



INFORMATION REGARDING ENVIRONMENTAL AUDIT REPORTS

August 2007

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ENVIRONMENTAL AUDIT REPORT

**GROUNDWATER QUALITY
88-90 ORDISH ROAD, DANDENONG
SOUTH**

For

NUPLEX ENVIRONMENTAL

September 2004

ENVIRONMENTAL AUDIT REPORT

**GROUNDWATER QUALITY
88-90 ORDISH ROAD, DANDENONG
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NUPLEX ENVIRONMENTAL

September 2004

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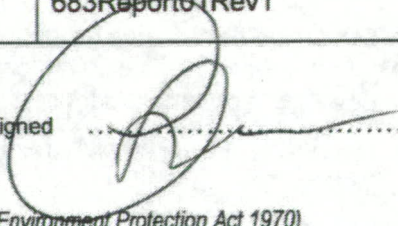
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ENVIRONMENTAL AUDIT REPORT

GROUNDWATER QUALITY

88-90 ORDISH ROAD, DANDENONG SOUTH

EXECUTIVE SUMMARY

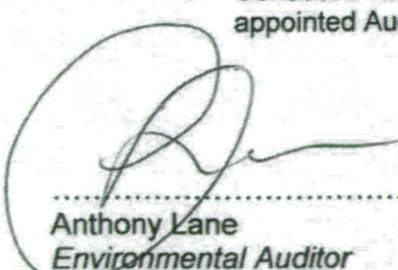
This environmental auditor report has been prepared in my capacity as an EPA-appointed Environmental Auditor (Contaminated Land) to provide an opinion on the groundwater quality at 88-90 Ordish Road, Dandenong South. This brief has been in response to expected changes to Waste Discharge Licence EI23855 issued by the EPA.

My conclusion, in relation to whether the groundwater quality objectives of the *State Environment Protection Policy* are being met, is that the groundwater quality at the premises **cannot be determined**. My reasons for this conclusion are as follows:

- a) No hydrogeological assessment has been undertaken at the site, hence groundwater occurrence, flow direction and rates, or background chemistry are not provided;
- b) The groundwater at the site has not been tested for a full suite of potential contaminants;
- c) Details on the existing groundwater monitoring bore network, including bore construction details, survey location and elevation, and records of bore development, are inadequate; and
- d) Records of sampling plan, field procedures, QA/QC and data validation are lacking.

I make recommendations for further work to:

- Investigate the hydrogeological conditions at the site through a comprehensive hydrogeological assessment;
- Investigate the groundwater quality status at the site through an upgraded groundwater monitoring program, and amend the EPA licence to reflect any relevant changes; and
- Conduct a further assessment of the groundwater protection status by an EPA appointed Auditor.



.....
Anthony Lane
Environmental Auditor
(appointed pursuant to the *Environment Protection Act 1970*)
2 September 2004

ENVIRONMENTAL AUDIT REPORT GROUNDWATER QUALITY, 88-90 ORDISH ROAD, DANDENONG SOUTH

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ABOUT ENVIRONMENTAL AUDITOR REVIEW REPORTS

LIST OF ABBREVIATIONS

ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BCL	Bore Construction Licence
DPI	Department of Primary Industry
DSE	Department of Sustainability and Environment
EPA	Environment Protection Authority
GDB	Groundwater Data Base
GMS	Groundwater Management System
GQRUZ	Groundwater Quality Restricted Use Zone
mBTC	Metres Below Top of Casing
NWQS	National Water Quality Management Strategy
RWA	Rural Water Authority
SEPP	State Environment Protection Policy
SEPP (GoV)	State Environment Protection Policy (Groundwaters of Victoria)
SoEA	Statement of Environmental Audit
SRW	Southern Rural Water Authority
SWL	Standing Water Level

ENVIRONMENTAL AUDIT REPORT

GROUNDWATER QUALITY, 88-90 ORDISH ROAD, DANDENONG SOUTH

1 INTRODUCTION

1.1 BACKGROUND

Mr Anthony Lane of Lane Consulting Pty Ltd was engaged by Nuplex Environmental in April 2004 to carry out a non-statutory groundwater quality review at 88-90 Ordish Road, Dandenong South (Figure 1). At the time of engagement it was expected that the current Waste Discharge Licence EI23855, issued by EPA on 30 August 1994 and amended 11 May 1998 for the site, would be amended to include a condition that the licence holder engage the services of an environmental auditor to provide an opinion on the groundwater quality at the site.

Following advice from EPA, it was determined that the groundwater quality review be performed as a statutory audit under s.53V of the *Environment Protection Act 1970*, consistent with the expected changes to the licence. Hence this report presents a statutory audit of groundwater quality in the Auditor's capacity as an EPA-appointed Environmental Auditor (Contaminated Land).

The site has been owned and operated by Nuplex Special Waste Pty Ltd (trading as Nuplex Environmental) since 1998 and has been used as a bulk liquid storage and treatment facility. Since then Nuplex Special Waste Pty Ltd became the operator and licence holder for the site. Prior to this, the site was owned and operated by Jennings Liquid Waste Pty Ltd and Browning Ferris Industries Pty Ltd (BFI).

Groundwater monitoring has been carried out at the site at seven groundwater bore locations on a biannual basis since 1993, and at four of these locations since 1990.

Figure 1 provides a site locality and **Figure 2** shows site features and the existing bore locations.

1.2 PREVIOUS REVIEWS AND AUDITS

The current licence requires that:

"By the 31 December 1997 the Licensee shall have all past groundwater monitoring data assessed by an expert hydrologist and report of the outcome of the assessment to the Authority. The report shall include a recommendation for an ongoing groundwater monitoring programme to apply from January 1998."

Radian Review 1997: Radian International Pty Ltd was commissioned by Nuplex Environmental to carry out a groundwater quality review in December 1997. Radian International concluded that the groundwater monitoring program at the site is inadequate in several respects, making a definitive evaluation of the groundwater quality at this site impossible.

Nadebaum/EPA Audit 2003: An environmental audit was carried out by an EPA team lead by Dr Peter Nadebaum of GHD Pty Ltd during 2003. The scope of the audit was that of a comprehensive "facilities audit". A report was prepared by Dr Nadebaum and EPA in 2003. The report recommended the licence holder review the available groundwater results and

prepare an investigation and action plan for submission to EPA.

Other recommendations pertaining to the site's hydrogeological investigations included that the licence holder:

"51. Carry out a review of soil contamination to identify where it may adversely affect the beneficial uses of the land, surface water or groundwater, with particular consideration to possible effects on surface water through run off in stormwater, and effects on the use of groundwater; and

52. Re-establish the seventh groundwater bore."

It is understood that the current audit is intended to assess the progress on groundwater protection measures since the earlier audits and reviews.

2 AUDIT SCOPE & CRITERIA

2.1 AUDIT SCOPE & METHOD

The scope of work undertaken by Anthony Lane to complete this audit has included the following tasks:

- ☐ Review of reports/documents describing previous groundwater monitoring at the site.
- ☐ Review of previous Environmental Audit Report carried out by Dr Peter Nadebaum of GHD Pty Ltd, on behalf of EPA Victoria.
- ☐ Review of data spreadsheet and laboratory analytical reports.
- ☐ Assessment of the groundwater data, bore logs and related hydrogeological information to determine whether sufficient information exists to ascertain the condition of the groundwater quality at the site.
- ☐ Assess whether the groundwater at the site is polluted with respect to the objectives of *SEPP Groundwaters of Victoria*.
- ☐ Inspection of the site and monitoring bores on 27 April 2004.
- ☐ Preparation of an environmental audit report (this report).

The reports reviewed as part of this audit included:

Author	Date	Document Title
Radian International	23 December 1997	Nuplex Jennings Site – Assessment of Groundwater Data – Letter Report
Dr Peter Nadebaum of GHD Pty Ltd	1 September 2003	Environmental Audit, Nuplex Special Waste Pty Ltd, Findings and Recommendations – WORKING DRAFT ONLY

2.2 AUDIT CRITERIA

The adopted Audit Criteria used as a basis for comparison with the current state of knowledge on groundwater protection and the status of monitoring facilities and programs include:

- ☐ *Environment Protection Act 1970*
- ☐ *Water Act 1989*

- ☐ SEPP Groundwaters of Victoria, and related water quality guidelines
- ☐ EPA Licence EI 23855, notably conditions 10.1 to 10.5 inclusive, under the heading "Groundwater Monitoring Conditions" and condition 13.1(g) & (h) under the heading "Reporting Conditions".
- ☐ Draft guidelines for Hydrogeological Assessment (Water Quality) EPA (in preparation)

2.3 IDENTIFICATION OF HAZARD AND RISK

As this audit is a statutory audit being carried out in accordance with s53V of the *Environment Protection Act 1970*, it is necessary to first identify the activity potentially presenting a hazard and potential risk of harm to the relevant element and segment of the environment.

In this case these can be summarised as follows:

- ☐ *Segment of the environment:* Nuplex Environmental facility at 88 – 90 Ordish Road Dandenong South.
- ☐ *Industrial Activity:* Storage and treatment of Prescribed industrial Waste
- ☐ *Environment element(s):* Groundwater

It is also noted that the site is in close proximity to a number of other sites with potential to be sources of contamination of the local groundwater, including that beneath the Nuplex site.

3 COMPLIANCE WITH EPA LICENCE

Prior to discussing my findings in relation to the status of groundwater quality, it is relevant to make some comment on the compliance by the licensee with the licence conditions (this section of report), and the hydrogeological interpretations in relation to this site (the following section).

3.1 ANNUAL REPORTING

The current licence requires groundwater monitoring of seven bores at the site during February and July each year. The licence has a requirement for annual reporting of the monitoring data (Condition 13.1g) and for 'an assessment of the monitoring results specified in sub condition g' (Condition 13.1h).

Other than a letter report by Radian International dated 23 December 1997, there appear to have been no assessments, as required by Condition 13.1h.

It is understood that EPA proposes to amend the site licence to include conditions commonly applied on other Schedule 4 premises for annual review and auditing of groundwater protection status.

It is recommended that:

The EPA licence should be amended to require the compilation and reporting of all groundwater monitoring data (current and historic) each year.

The EPA licence should be amended to require an assessment of the groundwater monitoring results, and preparation of an environmental audit report on groundwater quality, by an EPA appointed environmental auditor, annually, or less frequently dependant on the assessed risk.

3.2 GROUNDWATER MONITORING BORE NETWORK

Groundwater monitoring bore locations are shown on Figure 2 and bore details in Table 3.1.

The current licence requires the licence holder to maintain and monitor seven groundwater monitoring bores at the premises (Condition 10.1). Monitoring at bores BH1 to BH4 commenced in 1990, and monitoring bores BH5 to BH7 were installed in 1993. BH2 was damaged at the end of 1996, and this bore has not yet been replaced.

Table 3.1 summarises the condition of the bores, observed during a site inspection by the Auditor on 27th April 2004. Table 3.2 summarises the construction details of the bores. There are no details on bore construction for bores BH1 to BH4.

The bores have 100 mm diameter PVC casing which is likely to be solvent-jointed.

Although not a condition of the current licence, it is now customary for EPA to require the reporting of the unique registered bore identifier for each bore in the monitoring records and on the plan of premises. There is no record of a unique registration number for each bore.

There is no record of a bore level survey to enable calculation of groundwater levels relative to a common datum such as Australian Height Datum (AHD). This is necessary to enable groundwater flow direction to be estimated.

It is evident that the bore network has not been established on the basis of a hydrogeological assessment. Therefore the appropriateness of the bore locations and depths is not fully justified in terms of the imperative for groundwater protection in this area. Such an assessment would identify all aquifers relevant to the protection of groundwater in this vicinity and recommend an appropriate monitoring network (see discussion in Section 4)

Table 3.1: Monitoring Bore Condition

Bore no.	ID on bore	Bore Locked	Casing type	General Condition
BH1	No	No	100 mm Class 12 uPVC	Located in the external slope of the Tank Farm bund. No cap. PVC stand pipe broken below ground level. Sample integrity may be compromised by soil or water entering the inner casing.
BH2				Plan shows it located on the southern end of the tank Farm bund. Destroyed late 1996, not yet replaced.
BH3	No	No	100 mm uPVC sewer pipe	Located with cap below ground level but without a protective "road box". PVC cap broken leaving bore unsealed. Sample integrity may be compromised by soil or water entering the inner casing
BH4	No	No	100 mm Class 12 uPVC	Located in Teris' site. Difficult to access due to plant and equipment stored nearby.
BH5	No	No	100 mm uPVC sewer pipe	Located in vehicle parking area. Collar pipe/stand pipe bent. Inspection of the water surface revealed paper floating on water; a plastic bottle of "oily" appearance was noted jammed between the outer and inner casing.

Bore no.	ID on bore	Bore Locked	Casing type	General Condition
BH6	Yes	No	100 mm uPVC sewer pipe	Located beside driveway.
BH7	Yes	No	100 mm uPVC sewer pipe	Located beside driveway.

The available information on the design of the bores indicates a number of deficiencies compared with guidelines for good practice in groundwater monitoring:

- ☐ Shallow depth of the bores may be inadequate to monitor the groundwater regime at the site. However it is noted that Condition 10.1 of the EPA licence implies the use of such shallow bores.
- ☐ Large diameter (100 mm) casing is inconsistent with best practice for obtaining representative water samples by standard purge or minimum purge methods. Minimisation of bore volume is desirable, and 50 mm diameter is the norm.
- ☐ Use of solvent joint PVC presents a potential source of sample contamination by the solvent used, especially if it contains the compounds potentially present in the source of groundwater contamination.
- ☐ Lack of bore survey data prevents interpretation of groundwater flow direction.
- ☐ The height/length of the "stick up" of the bore casing above ground is not recorded.
- ☐ The registered bore number (under *Water Act 1989*) for the bores are not known. EPA would usually require these numbers to be used in conjunction with local nomenclature to report groundwater data
- ☐ It is concluded that the bore network is inadequate and, on the basis of a comprehensive hydrogeological assessment, would require significant upgrade.

Table 3.2: Monitoring Bore Construction Details

Local ID	ID	Ground Elevation (m AHD)	Top of Casing Elevation ³ (m AHD)	Constructed Depth (m bgl)	Screened interval (m bgl)	Filter pack interval (m bgl)	SWL (m bTOC) 19/2/2004
BH1	nk	nk	nk	nk	nk	nk	3.12
BH2	nk	nk	nk	nk	nk	nk	destroyed
BH3	nk	nk	nk	nk	nk	nk	1.90
BH4	nk	nk	nk	nk	nk	nk	3.06
BH5	39043 ¹	nk	nk	5.5	2.5-5.0	2.0-5.5	1.28
BH6	39043	nk	nk	5.5	2.5-5.0	2.0-5.5	3.88
BH7	39043	nk	nk	5.5	2.3-4.8	2.0-5.5	2.07

¹ BCL – Bore Construction Licence
² Top of PVC Pipe
 nk = not known
 m bTOC – m below top of PVC casing

*It is **recommended** that:*

The ground surface and top of casing on all current bores should be surveyed for position relative to AMG and level relative to Australian Height Datum (AHD). The height of casing stick up (both PVC and steel) should be measured and recorded. A survey plan showing the locations of BH1 to BH7 should be produced.

A hydrogeological assessment be carried out to identify the aquifers, groundwater occurrence and flow, the quality of natural groundwater and potential sources of contamination, and to recommend, in consultation with an EPA Auditor, a permeant groundwater monitoring network for the site.

The installation of any new bores should be under the direction of a suitably qualified and experienced hydrogeologist and all bores are developed thoroughly.

All bores should be registered with of the relevant Water Authority in accordance with the requirements Water Act 1989.

The bore logs and bore construction details should be recorded and provided to the Auditor in a tabulated format and that future annual reports include the bore numbers, as well as the unique registration numbers, and other information relating to bore construction and survey data.

The unique bore registration number should be recorded on all reports of groundwater data.

Measures are required to ensure that monitoring bores are made secure, are clearly identified and accessible, and the casing and protective caps are secure and locked.

3.3 GROUNDWATER CHEMISTRY MONITORING

Conditions 10.1 and 10.3 of the licence require monitoring of seven groundwater bores during February and July each year and that the samples be tested for total petroleum hydrocarbons (TPH) and electrical conductivity (EC) by a NATA accredited laboratory.

The testing program completed to date is summarised in Table 3.3. Monitoring bores BH5, BH6, and BH7 were installed in December 1993.

Table 3.3: Groundwater Testing Program

Parameter	Apr 1990	Jul 1990 – May 1994	Mar 1995 – Aug 1995	Nov 1995 – Jul 1996	Feb 1997 – Jul 1998	Feb 1999	Jul 1999 – present
pH	✓	✓	✓	✓	✓	✓	
EC	✓	✓	✓	✓	✓	✓	✓
Cl	✓			✓	✓		
SO ₄	✓			✓	✓		
HCO ₃					✓		
Na				✓	✓		
Ca				✓	✓		
Mg				✓	✓		
NH ₃	✓				✓		
NO ₃	✓			✓	✓		
Cd	✓	✓	✓	✓	✓		
Cr	✓	✓	✓	✓	✓		
Cu		✓	✓	✓	✓		
Pb	✓	✓	✓	✓	✓		
Zn	✓	✓	✓	✓	✓		
Hg	✓	✓	✓	✓	✓		
TRH			✓	✓	✓	✓	✓

The review shows:

- ☐ There is no evidence of a sampling / monitoring plan, formal data quality objectives or quality control (apart from the laboratory internal QC).
- ☐ It is unclear in the summary tables which form or species is reported for some parameters - notably bicarbonate (as HCO₃ or CaCO₃), sulphate (as SO₄ or S), and nitrogen species (reported as N or NH₃),
- ☐ The parameters tested may not reflect all the potential contaminants of concern, and there is no assessment report to justify the monitoring program design.

The monitoring could be improved by:

- ☐ Adoption of a groundwater monitoring program based on the findings of a comprehensive hydrogeological assessment (see section 4)
- ☐ Testing for a wider suite of parameters, agreed with the Auditor and following a hydrogeological assessment, for at least three monitoring events.
- ☐ Preparing and using a Data Quality Plan or Work Plan that specifies the procedures to be used, records to be kept and the parties responsible, such that the monitoring is undertaken in accordance with EPA guidelines
- ☐ Maintaining field records to demonstrate conformance with the Work Plan
- ☐ Chain of Custody records to demonstrate the integrity of the samples.

The following recommendations are made on the basis of these findings.

It is recommended that:

The contractor responsible for the monitoring program provide a Work Plan / Data Quality Plan to document the monitoring programs, procedures and records to be generated by the program.

The licence and premises plan be kept current to include any newly installed and replacement bores.

The report provided by the monitoring contractor, including the groundwater sampling field sheets and sample Chain of Custody be provided after each monitoring event.

The reporting of test results (and any summaries or plots of same) clearly state the species reported (e.g. NO_3 as N or NO_3 as NO_3 , HCO_3 or HCO_3 as CaCO_3).

The EPA licence conditions be amended to include a requirement for selected groundwater samples to be tested for a suite of analytes agreed with the Auditor following the hydrogeological assessment, for at least three sampling rounds, with the view to revising the number of analytes to be tested subject to monitoring results.

3.4 GROUNDWATER LEVEL MONITORING

Condition 10.5 of the licence requires groundwater levels be measured and recorded on each occasion that samples are obtained. Water level measurements since March 1995 are reported as "water depth" in metres.

This is not sufficiently specific to allow interpretation by a hydrogeologist. The correct terminology is "Standing Water Level" and whether the measurement is relative to Top of Casing or Below Ground Surface should be recorded. The relative level is referred to as "Reduced Water Level" and is calculated from the known level of the "Point of Measurement" relative to AHD.

It is recommended that:

Water levels continue to be measured every six months and the licence be amended to require the level reported as Standing Water Level (SWL) in metres below ground surface, and also below the surveyed measurement point on the bore casing, and reported as both SWL and Reduced Water Level relative to Australian Height Datum (AHD).

4 HYDROGEOLOGICAL DATA & INTERPRETATION

4.1 HYDROGEOLOGICAL ASSESSMENT

Characterisation of the hydrogeological setting of any site subject to groundwater monitoring is essential to the design and review of the monitoring network and program. The Auditor has seen no evidence of a comprehensive hydrogeological assessment having been undertaken at the site.

The lack of groundwater elevation data for all bores, and the absence of completion reports for bore BH1 to BH4 limits the Auditors ability to make other than preliminary comments on the site hydrogeology.

The Cranbourne 1:63,360 Geological Map indicates the site is located on Quaternary clayey floodplain or swamp sediments that overly sand, silty sand and clay of the Brighton Group. It is not clear whether the bores monitor groundwater in the fine grained Quaternary surficial sediments, or the deeper, more sandy, Brighton Group aquifer. The water table occurs at

approximately 2m below ground level. Groundwater may flow toward the creek located 400 m west of the site, although seasonally flow may be limited due to the shallow groundwater depth and low gradient. It is noted that the Radian report suggests that groundwater flow may be north-west to south-west. The shallow groundwater level and the position in the landscape suggest there may be an upward groundwater flow from the Brighton Group, with seasonal groundwater discharge by evapotranspiration and to surface water in the vicinity. A hydrogeological assessment needs to cover this aspect as this impacts on the likely contaminant movement and vertical distribution. It should be expected that an outcome from a comprehensive hydrogeological assessment will be the recommendation to install a number of additional new monitoring bores. Such assessment will require the drilling of at least 3 or 4 investigation bores which may be appropriate to convert to monitoring bores.

Given the number of sites in the immediate vicinity with potential to be sources of contamination of the local groundwater, including that beneath the Nuplex site, a hydrogeological assessment of wider coverage would provide valuable information on sub-regional hydrogeological conditions and groundwater quality in the Ordish Road area. However this is a matter for EPA to consider in light of information from a number of sites in the area, including Nuplex.

It is recommended that:

A hydrogeological assessment be carried out to identify the aquifers, groundwater occurrence and flow, the quality of natural groundwater and potential sources of contamination, and to recommend, in consultation with an EPA Auditor, a permanent groundwater monitoring network for the site. The hydrogeological assessment should be undertaken in accordance with the Draft EPA Hydrogeological Assessment Guidelines.

4.2 GROUNDWATER LEVEL INTERPRETATION

The groundwater depth below top of PVC pipe (recorded on MGT field sampling sheet) was between 1.28 m (bore BH5) and 3.88 m (bore BH6) in the most recent monitoring event (February 2004). However without casing stick up and level survey data it is not possible to determine the groundwater flow direction.

Future monitoring reports should include graphical representation of groundwater levels and elevation over time, as well as the tabulated data.

It is recommended that:

The annual monitoring report include tabulated SWL and RWL, graphs of RWL versus time and groundwater RWL contour plans.

4.3 GROUNDWATER QUALITY INTERPRETATION

Nuplex provided the Auditor with groundwater monitoring data collected at the site from April 1990 to February 2004. This was also provided in a MS-Excel spreadsheet. No previous interpretation of groundwater quality and/or trends had been carried out apart from the Radian report of 1997

The following comments are offered as preliminary findings:

- ☐ Salinity is measured as electrical conductivity with units uS/cm. Salinity (as mg/L TDS) has not been measured, preventing accurate assignment of the groundwater to a protected segment under SEPP Groundwaters of Victoria.
- ☐ Electrical conductivity values recorded at the site (1,400 – 11,000 uS/cm) vary between bores and in some bores vary significantly over time (eg BH7). The reason

for these fluctuations requires further evaluation as part of the hydrogeological assessment.

- ❑ Testing of organic analytes has been limited to Total Petroleum Hydrocarbons (TPH). A GCMS "fingerprint" analysis carried out on a groundwater sample from BH1 in 1999 indicated that TPH detected would most likely be diesel or kerosene. This needs further investigation to ascertain the likely source and provide for groundwater protection.
- ❑ TPH concentrations in bores BH1, BH3 and BH7 have fluctuated and do not show a trend, although consistent concentrations are generally greater than pre-1998 results. Fluctuating trends may be related to fluctuating water table (due to the presence of separate phase in the "smear zone" above the water table), although this requires further investigation.
- ❑ Testing of inorganic analytes has been limited to the monitoring rounds between 1995 and 1998. During these monitoring rounds selected metals, anions and cations were tested. A full suite of metals, anions and cations has not been tested for sufficient period to establish trend, and further such testing is required, subject to hydrogeological assessment.
- ❑ Groundwater quality diagrams, such as Piper Diagrams or Schoeller Plots, would assist in the interpretation of groundwater chemistry at the site. This can be addressed in the hydrogeological assessment.

It is recommended that:

The licence be amended to specify that the EPA and Auditor are provided with all groundwater monitoring results in a suitable electronic format.

Selected groundwater bores be tested for a wide range of analytes, such as those included in an "Auditor's screen", in the next three monitoring rounds.

TDS is measured in mg/L in the laboratory.

All groundwater bores are gauged using an interface probe to detect any separate phase (i.e. light or dense non-aqueous phase liquids) that may be present in the bore.

5 GROUNDWATER PROTECTION STATUS

This section provides the Auditor's response to the principal aspect of the audit brief, which is to verify whether groundwater is protected at the premises with regard to the objectives set out in *SEPP Groundwaters of Victoria*.

5.1 BENEFICIAL USES OF GROUNDWATER

Table 5.1 presents the classification of beneficial uses of groundwater protected in accordance with *SEPP Groundwaters of Victoria*.

Table 5.1 Protected Beneficial Uses of Groundwater Segments

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1,000)	B (1,001-3,500)	C (3,501-13,000)	D (greater than 13,000)
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water supply – <i>Desirable</i>	✓				
Potable water supply – <i>Acceptable</i>		✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks & gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (eg. Bathing, swimming)	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

Based on the information from the South Western Victoria 1:500,000 beneficial use mapsheet, the background groundwater salinity could be in Segment B or Segment C (DCNR, 1995).

Data from the most recent monitoring event reports groundwater conductivity between 1,400 uS/cm and 11,000 uS/cm (approximately 910 mg/L to 7,150 mg/L TDS¹). Lower salinities in parts of the site (bores BH3, BH5 and BH7) correlate with shallow groundwater depth may indicate preferential recharge in these areas. ✓

Based on the available information the site should be classified as Segment B groundwater; however, this requires confirmation in the recommended hydrogeological assessment.

In assessing whether the beneficial uses of the groundwater are protected the Auditor has applied the water quality guidelines applying to the assessment of groundwater contamination in Victoria as specified in Table 3 of the *SEPP Groundwaters of Victoria*.

5.2 GROUNDWATER PROTECTION ASSESSMENT SUMMARY

Tables 5.2 & 5.3 provide a summary of results from the most recent monitoring rounds in comparison to the SEPP criteria. In assessing the protection status of groundwater, all beneficial uses protected under Segment B must be considered.

Table 5.3 shows that the limit of reporting is greater than the guideline value for maintenance of ecosystems for some parameters. Future testing needs to be to an appropriate level of reporting to allow an assessment against application criteria.

The assessment present in Table 5.4 against each beneficial use is preliminary, and requires confirmation following the comprehensive hydrogeological assessment.

Further assessment is required to determine whether the site is, or has been, a source of

¹ Using the conversion TDS (mg/L) = 0.65 * EC (uS/cm)

organic and/or inorganic contaminants, as well as to determine whether neighbouring offsite landuses and activities impact on groundwater beneficial uses at the site.

An assessment of whether groundwater is polluted with respect to metals, requires determination of background metals concentration in the recommended hydrogeological assessment.

Table 5.2 Summary of Groundwater Results (February 2004)

Parameter	unit	Water Quality Criteria			Bores					
		ANZECC 2000 Maint. of Aquatic Ecosystems	ANZECC 1992 Raw water - drinking	ANZECC 1992 Stock watering	BH1	BH3	BH4	BH5	BH6	BH7
EC	uS/cm				11000	2000	10000	2000	7500	1400
TDS	mg/L	-	1000	3000	7150	1300	6500	1300	4875	910
Total TPH	ug/L	-	-	-	1470	970	<300	600	280	240

¹ TDS calculated as 0.65 x EC (uS/cm)

Table 5.3 Summary of Groundwater Results - Metals (July 1998)

Analyte	Water Quality Criteria			Bores (mg/L unless otherwise shown)					
	ANZECC 2000 Maintenance of aquatic ecosystems	ANZECC 1992 Raw water - drinking	ANZECC 1992 Stock watering	BH1	BH3	BH4	BH5	BH6	BH7
Cadmium	0.0002	0.005	0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	0.0033	0.05	1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Copper	0.0014	1.0	0.5	0.23	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	0.0034	0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	0.0006	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	0.008	5.0	20.0	1.3	<0.05	0.18	0.15	0.19	0.23

Table 5.4 Summary of Preliminary Groundwater Pollution Assessment

Beneficial Use Category	Protected Beneficial Uses of this Segment of groundwater	Polluted	Existing Use	Likely Use	Un-likely Use	Comment
Maintenance of Aquatic Ecosystem	✓	ND		✓		Groundwater flow direction is not known. Assuming groundwater flow direction, the nearest potential receiving body is Dandenong Creek, approximately 400 m west of the site.
Potable Water Supply						Not a protected beneficial use for this segment
Potable Mineral Water						It is not a mineral water or a recognised mineral water province, therefore this is not a protected beneficial use.
Agriculture, Parks & Gardens	✓	ND			✓	The expected low bore yield and high cost of a bore for this use, as well as the presence of a reticulated water supply, elevated groundwater salinity and industrial setting make this use unlikely.
Stock Watering	✓	ND			✓	The industrial setting and land planning scheme make this use unlikely.
Industrial Water use	✓	ND			✓	The expected low bore yield and high cost of a bore for this use, as well as the presence of a reticulated water supply, elevated groundwater salinity and industrial setting make this use unlikely.
Primary Contact Recreation	✓	ND			✓	The expected low bore yield and high cost of a bore for this use, as well as the presence of a reticulated water supply, elevated groundwater salinity and industrial setting make this use unlikely.
Buildings & Structures	✓	ND		✓		The shallow water table depth makes interaction likely.

ND = Not Determined

*It is **recommended** that:*

A further assessment of the protection status of the groundwater be made by an Auditor following the recommended Hydrogeological Assessment.

The Auditor be consulted prior to any works carried out to investigate the hydrogeological conditions at the site and/or works carried out to upgrade the current groundwater monitoring program.

6 CONCLUSIONS & RECOMMENDATIONS

My conclusion, in relation to whether the groundwater quality objectives of the *State Environment Protection Policy* are being met, is that the groundwater quality at the premises **cannot be determined**. My reasons for this conclusion are as follows:

- ☐ No hydrogeological assessment has been undertaken at the site, hence the relevant aquifers, groundwater occurrence, flow direction and rates, or background chemistry and potential sources of contamination are not assessed;
- ☐ Given the evidence of site history and that of the surrounding area, the groundwater at the site has not been tested for a sufficiently comprehensive suite of potential contaminants;
- ☐ Details on the existing groundwater monitoring bore network, including bore construction details, survey location and elevation, and records of bore development, are inadequate and the bore network will require upgrade on the basis of a Hydrogeological Assessment, after consultation with the Auditor;
- ☐ Records of sampling plan, field procedures, QA/QC and data validation are lacking.

The Auditor makes the following summary recommendations for further work to address the identified deficiencies and allow determination of the groundwater quality:

- ☐ Investigate the hydrogeological conditions at the site, through a comprehensive hydrogeological assessment;
- ☐ Investigate the groundwater quality status at the site through an upgraded groundwater monitoring program, and amend the EPA licence to reflect any relevant changes; and
- ☐ Conduct a further assessment of the groundwater protection status by an EPA appointed Auditor.

Table 6.1 provides the specific recommendations, summarised under the relevant headings.

Table 6.1 Recommended Measures

Aspect	It is recommended that ...
Annual reporting	1. The EPA licence should be amended to require the compilation and reporting of all groundwater monitoring data (current and historic) each year. 2. The EPA licence should be amended to require an assessment of the groundwater monitoring results, and preparation of an environmental audit report on groundwater quality, by an EPA appointed environmental auditor, annually, or less frequently dependant on the assessed risk.

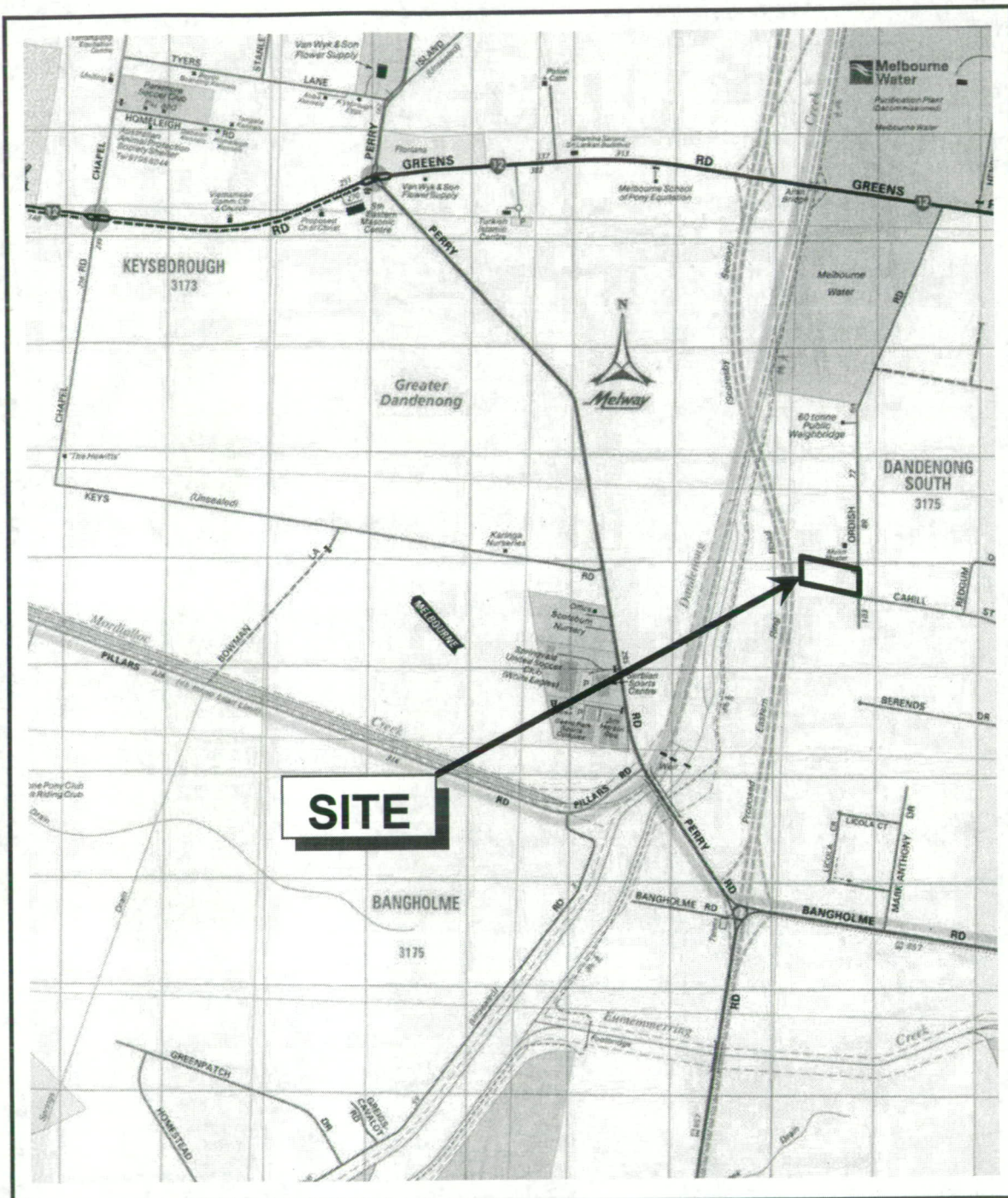
Aspect	It is recommended that ...
Groundwater monitoring bore network	3. The ground surface and top of casing on all current bores should be surveyed for position relative to AMG and level relative to Australian Height Datum (AHD). The height of casing stick up (both PVC and steel) should be measured and recorded. A survey plan showing the locations of BH1 to BH7 should be produced. 4. A hydrogeological assessment be carried out to identify the aquifers, groundwater occurrence and flow, the quality of natural groundwater and potential sources of contamination, and to recommend, in consultation with an EPA Auditor, a permeant groundwater monitoring network for the site. 5. The installation of any new bores should be under the direction of a suitably qualified and experienced hydrogeologist and all bores are developed thoroughly. 6. All bores should be registered with of the relevant Water Authority in accordance with the requirements Water Act 1989. 7. The bore logs and bore construction details should be recorded and provided to the Auditor in a tabulated format and that future annual reports include the bore numbers, as well as the unique registration numbers, and other information relating to bore construction and survey data. 8. The unique bore registration number should be recorded on all reports of groundwater data. 9. Measures are required to ensure that monitoring bores are made secure, are clearly identified and accessible, and the casing and protective caps are secure and locked.
Groundwater chemistry monitoring	10. The contractor responsible for the monitoring program provide a Work Plan / Data Quality Plan to document the monitoring programs, procedures and records to be generated by the program. 11. The licence and premises plan be kept current to include any newly installed and replacement bores. 12. The report provided by the monitoring contractor, including the groundwater sampling field sheets and sample Chain of Custody be provided after each monitoring event. 13. The reporting of test results (and any summaries or plots of same) clearly state the species reported (e.g. NO₃ as N or NO₃ as NO₃, HCO₃ or HCO₃ as CaCO₃). 14. The EPA licence conditions be amended to include a requirement for selected groundwater samples to be tested for a suite of analytes agreed with the Auditor following the hydrogeological assessment, for at least three sampling rounds, with the view to revising the number of analytes to be tested subject to monitoring results.

Aspect	It is recommended that ...
Groundwater Level Monitoring	15. Water levels continue to be measured every six months and the licence be amended to require the level reported as Standing Water Level (SWL) in metres below ground surface, and also below the surveyed measurement point on the bore casing, and reported as both SWL and Reduced Water Level relative to Australian Height Datum (AHD).
Hydrogeological Assessment	16. A hydrogeological assessment be carried out to identify the aquifers, groundwater occurrence and flow, the quality of natural groundwater and potential sources of contamination, and to recommend, in consultation with an EPA Auditor, a permanent groundwater monitoring network for the site. The hydrogeological assessment should be undertaken in accordance with the Draft EPA Hydrogeological Assessment Guidelines.
Groundwater Level Interpretation	17. The annual monitoring report include tabulated SWL and RWL, graphs of RWL versus time and groundwater RWL contour plans.
Groundwater Quality Interpretation	18. The licence be amended to specify that the EPA and Auditor are provided with all groundwater monitoring results in a suitable electronic format. 19. Selected groundwater bores be tested for a wide range of analytes, such as those included in an "Auditor's screen", in the next three monitoring rounds. 20. TDS is measured in mg/L in the laboratory. 21. All groundwater bores are gauged using an interface probe to detect any separate phase (i.e. light or dense non-aqueous phase liquids) that may be present in the bore.
Groundwater Protection Assessment Summary	22. A further assessment of the protection status of the groundwater be made by an Auditor following the recommended Hydrogeological Assessment. 23. The Auditor be consulted prior to any works carried out to investigate the hydrogeological conditions at the site and/or works carried out to upgrade the current groundwater monitoring program.

7 REFERENCES

1. Radian International (1997). Nuplex Jennings Site, Assessment of Groundwater Data, Letter Report, 23 December 1997.
2. Nadebaum, P. (2003). Environmental Audit, Nuplex Special Waste Pty Ltd, Findings and Recommendations (Draft Only). EPA Victoria, Southbank, Australia, 1 September 2003.
3. DCNR (1995) Victorian Groundwater Beneficial Use Map Series, South Western Victoria Water Table Aquifers. Department of Natural Resources and Environment.

FIGURES



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Figure 1: SITE LOCALITY

Nuplex Environmental
Environmental Audit Report
Groundwater Quality
88-90 Ordish Road, Dandenong South, Vic



FIGURE 2: SITE PLAN AND
Nuplex Environmental
Groundwater Quality

**ABOUT ENVIRONMENTAL AUDITOR
REVIEW REPORTS**

About Environmental Auditor Review Reports

The Environmental Assessment/Review Report by Lane Consulting is prepared for the client, the EPA and the Local Planning Authority (as applicable) for determining the contamination status of the site (soil and/or groundwater). The report is not intended for use by other parties or for other purposes. Use of the report by other parties or for purposes other than specified is at their own risk.

The report assumes that the site would only be used for one or more of the land uses existing or permitted suitable.

The Client at their discretion may implement the recommendations made in the report. However, the Auditor and Lane Consulting accept no liability for the costs incurred in the implementation of such recommendations.

The report provides a snapshot of the site conditions at the time of the site investigation/review. Consequently, the report may not be valid at a later time if there is any prospect of any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed since the assessment.

The Environmental Auditor Review is necessarily limited by constraints such as time, cost and available information; although normal auditing practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified or suspected as the result of a competent investigation and assessment.

The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the Report, the Auditor should be permitted to make an interpretation of these facts in relation to the Audit Report. Consequently, the Client should inform the Auditor and seek his opinion. The Auditor and Lane Consulting accept no liability for costs incurred due to such unexpected occurrences, given the inherent uncertainties in the assessment process.

The Auditor uses information provided by the Assessor as the basis for the assessment, and while reliance on this information is at the Auditor's discretion, he cannot guarantee any of the facts, findings or conclusions as presented by the Assessor. Further, the Auditor will not be liable for the use of information, provided by others and accepted in good faith, which is subsequently found to be intentionally misleading.

In reviewing the work of other consultants and so far as we provide opinions on any deficiencies in that work, we note that Lane Consulting is not necessarily privy to the instructions given by a client to other consultants. Such opinions are offered in good faith and on the basis of the evidence provided.

The Report is not and does not purport to be anything other than a contaminated land (and groundwater) review report. It is not a geotechnical report and bore logs produced (in most cases by the Assessor) are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The Audit Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Lane Consulting