

26 July 2005

Seri 26/07/05

Andrew McDonald
Director
Groundwater and Environmental Services
PO Box 190
CAMBRIDGE

Dear Andrew

Kowhai Timber, Matakana - Site Validation Report

The Auckland Regional Council acknowledges the receipt of the Site Validation Report for the above site dated 24 June 2005. This report has been reviewed by an Auckland Regional Council Contaminated Site Officer in accordance with the Proposed Auckland Regional Plan: Air, Land and Water - Amended to Incorporate Decisions on Submissions, dated October 2004 (ALWP).

File Ref1-30-0139

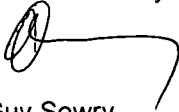
It has been determined that a discharge consent will be required if no further remediation is undertaken. Chromium levels exceed the levels outlined in the ALWP. The ALWP does not use the New Zealand Ministry for the Environment Timber Treatment Guideline value for Chromium. The ALWP defaults to the value listed in the Canadian Environmental Quality Guideline 1999. Therefore, could you please advise of your client's intention with regard to completing further remediation and or applying for a discharge consent.

In addition, the remainder of the site will remain as potentially contaminated until suitable documentation is approved by the Auckland Regional Council demonstrating that the site is not contaminated.

Please note that as the ARC is a ratepayer funded organisation, actual and reasonable costs of carrying out the assessment will be charged in accordance with section 36 of the Resource Management Act 1991. These costs may have included officer's time, travel analytical fees, and the costs of the delegated ARC consultant. An invoice will be forwarded shortly.

If you have any questions regarding this matter please do not hesitate in contacting the undersigned 366 2000 ext 8460 to discuss.

Yours sincerely



Guy Sowry
Environmental Planner
Contaminated Land Management Team

2003 ACHIEVEMENT AWARD WINNER



SVR 26/07/05

Summary contaminated sites report checklist					
Indicate the reports contained in this document	☐	☐	☐	☐	☐
Report section(s) and information to be presented	PSI	SIR	RAP	SVR	MMP
Executive summary	R ☒	R ☐	R ☒	R ☒	R ☐
Scope of work	R ☒	R ☐	R ☒	R ☒	R ☐
Site identification	R ☐	R ☐	R ☒	R ☒	R ☐
Site history	R ☐	S ☐	S ☒	S ☒	S ☐
Site condition and surrounding environment	R ☐	S ☐	S ☒	S ☒	S ☐
Geology and hydrology	A ☐	R ☐	S ☒	S ☒	S ☐
Sampling and analysis plan and sampling methodology	A ☐	R ☐	X	R ☒	R ☐
Field quality assurance and quality control (QA/QC)	N ☐	R ☐	X	R ☒	S ☐
Laboratory QA/QC	N ☐	R ☐	X	R ☒	X
QA/QC data evaluation	N ☐	R ☐	X	R ☒	X
Basis for guideline values	R ☐	R ☐	R ☒	R ☒	R ☐
Results	A ☐	R ☐	R ☒	R ☒	S ☐
Site characterisation	R ☐	R ☐	R ☒	R ☒	R ☐
Remedial actions	X	X	R ☒	S ☒	S ☐
Validation	X	X	X	R ☒	S ☐
Site management plan	X	X	R ☐	S ☐	S ☐
Ongoing site monitoring	X	X	X	N ☐	R ☐
Conclusions and recommendations	R ☐	R ☐	R ☒	R ☒	R ☐

Issues

- * CH - V. h. by. note we do not use CH in our plan. we use CCME. Therefore will need to transition back to eq. 87 for CH.
- * ~~no solution plan for~~
- * write letter to advise regarding further remedial works.

Minimum information requirements for each of the five stages

Report section(s) and information to be included	PSI	SIR	RAP	SVR	MMP
Executive summary - Background - Objectives of the investigation stage(s) being reported - Scope of work to be, or which has been, undertaken - Summary of conclusions and recommendations	R	R	R	R ✓ X	R
Scope of work A clear statement of the scope of work to be, or which has been, undertaken	R	R	R	R ✓	R
Site identification - Street number, street name, suburb and town/city - Legal description with lot, deposited plan and certificate of title number(s) - Geographic co-ordinates as per NZ Map Series 260 when dealing with a small part of a larger site - Current site plan with scale bar showing north direction, local water drainage and other locally significant features on-site and immediately off-site. The plan should also show the historical location of structures that may have affected the distribution of contamination (eg, buildings, underground storage tanks, treatment baths, etc) - Locality map	R	R	R	R ✓ ✓ X X X	R

Report section(s) and information to be included	PSI	SIR	RAP	SVR	MMP
Site history - Chronological list of site ownership and uses (including the relevant HAIL² codes for those uses) indicating information gaps, unoccupied periods and, if relevant, proposed uses - An outline of those contaminants commonly associated with each land use based on Contaminated Land Management Guidelines Schedule B, ANZSIC (1993) codes and AS4482.1/2 (1997 and 1999), and/or from site-specific information - Zoning – previous, present and, if relevant, proposed, with summary of reasons for changes to zoning that have occurred - Details of relevant building and related permits, licences, resource consents, approvals and trade waste agreements with records of compliance - Local usage of ground and surface water resources, including presence, rate and location of abstractions (current and historical) - Site layout plans showing present and past industrial processes - Sewer and services plans identifying active and abandoned services - Historical uses of adjacent land - Relevant complaint history - Local knowledge of site by staff and residents – present and former - Summary of literature relating to the site, including newspaper articles - Review of aerial and site photography with date and location (including direction of photography) indicated on site maps - Description of manufacturing processes - Inventory of materials and waste products associated with site use and their on-site storage and/or disposal locations - Details and locations of current and former underground and aboveground storage tanks with details of integrity testing - Product spill and loss history - Recorded discharges to land, water and air (authorised and unauthorised) - On-site and off-site disposal locations - Contaminant source areas and pathways on-site and off-site X - Integrity assessment (assessment of the accuracy of the information)	R	S	S	S	S

4
NCL

² Hazardous Activities and Industries List (Contaminated Land Management Guidelines Schedule A):

Report section(s) and information to be included	PSI	SIR	RAP	SVR	MMP
Site condition and surrounding environment - Topography, means of measurement and site map - Condition of buildings and roadways - Presence of drums, wastes and fill materials - Odours - Visual or quantified details of surface water quality - Flood potential described or mapped - Conditions at site boundary such as type and condition of fencing, soil stability, erosion, and storm water discharge - Visible signs of contamination such as identifiable waste products, discoloration or staining of soil, bare soil patches – on-site and at site boundary - Visible signs of plant stress - Details of any relevant local sensitive environment – rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna	R	S	S	S	S
Geology and hydrology - Background groundwater and surface water quality - Summary of local meteorology - Detailed map and description of location, design and construction of on-site wells, boreholes and pits - Site borehole logs / test pit logs showing stratigraphy using a recognised classification system and depth to groundwater table - Reported range of water table depths below ground surface - Description and location of springs and wells in the vicinity - Location, depth and extent of imported and locally derived fill - Direction(s) and rate of groundwater flow including, where applicable, groundwater levels surveyed to a common datum - Direction(s) of surface water run-off and identification of ponding areas - Preferential flow paths (surface and groundwater)	A	R	S	S	S
Sampling and analysis plan and sampling methodology - Sampling and analysis data quality objectives - Rationale for the selection of: - sampling pattern, locations and depths (as shown on site maps) - sampling density, including estimated size of the residual hotspots that may remain undetected and statistical confidence in the estimate - which samples are/were submitted for analysis and which samples are/were not analysed - the analytes for each sample and the analytical methods used - Detailed description of the sampling methods including: - sampling devices and equipment type - sampling containers and the type of seal used - sample preservation methods and reference to recognised protocols eg, APHA (1988) or US EPA SW846 (1992) - sample handling procedures - equipment decontamination procedures - Detailed description of any field-screening protocols, methods and equipment, and their calibration	A	R	X	R	R

✓
NCC

NCC

13

Report section(s) and information to be included	PSI	SIR	RAP	SVR	MMP
Basis for guideline values - Table listing all selected guideline values, with references - Demonstration that selection of guideline values is consistent with the principles of <i>Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values</i> - Assumptions and limitations of guideline values used	R	R	R	R	R
Results - Summary of previous results (where applicable) - Site plan(s) showing all samples and sampling locations, giving sample identification numbers and sample depth - Summary of all results in tabular form: - identifying essential details such as sample identification numbers and sample depth - showing comparison with relevant guideline values - highlighting every result exceeding the guideline values - A summary table of results containing the following statistics: minimum, maximum, arithmetic average and 95% upper confidence limit on the arithmetic average for each analyte - Site plan showing the extent of soil and/or groundwater contamination exceeding the relevant guideline values for the medium, location and sample depth	A	R	R	R X	S
Site characterisation - Assessment of the type of all environmental contamination, particularly in soil and groundwater - Assessment of the extent of soil and groundwater contamination, including identifiable off-site contamination that may cause environmental effects - Assessment of the potential for chemical degradation or interaction products - Assessment of possible exposure routes and risk to exposed populations (human and ecological risk)	R	R	R	R X X X	R
Remedial actions - Remediation goal(s) - Discussion of the remedial options available, including the status quo, identifying the means of risk reduction proposed in each - Rationale for selection of the recommended remedial option - Discussion of the extent of remediation required to achieve the remedial goal(s) - Identification of regulatory requirements such as permits, licences and approvals - Pre-remediation site management plan (eg, fencing, warning signs, stormwater diversion, etc.) - Names and phone numbers of appropriate personnel to contact during remediation - Demonstration of the disposal route for any material to be disposed off-site - Remediation schedule, including proposed hours of operation - Proposed testing to validate the site during and on completion of the remedial activities - Contingency plan if remedial strategy fails to reach the remediation goals - Staged progress reporting (for long-running projects)	X	X	R	S ✓ ✓ ✓ ✓ ✓ X X X X ✓ X ✓	S ~

Same
OEPA

Report section(s) and information to be included	PSI	SIR	RAP	SVR	MMP
Site management plan - Operational remediation site management plan including (where applicable): - community relations - stormwater and soil management - noise and odour control - dust control (including wheel wash) - contingency plans to respond to site incidents to obviate potential effects on the surrounding environment and community - proposed long-term site management - occupational safety and health issues and measures	X	X	R	S X	S
Validation - Rationale and justification for the validation strategy, including: - clean-up criteria selected - statistically based decision-making methodology - validation sampling and analysis plan - Details of statistical analysis of validation results and evaluation against the clean-up criteria - Verification of compliance with regulatory requirements set by all relevant local authorities - Documentation demonstrating that any material moved off-site has been received at point of disposal	X	X	X	R ✓ X X ✓	S
Ongoing site monitoring - Proposed ongoing site monitoring requirements (if any), including monitoring locations, parameters and frequency - Results of monitoring analyses, including all relevant QA/QC requirements stated above - Ongoing site or plant maintenance (eg, containment cap integrity, etc) or contingency plans - Details of those responsible for the maintenance/ monitoring programme(s) - Details to be included in the annual MMP report, including: - any changes to site owner or occupier - any changes to activities undertaken on-site - any changes to the physical layout of the site - any incidents where the management plan has had to be implemented (subsurface works, site development, etc)	X	X	X	N	R
Conclusions and recommendations - Brief summary of all relevant findings - Assumptions used in making conclusions - Extent of uncertainties in the results - Where remedial action has been taken, a list summarising the activities and the physical changes to the site - A clear statement that the consultant considers the site to be suitable for the current and, where applicable, the proposed use - A statement detailing all limitations and constraints on the use of the site (where applicable) - Recommendations for further work, if appropriate	R	R	R	R X X X ✓ ✓ ✓	R

Groundwater and Environmental Services

PO Box 190
Cambridge
07 8831612 / 027 4874410
28 June 05

Auckland Regional Council
Private Bag 92012
Auckland

ATTENTION: Sarah Harvey

Dear Sarah,

I have attached a copy of the remediation/validation report for the treatment plant area at Kowhai Timber, Matakana.

Please let me know if you have any questions.

Regards,



Andrew MacDonald
Groundwater and Environmental Services

KOWHAI TIMBER (1990) LIMITED

REMEDIATION & VALIDATION REPORT TREATMENT PLANT AREA

KOWHAI TIMBER

**362 MATAKANA VALLEY ROAD,
MATAKANA**

**Prepared by:
Groundwater and Environmental Services
P O Box 190,
Cambridge
24 June 2005**

Table of Contents

1	Introduction	1
1.1	Site Identification	1
1.2	Scope of Work	1
1.3	Summary of Contamination	2
1.4	Remediation Goals	2
1.5	Selected Remediation Option	3
1.6	Remediation of Lower Levels of Contamination	3
2	Site Remediation Works.....	3
2.1	Contractor Selection and Briefing.....	3
2.2	Remediation Area	3
2.3	Community Relations, Noise and Odours	4
2.4	Excavation and Removal of Contaminated Material	4
2.5	Control of Sediment Runoff and Contaminant Migration from Excavations	5
2.5.1	Soil replacement.....	6
2.6	Validation Sampling	6
2.6.1	Sampling Methods	6
2.7	Reinstatement of Remediated Areas.....	6
2.8	Health and Safety	7
3	Validation Results	7
3.1	Stage 1 Validation Results - 8 February 2005	7
3.2	Stage 2 Validation Results - 15 March 2005.....	7
3.3	Stage 3 Validation Results - 15 March 2005.....	9
4	Description of Remediated Area	9
5	Evaluation of Groundwater Issues.....	9
6	Conclusions and Recommendations.....	10

Figures

- Figure 1 Site Location and Layout
Figure 2 Remediation Area

Appendices

- Appendix A Landfill Weighbridge Receipts
Appendix B Laboratory Analytical Reports
Appendix C Validation Photographs

DISCLAIMER

No liability is assumed for misrepresentation of data or for items not visible, accessible or present at the time of 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 party shall be at such party's sole risk.

1 INTRODUCTION

Contamination by timber treatment chemicals had been identified around the CCA treatment plant at Kowhai Timber's property at 362 Matakana Valley Road. The nature of the detected contamination and details of the environmental investigations carried out to date at the property are provided in the September 2003 report by Groundwater & Environmental Services¹. ✓

A remedial action plan for the treatment plant area² was prepared in accordance with the Ministry for the Environment's Guidelines for Reporting on Contaminated Sites³ and submitted to Auckland Regional Council for approval. → was the RAP approved -) CHECK,

This report details the remedial work undertaken and the validation of remediation. not A RAP. documents remedial work.

1.1 Site Identification

The site is identified as 362 Matakana Valley Road, Matakana.

The legal description is: Pt Allot 51 Matakana PSH BLK III Mahurangi SD ✓

1.2 Scope of Work

The scope of work carried out for remediation and validation of the identified contamination consisted of:

1. Submission of the Remedial Action Plan to Auckland Regional Council for approval;
2. Obtaining a permit from Waste Management Limited to dispose of a special waste at Redvale Landfill;
3. Selection of the remediation contractor and briefing of site staff;
4. Location and marking out of the areas to be remediated;
5. Excavation and removal of contaminated material from the identified areas, tracing visible contamination outwards and downwards from the planned excavations where required;
6. Transporting the excavated material to Redvale landfill for disposal;
7. Validation of the remediated areas by sampling, analysis and visual inspection;

¹ Groundwater & Environmental Services (September 2003). Soil Contamination Investigation, 362 Matakana Valley Road, Matakana. Report prepared for Kowhai Timber (1990) Limited.

² Groundwater & Environmental Services (19 July 2004). Remedial Action Plan, 362 Matakana Valley Road, Matakana. Report prepared for Kowhai Timber (1990) Limited.

³ Ministry for the Environment (November 2003). Guidelines for Reporting on Contaminated Sites. Contaminated Sites Management Guidelines No. 1.

Groundwater and Environmental Services

8. Repeating steps 4 to 7 until the validation sample analyses met the applicable guidelines; and
9. Reporting the results of the remediation and validation.

1.3 Summary of Contamination

The previous investigation work identified areas on the property with timber treatment chemical contamination that exceeded the relevant guideline values⁴ for the protection of human health for unpaved/paved industrial commercial sites and for the protection of maintenance workers.

? T.T
business

Contamination by timber treatment chemicals (arsenic, chromium and copper) was measured in soils from around the treatment plant. Available information suggested that the majority of this contamination is likely to be the result of poor chemical handling, spills, and inappropriate disposal practices by former owners of the site. Current site practices were deemed to be unlikely to have contributed significantly to the contamination.

The arsenic levels in the zone immediately southwest of the treatment plant (indicated on Figure 1) were significantly above the timber treatment guideline levels for the protection of human health. There was a potential risk to site workers from the high arsenic concentrations in the contaminated material. The material also presented a risk of contamination to the adjacent stream that feeds into Matakana River.

On site
discussion
with Andrew
suggestions
Simon not
an issue?

The location of the high contamination zone was within the remediation zone shown on Figure 1.

1.4 Remediation Goals

A Remedial Action Plan (RAP) was prepared for the site to address the identified contamination. This plan was submitted to Auckland Regional Council for approval prior to being carried out.

was it
approved?

The property was on the market as a going concern. The owner intended to remediate identified contamination to levels below the industrial/commercial guidelines prior to the sale of the property being completed.

The goals of the remediation plan for this property were:

1. To remediate the identified contamination resulting from timber treatment activities to levels below the guideline values for the protection of human health for both unpaved and paved industrial/commercial sites (no management plan) and for the protection of maintenance workers; and

⁴ Ministry for the Environment & Ministry of Health (June 1997). Health and Environmental Guidelines for Selected Timber Treatment Chemicals.

2. To reduce the potential risk to the environment from contamination by timber treatment chemicals at the site by remediating the most highly contaminated materials.

1.5 Selected Remediation Option

After taking all relevant factors into account the recommended remediation option for this site was to excavate the identified contaminated material for disposal to a licensed landfill.

Excavation and removal of the more highly contaminated material was the best option to reduce the potential risks to human health and the environment from the identified contamination. Following the removal of the contaminated material, validation samples were to be collected from the exposed sides and base of the excavation and analysed for contaminants of concern. Remaining contamination in excess of permitted levels could then be removed and additional validation samples taken.

1.6 Remediation of Lower Levels of Contamination

From a human health perspective, it is not necessary to remove contamination at levels below the guideline values for the protection of human health for unpaved/paved industrial commercial sites and for the protection of maintenance workers. There are unlikely to be any adverse effects on human health from exposure to this material. On this basis no remediation is proposed for areas with levels of contamination below the applied guideline values. Any change in land use to a more sensitive class would require a review of the environmental investigation data and remediation plan.

2 SITE REMEDIATION WORKS

The remediation activities were described in detail in the Remedial Action Plan (RAP) for the property. Information about the implementation of the RAP is provided in the following sections.

2.1 Contractor Selection and Briefing

The contractor selected to undertake the remedial works was Rathe Contractors Ltd (Rathe). Rathe staff are experienced in the excavation and cartage of contaminated materials, having been involved in similar work on other sites.

The contractor's staff members involved in the remediation were briefed on the nature of contamination and site-specific health and safety procedures prior to commencing the remediation. The staff included an excavator operator and truck drivers who were transporting the contaminated material to Redvale Landfill. Appropriate personal protection equipment was provided by the contractor for the staff to use as required.

2.2 Remediation Area

The remediation area was located southeast of the timber treatment plant. The contaminated material consisted of variable, organic-rich topsoil over a sandy to silty clay substrate.

Groundwater and Environmental Services

Chemical staining of the soils and clay was visible over some of the area of high contamination. The contamination originated from the disposal of treatment sump sludge and spills of chemicals during past CCA timber treatment at the property. Other areas, where treated timber was stored had elevated levels of copper, chromium and arsenic but these were below the applicable guideline values for unpaved industrial/commercial sites.

The initial estimate of the lateral extent, depth range and volume of material to be remediated (as provided in the RAP) was made on the basis of the previously collected environmental information and assumptions about the spread of contaminants based on that information. A scale error led to an overestimation of the size of the initial remediation area. The initial estimate for the volume of material to be removed from the site to complete the remediation of the identified chemical contamination on the property was 54 m³. This estimate included soils to an average depth of 200 mm across the identified area of high contamination.

Figure 1 shows the remediation area, which included all of the chemical contamination identified as being in excess of the relevant guidelines on the property.

The areas requiring remediation were identified and marked out prior to the excavation commencing.

2.3 Community Relations, Noise and Odours

Given the size of the site and the distance of the contaminated areas from the site boundaries, no specific consultation with surrounding landowners or occupiers was carried out prior to or during the remediation.

The level of noise was less than that associated with the normal site activities. Limits were however placed on the hours of work to prevent any noise nuisance to the closest residential properties.

The chemical contamination on this property did not cause nuisance odours during the remediation.

2.4 Excavation and Removal of Contaminated Material

The contaminated material identified as having concentrations above the relevant guideline levels was excavated from the identified area and transported to Redvale landfill for disposal.

For each of the stages, prior to leaving the designated remediation areas, the trucks and excavator were inspected to ensure that no contaminated material was tracked from the remediation areas to other parts of the property.

WHEEL
WASH X

No pre-treatment of the excavated material was necessary to make it less hazardous for handling and transport, however appropriate health and safety procedures were followed to avoid the generation of contaminated dust and contact with contaminated material by remediation workers.

Disposal at Redvale Landfill was in accordance with the resource consents and acceptance procedures for that facility. A disposal permit was obtained for the material following the

submission of the results of leachate generation potential (TCLP) testing carried out on a representative sample of the contamination.

The site remediation work was carried out in three separate stages. The excavation and disposal dates were:

Stage	Date(s)	Tonnage
Stage 1	27 January 2005 & 28 January 2005	88.02 t ✓
Stage 2	8 March 2005	39.06 t ✓
Stage 3	29 March 2005	10.58 t ✓

The excavation was significantly deeper than originally planned as contamination was found to extend to much greater depths than anticipated. A zone of strong chemical staining of the silty clay was found to extend to the southeast from the corner of the treatment plant. Material from this zone was traced outwards and down and completely removed in the first stage of remediation work.

Validation sampling was carried out according to the method outlined in section 2.6.

Following the Stage 1 validation sampling of the site, the excavation depth and extent was increased to allow removal of additional contamination as found in the validation samples. The contaminated material removed in Stage 2 of the remediation did not contain any visible contamination however arsenic levels were elevated above the industrial/commercial guidelines. ✓

Validation sampling following the Stage 2 remediation work showed the presence of an isolated pocket of remaining contamination in the east of the remediation area. This was removed in Stage 3 of the remediation. ✓
Excavated

Figure 1 shows the extent of the Stage 1 excavation and the locations of the Stage 1 validation samples. Figure 2 shows the final extent of the excavations and the locations of the Stage 2 and 3 validation samples. ✓

Weighbridge receipts from Redvale Landfill and accounts from Waste Management Ltd were retained to provide proof of the volume of material disposed of. These receipts are attached to this report in Appendix A. ✓

2.5 Control of Sediment Runoff and Contaminant Migration from Excavations

Sediment control measures were put in place between the excavation and the nearby stream to prevent the movement of contaminated sediment into the stream. The excavation was graded so that sediment could not escape from its other sides. ✓

Prior to leaving the excavation area, all trucks were inspected to ensure no contaminated soil or other material was tracked off site or to other areas on site. Any material adhering to the truck was cleaned off into the excavation area. These measures ensured that no potentially ✓

contaminated dust or soil was deposited on other parts of the site or along the route to the landfill.

2.5.1 Soil replacement

No imported soil or fill was required to replace contaminated material excavated from the site.

2.6 Validation Sampling

At the completion of each stage of the remediation, the exposed sides and base of the excavation was sampled by Andrew MacDonald of Groundwater and Environmental Services to verify that remaining contaminant levels were below the applicable guideline values for the site.

Samples were delivered directly to Hill Laboratories, Hamilton under chain of custody documentation and analysed for copper, chromium and arsenic (CCA).

The excavation remained open until the results of the sample analysis had been received and checked. The remaining levels of contamination are recorded in Table 1 and the laboratory analytical reports are attached in Appendix B.

Photographs of the excavation were taken following the sampling and are attached as Appendix C to this report.

2.6.1 Sampling Methods

Sample collection in each validation location was carried out using a stainless steel trowel. Samples taken from the base of a remediated area were taken from the surface down to 100 mm below the excavation surface. Samples from the edge of the remediated areas were taken over the depth range of the excavation at that point.

The samples were transferred from the bowls to sample jars supplied by Hill Laboratories. Once in the jars, samples were sealed and placed directly into a chilly bin and kept in cold storage prior to dispatch to the laboratory 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 sequential reference was a 3-digit number starting at 001.

A decontaminated stainless steel trowel, sample collection/mixing bowl, and spoon were used 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.

2.7 Reinstatement of Remediated Areas

The property remains under commercial/industrial land use. Once the remediated areas were validated, they were allowed to be re-vegetated to reduce the potential for surface water

runoff. The remediation area is not accessed for any site activities and no further reinstatement was required.

2.8 Health and Safety

All remediation activities were subject to the provisions of the site-specific health and safety plan for intrusive activities involving contaminated materials as provided in the RAP.

There was no public access to the remediation area during site works.

3 VALIDATION RESULTS

Analytical results for the validation analyses at the site are summarised in the following sections. All samples were analysed at Hill Laboratories, Hamilton. The full text of the laboratory analytical reports, including a summary of the methods used and detection limits, is provided in Appendix B.

3.1 Stage 1 Validation Results – 8 February 2005

14 samples were collected from the base and sides of the remediation excavation following the first stage of remediation. The majority of the samples tested were above the applicable guideline for arsenic. There was no visible chemical staining of the sampled material however it was found to have significant remaining arsenic contamination.

The results are shown on Table 1 below.

Only 3 of the 14 initial samples were within the acceptable guideline levels for arsenic on an industrial site.

The Stage 1 sample locations are shown on Figure 1.

Following the receipt of the analytical results for Stage 1, the remediation contractor was instructed to remove additional material in the areas with high remaining levels of arsenic.

The disposal of contaminated material from the second stage of the remediation was carried out under the same landfill acceptance documentation as the Stage 1 disposal.

3.2 Stage 2 Validation Results - 15 March 2005

11 samples were collected from the base and sides of the remediation excavation following the second stage of remediation. The analytical results for the Stage 2 validation sampling, as provided on Table 1, showed that only one of the samples contained arsenic levels above the commercial/industrial guideline level. The sample locations are shown on Figure 2.

Following the receipt of the analytical results for Stage 2, the remediation contractor was instructed to remove additional material in the remaining area of high arsenic levels. The excavation was to extend three metres out to the north, south and west from the location of sample KTL05016 and approximately 0.5 metres towards the east.

The disposal of contaminated material from the second stage of the remediation was carried out under the same landfill acceptance documentation as the earlier disposal.

87

Total III

CNC 91

Table 1 Validation Sampling Results

Sample Number	Arsenic	Chromium	Copper
Stage 1 Validation - 8 February 2005			
KTL05001	721	172	55
KTL05002	8	50	16
KTL05003	1700	1020	651
KTL05004	7330	5150	5960
KTL05005	990	826	231
KTL05006	912	477	520
KTL05007	1180	568	237
KTL05008	828	467	257
KTL05009	81	64	12
KTL05010	2060	2410	1010
KTL05011	1220	1320	144
KTL05012	176	165	30
KTL05013	966	546	278
KTL05014	1880	592	1170
Stage 2 Validation - 15 March 2005			
KTL05015	143	76	67
KTL05016	919	- 102 *	338 *
KTL05017	148	162 *	48
KTL05018	128	- 98 *	19
KTL05019	14	71	17
KTL05020	6	40	15
KTL05021	114	- 108 *	38
KTL05022	2	42	10
KTL05023	7	46	14
KTL05024	148	178 *	42
KTL05025	9	55	12
Stage 3 Validation - 17 May 2005			
KTL05026	12	158 *	14
KTL05027	6	273 *	15
MFE Guidelines	500	NL	NL

Notes:

1. All concentrations are in mg/kg.
2. NL denotes no guideline limit.
3. Bold values exceed MFE guideline values for unpaved or paved (no management plan) industrial/commercial sites and for the protection of maintenance workers.

only 300

→ no an issues removed
during site 3.

→ no sampling to be
for site 3
combined site
2 + 3.

3.3 Stage 3 Validation Results - 15 March 2005

Two additional samples were collected from the Stage 3 remediation zone following the removal of the contaminated material in the vicinity of KTL05016.

The analytical results for the Stage 3 validation sampling did not contain any contaminants at levels above the applicable commercial/industrial guidelines. The analytical results are included on Table 1 and the sample locations are shown on Figure 2.

Corzi
File T.T.

No further remediation was required following the receipt of the Stage 3 validation results. The remediation was deemed to be complete and the area was able to be re-vegetated.

4 DESCRIPTION OF REMEDIATED AREA

Material with contamination levels above the relevant guideline values was removed from the remediation area in three stages.

The original RAP estimate of the volume of material to be removed from the site to complete the remediation was 54 m³ (roughly 90 tonnes). This estimate included some overlying refuse plus gravel, clay and soils to shallow depths from the identified area of contamination.

The original volume estimate was based on assumptions about the extent and depth of contamination at the site. The actual depth of contamination was found to be greater than initially estimated and the remediation excavation depth was increased to include all of this material following the procedure laid down in the RAP.

The total weight of material removed from the site for disposal at Redvale Landfill during the three stages of remediation was 137.66 t, which equates to approximately 80 m³.

The layout and extent of the remediated area is provided on Figure 2.

=> Depth?

5 EVALUATION OF GROUNDWATER ISSUES

No intrusive groundwater investigation was carried out as part of the site remediation. The groundwater system is unlikely to be significantly impacted from the timber treatment plant contamination for the following reasons:

1. The zone of historical soil contamination to the southeast of the timber treatment plant has been remediated.
2. The part of the local groundwater system in the area around the timber treatment plant has a small catchment that is likely to be restricted to the area between the two stream gullies and Matakana Valley Road.
3. Relatively low permeability materials at the site as shown in the base of the remediation zone are likely to provide an effective barrier to the infiltration of surface water to the groundwater system. This low permeability is demonstrated on other parts of the site by the persistent ponding of surface water even after relatively little rain or after significant periods without rain.

4. Ground surface slopes at the area around the treatment plant and the short travel distance for surface water to enter the adjacent streams also reduce the potential for significant contamination of the underlying groundwater system by infiltration of surface water.
5. The contrast between the low permeability silts and clays and the relatively high permeability overlying topsoil in the remediation zone is likely to have further restricted the downwards movement of contaminants into groundwater. Given the slope towards the stream in this area, incident rainfall is likely to drain through the relatively permeable upper soil layers to the adjacent stream. A water sample taken from the stream adjacent to the remediation zone during a low flow period showed that the stream water met the ANZECC 95% guideline.
6. The standing water level at the base of the larger stream during periods of no rainfall, where there is little if any flow from upstream, is likely to be related to the local groundwater level of this area. Groundwater is likely to discharge to the streams during low flow conditions and may be recharged from the streams during higher flows.
7. The sediment and soil contamination did not appear to be having a significant impact on the concentrations of contaminants in the stream water prior to the remediation. Water samples taken during the initial investigation (when water to the base of the stream was essentially stagnant) did not reveal any significant contamination in the area adjacent to the worst soil contamination.

Given the low permeability of the underlying material and the removal of the highly contamination zone, significant contamination of the groundwater is unlikely and no groundwater investigation and monitoring is proposed at this time.

6 CONCLUSIONS AND RECOMMENDATIONS

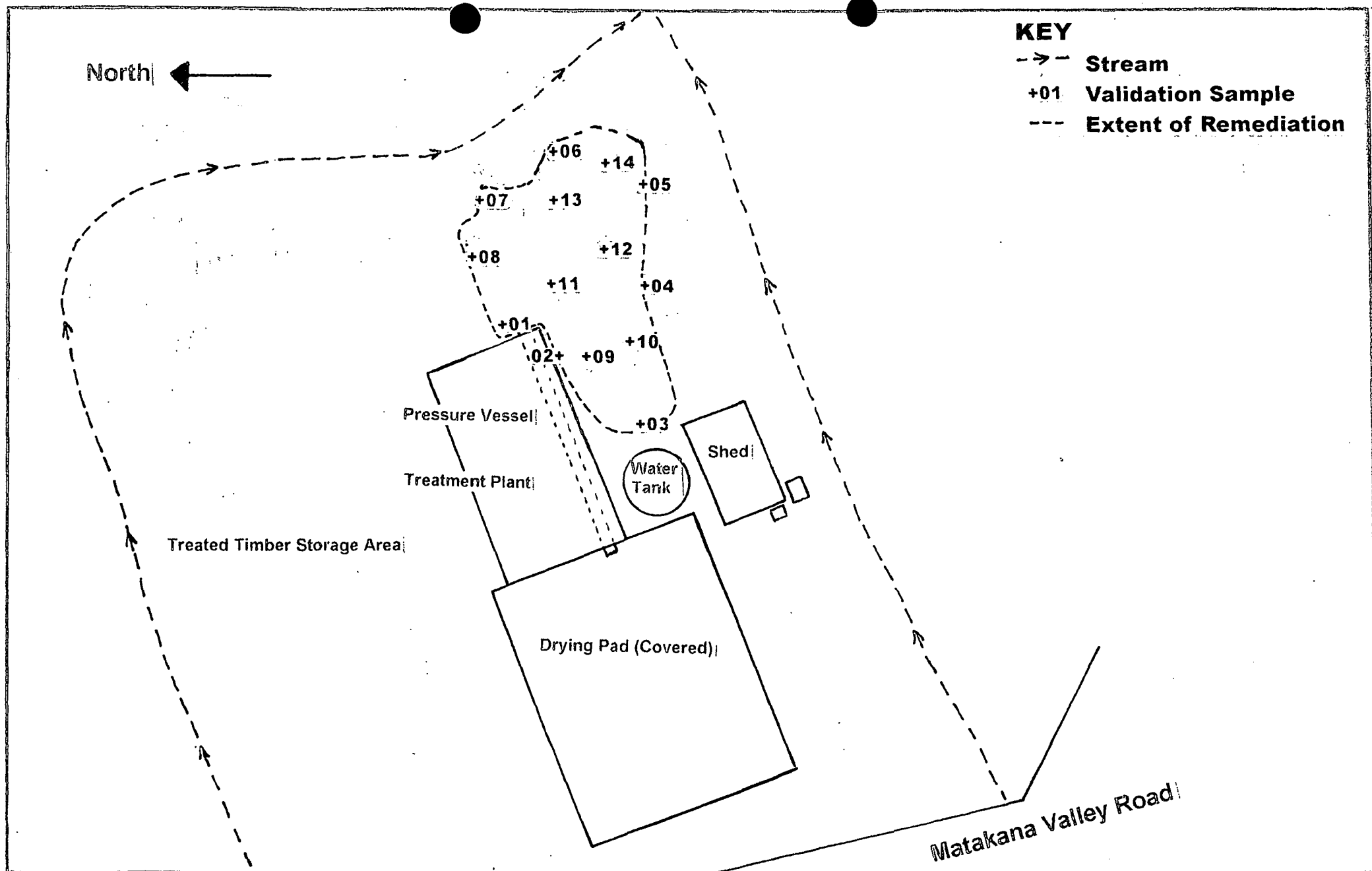
The validation sampling results show that the area southeast of the timber treatment plant has been remediated in accordance with the criteria laid down in the RAP.

No further remediation is required for this area.

=> Consistent with Ch.

The identified contamination at the property has been remediated to the point where remaining levels of contamination are below the timber treatment guideline values for the protection of human health for both unpaved and paved industrial/commercial sites (no management plan) and for the protection of maintenance workers.

Provided that the use of the site remains in the commercial/industrial category, no further site management plans are required for the remediated area. In the event that there was a need to change the land use to a more sensitive classification, additional environmental investigation would be required.



Groundwater &
Environmental Services

Figure 1: Stage 1 Remediation/Validation
Kowhai Timber

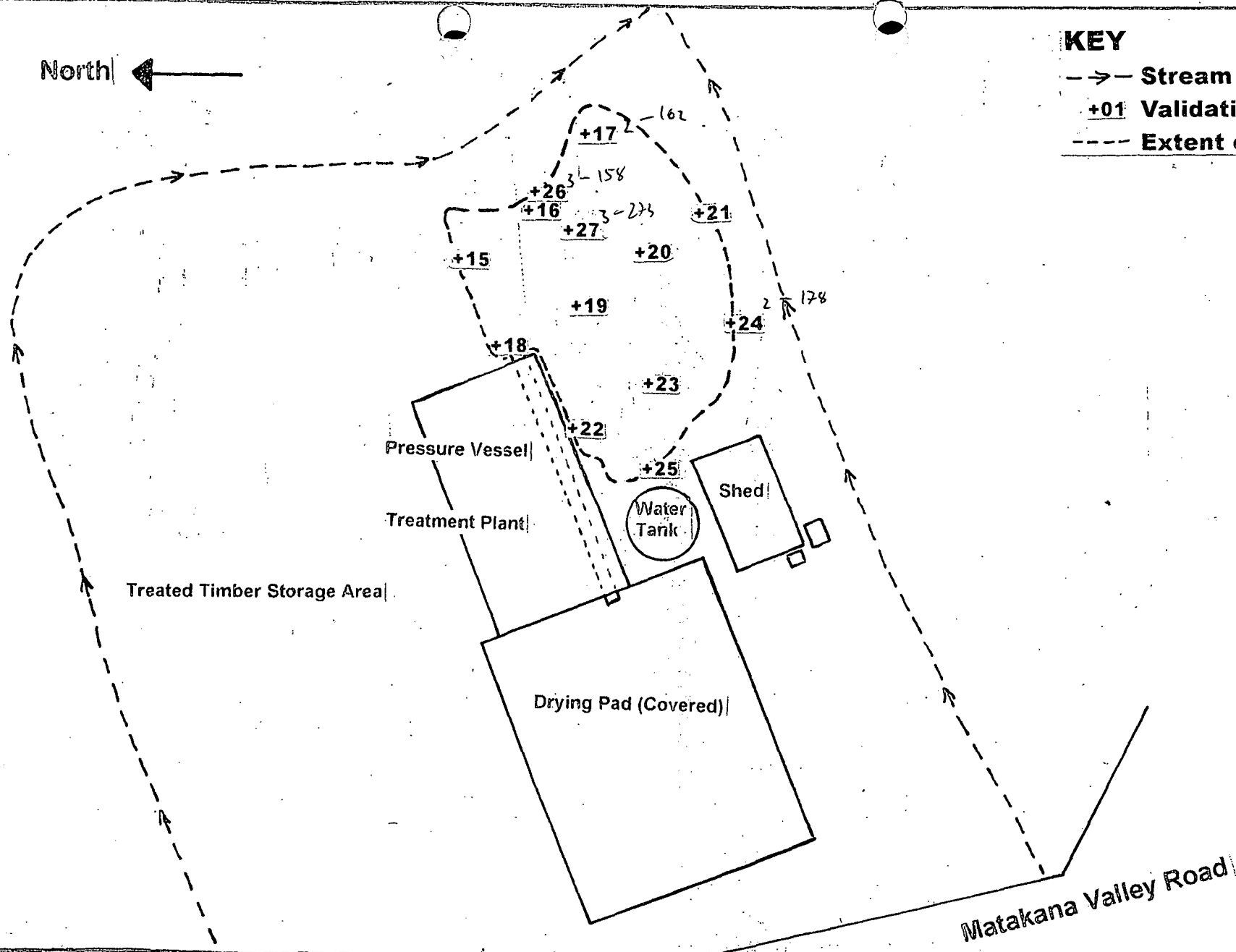
Approximate Scale 1:3000

DRAWN	CHECKED	SCALES	SHEET
TRACED	DATE June 05		SERIES OF
			FIG

North 

KEY

-  Stream
-  +01 Validation Sample
-  Extent of Remediation



Groundwater &
Environmental Services

Figure 2: Stage 2&3 Remediation/Validation
Kowhai Timber

Approximate Scale 1:3000

DRAWN	CHECKED	SCALE	SHEET
TRACED	DATE June 05		SHEET

Waste Management

**Tax Invoice**

GST Registration No. 10-414-695

Kowhai Timber Ltd
362 Matakana Valley Rd
MATAKANA

Account Number 498199
Invoice Number 12
Invoice Date 31-January-2005

Redvale Landfill
Landfill Access Rd
Dairy Flat
Auckland
PO Box 228, Silverdale,
New Zealand

Tel 64 9 427 0606
Fax 64 9 428 8284

Page 1

INVOICE

Tip Date	Ticket Number	Waste Code	Reference	Vehicle Reg	Vehicle Type	Net Weight	Nett Charge
1/2005	155800	CONTSOIL		TH6621	Truck & Trailer	15060	978.90
27/01/2005	155803	CONTSOIL		UO295		18100	1,176.50
28/01/2005	155871	CONTSOIL		WJ7150		25960	1,687.40
28/01/2005	155885	CONTSOIL		WH8460		28900	1,878.50

Total kgs: 88,020

Sub Total \$5,721.30

GST \$715.16

TOTAL inc GST: \$ \$6,436.46

PAID

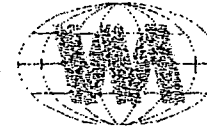
With Thanks

R. D. Jones

Chg. no: 50025

REDVALE LANDFILL
LANDFILL ACCESS RD, DAIRY FLAT
PO BOX 228 SILVERDALE
TELEPHONE 0-9-427 0600
FAX 0-9-426 8784

Waste Management



GST Reg No: 10-414-695

Customer:

Kowhai Timber Ltd
362 Matakana Valley Rd
MATAKANA

Ticket No:

162377

Operator:

Ron

Transaction Type:

A/C

Site:

Tel No: (09) 427 0600

Redvale Landfill

Vehicle Reg. No:

Carrier:

TH6621

Vehicle Description:

Carrier Reg. No:

Driver

Driver's Signature

Waste Type:

Contaminated Soil

Description

CONTSOIL

Comments:

Kg

Seq No.

Date

Time

Gross

Tare

Nett

34560

13940

20620

08/03/2005 03:21 PM

08/03/2005 03:51 PM

Nett \$

Operator's signature

Origin:

Local

Order No:

GST \$

Gross \$

Disposal Module:

5501-794416-57-top

Fax L22 7717

REDVALE LANDFILL
LANDFILL ACCESS RD, DAIRY FLAT
PO BOX 228 SILVERDALE
TELEPHONE 0-9-427 0600
FAX 0-9-426 8284

Waste Management



GST Reg No: 10-414-695

Customer:

Kowhai Timber Ltd
362 Matakana Valley Rd
MATAKANA

Ticket No.: 162309

Operator: Ron

Transaction Type: A/C

Site:

Tel No.: (09) 427 0600

Redvale Landfill

Vehicle Reg. No:

Carrier:

TH6621

Vehicle Description:

Carrier Reg. No:

Driver

Driver's Signature

Waste Type: Contaminated Soil

Description: CONTSOIL

Comments:

Kg

Seq No.

Date

Time

Gross

Tare

Net

32460

14020

18440

08/03/2005 12:55 PM

08/03/2005 01:20 PM

Volume

Nett \$

GST \$

Gross \$

Operator's signature

Origin:

Local

Order No.:

Disposal Module: 5501-794416-57-top

CPI PRINT LIMITED PH 09-236 4440

#2264 P.002/003

MAR.09'2005 16:20

JAN-05-05 11:00 FRANK

Waste Manifest

NOTES

LANDFILL ACCESS RD, DAIRY FLAT
PO BOX 228 SILVERDALE
TELEPHONE 0-9-427 0600
FAX 0-9-426 8284

Customer:
Kohhai Timber Ltd
362 Matakana Valley Rd
MATAKANA

Vehicle Reg. No.: WJ7150

Driver:

Waste Type: Contaminated Soil
Description: CONTAMINATED SOIL
Comments:

Origin:

Order No.: Local

Disposal Module: 5472-106002-04

Generator Name: Kowhai
Site Address: 362 Matakana
Technical Contact on Site
Conditions of Acceptance
Hauler: Rother Contract
Delivery Date: Friday 21

Company to Charge: Kowhai

Postal Address:

Priming: Tissue Rate

Handling Instructions: P

Waste Description: CC

Physical State: OS

Incidental Waste & Arrog

Methods of Shipment:

Sampling Frequency: 1

Retain Sample: 2 Y

Green Tissue:

(Note frequency final for every sample)



Waste Management

BST Reg No: 10-414-695

Operator: Richard

Ticket No: 155671

Transaction Type: A/C

Site:

Tel No: (09) 427 0600

Redvale Landfill

Vehicle Description:

Carrier Reg. No.:

Driver's Signature

Gross
Tare
Net

41260
15300
25960

26/01/2005 08:39 AM
26/01/2005 09:04 AM
26/01/2005 09:04 AM

Kg

Seq No

Date

Time

Net

GST

Gross

Operator's signature

Cell Defects: ☒ Repair

Special Precautions: ☐ Disposal Instructions:

Redvale Landfill Special Waste Engineer
SIMON COURT

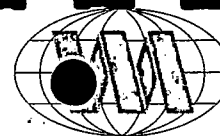
Special Waste Manifest - 10/01/05

Sorry can locate
landfill detail
for the 27/01/05
Have

1844
20620
0

REDALE LANDFILL
LANDFILL ACCESS RD, DAIRY FLAT
PO BOX 228 SILVERDALE
TELEPHONE 0-9-427 0600
FAX 0-9-426 8284

Waste Management



GST Reg No: 10-414-695

Customer:

Kowhai Timber Ltd
362 Matakana Valley Rd
MATAKANA

Ticket No.: 165943 Operator: Ron
Transaction Type: A/C
Site: Tel No.: (09) 427 0600

Redvale Landfill

Vehicle Reg. No.: AYP209
Carrier:

Vehicle Description:
Carrier Reg. No.:

Driver

Driver's Signature

Waste Type: Contaminated Soil

Description: CONTSOIL

Comments:

	Kg	Seq No.	Date	Time
Gross	21100		29/03/2005	02:14 PM
Tare	10520		29/03/2005	02:39 PM
Nett	10580			Volume

Origin: Local

Order No.:

Disposal Module: 5518-794416-57-top

Nett \$

Operator's signature

GST \$

Gross \$

Appendix B

Laboratory Analytical Reports

Hill Laboratories

R J Hill Laboratories Limited

Address:
1 Clyde Street,
Private Bag 3205,
Hamilton, New Zealand

Telephone:
+64 (7) 858-2000
Facsimile:
+64 (7) 858-2001

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



Client: Groundwater & Environmental Service
Address: P O Box 190,
CAMBRIDGE
Contact: Andrew MacDonald

Laboratory No: 378424
Date Registered: 17/05/2005
Date Completed: 23/05/2005
Page Number: 1 of 1

Client's Reference: Kowhai

The results for the analyses you requested are as follows:

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)
KTL05026 17/05/05	378424/1	12	158	14
KTL05027 17/05/05	378424/2	6	273	15

Sample Containers

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

Container Description	Container Size (mL)	Number of Containers
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 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

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.

This report must not be reproduced, except in full, without the written consent of the signatory.

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager

Terry Cooney, MSc(Hons), PhD MNZIC
General Manager



This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited. This report may not be reproduced, except in full, without the written consent of the signatory.

Hill Laboratories

R J Hill Laboratories Limited

Address:
1 Clyde Street,
Private Bag 3205,
Hamilton, New Zealand

Telephone:
+64 (7) 858-2000
Facsimile:
+64 (7) 858-2001

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



Client: Groundwater & Environmental Service
Address: P O Box 190,
CAMBRIDGE
Contact: Andrew MacDonald

Laboratory No: 367886
Date Registered: 9/02/2005
Date Completed: 15/02/2005
Page Number: 1 of 2

Client's Reference: Kowhai Timber

The results for the analyses you requested are as follows:

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)
KTL 05001 8/2/05	367886/1	721	172	55
KTL 05002 8/2/05	367886/2	8	50	16
KTL 05003 8/2/05	367886/3	1700	1020	651
KTL 05004 8/2/05	367886/4	7330	5150	5960
KTL 05005 8/2/05	367886/5	990	826	231
KTL 05006 8/2/05	367886/6	912	477	520
KTL 05007 8/2/05	367886/7	1180	568	237
KTL 05008 8/2/05	367886/8	828	467	257
KTL 05009 8/2/05	367886/9	81	64	12
KTL 05010 8/2/05	367886/10	2060	2410	1010
KTL 05011 8/2/05	367886/11	1220	1320	144
KTL 05012 8/2/05	367886/12	176	165	30
KTL 05013 8/2/05	367886/13	966	546	278
KTL 05014 8/2/05	367886/14	1880	592	1170

Sample Containers

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

Container Description	Container Size (mL)	Number of Containers
Glass Jar (Soils)	300	14

Details of sample bottle preparation procedures are available upon request.



This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited.
This report may not be reproduced, except in full, without the written consent of the signatory.

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 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

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.

This report must not be reproduced, except in full, without the written consent of the signatory.

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager


Terry Cooney, MSc(Hons), PhD MNZIC
General Manager

Hill Laboratories

R J Hill Laboratories Limited

Address:
1 Clyde Street,
Private Bag 3205,
✉ Hamilton, New Zealand

Telephone:
+64 (7) 858-2000
Facsimile:
☎ +64 (7) 858-2001

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



Client: Groundwater & Environmental Service
Address: P O Box 190,
CAMBRIDGE
Contact: Andrew MacDonald

Laboratory No: 372055
Date Registered: 16/03/2005
Date Completed: 23/03/2005
Page Number: 1 of 2

Client's Reference: Kowhai Timber

The results for the analyses you requested are as follows:

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)
KTL05015 15/03/05	372055/1	143	76	67
KTL05016 15/03/05	372055/2	919	102	338
KTL05017 15/03/05	372055/3	148	162	48
KTL05018 15/03/05	372055/4	128	98	19
KTL05019 15/03/05	372055/5	14	71	17
KTL05020 15/03/05	372055/6	6	40	15
KTL05021 15/03/05	372055/7	114	108	38
KTL05022 15/03/05	372055/8	2	42	10
KTL05023 15/03/05	372055/9	7	46	14
KTL05024 15/03/05	372055/10	148	178	42
KTL05025 15/03/05	372055/11	9	55	12

Sample Containers

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

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

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 Arsenic	Nitric / hydrochloric acid digestion, ICP-MS. US EPA 200.2	2 mg/kg dry wt



This Laboratory is accredited by International Accreditation New Zealand (previously known as TELARC). The tests reported herein have been performed in accordance with its terms of accreditation, with the exception of tests marked *, which are not accredited.
This report may not be reproduced, except in full, without the written consent of the signatory.

Parameter	Method Used	Detection Limit
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

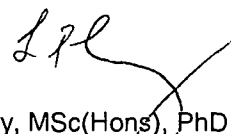
Analyst's Comments:

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.

This report must not be reproduced, except in full, without the written consent of the signatory.

Peter Robinson, MSc(Hons), PhD FNZIC
Environmental Division Manager


Terry Cooney, MSc(Hons), PhD MNZIC
General Manager

Appendix C

Validation Photographs





