Patea Hydro Electric Power Scheme

Lake Rotorangi Hazard Survey

August 2011

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REPORT OF SURVEY

Report Prepared for:

Lake Rotorangi Hazard Identification Survey

Report Date: 26 August 2011
Surveyed Between: 25 – 27 July 2011

Report Prepared By:

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REPORT OF SURVEY

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LIST OF ABBREVIATIONS

Abbreviated terms which may be used in this document are as follows:

BM	Bench Mark
CD	Chart Datum
DML	Discovery Marine Ltd
DGPS	Differential GPS
GPS	Global Positioning System
RTK	Real Time Kinematic (GPS Positioning System)
SBES	Single Beam Echo Sounder
SD	Sounding Datum
RL	Reduced Level
TM	Terramodel v10.60
HWSC	Hawera Water Ski Club
GOs	HYDROpro Guidance Objects

1. Introduction

Discovery Marine Ltd was contracted by TrustPower Ltd to undertake a Hazard Identification Survey of Lake Rotorangi located in South Taranaki, New Zealand. This survey would identify areas of shallow water and submerged hazards considered dangerous to recreational lake users during times of low lake levels.

The area to be investigated is bounded by the Glen Nui boat ramp in the north, and the Patea Dam in the south.

A reconnaissance of the area was completed on 30th March 2011, with DML's survey team mobilising to the Hawera Water Ski Club at the end of Pukekino Road on 25th July 2011. The hazard identification survey was completed over the 26th, 27th and 28th of July 2011, with demobilisation complete on the 29th of July 2011.

2. Equipment

Vessels:

DML's survey vessel Penguin II was used for the survey. A jet ski was also used as a standby safety vessel.

Survey Equipment:

Echo Sounder: Tritech PA500 digital sounder (10m max depth)

Depth Acquisition:	8 - 10 soundings per second
Frequency:	500 kHz
Beam Width:	SBES - 6°
Accuracy:	+/- 1cm

Positioning System: A Trimble R6 GNSS Rover Receiver was used in Autonomous mode.

Accuracy:	Horizontal:	±2m

Digital Acquisition System:

Trimble HYDROpro Navigation v2.32 software was used for digital data acquisition and navigation on the lake.

3. Survey Methodology

Mobilisation/Setup

Prior to departing for the site, geodetic parameters for the survey as well as geo-referenced TOPO50 maps (1:50,000) and a DXF coastline covering the Lake Rotorangi region were loaded in to the HYDROpro data acquisition software. Using the TOPO50 maps and DXF coastline for reference, Guidance Objects (GOs) to aid vessel navigation on the lake were created within HYDROpro.

Data Acquisition

During survey operations the helmsman was able to use the GOs to navigate along the lake, while the system operator monitored position and depth quality. Where possible a zig zag pattern has been run around the lake edge, from the edge of a safe navigation zone out to 10m depth. Along steep areas no lake bottom was measured as the depth was greater than 10m.

The system operator was able to identify areas that required further investigation, such as shoaling and lake bed features. Position fixes were recorded for hazardous features as well as photographs of features and the lake bank.

Data Editing and Processing

All depth data was processed using the HYDROPro NavEdit software suite. Corrections for transducer offset and lake water levels were applied to the depth database and depth spikes and spurious soundings removed. A manual quality control check of corrected soundings was then carried out.

Edited data was exported into Terramodel v10.60 (TM) software, where depth points were viewed with hazard position fixes to determine a line of safe navigation on the lake. Two 1:10,000 sheets of the lake area were produced to show all hazard areas and the line of safe navigation with the TOPO50 maps overlayed.

In selected areas, ASCII point data was exported to Surfer version 8.0 and gridded at 20m intervals for the production of 2d images.

4. Lake Levels

Lake levels for Lake Rotorangi were provided by TrustPower, for the period the DML survey team were on site. These lake levels were used directly to reduce depth data recorded by DML. The lake level gauge is located at the Patea dam with the level measured at an accuracy of ±1cm.

Due to the timing of DML mobilising to the area coinciding with construction work at the HWSC, the lake level was near its lowest consented level of 74mRL during survey operations. The low lake level exposed shallow banks, semi submerged tree stumps and braches and proved beneficial in identifying potentially hazardous areas for recreational lake users.

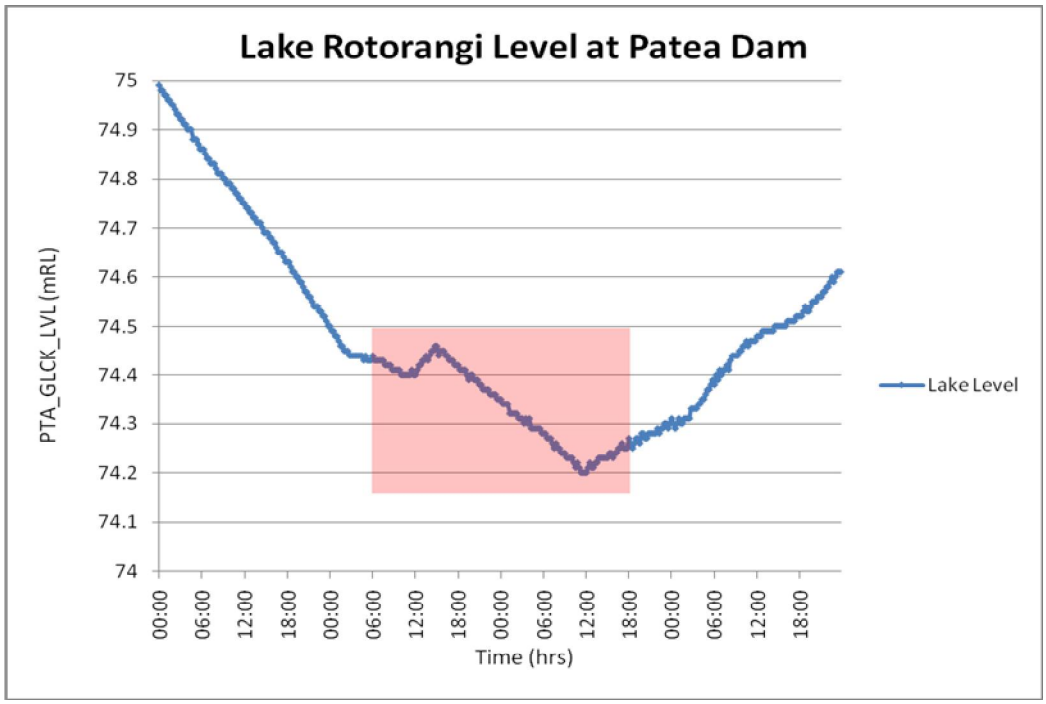

Figure 1: Graph of Lake Rotorangi Level from 12:00am 25th of July 2011 to 12:00am 29th July 2011. Red box indicates lake level during bathymetric survey operations.

5. Survey Results

DML investigated Lake Rotorangi between Glen Nui and Patea Dam for hazards by surveying an area, where possible between the lake bank and 10m depth. The majority of the lake edge is steep, in some areas the cliff face above the water continues more than 10m below water level and could not be sounded.

The low lake level allowed a visual survey of the lake bank to be undertaken and photographed (Lake bank photos in Appendix B). From analysis of the survey data and photographs, a safe navigation line has been determined around the lake edge and marked on the associated plans (11_13_1 &11_13_2). The safe navigation line attempts to bound areas where weed or tree stumps and branches are hazardous to recreational lake users.

A number of significant hazards have been identified and numbered on the associated plans. These are outlined further in Appendix A. Shallow areas were noted to extend out from most headlands with the lake bed rising quickly. Caution should therefore be exercised while navigating around headlands close to the lake edge.

Due to the scale of the TOPO50 maps, it is difficult to accurately reference the safe navigation line to the physical lake edge, as the lake edge often deviates from the edge depicted on the NZTOPO50 maps. It is therefore recommended that where lake users are uncertain of the location of the safe navigation line, a minimum of 10m from the water edge be kept to avoid submerged hazards on the lake bed.

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Discovery Marine Ltd

APPENDIX A

A1 - Glen Nui Reach

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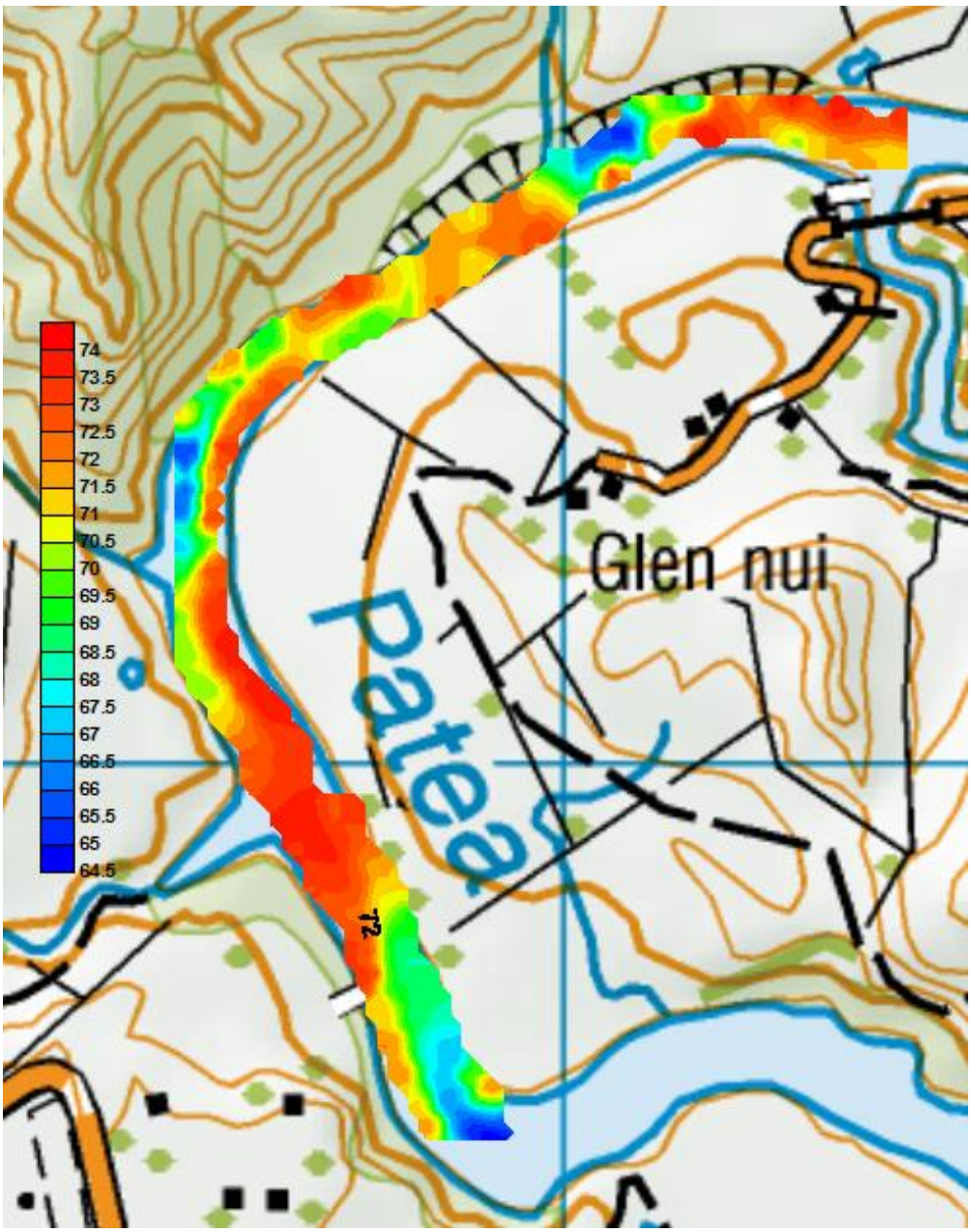


Figure 2: Colour banded bathymetry in the Glen Nui Reach

Areas of the Glen Nui reach were very shallow with the low lake level. Large sand banks are evident where the lake bends, and at the tributary confluence north of the Caniwi lodge landing. It is recommended that during times of low lake levels this area is navigated slowly or avoided if possible.

A1 – Sand Banks on right bank, opposite Glen Nui Boat Ramp

A1 – Sand Banks on left bank, downstream of Glen Nui Boat Ramp

A1a – Submerged Branches on left bank, downstream of Glen Nui

A line of partially submerged branches extending approximately 10m perpendicular to the lake edge.

A1b – Tree Stumps/Roots on left bank, downstream of Glen Nui

A line of tree stumps that would be submerged with regular lake levels. This is near a lake corner where recreational boat users apparently come close to the lake edge.

A2 – Fallen Pine Tree on left bank.

A large dead pine tree has collapsed into the lake. There are several partially submerged branches and hazards in the immediate area surrounding the tree..

A3 – Semi Submerged Braches on left bank

A large area of lake bank with several bare tree trunks extending into the lake.

A3 – Semi Submerged Braches on left bank

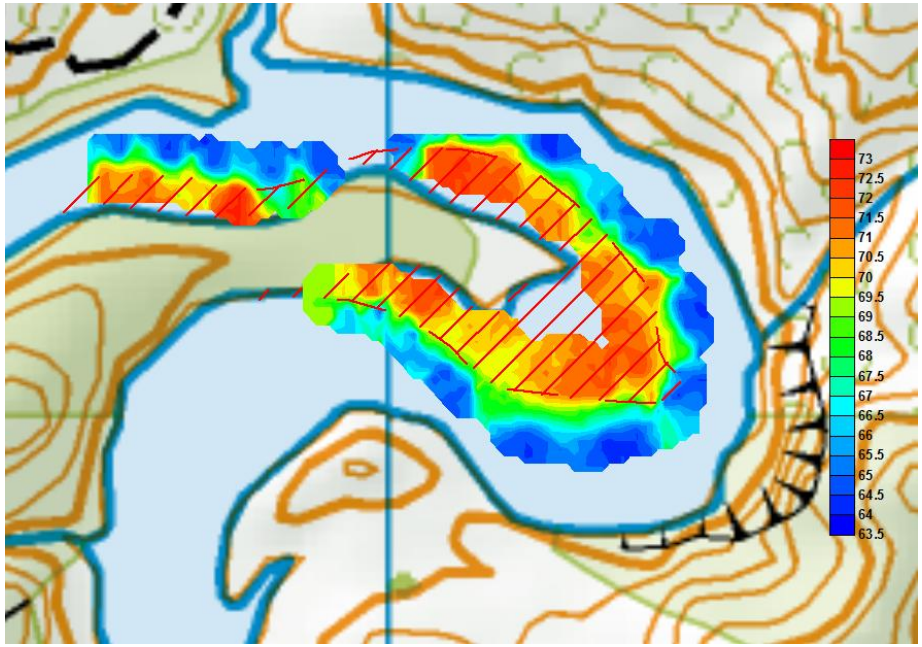
A4 – Exposed Tree Branch on left bank downstream of Otauira Stream

An exposed tree branch extends 10m out from the lake bank, 1m above the lake level. Will cover with normal lake levels

A4 – Exposed Tree Branch on left bank

Photo of tree hazard extending into lake.

A5 – Large Semi Submerged Tree Area on right bank downstream of Otauira Stream.



A large shallow hazard area extends off this headland and is covered with weed, tree stumps and branches. With the low lake level it was evident that the scattered submerged tree branches extend out into the lake as shown above by the hatched hazard area.

A5 – Large Semi Submerged Tree Area on right bank downstream of Otauira Stream.

Photo of the lake bank with tree stumps, branches and weed.

A5 – Large Semi Submerged Tree Area on right bank

Photo of the lake bank with tree stumps, branches and weed.

A5 – Large Semi Submerged Tree Area on right bank

Photo of the lake bank with semi submerged branches in the foreground.

A6 –Submerged Tree Stump on left bank, upstream of HWSC

A 0.3m diameter tree stump was found submerged 0.05m and 5m from the lake edge. It is outside the safe navigation zone and close passage around this headland should be avoided.

A6 –Submerged Tree Stump on left bank, upstream of HWSC

Photo showing approximate location of submerged tree stump.

A7 – Weed covered shallow sandy area on left bank, upstream of HWSC

A sandy, weed covered bank extends into the confluence from the southern headland. There are large floating areas of weed in this area also

A8 – Submerged tree stumps close to bank on left bank opposite HWSC

Several tree stumps submerged 0.05m have been seen close to the bank in this area opposite HWSC.

A9 – Weed covered, shallow, sandy area on left bank opposite Pukekino Road

A large sandy, weed covered bank extends out from the entrance to two small lake arms and a landing area. Bank was approximately 0.5m above the low lake level. There were also large areas of floating weed surrounding the bank

A9 – Weed covered, shallow, sandy area on left bank opposite Pukekino Road

Photo of a tree hazard close to the lake bank in the north of this area. Tree would be submerged with normal lake levels.

A10 – Felled trees on bank extending to water line & submerged on left bank, downstream of Pukekino Road

Fallen tree extending from lake bank into water. The end of this tree is submerged approximately 5m from lake edge. Tree would be covered with normal lake levels.

A11 – Submerged branches and weed near bank on right bank downstream of Pukekino Road

Tree branches extending out from shallow headland into water. Avoid passage close to the headland when entering small bay.

A12 – Submerged branches & weed near marker buoys on right bank

Several isolated tree branches and areas of floating weed have been seen, 5 to 10m off the lake bank close to some marker buoys. These buoys may be used as part of a ski lane. It is recommended that close passage to the lake bank be avoided in this area or the buoys moved further from the bank.

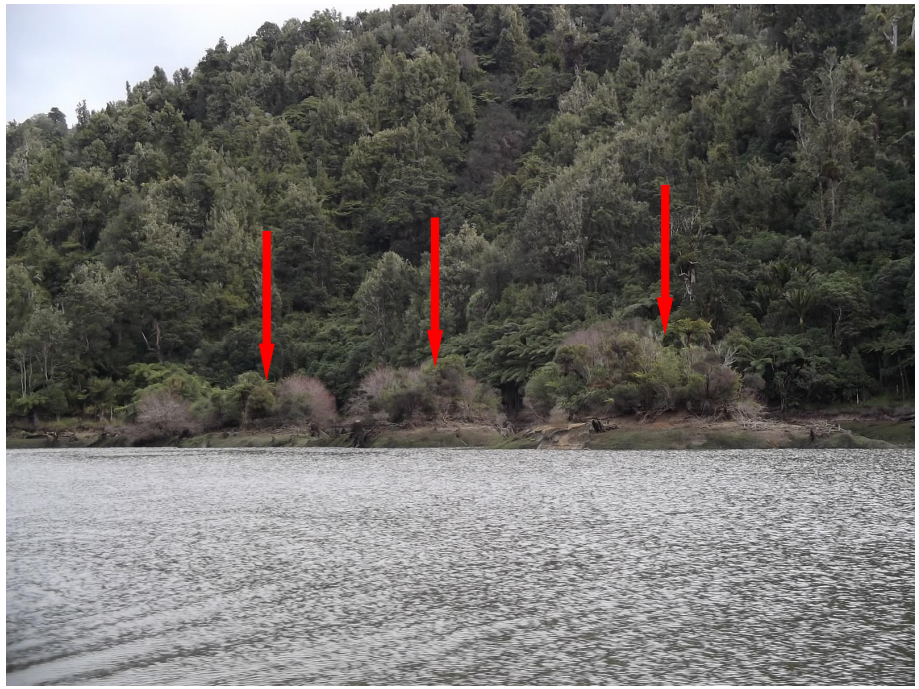
A13 – Small Raft/Wreck on right bank

What appears to be an upside down raft was found loosely tethered to the land. It is unsure whether this raft is floating or submerged when the lake is at its normal level.

A14 – Fallen trees on bank and semi submerged branches on right bank

Photo showing tree stumps and branches extending into the lake on a narrow headland. Close passage to this headland should be avoided.

A15 – Normally submerged land area on right bank



Three clumps of bush that appear partially submerged at normal lake levels. It is recommended lake users avoid passage between these as its is shallow an there are numerous semi submerged branches surrounding them.

A16 – Partially Submerged Barge/Caravan on left bank, upstream of Patea Dam

A partially submerged caravan barge was discovered tethered to the lake bank. It is recommended lake users avoid this area as the barge may break free and become fully submerged.

A17 – Patea Dam

A large boom extends across the lake in front of the dam wall.

APPENDIX B

B1 – Left Bank

B2 – Right Bank

B3 – Right Bank

B4 – Right Bank

B5 – Left Bank

B6 – Left Bank

B7 – Left Bank

B8 – Left Bank

B9 – Right Bank

B10 – Right Bank

B11 – Left Bank

B12 – Right Bank

B13 – Right Bank

B14 – Right Bank

B15 – Right Bank

B16 – Right Bank

B17 – Left Bank

B18 – Right Bank

B19 – Left Bank

B20 – Right Bank

B21 – Left Bank

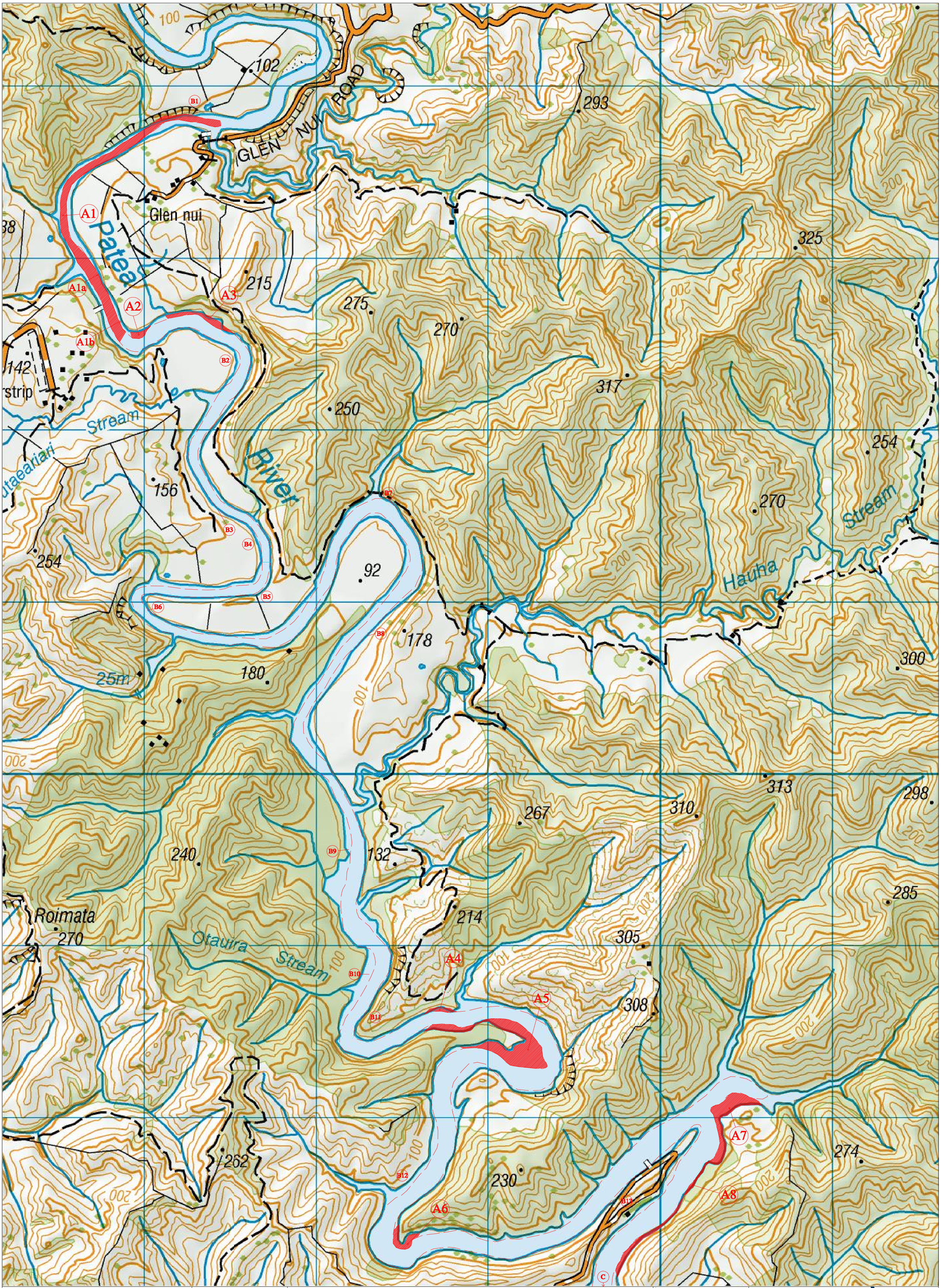
B22 – Left Bank

B23 – Right Bank

B24 – Left Bank

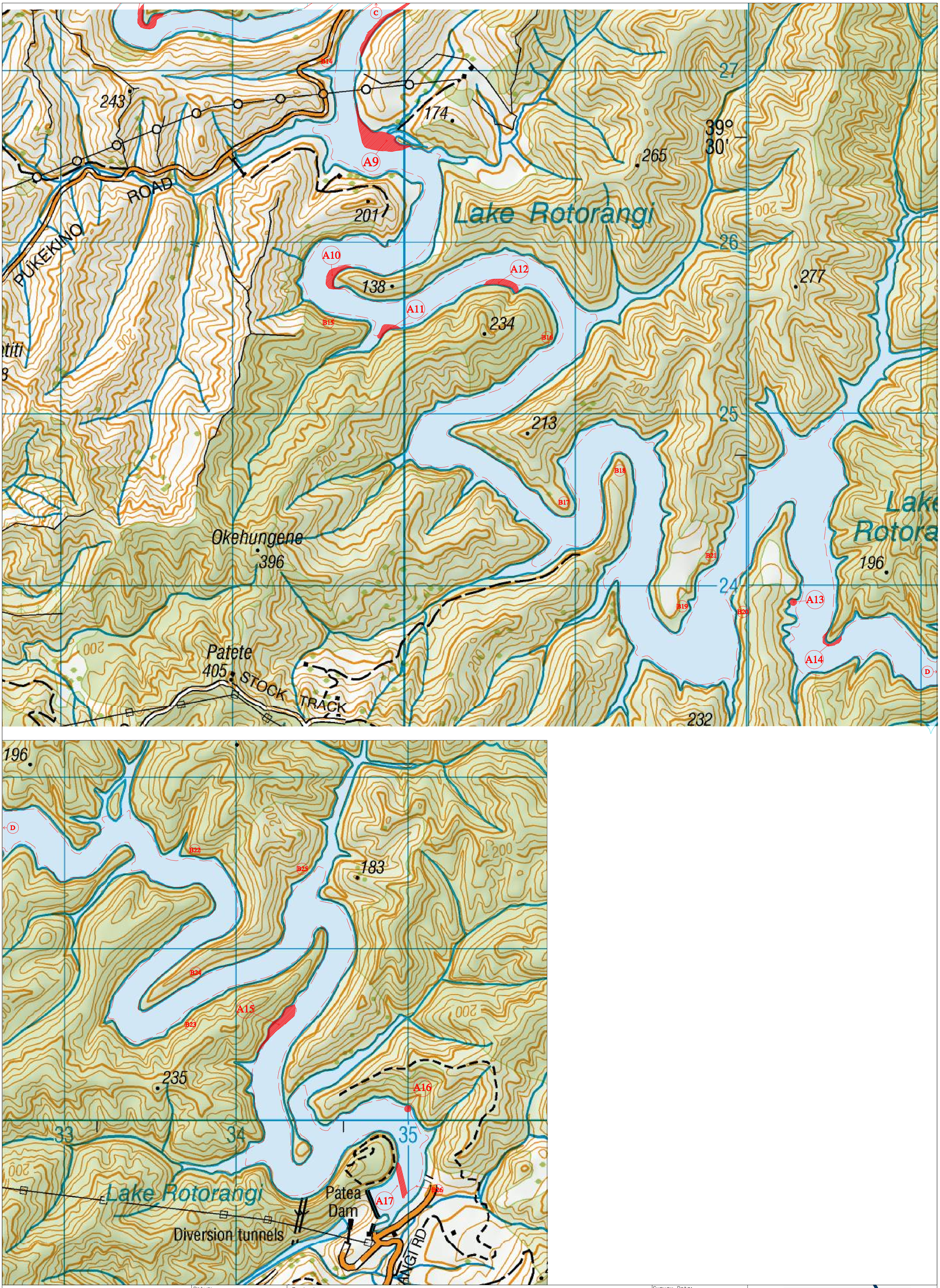
B25 – Left Bank

B26 – Left Bank



Surveyed By Discovery Marine Ltd Hydrographic and Coastal Management Services POBox 4048, Mt Maunganui, Bay of Plenty, New Zealand info@dmlsurveys.co.nz www.dmlsurveys.co.nz	Datum: NZGD2000	Project: **Lake Rotorangi Hazard Survey**	Survey Date: 25,26, 27 July 2011
	Grid: NZTM	Drawing: North of HWSC to Glen Nui	Scale: 1:10.000
	Vertical: Patea Dam		DML Job ID: 11_13 DWG No. 11_13_1

TrustPower



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			DWG No. 11_13_2