E

Dial Before You Dig Search

Caller Details

Contact: Mr Dale Engler
Company: Tonkin Consulting
Address: Level 2 66 Rundle Street
Kent Town SA 5067

Caller Id: 1285524
Mobile: 0417887751
Email: dale.engler@tonkin.com.au
Phone: 08 82733100
Fax: 0882733110

Dig Site and Enquiry Details

WARNING: The map below only displays the location of the proposed dig site and does not display any asset owners' pipe or cables. The area highlighted has been used only to identify the participating asset owners, who will send information to you directly.



User Reference: Not Supplied
Working on Behalf of: Private
Enquiry Date: 16/04/2014
Start Date: 01/05/2014
End Date: 01/05/2014

Address: Section 714 Hd Melville Beach Road
Edithburgh SA 5583

Job Purpose: Excavation
Onsite Activity: Mechanical Excavation
Location of Workplace: Private Property
Location in Road: Not Supplied

- Check that the location of the dig site is correct. If not you must submit a new enquiry.
- Should the scope of works change, or plan validity dates expire, you must submit a new enquiry.
- Do NOT dig without plans. Safe excavation is your responsibility. If you do not understand the plans or how to proceed safely, please contact the relevant asset owners.

Notes/Description of Works:

Landfill gas investigations for this former landfill site may require testpitting to assess the soil profile

Your Responsibilities and Duty of Care

- If plans are not received within 2 working days, contact the asset owners directly & quote their Sequence No.
- ALWAYS perform an onsite inspection for the presence of assets. Should you require an onsite location, contact the asset owners directly. Please remember, plans do not detail the exact location of assets.
- Pothole to establish the exact location of all underground assets using a hand shovel, before using heavy machinery.
- Ensure you adhere to any State legislative requirements regarding Duty of Care and safe digging requirements.
- If you damage an underground asset you MUST advise the asset owner immediately.
- By using this service, you agree to Privacy Policy and the terms and disclaimers set out at www.1100.com.au
- For more information on safe excavation practices, visit www.1100.com.au

Asset Owner Details

The assets owners listed below have been requested to contact you with information about their asset locations within 2 working days. Additional time should be allowed for information issued by post. It is **your responsibility** to identify the presence of any underground assets in and around your proposed dig site. Please be aware, that not all asset owners are registered with the Dial Before You Dig service, so it is **your responsibility** to identify and contact any asset owners not listed here directly.

** Asset owners highlighted by asterisks ** require that you visit their offices to collect plans.

Asset owners highlighted with a hash require that you call them to discuss your enquiry or to obtain plans.

Seq. No.	Authority Name	Phone	Status
33596096	SA Power Networks	0882920218	NOTIFIED
33596098	Sa Water	0874241117	NOTIFIED
33596097	Telstra SANT	1800653935	NOTIFIED
33596095	Yorke Peninsula (DC) **	0888320000	NOTIFIED

END OF UTILITIES LIST

Seq No:	33596098
Date:	4/16/2014
Enquiries:	1300 884 037
Fax:	08 7003 1117
Hours:	8:00am - 4:30pm
dialbeforeyoudig@sawater.com.au	

SOUTH AUSTRALIAN WATER CORPORATION

Dial Before You Dig Cover Sheet

To:	Tonkin Consulting	Phone No:	08 82733100
Attention:	Mr Dale Engler	Mobile No:	0417887751
Address:	Level 2 66 Rundle Street	Fax No:	0882733110
Suburb:	Kent Town 5067 SA		
Email:	dale.engler@tonkin.com.au		

Dial Before You Dig Request Details

Address:	Beach Road	Suburb:	Edithburgh
Side of Street:		Intersection:	
Distance:			
Activity Code:	15	Activity Description:	Mechanical Excavation
Map Type:	Satopo	Map Ref:	6427G4
GPS X Coord:		GPS Y Coord:	
Private/Road/Both:	Private	Traffic Affected:	False
Notification No:	7332487		
Message:	Landfill gas investigations for this former landfill site may require testpitting to assess the soil profile		

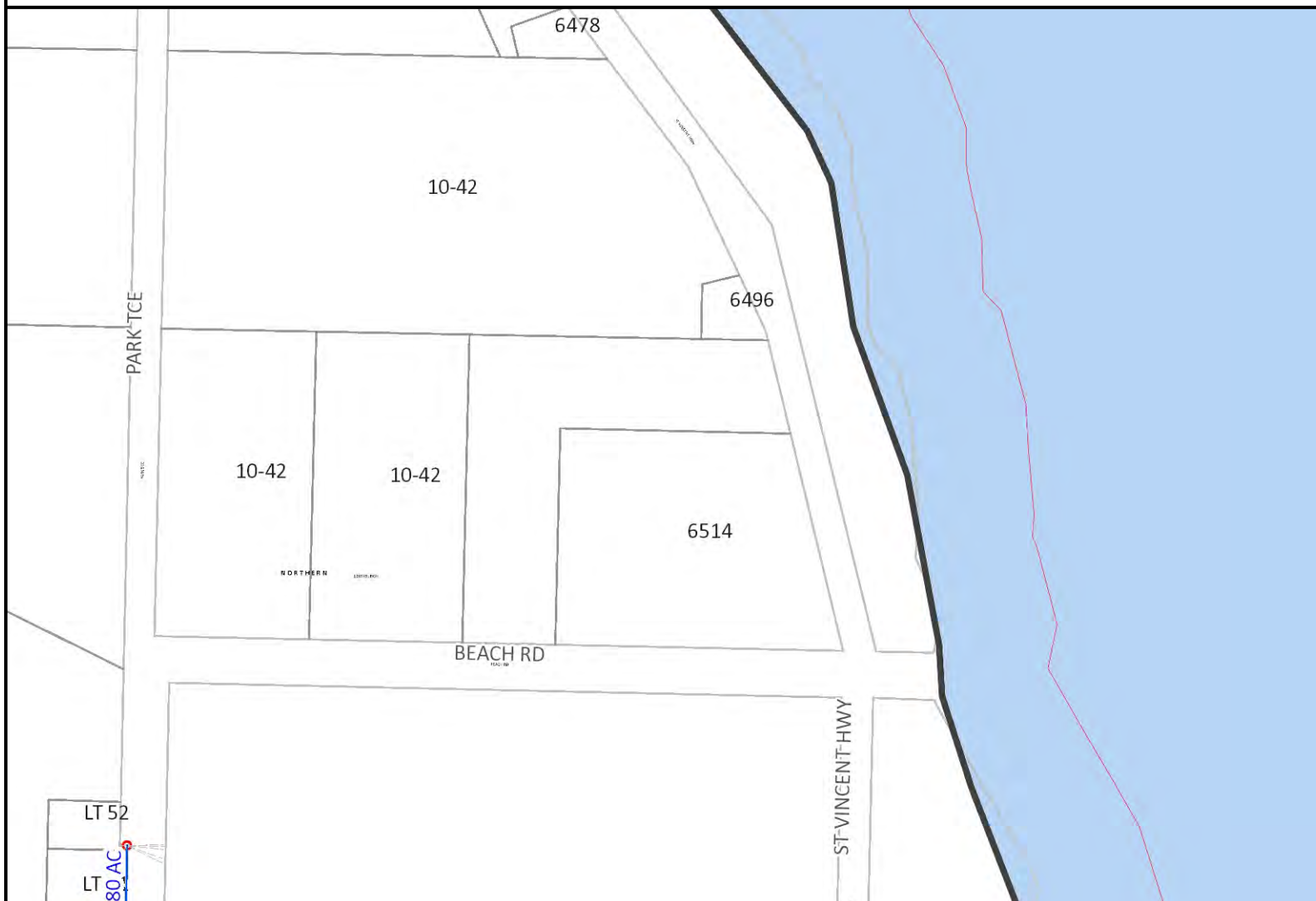
SA Water Comments

Please find attached your Dial Before You Dig map request results.

Number of Pages including this one:5

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The information contained in this message may be confidential and may also be subject of legal, professional or public interest immunity. If you are not the intended recipient any use, disclosure or copying of this document is unauthorised. If you have received this message in error, please contact the above named person.



Enquiries: 1300 650 950

Facsimile: (08) 7003 3329

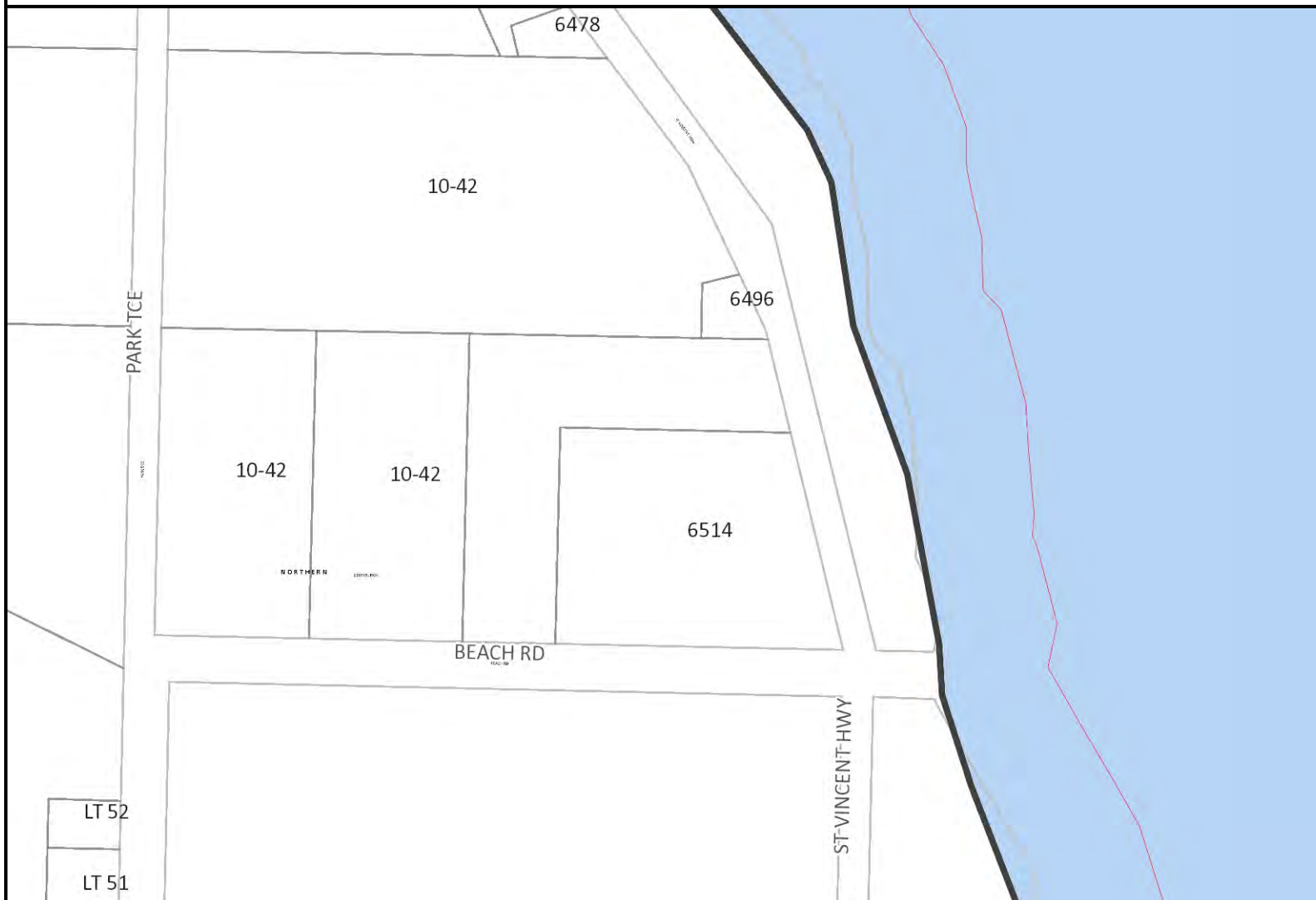
DIAL.BEFORE.YOU.DIG@sawater.com.au

- ▲ CP Test Points
- CP Transformer Rectifiers
- ▲ CP Insulated Joints
- CP Anodes
- CP Anode Bed Outlines
- × CP Anode Beds
- CP Anode Cables
- CP Cathode Cables
- CP Electricity Supply Cables
- Water Main Labels
- Water Mains
 - Potable System
 - Non-Potable System
 - Non-Potable System (Raw Water)
 - Potability Not Allocated
 - ... Private Ownership
- Water Mains Planning
- Water Connections
 - Other
 - Logical
- Water Hydrants
- Water Pillar Hydrants
- Water Valves
 - Locked
 - Not locked



Enquiries: 1300 650 950
Facsimile: (08) 7003 3329
DIAL.BEFORE.YOU.DIG@sawater.com.au

- ▲ CP Test Points
- CP Transformer Rectifiers
- ▲ CP Insulated Joints
- CP Anodes
- CP Anode Bed Outlines
- × CP Anode Beds
- CP Anode Cables
- CP Cathode Cables
- CP Electricity Supply Cables
- Wastewater Gravity Labels
- Wastewater Pumping Labels
- Wastewater Low Pressure Labels
- Wastewater Vacuum Labels
- Wastewater Gravity Mains
- Wastewater Vacuum Mains
- Wastewater Pumping Mains
- Standard
- Sludge
- Effluent Outfall
- Wastewater Low Pressure
- Wastewater Connections
- Wastewater Connections
- Common Effluent
- Wastewater Ancillary Pipes
- Wastewater Mains Planning



Enquiries: 1300 650 950
Facsimile: (08) 7003 3329
DIAL.BEFORE.YOU.DIG@sawater.com.au

- ▲ CP Test Points
- CP Transformer Rectifiers
- ▲ CP Insulated Joints
- CP Anodes
- CP Anode Bed Outlines
- × CP Anode Beds
- CP Anode Cables
- CP Cathode Cables
- CP Electricity Supply Cables
- Recycled Water Main Labels
- Recycled Water Mains
- In Service Mains
- Abandoned
- Abandoned and Replaced
- Recycled Water Connections
- Gazetted
- Abandoned
- Recycled Water Mains Planning
- Recycled Water Valves
- River Murray
- Inland Water
- SA Water Regions
- Land Parcels
- House Numbers
- Street Labels



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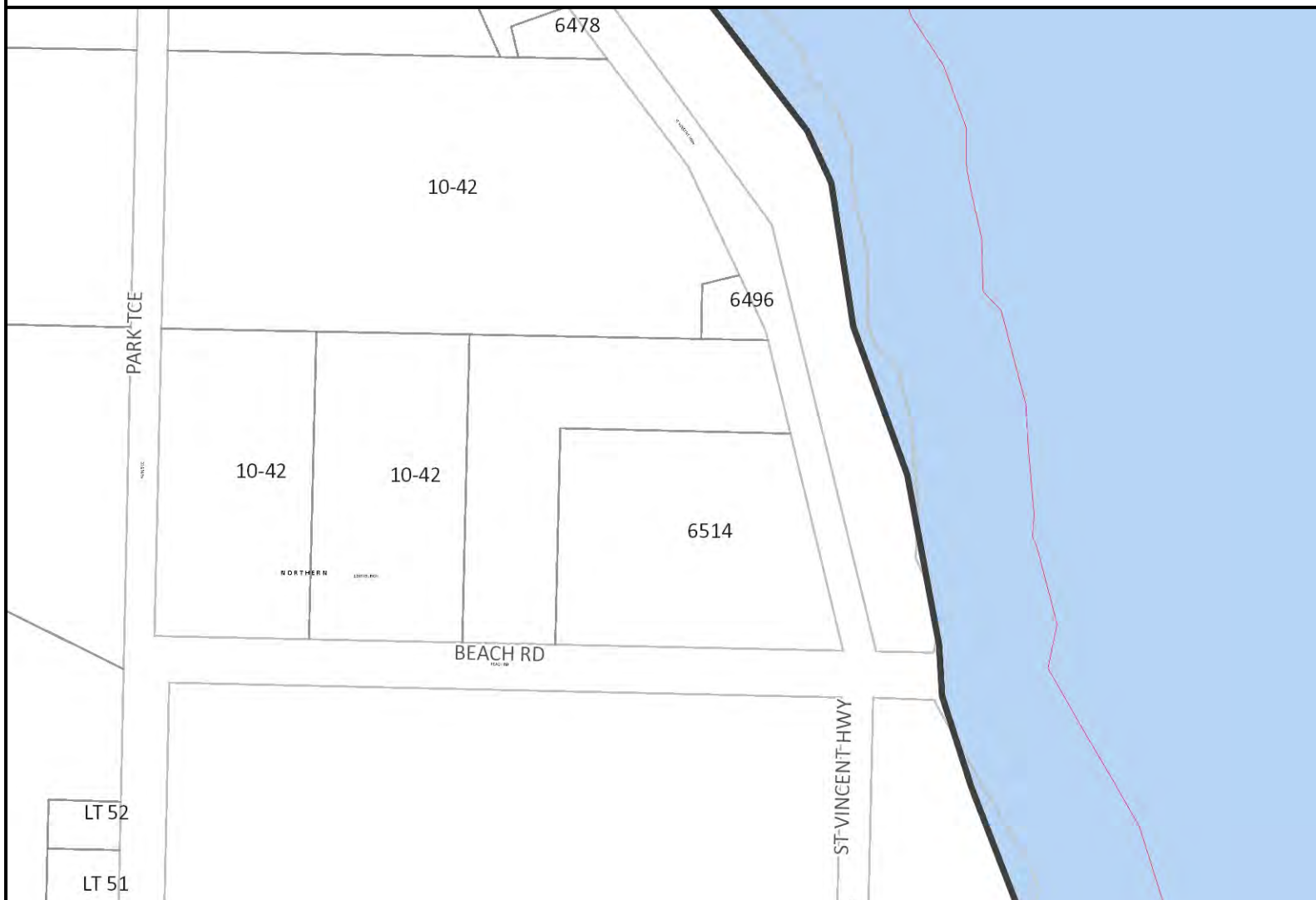
beach rd

235329

Report Generated: 16/4/2014 1:47 PM

Scale 1:4,105.24

(@A4)



Enquiries: 1300 650 950
Facsimile: (08) 7003 3329
DIAL.BEFORE.YOU.DIG@sawater.com.au

- ▲ CP Test Points
- CP Transformer Rectifiers
- ▲ CP Insulated Joints
- CP Anodes
- CP Anode Bed Outlines
- × CP Anode Beds
- CP Anode Cables
- CP Cathode Cables
- CP Electricity Supply Cables
- Salt Interception Main Labels
- Salt Interception Mains
- Salt Interception Valves
- Salt Interception Pumps
- ✕ Salt Interception Attachments
- Ⓜ Salt Interception Meters
- Salt Interception Junctions
- ⊗ Salt Interception Production Bores
- ⊗ Salt Interception Observation Bores
- Salt Interception Consumer Elec. Main
- River Murray
- Inland Water
- SA Water Regions
- Land Parcels
- House Numbers
- Street Labels



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beach rd
235329

Report Generated: 16/4/2014 1:47 PM

Scale 1:4,105.24

(@A4)

Sequence Number 33596096

Date Requested Apr 16, 2014

Mr Dale Engler
Tonkin Consulting
Level 2 66 Rundle Street
Kent Town SA 5067

Telephone 08 82733100 Fax 088273311

Email dale.engler@tonkin.com.au



No SA Power Networks underground assets located



As a result of your request for information it has been determined that there are no SA Power Networks underground assets in the requested area. If you believe this to be incorrect please contact SA Power Networks [contact: 8292 0218] to discuss your request.

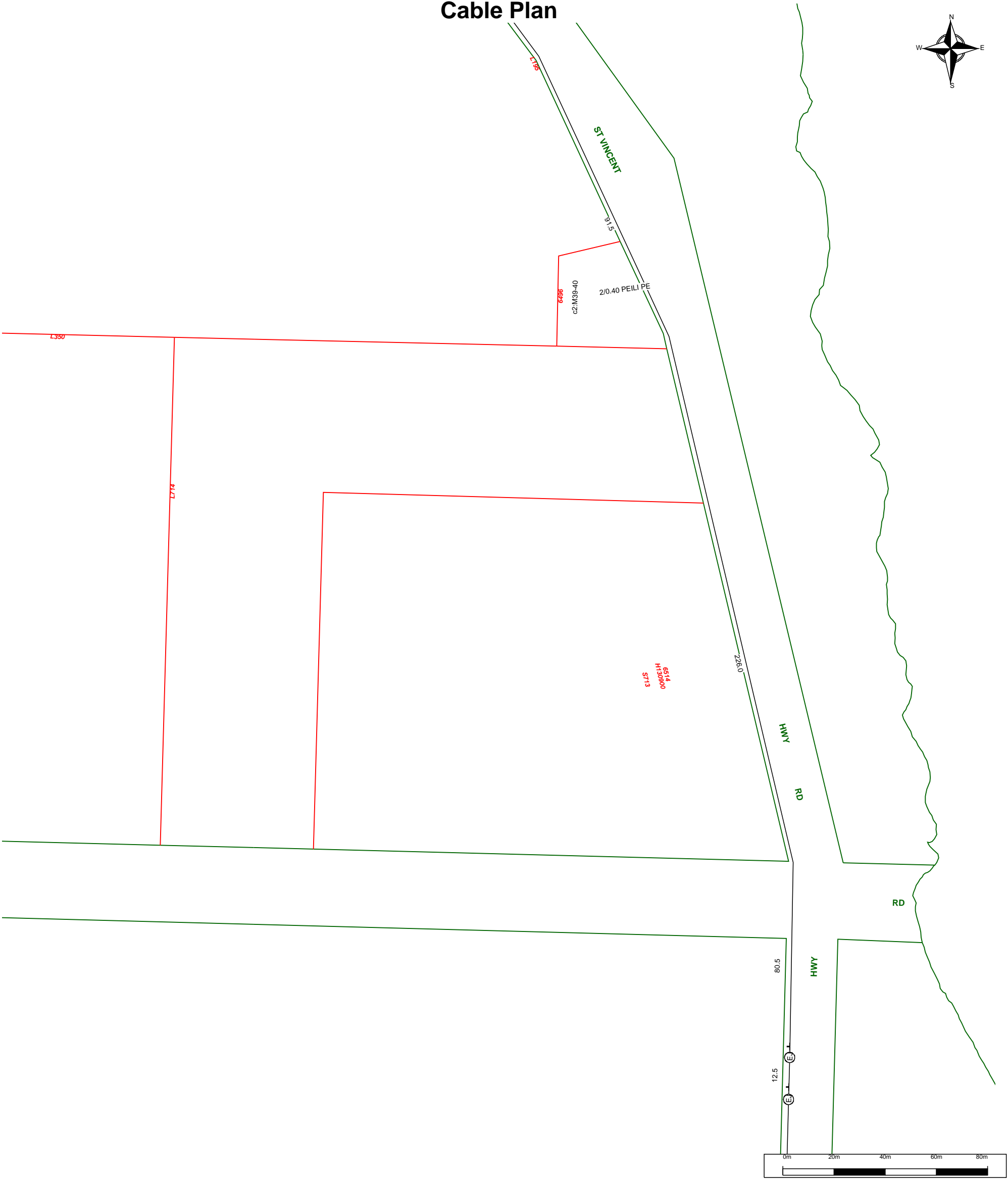
Please ensure that you have read all accompanying documentation and that you comply with the terms and conditions of the supply of this data.

Area Requested:

Beach Road Edithburgh SA 5583



Cable Plan



For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 16/04/2014 10:07:39

Sequence Number: 33596097

Please read Duty of Care prior to any excavating

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

Appendix F

Surface Walkover Survey Results

RENTALS

Equipment Report – Inspectra Laser Gas Detector

This FID/PID has been performance checked as follows:

Calibration PID	Actual Value	Reading	Pass?		
Zero – fresh air	0.0 ppm	2.2 ppm	<input checked="" type="checkbox"/>		
Span – Methane	100 ppm	101 ppm	<input checked="" type="checkbox"/>		
Operations Check					
<input checked="" type="checkbox"/>	Performance Check (pump, lamp, sensor & battery voltage check)				
<input checked="" type="checkbox"/>	Battery Charged	<input checked="" type="checkbox"/>	Filters Check	<input checked="" type="checkbox"/>	Dilution valve
<input checked="" type="checkbox"/>	Electrical Safety Tag attached (AS/NZS 3760)		Tag No: 7893		Valid to: 19/5/14

Date: 14/5/2014 Checked by: P.O.
Signed: P.O.

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum \$20 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Laser Inspectra Operational Check, plus Battery Voltage @ Full ✓
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Telescopic Rod and Suction Cup
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Rigid Rod → Damaged
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Connecting tube for bump checks
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Spare water trap filter(s) 0.45um Qty 3
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Charger 240v to 12v 500mA
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Carry strap
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Instruction Manual
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Cigarette filters
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Screw driver and pin wrench tool
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Carry case
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Plug Quick Coupler and O-rings
<input type="checkbox"/>	<input type="checkbox"/>	Check to confirm electrical safety (tag must be valid)
Processors Signature/ Initials P.O.		

Quote Reference	41000888	Condition on return
Customer Ref		
Equipment ID	TOL 5005A	
Equipment serial no.		
Return Date	/ /	
Return Time		

“We do more than give you great equipment... We give you great solutions!”

Phone: (Free Call) 1300 735 295		Environmental Assessment Technologies		Fax: (Free Call) 1800 675 123	
Melbourne Branch 5 Caribbean Drive, Scoresby 3179 Email: RentalsEnviroVIC@thermofisher.com	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113 Email: RentalsEnviroNSW@thermofisher.com	Adelaide Branch 27 Beulah Road, Norwood, South Australia 5067 Email: RentalsEnviroSA@thermofisher.com	Brisbane Branch Unit 2/5 Ross St Newstead 4006 Email: RentalsEnviroQLD@thermofisher.com	Perth Branch 121 Beringarra Ave Malaga WA 6090 Email: RentalsEnviroWA@thermofisher.com	

LANDFILL GAS MONITORING

Version: Jan 2014



Client: Access planning		Ambient Temp: 26 C		Date sampled: 16/5/14	
PM: DE		General weather conditions		Sampler: SE	
Job No: 2014 0048		mild early morning		Equipment: TDL500	
Location: Edithburg Landfill		getting increasingly gusty.			
Location no.	Wind speed	Time	CH ₄ PPM	Observations/ Comments	
Ambient	2.9	9.20	1.9	2 m above ground	
				5 cm above ground	
Low alarm set				Checked working with lighter	
Start Point				Started cemetery side of the entrance gate	
1				on the south eastern side	
				completed 3/4 of the boundary	
Shed	NA	9.32	2.8	2m above ground	
			2.9	5cm above ground	
				-shed has no ventilation / no whirley birds etc,	
				just used as a storage shed for council. see	
				image on next field sheet #2.	
Note:	16.0	10.30		Bad weather coming in	
Note:	23.0	11.20		Gusty conditions	
Ambient (internal site)	23.5	11.56	2.5	2m above ground	
			2.5	2cm above ground.	
Exterior grassed area.	22.1	12.11	2.3	Grassed area monitored, including south	
			2.3	western boundary around adjacent paddock,	
				which is used for cropping wheat.	
Post Amb	20.3	12.50	2.4	2m above ground.	
			2.4	5cm above ground	
one	(marked on field map)			wombat / fox holes	
two				approx 6 of them.	
three					
four			2.4	landfill start, also appears to be uncapped.	
				looks like old construction + demolition waste	
				monitored along the edge, see images	
five				gravel, dirt stock piles	
six				stockpiles of old trees (very large logs)	
seven				greenwaste, see images	