

KOWHAI TIMBER (1990) LIMITED

**SOIL CONTAMINATION INVESTIGATION
MATAKANA VALLEY ROAD ROAD,
MATAKANA**

CONFIDENTIAL

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DISCLAIMER

No liability is assumed for misrepresentation of data or for items not visible, accessible or present at the time of the site investigations conducted by Groundwater and Environmental Services that may affect the validity and/or accuracy of the interpretation of environmental data. Interpretations and conclusions presented herein are based on data presented in this report, information from others and experience on similar projects. The available data does not preclude the presence of materials at other locations at the site, which presently or in the future may be considered hazardous. Services in respect of this investigation have been performed in accordance with professional standards for investigations of contamination assessment. No guarantees are either expressed or implied. This document and the information contained herein have been prepared for the use of Kowhai Timber (1990) Limited. Any reliance on this report by any other parties shall be at such party's sole risk.

1 Introduction

There has been a sawmill on the property at 362 Matakana Valley Road since 1947 and timber treatment has been carried out there since approximately 1950.

Auckland Regional Council (ARC) had previously identified contamination with copper, chromium and arsenic in near surface soils around the timber treatment plant. Additional investigation of the site was requested by ARC to determine the nature and extent of the contamination.

Following a review of ARC files and other background information relating to the property, shallow soil and sediment samples were taken from across the property, concentrating on the area around the CCA timber treatment plant. Water samples were also taken from the stream immediately upstream and downstream of the treatment plant. The historical information, sampling and results are detailed in this report.

1.1 Scope

This investigation was primarily designed to assess the nature and extent of near surface soil contamination relating to CCA timber treatment and storage activities at the site. The work for this investigation involved:

- Walkover site inspection of the entire property owned by Kowhai Timber (1990) Limited;
- Review of files relating to the property held by Auckland Regional Council;
- Discussions with the site owner about present and past site operations;
- Discussions with Mobil Oil (NZ) Limited about the past removal of an underground diesel storage tank from the sawmill area of the site;
- Review the 1997 site assessment carried out for Mobil Oil (NZ) limited;
- Collection of 17 shallow soil samples from the area around the CCA timber treatment plant and analysing them for total recoverable arsenic, total chromium (Cr(III) and Cr(VI)) and copper;
- Analysing 2 of the above samples for Chromium VI;
- Collecting 2 surface water samples from the larger of the two small streams beside the CCA timber treatment plant (one upstream of the plant and one downstream) and analysing them for total arsenic, chromium and copper;
- Collecting 2 soil samples from the sawmill for analysis for CCA, boron, pentachlorophenol and tetrachlorophenol; and
- Reporting on findings and recommending further actions.

1.2 Site Contamination – Relevant Guidelines

A range of guidelines have been published, against which site contaminant concentrations can be compared to determine the degree of risk that they present to human health and the environment. Values have also been published for the normal range of concentrations of inorganic parameters in soils from the Auckland Region. These are discussed in the following sections.

1.2.1 Guidelines for the Protection of Human Health

The most relevant guidelines for assessing this site in terms of human health issues for the site are the "Health and Environmental Guidelines for Selected Timber Treatment Chemicals (Ministry for the Environment/Ministry of Health, 1997).

These guidelines were designed to allow the application of a risk-based approach specifically for the assessment and management of sites contaminated by timber treatment operations. The guidelines for unpaved commercial/industrial land are considered to be the most appropriate for use in assessing this property as there is no intention to change the land use.

The timber treatment guidelines stipulate allowable levels in soil for different land use activities as summarised in the following table.

Soil guideline values for land use classes (mg/kg)

Contaminant	Residential (10% home grown produce)	Industrial/Commercial			Maintenance
		Unpaved	Paved, no management plan ¹	Paved, with management plan ²	
Arsenic	30	500	650	2,500-NL ³	650
Boron	3(Soluble)	NL	NL	NL	NL
Chromium III	600	NL	NL	NL	NL
Chromium IV	25	360	510	1,800-NL	510
Copper	130	NL	NL	NL	NL
Pentachlorophenol	7	570	1000		1000

Notes:

1. Guidelines based on the requirement for the protection of maintenance workers.
2. Guidelines for paved sites range from a five-fold protection factor applied to the criteria for unpaved sites to a not limited situation where the management plan ensures appropriate protection of workers and the integrity of the paving or capping.
3. NL denotes not limited.

1.2.2 Environmental Quality Guidelines

In accordance with ARC protocols, the Canadian Environmental Quality Guidelines (Canadian Council of Ministers of the Environment (1999)) are used for contaminated site assessment.

These guidelines provide goals for the quality of atmospheric, aquatic, and terrestrial ecosystems that should result in negligible risk to biota, their functions, or any interactions that are integral to sustaining the health of ecosystems and the designated resource uses they support.

The CCME guidelines for industrial soil and freshwater aquatic life are presented in the table below.

Contaminant	Aquatic life, Fresh Water (mg/l)	Sediment Fresh Water (PEL) (mg/kg)	Soil Industrial Use (mg/kg)
Arsenic	0.005	17	12
Boron	0.005		-
Chromium		90	87
Chromium (III)	0.0089		
Chromium (VI)	0.001		1.4
Copper	0.002 – 0.004	197	91
PCP	0.0005		7.6

ANZECC¹ guidelines are also used when assessing issues associated with contaminated water. The fresh water guideline values for the protection of 95% of species (slightly to moderately disturbed systems) are presented below. The guideline trigger values given are indicative of potential problems only and site-specific factors should be taken into account in considering any sampling results.

Contaminant	Trigger value (mg/l)
Arsenic	0.024
Chromium (III)	0.0002
Copper	0.0014

1.2.3 Use of Contamination Guidelines

A comparison of guidelines with actual site contamination provides guidance on the potential risks presented by the site contamination. The need for remediation is established by evaluating the actual risk on a site-specific basis. Factors involved in this evaluation include the physical and chemical characteristics of the contaminants, their toxicity, and the ease of exposure of humans, plants and animals to contaminants in soil, air and water.

A key factor in this assessment is the intended land use. Higher contaminant concentrations are deemed acceptable at commercial/industrial sites because direct contact with contaminants is usually limited, a person's time at the site is usually limited to a working week, there is not usually any produce grown on such sites for human consumption, and opportunities for children to come into contact with contaminated soil are usually restricted.

¹ Australian and New Zealand Environment and Conservation Council, 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

1.2.4 Background Concentrations for the Auckland Region

Values for the natural background concentrations for a range of inorganic elements have been provided by ARC¹. The total recoverable concentration ranges for elements relevant to this investigation are provided in the Table below.

Element	Volcanic Derived Soils (mg/kg)	Non-Volcanic Derived Soils (mg/kg)	Local 205 / 201
Arsenic	0.4 - 12	0.4 - 12	1.36 - 2.63
Boron	<2 - 260	2 - 45	41.1 - 42.2
Chromium	3 - 125	2 - 55	38.3 - 20
Copper	20 - 90	1 - 45	29 - 35.3

2 Information about the Site

2.1 Site Description

Kowhai Timbers is located at 362 Matakana Valley Road, approximately 2 km northwest of the intersection between Matakana Road, Leigh Road and Matakana Valley Road. The property is bounded on the western side by Matakana Valley Road and to the north by the adjacent property. The Matakana River surrounds the remainder of the property.

The surrounding properties are predominantly rural in nature with the majority being farms. The property to the northeast, on the other side of Matakana River, houses a chicken farm.

2.2 Site Geology and Hydrogeology

The geology of the immediate area of the site is expected to be dominated by terrace deposits; including silts and clays. Information from Gary Ryan indicates that the site soils have very poor drainage, with significant ponding in depressions on the site common in both summer and winter. Large volumes of limestone fill have been placed on the property since 1990 to reduce the amount of standing water and mud and to allow better use of the working areas.

The observations by Gary Ryan and the materials encountered during the site sampling indicate that the materials beneath the site are likely to be relatively impermeable to water seepage and would be likely to restrict the movement of contaminants through the ground.

2.3 Walkover Site Inspection

A walkover inspection of the property was carried out to assist in planning the sampling programme. During the site walkover the property was checked for visual indications of contamination or potential causes of contamination. Particular attention was paid to the CCA timber treatment plant and its surroundings as the plant is

¹ Background Concentrations of Inorganic Elements in Soils from the Auckland Region, October 2001. Auckland Regional Council Technical Publication No. 153.

considered the most likely existing source of contamination on the property. The layout of the property is shown on Figure 1.

Observations from the site walkover are summarised below:

- The property has a number of buildings on it. The sawmill, workshop and a small house are located in the northern part of the property. Timber treatment, timber storage, planing, and sawdust collection buildings and offices occupy the southern part of the site;
- The timber treatment plant, covered drying pad and treated timber storage area are located adjacent to Matakana Valley Road between two streams that flow towards Matakana River. The stream to the south of the building had no flow in it at the time of the site inspection or later sampling. The stream to the north of the plant had very low flow or was stagnant during the site visits. Both streams originate on farmland to the west of Matakana Valley Road and are only likely to have significant flow during larger rainfall events;
- The timber treatment plant appears relatively unchanged from its probable original configuration. There is however a welded section at the rear of the vessel that has been added on. The plant is old but appears to be in good working order. A large collection sump is present beneath the rear of the vessel;
- A small volume of treated timber was stacked on the ground near the drying pad. This timber was treated on behalf of its owners and was awaiting collection;
- There was an area west of the existing sawdust collection shed, where untreated sawdust was formerly discharged and collected. A significant quantity of old sawdust remains in this area however there does not appear to be any recent material;
- Timber drying buildings on the property are heated by electricity;
- There is an aboveground diesel tank next to the workshop;
- Large quantities of logs are stored in the northern part of the property – there does not appear to be any treated timber stored outside of the treatment plant area.

2.4 Discussions with the Site Owner

Gary Ryan has owned the property since 1990. The following observations are compiled from a number of discussions with Gary Ryan over the course of the investigations:

- The property is currently on the market as a going concern;
- The sawmill deals mainly with native timbers (predominantly macrocarpa, swamp kauri and eucalypts) and the amount of treatment carried out is therefore limited;
- CCA treatment in the pressure vessel is currently the only form of treatment carried out at the property;
- Treatment is carried out infrequently (roughly on a monthly basis) with most treatment carried out on exotic timbers milled on nearby properties;

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- Treated timber is left in the pressure vessel overnight to allow most of the excess chemicals to remain in the treatment system. There is no requirement to vary this procedure as demands on the treatment plant are low;
- Treatment chemicals are supplied by Koppers Hickson and all waste sludge is also removed for disposal by them;
- The treated timber drying pad has been bunded and covered with a roof since Mr Ryan took over in 1990. Roof water is collected in a water tank located immediately south of the treatment plant;
- Water collected in the sump in the drying pad is discharged to the treatment plant sump;
- The eastern end of the timber treatment pressure vessel has been repaired at some stage, prior to Mr Ryan's ownership, following an incident when the end blew off the vessel during use. There would have been significant discharge of treatment chemicals to ground during this incident. The vessel was repaired and extended slightly to accommodate longer lengths of timber.
- Former owners are thought to have emptied the sludge from the treatment plant sump onto the adjacent ground at the southeast of the plant;
- Discharge from the drying pad was also thought to end up on the ground south of the plant;
- There was a boric treatment spray tunnel and associated sump in the former sawmill however this was not in use when the site was purchased in 1990. The spray tunnel was approximately 2 m long by 0.6 m wide by 1.5 m high with a conveyor running through it. It was located at the southeast corner of the mill and had trays and a sump under the outlet to collect drips. The area where the spray tunnel was located is now within the new sawmill and is covered in concrete;
- Relatives of the former owner/operator, Laurie Hodgetts, have stated that there was no PCP use at the site;
- Remediation of hydrocarbon contamination was carried out in 1996/97 by a contractor working for Mobil Oil (NZ) Limited (Mobil). The contractor removed an underground storage tank and removed contaminated soil from the mill area and south of the treatment plant. The hydrocarbon contamination immediately south of the treatment plant was from discharges from the treatment plant pump and motor;
- Sawdust from the planing building was formerly discharged to the southwest of the building and allowed to enter the Matakana River. Since taking over the property in 1990, a collection shed has been constructed to house sawdust from the planing building. The sawdust is sold to the public and none is deposited on the riverbank. The sawdust from the planing operations is untreated native timber.

2.5 Review of Auckland Regional Council Files

Files on the property held by ARC were reviewed at the Council premises. A number of contamination-related issues were identified in the files and these are summarised in the table below. The site file number is N108-30-0139.

Groundwater and Environmental Services

Type	Date	Summary
Site Visit	1/8/85	"Sawmill Products" – owner was Laurie Hodgetts.
ARWB Site Visit	19/12/90	Treatment plant used 2 times in last six months. Prior to new ownership it was used up to 3 times per week.
Sampling	17/12/91	Six samples taken.
Audit	29/7/96	Identified a number of issues including the CCA treatment plant, sawdust being pushed into the river, historic boric treatment at the mill site, and a complaint about mist emanating from the treatment plant.
Assessment	29/7/96	Exhaust from the pump motor causing oil contamination south of the treatment plant. Disused UST on site. CCA treatment at the site started in 1950. Pad outside treatment plant – CCA collected in a sump and <u>recycled from the sump during treatment but discharged to ground when finished.</u>
Note	3/3/97	Mobil contractor checked the UST to be removed. Oil contamination inside mill to be removed. Treatment pad to be roofed by June. No anti-sapstaining carried out – only boric treatment.
Letter	5/3/97	Kowhai Timber to ARC. Noted that the Mobil Contractor was a Mr Humphreys.
Pollution Complaint	29/9/97	Stated that waste was going down the river and a mist was coming from the pressure cylinder and drifting across the area. The council officer believed that the mist was likely to be the exhaust from the motor in the treatment plant.
Audit	7/11/00	Noted that owner was unaware of PCP use on site. Plant age is given as approximately 45 years. Volume treated is 3.5 m ³ per charge. CCA treatment used approximately 1 day per week. Gary Ryan is the only treatment plant operator. The original sawmill burnt down in 1997. Notes that the site is adjacent to the Matakana River Notes that the wife of the former owner (Mrs June Hodgetts) may have the old records from the plant. There is no record of prior environmental investigations. The drying pad had been bunded since the previous visit. Timber is stored in the vessel overnight to allow the treatment solution to drip into the vessel. Sludge from the process is collected for disposal by Hicksons. Samples were taken from the storage area and the southeast corner of the plant. All sawdust is now collected and sold The overflow from the treatment pad sump is recirculated to the treatment plant. Limestone has been used for extensive filling on the site.
Letter	4/4/01	Noted that a letter was to follow in mid-May with issues and actions to be taken.

2.6 Hydrocarbon Contamination Issues

Issues associated with actual and potential hydrocarbon contamination at the site have been dealt with previously in a 1997 report by Pattle Delamore Partners Limited (PDP)¹. The report by PDP is attached in Appendix A.

The report concluded that there were no health risks associated with remaining hydrocarbon-contaminated soil in the vicinity of the former diesel engine and Mobil storage tank in the sawmill. The report also noted that an earlier report on the removal of an underground storage tank from the property found no residual hydrocarbon contamination beneath the tank. No adverse environmental effects were anticipated from the remaining hydrocarbons in the soil and no additional investigation was recommended.

An earlier report by Mobil on the removal of the underground storage tank was unable to be located during this investigation. The report was apparently not found during a search of the Mobil archives and no copies were supplied to either Kowhai Timbers or Auckland Regional Council.

3 Site Sampling

Soil and water sampling at the site was focussed around the CCA treatment plant where previous evidence had indicated that there was significant contamination of the soils. A total of 19 soil samples were taken from this area. Two surface water samples were taken from the stream adjacent to the CCA treatment plant.

Samples were also taken from the area next to the location of the former boric spray tunnel and beneath the boric-treated timber drying area.

Sample locations were set out prior to sampling. The location of each site was recorded using offsets from existing site features. The sample dates, locations, numbers and types are provided in the table below. The sample locations are shown on Figure 2.

10 soil samples and 2 stream water samples were collected during the first round of sampling on 19 August 2003. Following a review of the initial sampling results, a further 9 soil samples were collected during a subsequent sampling round on 2 October 2003. 2 sediment samples were also collected in the second round of sampling. The second round of sampling was designed to better define the nature and extent of contamination detected in the first round and to extend the sampling to the stream sediment, sawmill area and former boric treated timber storage area.

¹ Pattle Delamore Partners Limited, June 1997. Report on Site Reconnaissance, Kowhai Timbers, Matakana. Report prepared for Mobil Oil (NZ) Limited.

Sample Information

Sample Location	Sample Date	Sample Number	Sample Type
1	19 Aug 03	KTL03001	Soil
2		KTL03002	Soil
3		KTL03003	Soil
4		KTL03004	Soil
5		KTL03005	Soil
6		KTL03006	Soil
7		KTL03007	Soil
8		KTL03008	Soil
9		KTL03009	Soil
10		KTL03010	Soil
11		KTL03011	Water
12		KTL03012	Water
13	2 Oct 03	KTL03013	Sediment
13		KTL03014	Sediment
8		KTL03015	Soil
9		KTL03016	Soil
17		KTL03017	Soil
18		KTL03018	Soil
19		KTL03019	Soil
20		KTL03020	Soil
21		KTL03021	Soil
22		KTL03022	Soil
23		KTL03023	Soil

3.1.1 Sampling Method

3.1.1.1 Soil Samples

In areas where there was vegetation, this was cleared away from the sample location prior to sampling. Excavation down to 100 mm below the ground surface was carried out at each site using either a stainless steel trowel or stainless steel core sampler.

The excavated material from each sample location was placed directly into a stainless steel mixing bowl where it was homogenised by mixing with a stainless steel spoon.

The samples were transferred from the bowls to sample jars supplied by the analytical laboratory. Material such as gravel with a grain size of larger than 20 mm was not generally included in the sample sent for analysis.

Once in the jars, samples were sealed and placed directly into a chilly bin and kept in cool storage prior to dispatch to the analytical laboratory (Hill Laboratories, Hamilton) under chain of custody (COC) documentation.

The samples were given a unique identification number according to the following system:

Client Identifier/Year Reference/Sequential Reference

The client identifier was KTL and the sequential reference was a 3-digit number starting at 001.

Sample KTL03017 was a composite sample, consisting of samples from three points across the former boric treated timber storage area. The samples were mixed together in a stainless steel mixing bowl prior to being put into the sample jars.

3.1.2 Equipment Decontamination

There was a decontaminated stainless steel trowel or corer, sample collection/mixing bowl, and spoon available for each sample location. These were decontaminated prior to use by rinsing in a potable water bath, washing in a solution of potable water and Decon 90 (a zero residue analytical detergent), and rinsing in another bath of potable water. The rinsing and decontamination baths were cleaned and refilled on a regular basis during the course of the fieldwork.

3.2 Material Descriptions

Geologic materials encountered during the sampling programme were described in terms of colour, nature, and particle size.

Attention was also paid to the presence of indicators of chemical contamination. Typical indicators include unusual colouring, chemical residues, refuse, and odours. A record of the sampling observations is provided in the following table.

Soil Sample Descriptions

Location	Depth Range	Sample Number	Description
1	0-100	KTL03001	By northwest corner of drying pad Minor medium brown topsoil over medium orange brown silty to clayey gravel
2	0-100	KTL03002	By southwest corner of drying pad Minor limestone gravel on ground surface. Light orange brown clay and angular greywacke gravel
3	0-100	KTL03003	By northwest corner of treatment plant Medium gray clay and angular gravel over light orange sandy silt
4	0-100	KTL03004	By northeast corner of treatment plant Medium to dark brown topsoil over light orange clay and angular gravels
5	0-100	KTL03005	Timber storage area Dark brown topsoil with abundant plant material over limestone gravel and medium orange clay
6	0-100	KTL03006	Timber storage area Dark brown topsoil with abundant plant material over limestone gravel and medium orange clay
7	0-100	KTL03007	East of timber storage area Dark brown topsoil with abundant plant material and occasional

			burnt wood over clay. Minor greywacke and limestone gravel
8	0-150	KTL03008	South of treatment plant Dark brown sandy topsoil with abundant plant material. Minor clay at the base of the sample
9	0-150	KTL03009	Southeast of treatment plant Minor dark brown topsoil over green-stained, weakly clayey sand. Clay increases with depth. Minor refuse mixed with the sandy material
10	0-260	KTL03010	Near stream bank, east of treatment plant Dark brown soft, organic-rich matting over orange silty sand with minor clay
13	0-170	KTL03013	In stream, east of treatment plant Sandy silt with organic material and plant matter
13	170-350	KTL03014	In stream, east of treatment plant Medium greenish-gray clayey silt
8	150-300	KTL03015	Deeper sample from Location 8 Medium orange-brown silty clay with minor greywacke rock
9	150-300	KTL03016	Deeper Sample from Location 9 Medium orange-brown silty clay
17	0-150	KTL03017	Former boric-treated timber storage area Composite sample of gravel and light to medium brown silty soil
18	0-150	KTL03018	East of mill and former sump location Medium gray, soft, silty clay with wood fragments and fibres. Gravel on ground surface
19	0-200	KTL03019	By northeast corner of shed by water tank (south of treatment plant) Dark brown topsoil with medium orange-brown clay beneath. Occasional plant material
20	0-200	KTL03020	Refuse area south of treatment plant Concrete, wire, plastic, wood, car parts, glass Very dark brown topsoil with abundant organic matter
21	0-200	KTL03021	2 m west of stream margin 10 cm of plant-rich topsoil over medium orange clay to 20cm
22	0-200	KTL03022	0.9 m east of treatment plant Light orange, weak to moderately clayey, sandy soil
23	0-200	KTL03023	Slope break above stream, 7.2 m east of treatment plant Medium to dark gray, plant-rich clayey soil with occasional gravel

4 Analytical Results

Analytical results for the soil investigations at the site are summarised in the following sections. The full text of the laboratory analytical reports is provided in Appendix B.

4.1 Summary of Analyses

The following table provides the analytical results from the soil and water samples taken during this investigation. Results that exceed the relevant MFE guidelines for unpaved or paved (no management plan) industrial/commercial sites and for the protection of maintenance workers have been highlighted.

Soil and Water Sample Analytical Results (mg/kg)

Sample Number	As	Cr(Total)	Cu	Cr(VI)	Boron	PCP	TCP
Soil Samples							
MFE Guidelines (industrial)	500	NL	NL	360	NL	570	-
MFE Guidelines (residential)	30	600	130	25	3(sol)	7	-
CCME Guidelines -	12	87	91	1.4	NL	7.6	-
ARC Background	0.4-12	3-125	20-90		42.2		
KTL03001	79	187	93				
KTL03002	404	405	268				
KTL03003	70	120	83				
KTL03004	425	304	354				
KTL03005	374	639	314				
KTL03006	257	289	233				
KTL03007	5	14	21				
KTL03008 s	3140	4710	3670				
KTL03015 s	324	327	198				
KTL03009 s	42300	21900	19100	<0.4			
KTL03016 s	1130	784	2000				
KTL03010	2770	2470	5460	<0.4			
KTL03013	17 (37)	90 45	147 25				
KTL03014	17 (103)	90 (408)	197 64				
KTL03017	49	72	62		90	<0.05	<0.05
KTL03018	27	43	67		<20	0.13	<0.05
KTL03019	2280	1850	2010				
KTL03020	10000	6000	6160				
KTL03021	2460	4130	2530				
KTL03022	56	63	38				
KTL03023	18	23	78				
Water Samples							
ANZECC Guidelines (95%)	0.024	0.0002	0.0014				
CCME	0.005	0.0089	0.004				
KTL03011	<0.001	0.0006	0.0007				
KTL03012	<0.001	<0.0005	0.0006				

Notes:

- 1 All values reported in mg/kg dry weight.
- 2 Bold values exceed MFE guideline values for unpaved or paved (no management plan) industrial/commercial sites and for the protection of maintenance workers.

4.2 Discussion of Soil and Sediment Analytical Results

4.2.1 CCA Treatment Plant Area

The analytical results for the soil and sediment samples from around the CCA treatment plant are shown on Figure 2. Each of the boxes on Figure 2 includes the sample number followed by the results for arsenic, chromium and copper in that order.

The highest concentrations of contaminants are located in the area immediately south and southeast of the treatment plant, extending down to near the edge of the stream. This area includes locations 8, 9, 10, 19, 20, and 21 which all have high concentrations of arsenic, chromium and copper. The arsenic levels in this zone exceed the MFE guidelines for industrial sites by factors of 4 to 84. The chromium and copper levels are also high however their concentrations are not limited in the MFE guidelines. Arsenic at the levels measured may present a significant risk to the health and safety of site workers.

The contaminant concentration appears to decrease significantly with increasing depth below ground. Samples were taken at two different depths at locations 8 and 9. The concentrations in the deeper samples (KTL03015 and KTL03016) were at least a factor of ten lower than those measured in the shallower samples (KTL03008 and KTL03009). This information suggests that the contamination is unlikely to have migrated to any great depth through the soils on the site and a relatively thin layer of 100 to 200 mm thick is likely to contain the majority of the contamination at levels above the relevant guidelines.

Contaminant concentrations are elevated in the remainder of the samples (with the exception of KTL03007) around the treatment plant and treated timber storage area. Although these concentrations are elevated, they are below the MFE guidelines for industrial sites and do not present any significant risk to the health and safety of site workers.

Two of the higher concentration samples (KTL03009 and KTL03010) were also tested for the more toxic hexavalent chromium (Cr(VI)). No Cr(VI) was present above the analytical detection limit.

4.3 Stream Sediment sampling

Two samples were taken from the stream immediately east of the highly contaminated zone identified above. The samples were from the same location with KTL03013 representing the upper depth range (sediment surface to 170 mm below) and KTL03014 representing the lower depth range (170 mm to 350 mm). The concentrations observed in the stream sediments were significantly lower than those in the area immediately to the west. Arsenic was elevated above the normal background in both the shallow and deep samples, with the deep sample having the higher concentration. Chromium was elevated above the normal background in only the deeper of the samples. The copper concentrations were within the normal background range.

Arsenic levels exceed the probable effect level from the CCME guidelines for both samples while chromium levels only exceed the guideline for the deeper sample.

The results of the sediment sample analysis suggest that higher concentrations of contamination entered the stream in the past than are currently entering. This would explain the lower contamination concentrations near the surface.

4.3.1 Mill and Boric Treated Timber Storage Areas

Sample KTL03017 from the former storage area for boric treated timber showed a level of boron of 90 mg/kg. Boron concentrations are not limited by the MFE industrial site guidelines and the low level measured here is therefore unlikely to have any significant effects on the health of site workers. PCP and TCP were not detected in this sample.

The sample KTL03018 was taken from east of the assumed location of the former sump beneath the sawmill. The arsenic, chromium and copper levels in this sample were below the MFE guidelines of industrial sites as well as being below the residential guidelines. Arsenic levels exceeded the CCME guideline value and the normal background range for Auckland soils however the chromium and copper levels were below both sets of guidelines.

No boron was detected in sample KTL03018 however there was some pentachlorophenol (PCP) detected. The PCP level was low and well within the guidelines for unpaved industrial sites and is therefore unlikely to have any significant effects on the health of site workers. No tetrachlorophenol (TCP) was detected in the sample.

4.4 Discussion of Stream Water Analytical Results

From the analyses of the 2 water samples, only the chromium level from sample KTL03011 exceeded any of the guidelines. The level of 0.0006 mg/l was above the ANZECC trigger level of 0.0002 mg/l but significantly below the CCME guideline value of 0.0089 mg/l.

This water sample was taken from the area immediately upstream of the treatment plant and may not be directly related to the operation of the plant. The sample taken from the stream just beside the most contaminated soil zone did not contain chromium at levels above the analytical detection limit.

5 Conclusions

Contamination by timber treatment chemicals (arsenic, chromium and copper) was measured in soils from around the treatment plant. Background information suggests that the majority of this contamination is likely to be a result of poor chemical handling and disposal practices by former owners of the site. Current site practices are unlikely to be contributing significantly to this contamination.

The arsenic levels in the zone south and southwest of the treatment plant (indicated on Figure 2) are significantly above the MFE timber treatment guideline levels for the protection of human health. There is a potential risk to site workers from these arsenic

concentrations if the material remains in place. This material also presents a risk of contamination of the stream that feeds into Matakana River.

There is evidence of contamination by timber treatment chemicals in the sediments of the adjacent stream. Higher contaminant levels at greater depths in the sediment imply that the majority of the contamination is related to past site activities. The sediment and soil contamination does not appear to be having a significant impact on the concentrations of contaminants in the stream water. Water samples taken when the stream was essentially stagnant did not reveal significant contamination in the area adjacent to the worst soil contamination.

The samples taken near the former location of the boric spray tunnel and the boric-treated timber storage areas did not reveal any significant contamination above relevant guidelines. A low concentration of PCP was however detected, indicating that some PCP was used on the site in the past.

6 Recommendations

On the basis of the analytical results and assumptions about the extent of contamination, it is recommended that the following actions be considered so that the property meets the criteria for an unpaved industrial/commercial site with no management plan and for the protection of maintenance workers:

Remediation and Validation

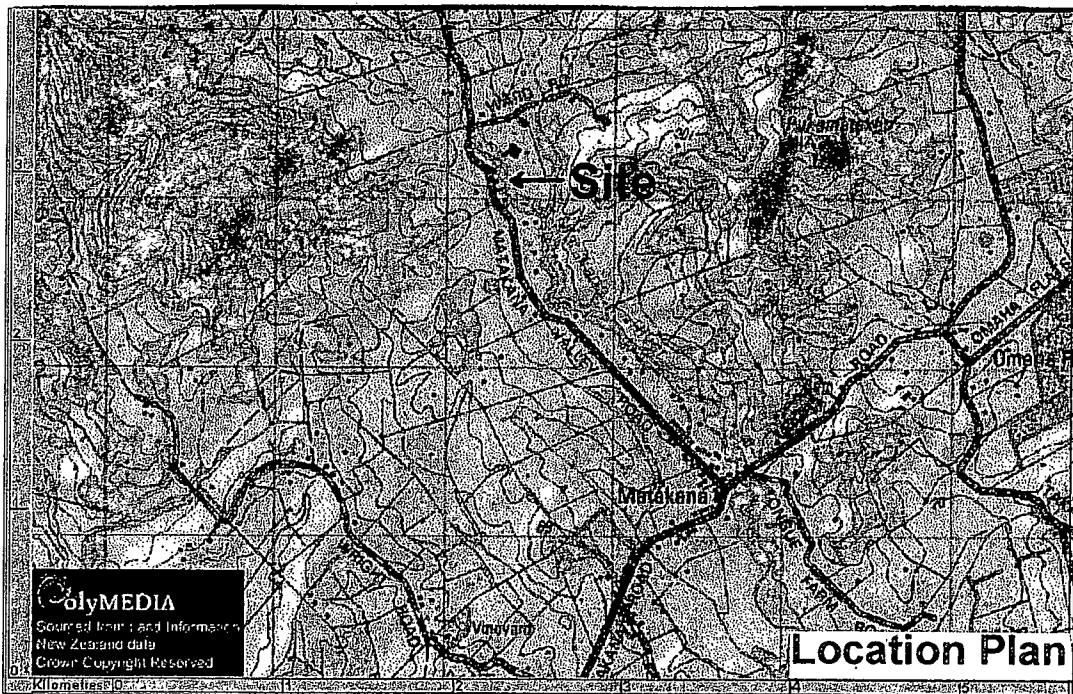
1. Excavation and removal of the most highly contaminated material and refuse from the zone southwest of the treatment plant in the area of samples KTL03008, KTL03009, KTL03010, KTL03019, KTL03020, and KTL03021. This zone is shown on Figure 2.
2. Disposal of the excavated material at a licensed hazardous waste facility.
3. Validation sampling of the remediated area. Following removal of the most contaminated soil, soil samples would be taken at the edges and base of the excavations to check the concentrations of contaminants. Recommendations for additional soil removal, if necessary, would be made at this time.

Site Management Plan

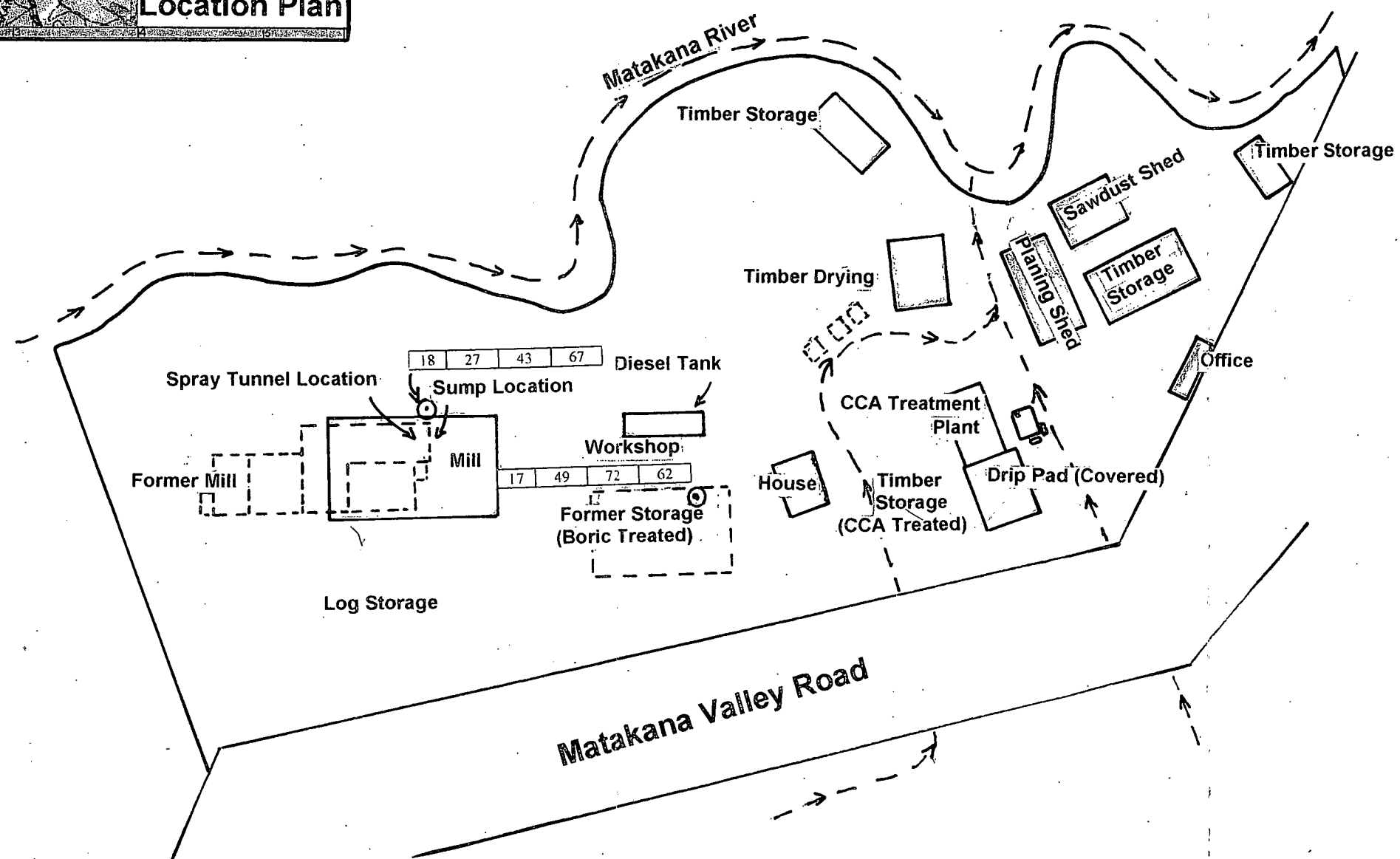
An alternative to the removal option outlined above would be to have the contaminated area covered by a site management plan to restrict access to the contaminated material. A management plan would need to include the following:

1. The preparation of a detailed risk assessment;
2. Procedures for controlling maintenance worker access to contaminated areas;
3. Requirements for the use of protective equipment and clothing by maintenance workers who may be exposed to contaminated soil; and
4. Procedures to ensure that new site owners/tenants were informed of the presence of contamination and potential risks from exposure to site soils.

The implementation of such a management plan can be onerous and it is recommended that the site should be remediated to meet the guidelines for an industrial/commercial site with no management plan and for the protection of maintenance workers. This allows maximum flexibility in site use and reduces the need for long-term regulatory involvement in site operations.



Site Layout

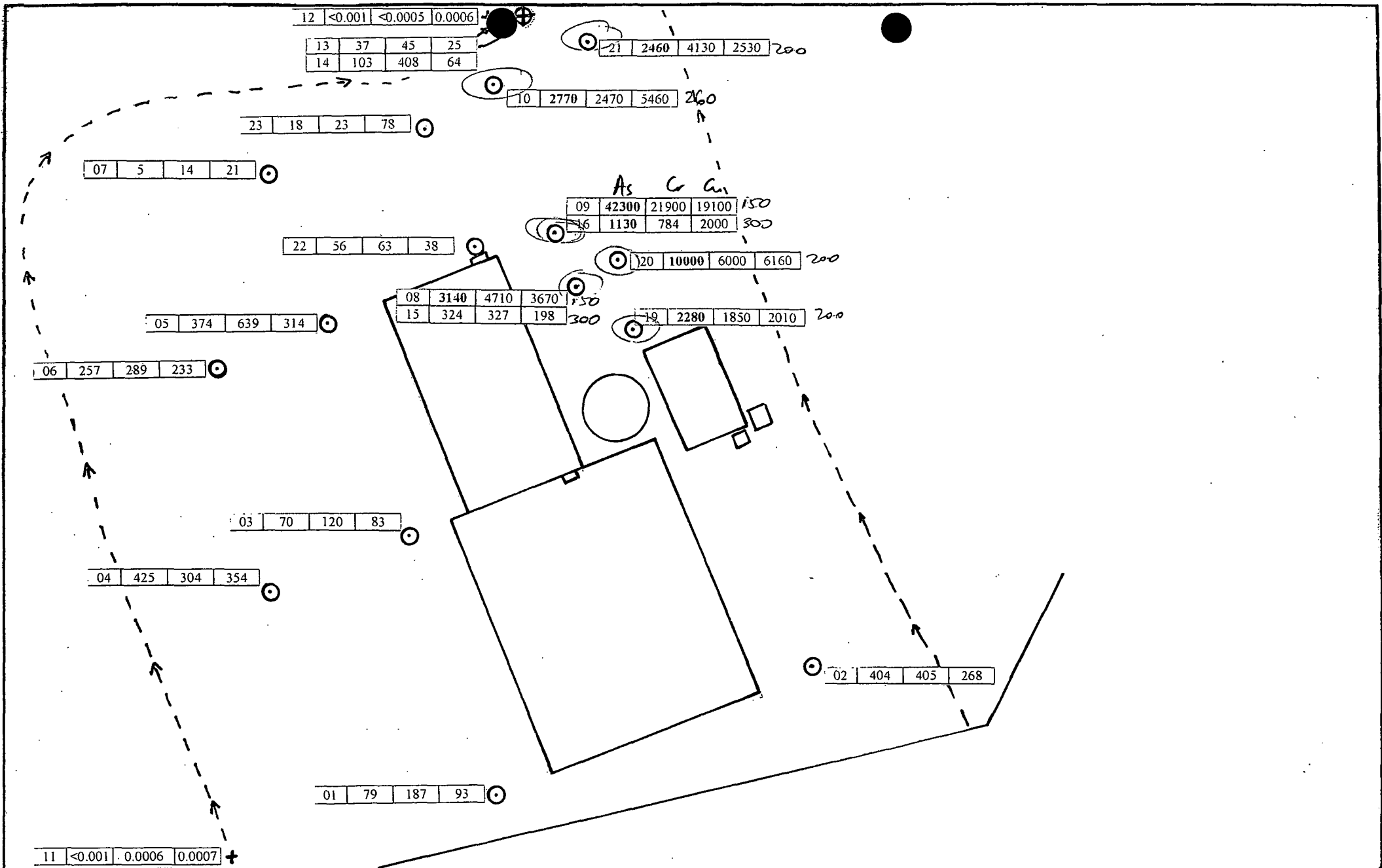


Groundwater &
Environmental Services

Figure 1 Site Layout and Location - Kowhai Timber
362 Matakana Valley Road, Matakana

Approximate Scale 1:1000

DRAWN	CHECKED	SCALES	SHEET
TRACED	DATE Nov 03		SERIES OF
			REF



Groundwater &
Environmental Services

Figure 2 Treatment Plant Sampling Locations
Kowhai Timber

Approximate Scale 1:3000

DRAWN
TRACED

CHECKED

DATE Nov 03

SCALES

SHEET

SERIES OF

REF

Appendix A

Report by Pattle Delamore Partners

PRIVILEGED AND CONFIDENTIAL
PREPARED FOR THE PURPOSES OF OBTAINING LEGAL ADVICE

REPORT ON
SITE RECONNAISSANCE
KOWHAI TIMBERS
MATAKANA

Prepared for
MOBIL OIL (NZ) LIMITED
WELLINGTON

Prepared by
PATTLE DELAMORE PARTNERS LIMITED
AUCKLAND

Reference A497

June 1997

SUMMARY

Kowhai Timbers is located near Matakana township, about 10km northeast of Warkworth. Recently, some hydrocarbon impacted soil was removed from the surface around an above ground storage tank and diesel engine in the sawmill. Analysis of soil samples collected from the base of the excavation revealed elevated total petroleum hydrocarbon concentrations in the remaining soil. Pattle Delamore Partners Limited on behalf of Mobil Oil (NZ) Limited undertook a site reconnaissance to establish the likelihood of the contamination migrating, the proximity of any receptors and determine if any additional investigation is required.

It is considered that there are no health risks associated with the hydrocarbon impacted soil in the vicinity of the diesel engine and Mobil storage tank in the sawmill. Migration of the remaining petroleum residues in the soil is unlikely, so there should be no adverse environmental impacts related to the petroleum residues remaining in the ground. No additional investigation is recommended.

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1.0 INTRODUCTION

Kowhai Timbers is located near Matakana township, about 10km northeast of Warkworth. On 9 April 1997, a diesel underground storage tank was removed from the site. During the removal, some hydrocarbon impacted soil was excavated from around an above ground storage tank (supplied by Mobil) and a diesel engine in the nearby sawmill. The Mobil engineer on site during the tank removal collected soil samples from the tankpit and from the base of the excavation in the sawmill. Analysis of the soil samples revealed elevated total petroleum hydrocarbon (TPH) concentrations in the soil remaining within the sawmill.

The following report has been prepared by Pattle Delamore Partners Limited on behalf of Mobil Oil (NZ) Limited to establish the likelihood of the contamination migrating, the proximity of any receptors and to determine if any additional investigation is required.

2.0 SITE DESCRIPTION

Kowhai Timbers Ltd is located on Matakana Valley Road about 2km northwest of Matakana township (Figure 1). The site is bounded by the road to the southwest and by Matakana River to the northeast. Kowhai Timbers Ltd produces sawn and treated timber. The neighbouring properties are farms.

The sawmill shed is located towards the northwestern end of the site, within a log storage area (Photo 1). Matakana Valley Road is located about 15m to the southwest of the shed and Matakana River is located approximately 30m to the northeast of the shed. The river surface is about 8 to 10m below the ground surface at the shed. Matakana River discharges into Kawau Bay approximately 8km to the southeast.

Figure 1 shows the area around the northwestern end of the mill shed. An above ground diesel storage tank (Photo 2) and a diesel engine (Photo 3) are contained within a bunded concrete area inside the shed.

3.0 PREVIOUS RESULTS

On 9 April 1997, a 4,500L diesel underground storage tank was removed from near the sawmill, adjacent to Matakana Valley Road (Figure 1). According to the Mobil tank removal report, the tank was in good condition with paint still intact. The soil profile in the tankpit was described as clay. Total petroleum hydrocarbon (TPH) concentrations were below detection limits in two soil samples taken from the base of the tankpit by the Mobil engineer. (Mobil, 1996)

In addition to the removal of the tank from near the sawmill, approximately 13m³ of hydrocarbon impacted soil was excavated from around the tank and engine inside the sawmill (it is understood that the fuel pump on the diesel engine had been leaking over an extended period, contributing to the petroleum residues in the ground). The excavation ranged down to 500mm in depth and the excavated soil was removed off site for disposal. Subsequently, the excavation was backfilled with gravel, then concreted and bunded.

Two soil samples were collected by the Mobil engineer from the base of the excavation in the sawmill prior to backfilling. TPH concentrations of 1,700mg/kg and 24,300mg/kg were measured in the soil samples. The associated chromatograms indicated that the petroleum residues in the soil were due to diesel and, to a lesser extent, lubricating oil. The laboratory reports are appended. The soil sample with the highest TPH concentration was taken from a point immediately adjacent to the diesel engine, where the most extensive hydrocarbon impacts were observed prior to excavation.

4.0 SITE VISIT

PDP visited the Kowhai Timber site on 26 May 1997. The site manager, Mr Gary Ryan, was interviewed regarding the site history and general site practices. The area in the vicinity of the diesel engine and storage tank was closely inspected. To inspect the shallow geology, a hand auger hole (BH1) was drilled adjacent to the concrete bund wall (Figure 1). It was not possible to drill additional auger holes in the vicinity of the sawmill due to the hardness of the ground surface.

The Auckland Regional Council were contacted to provide information on groundwater usage within a 1km radius of the site. The contractor who removed the impacted soil from the site, Mr Ray Humphrey, was contacted for information on the site.

5.0 RESULTS

5.1 Site Observations

The site investigation was focussed around the end of the sawmill containing the diesel engine and the Mobil storage tank (Figure 1). The area beneath the diesel engine and Mobil tank was unsurfaced prior to the April 9 excavation. At the time of the PDP site visit, the area was sealed with a concrete floor. A bund, 60 to 300mm high, surrounds the concrete floor (Figure 1). Hydrocarbon staining was noted on the concrete beneath the diesel engine (Photo 3). The engine appeared to be leaking a small amount of diesel and possibly lubricating oil. The concrete beneath the Mobil storage tank appeared clean.

Outside the bunded area and adjacent to the building, the ground surface consists of concrete or gravel over wooden boards. Beyond the concrete and gravel, woodchip and sawdust covers the ground surface, to an unknown depth, a few metres from the sawmill to within a few metres of Matakana River, about 30m to the northeast (Photo 4). The hand auger hole (BH1) was drilled in a small area (about 0.5m²) of exposed soil located adjacent to the northeastern edge of the sawmill shed (Figure 1). There were no obvious hydrocarbon impacts on the ground surface in the vicinity of the bunded area.

The sides of the building, in the vicinity of the Mobil tank, are unclad along the northeastern edge of the building and at a vehicle access point on the southwestern side. The corrugated iron roof is rusted with several sizable holes. It is understood that the roof will be repaired and the side of the building reclad in the near future to prevent rain from entering the shed (Gary Ryan, pers comm).

5.2 Hydrogeology

The New Zealand Geological Survey Map (B.N.Thompson, 1961) shows the site area to be underlain by undifferentiated material including terrace deposits. Hand auger hole BH1 revealed a 100mm layer of gravel and woodchip fill over a layer of soft to firm clayey silt, which extended to the base of the hole at 0.5m depth. It was not possible to auger deeper than 0.5m due to the increasing firmness of the silt. The clayey silt was grey, with a slight undefined odour, to a depth of 300mm. Between 300mm and the base of the hole, the clayey silt was yellow brown with some grey areas and no odour.

According to the Mobil tank removal report, the tankpit excavation, approximately 15m from the sawmill (Figure 1), was excavated in clay. The clay extended to the base of the tankpit at about 2.5m depth. No groundwater was observed in the tankpit. It is expected that similar geological conditions exist beneath the sawmill.

Given the elevation of the sawmill above the nearby river (8 to 10m), the groundwater table beneath the sawmill is expected to be at some point below 2.5m depth (the base of the tankpit). Ground water was not encountered in either BH1 or the tankpit. The groundwater flow direction is expected to be between the northeast and east, towards Matakana River. The permeability of the clayey silt encountered is expected to be low. There are no known underground services in the vicinity of the sawmill that could act as preferential migration pathways (Gary Ryan, pers comm).

Records show that there are no groundwater wells in the expected down gradient direction, within a 1km radius. The nearest well is approximately 400m to the north, on the opposite side of Matakana River. The well is screened from 32 to 45m depth.

6.0 ASSESSMENT

6.1 General

It is considered that there is no health hazard associated with the hydrocarbon impacted soil in the vicinity of the diesel engine and Mobil storage tank in the northwestern end of the sawmill. The peak TPH concentrations measured in the soil samples collected from the area are within the relevant soil acceptance criteria from the Oil Industry Guidelines (OIEWG, 1996). The soil acceptance criteria are protective of human health.

In addition, the area of concern is now sealed and bunded with concrete, providing a barrier for human access and infiltration of water. The petroleum residues are unlikely to migrate because of the reduced infiltration and the low permeability of the underlying soil.

6.2 Groundwater

It is considered that adverse impacts on groundwater quality are unlikely given the nature and composition of the petroleum residues in the soil, the concrete capping over the impacted area, and the low permeability of the underlying soil.

As discussed above, the groundwater table is expected to be at least 2.5m below the ground surface in the vicinity of the sawmill shed. The Oil Industry Guidelines provide screening criteria to indicate the potential for soil to have an adverse effect on groundwater quality (Table 1). For the soil sample test results, the criteria are exceeded by the highest concentration of $C_{10} - C_{14}$ hydrocarbons, assuming the water table is at 2.0m depth (a peak concentration of 1,378mg/kg compared with the acceptance criteria of 560mg/kg). However, if the water table is assumed to be at 4.0m, the acceptance criteria for $C_{10} - C_{14}$ hydrocarbons are above concentrations that "may be encountered on site" (OIEWG, 1996). The screening criteria are designed to be conservative, indicating the potential for an adverse effect rather than any actual effects. As the area is now sealed, the potential for downward migration of petroleum residues is significantly reduced.

In addition, since according to ARC records the shallow groundwater in the site vicinity is not utilised, no adverse effect on the groundwater resource is expected.

6.3 Surface Water

The Matakana River is a possible receptor, given its proximity to the sawmill. The two potential migration pathways from the sawmill to the river are groundwater migration or overland flow of surface runoff. As discussed above, groundwater is unlikely to be a complete migration pathway.

Any petroleum residues in surface runoff in the past are likely to have been significantly attenuated by the sawdust and woodchip piles between the sawmill and the river. No evidence of hydrocarbon impacts was noted on the surface near the sawmill. In addition, although the roof of the sawmill probably leaks to some extent, the cover provided by the roof will have minimised runoff from around the diesel engine area. The concrete bunding will contain any minor product spills and prevent runoff from impacted soil in the future.

6.4 Protection of Human Health

The maximum TPH concentrations measured in the soil samples, taken from around the diesel engine and Mobil tank, were within the soil acceptance criteria in the Oil Industry Guidelines (Table 1). The criteria are protective of human health and, for the commercial or industrial site use, assume a largely unpaved surface where workers may come in direct contact with the soil. The concrete floor around the engine and storage tank provides an effective barrier to worker contact with the underlying soil, reducing any potential health risks.

In addition, the Oil Industry Guidelines recommend averaging soil sample results over the typical area in which a person may spend most of their time. In this case the area may assumed to be the bunded area. Average concentrations are likely to be lower than the peak concentration in the soil sample taken from beneath the diesel engine.

7.0 CONCLUSIONS

- The information shows that there is no health risk exists associated with the hydrocarbon impacted soil in the vicinity of the diesel engine and Mobil storage tank in the northwestern end of the sawmill.

- Since migration of the petroleum residues in the soil is unlikely, no environmental risk is considered to exist.

8.0 RECOMMENDATIONS

No additional investigation is recommended.

9.0 REFERENCES

OIEWG, 1996, *Draft Guidelines for the Assessment and Management of Petroleum Hydrocarbon Contaminated Sites*, October 1996, Oil Industry Environmental Working Group.

Mobil, 1996, *Tank Removal Report, Kowhai Sawmill, Matakana Road, Matakana*, April 1996, Mobil Oil NZ Limited.

B.N.Thompson, 1961, *Geological Map of New Zealand, Sheet 2A, Whangarei*, 1:250,000, DSIR, Wellington, New Zealand.

Table 1: Soil Sample Results

TPHs	Sample Location				Soil Acceptance Criteria ²				
	Tankpit	Tankpit	Sawmill	Sawmill	Heavy Fraction TPH (Commercial) ⁴	Inhalation Pathway ⁵		Protective of Groundwater ⁶	
						Indoor	Outdoor	GW 2m	GW 4m
C ₆ - C ₉ (Hexane)	<15	<15	<15	<15	-	180	NA	59	NA
C ₁₀ - C ₁₄ (Nonane)	<15	<15	30	1,378	1,800	3,500	NA	560	NA
C ₁₅ - C ₃₆ (Eicosane)	<15	<15	1,670	22,922	>10,000	NA	NA	-	-
Total	<15	<15	1,700	24,300	-	-	-	-	-

Note: 1. All results in mg/kg.

2. Criteria from Guidelines for Assessment and Management of Petroleum Hydrocarbon Contaminated Sites (OIEWG, 1996).

3. All criteria assume an Industrial/Commercial site use, silty clay soil type and contamination depth <1m.

4. Based on heavy fraction TPH associated with diesel.

5. Route specific soil acceptance criteria through inhalation pathway.

6. Soil screening criteria to indicate the potential for adverse impacts on groundwater quality.

7. NA indicates contaminant is not limiting as health based criterion is significantly higher than may be encountered on site.

APPENDIX

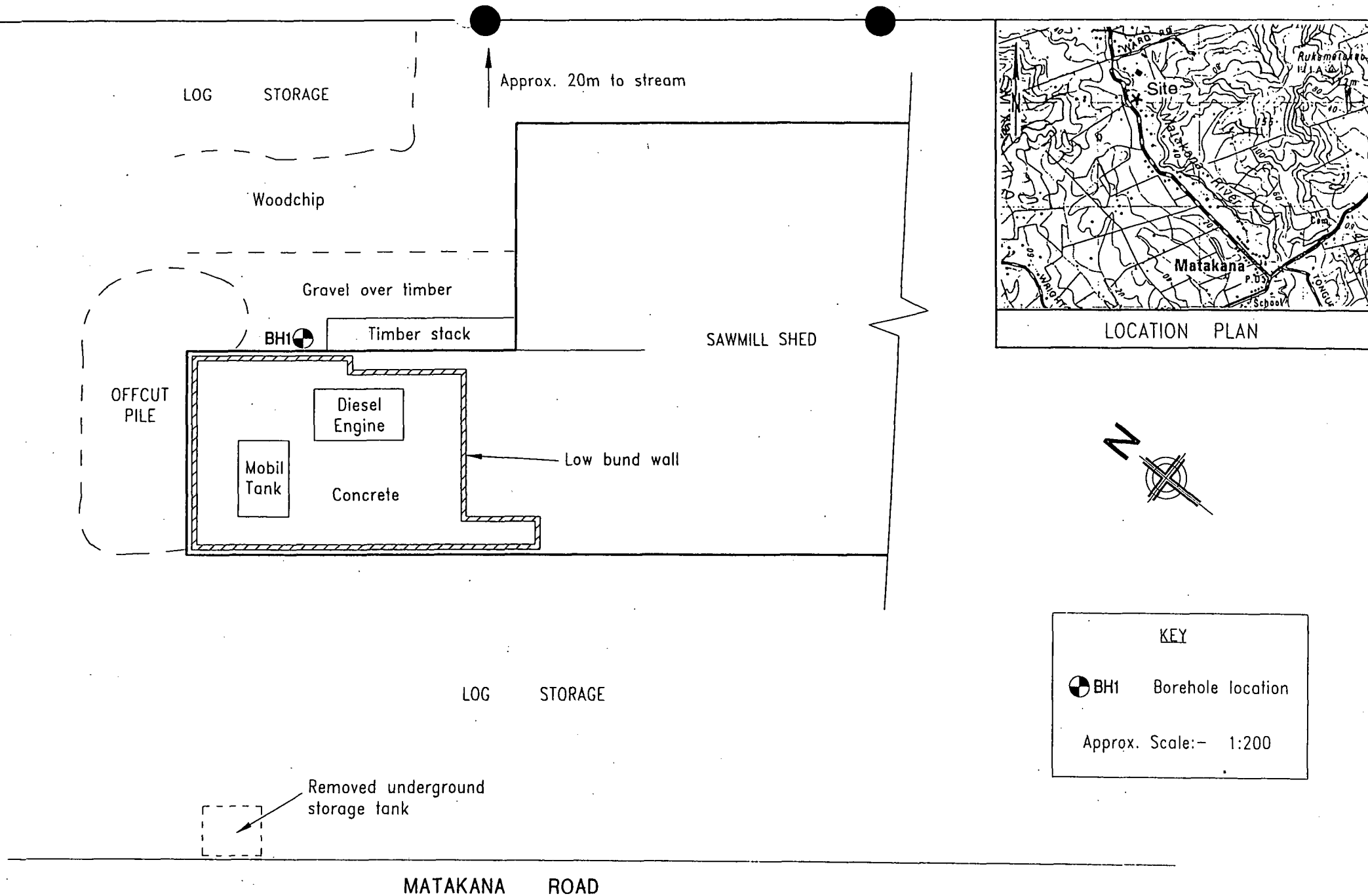


Figure 1 : SITE PLAN



LOG OF BOREHOLE

HOLE NO. BH1

LOCATION: Kauhai Timbers Ltd., Matakana.

JOB NO: A497

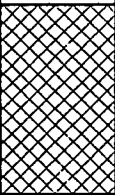
DATE: 26/5/97

RL GROUND: --

RL TOP OF CASING: --

LOGGED BY: M.C.

METHOD: Hand Auger

DESCRIPTION OF SOIL	GRAPHIC LOG	DEPTH (m)	SAMPLE DETAILS	WATER LEVEL	INSTALLATION
GRAVEL and WOODCHIP mix. (FILL)		0.1			
SILT, clayey, soft, grey, slight odour		0.2	● SS1		
SILT, clayey, firm, yellow brown, with grey areas, some rootlets.		0.3			
		0.4	● SS2		
End of borehole at 0.5m. Unable to auger further.		0.5			
		0.6			
		0.7			
		0.8			
REMARKS: SS1 and SS2 grab samples not suitable for analysis		Pattle Delamore Partners Limited			

ALLAN ASPELL & ASSOCIATES LTD

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34 CONSTELLATION DRIVE
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MEMBER NZ ASSOCIATION OF
CONSULTING LABORATORIES

A C ASPELL, MSc (Hons), PhD

FILE DETAILS		
	No.	Date
Report no.	L13215	11/04/97
Associated fax	F13215	11/04/97
Invoice	A9169	11/04/97

SAMPLE CUSTODY		
	No.	Date
Received		08/04/97
Receipt advice	R	
Disposal		25/04/97

SAMPLE DETAILS		
Type	No.	
Soil		4

CLIENT
Mobil Oil (NZ) Ltd P O Box 1709 AUCKLAND Attention: Marcus Bird

PROJECT DETAILS	
Order no.	
Project no.	97/05
Sample collection by	M Bird
Collection date	08/04/97

CERTIFICATE OF ANALYSIS

ANALYSIS OF SOIL SAMPLES: KOWHAI MILL MATAKANA

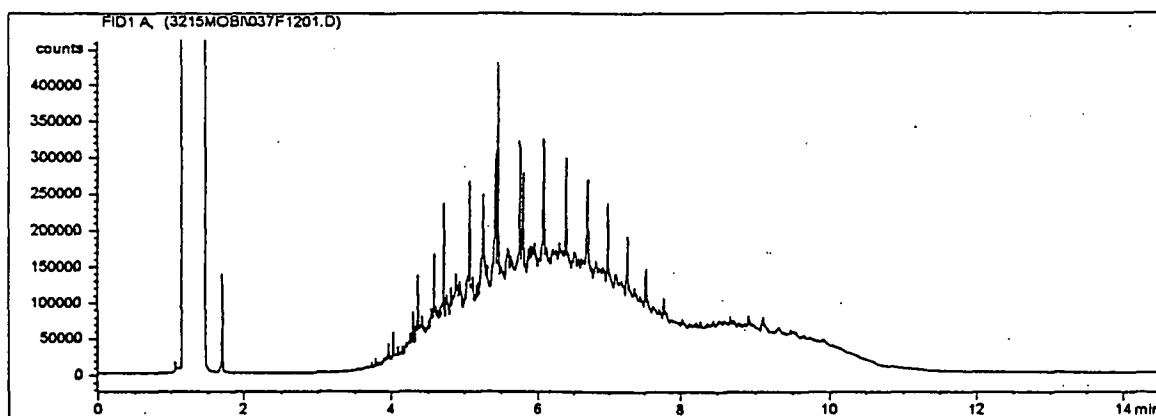
Sample: Soil	C ₆ - C ₉ (mg/kg dry weight)	C ₁₀ - C ₁₄ (mg/kg dry weight)	C ₁₅ - C ₄₄ (mg/kg dry weight)	TPH (mg/kg dry weight)
#1	<15	<15	<15	<15
#2	<15	<15	<15	<15
#3	<15	1378	22922	24300
#4	<15	30	1670	1700

Method(s) of analysis
TPH

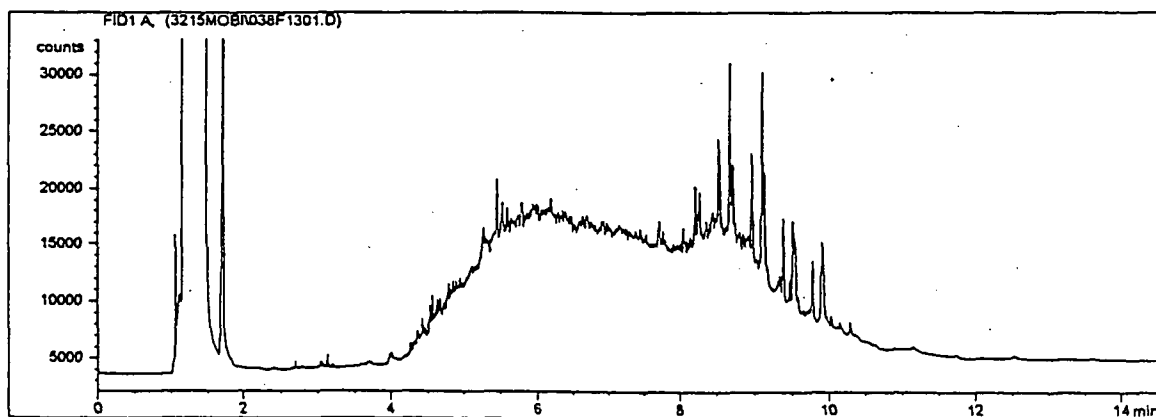
Super-critical fluid extraction [USEPA method 3560].
GC-FID [USEPA method 8015 mod].



A C ASPELL



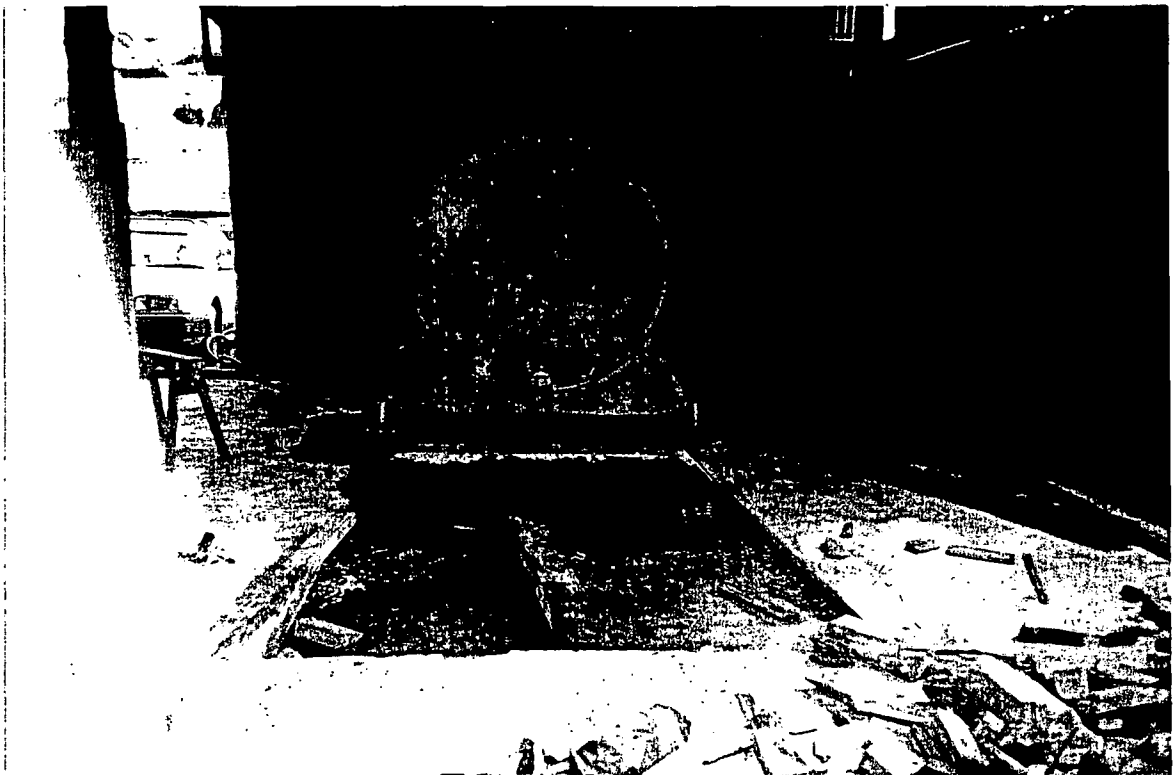
Sample : 3



Sample : 4



Photograph 1: Sawmill Shed Facing East.



Photograph 2: Storage Tank in Sawmill.



Photograph 3: Diesel Engine in Sawmill.



Photograph 4: Rear of Sawmill Shed and Matakana River.

Appendix B

Laboratory Analytical Reports

Hill Laboratories

R J Hill Laboratories Limited

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Private Bag 3205,
Hamilton, New Zealand

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Facsimile:
+64 (7) 858-2001

Email:
mail@hill-labs.co.nz
Internet:
www.hill-labs.co.nz



Client: Groundwater and Environmental Services
Address: P O Box 17273,
Greenlane
AUCKLAND
Contact: Andrew MacDonald

Laboratory No: 318734
Date Registered: 20/08/2003
Date Completed: 25/08/2003
Page Number: 1 of 2

Client's Reference: Kowhai Timber KTL-1001

The results for the analyses you requested are as follows:

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Dry Matter (g/100g as rcvd)	Chromium VI* (mg/kg dry wt)
KTL03009 19/8/03	318734/9	71.3	< 0.4
KTL03010 19/8/03	318734/10	64.9	< 0.4

* This test is not accredited.

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Total Recoverable Arsenic (mg/kg dry wt)	Total Recoverable Chromium (mg/kg dry wt)	Total Recoverable Copper (mg/kg dry wt)
KTL03001 19/8/03	318734/1	79	187	93
KTL03002 19/8/03	318734/2	404	405	268
KTL03003 19/8/03	318734/3	70	120	83
KTL03004 19/8/03	318734/4	425	304	354
KTL03005 19/8/03	318734/5	374	639	314
KTL03006 19/8/03	318734/6	257	289	233
KTL03007 19/8/03	318734/7	5	14	21
KTL03008 19/8/03	318734/8	3140	4710	3670
KTL03009 19/8/03	318734/9	42300	21900	19100
KTL03010 19/8/03	318734/10	2770	2470	5460

Sample Type: Water,

Sample Name	Lab No	Total Arsenic (g.m-3)	Total Chromium (g.m-3)	Total Copper (g.m-3)
KTL03011 19/8/03	318734/11	< 0.001	0.0006	0.0007
KTL03012 19/8/03	318734/12	< 0.001	< 0.0005	0.0006



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Client: Groundwater & Environmental Services
Address: P O Box 17273,
Greenlane
AUCKLAND
Contact: Andrew MacDonald

Laboratory No: 322696
Date Registered: 3/10/2003
Date Completed: 10/10/2003
Page Number: 1 of 2

Client's Reference: KTL-1002 Kowhai Timber

The results for the analyses you requested are as follows:

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Total Recoverable Boron (mg/kg dry wt)
KTL03017 2/10/03	322696/5	90
KTL03018 2/10/03	322696/6	< 20

Pentachlorophenol in solids, screening by GC-ECD

Sample Name	KTL03017 2/10/03	KTL03018 2/10/03
Lab No	322696/5	322696/6
Units	(mg/kg dry wt)	(mg/kg dry wt)
Pentachlorophenol	< 0.05	0.13
Tetrachlorophenol	< 0.05	< 0.05

Sample Type: Environmental Solids, Soil

Sample Name	Lab No	Total Recoverable Arsenic (mg/kg dry wt)	Total Recoverable Chromium (mg/kg dry wt)	Total Recoverable Copper (mg/kg dry wt)
KTL03013 2/10/03	322696/1	37	45	25
KTL03014 2/10/03	322696/2	103	408	64
KTL03015 2/10/03	322696/3	324	327	198
KTL03016 2/10/03	322696/4	1130	784	200
KTL03017 2/10/03	322696/5	49	72	62
KTL03018 2/10/03	322696/6	27	43	67
KTL03019 2/10/03	322696/7	2280	1850	2010
KTL03020 2/10/03	322696/8	10000	6000	6160
KTL03021 2/10/03	322696/9	2460	4130	2530
KTL03022 2/10/03	322696/10	56	63	38
KTL03023 2/10/03	322696/11	18	23	78



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Sample Containers

The following table shows the sample containers that were associated with this job.

Container Description	Container Size (mL)	Number of Containers
Plastic Jar (Soils)	400	11
Glass Jar (Soils)	300	2

Details of sample bottle preparation procedures are available upon request.

Summary of Methods Used and Detection Limits

The following table(s) gives a brief description of the methods used to conduct the analyses for this job.

The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Substance Type: Environmental Solids

Parameter	Method Used	Detection Limit
Dry and sieve sample	Air dry (35°C), sieved to pass 2mm.	N/A
Total Recoverable digest	Nitric / hydrochloric acid digestion, US EPA 200.2	N/A
Total Recoverable Boron	Nitric / hydrochloric acid digestion, ICP-MS, US EPA 200.2	20 mg/kg dry wt
Total Recoverable Arsenic	Nitric / hydrochloric acid digestion, ICP-MS, US EPA 200.2	2 mg/kg dry wt
Total Recoverable Chromium	Nitric / hydrochloric acid digestion, ICP-MS, US EPA 200.2	2 mg/kg dry wt
Total Recoverable Copper	Nitric / hydrochloric acid digestion, ICP-MS, US EPA 200.2	2 mg/kg dry wt
Pentachlorophenol in solids, screening by GC-ECD	Acetone/hexane extraction, GC-ECD analysis In-House	N/A

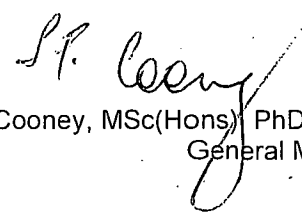
Analyst's Comments:

These samples were collected by yourselves and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the submitter.

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