

STORYS CREEK

JIG TAILINGS RELOCATION REPORT

JUNE 2003



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1.0 INTRODUCTION

The Storys Creek/Rossarden remediation project is a cooperative project between Mineral Resources Tasmania (MRT), the Department of the Primary Industry Water and Environment (DPIWE) and the Commonwealth Department of the Environment. The aim is to design and implement a remediation strategy for the Storys Creek and Rossarden abandoned mine sites to reduce acid and heavy metal discharge into the South Esk River system (Figure 1).

In early 2000, the tailings materials from the "Precipitate Dam" were excavated and deposited in a purpose built dump and capped with clay materials.

The work was completed in June 2000 and a report completed (JMP,2000)

A large deposit of jig tailings also existed on the western side of Storys Creek and in 2000 as part of Precipitate Dam materials a small amount was removed as a trial.

In 2001 a proposal was prepared by MRT for part Riverworks funding to remove 50,000 m³ of the jig tailings and encapsulate as an extension of the Precipitate tailings dump. The proposal was accepted and was jointly funded by the Commonwealth through Riverworks Tasmania and the State through the Rehabilitation of Mining Land Trust Fund (Figure 2).

This report details the nature and conduct of the works.

Approximately 71,000m³ of Jig Tailings was removed and encapsulated versus the budgeted quantity of 50,000m³, with approximately 30,000m³ remaining insitu. The increase in quantities is attributed to an unanticipated change in topography underlying the jig tailings. What was assumed as an adit entrance into the hillside by the surveyor was revealed after excavation to consist of a timbered adit located on mullock, with the hillside a further 30m or so into the tailings. This accounted for the increase of tailings quantities. The encapsulation design was varied to reduce costs.

2.0 BACKGROUND

2.1 HISTORY

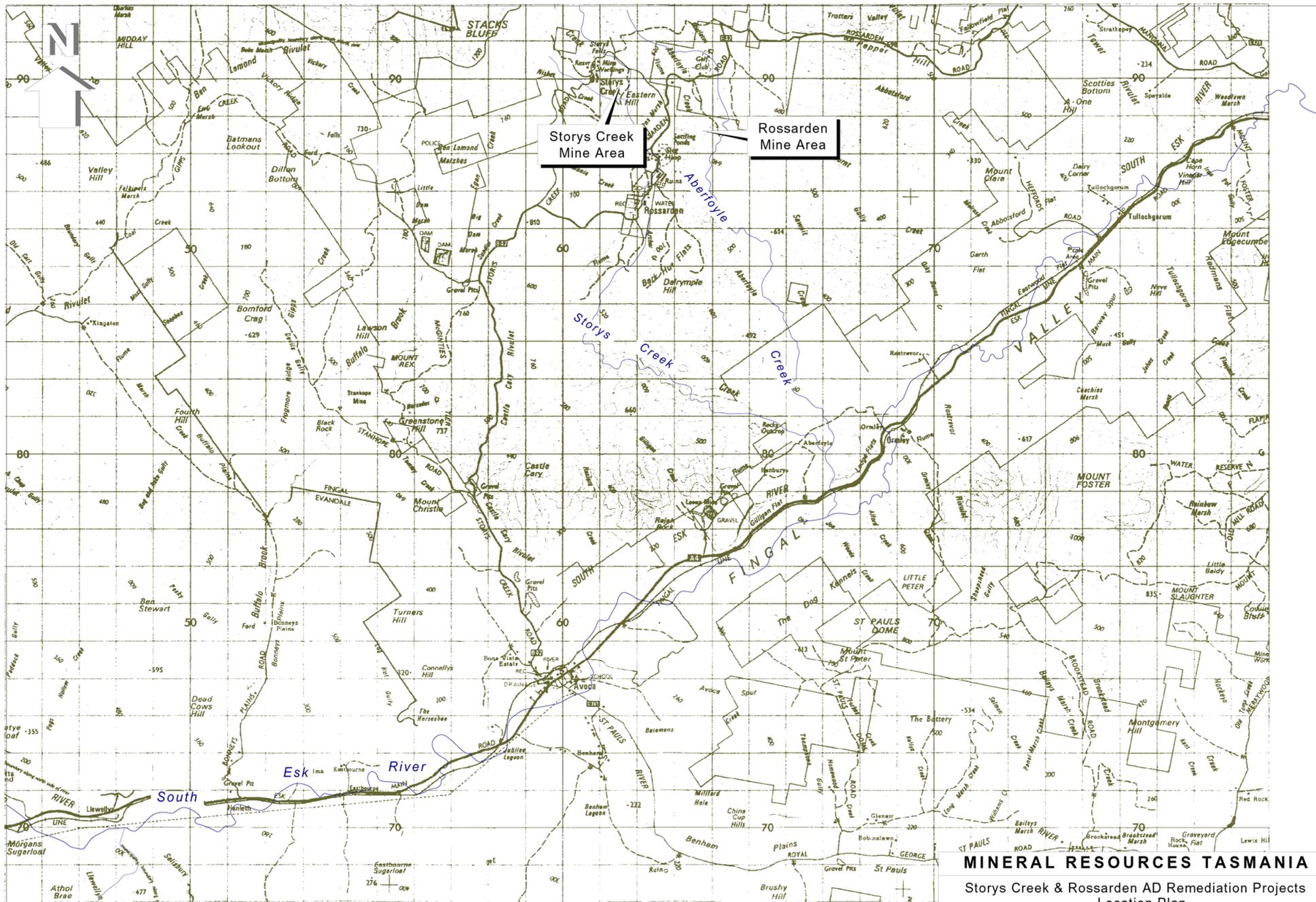
Jig tailings were deposited as a by product of the minerals processing on the banks of Storys Creek from the 1950's to mine closure in the early 1980s.

Both laboratory and lysimeter trials revealed that the jig tailings were leaching high concentrations of contaminants and were estimated as probably the largest single source of contaminants to Storys Creek waters (JMP 2000b).

2.2 SITE INVESTIGATIONS AND DESIGN

The surface of the jig tailings was surveyed by G.J Walkem and Co and outcrops were also surveyed. The surface was modelled and volumes estimated using an assumed original topography profile. The surveyor's estimated approximately 40-50,000m³ was contained in the tailings deposit.

A trial excavation in 2000 demonstrated that the jig tailings could be removed quite easily and lysimeter tests determined the alkalinity required to buffer acidity. This was 10kg/tonne.



1 grid space to 1km

(June 2000)

MINERAL RESOURCES TASMANIA

Stors Creek & Rossarden AD Remediation Projects
Location Plan

John Miedecke & Partners P/L **FIG 1**

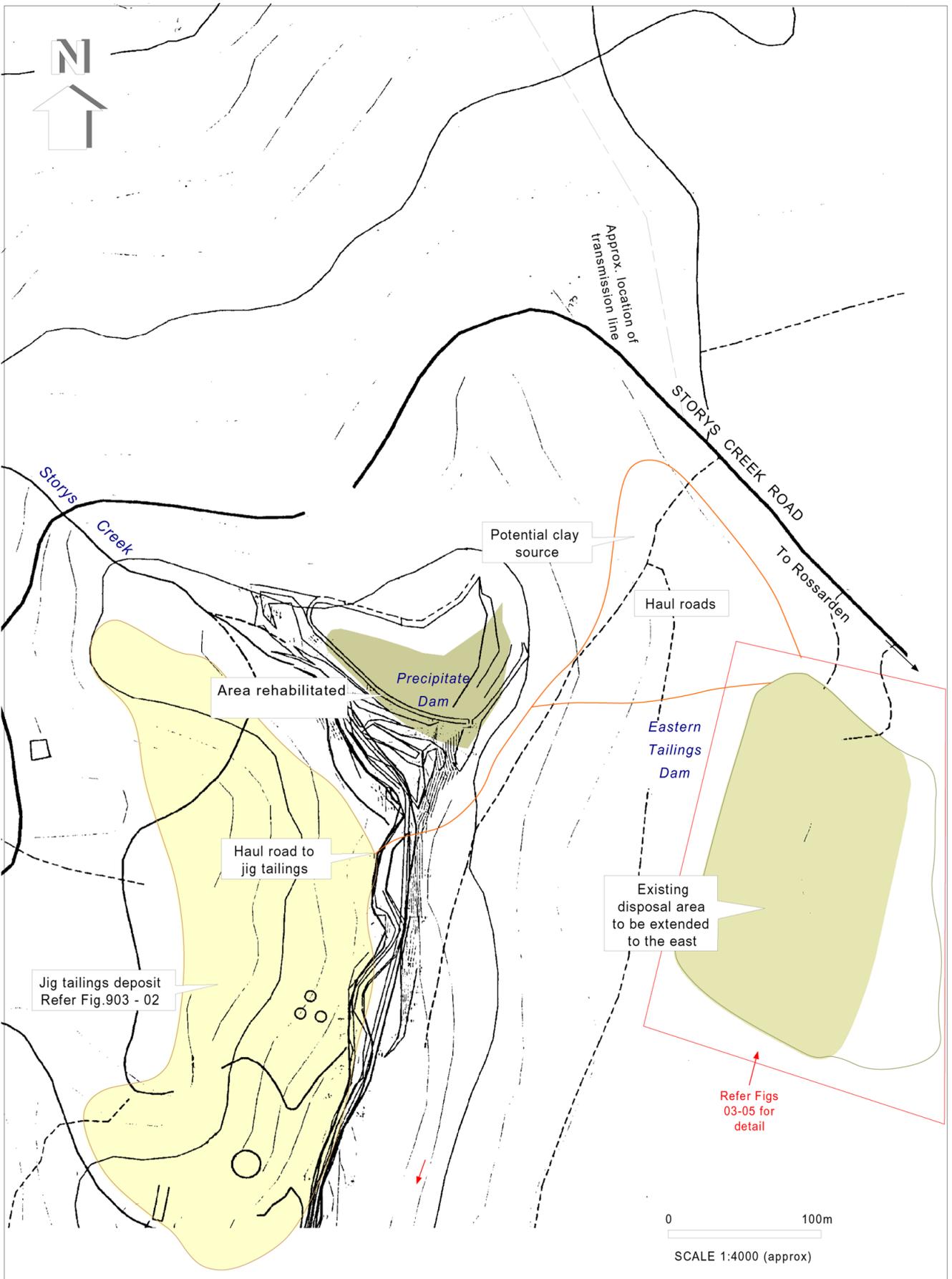


FIG 903 - 01

MINERAL RESOURCES TASMANIA

Storys Creek Remediation
Jig Tailings Contract Area Plan

John Miedecke & Partners P/L **Fig 2**

(Aug 2001)

The previous dump design for the Precipitate Dam materials had left an area to the eastern side of the dump designated as an extension area for jig tailings disposal and this area was not clay capped at the completion of the 2000 works programme.

3.0 CONTRACT INFORMATION

3.1 CONTRACT

In July 2002 civil engineering contractors were invited to submit an expression of interest to tender for the project.

They were advised a short list would be selected to tender.

A site visit was held on 29 August 2002 and tender documents were issued to five tenderers. The tender document is a separate document (JMP 2001).

Three valid tenders were received.

They were:

- Hazell Bros Group;
- Gradco;
- Becketts Heavy Plant Hire Pty Ltd

The tenders were received and assessed by:

- Guna Ginneliya Department of Roads and Transport
- John Pemberton MRT
- John Miedecke , JMP

The lowest tender received was from Gradco and after the assessment Gradco Pty Ltd were awarded the contract for a tender price of \$348,000 (all costs exclude GST).

Contract documents were prepared and signed by the Crown and the contractor.

During the contract the Scope of Works was altered. This was to provide additional funds for the removal of additional jig tailings after more jig tailings were uncovered. The clay capping layer was reduced in thickness and the outer slopes steepened to allow for the increased volume of tailings (71,000m³ vs 50,000 m³) budgeted to be encapsulated.

An additional \$30,000 was required for the removal and encapsulation of an additional 21,000 m³ of tailings .

3.2 CONTRACT ADMINISTRATION

The contract was administered under AS2124-1992 standard conditions of contract, with the following personnel.

Superintendent - John Miedecke and Partners Pty Ltd

Superintendent representative- John Wilson

All surveys were conducted by G J Walkem and Co, Licensed surveyors, Launceston.

The Contract budget was \$405,000. This included all supervision and additional works.

The final cost was \$401,000.

An additional 21,000m³ of tailings were removed and encapsulated.

A final summary of costs is enclosed in Appendix A.

There were no disputes and the Contractor performed all works to a high standard to provide a very satisfactory result.

A certificate of practical completion was issued on 17 February 2003

4.0 JIG TAILINGS RELOCATION WORKS

4.1 SITE WORKS AND ACCESS ROADS

The contractor commenced work in November 2002 and completed all site works by late February 2003.

These works included,

- vegetation clearing and topsoil removal from the disposal site;
- removal of clay capping from a portion of the existing dump area;
- construction of an access road to the jig tailings via a crossing of Storys Creek.
- establishment of drainage and water treatment ponds downslope of the jig tailings removal area;
- works area and temporary office establishment;
- video tape and condition assessment of the Storys Creek road to be used for jig tails cartage.

Figure 2 shows the location of the access roads, clay sources and water treatment pond.

All haul roads were left insitu after placement of grips to allow future tailings removal if required.

4.2 JIG TAILINGS RELOCATION

The relocation of the tailings was commenced in late November in a single shift operation.

Figure 3 shows a plan of the jig tailings area.

The estimate of the volumes by the surveyor was 50,000m³.

The tailings were removed by excavators, Volvo 30 tonne capacity dump trucks and standard road trucks via internal haul roads and the Storys Creek public road. A haul road was constructed over Storys Creek to the existing haul road system.

The contractor had few problems in completing the contract. Weather conditions were excellent with little rain and the collection ponds constructed at the base of the slope did not receive any runoff.



Figure 3

MINERAL RESOURCES TASMANIA
Stories Creek Remediation
Jig Tailings Location Survey
John Miedecke & Partners P/L

Additional lime was placed on the western slopes after jig tailings removal and over the remaining tailings (100 vs 70 tonnes budgeted).

4.3 DISPOSAL SITE

4.3.1 Description

The area selected for the relocated tailings was the eastern side of the disposal area used for the relocated precipitate dam tailings materials. Provision had been made for this in the design and construction. Figure 4 shows the plan.

The total site occupied an area of approximately 3.2 ha.

The clay, topsoil and subsoil had been previously removed for part of the area and formed an embankment around the site. These materials were suitable for return and reuse as a capping and growth medium.

4.3.2 Design

The design was as a mound with side slopes consisting of between 1:4 and 1:6 side slopes, with a surface area of approximately 1ha hectares. Figures 4, 5 and 6 show the design plan and sections of the storage. The slopes graded into the surrounding topography with a toe drain directing runoff to the Storys Creek catchment via settlement dams.

4.3.3 Site Preparation

Most of the area was disturbed, with a small area to the east towards the Storys creek road requiring clearing.

This area was cleared of all vegetation (after recovery of any recoverable timber) and topsoils stripped and stockpiled at the boundary of the site. The cleared area was also found to have significant clay pockets and these were also stockpiled separately.

The boundaries of the storage was excavated through the existing tailings (on the western side into basement material to form a key and leachate barrier. This excavation was backfilled with clay (see Figures 5 and 6).

Due to a survey error (baseline layout) the area cleared and prepare was less than required in the contract (7291m² vs 9100m²). This was not discovered until after the preparation works were completed.

4.3.4 Relocated Tailings Placement

The jig tailings materials were transported from deposits on the western side of Storys Creek and dumped in layers on the prepared surface of compacted precipitate dam tailings materials.

The piles were then dozed flat to form a layer and the next layer of tailings then dumped on this surface (see photographs). Each layer was treated with crushed limestone using a 6 wheel drive fertiliser spreader.

800 tonnes was placed over the tailings.

The dump was essentially constructed in accordance with the design, but was made

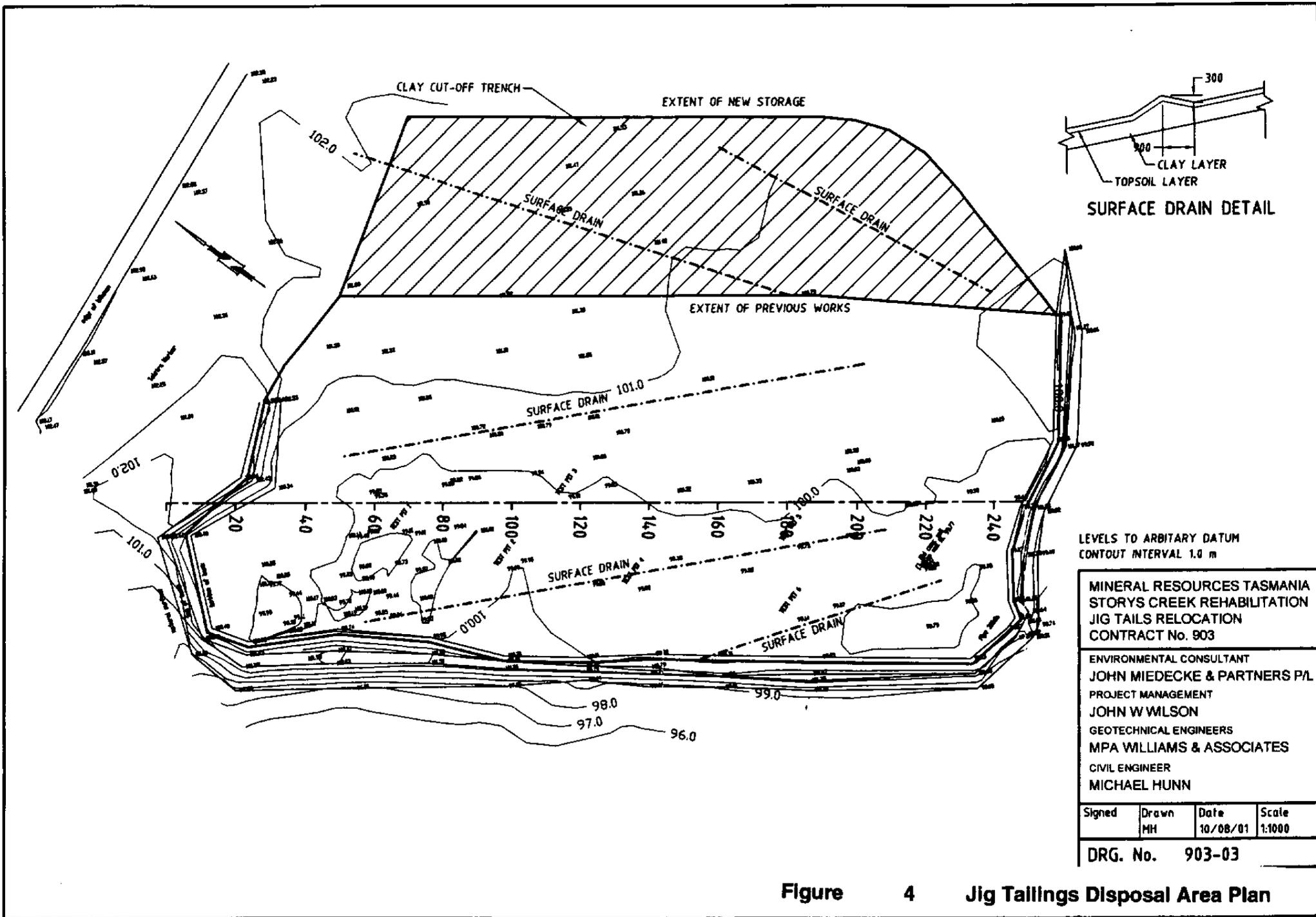
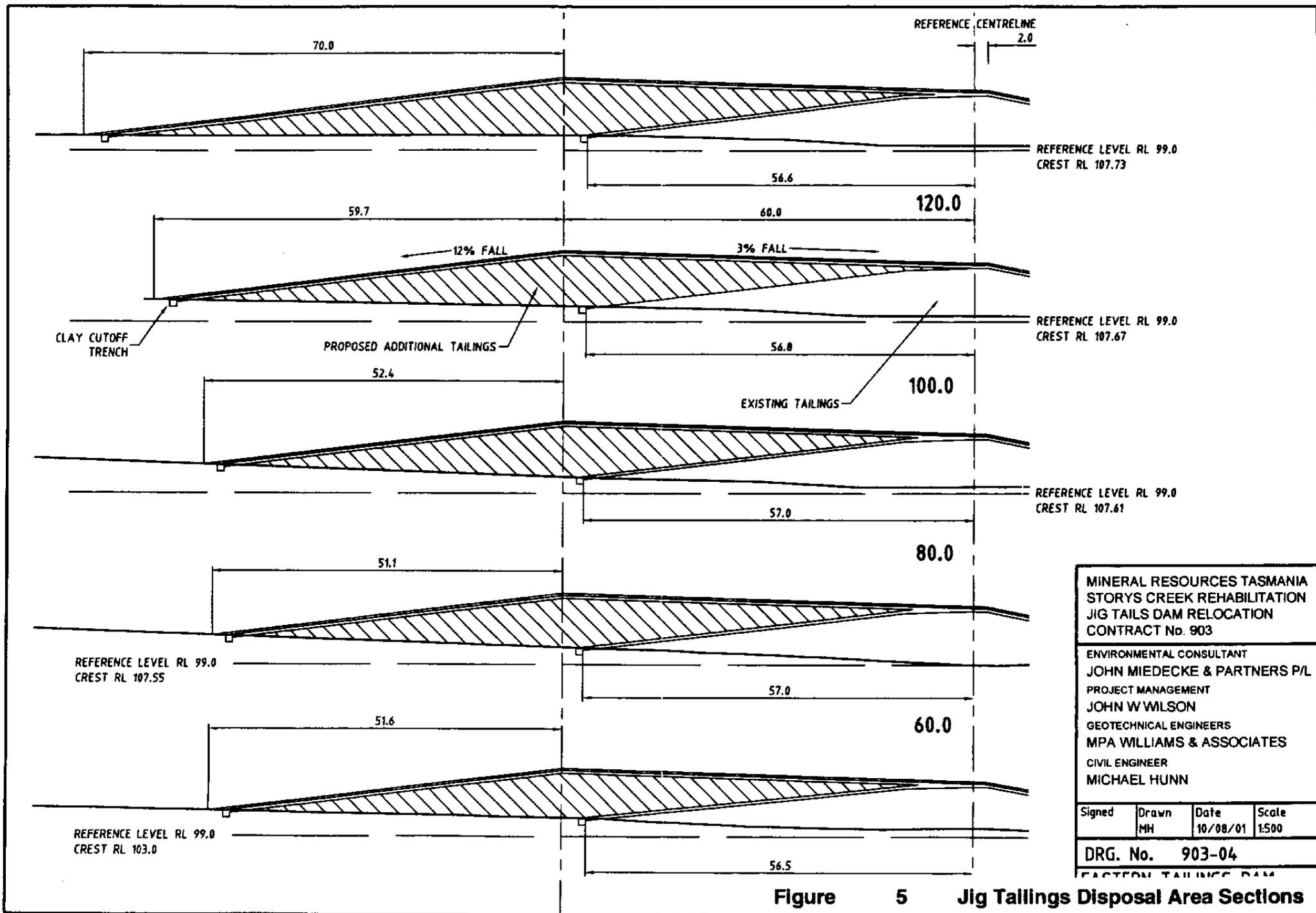


Figure 4 Jig Tailings Disposal Area Plan



MINERAL RESOURCES TASMANIA
 STORY'S CREEK REHABILITATION
 JIG TAILS DAM RELOCATION
 CONTRACT No. 903

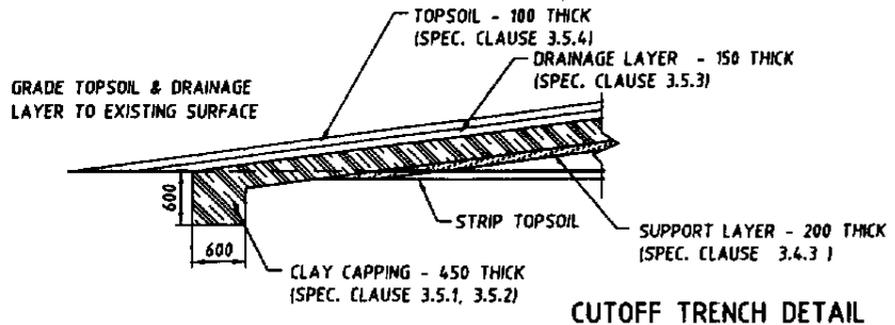
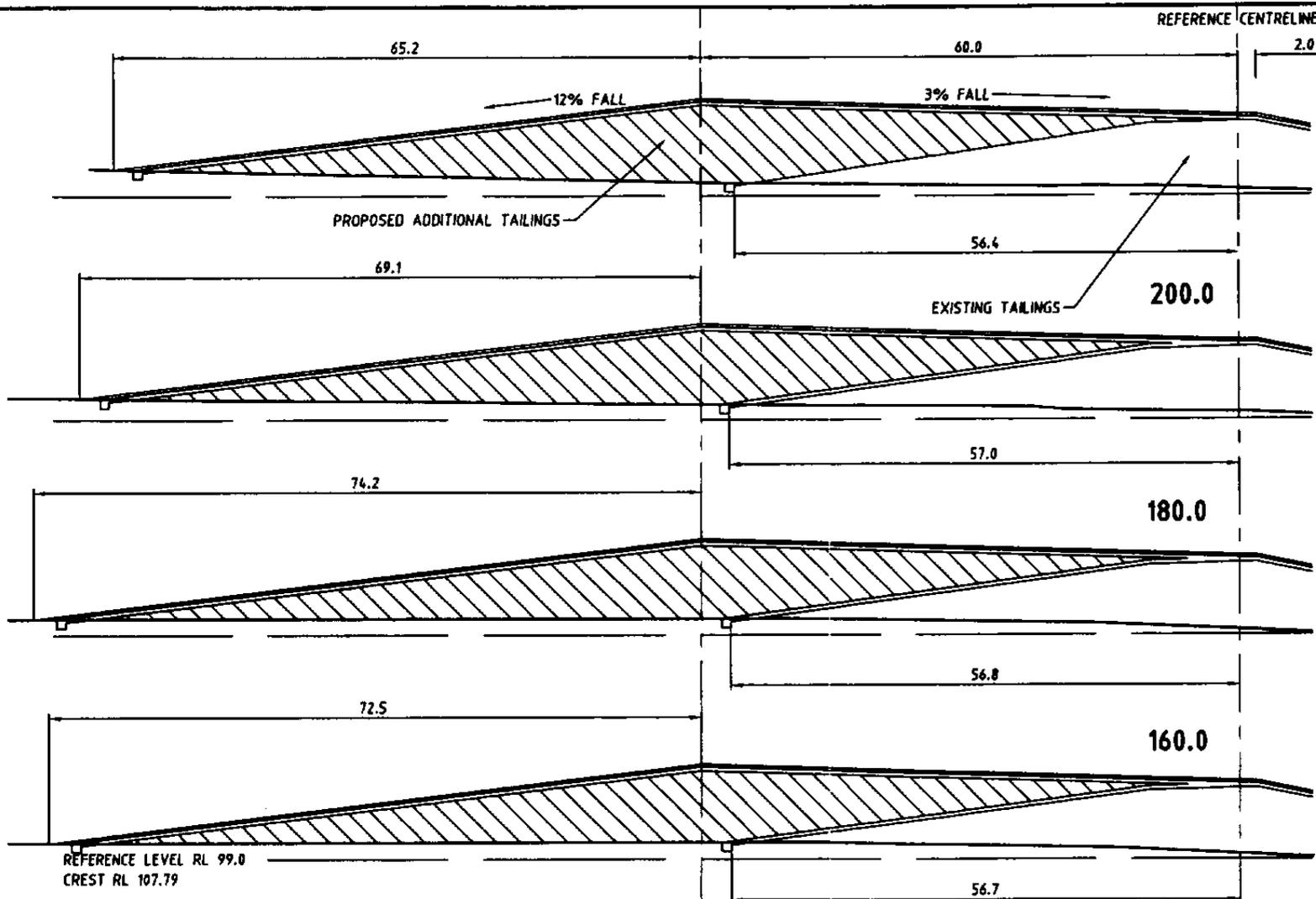
ENVIRONMENTAL CONSULTANT
 JOHN MIEDECKE & PARTNERS P/L
 PROJECT MANAGEMENT
 JOHN W WILSON
 GEOTECHNICAL ENGINEERS
 MPA WILLIAMS & ASSOCIATES
 CIVIL ENGINEER
 MICHAEL HUNN

Signed	Drawn	Date	Scale
	MH	10/08/01	1:500

DRG. No. 903-04

FACILITY TAILINGS DAM

Figure 5 Jig Tailings Disposal Area Sections



MINERAL RESOURCES TASMANIA
STORYS CREEK REHABILITATION
JIG TAILS RELOCATION
CONTRACT No. 903

ENVIRONMENTAL CONSULTANT
JOHN MIEDECKE & PARTNERS P/L
PROJECT MANAGEMENT
JOHN W WILSON
GEOTECHNICAL ENGINEERS
MPA WILLIAMS & ASSOCIATES
CIVIL ENGINEER
MICHAEL HUNN

Signed	Drawn	Date	Scale
	MH	10/08/01	1:500

Figure 6 Jig Tailings Disposal Area
SECTIONS & DETAILS

higher to include the additional tailings materials and the sides steepened. Additional drainage berms were installed. The clay capping was reduced in thickness to use available materials and reduce the budget. Figure 7 shows the survey plan in late December 2002. Additional materials were placed and this is not a final survey plan.

4.3.5 Clay Capping

The cover design provided for a 150mm of topsoil/ growth medium and 450mm of compacted clay over 500mm of compacted precipitate dam tailings. The clay cover was to be keyed into bedrock on all sides.

After it was found that additional tailings significantly exceeded the anticipated volumes budget savings were investigated. As a result the clay thickness was reduced from 450mm to 300mm. This used all the existing clay stockpile and took into account the low permeability of the support layer of compacted precipitate dam tailings and the 800 tonnes of limestone added as a neutralisation agent.

4.3.6 Clay Compaction

The precipitate dam tailings and clay capping was placed in layers to a minimum 95% compaction and keyed into bedrock through the underlying tailings materials. A compaction test section was constructed and tested by BFP Consultants using a nuclear densometer (Appendix B).

The trial showed that a dry density ratio of 102.8% was achieved with 4 passes with a vibratory roller and this was specified. The contract specified a 95% standard compaction at OMC. This was similar to the previous works. The support layer was also tested (the compacted precipitate dam tailings) and they recorded 106.6%.

4.3.7 Topsoil and Drainage

The final topsoil layer was placed with Volvo off highway trucks and spread with an excavator. Drainage berms were established to control drainage and directed to natural surface. Vegetation previously cleared and stockpiled was also placed on the storage surface prior to revegetation.

4.3.8 Haul Roads

All haul roads were scraped clean of tailing materials and left in place for future use. Approximately 5 tonnes of crushed limestone was spread over the haul road to prevent remaining tailings oxidation.

4.4 ADDITIONAL WORKS

Additional works were confined to additional limestone application and heritage works.

Public access to the underground workings is a potential risk, therefore adit (tunnel) covers were installed in May at a cost of \$5,000.

4.5 REHABILITATION

The original budget included revegetation. Seed application and planting of native grasses will be carried out in July 2003. The anticipated cost is \$13,000.

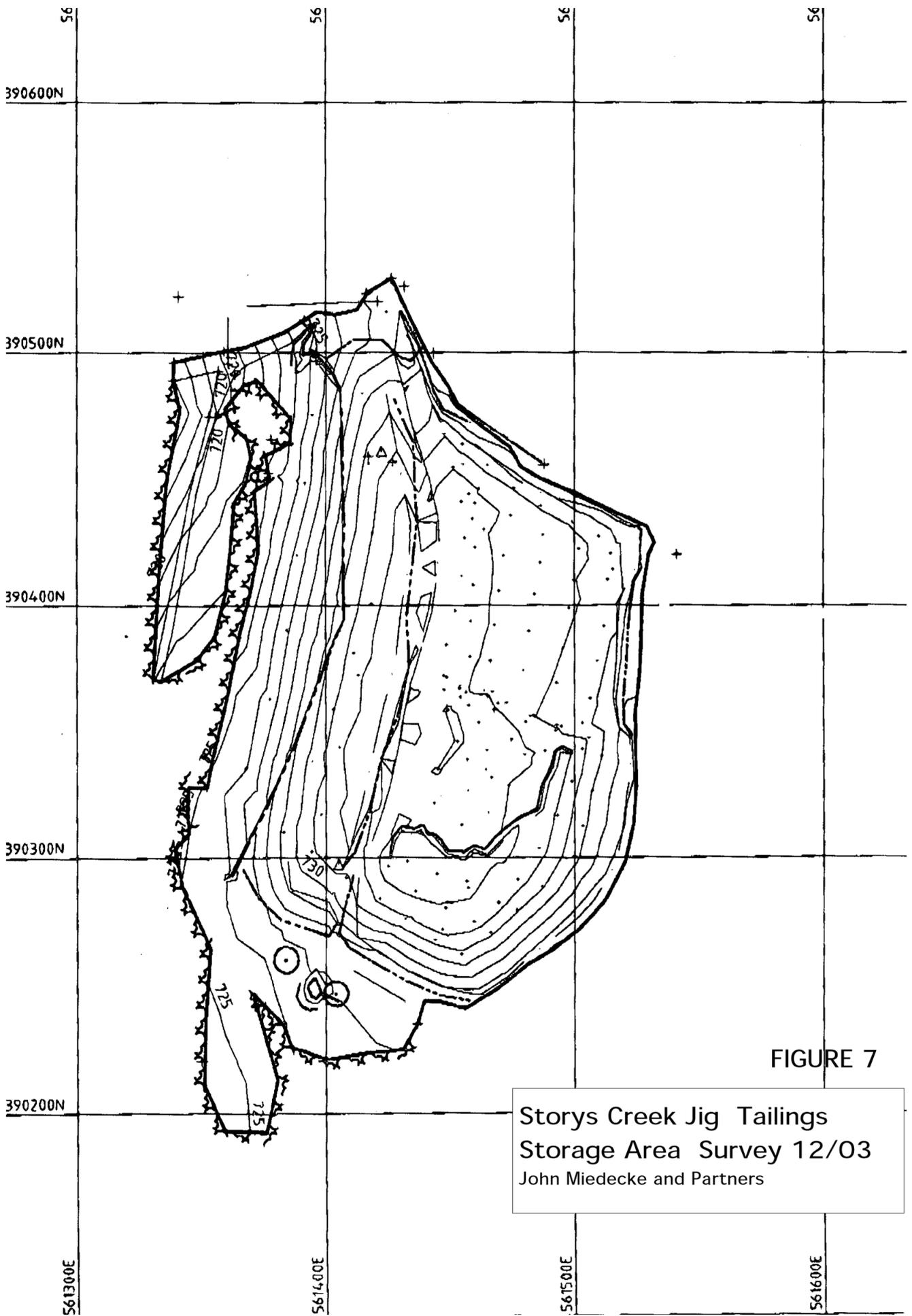


FIGURE 7

Storys Creek Jig Tailings
Storage Area Survey 12/03
John Miedecke and Partners

An additional 5 tonnes of crushed limestone was spread over the area to the east of Storys Creek , including all former rehabilitated areas.

4.6 OCCUPATIONAL HEALTH AND SAFETY

The work was completed with no lost time accidents or injury.

4.7 ENVIRONMENTAL MANAGEMENT

The tender documents had specific sections dealing with the site environmental management. A specific site meeting was held with the contractors management staff to fully brief the contractor on environmental requirements and procedures

Drainage from the jig tailing removal area was directed to catchment ponds which had provision for dosing with lime. This was not required.

Crushed limestone was spread over all exposed areas at the completion of works.

A major component was the protection of items and areas of significant heritage values. These areas were flagged by MRT Archaeologists and the Contractor adopted specific procedures within these areas. Figure 8 shows the areas

The Contractor did these works with great diligence.

The area of the old battery was excluded from tailing removal at the request of a local resident and MRT.

Items of heritage interest were recovered and placed on the top of the western slopes.

REFERENCES

JMP 2000. Storys Creek Precipitate Dam Relocation Construction Report . John Miedecke and Partners, June 2000.

JMP 2000b. Storys Creek/Rossarden Acid Drainage Remediation Study – Final Report John Miedecke and Partners, June 2000.

JMP 2001. Storys Creek Rehabilitation Jig Tailings Relocation – Contract 903 Tender and Construction Documents . John Miedecke and Partners, August 2002.

Feature No.	Feature name
01	Side Creek alluvials
02	Miers Adit
03	Side Creek drain
04	Side Creek slope
05	Drainage adit
06	South Bank adit
07	Main Ck. U/hand slope
08	Ferrous dump
09	Original mill site
10	Mill trace terminus
11	Concrete water tank
12	Number 3 adit
13	Jacques rock crusher
14	Comm. gas producer 1
15	Cast iron water pipe
16	Post sequence
17	Stone cairn
18	Adit No. 2 entrance
19	Timber ore tram (Nth)
20	Pump house
21	Pump house stoops
22	Ore bins
23	Stacked mullock
24	Shower room slab
25	Stone steps
26	Adit number 1
27	Compressor
28	Comm. gas producer 2
29	Sanders adit
30	Timber gear slide
31	Timber bridge
32	Water flume
33	North western slope
34	Carbide dump
35	Timber hut
36	Machinery component
37	Bridge side adit
38	Concrete tank pad
39	Collapsed stoop
40	Mine managers house
41	Second mill footings
42	Drying/separating shed
43	Sloped outcrop 1
44	Sloped outcrop 2
45	Ferrous junk yard
46	Slope/surface travelway
47	Former compressor shed
48	Erect bull wheel
49	Jig tailings dumps
50	Vacant house lot 1
51	Volker Hahl's house
52	Vacant house lot 2
53	Miners cottage
54	Vacant house lot 3
55	Foster's Vela workings
56	Vacant house lot 4
57	Vacant house lot 5
58	Vacant house lot 6

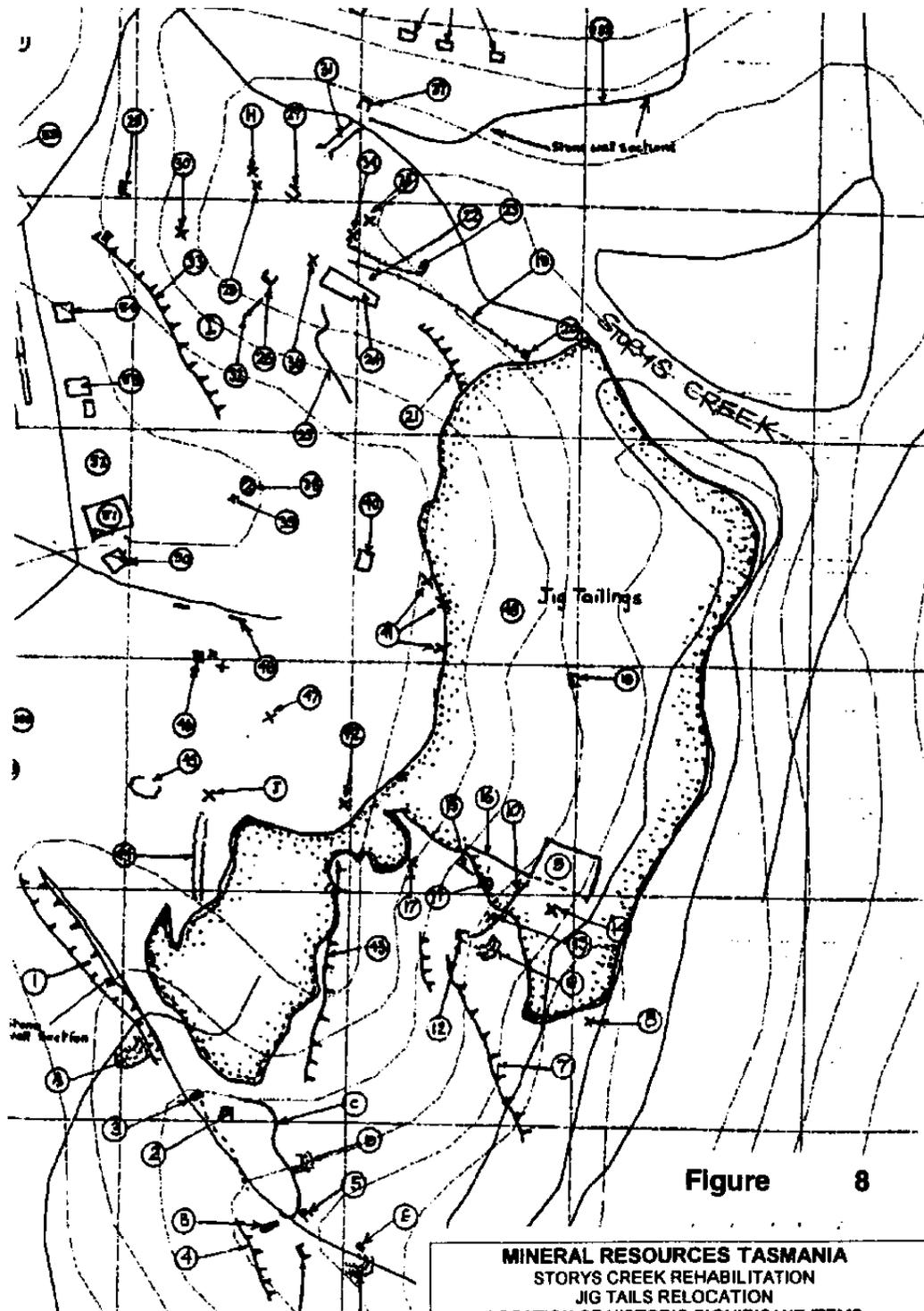


Figure 8

MINERAL RESOURCES TASMANIA
 STORYS CREEK REHABILITATION
 JIG TAILS RELOCATION
 LOCATION OF HISTORIC SIGNIFICANT ITEMS
 John Miedecke and Partners Pty Ltd
 DRAWING No 903 - 06

PHOTOGRAPHS



View of Jig Tailings Deposits Nov 2002



View of Jig Tailings Deposits February 2003



Excavator Clearing Old Battery Area



View of Tramway and Old Adit Entrance



Disposal Area - Prepared Base



Placing Tailings



Drain on Final Surface of Deposit Area



Placing Topsoil



Placing Limestone on Slopes



Final Surface After Tailings Removal

APPENDICES

Appendix A Contract Financial Summary etc

Appendix B BFP Consultants Compaction Test results

Schedule of Rates
Storys Creek Rehabilitation
Contract No. 903

Progress Claim No: 4

Period: As At 14/02/2003

		Original Contract Sum (Less Prov. Sums, Day Works & GST)				Works Complete Previous Claim		Works Complete This Claim		Total Works Complete	
Item	Description	unit	qty	rate (\$)	amount (\$)	qty	amount (\$)	qty	amount (\$)	qty	amount (\$)
ORIGINAL SCOPE OF WORK											
	Site Establishment	Item	1	3,750.00	\$3,750.00	100%	\$3,750.00	-	-	100%	\$3,750.00
3.2	Care of the Works	Item	1	1,000.00	\$1,000.00	60%	\$600.00	40%	\$400.00	100%	\$1,000.00
3.3.2	Prepare Dam Site	m ²	9100	0.80	\$7,280.00	7291	\$5,832.80	-	-	7291	\$5,832.80
3.3.2.1	Tailings to Base	m ²	9100	0.46	\$4,186.00	7291	\$3,353.86	-	-	7291	\$3,353.86
3.3.2.2	Stockpile Existing Tailings	m ³	7680	0.90	\$6,912.00	6830	\$6,147.00	-	-	6830	\$6,147.00
3.3.3	Haul Road/Creek Crossing	Item	1	36,500.00	\$36,500.00	60%	\$21,900.00	35%	\$12,600.00	95%	\$34,500.00
3.4.2	Relocate Clay	m ³	1600	1.75	\$2,800.00	1600	\$2,800.00	-	-	1600	\$2,800.00
3.4.3	Relocate Tailings	m ³	50000	2.85	\$142,500.00	45000	\$128,250.00	26167	\$74,575.95	71167	\$202,825.95
3.4.4	Lime Dosing	tonne	1	1,250.00	\$1,250.00	-	-	-	-	-	-
3.4.4	Collection Ponds	Item	2	600.00	\$1,200.00	2	\$1,200.00	-	-	2	\$1,200.00
3.4.7	Lime to Tailings	tonne	800	42.00	\$33,600.00	400	\$20,160.00	320	\$13,440.00	800	\$33,600.00
3.5.1	Clay Capping	m ²	25600	2.10	\$53,760.00	3840	\$5,376.00	18160	\$25,424.00	22000	\$30,800.00
3.5.2.3	Clay Capping Toe	m	300	6.00	\$1,800.00	-	-	300	\$1,800.00	300	\$1,800.00
3.5.2.5	Testing Clay	Item	1	500.00	\$500.00	-	-	100%	\$500.00	100%	\$500.00
3.5.3	Support Layer	m ²	25600	0.35	\$8,960.00	-	-	22200	\$7,770.00	22200	\$7,770.00
3.5.4	Topsoil Layer	m ²	25600	0.20	\$5,120.00	-	-	22300	\$4,460.00	22300	\$4,460.00
3.5.5.2	Lime to Western Slopes	tonne	70	42.00	\$2,940.00	-	-	100	\$4,200.00	100	\$4,200.00
3.7	Demobilize Site	Item	1	3,500.00	\$3,500.00	-	-	100%	\$3,500.00	100%	\$3,500.00
Total Excluding GST					\$317,558.00	Ex GST	\$199,369.66	Ex GST	\$148,669.95	Ex GST	\$348,039.61

NOTES

* (1) ITEM 3.3.3 \$2000.00 DEDUCTED - REHABILITATION NOT REQUIRED

* (2) ITEM 3.5.1 CLAY CAPPING THICKNESS REDUCED TO 300mm THICK - REVISED RATE \$1.40m²

**Variations
Storys Creek Rehabilitation
Contract No. 903**

Progress Claim No: 4

Period: As At 14/02/2003

		Variations Allowed Contract Sum (Excluding GST)				Original	Variations Complete Previous Claim	Variations Complete This Claim	Variation Works Complete
Item	Description	unit	qty	rate (\$)	amount (\$)	amount (\$)	amount (\$)	amount (\$)	
VARIATIONS									
3.4.1	Survey	Item	1	2,000.00	\$2,000.00				
1.1.2	Day Works Provisional	Item	1	10,000.00	\$10,000.00				
1.1.2	Day Works Schedule	Item	1	18,450.00	\$18,450.00				
VO 1	Lime to Mine Shaft	Item	1	-	-	\$1,000.23	-	\$1,000.23	
VO 2	Dayworks - Slope Grooming	Item	1	-	-	\$1,028.50	-	\$1,028.50	
VO 3	Dayworks - Slope Grooming	Item	1	-	-	\$1,355.75	-	\$1,355.75	
VO 4	Survey Costs	Item	1	-	-	\$7,002.60	-	\$7,002.60	
VO 5	Dayworks - Slope Grooming	Item	1	-	-	\$2,711.50	-	\$2,711.50	
VO 6	Dayworks - Slope Grooming	Item	1	-	-	\$3,179.00	-	\$3,179.00	
VO 7	Dayworks - Slope Grooming	Item	1	-	-		\$3,272.50	\$3,272.50	
VO 8	Survey Costs	Item	1	-	-		\$880.00	\$880.00	
VO 9	Dayworks - Slope Grooming	Item	1	-	-		\$2,805.50	\$2,805.50	
VO 10	Dayworks - Slope Grooming	Item	1	-	-		\$4,020.50	\$4,020.50	
VO 11	Dayworks - Slope Grooming	Item	1	-	-		\$2,024.00	\$2,024.00	
VO 12	Dayworks - Roadworks	Item	1	-	-		\$654.50	\$654.50	
Total Excluding GST					\$30,450.00	\$16,277.58	\$13,657.00	\$29,934.58	



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STORE'S CAROL ENCAPSULATION.

ROLLER TRIAL.

<i>PASSES</i>	<i>DENSITY</i>	<i>MOISTURE CONTENT FROM OPTIMUM.</i> <i>0.</i>
<i>4</i>	<i>102.8</i>	<i>-2.1</i>
<i>6</i>	<i>103.8</i>	<i>+0.1</i>
<i>8</i>	<i>99.6</i>	<i>+0.5</i>
<i>SUPPORT LAYER</i>	<i>106.6</i>	<i>-2.2</i>