MINERAL RESOURCES TASMANIA

Tasmania

DEPARTMENT *of* INFRASTRUCTURE, ENERGY *and* RESOURCES

NHT Funded Project
NLP 13188

Natural Heritage Trust

Helping Communities Helping Australia

The effects of waste disposal on groundwater quality in Tasmania

Port Sorell waste depot

Tasmanian Geological Survey Record 2002/03

Tasmania
DEPARTMENT of INFRASTRUCTURE, ENERGY and RESOURCES

Mineral Resources Tasmania
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Groundwater quality investigations at the Port Sorell waste depot

A. R. Ezzy

Abstract

The Port Sorell waste depot was a disposal site for general and industrial waste. The waste depot was converted to a waste transfer station in 1995. The local groundwater table slopes towards the southeast. Waste fill has a hydraulic connection with the surface water drainage system. Clay-rich sediments appear to be perching and/or storing water. Groundwater and surface water quality is degraded around the site. Surface water management, capping of both landfills, appropriate disposal of sediments contaminated by hydrocarbons, leachate management infrastructure, and protection of the public from contaminated surface and groundwater are all considered to be high priorities at the site.

INTRODUCTION

Mineral Resources Tasmania (MRT) initiated a project to investigate the effects of waste disposal on groundwater quality in Tasmania. The project was funded by MRT and the Natural Heritage Trust (NHT) and included a number of sites for detailed study. The waste depot at Port Sorell was one of these sites.

The objectives of the investigations at the Port Sorell waste depot were to:

- Determine the geological nature of the host materials;
- Identify the depth of the water table;
- Examine the quality of the groundwater; and
- Identify if a potential hydraulic connection exists between the waste fill materials and the local hydrological system.

SITE DESCRIPTION

The Port Sorell waste depot is located on Depot Road, 100 metres west of Shearwater and 1.5 kilometres northwest of Port Sorell (460 300 mE, 5 443 400 mN) (fig. 1). The waste depot was in operation between approximately 1973 and 1995. The (then) Department of Environment undertook the first inspection of the facility around 1975.

Site history and waste management

The site became a waste transfer station in 1995, at which time all waste disposal (except inert waste) ceased at the site. No engineered fill sequence was used at the site and current leachate collection is based on discharges into surface waterways.

Two landfill footprints, an in-ground waste oil tank and a historical liquid waste disposal area, exist at the site. The eastern landfill footprint represents the main historical disposal area used by the Latrobe Council. Leachate flow follows the waterway to the south of this landfill footprint (Plate 1). Plate 2 shows leachate in a surface drain to the east of the landfill footprint.

Industrial waste was deposited in the western landfill footprint at the site until 1993. Plate 3 shows the landfill footprint and surface leachate discharges from the site.

Waste oil has been stored in a cement tank at the location of borehole PSWD2000/1 for over a decade (Plate 4). Between approximately 1973 and 1995 liquid waste was disposed of in the area of borehole PWSD2000/2. The source of the liquid waste (dye) was local textile factories.

All disposal sites are located in heterogenous layers of clay and sand sediments.

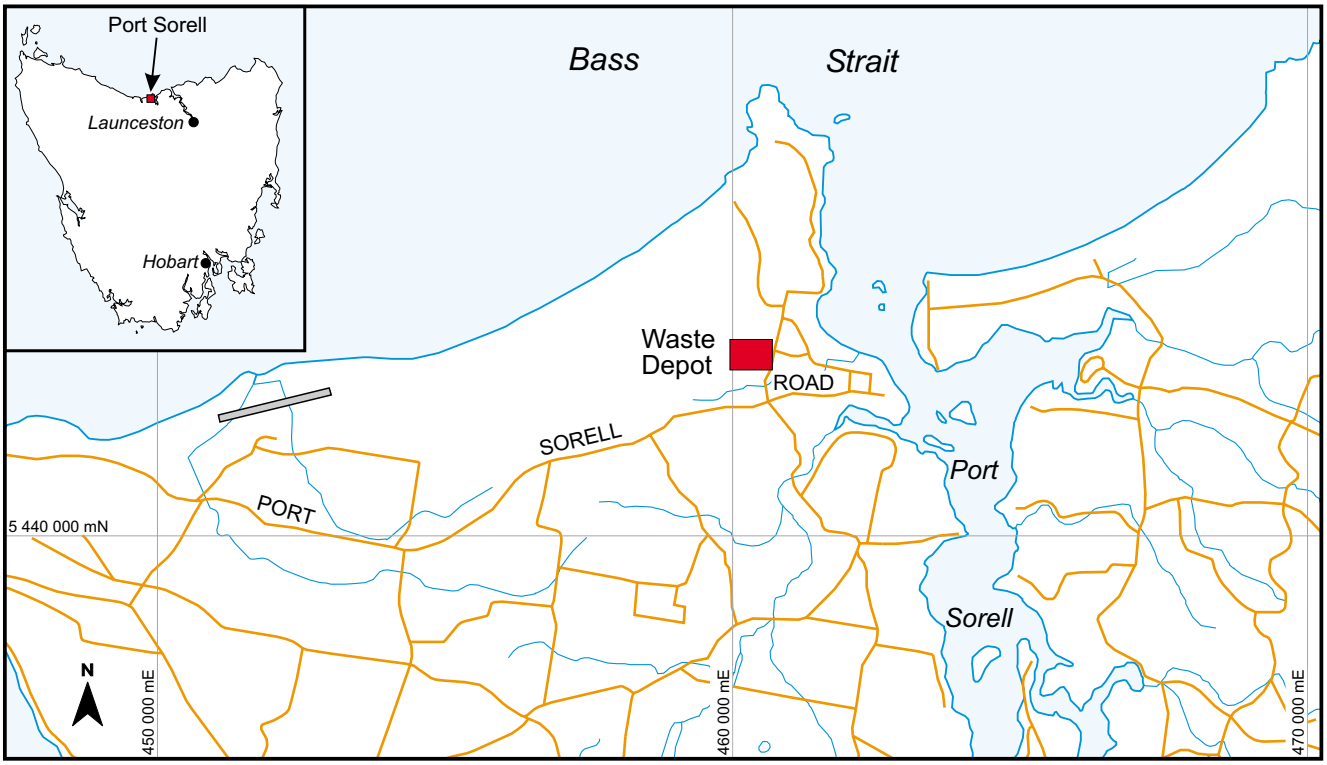


Figure 1. *Location of waste depot, Port Sorell*

Plate 1

Leachate flowing in the waterway to the south of the eastern landfill footprint.

Plate 2

Leachate flowing in the surface drain to the east of the eastern landfill footprint.

Plate 3

Landfill footprint and surface leachate discharges from the north corner of the footprint

Photo 4

Waste oil cement tank at the location of borehole PSWD2000/1

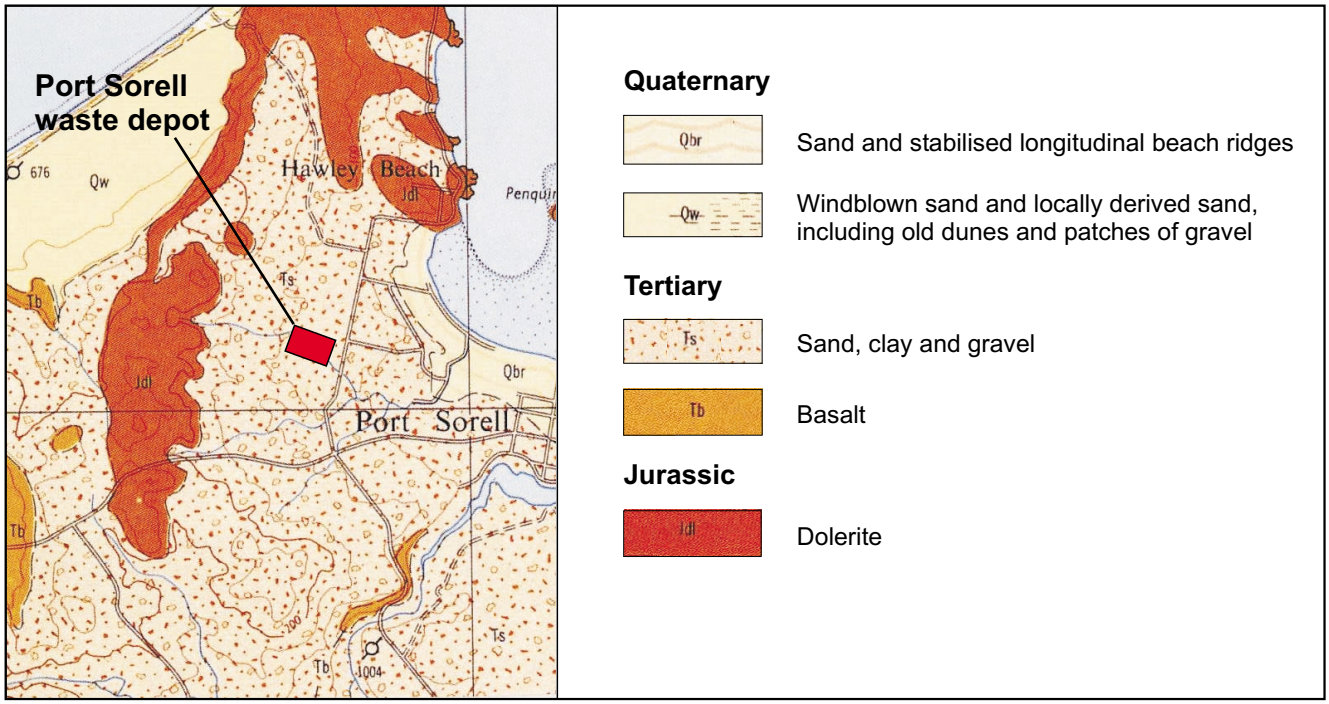


Figure 2

Extract from Beaconsfield geological map (Gee and Legge, 1971) showing the geology of the Port Sorell area.

Geology

The Tasmania Department of Mines 1:63,360 scale geological map of the area (Beaconsfield geological map sheet, Gee and Legge, 1971) indicates that the geology of the waste disposal area comprises Tertiary sediments consisting of sand, clay and gravel. The map indicates that Jurassic dolerite occurs approximately 200 metres to the west of the disposal area. Figure 2 is a modified extract from the Beaconsfield geological map.

Geological mapping during the current study indicated that the site is dominated by sand deposits within 70 metres of the waste disposal site in all directions. Council has excavated large blocks of dolerite in the area. This supports the Beaconsfield map sheet, which indicates that the Tertiary sediments are most likely underlain by Jurassic dolerite.

Hydrology

All the waste disposal areas are located on (or in the catchment of) a tributary of Poyston Creek. Poyston Creek passes through the Shearwater Country Club approximately one kilometre downstream of the waste disposal site and discharges onto Freers Beach a further 500 metres to the east. Australian Bureau of Meteorology rainfall station 091232 (Devonport East) is the closest rainfall station to the site. The rainfall chart of average monthly recorded rainfall (fig. 3) shows that the highest rainfall occurs in autumn/winter (April to August), with an average annual rainfall for the station of 898.7 mm.

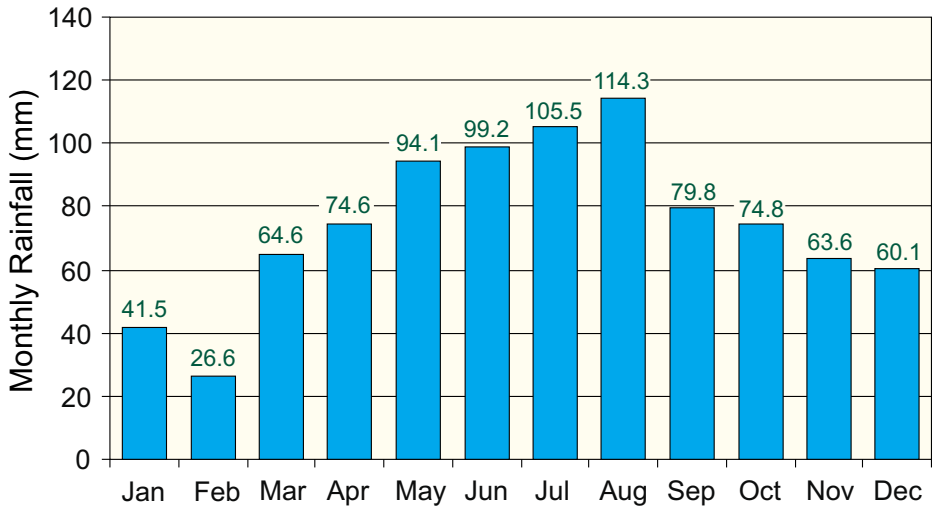


Figure 3

Average monthly rainfall for Australian Bureau of Meteorology rainfall station 0912232 (Devonport East)

INVESTIGATION METHODS

Borehole drilling and installation

Six 120 mm diameter monitoring bores were auger drilled between 13 and 14 September 2000 for this project (fig. 4). Fifty millimetre PVC casing and slotted screens with bentonite seals were installed in each hole. All bores were logged in accordance with AS1726-1993; engineering logs are presented in Appendix 1.

Groundwater was encountered between 1.5 and 5.2 metres depth below ground level across the site. Flow during drilling indicated that the groundwater in all boreholes was unconfined. Yields recorded from pumping the bores ranged between 0.020 to 0.023 l/s. Figure 5 shows two cross-sections of the site and the related standing water levels on 14 August 2001.

Both the unsaturated and saturated zones consist of heterogenous layers of fine to coarse-grained sand and low to high plasticity clays. Waste fill was intersected in boreholes PSWD2000/3, PSWD2000/5 and PSWD2000/6. A strong hydrocarbon odour was observed on returns from PSWD2000/1 and three soil samples were collected and analysed for total petroleum hydrocarbons. The laboratory report from Analytical Services Tasmania is presented in Appendix 2.

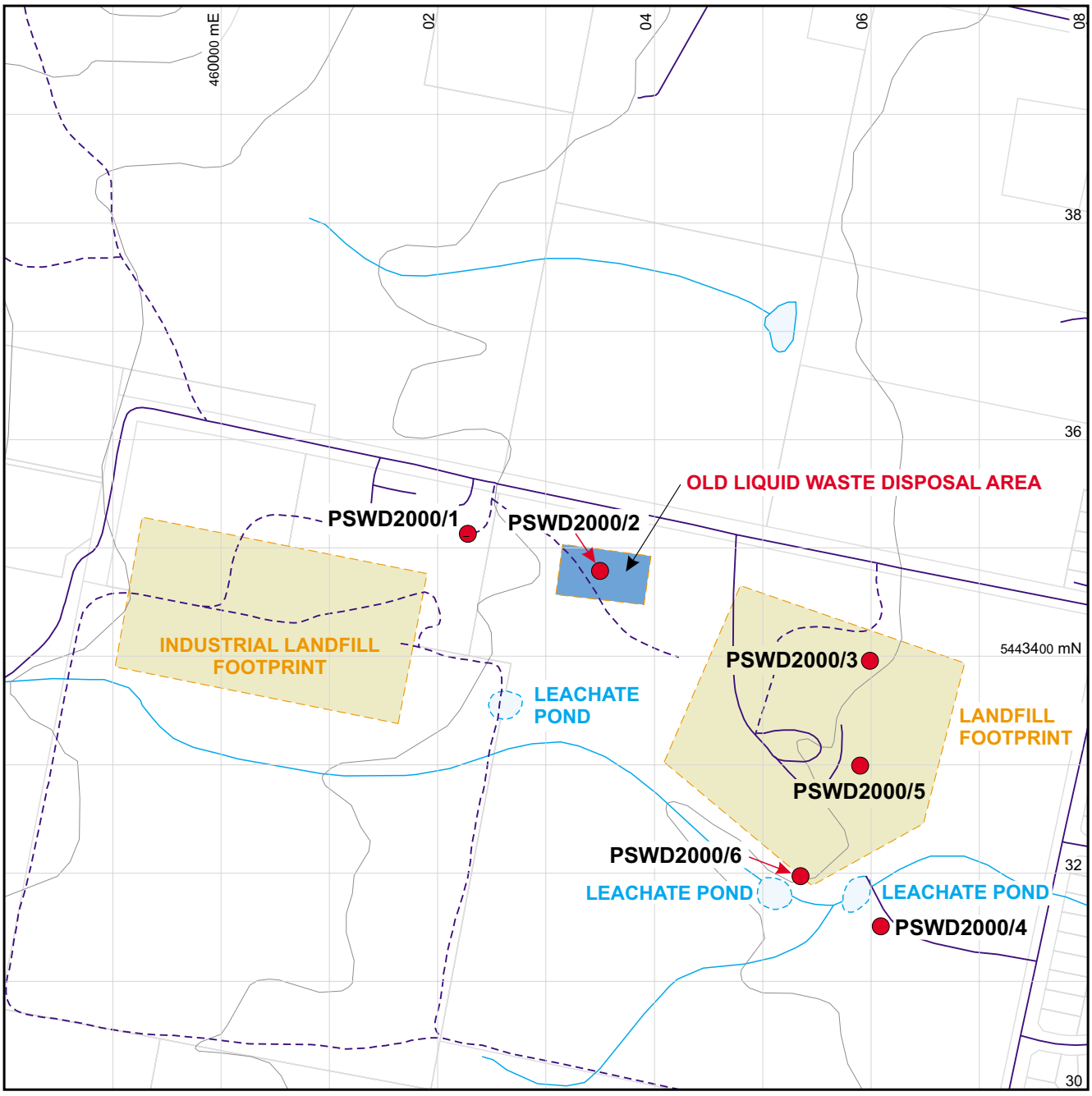


Figure 4

Locations of environmental monitoring bores installed at the Port Sorell waste depot.

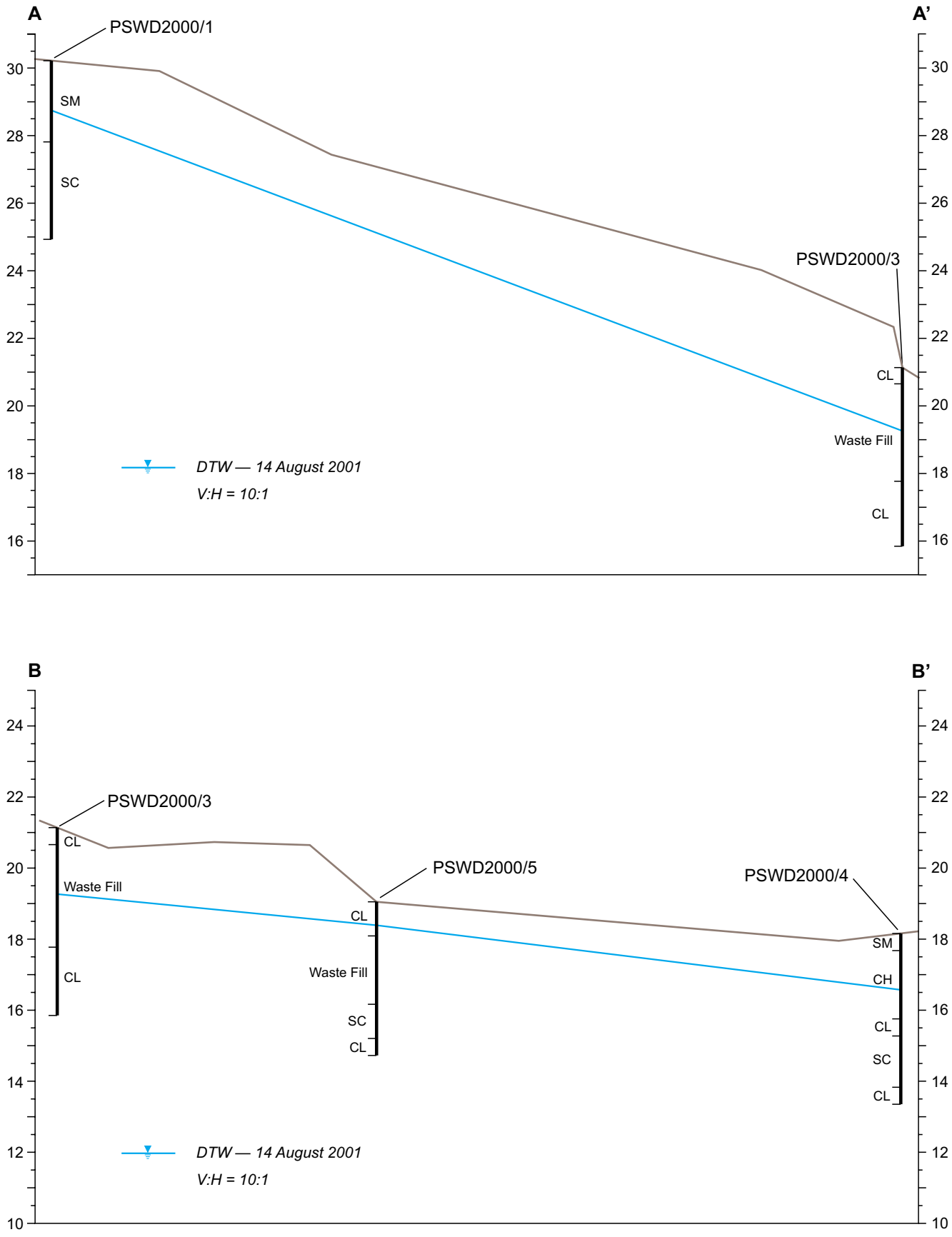


Figure 5

Cross sections and related standing water levels on 14 August 2001 for bores PSWD2000/1 AND PSWD2000/3 (A–A') and PSWD2000/3, PSWD2000/5 AND PSWD2000/4 (B–B')

In situ permeability testing

One extraction and two injection slug tests were carried out on 15 August 2001 on bores PSWD2000/6 and PSWD2000/5 respectively. Data collected during the slug tests are presented in Appendix 3.

Slug test data were analysed in the software package *AquiferWin32* (Version 2.17, Environmental Simulations Inc.). The Bouwer and Rice (1976 Unconfined Aquifer) solution was used to calculate the hydraulic conductivities depicted in Figure 6 (a), (b) and (c) for PSWD2000/5 (1st test), PSWD2000/5 (2nd test) and PSWD2000/6 respectively. This method was selected as the most appropriate available within the software package.

These data indicate that the sand material (screened in PSWD2000/6) has a permeability of around 0.1 m/day and the waste fill (screened in PSWD2000/5) is an order of magnitude more permeable at <1 m/day.

CONCEPTUAL HYDROLOGICAL MODEL

Cross sections indicate that the water table slopes towards the leachate ponds in the southeast corner of the site. Clay-rich sediments acting as aquicludes appear to be perching and/or storing water, which intercepts the waste fill material. Saturated waste fill discharges to surface waters at various locations across the site. The hydraulic conductivity of the waste fill implies rapid water infiltration and migration and consequent leachate generation.

SURFACE AND GROUNDWATER CHEMISTRY

All bores were sampled in accordance with Australian/New Zealand Standard AS/NZS 5667.11:1998 on 16 November 2000. Six additional surface water samples were also collected. Analytical Services Tasmania (in accordance with relevant Australian and international standards) carried out laboratory testing of the surface and groundwater samples; the laboratory reports are presented in Appendix 4. Groundwater values for pH ranged between 4.5 to 6.7, with conductivity ranging between 756 and 3190 µS/cm. Analytical results for surface and groundwater samples are presented on site maps in Appendix 5.

Figure 7 shows an anion Ternary plot for the results of the groundwater samples. Tables 1 and 2 are comparisons of the analytical results against international standards where a guideline/emission value is stated by the relevant standard.

The high ammonia and bicarbonate levels in the bores that intercepted waste fill, combined with near-neutral pH data, indicate an advance stage of anaerobic degradation in the landfill.

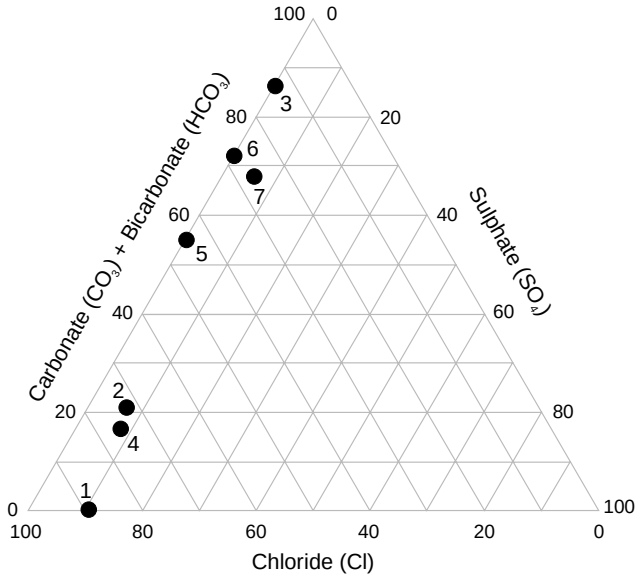


Figure 7

Anion Ternary plot for groundwater bores at the Port Sorell waste depot. 1 = PSWD2000/1; 2 = PSWD2000/2; 3 = PSWD2000/3; 4 = PSWD2000/4; 5 = PSWD2000/5; 6 = PSWD2000/6; 7 = average of all MRT groundwater records for Quaternary coastal sands.

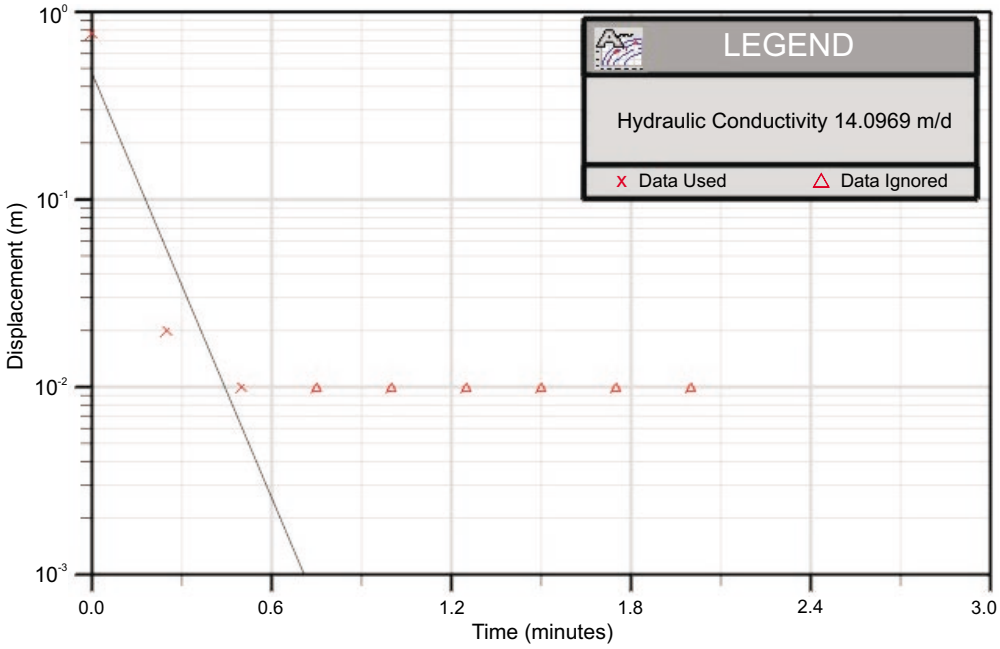
CONTAMINATION ASSESSMENT

Groundwater chemistry varies across the site with respect to the hydrological system and the pollution sources. Groundwater and sediment samples collected from bore PSWD2000/1 indicated petroleum contamination of the sediment and groundwater in the area of the waste oil tank. Chloride, aluminium, lead and zinc were also elevated in the groundwater from bore PSWD2000/1. Ammonia concentrations in bores PSWD2000/3, 5 and 6 indicate contamination of the groundwater in the area of the eastern landfill footprint. No existing bore may give a true indication of background groundwater chemistry. Because of its location and being screened in clay-rich sediments, hole PSWD2000/2 is currently thought to provide the closest data to background conditions.

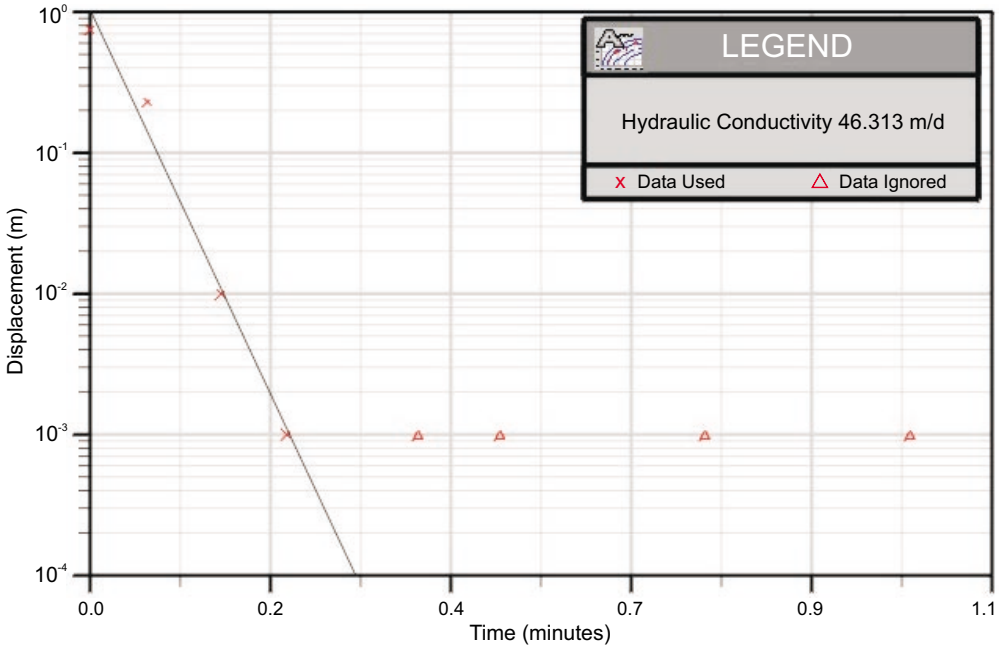
Ammonia concentrations in the surface water are consistent with the discharge of contaminated groundwater to the surface hydrological system. The elevated levels for the water quality parameters analysed for the industrial site leachate indicate that a significant degree of environmental harm may be associated with this industrial landfill.

Iron and manganese concentrations in surface water and groundwater may have contributed to aerobic and anaerobic phases of the degradation of the waste fill material. The close proximity of dolerite and clay-rich sediments may also be affecting iron and manganese concentrations at the site.

(a) PSWD2000/5, first test (K = 14.10 m/d / 1.63 x 10^{-4} m/sec)



(b) PSWD2000/5 second test (K = 46.31 m/d / 5.36 x 10^{-4} m/sec)



(c) PSWD2000/6 (K = 0.11 m/d / 1.30 x 10^{-6} m/sec)

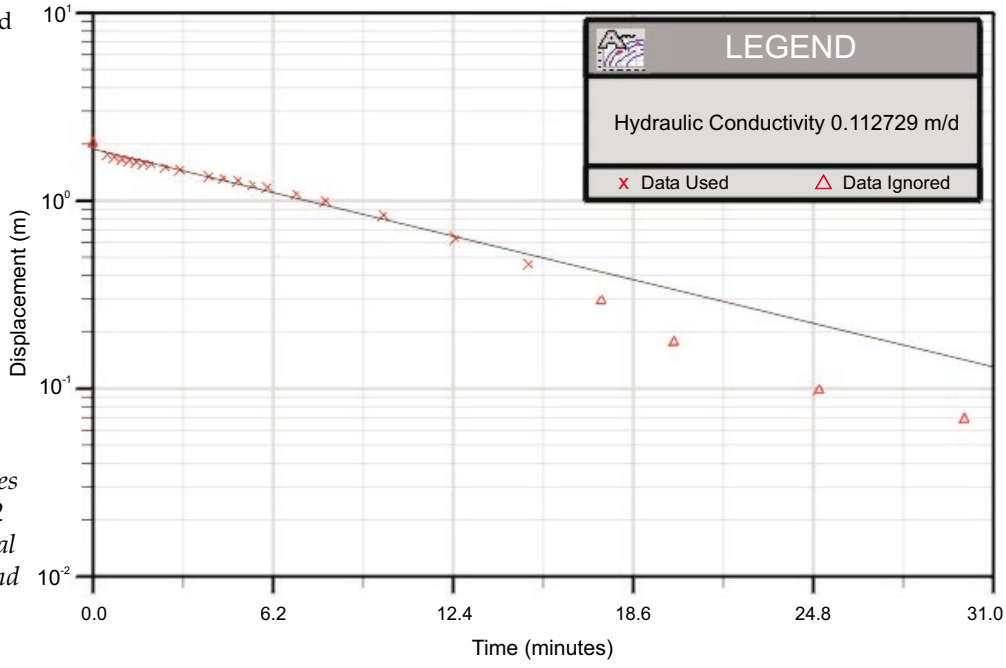


Figure 6

Hydraulic conductivity values calculated in AquiferWin32 (Version 2.17, Environmental Simulations Inc.), Bouwer and Rice (1976, Unconfined Aquifer) solution.

Table 1. *Comparison of the analytical results against water quality standards (guideline value listed when stated by a relevant standard). Highlighted values exceed emission limits.*

Parameter	PSWD 2000/1	PSWD 2000/2	PSWD 2000/3	PSWD 2000/4	PSWD 2000/5	PSWD 2000/6	Southeast pond	East outflow	East leachate pond	Northeast drain	Eastern apex drain	Industrial leachate	Emission limit
pH	4.5	5.9	6.7	6.1	6.4	6.6	-	-	-	-	-	-	N/A
Conductivity (µS/cm)	3190	756	1410	1080	979	2720	-	-	-	-	-	-	N/A: note average sea water value 36 000.
Alkalinity CO_3 (mg/L)	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	N/A
Alkalinity HCO_3 (mg/L)	<1	74	690	106	363	1270	-	-	-	-	-	-	N/A
Chloride (mg/L)	800	150	61	280	170	280	-	-	-	-	-	-	250* (mg/L)
Sulphate (mg/L)	130	20	1.2	41	1.9	2.4	-	-	-	-	-	-	250* (mg/L)
Ammonia (mg/L)	0.019	0.111	18.400	0.122	11.600	41.800	8.360	1.880	3.580	0.561	27.700	93.800	0.5* (mg/L) nitrogen (as ammonia)
Nitrate + Nitrite (mg/L)	2.360	0.009	0.006	0.012	0.006	0.006	0.518	1.100	0.156	0.024	0.008	0.012	10.0* (mg/L) nitrogen (as nitrate or nitrite)
Nitrite (mg/L)	0.004	<0.002	<0.002	0.003	<0.002	0.003	0.140	0.062	0.030	0.019	0.006	0.007	10.0* (mg/L) nitrogen (as nitrate or nitrite)
Ortho - P (mg/L)	0.004	0.003	0.004	0.005	0.004	0.007	0.039	0.009	0.09	0.020	0.005	0.009	2.0* as phosphorus
Aluminium (mg/L)	8.940	0.106	<0.010	0.018	0.037	<0.010	0.081	0.048	0.273	0.155	<0.010	0.022	N/A
Arsenic (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.05* (mg/L)
Cadmium (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01* (mg/L)
Cobalt (mg/L)	0.008	0.003	0.004	0.011	0.004	0.006	0.002	0.002	0.001	0.006	0.003	0.006	N/A
Chromium (mg/L)	0.010	0.002	0.006	0.002	0.002	0.006	0.003	0.002	0.005	0.015	<0.001	0.003	0.5* (mg/L)
Copper (mg/L)	0.008	0.013	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	1.0* (mg/L)
Iron (mg/L)	1.410	0.255	34.400	1.910	0.762	3.800	1.580	0.313	3.420	3.390	1.210	34.200	(Combined iron and manganese total) (1.0* (mg/L)
Manganese (mg/L)	0.102	0.109	0.751	0.137	0.979	3.110	0.284	0.101	0.080	0.131	0.997	0.790	
Nickel (mg/L)	0.012	0.007	0.002	0.020	0.008	0.005	0.004	0.004	0.004	0.010	0.002	0.021	0.1** (mg/L)
Lead (mg/L)	0.044	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.05* (mg/L)
Zinc (mg/L)	0.038	0.017	0.011	0.014	0.003	0.004	0.017	0.015	0.011	0.014	0.005	0.007	5.0* (mg/L)
TPH (mg/L)	12.000	-	-	-	-	-	-	-	-	-	0.278	<0.040	N/A
TPH C_{06}-C_{09} (mg/L)	11.900	-	-	-	-	-	-	-	-	-	0.014	<0.010	N/A
TPH C_{10}-C_{14} (mg/L)	<0.010	-	-	-	-	-	-	-	-	-	0.062	<0.010	N/A
TPH C_{15}-C_{28} (mg/L)	<0.010	-	-	-	-	-	-	-	-	-	0.095	<0.010	N/A
TPH C_{29}+ (mg/L)	<0.010	-	-	-	-	-	-	-	-	-	0.106	<0.010	N/A

* *Environment Protection (Water Pollution) Regulations 1974*, emission into inland water
* Australian Water Quality Guidelines for Fresh and Marine Waters, 1992
N/A No emission limit available
Shaded values exceed emission limits

Table 2. *Comparison of analytical results against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000.*

Analyte	PORT SORELL WASTE DEPOT												ANZECC 2000		
	PSWD 2000/1	PSWD 2000/2	PSWD 2000/3	PSWD 2000/4	PSWD 2000/5	PSWD 2000/6	Southeast pond	East outflow	East leachate pond	Northeast drain	Eastern apex drain	Indus-trial leachate	Irrigation		Livestock Drinking
													STV (Short-term)	LTV (Long-term)	
Standing Water Level (m)	1.55	3.58	2.42	1.29	0.87	3.12	-	-	-	-	-	-			
pH field (pH Units)	4.9	6.2	6.9	6.8	6.7	6.8	-	-	-	-	-	-	**6.0–8.5		
pH laboratory (pH Units)	4.5	5.9	6.7	6.1	6.4	6.6	-	-	-	-	-	-	**6.0–8.5		
Conductivity (µS/cm)	3190	756	1410	1008	979	2730	-	-	-	-	-	-	(1) (Refer Tables 4.2.3 & 4.2.4)		
Chloride (mg/L)	800	150	61	280	170	280	-	-	-	-	-	-	(2) MT (Refer Table 4.2.6) MR (Refer Table 4.2.7)		
Sulphate (mg/L)	130	20	1.2	41	1.9	2.4	-	-	-	-	-	-			
NH_3-N (mg/L)	0.019	0.111	18.4	0.122	11.6	41.8	8.36	1.88	3.58	0.561	27.7	93.8			
(NO_2 + NO_3)-N (mg/l)	2.36	0.009	0.006	0.012	0.006	0.006	0.518	1.1	0.156	0.024	0.008	0.012			
NO_2-N (mg/L)	0.004	<0.002	<0.002	0.003	<0.002	0.003	0.14	0.062	0.03	0.019	0.006	0.007			
PO_4-P (mg/L)	0.004	0.003	0.004	0.005	0.004	0.007	0.039	0.009	0.09	0.02	0.005	0.009			
Aluminium (µg/L)	8940	106	<10	18	37	<10	81	48	273	155	<10	22	20,000	5,000	5,000
Arsenic (µg/L)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	2000	100	500
Cadmium (µg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	50	10	10
Cobalt (µg/L)	8	3	4	11	4	6	2	2	1	6	3	6	100	50	1,000
Chromium (µg/L)	10	2	6	2	2	6	3	2	5	15	1	3	1,000***	100***	1,000
Copper (µg/L)	8	13	<1	2	2	<1	<1	<1	<1	5	<1	<1	5,000	200	400–5,000
Iron (µg/L)	1410	255	34400	1910	762	3800	1580	313	3420	3390	1210	34200	10,000	200	NST
Manganese (µg/L)	102	109	751	137	979	3110	284	101	80	313	997	790	10,000	200	NST
Nickel (µg/L)	12	7	2	20	8	5	4	4	4	10	2	21	2000	200	1,000
Lead (µg/L)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5,000	2,000	100
Zinc (µg/L)	38	17	11	14	3	4	17	15	11	14	5	7	5,000	2,000	20,000

Shaded values indicate above relevant guideline levels.

Notes: ** set to limit potential for corrosion and fouling of pumping, irrigation and stock watering systems.
*** chromium (VI)
(1) Suitability depends on salt tolerance of crop & calculation of ECse, the average root zone salinity. ECse depends on soil type & average root zone leaching fraction.
(2) ES = Suits extremely sensitive crops.
MS = Suits moderately sensitive crops, may affect sensitive crops.
MT = Suits moderately tolerant crops.
MR = Medium risk of increasing crop cadmium concentrations.
MA = May affect crops sensitive to foliar injury through foliar absorbtion.
STV — Short term trigger value for contaminant in irrigation water (<20 years) use
LTV — Long term trigger value for contaminant in irrigation water (100 years) use
NST — Not sufficiently toxic

PRINCIPAL CONCLUSIONS

The combination of the direct recharge of the fill material by groundwater, rainfall and up-gradient surface water has produced discharges to the down gradient surface water that may potentially affect the groundwater.

This site will require substantial engineering works to avoid continued degradation of surface and groundwater quality within the area of the waste disposal activities. Issues include surface water management, appropriate capping of both landfills, suitable disposal of hydrocarbon contaminated sediments, leachate management infrastructure, and contaminated surface and groundwater.

FURTHER WORK

The detection of off-site transportation of polluted surface water requires an assessment of the risk to human health in the local down-gradient hydrological system. Monitoring of additional shallow and deeper hard-rock bore holes (including background holes), combined with selective surface water sites, would allow a greater understanding of the extent of water quality degradation and any natural attenuation processes which may be occurring at the site.

On-going monitoring of the water levels in relation to the base of the fill material would give an indication of the success of future leachate control infrastructure at the site.

REFERENCES

GEE, R. D.; LEGGE, P. J. 1971. Geological atlas one mile series. Zone 7 Sheet 30. Beaconsfield. *Department of Mines Tasmania*.

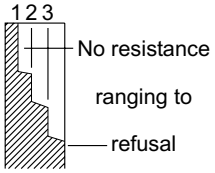
[30 May 2002]

Appendix 1

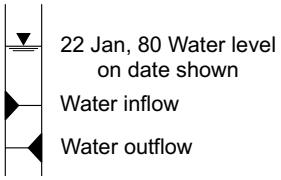
Engineering logs

EXPLANATION SHEET FOR ENGINEERING LOGS
Borehole and excavation log

Penetration



Water



Notes — samples and tests

U50	Undisturbed sample 50 mm diameter
D	Disturbed sample
N	Standard penetrometer blow count for 300 mm
N*	SPT + Sample

Material classification

Based on Unified Soil Classification System.

In Graphic Log materials are represented by clear contrasting symbols consistent for each project.

Moisture content

D	Dry, looks and feels dry
M	Moist, no free water on hand when remoulding
W	Wet, free water on hand when remoulding
LL	Liquid limit
PL	Plastic limit
PI	Plasticity index

e.g. M>PL — Moist, moisture content greater than the plastic limit

Consistency

		: hand penetrometer
VS	Very soft	<25 (kPa)
S	Soft	25 – 50
F	Firm	50 – 100
St	Stiff	100 – 200
VSt	Very stiff	200 – 400
H	Hard	>400
Fb	Friable	

Notes: X on log is test result
— is range of results

Density index

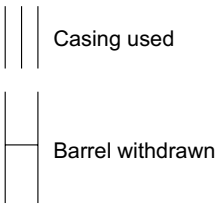
		%
VL	Very loose	0 – 15
L	Loose	15 – 35
MD	Medium dense	35 – 65
D	Dense	65 – 85
VD	Very dense	85 – 100

Fracture description

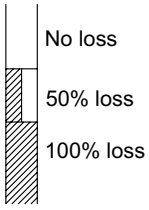
RP	Rough planar
RL	Rough irregular
SP	Smooth planar
SL	Smooth irregular

Cored borehole log

Case - lift



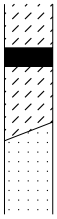
Fluid loss



Lugeons

Lugeon units (uL) are a measure of rock mass permeability. For a 46 to 74 mm diameter borehole 1 Lugeon is defined as a rate of loss of 1 litre per metre per minute. 1 Lugeon is roughly equivalent to a permeability of 1 x 10^{-4} mm / sec.

Graphic log



No core

Rock substances represented by clear, contrasting symbols consistent for each project.

Weathering

Fr	Fresh
SW	Slightly weathered
HW	Highly weathered
EW	Extremely weathered

Strength

		point load strength index $I_{s\,(50)}$ (MPa)
EL	Extremely low	< 0.03
VL	Very low	0.03 – 0.1
L	Low	0.1 – 0.3
M	Medium	0.3 – 1
H	High	1 – 3
VH	Very high	3 – 10
EH	Extremely high	>10

Notes: X on log is test result.

Significant defects

Significant defects shown graphically

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/1**
Sheet 1 of 2

Project	Port Sorell waste depot	Location	Depot Road, Port Sorell
Co-ordinates	55 460228 mE 5443513 mN	Drill type	Auger
		Drill method	Rotary
		Drill fluid	Nil
R.L.		Hole commenced	13 September 2000
Inclination	Vertical	Hole completed	13 September 2000
Bearing		Drilled by	Mr Shane Heawood
		Logged by	Mr Andrew Ezzy
		Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
	No screen	Cement	D Sample ID 1	0.0		SM	SAND - fine, grey, clayey, strong hydrocarbon odour	M	S L	Tertiary sediments Hydrocarbon contaminated soil
		Bentonite	D Sample ID 2	0.5		SM	SAND - fine, dark grey, strong hydrocarbon odour	M	S L	Tertiary sediments Hydrocarbon contaminated soil
			D Sample ID 3	1.0		SM	SAND - fine, dark brown	D	S L	Tertiary sediments
			D Sample ID 4	1.5		SM	SAND - fine, yellow	M	S/L	Tertiary sediments
			D Sample ID 5			SM	SAND - medium to fine, grey	W	VS L	Tertiary sediments
			D Sample ID 6	2.0						
	2 metre slotted screen	7 mm Gravel	D Sample ID 7	2.5		SC	SAND - medium to fine, grey, clayey	W	VS VL	Tertiary sediments
			D Sample ID 8	3.0						
			D Sample ID 9	3.5						
	No screen		D Sample ID 9	4.0						
	Back in fil	Back in fil	D Sample ID 9	4.5						

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/1**
Sheet 2 of 2

Project: Port Sorell waste depot
Location: Depot Road, Port Sorell

Co-ordinates: 55 460228 mE, 5443513 mN
R.L.:
Inclination: Vertical
Bearing:

Drill type: Auger
Drill method: Rotary
Drill fluid: Nil

Hole commenced: 13 September 2000
Hole completed: 13 September 2000
Drilled by: Mr Shane Heawood
Logged by: Mr Andrew Ezzy
Checked by: Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
	Back in fil	Back in fil	D Sample ID 9				(As sheet 1)			
				5.5			End of hole at 5.5 m Bailed for 5 minutes. At end of bailing pH 7.7 and conductivity 910 µS/cm.			
			Sample ID numbers refer to samples stored in MRT core shed							

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/2**
Sheet 1 of 2

Project: Port Sorell waste depot
Location: Depot Road, Port Sorell

Co-ordinates: 55 460350 mE, 5443479 mN
R.L.
Inclination: Vertical
Bearing

Drill type: Auger
Drill method: Rotary
Drill fluid: Nil

Hole commenced: 13 September 2000
Hole completed: 13 September 2000
Drilled by: Mr Shane Heawood
Logged by: Mr Andrew Ezzy
Checked by: Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
	No screen	Cement	D Sample ID 1			SM	SAND - fine, light grey, 20% sand medium to fine dark brown, extremely weathered dolerite pebbles	M	S L	Reworked Tertiary sediments
		Bentonite	D Sample ID 2	0.5		SP	SAND - medium, yellow and red-yellow, rock fragments	D	S L	Reworked Tertiary sediments
			D Sample ID 3	1.0		SM	SAND - fine, mottled black, red-yellow and light red	M	S L	Reworked Tertiary sediments
			D Sample ID 4	1.5		SC	SAND - medium, light grey, clayey	M	F	Reworked Tertiary sediments
			D Sample ID 5	2.0		SC	SAND - medium, light yellow and grey, clayey	M	L	Reworked Tertiary sediments
		7 mm Gravel	D Sample ID 6	2.5		SC	SAND - medium to fine, light grey and green-yellow, 15% clay mottles light grey	M	L	Reworked Tertiary sediments
			D Sample ID 7	3.0		CL	CLAY - medium plasticity, grey, sandy	M	F	Tertiary sediments
			D Sample ID 8	3.5		SM	SAND - fine, grey, 15% clay mottles medium plasticity grey	M	S L	Tertiary sediments
			D Sample ID 9	4.0		SC	SANDY CLAY - medium plasticity, grey, clayey sand	M	F	Tertiary sediments
			D Sample ID 10	4.5						

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/2**
Sheet 2 of 2

Project: Port Sorell waste depot
Location: Depot Road, Port Sorell

Co-ordinates: 55 460350 mE, 5443479 mN
R.L.
Inclination: Vertical
Bearing

Drill type: Auger
Drill method: Rotary
Drill fluid: Nil

Hole commenced: 13 September 2000
Hole completed: 13 September 2000
Drilled by: Mr Shane Heawood
Logged by: Mr Andrew Ezzy
Checked by: Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
	No screen		D Sample ID 11			CH	CLAY - high plasticity, grey, sandy	M	F	Tertiary sediments
	2 metre slotted screen	7 mm Gravel	D Sample ID 12	5.5		CH	CLAY - high plasticity, grey, sandy	W	F	Tertiary sediments
			D Sample ID 13	6.0		CH	CLAY - high plasticity, grey, sandy	W	S	Tertiary sediments
			D Sample ID 14	6.5						
			D Sample ID 15	7.0						
	No screen		D Sample ID 16	7.5		CL	CLAY - low plasticity, grey	M	H D	Tertiary sediments
			Sample ID numbers refer to samples stored in MRT core shed	8.0			End of hole at 8.0 m Pumped for 5 minutes at 5 L/m At end of pumping pH 7.8 and conductivity 1520 µS/cm			

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/3**
Sheet 1 of 2

Project	Port Sorell waste depot			Location	Depot Road, Port Sorell
Co-ordinates	55 460599 mE 5443396 mN	Drill type	Auger	Hole commenced	13 September 2000
		Drill method	Rotary	Hole completed	13 September 2000
R.L.		Drill fluid	Nil	Drilled by	Mr Shane Heawood
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
		Cement	D Sample ID 1			CL	CLAY - low plasticity, light red, sandy	M	MD	Cover material
		Bentonite	D Sample ID 2	0.5			WASTE fill - domestic refuse and paper fibre, sand fine dark grey and brown	M		Refuse
	No screen		D Sample ID 3	1.0			WASTE fill - domestic refuse and paper fibre, sand fine dark grey clayey	M		Refuse
			D Sample ID 4	1.5						
			D Sample ID 5	2.0						
		7 mm Gravel	D Sample ID 6	2.5			WASTE fill - domestic refuse and paper fibre, sand fine dark grey clayey	W		Refuse
	1.5 metre slotted screen		D Sample ID 7	3.0						
			D Sample ID 8	3.5		CL	CLAY - low plasticity, green and grey, sandy	W	VS VL	Tertiary sediments
		Back in fil	D Sample ID 9	4.0		CL	CLAY - low plasticity, green, light red and grey	M	H D	Tertiary sediments
	No screen		D Sample ID 10	4.5						

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/3**
Sheet 2 of 2

Project	Port Sorell waste depot	Location	Depot Road, Port Sorell
Co-ordinates	55 460599 mE 5443396 mN	Drill type	Auger
		Drill method	Rotary
		Drill fluid	Nil
R.L.		Hole commenced	13 September 2000
Inclination	Vertical	Hole completed	13 September 2000
Bearing		Drilled by	Mr Shane Heawood
		Logged by	Mr Andrew Ezzy
		Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
	No screen	Back in fil					(As sheet 1)			
			Sample ID numbers refer to samples stored in MRT core shed	5.5			End of hole at 5.5 m Bailed for 5 minutes. At end of bailing pH 7.6 and conductivity 860 µS/cm.			

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/4**
Sheet 1 of 2

Project	Port Sorell waste depot			Location	Depot Road, Port Sorell
Co-ordinates	55 460609 mE 5443151 mN	Drill type	Auger	Hole commenced	14 September 2000
		Drill method	Rotary	Hole completed	14 September 2000
R.L.		Drill fluid	Nil	Drilled by	Mr Shane Heawood
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
		Cement	D Sample ID 1			SM	SAND - fine, light grey	M	S L	Tertiary sediments
		Bentonite	D Sample ID 2	0.5		CH	CLAY - high plasticity, mottled 60% light red and 40% grey, sandy	M	S L	Tertiary sediments
	No screen		D Sample ID 3	1.0						
			D Sample ID 4	1.5						
			D Sample ID 5	2.0						
		7 mm Gravel	D Sample ID 6	2.5		CL	CLAY - medium plasticity, grey, 10% sandy clay grey mottles	M	S	Tertiary sediments
	2.0 metre slotted screen		D Sample ID 7	3.0		SC	SAND - medium, grey, clayey	W	VS VL	Tertiary sediments
			D Sample ID 7	3.5						
			D Sample ID 7	4.0						
	No screen		D Sample ID 8	4.5		CL	CLAY - low plasticity, green and grey	M	D St	Tertiary sediments

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/4**
Sheet 2 of 2

Project: Port Sorell waste depot
Location: Depot Road, Port Sorell

Co-ordinates: 55 460609 mE, 5443151 mN
R.L.
Inclination: Vertical
Bearing

Drill type: Auger
Drill method: Rotary
Drill fluid: Nil

Hole commenced: 14 September 2000
Hole completed: 14 September 2000
Drilled by: Mr Shane Heawood
Logged by: Mr Andrew Ezzy
Checked by: Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
			Sample ID numbers refer to samples stored in MRT core shed				End of hole at 5.0 m Bailed for 5 minutes. At end of bailing pH 8.3 and conductivity 310 µS/cm.			

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/5**
Sheet 1 of 1

Project	Port Sorell waste depot			Location	Depot Road, Port Sorell
Co-ordinates	55 460590 mE 5443299 mN	Drill type	Auger	Hole commenced	14 September 2000
		Drill method	Rotary	Hole completed	14 September 2000
R.L.		Drill fluid	Nil	Drilled by	Mr Shane Heawood
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
		Cement	No samples collected due to extremely poor weather conditions	0.0		CL	CLAY - medium plasticity, white, rock fragments	M	H D	Capping material
		Bentonite		0.5		CH	CLAY - high plasticity, mottled 50% light red and 50% grey	M	F	Capping material
	No screen			1.0			WASTE fill - Pulp wood fibre	W		Refuse
	1.5 metre slotted screen	7 mm Gravel		1.5						
				2.0						
				2.5						
				3.0		SC	SAND - medium, green-yellow and grey, clayey	W	VS VL	Tertiary sediments
	No screen			3.5						
	Back in fil	Back in fil		4.0		CL	CLAY - medium plasticity, green and grey	M	H D	Tertiary sediments
				4.5			End of hole at 4.5 m Pumped for 4.0 L/m for 15 minutes. At end of pumping pH 6.9 and conductivity 1290 µS/cm.			

Sample ID numbers refer to samples stored in MRT core shed

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/6**
Sheet 1 of 2

Project	Port Sorell waste depot			Location	Depot Road, Port Sorell
Co-ordinates	55 460535 mE 5443197 mN	Drill type	Auger	Hole commenced	14 September 2000
		Drill method	Rotary	Hole completed	14 September 2000
R.L.		Drill fluid	Nil	Drilled by	Mr Shane Heawood
Inclination	Vertical			Logged by	Mr Andrew Ezzy
Bearing				Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes samples, tests	metres R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
		Cement	D Sample ID 1			CL	CLAY - low plasticity, mottled light red, light grey and red-yellow, rock fragments	M	H	Capping material
		Bentonite	D Sample ID 2	0.5		CL	CLAY - medium plasticity, 50% light red and 50% grey	M	F	Capping material
			D Sample ID 3 & 4			SC	SAND - medium, green and grey, clayey	W	S L	Capping material
	No screen	7 mm Gravel		1.0			WASTE FILL - plastic, wood, metals, sand, medium, green and grey, clayey	W		Refuse mixed with tertiary sediments
			D Sample ID 5	1.5			WASTE FILL - plastic, wood, metals, clay, medium plasticity, green-grey, sandy	M		Refuse mixed with tertiary sediments
			D Sample ID 6	2.0			WASTE FILL - plastic, wood, metals, clay, high plasticity, mottled 90% green-grey, 10% yellow	M		Refuse mixed with tertiary sediments
			D Sample ID 7	2.5		SC	SAND - medium, dark grey, clayey	W	VS VL	Tertiary sediments
	2.0 metre slotted screen		D Sample ID 8	3.0		SC	SAND - medium, light green-grey, clayey	W	VS VL	Tertiary sediments
		Back in fill	D Sample ID 9	3.5						
			D Sample ID 10	4.0		SC	SAND - medium, yellow, clayey	W	VS VL	Tertiary sediments
			D Sample ID 11			SC	SAND - medium, yellow, clayey, sand, 15% clay medium plasticity orange	W	VS VL	Tertiary sediments
	No screen		D Sample ID 12	4.5		CL	CLAY - medium plasticity, green-grey	M	F	Tertiary sediments

MINERAL RESOURCES TASMANIA

ENGINEERING LOG - BOREHOLE

Borehole no. **PSWD 2000/6**
Sheet 2 of 2

Project	Port Sorell waste depot	Location	Depot Road, Port Sorell
Co-ordinates	55 460535 mE 5443197 mN	Drill type	Auger
		Drill method	Rotary
		Drill fluid	Nil
R.L.		Hole commenced	14 September 2000
Inclination	Vertical	Hole completed	14 September 2000
Bearing		Drilled by	Mr Shane Heawood
		Logged by	Mr Andrew Ezzy
		Checked by	Mr Adrian Waite

penetration 1 2 3	support	water	notes: samples, tests	metres: R.L. / depth	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency density index	structure, geology
			Sample ID numbers refer to samples stored in MRT core shed				End of hole at 5.1 m Bailed for 10 minutes. At end of bailing pH 6.4 and conductivity 1450 µS/cm.			

Appendix 2

Analytical Services Tasmania – Laboratory reports for samples analysed for total petroleum hydrocarbons

Tasmania

ANALYTICAL SERVICES TASMANIA
Sandy Bay Laboratory
c|- Chemistry Department University of Tasmania
Sandy Bay Tasmania 7005
Telephone: (03) 6226 7175 Fax: (03) 6226 7825
Email: ast.sandybay@dpiwe.tas.gov.au

Laboratory Report

Report No: 13503 ***Please quote this number when making enquiries about this report***
Submitted By: Andrew Ezzy
Client: Mineral Resources Tasmania
Site Description: PSWD2000/1
Received: 15-Sep-00 **Client Order No:**
Report Date: 06-Oct-00
Report To: Andrew Ezzy
Address: Gordons Hill Rd Rosny TAS 7018

Test Method(s) :
2403-Soil: TPH and BTEX in Soil by GC-FID

		Lab.No.:	11405	11406	11407
		Sample Id.:	PSWD 0-0.5m	PSWD 0.5-0.9m	PSWD 0.9-1.5m
Method	Analyte	Units / Sampled On :	13-09-00 11:10	13-09-00 11:12	13-09-00 11:15
2403-Soil	TPH	mg/kgDMB	3210	223	40
	TPH C06-C09	mg/kgDMB	<5	<5	<5
	TPH C10-C14	mg/kgDMB	72	<5	<5
	TPH C15-C28	mg/kgDMB	1400	97	5
	TPH C29+	mg/kgDMB	1740	123	35

Samples analysed as received.

Mike Johnson
Manager

Page 1 of 1

Appendix 3

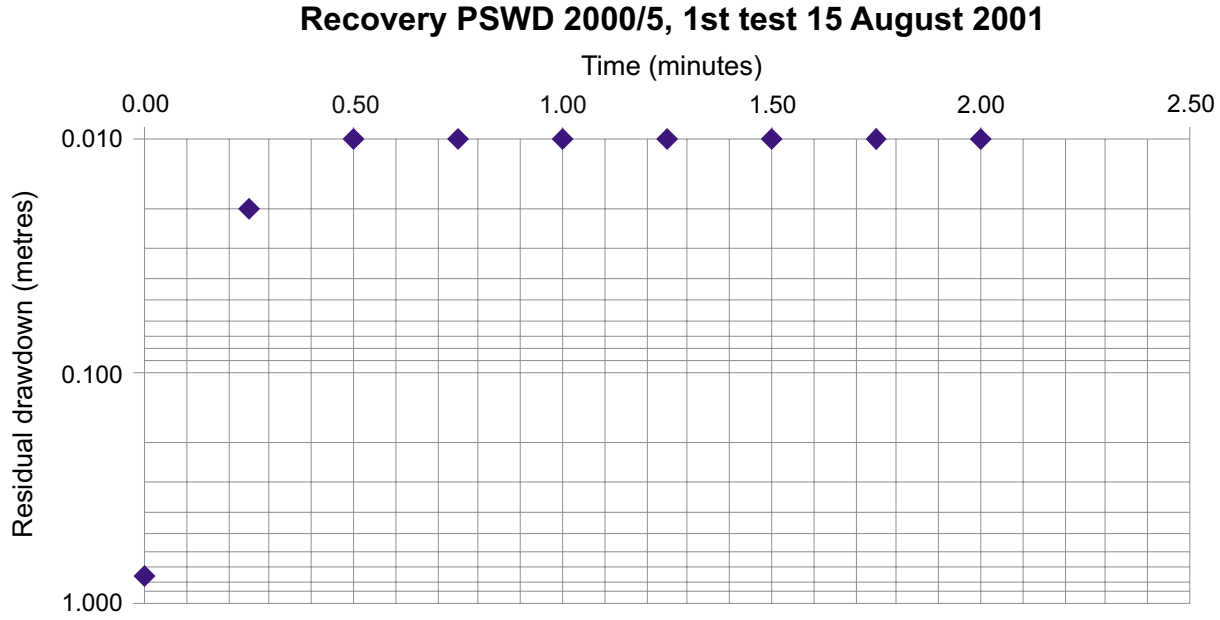
Raw data collected for slug extraction tests

Port Sorell waste depot recovery pump test — slug injection falling head data

Date: 15/08/2001
Bore: PSWD 2000/5
TD: 4.00 m
SWL: 0.75 m

Recovery data

Time	*Residual drawdown*	*Measurement*
0.00	0.77	0.00
0.25	0.02	0.77
0.50	0.01	0.76
0.75	0.01	0.749
1.00	0.01	0.749
1.25	0.01	0.749
1.50	0.01	0.749
1.75	0.01	0.749
2.00	0.01	0.749

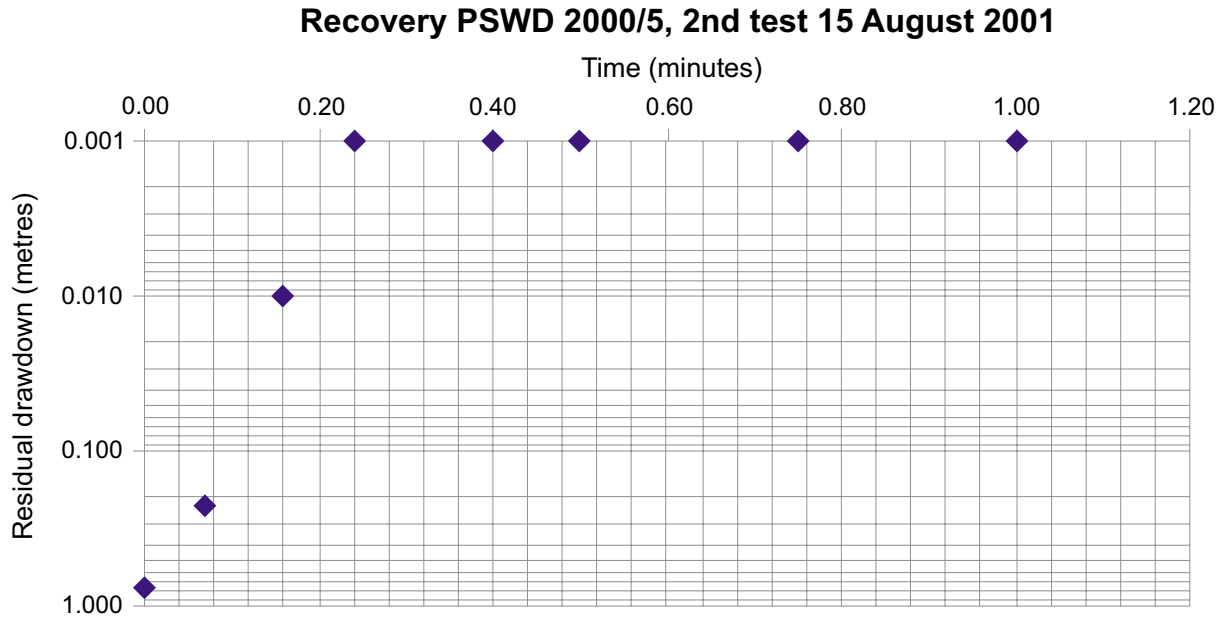


Port Sorell waste depot recovery pump test — slug injection falling head data

Date: 15/08/2001
Bore: PSWD 2000/6
TD: 5.10 m
SWL: 0.75 m

Recovery data

Time	*Residual drawdown*	*Measurement*
0.00	0.750	0.00
0.07	0.230	0.52
0.16	0.010	0.74
0.24	0.001	0.749
0.40	0.001	0.749
0.50	0.001	0.749
0.75	0.001	0.749
1.00	0.001	0.749

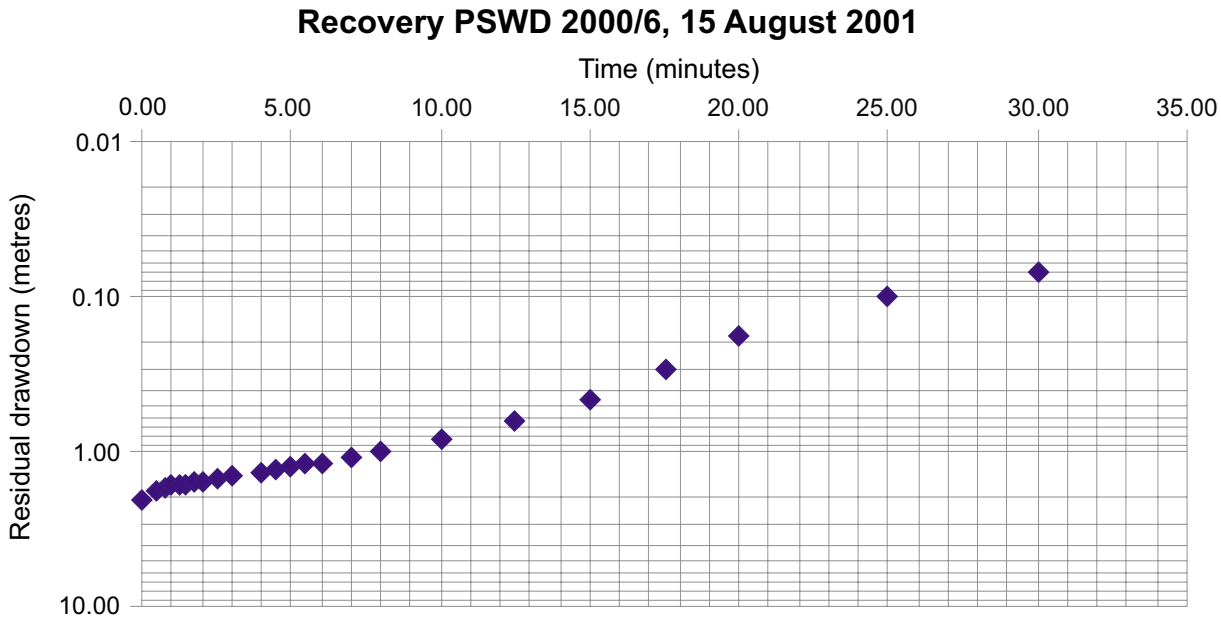


Port Sorell waste depot recovery pump test — slug extraction recovery data

Date: 15/08/2001
Bore: PSWD 2000/6
TD: 5.10 m
Flow: 4.0 l/m
SWL: 3.04 m

Recovery data

Time	*Residual drawdown*	*Measurement*
0.00	2.06	5.10
0.50	1.76	4.80
0.75	1.71	4.75
1.00	1.66	4.70
1.25	1.64	4.68
1.50	1.61	4.65
1.75	1.59	4.63
2.00	1.57	4.61
2.50	1.51	4.55
3.00	1.46	4.50
4.00	1.35	4.39
4.50	1.32	4.36
5.00	1.28	4.32
5.50	1.22	4.26
6.00	1.18	4.22
7.00	1.09	4.13
8.00	1.00	4.04
10.00	0.84	3.88
12.50	0.63	3.67
15.00	0.46	3.50
17.50	0.30	3.34
20.00	0.18	3.22
25.00	0.10	3.14
30.00	0.07	3.11



Appendix 4

Analytical Services Tasmania – Laboratory reports

Tasmania

ANALYTICAL SERVICES TASMANIA
Sandy Bay Laboratory
c|- Chemistry Department University of Tasmania
Sandy Bay Tasmania 7005
Telephone: (03) 6226 7175 Fax: (03) 6226 7825
Email: ast.sandybay@dpiwe.tas.gov.au

NATA Accreditation Number: 5589

Laboratory Report

Report No:	13866	***Please quote this number when making enquiries about this report***	
Submitted By:	Andrew Ezzy		
Client:	Mineral Resources Tasmania		
Site Description:	Port Sorell		
Received:	17-Nov-00	**Client Order No:**	
Report Date:	13-Dec-00		
Report To:	Andrew Ezzy		
Address:	Gordons Hill Rd Rosny TAS 7018		

Test Method(s) :

1001-Water:	pH in Water by APHA Method 4500-H
1002-Water:	Conductivity by APHA Method 2510
1101-Water:	Alkalinity by APHA Method 2320/4500-CO2
1103-Water:	Anions by Ion Chromatography APHA Method 4110C
1201-Water:	Nutrients by APHA Method 4500
1301-Water:	Metals in Water by APHA Method 3030/3120
1406-Water:	TPH and BTEX in Water by GC-FID *

Mike Johnson
Manager

Tasmania

ANALYTICAL SERVICES TASMANIA
Sandy Bay Laboratory
c|- Chemistry Department University of Tasmania
Sandy Bay Tasmania 7005

NATA Accreditation Number: 5589

Report No: 13866 **Report Date:** 13-Dec-00

		Lab.No.:	13698	13699	13700	13701
		Sample Id.:	PSWD 2000/1	PSWD 2000/2	PSWD 2000/3	PSWD 2000/4
Method	**Analyte**	**Units / Sampled On :**	16/11/00 11:45	16/11/00 12:40	16/11/00 14:35	16/11/00 10:30
1001-Water	pH		4.5	5.9	6.7	6.1
1002-Water	Conductivity	µS/cm	3190	756	1410	1080
1101-Water	Alkalinity CO3	mg/L CaCO3	<1	<1	<1	<1
	Alkalinity HCO3	mg/L CaCO3	<1	74	690	106
1103-Water	Chloride	mg/L	800	150	61	280
	Sulphate	mg/L	130	20	1.2	41
1201-Water	Ammonia	µg-N/L	19	111	18400	122
	Nitrate+Nitrite	µg-N/L	2360	9	6	12
	Nitrite	µg-N/L	4	<2	<2	3
	Ortho-P	µg-P/L	4	3	4	5
1301-Water	Al (Dissolved)	µg/L	8940	106	<10	18
	As (Dissolved)	µg/L	<5	<5	<5	<5
	Cd (Dissolved)	µg/L	<1	<1	<1	<1
	Co (Dissolved)	µg/L	8	3	4	11
	Cr (Dissolved)	µg/L	10	2	6	2
	Cu (Dissolved)	µg/L	8	13	<1	2
	Fe (Dissolved)	µg/L	1410	255	34400	1910
	Mn (Dissolved)	µg/L	102	109	751	137
	Ni (Dissolved)	µg/L	12	7	2	20
	Pb (Dissolved)	µg/L	44	<5	<5	<5
	Zn (Dissolved)	µg/L	38	17	11	14
1406-Water	TPH	µg/L	12000			
	TPH C06-C09	µg/L	11900			
	TPH C10-C14	µg/L	<10			
	TPH C15-C28	µg/L	<10			
	TPH C29+	µg/L	<10			

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Sandy Bay Laboratory
c|- Chemistry Department University of Tasmania
Sandy Bay Tasmania 7005

NATA Accreditation Number: 5589

Report No: 13866 **Report Date:** 13-Dec-00

		Lab.No.:	13702	13703	13704	13705
		Sample Id.:	PSWD 2000/5	PSWD 2000/6	SouthEastPond	EastOutflow
Method	**Analyte**	**Units / Sampled On :**	16/11/00 14:10	16/11/00 13:20	16/11/00 13:40	16/11/00 11:05
1001-Water	pH		6.4	6.6		
1002-Water	Conductivity	µS/cm	979	2720		
1101-Water	Alkalinity CO3	mg/L CaCO3	<1	<1		
	Alkalinity HCO3	mg/L CaCO3	363	1270		
1103-Water	Chloride	mg/L	170	280		
	Sulphate	mg/L	1.9	2.4		
1201-Water	Ammonia	µg-N/L	11600	41800	8360	1880
	Nitrate+Nitrite	µg-N/L	6	6	518	1100
	Nitrite	µg-N/L	<2	3	140	62
	Ortho-P	µg-P/L	4	7	39	9
1301-Water	Al (Dissolved)	µg/L	37	<10	81	48
	As (Dissolved)	µg/L	<5	<5	<5	<5
	Cd (Dissolved)	µg/L	<1	<1	<1	<1
	Co (Dissolved)	µg/L	4	6	2	2
	Cr (Dissolved)	µg/L	2	6	3	2
	Cu (Dissolved)	µg/L	2	<1	<1	<1
	Fe (Dissolved)	µg/L	762	3800	1580	313
	Mn (Dissolved)	µg/L	979	3110	284	101
	Ni (Dissolved)	µg/L	8	5	4	4
	Pb (Dissolved)	µg/L	<5	<5	<5	<5
	Zn (Dissolved)	µg/L	3	4	17	15

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Sandy Bay Tasmania 7005

NATA Accreditation Number: 5589

Report No: 13866 **Report Date:** 13-Dec-00

		Lab.No.:	13706	13707	13708	13709
		Sample Id.:	EastLeachatePond	NorthEastDrain	EasternApexDrain	APPM Leachate
Method	**Analyte**	**Units / Sampled On :**	16/11/00 11:00	16/11/00 11:10	16/11/00 13:50	16/11/00 11:50
1201-Water	Ammonia	µg-N/L	3580	561	27700	93800
	Nitrate+Nitrite	µg-N/L	156	24	8	12
	Nitrite	µg-N/L	30	19	6	7
	Ortho-P	µg-P/L	9	20	5	9
1301-Water	Al (Dissolved)	µg/L	273	155	<10	22
	As (Dissolved)	µg/L	<5	<5	<5	<5
	Cd (Dissolved)	µg/L	<1	<1	<1	<1
	Co (Dissolved)	µg/L	1	6	3	6
	Cr (Dissolved)	µg/L	5	15	<1	3
	Cu (Dissolved)	µg/L	<1	5	<1	<1
	Fe (Dissolved)	µg/L	3420	3390	1210	34200
	Mn (Dissolved)	µg/L	80	131	997	790
	Ni (Dissolved)	µg/L	4	10	2	21
	Pb (Dissolved)	µg/L	<5	<5	<5	6
	Zn (Dissolved)	µg/L	11	14	5	7
1406-Water	TPH	µg/L			278	<40
	TPH C06-C09	µg/L			14	<10
	TPH C10-C14	µg/L			62	<10
	TPH C15-C28	µg/L			95	<10
	TPH C29+	µg/L			106	<10

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NATA Accreditation Number: 5589

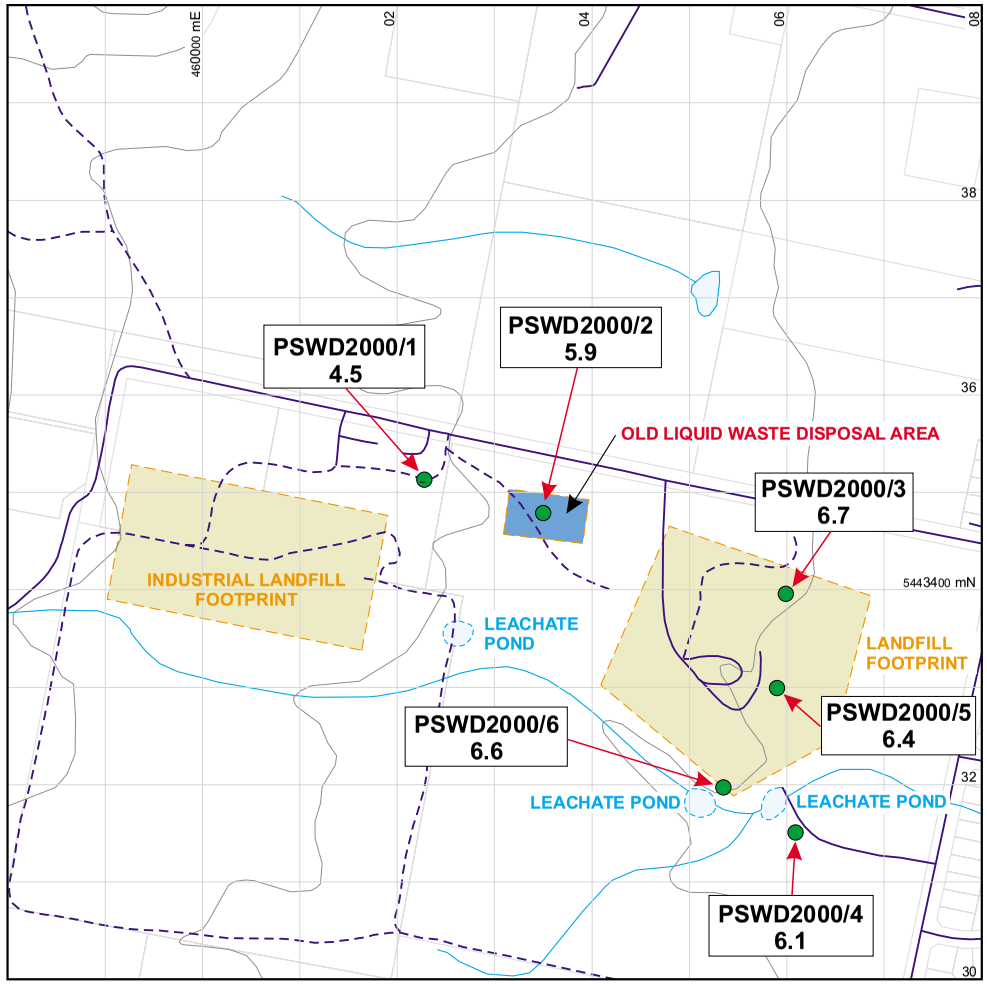
Report No: 13866 **Report Date:** 13-Dec-00

Lab. No.	*Analyte*	*Method Used:*	*Client Sample ID.*
13698	TPH (Water)	1406-Water	PSWD 2000/1

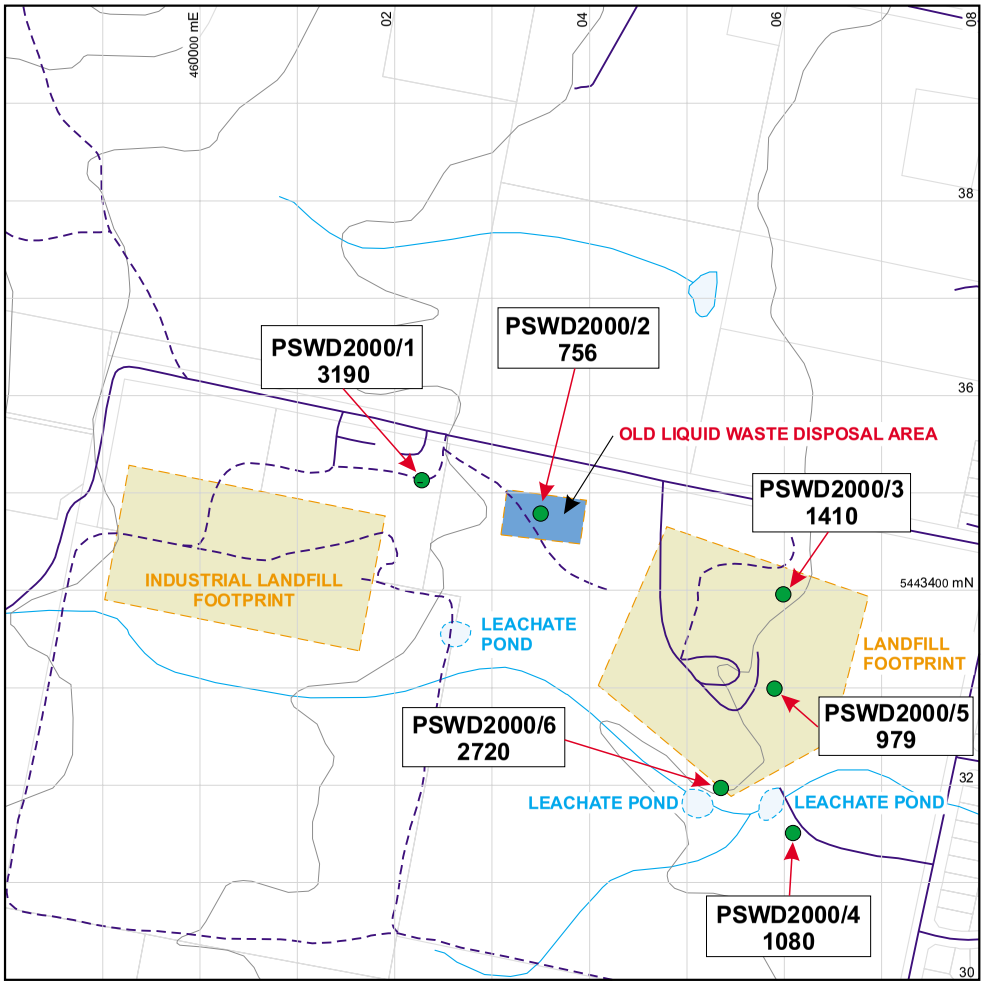
The positive C6-C9 TPH result is attributed the presence of a single peak, which has been tentatively identified by gas chromatography-mass spectrometry as Cyclohexanone.

Appendix 5
Analytical results on site map

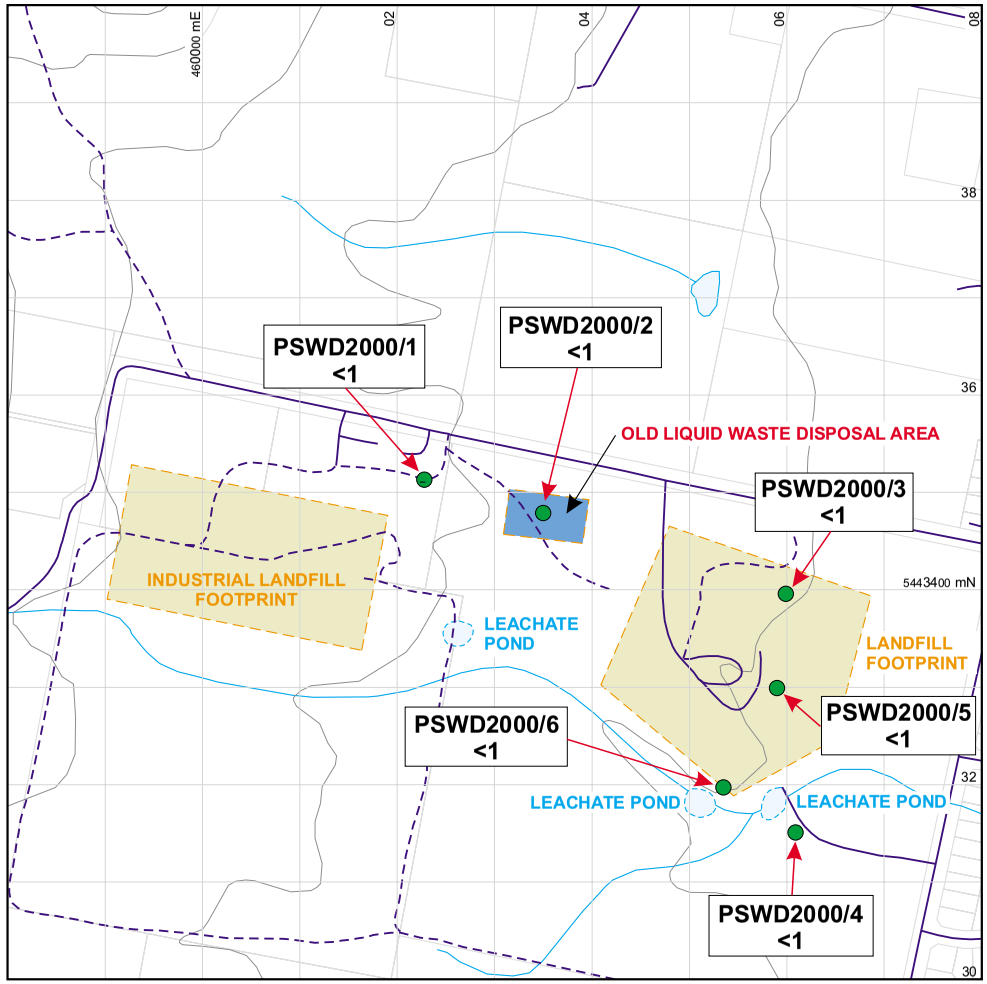
Port Sorell Waste Depot
November 2000
pH



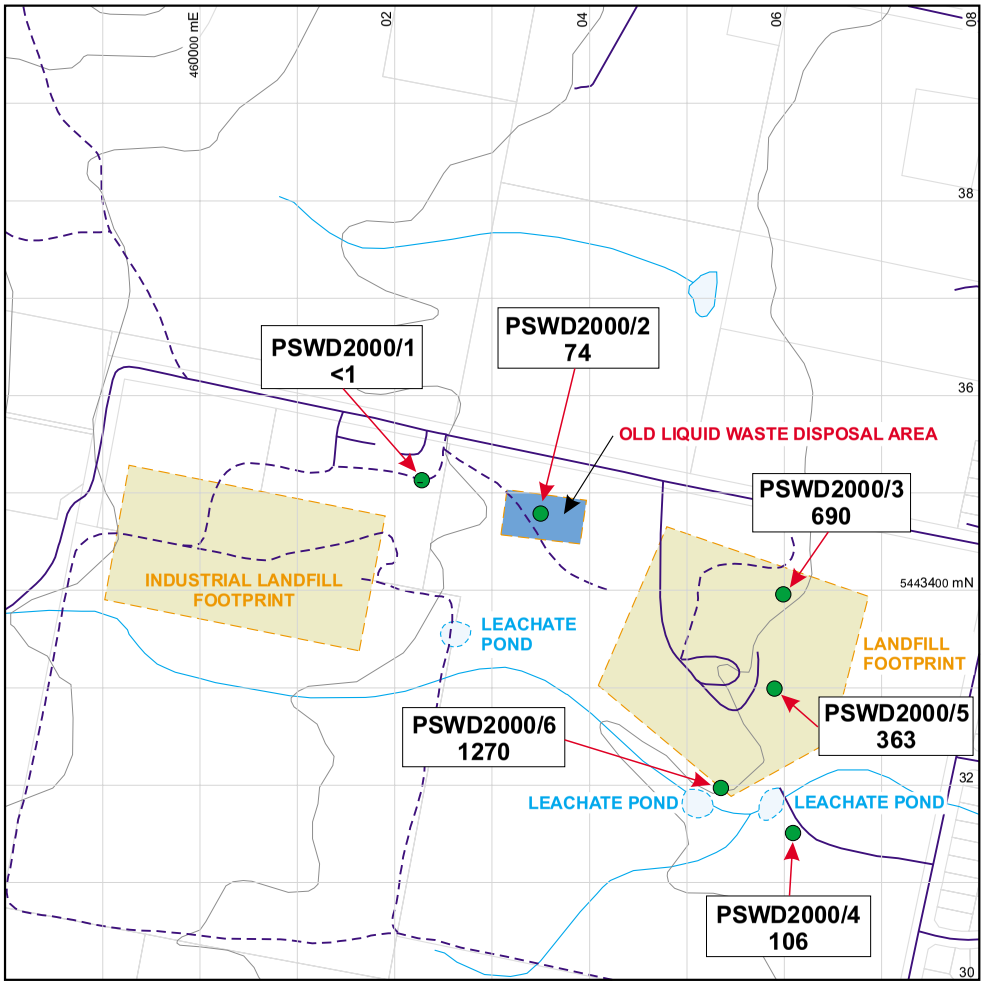
Port Sorell Waste Depot
November 2000
Conductivity (μS/cm)



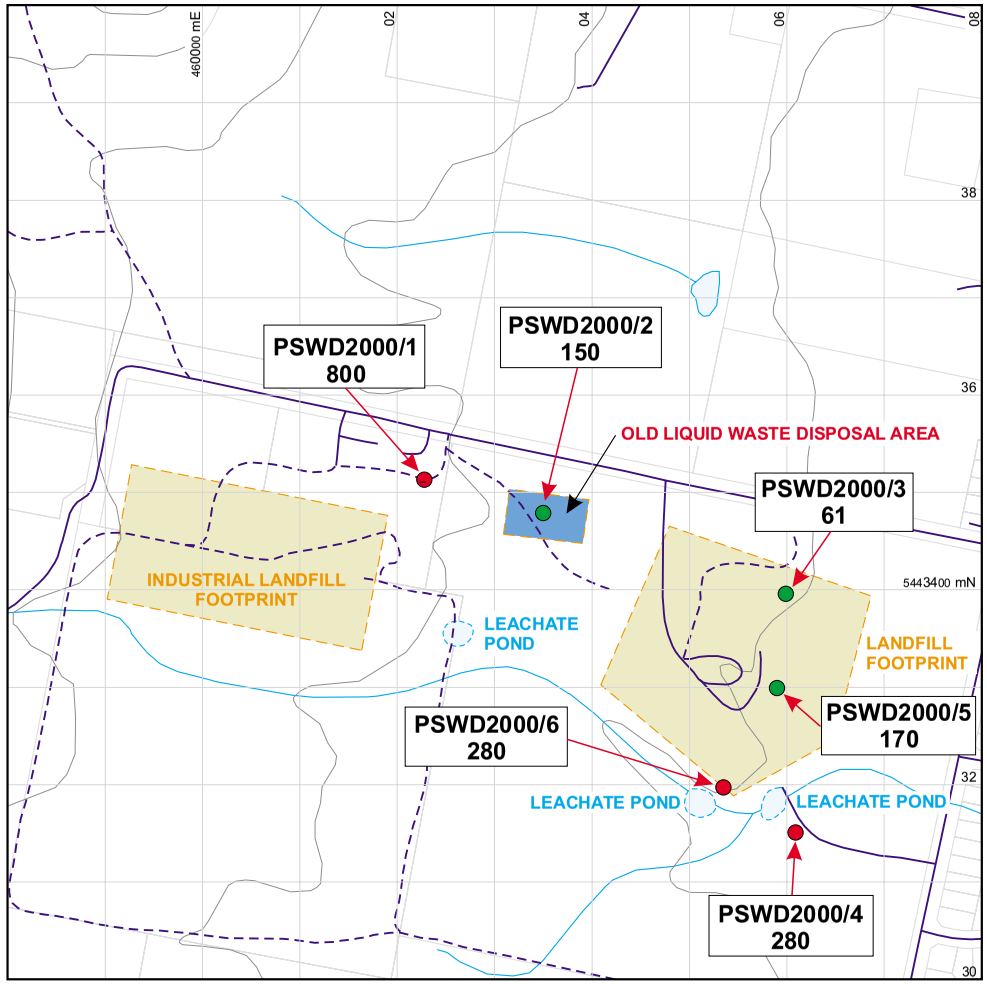
Port Sorell Waste Depot
November 2000
Alkalinity CO_3 (mg/L $CaCO_3$)



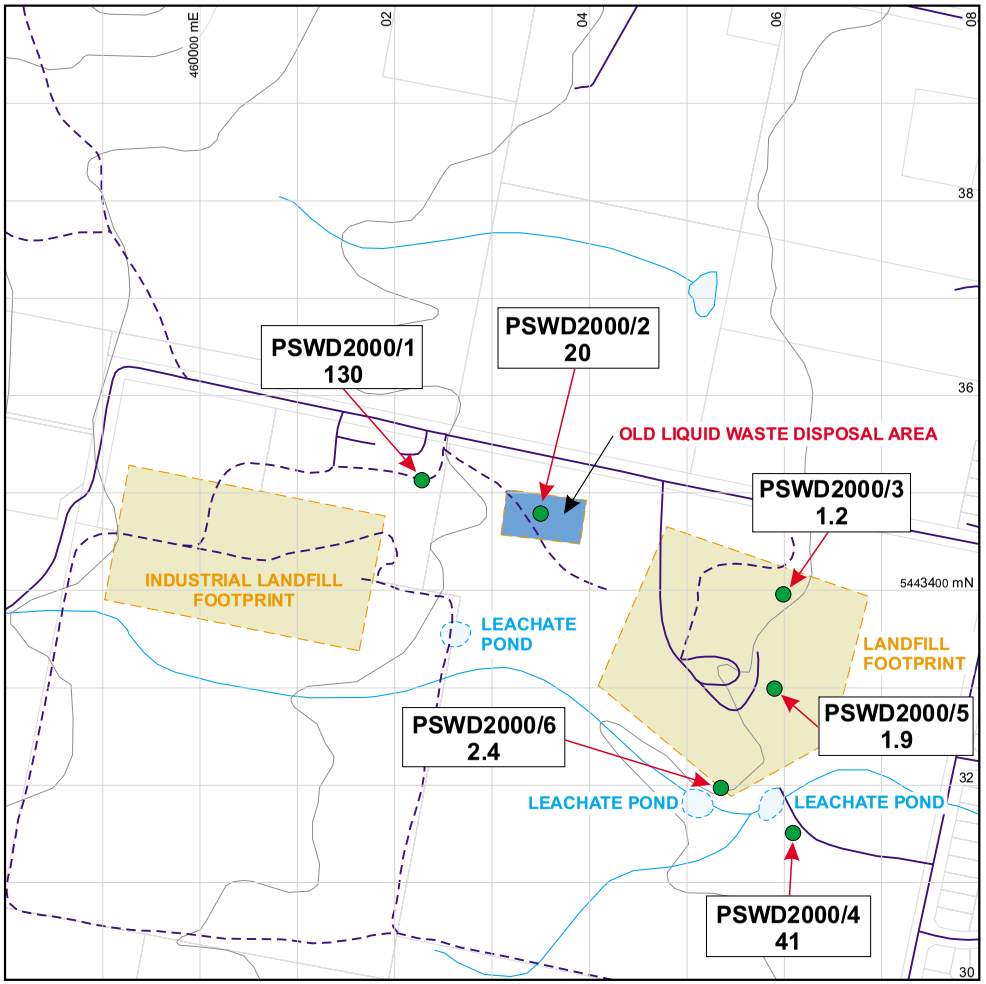
Port Sorell Waste Depot
November 2000
Alkalinity HCO_3 (mg/L $CaCO_3$)



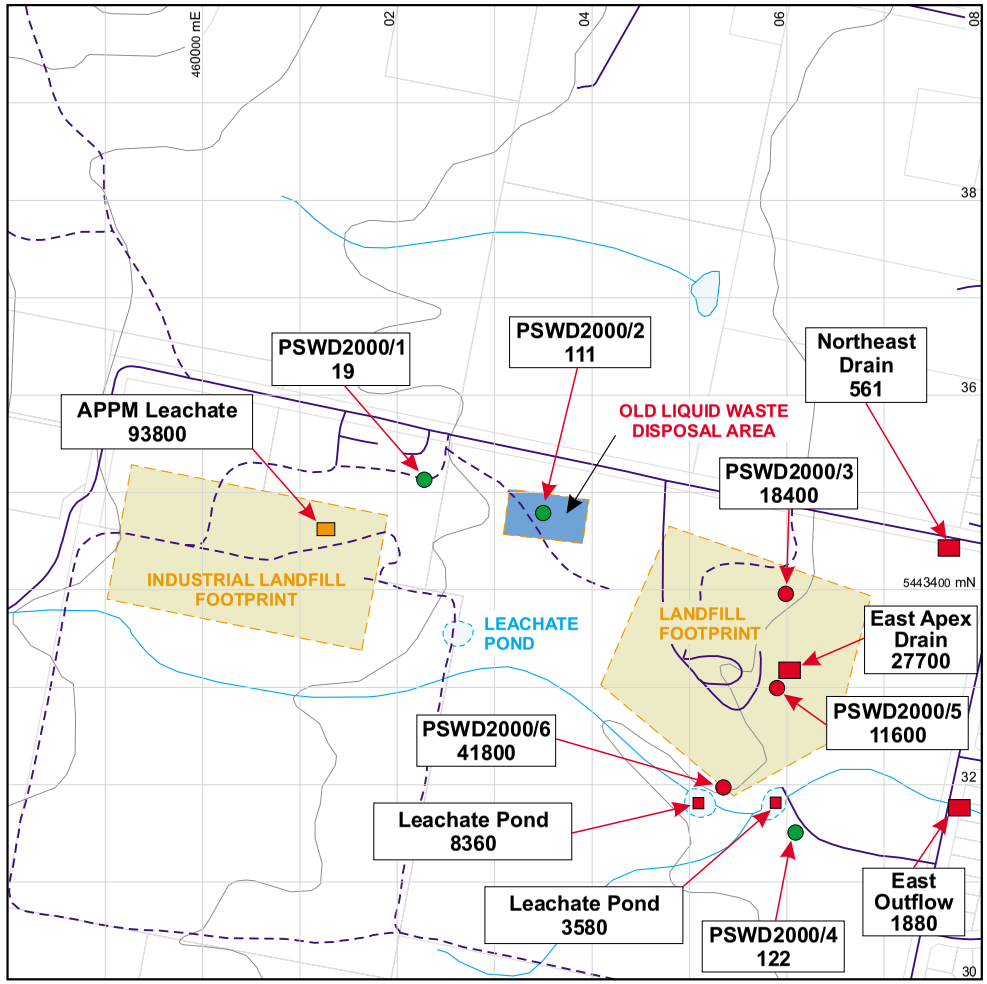
Port Sorell Waste Depot
November 2000
Chloride (mg/L)



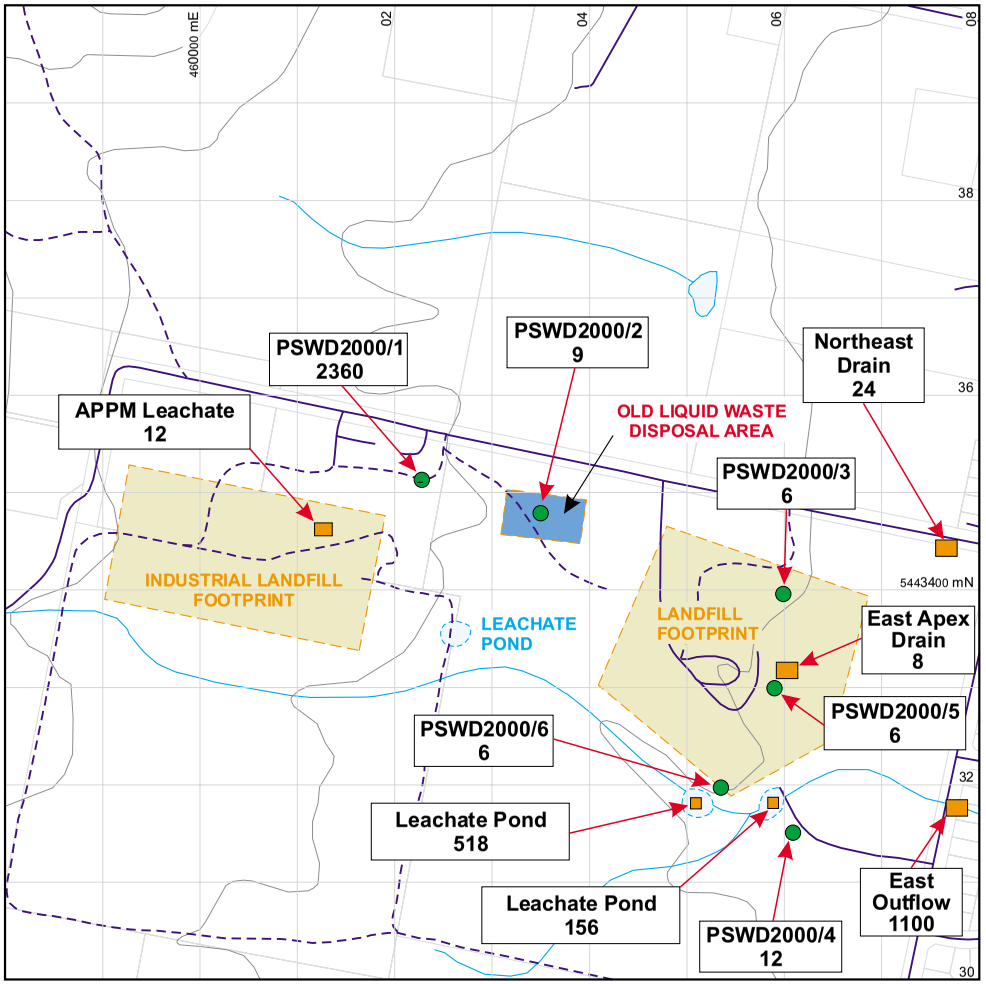
Port Sorell Waste Depot
November 2000
Sulphate (mg/L)



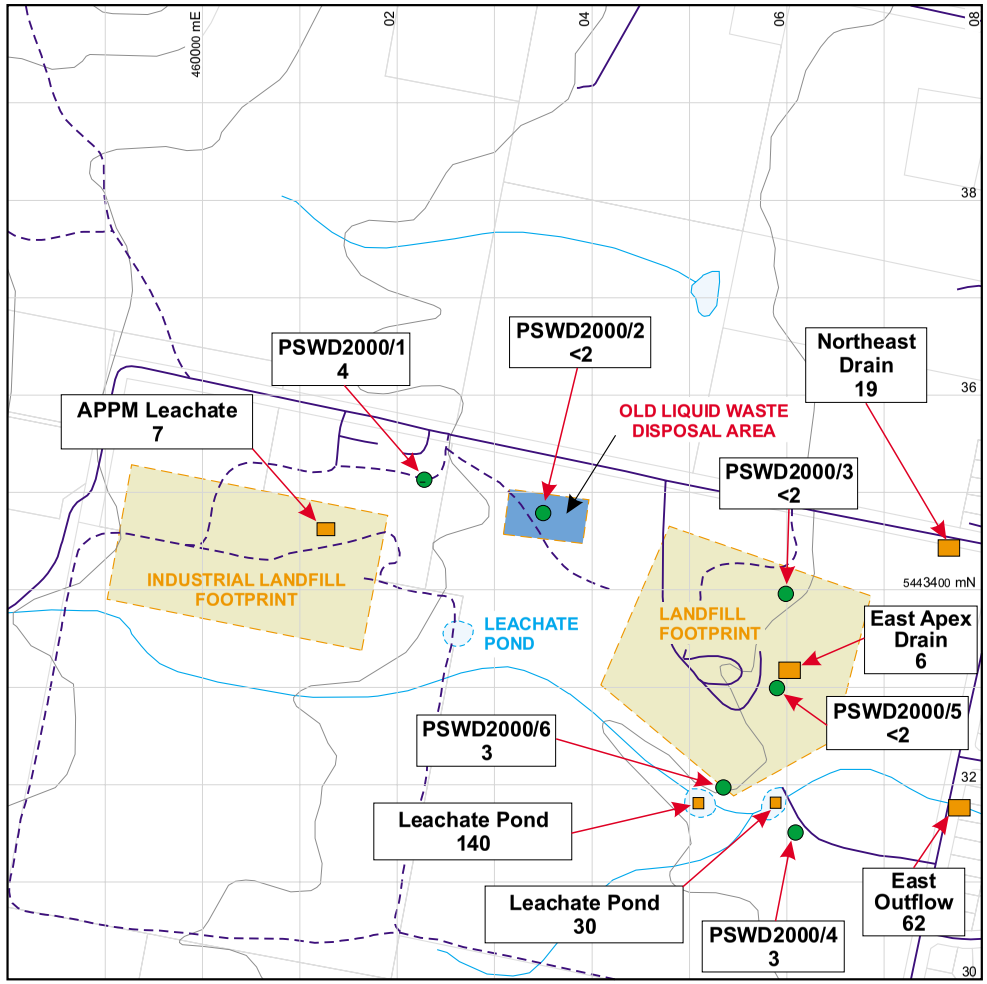
Port Sorell Waste Depot
November 2000
Ammonia (μg-N/L)



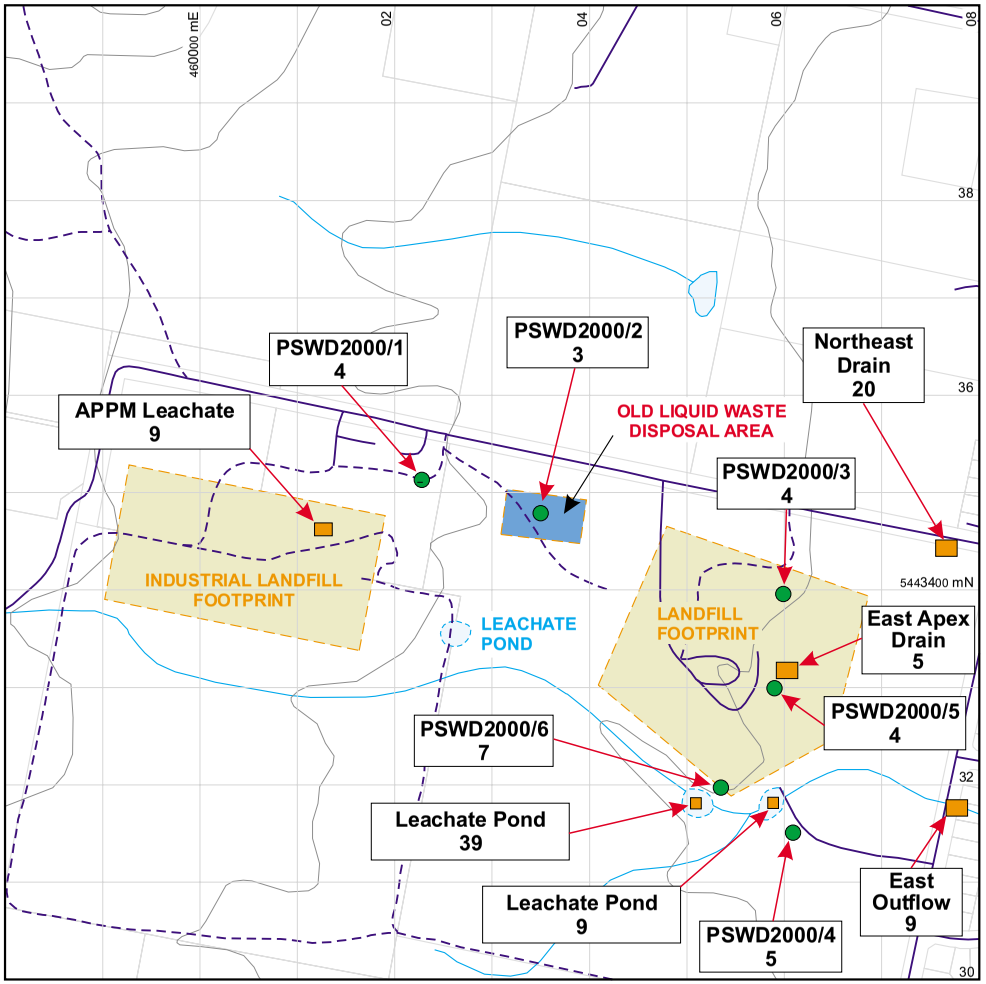
Port Sorell Waste Depot
November 2000
Nitrate + Nitrite (μg-N/L)



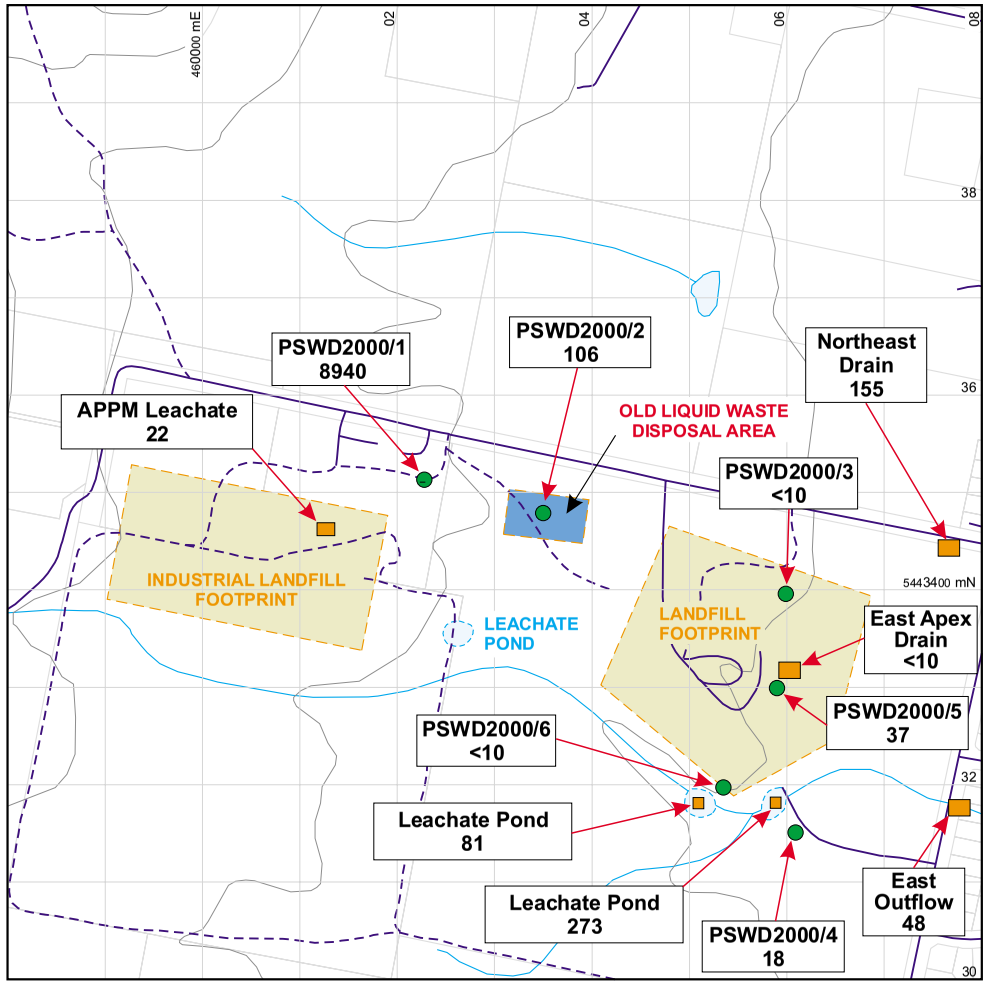
Port Sorell Waste Depot
November 2000
Nitrite (μg-N/L)



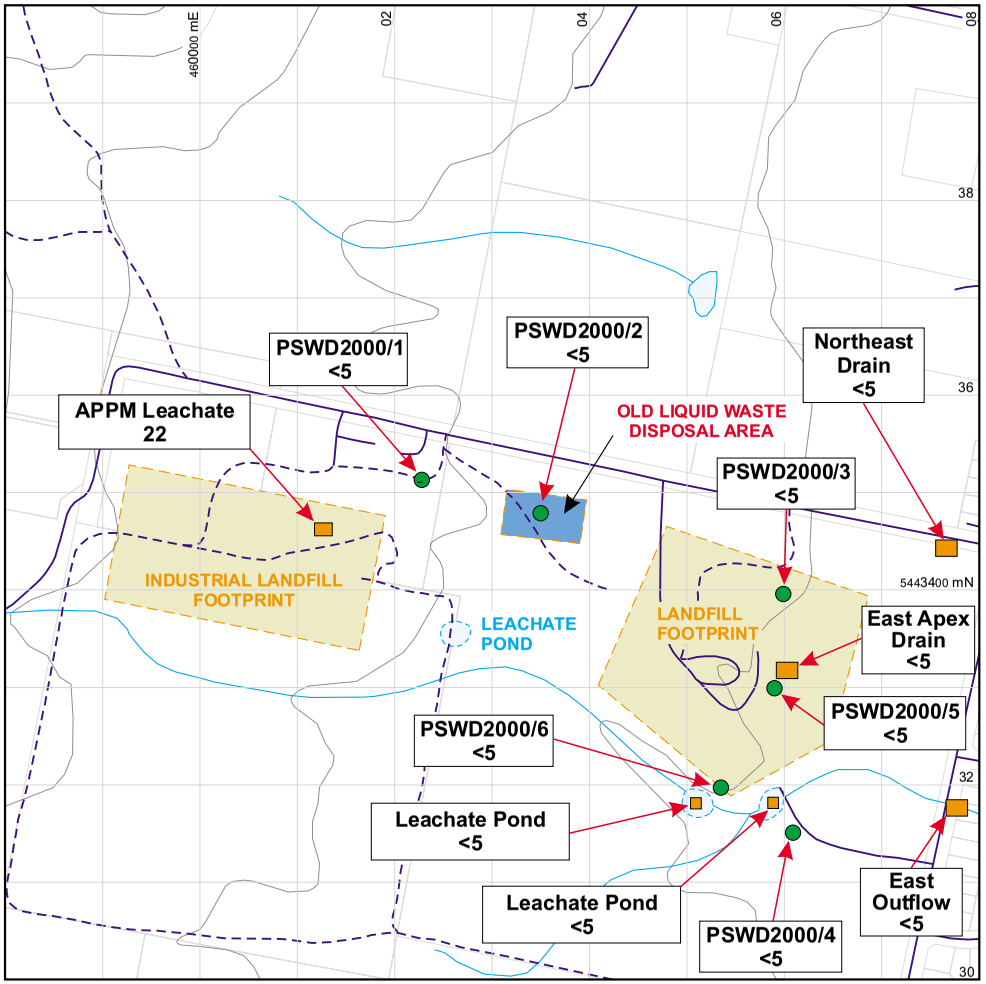
Port Sorell Waste Depot
November 2000
Ortho-P (μg-N/L)



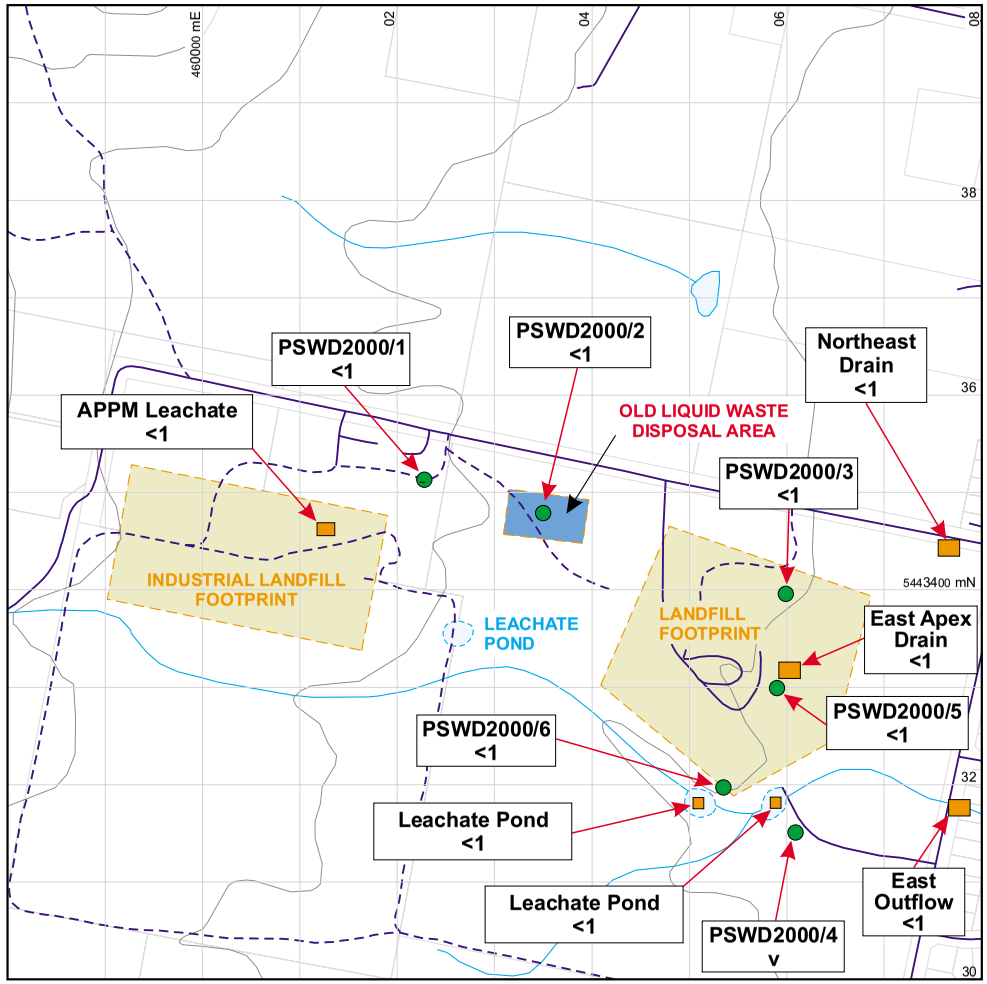
Port Sorell Waste Depot
November 2000
Al (µg/L)



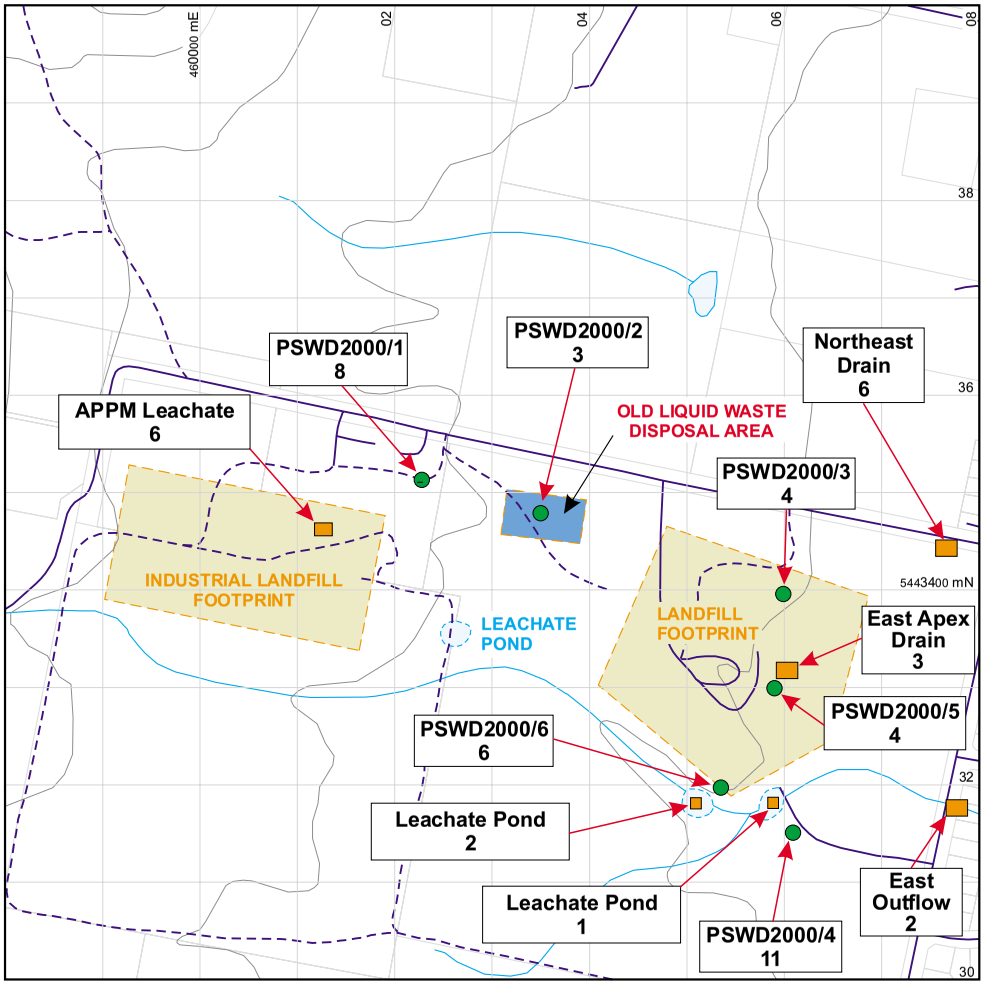
Port Sorell Waste Depot
November 2000
As (µg/L)



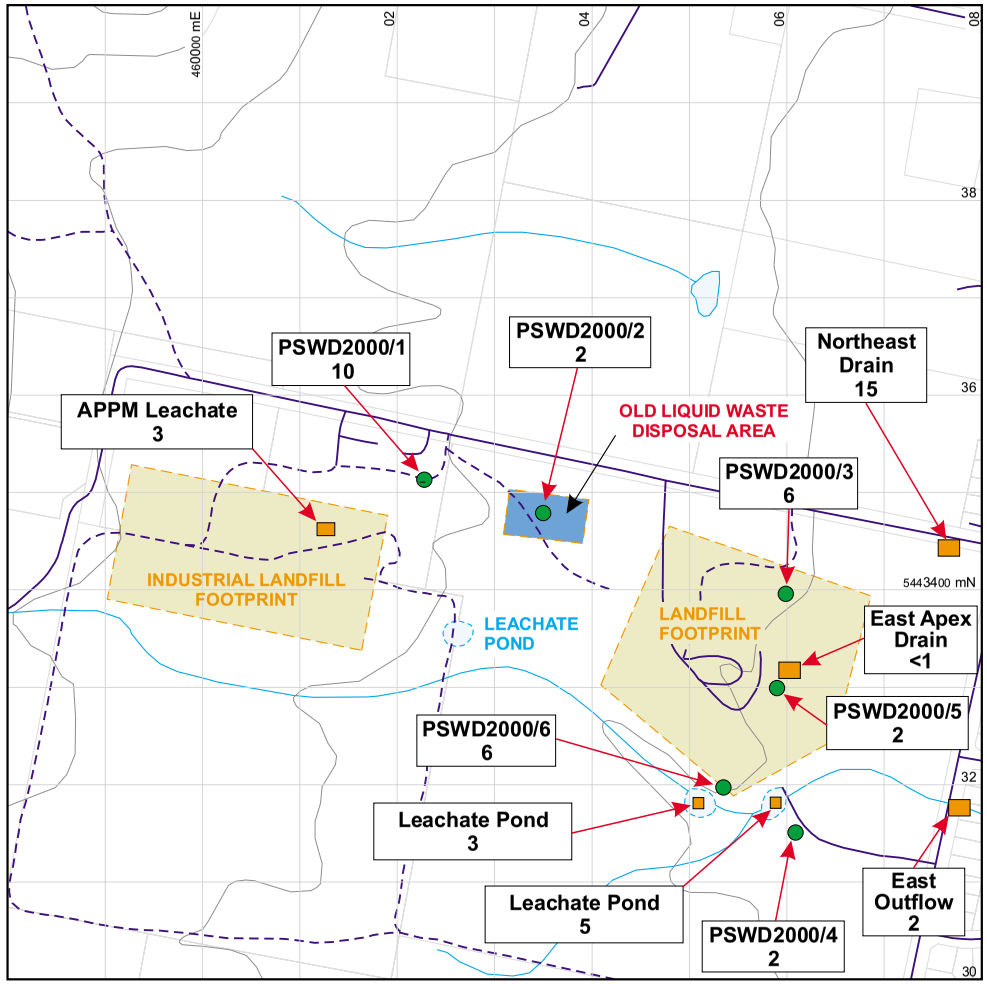
Port Sorell Waste Depot
November 2000
Cd (μg/L)



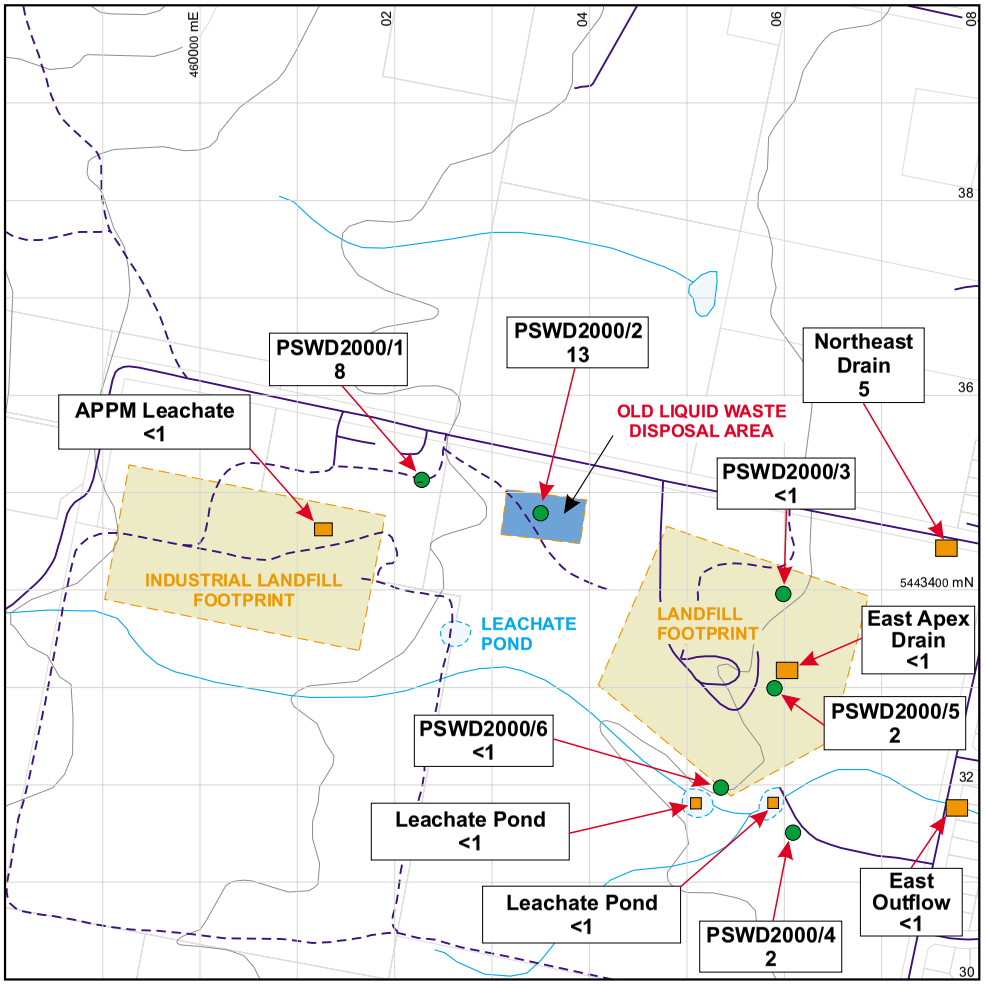
Port Sorell Waste Depot
November 2000
Co (μg/L)



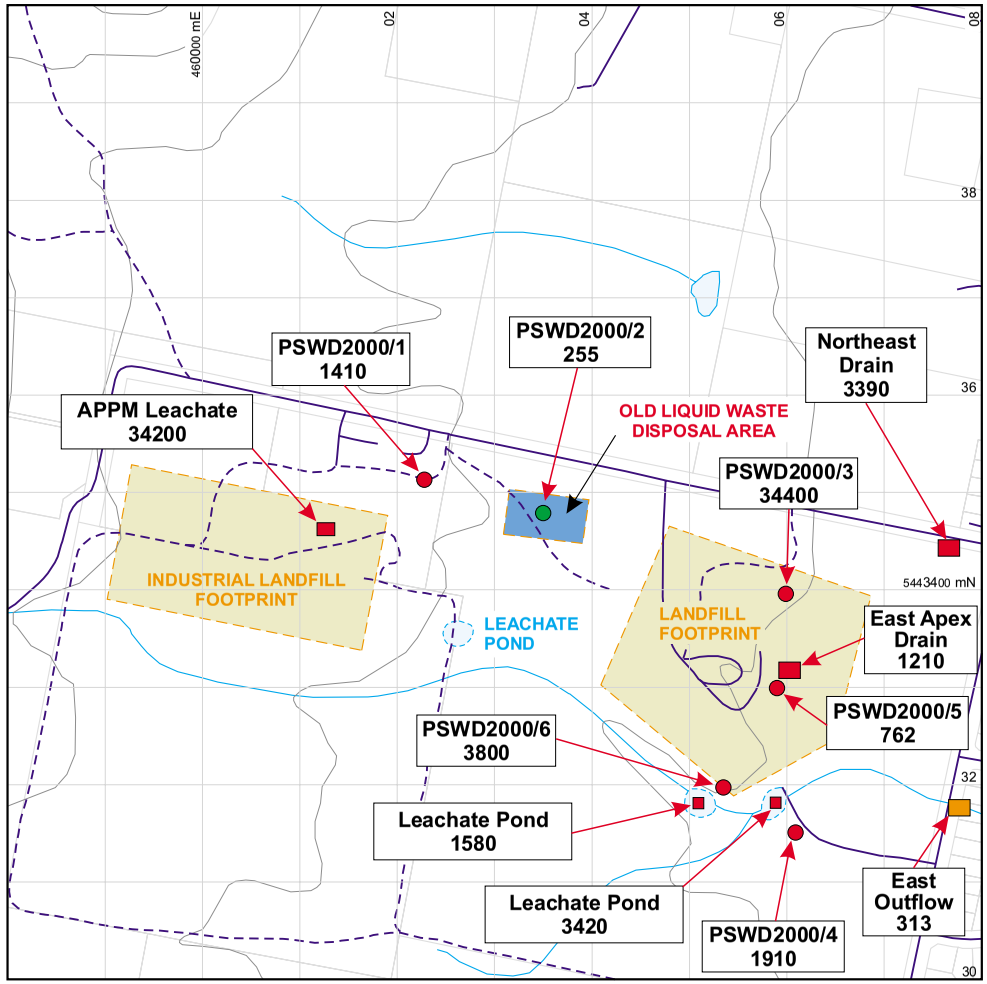
Port Sorell Waste Depot
November 2000
Cr (μg/L)



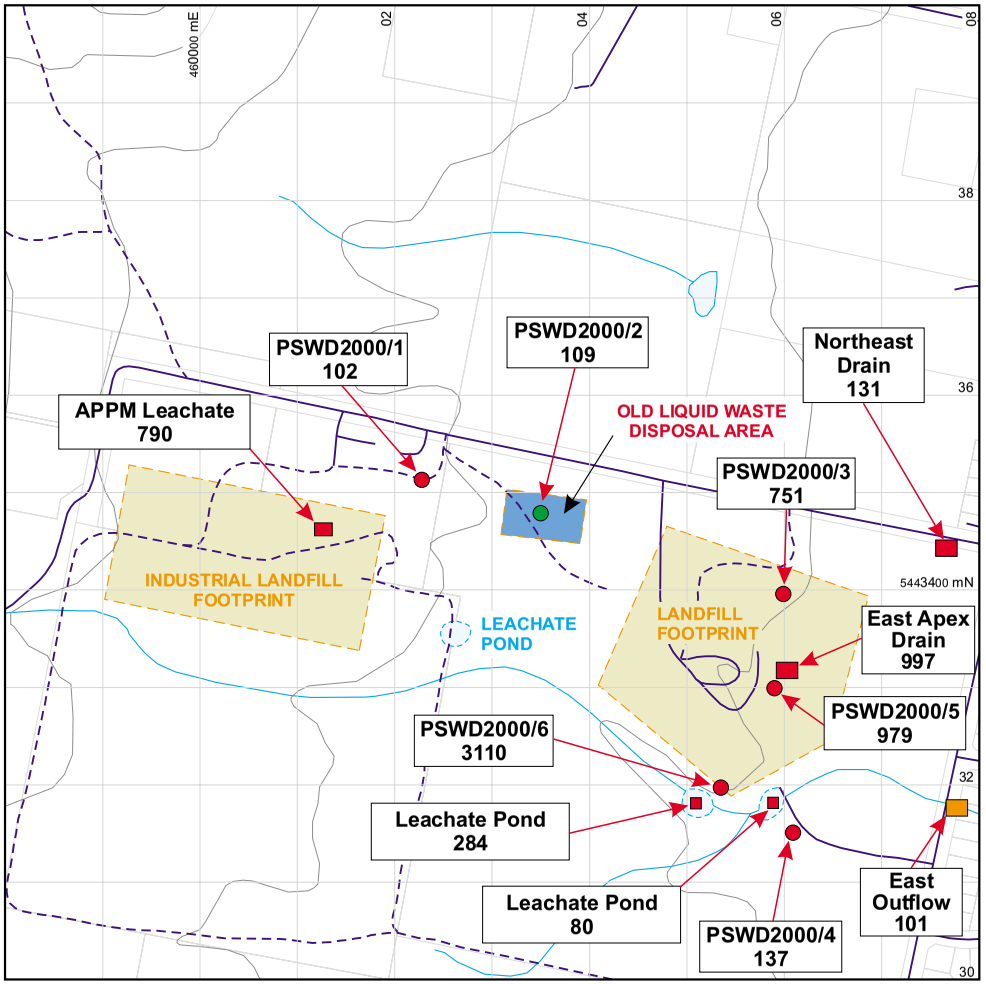
Port Sorell Waste Depot
November 2000
Cu (μg/L)



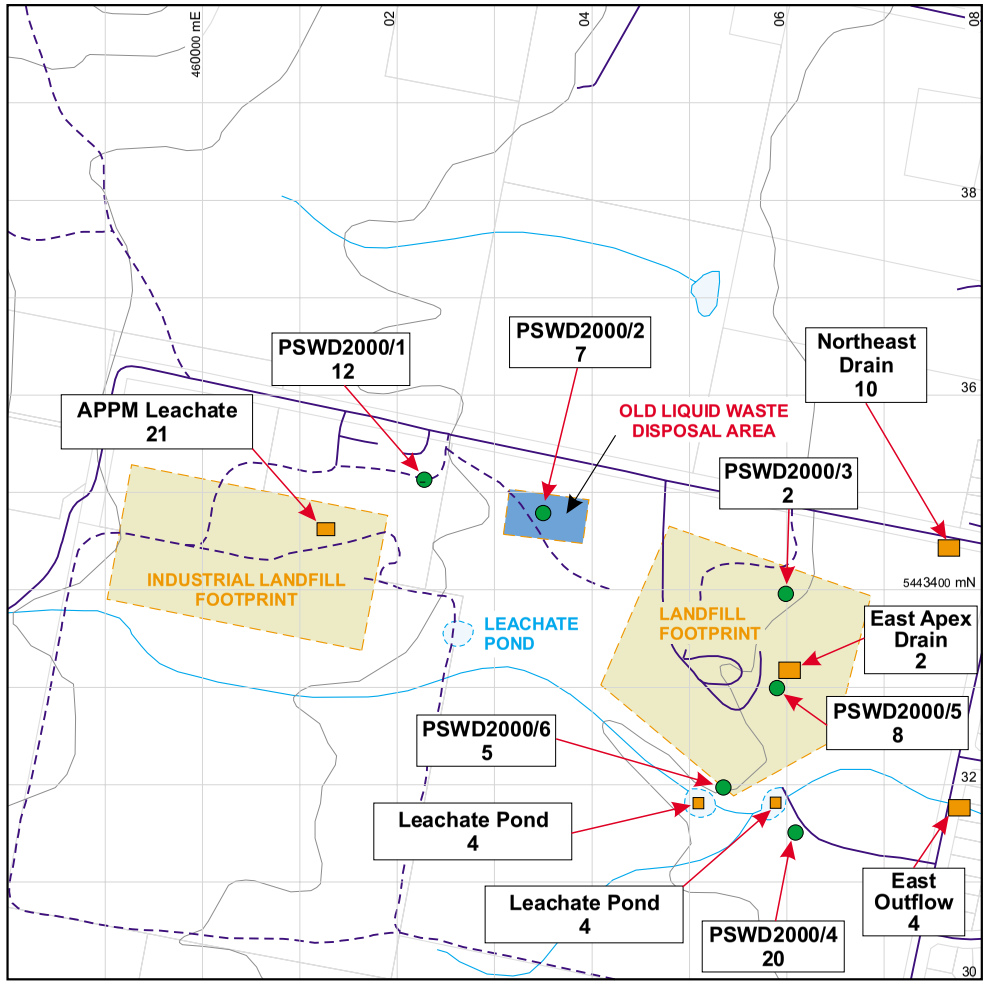
Port Sorell Waste Depot
November 2000
Fe (μg/L)



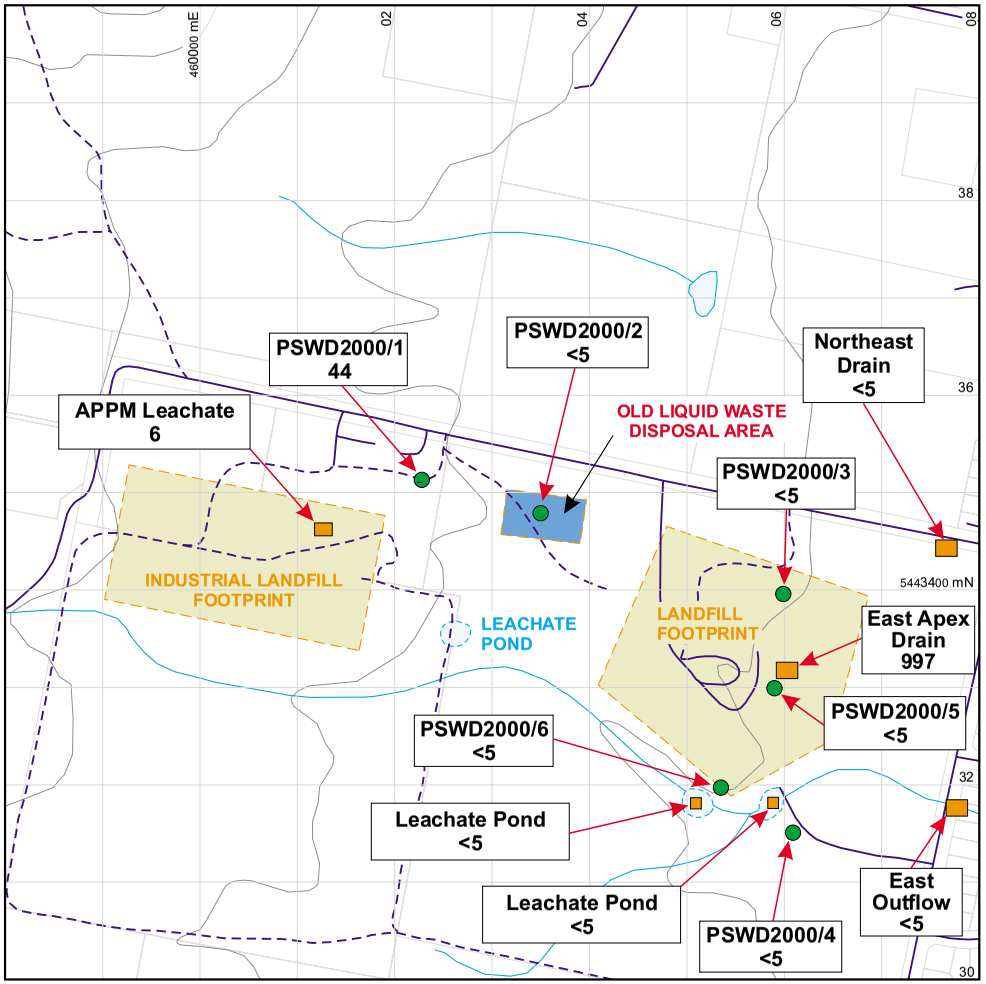
Port Sorell Waste Depot
November 2000
Mn (μg/L)



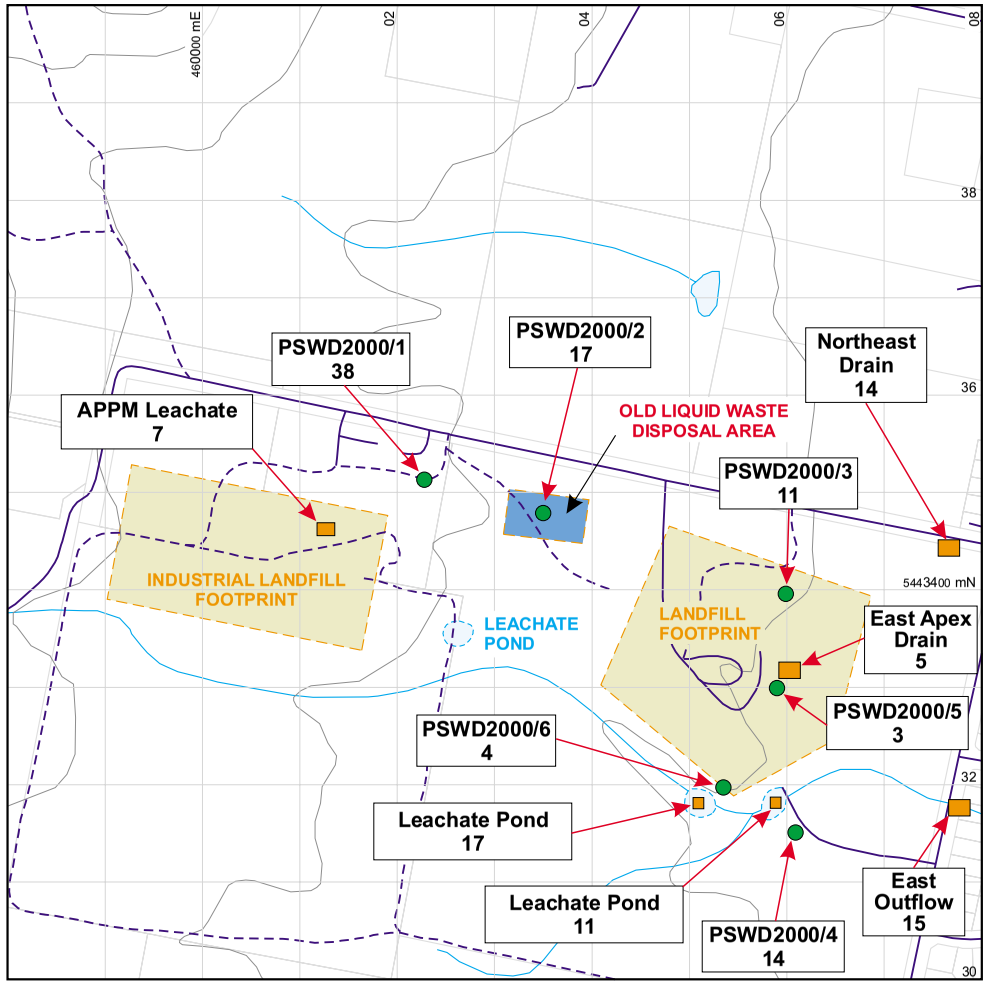
Port Sorell Waste Depot
November 2000
Ni (µg/L)



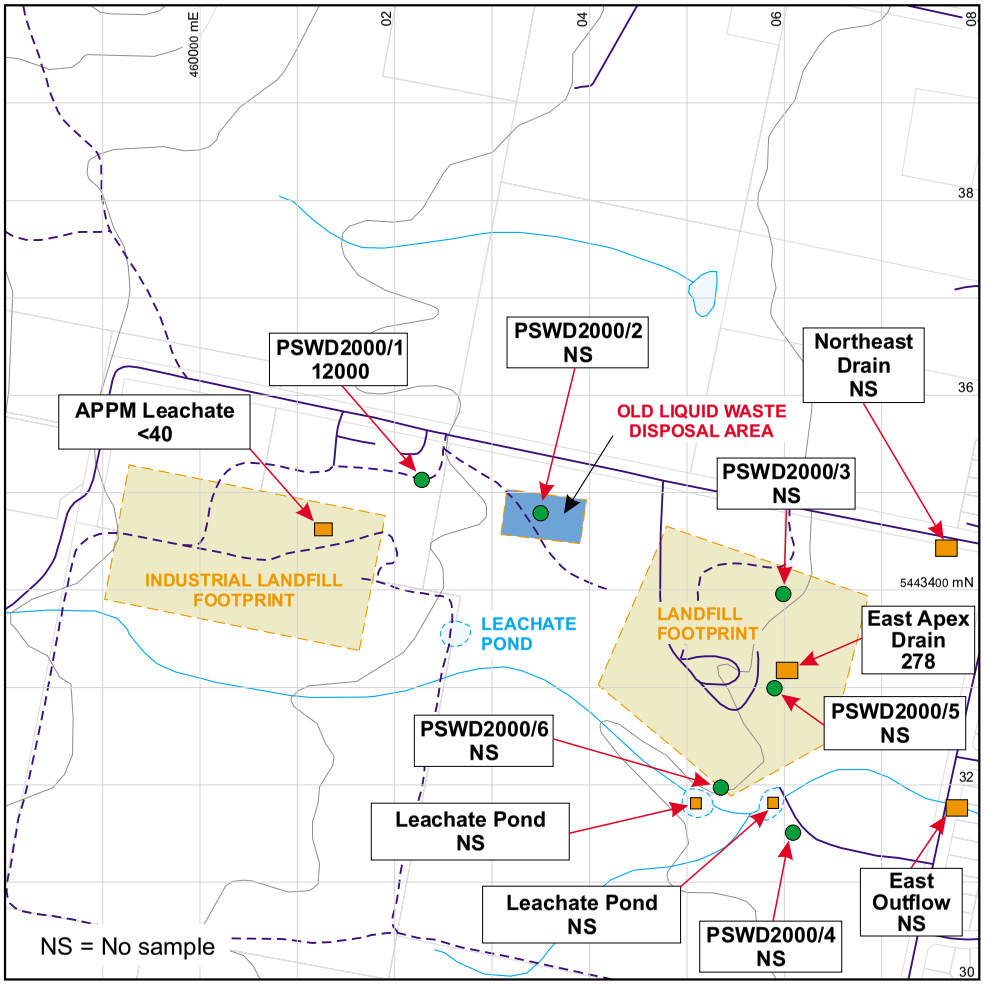
Port Sorell Waste Depot
November 2000
Pb (µg/L)



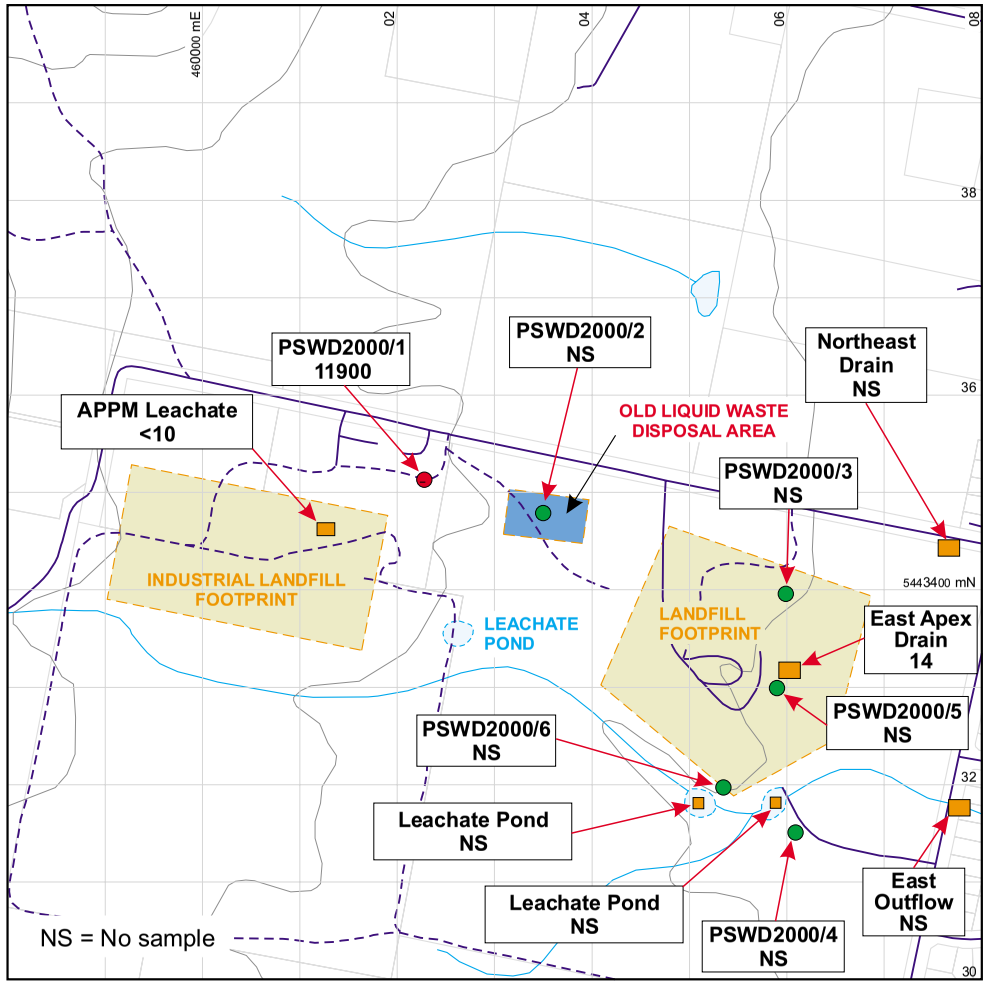
Port Sorell Waste Depot
November 2000
Zn (µg/L)



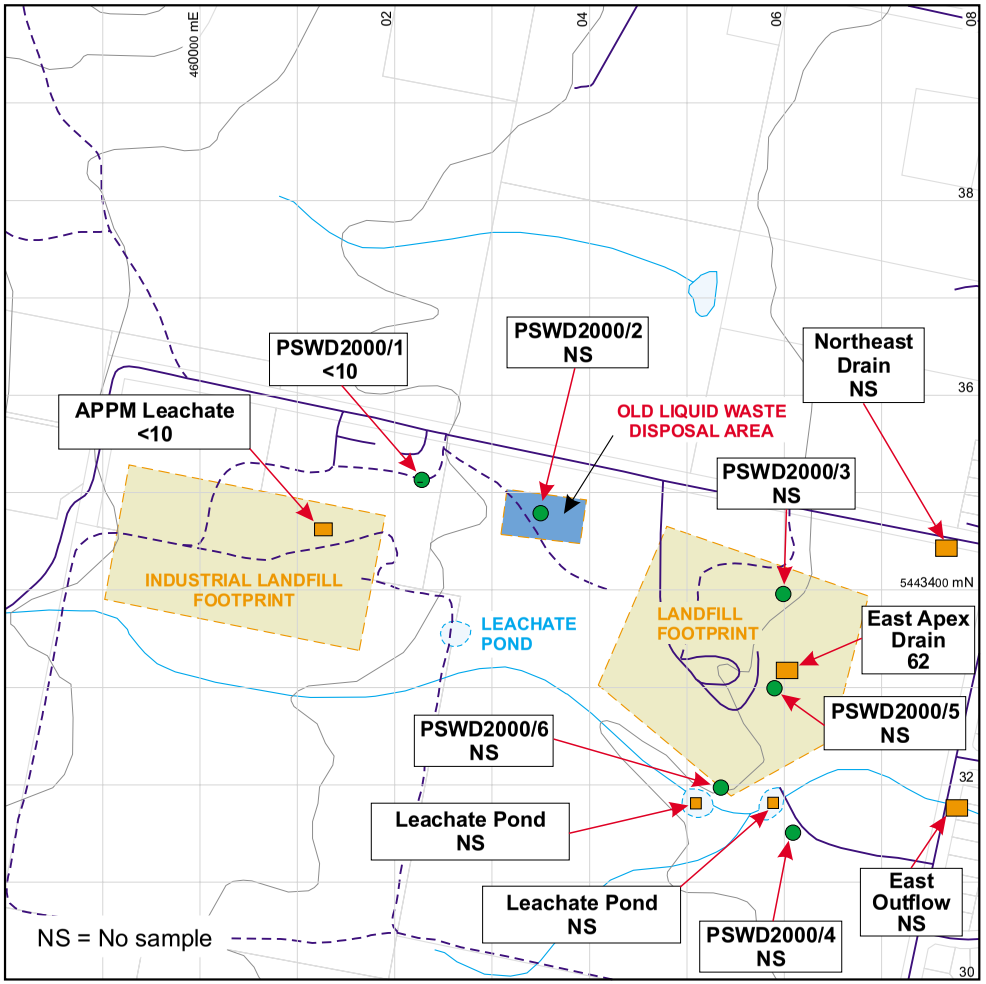
Port Sorell Waste Depot
November 2000
TPH (µg/L)



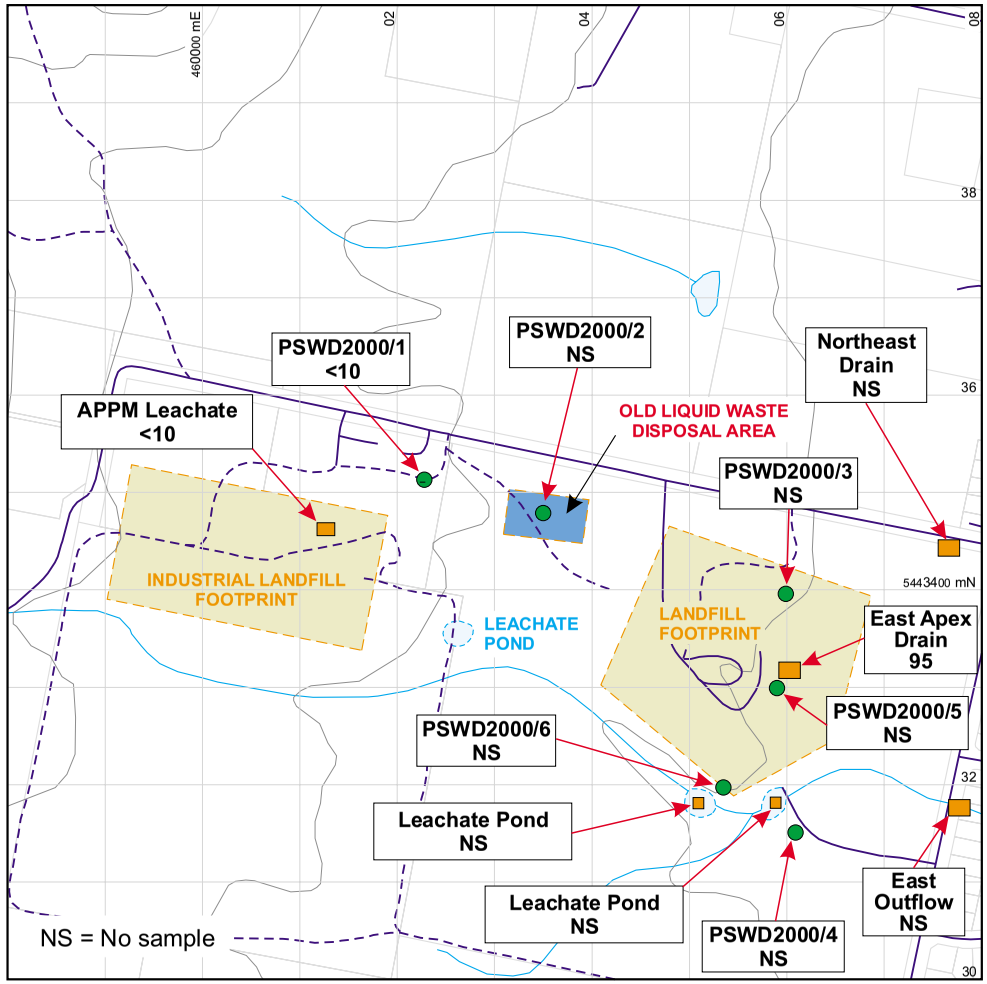
Port Sorell Waste Depot
November 2000
TPH C_{06}–C_{09} (µg/L)



Port Sorell Waste Depot
November 2000
TPH C_{10}–C_{14} (µg/L)



Port Sorell Waste Depot
November 2000
TPH C_{15}–C_{28} (μg/L)



Port Sorell Waste Depot
November 2000
TPH C_{29}+ (μg/L)