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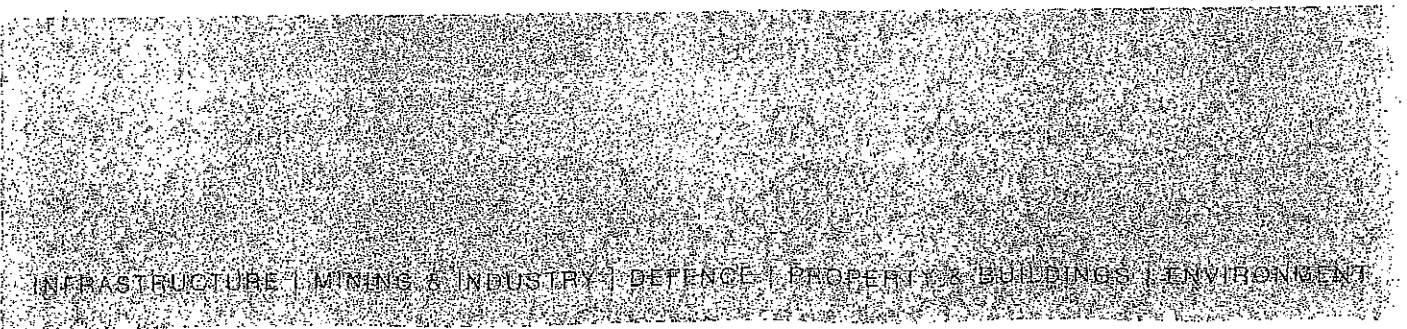
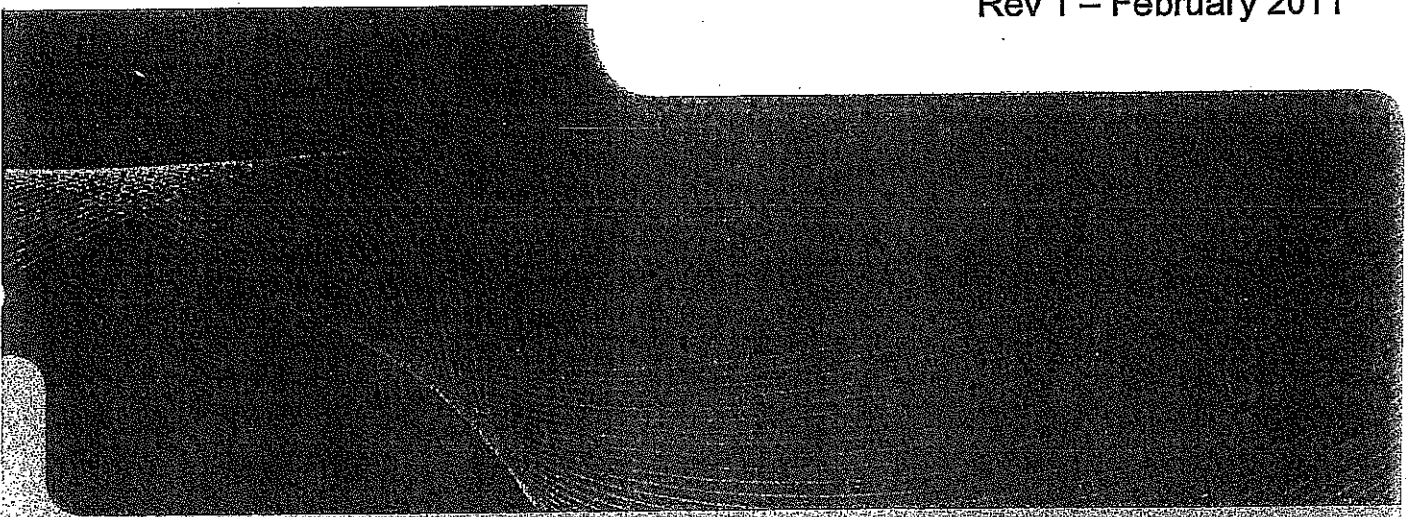
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**Toowoomba Regional
Council**

**Report for Cooby Dam
Special Dam Safety Inspection
following January 2011 Flood**

Rev 1 – February 2011





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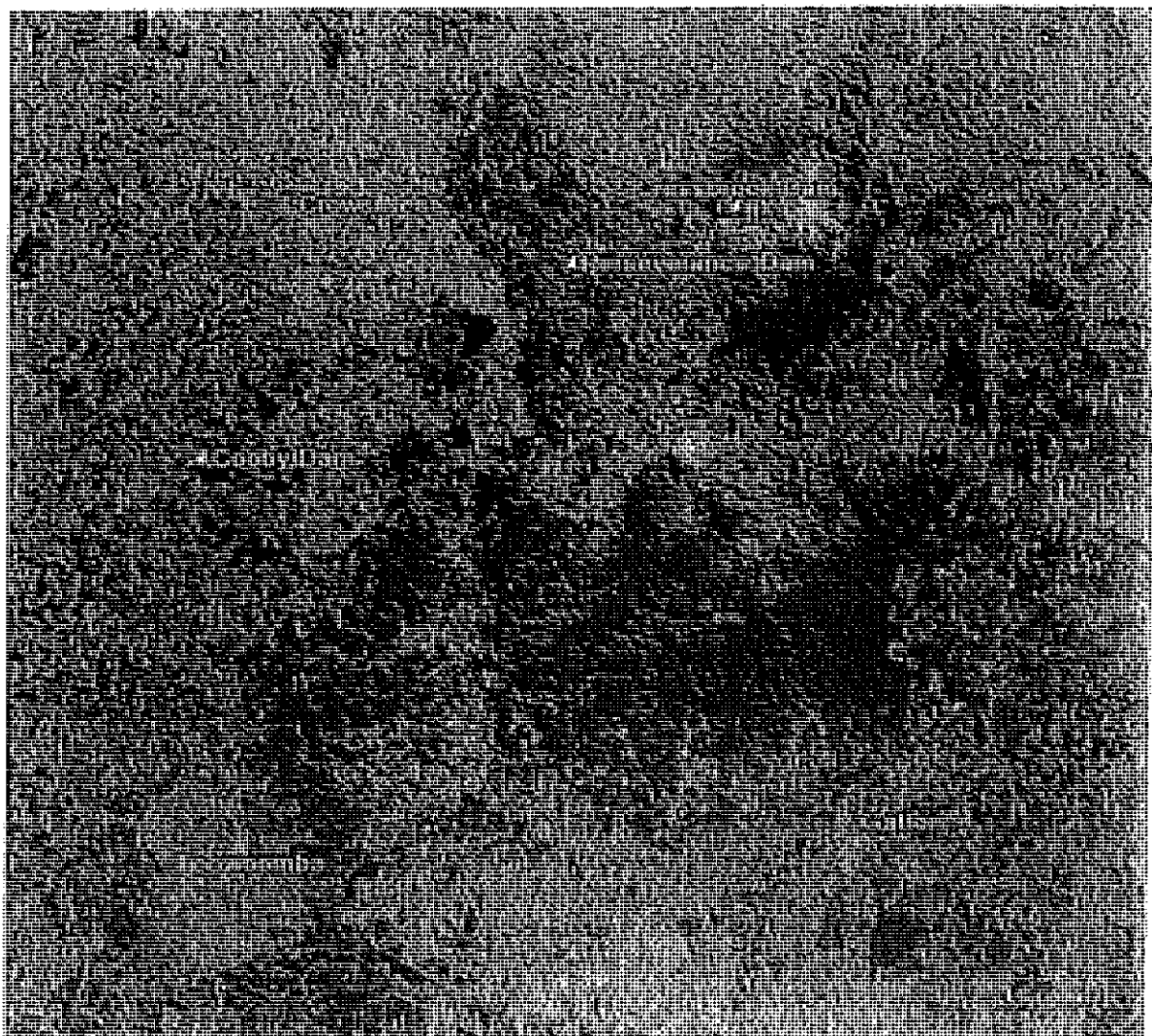
- A Selection of Drawings of Cooby Dam
- B Photographic Record of Site Inspection



1. Introduction

Cooby Dam is owned and operated by the Toowoomba Regional Council (TRC) and impounds one of the reservoirs providing the water supply for the City of Toowoomba. The other water supply dams owned and operated by TRC are Cressbrook Dam and Perseverance Dam. Cooby Dam is located on Cooby Creek, approximately 20 km north of Toowoomba as shown in Figure 1.1¹. An aerial view of the dam is included in Figure 1.2². A selection of drawings is included in Appendix A.

Figure 1.1 Location Plan

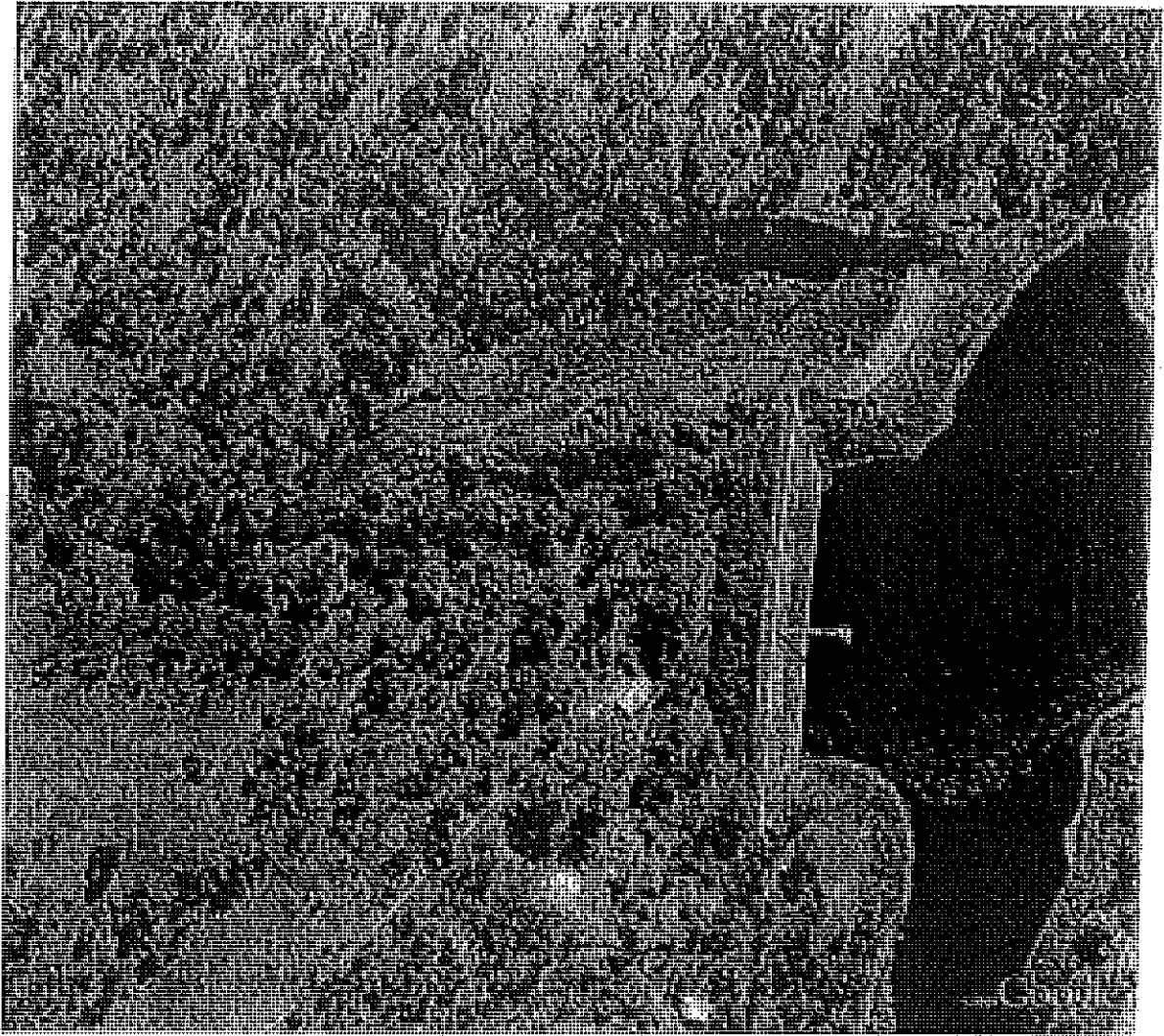


¹ Google Earth Pro, accessed 14 September 2010.

² Google Earth Pro, accessed 31 January 2011.



Figure 1.2 Aerial view of Cooby Dam



During December and January, persistent rainfall over the catchment caused the reservoir to rise from RL 471.89 m (34% full) on 17 December 2010 to FSL (RL 478.54 m) on 10 January 2011. The peak reservoir level of RL 480.09 m occurred at 7:43am on 11 January 2011. This equates to a peak discharge of approximately 258 m³/s. This event was the highest reservoir level in the available records (dating back to January 1974) and was the first spill event since March 2000. The 5-day rainfall total at Cooby Dam to 11 January 2011 was 279 mm, the highest in the available records. The reservoir level trace and the 5-day rainfall totals are plotted in Figure 1.3.

A selection of photographs (courtesy of TRC) from around the peak of the flood on 11 January 2011 are included in Figure 1.4 to Figure 1.10. A selection of aerial photographs of the dam and spillway from the days following the flood peak are included in Figure 1.11 to Figure 1.13.



Figure 1.3 Reservoir level trace and 5-day rainfall totals

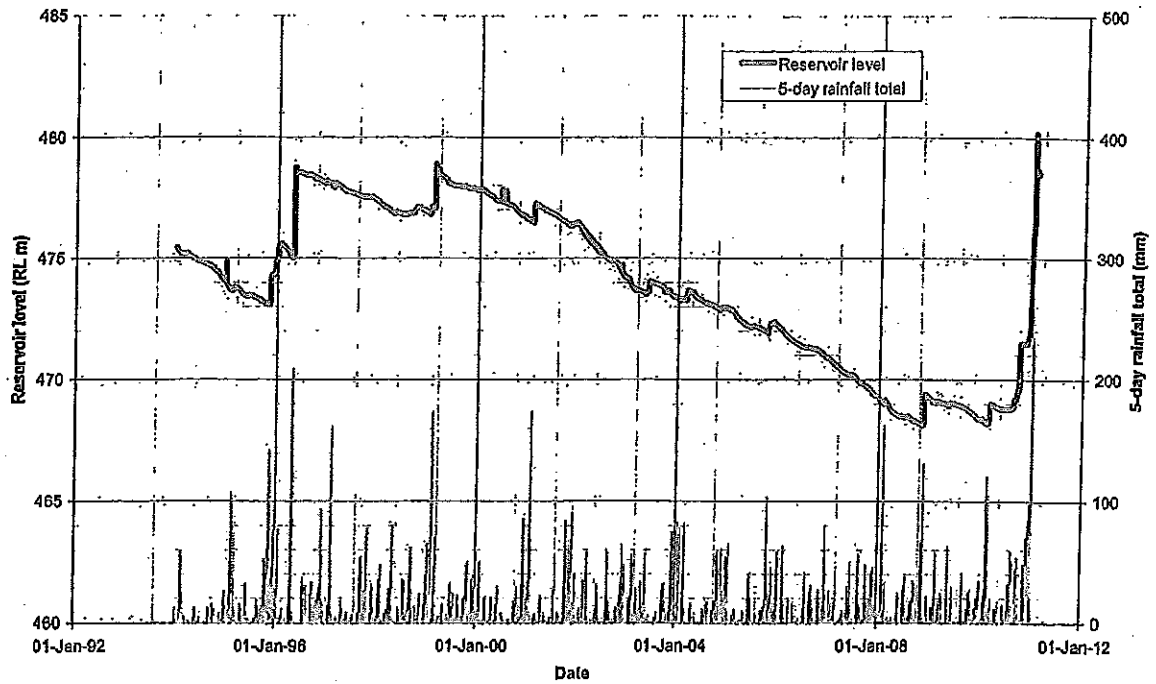


Figure 1.4 Overview of dam and tower from right abutment



Figure 1.5 Overview of spillway crest from left bank of spillway

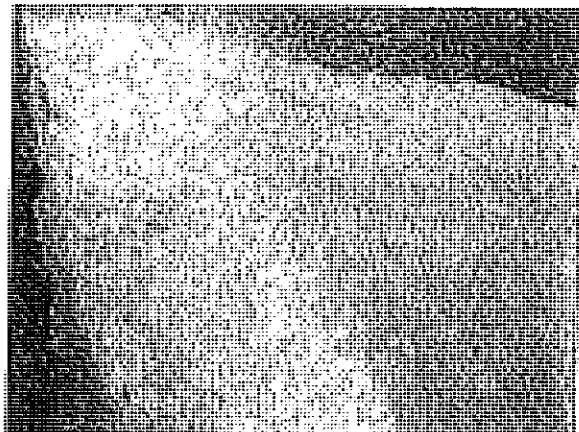


Figure 1.6 Flow in upper section of spillway from left bank of spillway crest



Figure 1.7 Flow over "drop" in spillway channel



Figure 1.8 Flow in lower section of spillway from left bank (looking upstream)



Figure 1.9 Confluence of spillway and river channel (looking downstream)

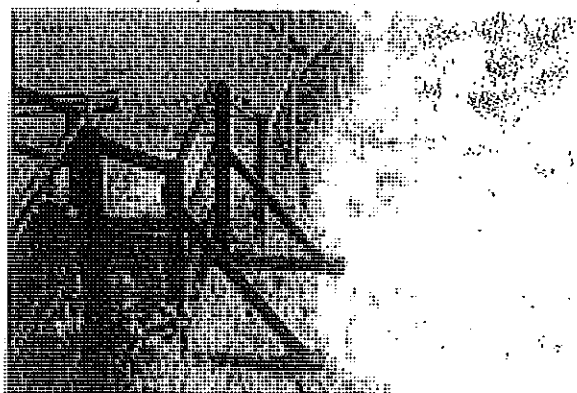


Figure 1.10 Undermining of walkway at downstream left side of spillway channel



Figure 1.11 Overview of Cooby Dam, spillway and reservoir



Figure 1.12 Overview of Cooby Dam and spillway

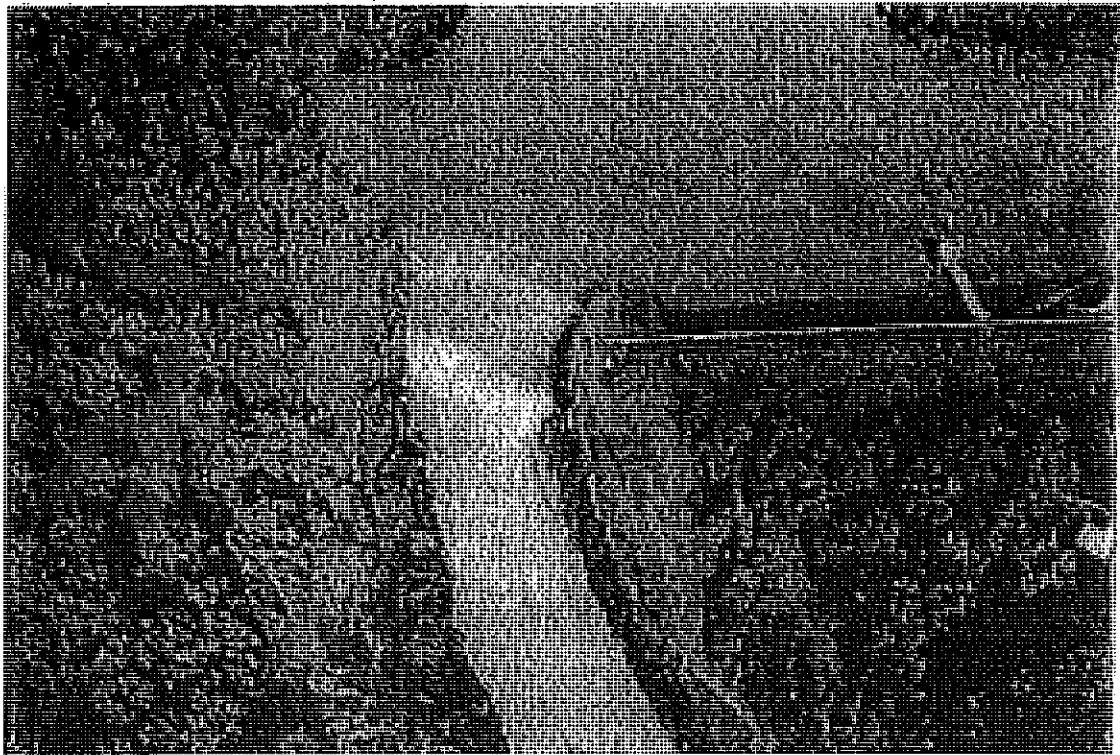
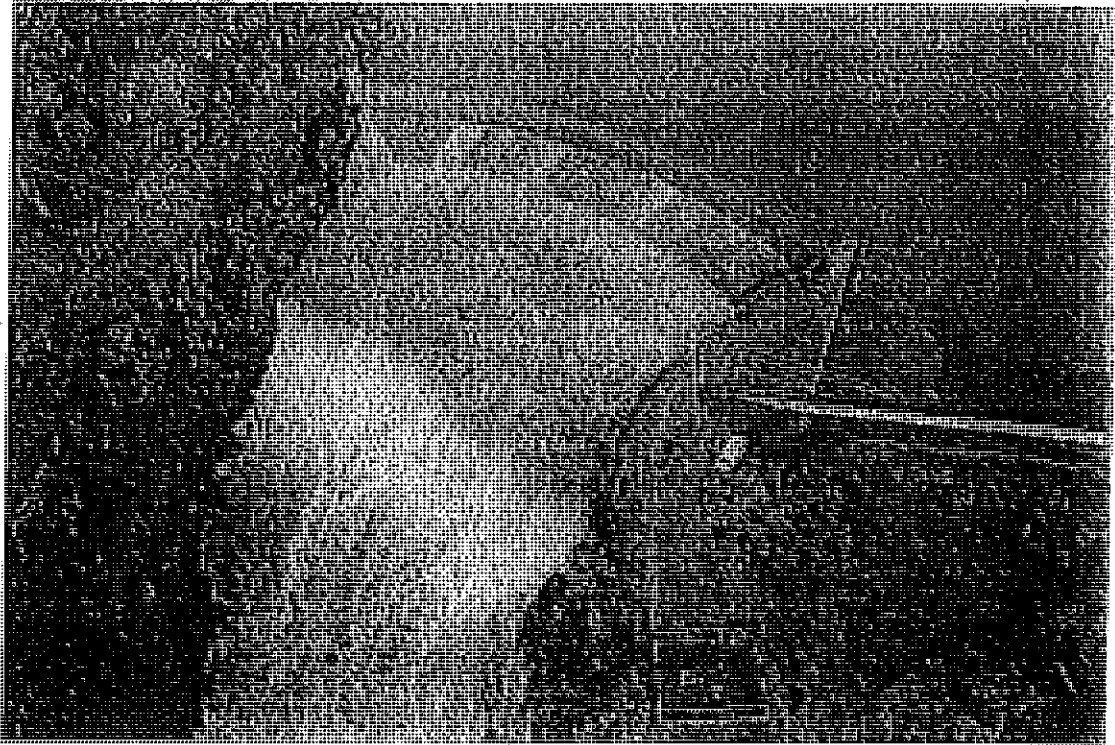




Figure 1.13 Overview of Cooby Dam spillway



GHD Pty Ltd was engaged by Toowoomba Regional Council (TRC) to undertake a special post-flood dam safety inspection of Cooby Dam in accordance with the guidelines presented in NR&M (2002). The site inspection was undertaken on 19 January 2011. The outcomes from this inspection can be compared with previous inspections, the most recent of which was the 2010 annual inspection (GHD, 2010a).

The report is set out as follows:

- ▶ Section 2 – Conclusions and Recommendations;
- ▶ Section 3 – Information on the Dam;
- ▶ Section 4 – Periodic Inspection General Information;
- ▶ Section 5 – Dam Embankment;
- ▶ Section 6 – Spillway;
- ▶ Section 7 – Outlet Works; and
- ▶ Section 8 – References.

Note that no instrumentation data was available for review at this time. Refer to GHD (2010b) for the most recent review.



2. Conclusions and Recommendations

2.1 Conclusions

Cooby Dam was well designed and constructed in accordance with accepted practice at the time. It has generally performed well and as expected throughout its operational life.

During the floods of December 2010/January 2011, the dam experienced its greatest flood since at least 1974, which is the start of the available records. The dam and spillway performed well during the event. The erosion noted in the spillway channel is not considered significant.

2.2 Recommendations

The recommendations arising from this special inspection are given throughout the report. They are numbered as "RX.Y.N/ZZ-S", where X is the section number, Y is the sub-section number within the section (where appropriate), N is the recommendation number within the section or sub-section, ZZ is the year of the inspection when the recommendation was made and S is to denote that this was from a special inspection rather than an annual or comprehensive inspection. For example, R6.5.1/11-S is the first recommendation in sub-section 6.5 from the 2011 special inspection.

The following is a consolidated list of additional recommendations arising from this inspection.

Table 2.1 Summary of Recommendations

Section	Ref No	Recommendation	Timing
5.5	R5.5.1/11-S	Undertake an inspection of the drainage pit to identify pipes connected to the pit and use service location equipment to plot the extent of any pipes connected to the pit.	March 2011 (prior to inspection for 2011 safety review)
6.2	R6.2.1/11-S	Undertake a complete inspection of the spillway (including the approach channel, crest structure, channel, cut slopes and immediate downstream river channel) when the spillway stops flowing.	When spillway stops discharging
6.4	R6.4.1/11-S	Prevent public access to top of the left side spillway cut between the weather station and the downstream end of the spillway due to undermining of the cut slopes.	Immediate
7.1.3	R7.1.3.1/11-S	Investigate reason for inundation of the outlet tunnel given that records show that the drain valve at the tunnel plug was closed prior to the flood.	When spillway stops discharging and tunnel is drained and made safe



3. Information on the Dam

The key features of the dam and associated structures are summarised in the following table.

Note: Construction RLs should have a correction of +3.668 m applied for AHD

Table 3.1 Statistical summary of dam features

Name and location	
Name of Dam	Cooby Dam
Other Names	Cooby Creek Dam
Location	
Region	South East Queensland
Shire	Toowoomba Region
Nearest Town	Meringandan
Stream and AMTD	Cooby Creek 8.2 km
Ownership	
Licence No	n/a
Current Owner	Toowoomba Regional Council
Designer (Date)	Department of Irrigation and Water Supply (1930s) Upgrade wave wall 1997 GHD B Forbes
Construction Authority – Supervisor	Department of Irrigation and Water Supply
Construction Contractor	Mr V Doyle
Construction period	1938-41
Safety review dates	1990 (Stage 1), 1994 (Stage 2)
Technical data	
Dam Type	Concrete-faced rock fill
Purpose	Water supply
Dam Height (above lowest toe)	32 m
Dam Length	207 m
Storage at FSL	23,100 ML
Spillway Type	Ungated ogee-controlled spillway with an unlined chute



Outlet Description	A dry concrete Intake tower with three valved inlets at different levels discharging through a common 600 mm diameter cast iron outlet pipe located in the concrete-lined diversion tunnel on the left bank.
Storage characteristics	
Full supply level (FSL)	RL 478.54 m
Storage capacity	23,100 ML
Surface area	300 ha
Length of shoreline	Unknown
Spillway capacity	FSL is at spillway crest – zero discharge
Outlet capacity	1.4 m ³ /s (approx)
Dam crest level (DCL)	RL 482.9 m (dam embankment crest) RL 484.0 m (including 1.1 m high parapet wall)
Storage capacity	36,000 ML at dam embankment crest
Spillway capacity	1,284 m ³ /s at dam embankment crest
Catchment description	
Catchment area	16,900 ha
Catchment description	<p>The catchment as described in Sunwater (2003):</p> <p><i>"Is defined to the north, west and south by the Great Dividing Range with a range of lower hills marking the western boundary. The catchment consists of gently sloping hills with an average slope of the total catchment of 6 m/km. The topography elevation is 550 m to 650 m above the sea level."</i></p> <p>And continues:</p> <p><i>"Cooby Creek is the primary stream in the Cooby Dam catchment, draining in a south-westerly direction from the relatively steep Great Dividing Range towards Cooby Creek Reservoir. Cooby Creek becomes Oakey Creek west of the Cooby Creek Dam and then drains into the Condamine just west of Dalby."</i></p> <p><i>"The climate of the region is temperate with warm summers and cool winters. The mean annual rainfall in the catchment is in the order of 600 mm with most rain falling in the summer months. Average annual evaporation within the Cooby Dam catchment is approximately 700 mm."</i></p>



Design Rainfall Review

Methods	Refer to Sunwater (2003). ARR (1999), GTSM-R PMP data dated April 2003, CRC-FORGE data from DNRM.
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Original Spillway Design Flood

Maximum Level	RL 481.3 m (approx)
Flood volume	Unknown
Peak Discharge	680 m ³ /s
AEP of Flood	1 in 2,000 (approx) estimated from data in Sunwater (2003)
Freeboard	1.6 m below original dam crest level 2.7 m below wave wall

Acceptable Flood Capacity

Maximum Level	RL 486.81 m
Flood Volume	92,600 ML
Peak Discharge	5,410 m ³ /s
AEP of Flood	1 in 6,180,000
Freeboard	Wave wall overtopped by 2.8 m

Dam Crest Flood (DCF)

Maximum Level	RL 484.0 m (including 1.1 m high wave wall)
Flood Volume	Unknown
Peak Discharge	1,920 m ³ /s
AEP of Flood	1 in 147,000 (approx) estimated from data in Sunwater (2003)
Freeboard	Zero

PMP Design Flood

Maximum Level	RL 486.8 m assuming flow over the wave wall and through the spillway An approximate reservoir level assuming no overtopping of the wave wall as required by NRM&W guidelines is RL 488.3 m
Flood Volume	Unknown
Peak Discharge	5,410 m ³ /s
Freeboard	None – Dam overtopped by 2.8 m in its current configuration



Description of dam wall	
Wall Type	Concrete-faced rock fill
Wall Height (above lowest D/S toe)	32 m
Built Height (above lowest foundation)	As above (depth of excavation for cut off trench not known)
Crest Elevation	RL 484.0 m (Including 1.1m wave wall)
Elevation of foundation	RL 452 m (approx)
Wall Length	207 m
Wall Description (dimensions and zone arrangements)	<ul style="list-style-type: none"> ▸ Crest width of 4.9 m ▸ Upstream slope of 1.2H:1V ▸ Downstream slope of 1:1 above RL 470.96 m and 1.4H:1V below RL 470.96 m ▸ Face slab poured in 9.1 m x 9.1 m panels with the thickness varying from 0.61 m thick at the toe to 0.3 m thick at the crest ▸ Wave wall – structural reinforced concrete cantilever wall with base slab 250 mm thick and vertical walls 200 mm thick with a 200 mm wide trapezoidal extension at the crest for wave deflection. Design flood level 600 mm below crest of wall.
Total Quantities	Unknown
Materials Description	Basalt rockfill from the spillway excavation
Description of spillway	
Spillway Description	Ungated ogee-controlled spillway with an unlined rock chute
Spillway Crest	RL 478.54 m
Spillway Width	69 m with upstream curvature on a radius of 76 m
Energy Dissipation Method	Unlined rock discharge channel
Design Head	2.8 m (approx)
Control Description	Uncontrolled
Description of outlet works	
Reservoir Outlet Description	Multi-level dry intake tower
Conduit Description	600 mm diameter cast iron outlet pipe located in the concrete-lined diversion tunnel on the left bank



Regulator Description	Three gate valve outlets in the intake tower of approximately 600 mm diameter at RL 473.7 m, RL 466.3 m and RL 457.2 m.
Hydrologic Performance ³	
Date	11 January 2011
Peak reservoir level	RL 480.09 m (1.55m depth)
Peak Discharge	258 m ³ /s
Date	22 June 1983
Peak reservoir level	RL 479.35 m (0.81m depth)
Peak Discharge	155 m ³ /s
Date	20 January 1976
Peak reservoir level	RL 479.15 m (0.61m depth)
Peak Discharge	118 m ³ /s
Date	9 February 1999
Peak reservoir level	RL 478.90 m (0.36m depth)
Peak Discharge	72 m ³ /s
Date	12 April 1988 and 12 December 1974
Peak reservoir level	RL 478.82 m (0.28m depth)
Peak Discharge	57 m ³ /s
Description of access	
Access description	Sealed all-weather road
Access route	North from Toowoomba on the New England Highway, turning left at Highfields where signposted to Cooby Dam
Hazard Rating (from Sunwater (2004a))	
Event	Sunny day failure
Incremental population at risk	67
Hazard rating	High B
Event	Dam crest flood failure
Incremental population at risk	572
Hazard rating	High A
Event	PMP design flood failure

³ Peak discharge is estimated from the spillway rating curve using the peak reservoir level.



Incremental population at risk	547
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Hazard rating	High A
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Failure Impact Rating

According to the Sunwater (2005), the dam has been assessed as a Category 2 dam in accordance with the guidelines in NR&M (2002a).



4. Periodic Inspection General Information

4.1 General

Date of inspection: 19 February 2011
Inspection by: James Willey (RPEQ 6295)
Report prepared by: James Willey
Report reviewed by: Malcolm Barker (RPEQ 7468)
Approved by: Jon Williams (RPEQ 7906)

It should be noted that the Cooby Dam Project includes the dam, spillway, intake tower and pump station. The pump station is at the downstream toe of the dam. This structure is not considered to be a dam safety concern and therefore an inspection of it was outside the scope of this study.

4.2 Conditions at Time of Inspection

Clear	X	Light cloud
Cloudy		
Overcast		
Rain		

Temperature 25°C
Wind

4.3 Operational Status at Time of Inspection

Reservoir water surface level: RL 478.7 m (0.16 m over spillway crest)
Reservoir storage volume: 18,700 ML (approx)
Releases Spillway: 8 m³/s (approx)
 Outlets: Nil



4.4 Inspection Team

Inspected By :

James Willey – GHD

Reijer van der Vlugt – GHD

Laurie Ashe – TRC

Shane Hoffmann – TRC

4.5 Photographic Record

The photographic record from the inspection is included in Appendix B and referenced where appropriate in the following sections.



5. Dam Embankment

5.1 Embankment Crest

Pavement general condition	Bitumen seal generally in good condition
Cracks	No change noted in previously-noted cracks in bitumen (Photo 7).
Sinkholes	None evident
Alignment	Wave wall on the upstream side (Photo 5) and the fence on downstream side (Photo 6 and Photo 8) of the crest are generally straight. No change evident.
Erosion	None significant
Vegetation	None evident
Depressions	None evident
Settlement	None evident

Comments:

► No comments

5.2 Crest Wave Wall

General condition	Good
Cracks	None significant
Spalling	None evident
Joint condition	Good. Minor opening of wave wall joints noted, but no change evident.
Seepage	None evident
Movement	None evident
Vegetation	None evident
Alignment	Straight (Photo 5)

Comments:

► No comments



5.3 Embankment Upstream Face Slab

General condition	Generally Good
Cracks	Shrinkage cracking noted across slab, but no change evident.
Spalling	None evident. Previously repaired areas now submerged.
Joint condition	Good
Seepage	None evident
Movement	None evident
Debris	None evident
Vegetation	None evident

Comments:

- ▶ The upstream face slab is in good condition given its age.

5.4 Embankment Downstream Slope

Cracks	None evident – downstream face is rockfill
Sinkholes	None evident
Slides	Minor ravelling noted on downstream face, but no change evident
Bulging	Occasional undulations at toe due to minor slides (Photo 12 and Photo 13)
Wet spots	None evident
Boils	None evident
Depressions	None evident
Deterioration of the slope protection	None evident
Erosion	None evident
Vegetation	Grass cover and small shrubs (Photo 9).
Animal burrows	None evident

Comments:

- ▶ No comments



5.5 Embankment Downstream Toe Berm

Cracks	None evident
Sinkholes	None evident
Slides	None evident
Bulging	None evident
Wet spots	None evident
Boils	None evident
Depressions	None evident
Deterioration of the slope protection	None evident
Erosion	None evident
Vegetation	As noted previously, grass and large trees have been planted in the downstream toe berm, but given the size of the berm, the trees do not present any concerns related to dam safety.
Animal burrows	None evident

Comments:

- ▶ A concrete drainage pit was noted in the middle of a garden bed approximately 10 m from the downstream toe of the dam (Photo 17). It is likely that this forms part of the foundation drainage network under the toe berm and is connected to the concrete pit at the toe of the toe berm (below the toilet block).

Recommendation:

- ▶ **R5.5.1/11-S – Undertake an inspection of the drainage pit to identify pipes connected to the pit and use service location equipment to plot the extent of any pipes connected to the pit.**

5.6 Embankment Abutments

Cracks	None evident
Wet spots	None evident
Vegetation	Grass small shrubs and trees (Photo 14 and Photo 15)
Slides	None evident
Erosion	None evident



Comments:

- ▶ No comments

5.7 Embankment Toe

Wet spots	None evident
Vegetation	Extensive grass cover and large trees
Boils	None evident

Comments:

- ▶ Downstream toe area was inundated by the backwater from the spillway at the time of the inspection (Photo 19).
- ▶ Damage to the road on the left bank of the river channel evident from pieces of bitumen amongst debris.

5.8 Instrumentation

Piezometers	n/a
Survey monuments	Survey monitoring points are located in the wave wall and in the top of the face slab.
Seepage monitoring	Two v-notch weirs monitor seepage from the toe berm and the diversion tunnel. The extent and location of the collection zone for the former is not known.
Other	The water level is recorded automatically at the intake tower with the data captured by telemetry.

Comments:

- ▶ Instrumentation at downstream toe was inundated during the flood event and will need to be checked to ensure they are operable.

5.9 Access Road

Pavement general condition	Good
Guard rails	n/a
Signs	n/a



Comments:

- ▶ From the main road into the damsite, the vehicular access road is on the downstream left abutment and terminates at the pump station. This road normally provides public access to the recreational facilities at the toe of the dam, but was closed at the time of the inspection.



6. Spillway

6.1 Approach channel

General condition Not inspected, but no blockage evident (Photo 24 and Photo 25).

Erosion

Debris

Loose rocks

Vegetation

Comments:

- ▶ Not inspected due to ongoing spillway discharges. Area inspected from left bank only.

6.2 Spillway Crest Section and Training Walls

General condition Not inspected in detail, but no significant damage observed.

Cracks

Spalling

Joint condition

Seepage

Movement

Debris Collection of debris from flood evident on spillway crest (Photo 26)

Vegetation

Comments:

- ▶ Area observed from left bank only due to ongoing spillway discharge.

Recommendations:

- ▶ R6.2.1/11-S – Undertake a complete inspection of the spillway (including the approach channel, crest structure, channel, cut slopes and immediate downstream river channel) when the spillway stops flowing.



6.3 Spillway Chute

General condition	Not inspected in detail, but no significant damage observed.
Erosion	Erosion evident particularly in lower right side of chute (Photo 34).
Debris	Collection of debris from flood evident in spillway chute (Photo 29)
Loose rocks	
Vegetation	

Comments:

- ▶ No comments

6.4 Spillway – Left Cut Slope

General condition	Not inspected in detail.
Erosion	Undermining of the left side cut towards the downstream end was observed, in particular in the vicinity of the bottom of the stairs (Photo 36 and Photo 38).
Debris	
Loose rocks	
Vegetation	

Comments:

- ▶ Not inspected in detail due to ongoing spillway discharges.

Recommendations:

- ▶ ***R6.4.1/11-S – Prevent public access to top of the left side spillway cut between the weather station and the downstream end of the spillway due to undermining of the cut slopes.***

6.5 Spillway – Right Cut Slope

General condition	Not inspected in detail.
Erosion	Erosion noted at base of cut slope.
Debris	



Loose rocks

Vegetation

Comments:

- ▶ Not inspected due to ongoing spillway discharges. Area inspected from left bank only.

6.6 River Channel in the Vicinity of the Spillway

General condition

Not inspected in detail.

Erosion

Erosion likely in area of original pond and causeway at the downstream end of the spillway.

Debris

Loose rocks

Vegetation

Comments:

- ▶ Not inspected due to ongoing spillway discharges. Area inspected from left bank only.



7. Outlet Works

7.1 Structural Items

7.1.1 Intake Structure Access Bridge

General condition	Good (refer Photo 47 to Photo 49)
Metalwork condition	As note previously, corrosion is developing.
Coatings	Satisfactory
Decking	Satisfactory
Abutments	Good.

Comments:

- ▶ Decking on the bridge is monitored on an ongoing basis and repaired as needed.
- ▶ It has previously been recommended to paint the bridge truss. It is understood that options for doing this are being investigated due to environmental concerns. Based on discussions with TRC, it is likely that significant maintenance of the bridge will be undertaken when the spillway upgrade works are done.

7.1.2 Intake Structure

General condition	Very good. Note that the tower was only inspected from the bridge entry level due to flooding of the tunnel.
Cracking	A crack was noted around the intake tower at about mid-height between the bridge deck level and the top of the structure (Photo 50). It is unclear whether this crack has been noted previously, but close inspection of previous inspection photos has shown its existence. This crack is not considered to be a structural problem.
Spalling	
Joint condition	
Seepage	
Movement	

Comments:

- ▶ No comments



7.1.3 Outlet Tunnel

General condition Not inspected due to flooding of the tunnel.

Crackling

Spalling

Joint condition

Seepage

Movement

Comments:

- ▶ No comments

Recommendations:

- ▶ *R7.1.3.1/11-S – Investigate reason for inundation of the outlet tunnel given that records show that the drain valve at the tunnel plug was closed prior to the flood.*

7.2 Mechanical and Electrical Items

7.2.1 Intake Valves, Pipework and Operating Equipment

General condition Not inspected due to flooding of the tunnel

Metalwork condition

Coatings

Leakage

Shafts

Gears

Couplings

Guards

Upstream closure gate

Ventilation

Control system

Security



Other

Comments:

► No comments

7.2.2 Intake Trashracks

General condition Not inspected as all are submerged

Coatings

Comments:

► No comments

7.2.3 Scour Intake Trashracks and Bulkheads

General condition Underwater. Not inspected.

Comments:

► No comments

7.2.4 Outlet Tunnel Pipework and Valves

General condition Not inspected due to flooding of the tunnel.

Metalwork condition

Coatings

Leakage

Valves

Control system

Security

Ventilation

Comments:

► No comments



7.2.5 Power

Operation Not inspected

Fire protection

Protection against vandalism

Operating Instructions posted

Lighting

Comments:

▶ No comments



8. References

DEPARTMENT OF NATURAL RESOURCES AND MINES (NR&M), 2002, *Queensland Dam Safety Management Guidelines*, NR&M, Brisbane.

GHD PTY LTD, 2010a, *Cooby Dam – 2010 Annual Dam Safety Inspection*, GHD, Brisbane.

GHD PTY LTD, 2010b, *Toowoomba Regional Council Dams – 2010 Review of Dam Safety Instrumentation*, GHD, Brisbane.

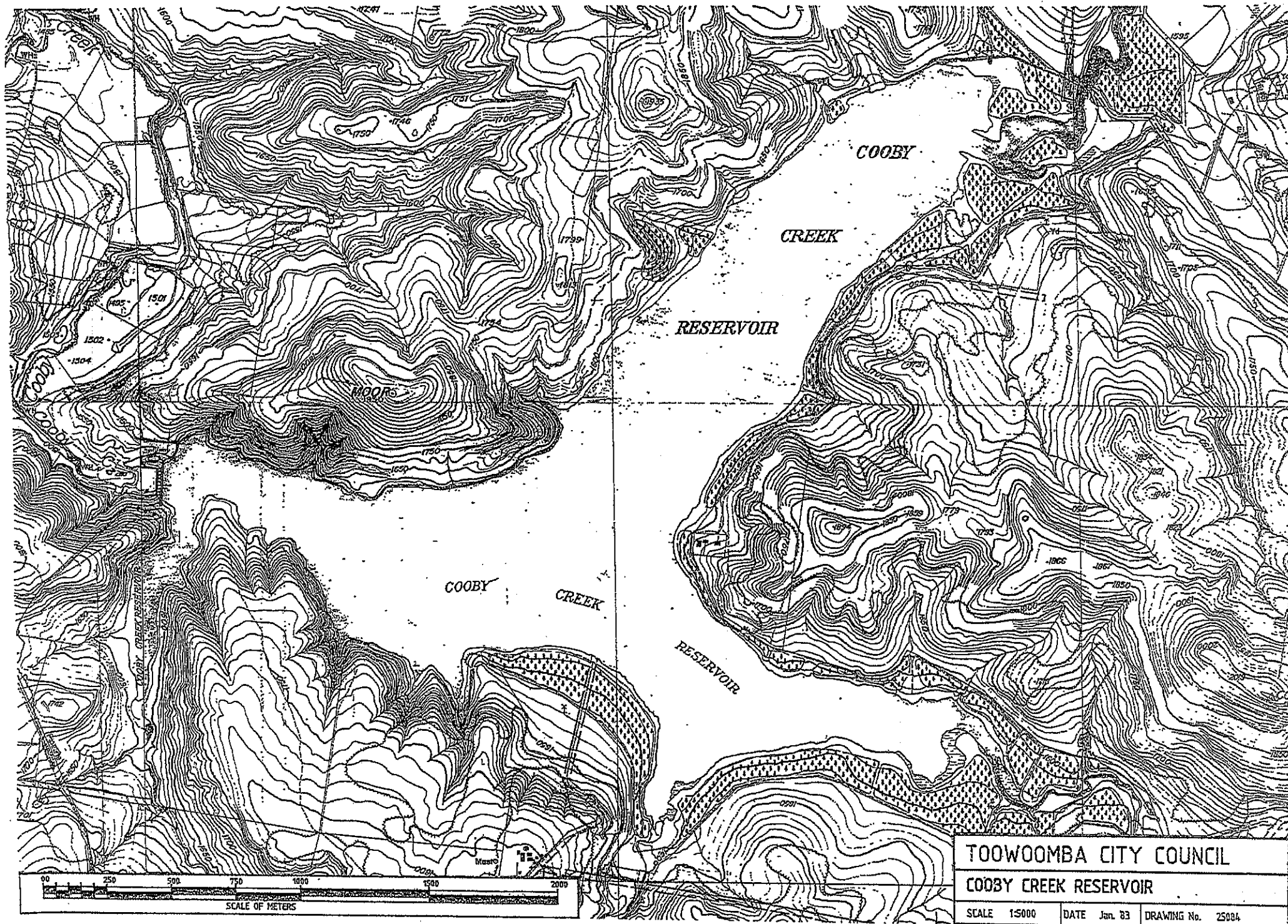


Appendix A

Selection of Drawings of Cooby Dam



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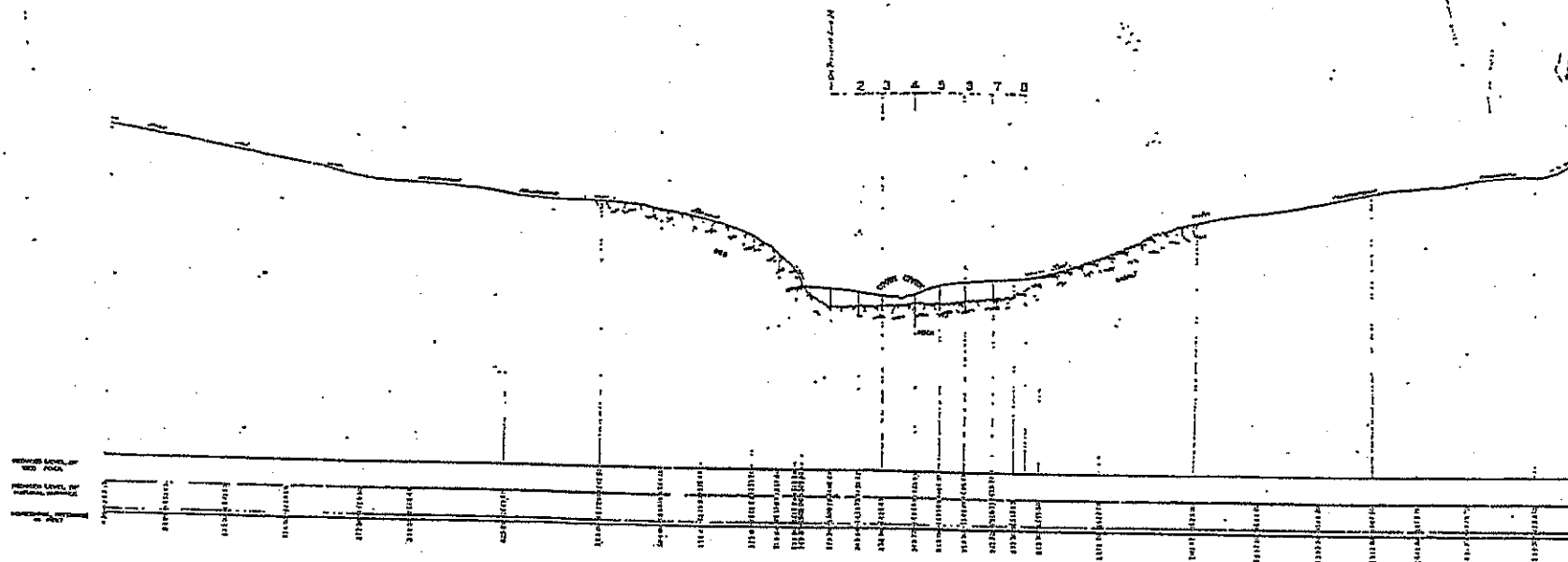
TOOWOOMBA CITY COUNCIL

COOBY CREEK RESERVOIR

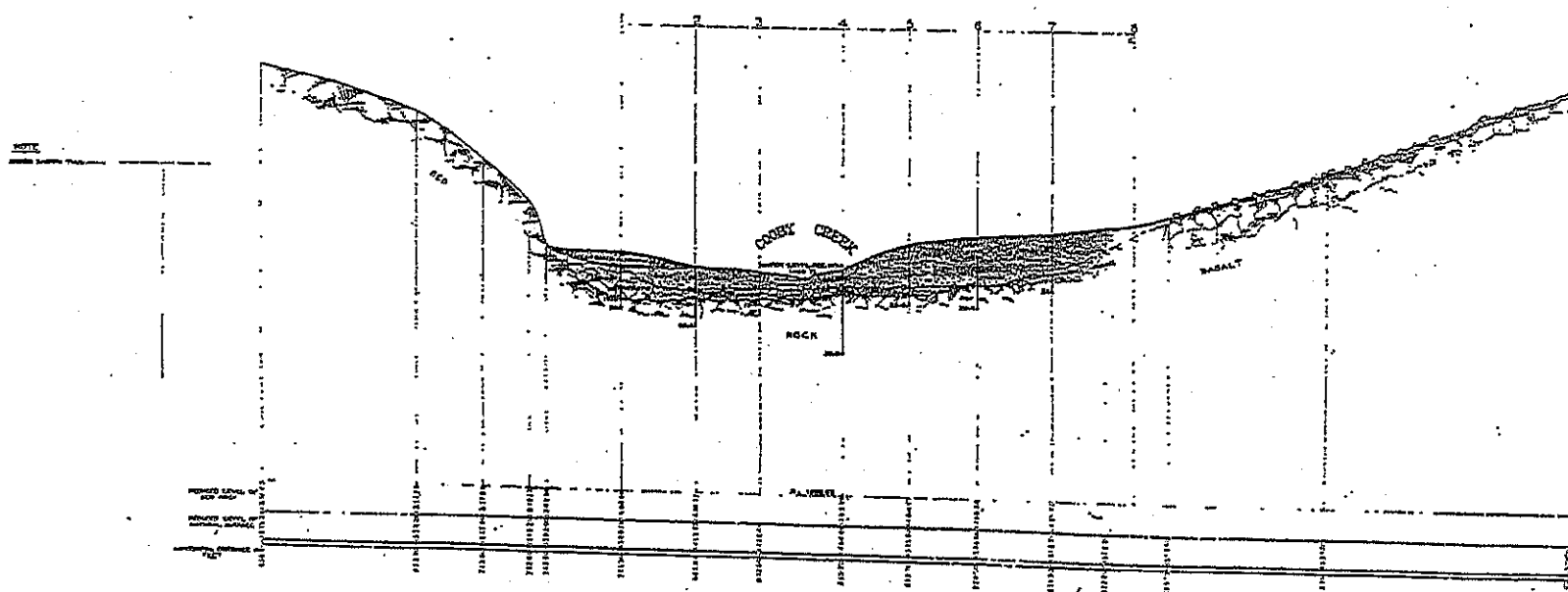
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LONGITUDINAL SECTION LOOKING UPSTREAM



ENLARGED LONGITUDINAL SECTION AT DORE

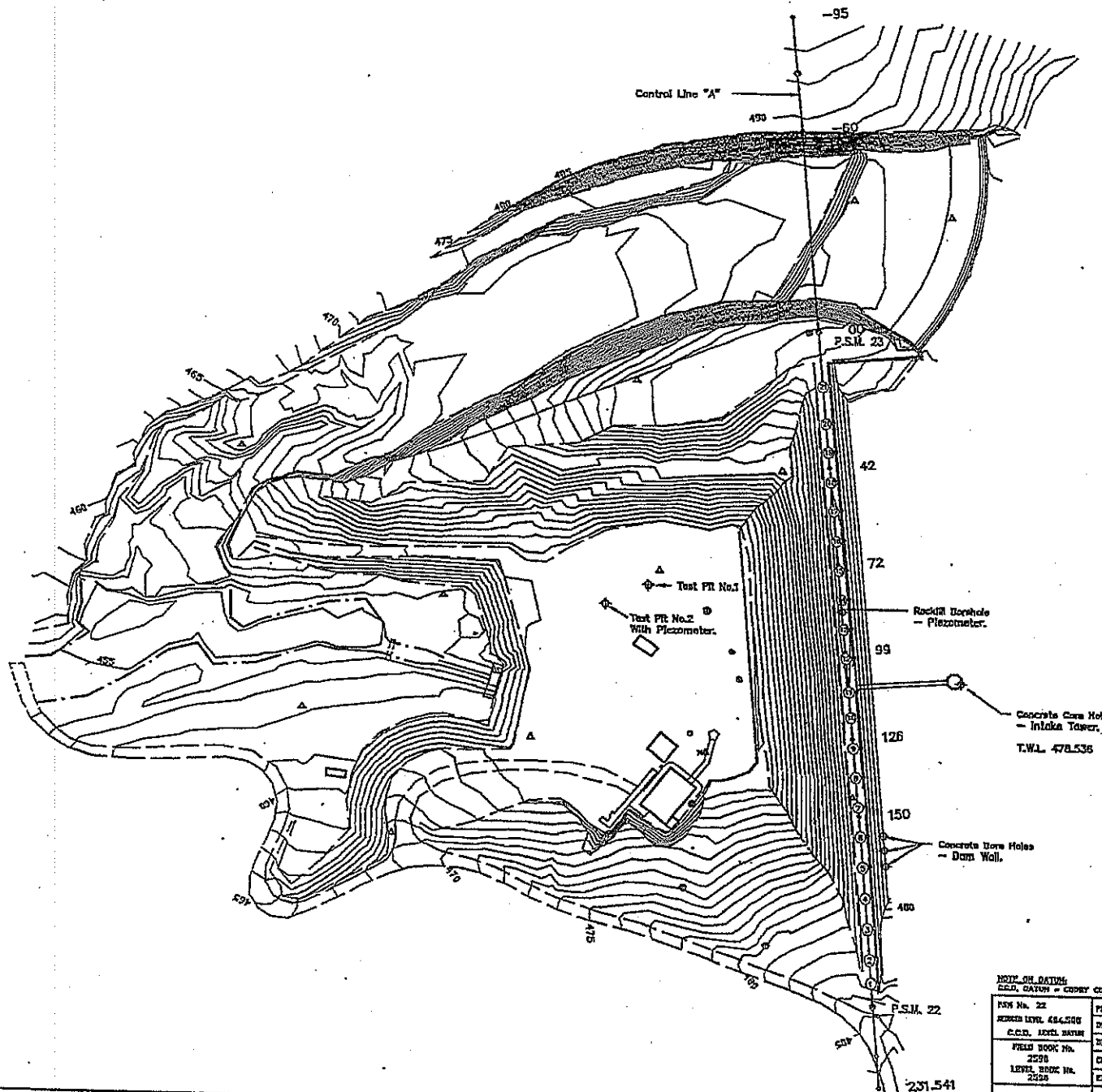
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TOOWOOMBA WATER	
SECTION & STRAIGHT	
DAM SITE DORE COCKY	
REG. NO. 13201	1933
INDEX JW 7 6-2	1933
JOB 135	1933

25152





Pages 42 through 43 redacted for the following reasons:



NO. OF DATUM		DESIGN		DRAWN		CHECKED		EXAMINED	
NO. 22	DESIGNED	C. Mettler	DRAWN	J. Van der Neulen	CHECKED		EXAMINED		
REVISION LEVEL 484.500	C.C.D. LEVEL DATUM								
FIELD BOOK No. 2598									
LEVEL BOOK No. 2598									

TOOWOOMBA CITY COUNCIL		COOBY DAM SAFETY REVIEW		GENERAL LAYOUT	
L. Bradbury 4-12-83	REVISION NO. - 1/12-83	DESIGNED BY - W.S.E.E.	CITY ENGINEER	DATE	25092

EAST

WEST

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482.930

A

126.000

482.987

LINE

99.000

483.052

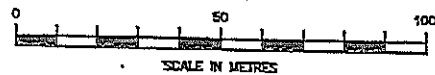
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CONTROL

42.000

482.970



NOTE ON DATUM

C.G.D. DATUM = COOBY CONSTRUCTION DATUM, RELATIONSHIP TO AHD. TO BE ESTABLISHED.

P.M. No. 22

DESIGNED L.M. L.R.L.S.

C.G.D. LEVEL DATUM

FIELD BOOK No.

LEVEL BOOK No.

2558

2558

I. Bradbury C.O.-28

SURVEYOR

PLANNED G. Notcher

DESIGNED

DRAWN J. Van der Merwe

CHECKED

EXAMINED

TOOWOOMBA CITY COUNCIL

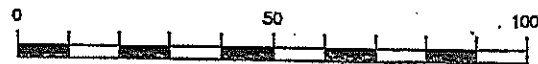
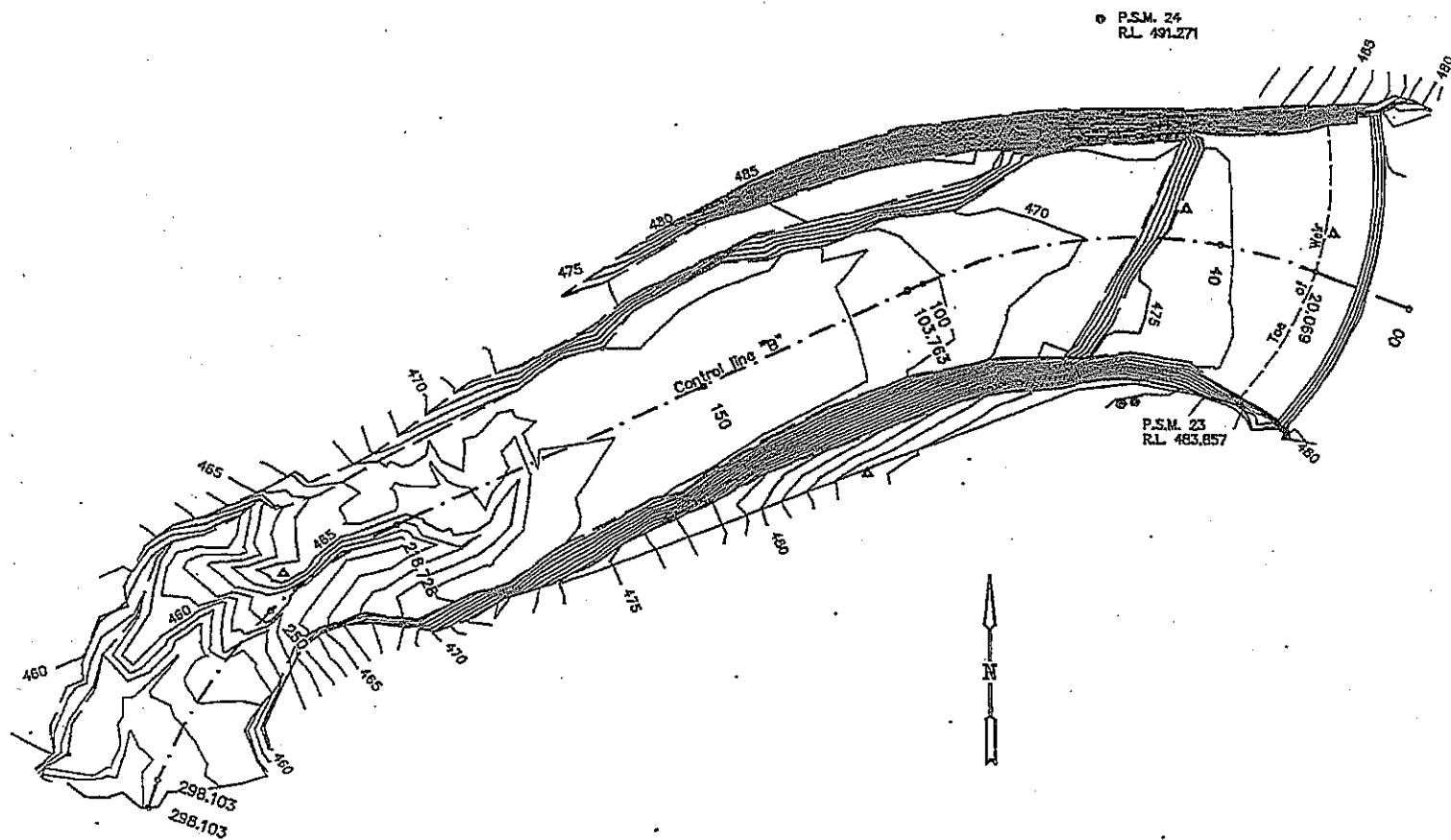
COOBY DAM SAFETY REVIEW

COOBY DAM WALL CROSS SECTIONS

CITY ENGINEER DATE SCALE 1:250

DIAL A3 DRAWING No. 25094

25094



SCALE IN METRES

NOTE ON DATUM

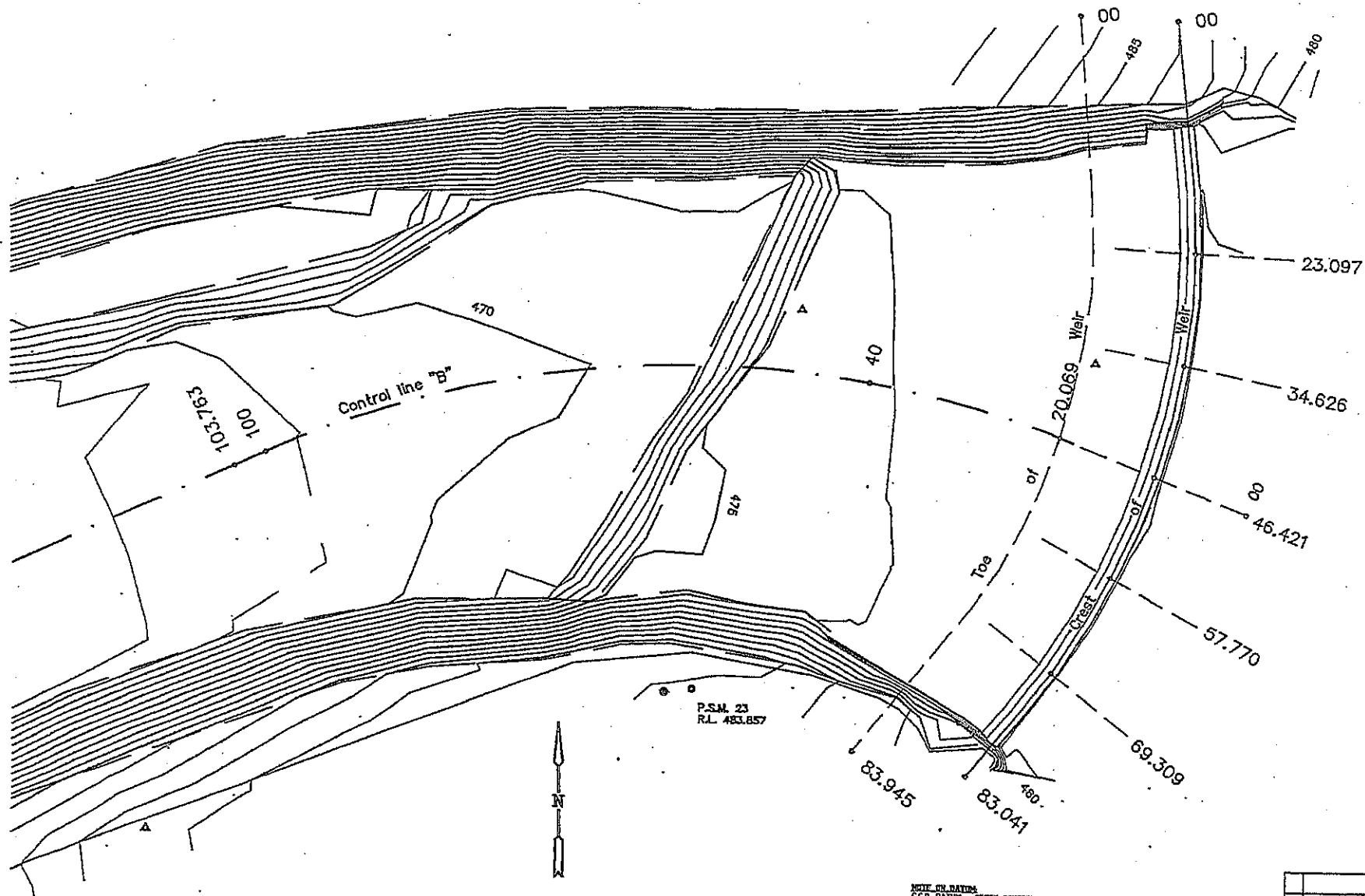
C.C.D. DATUM = COOBY CONSTRUCTION DATUM RELATIONSHIP TO A.M.D. TO BE ESTABLISHED.

P.M. No. 22	PLATTED	G. Noteller
DESIGNED	DESIGNED	
C.C.D. LEVEL DATUM	DRAWN	J. Van der Meulen
FIELD BOOK No. 2538	CHECKED	
LEVEL BOOK No. 2538	EXAMINED	

TOOWOOMBA CITY COUNCIL

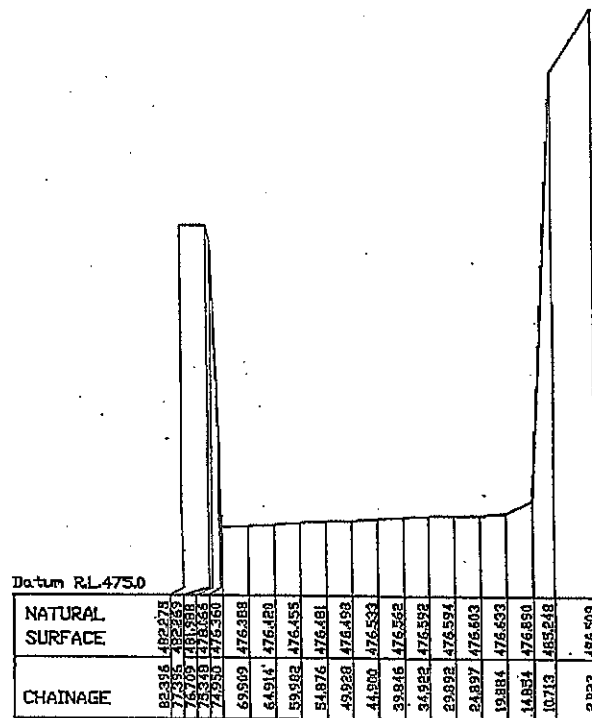
**COOBY DAM SAFETY REVIEW
DAM SPILLWAY WEIR AND CHANNEL**

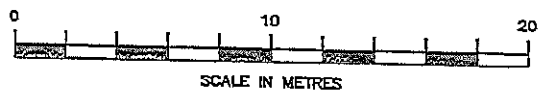
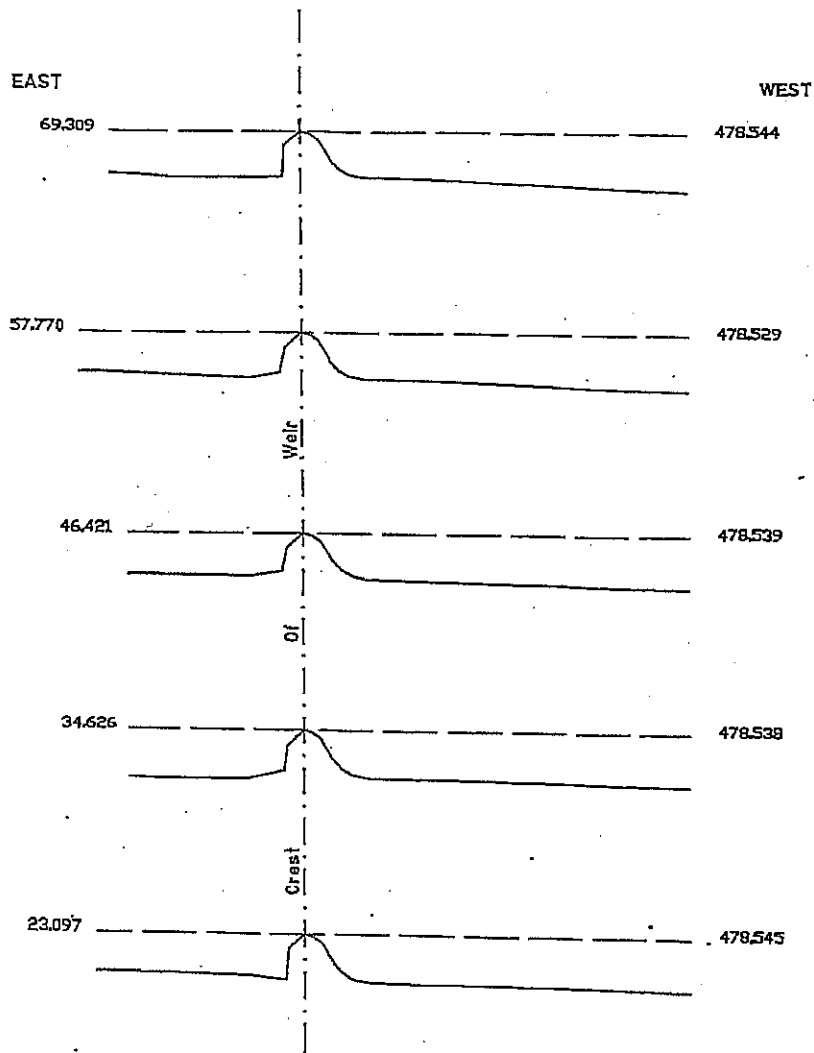
J. Bradbury 4-12-89 SURVEYOR	ENGINEER	DATE	SCALE 1:1000	SHEET A3	DRAWING No. 25085
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NOTE ON DATUM C.C.D. DATUM = COOBY CONSTRUCTION DATUM, RELATIONSHIP TO A.M.D. TO BE ESTABLISHED.				No.	REVISIONS	DRAWN	APPROVED	DATE
PSM No. 22	DESIGNED	G. Nollner	TOOWOOMBA CITY COUNCIL COOBY DAM SAFETY REVIEW DAM SPILLWAY WEIR AND CHANNEL					
REVISION NO. 484.576	DESIGNED							
C.C.D. LEVEL DATUM	DRAWN	J. Van der Meulen						
FIELD BOOK No. 2558	CHECKED							
LEVEL BOOK No. 2558	EXAMINED		DRAWING No. 25098					
J. Bradbury & Co. Pty. Ltd. SURVEYORS			SURVEYED BY - J. VAN DER MEULEN		SURVEYED BY - G. NOLLNER		CITY ENGINEER	
			DATE		SCALE		SHEET	

25098





NOTE ON DATING:
C.C.D. DATUM = COOBY CONSTRUCTION DATUM, RELATIONSHIP TO A.H.S. TO BE ESTABLISHED.

PN No. 22	PLOTTED	C. Nottel
DESIGNED BY: A.S. 136	DESIGNED	
C.C.D. LEVEL 6420	DRAWN	J. Van der Merwe
FIELD BOOK No. 2538	CHECKED	
LEVEL BOOK No. 2538	EXAMINED	

J. Brackbury 4-12-83
SURVEYOR

EXTENSION OF - R.H. 1.01
STATIONING ON - W.E. 1.2

CITY ENGINEER

DATE

SCALE

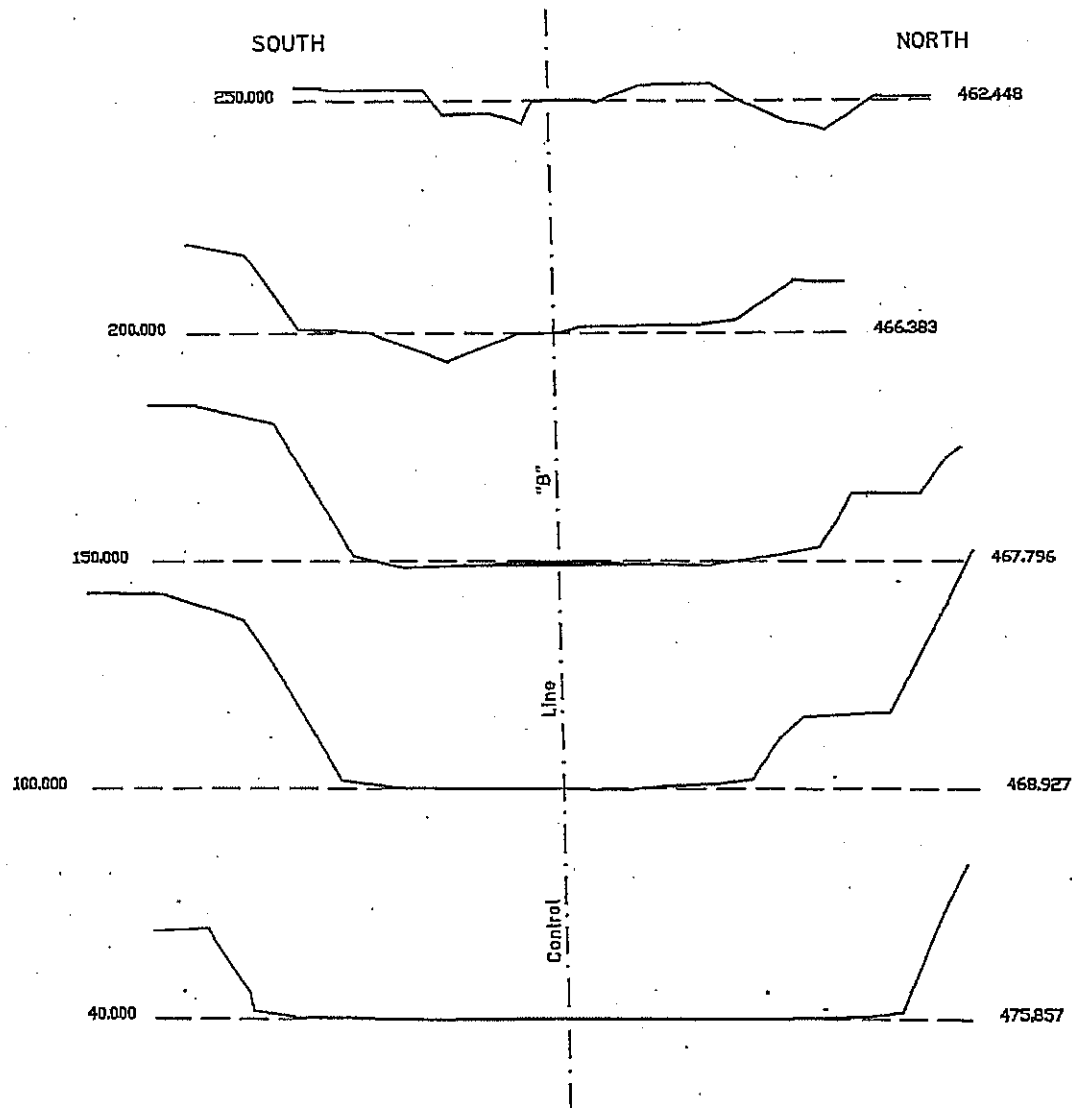
DATE

DRAWING No.

25098

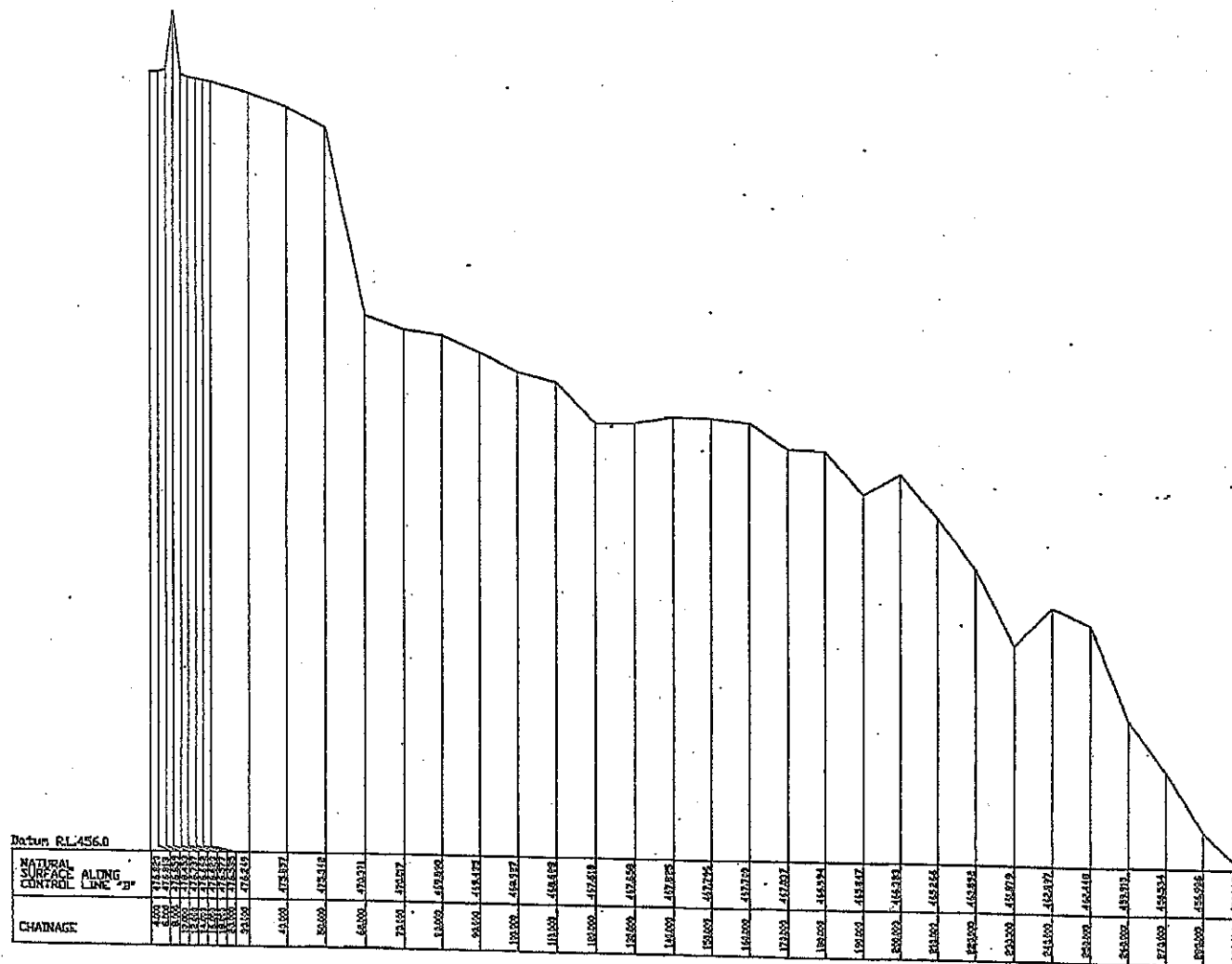
TOOWOOMBA CITY COUNCIL

COOBY DAM SAFETY REVIEW
CROSS SECTIONS AT SPILLWAY WEIR



NOTE ON DAMS
C.D. DRAIN & COBY CONSTRUCTION DRAIN RELATIONSHIP TO AHR TO BE ESTABLISHED.

FSN No. 22	DESIGNED	D. Nottel	TOOWOOMBA CITY COUNCIL				
REVISED DRL. 18/12/98	DESIGNED						
C.D. DRL. 18/12/98	DRAWN	J. Van der Meulen	COBY DAM SAFETY REVIEW CROSS SECTIONS ALONG SPILLWAY CHANNEL				
FIELD BOOK No. 2338	CHECKED						
18/12/98 No. 2338	EXAMINED						
J. Bradbury 4-12-98 SURVEYOR	REVISION DRL. - 18/12/98	REVISION DRL. - 18/12/98	CITY ENGINEER	DATE	SCALE	SHEET	DRAWN No.
					1:200	A3	25099



Scales Horizontal 1:250
Vertical 1:25



NOTE ON DATUM C.C.D. DATUM = COOBY CONSTRUCTION DATUM RELATIVE TO A.M.D. TO BE ESTABLISHED.		No.	REVISIONS	DRAWN	APPROVED	DATE
FORM No. 22 RECORD SHEET 456.568 C.C.D. ELEV. DATUM		TOOWOOMBA CITY COUNCIL				
FIELD BOOK No. 2508 ELEV. BOOK No. 2508		COOBY DAM SAFETY REVIEW LONGITUDINAL SECTION ALONG SPILLWAY CHANNEL				
J. Bradbury L-12-08 SURVEYOR		PLOTTED C. Nelder				
		CHECKED J. Van der Meulen				
		REVIEWED				
DRAWN BY - J.M. & M.S.		CITY ENGINEER	DATE	SCALE 1:250	SHEET A3	DRAWING No. 25100

Pages 53 through 55 redacted for the following reasons:



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Appendix B

Photographic Record of Site Inspection



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Photo 1 Overview of dam and tower from upstream left abutment



Photo 2 Upstream face of dam from right abutment (Note straight waterline)





Photo 3 Right side of upstream face viewed from tower

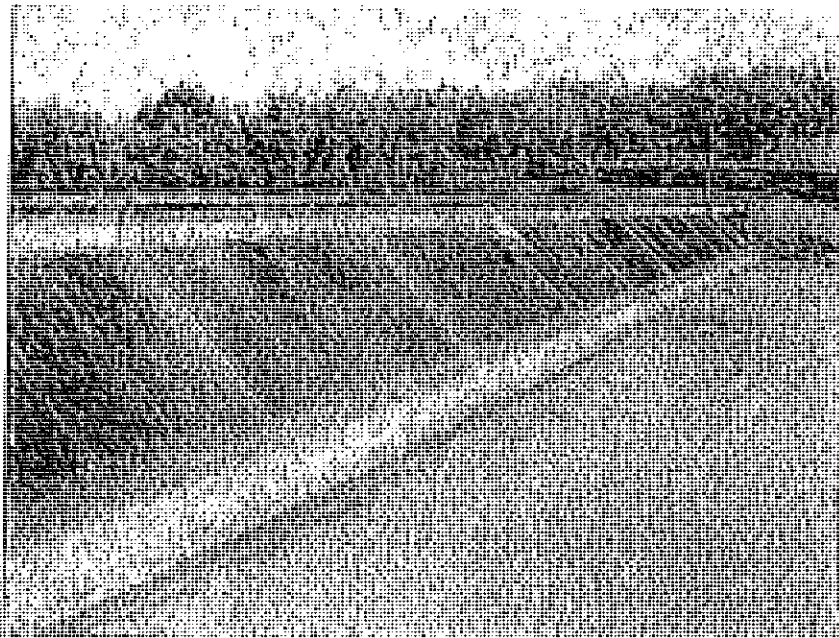


Photo 4 Left side of upstream face viewed from tower

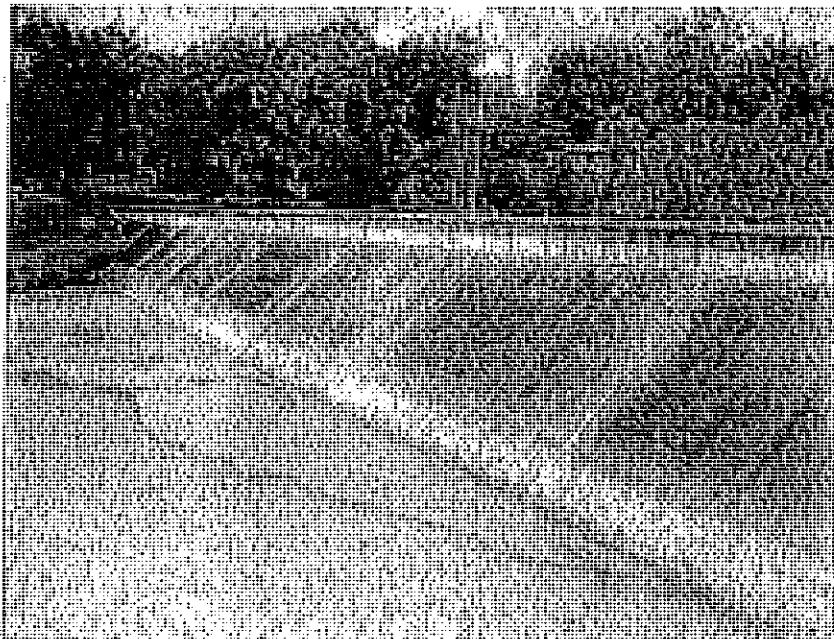




Photo 5 Looking along wave wall on upstream side of dam crest from left abutment

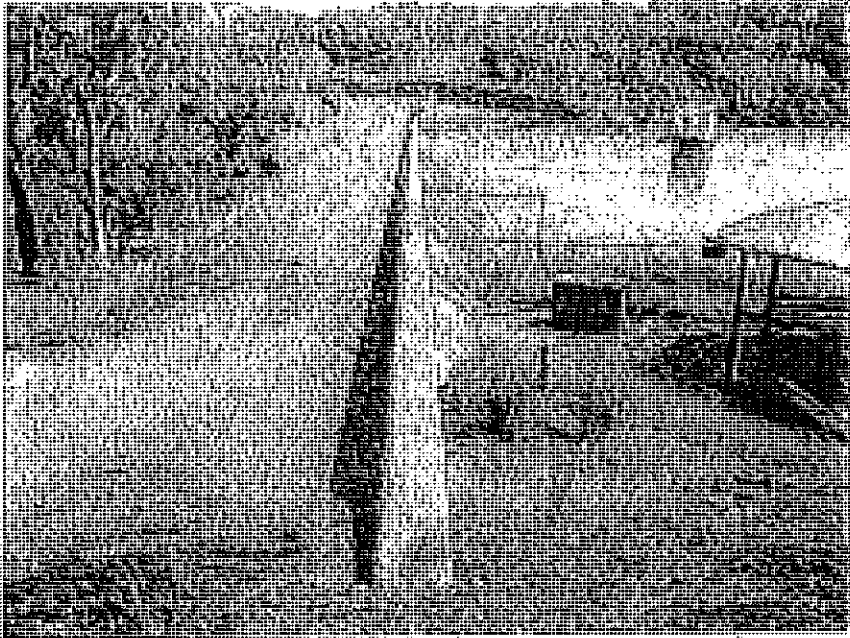


Photo 6 Looking along fence on downstream side of dam crest from left abutment

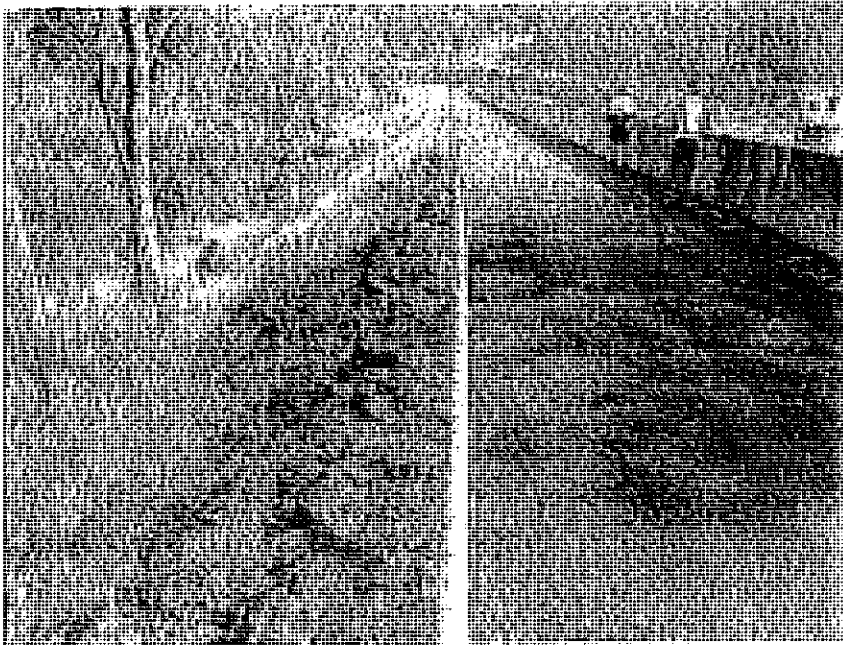




Photo 7 Cracking in dam crest near left abutment

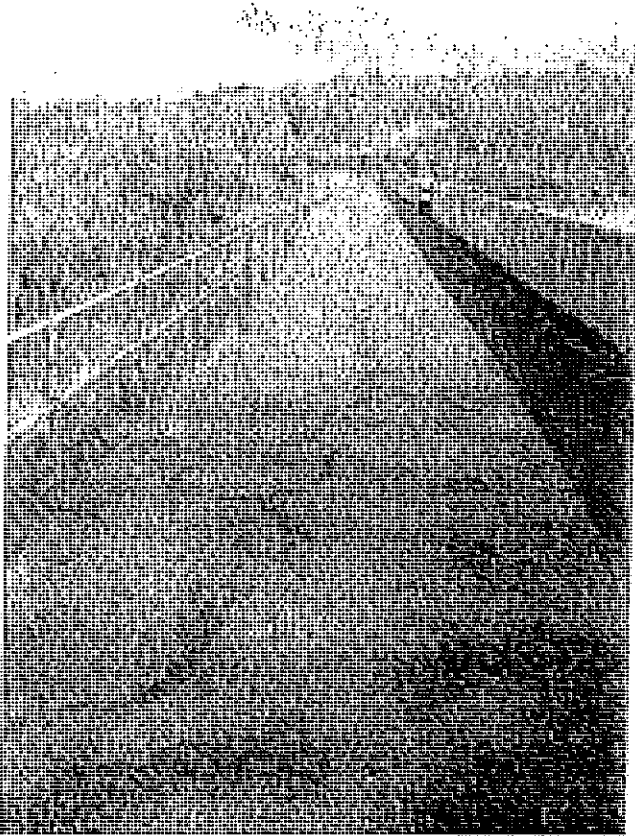


Photo 8 Looking along fence on downstream side of dam crest from right abutment

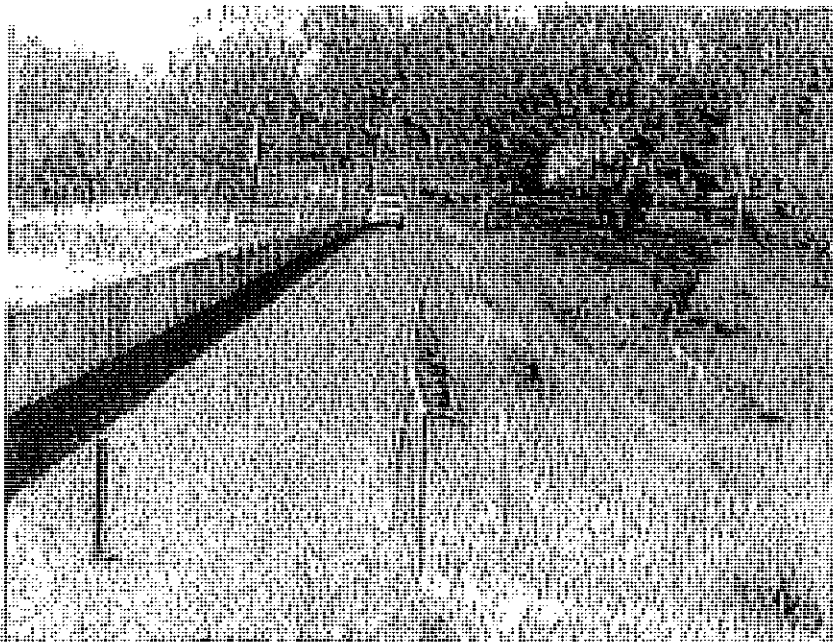




Photo 9 Overview of downstream face from right abutment

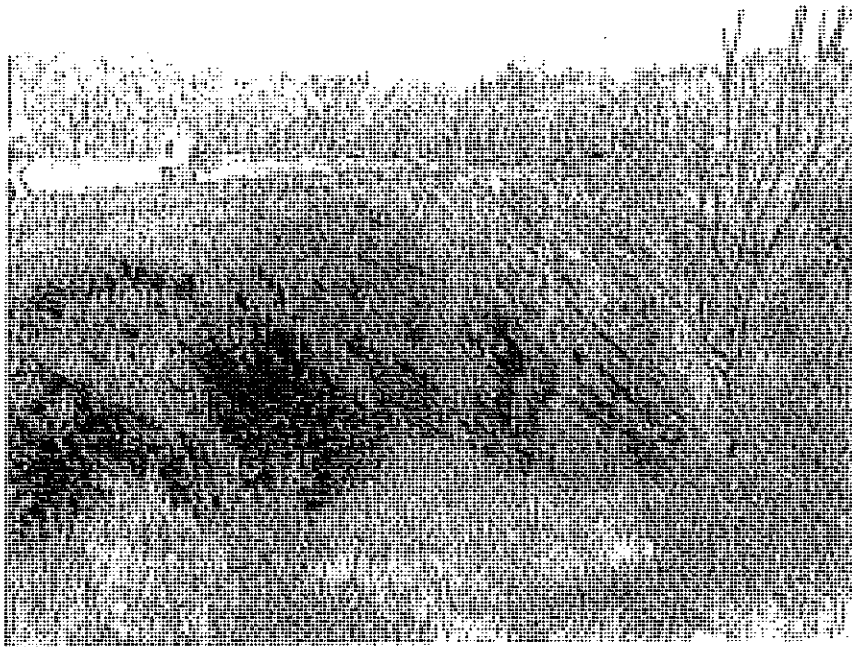


Photo 10 Left abutment groin viewed from dam toe

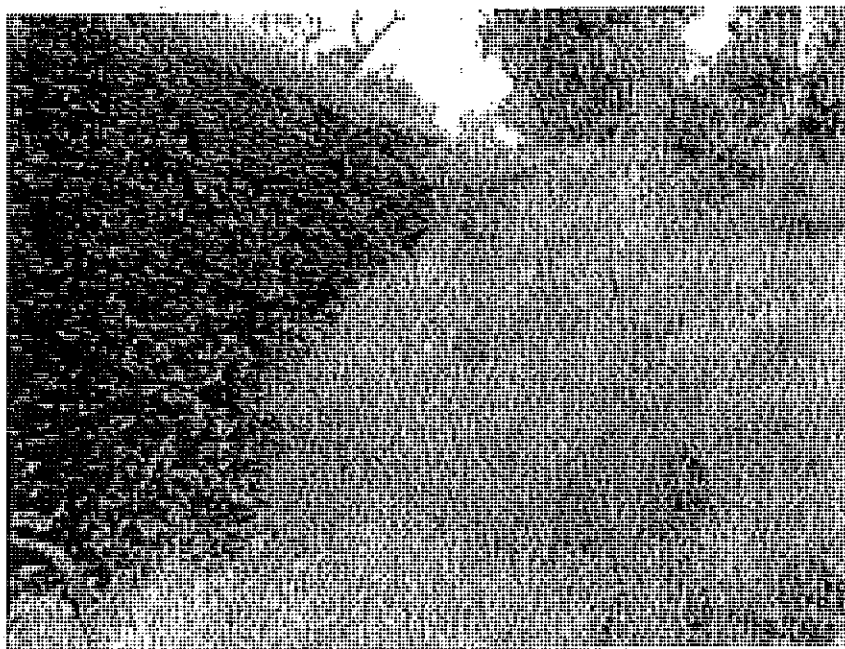




Photo 11 Right abutment groin viewed from dam toe



Photo 12 Looking across downstream face and along downstream toe from left





Photo 13 Looking across downstream face and along downstream toe from right



Photo 14 Downstream left abutment viewed from dam crest

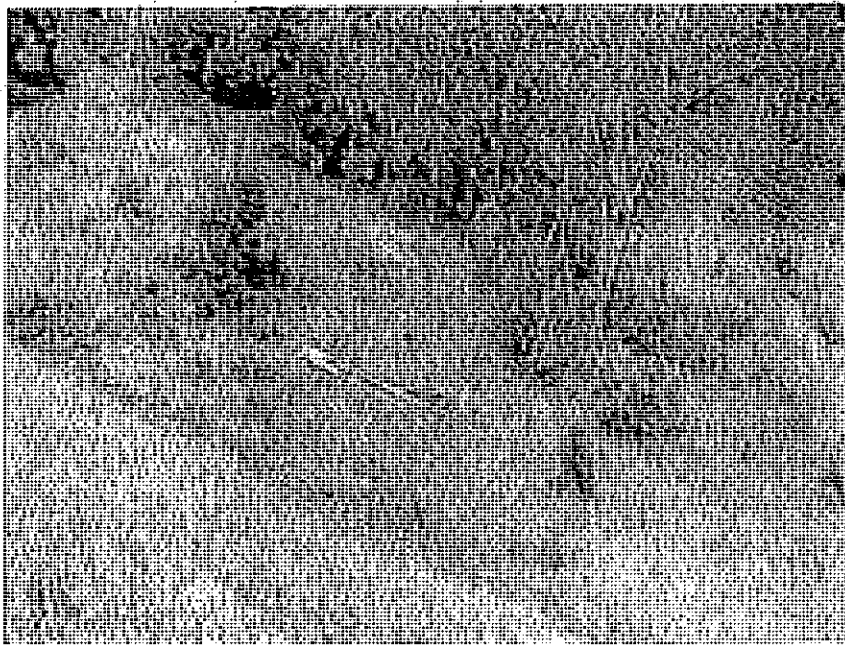




Photo 15 Downstream right abutment viewed from dam crest

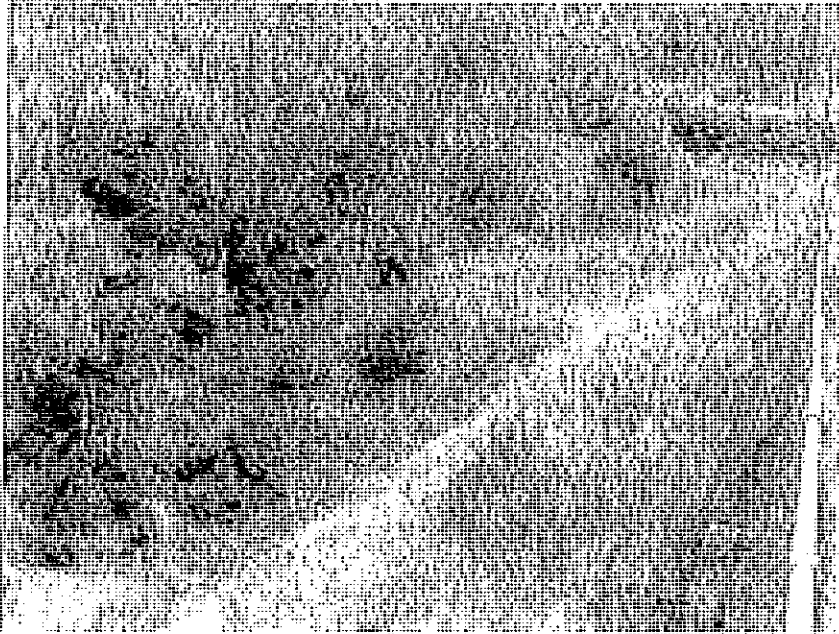


Photo 16 Dam toe berm area viewed from dam crest

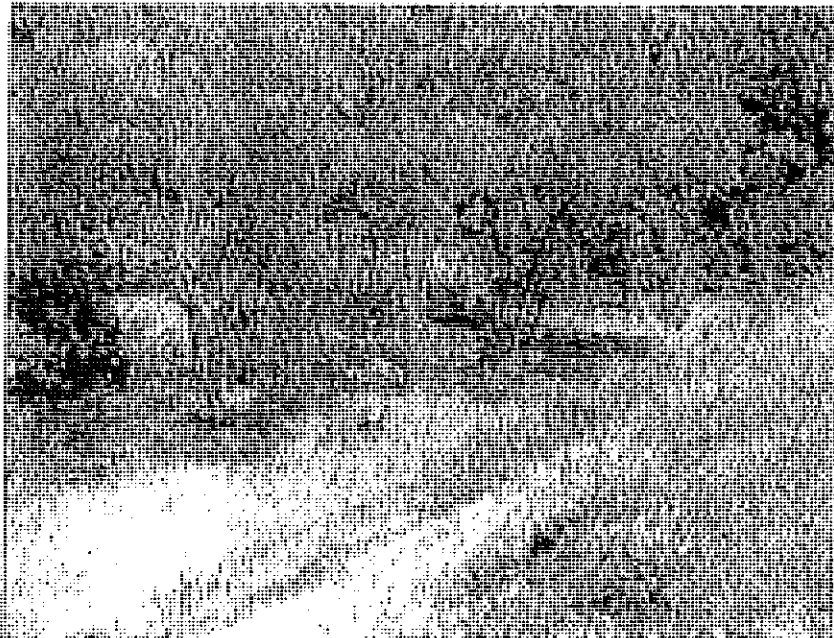




Photo 17 Drainage pit in toe berm (likely to be part of foundation drainage system)



Photo 18 Inside of drainage pit

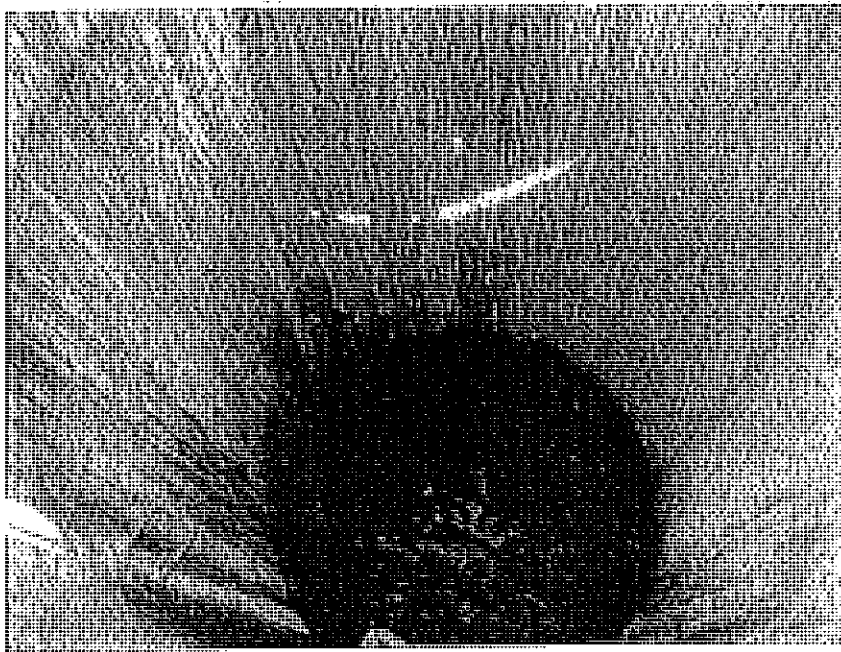




Photo 19 Downstream toe area viewed from toe berm

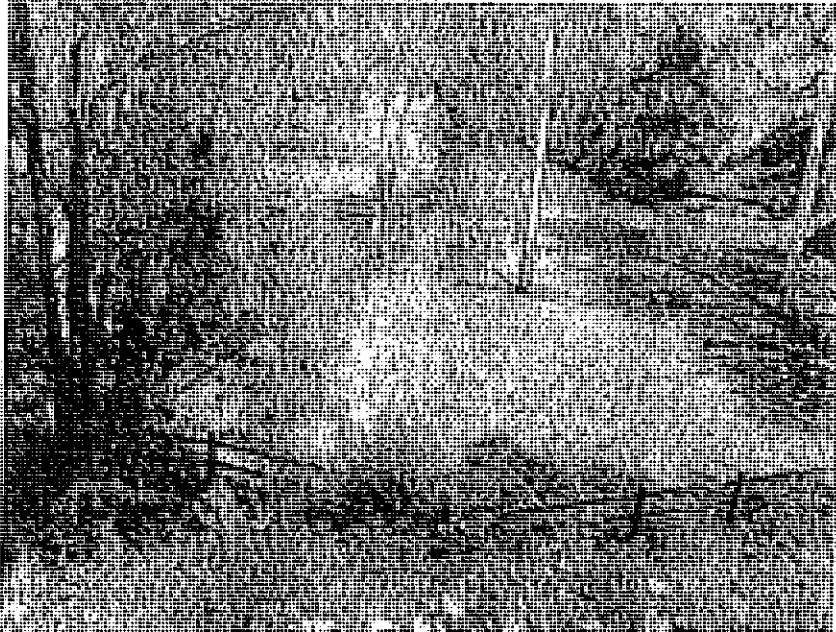
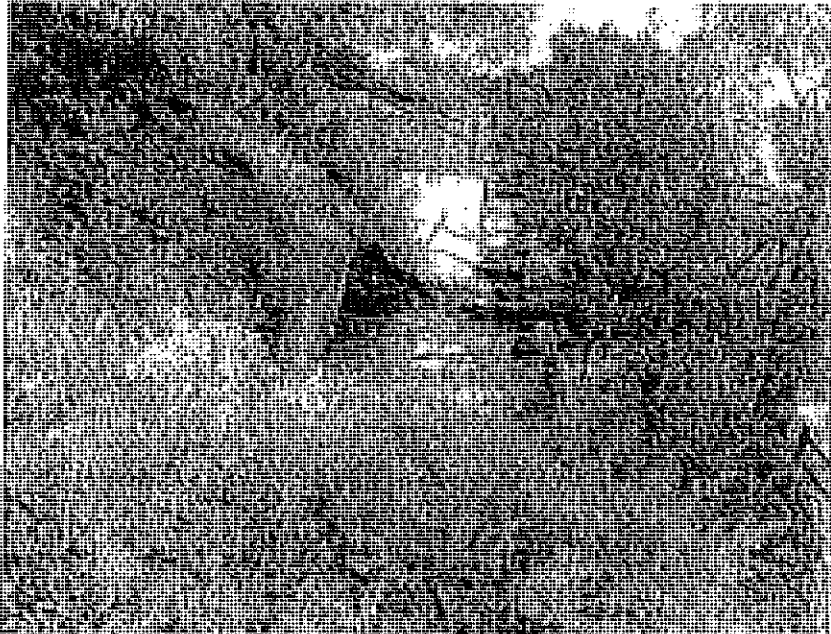


Photo 20 Tunnel portal viewed from toe berm



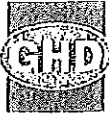


Photo 21 Downstream toe area – Photo 1 of 3



Photo 22 Downstream toe area – Photo 2 of 3





Photo 23 Downstream toe area – Photo 3 of 3



Photo 24 Spillway crest and approach channel viewed from left bank – Photo 1 of 2

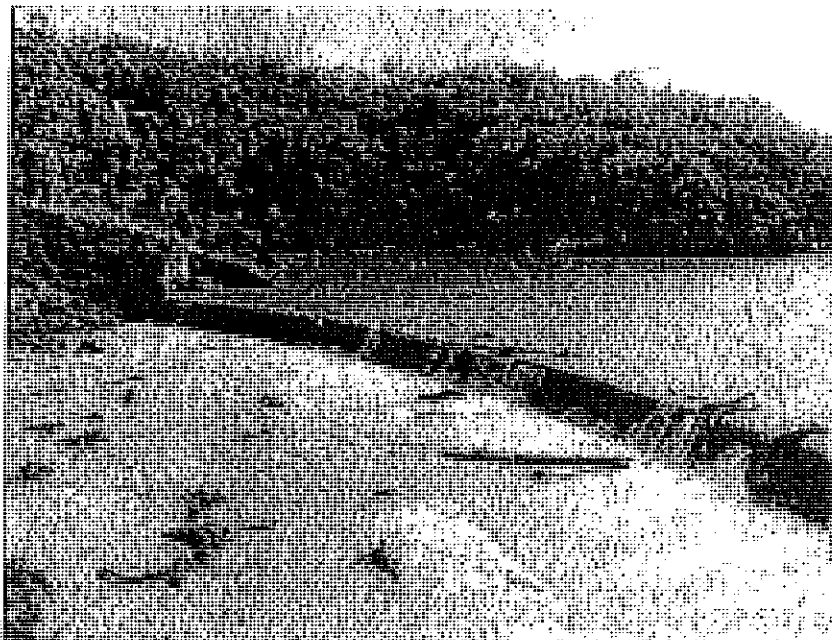




Photo 25 Spillway crest and approach channel viewed from left bank – Photo 2 of 2

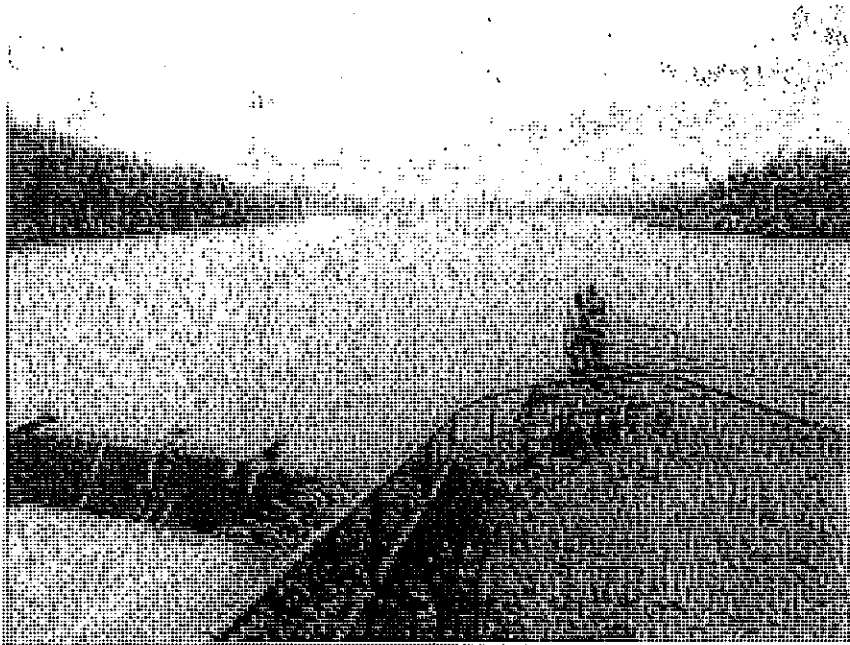


Photo 26 Overview of spillway crest viewed from left bank

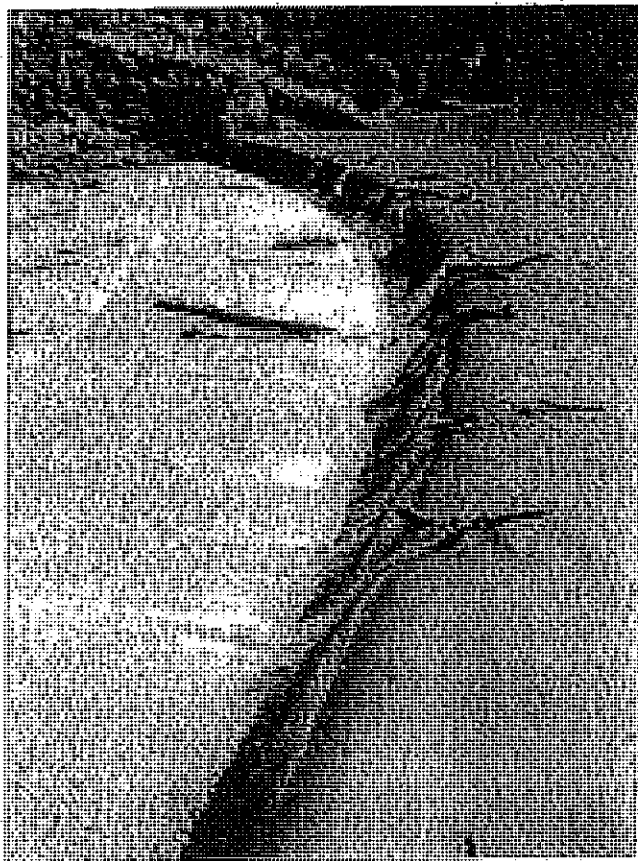




Photo 27 Right side of spillway crest viewed from left bank



Photo 28 Looking down on left side spillway wall

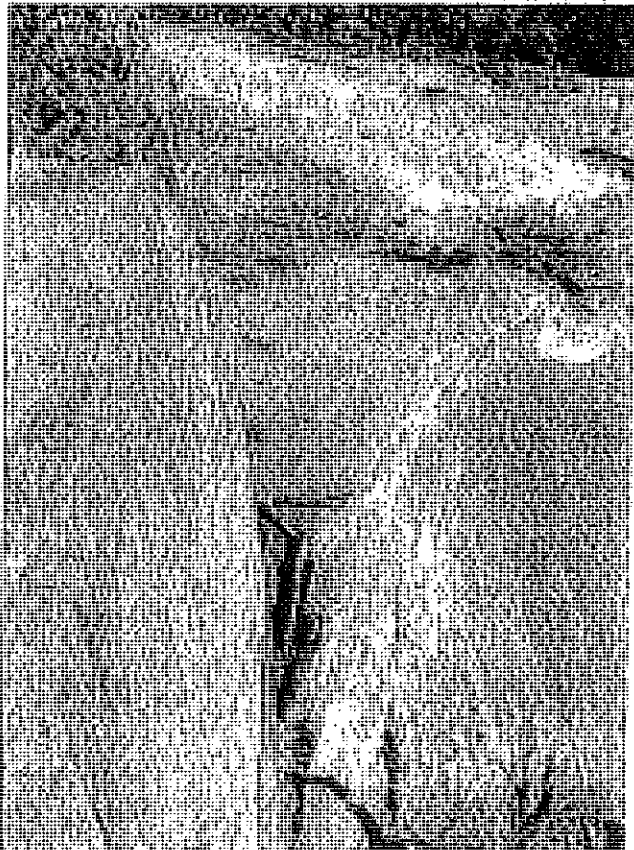




Photo 29 Flow in upper section of spillway chute viewed from left bank

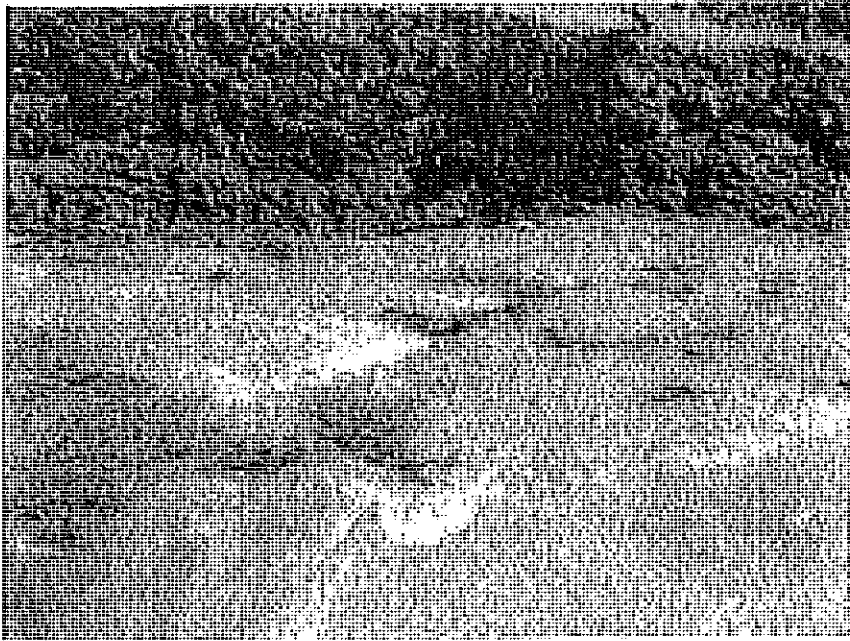


Photo 30 Right side spillway cut viewed from left bank – Photo 1 of 3





Photo 31 Right side spillway cut viewed from left bank – Photo 2 of 3



Photo 32 Right side spillway cut viewed from left bank – Photo 3 of 3

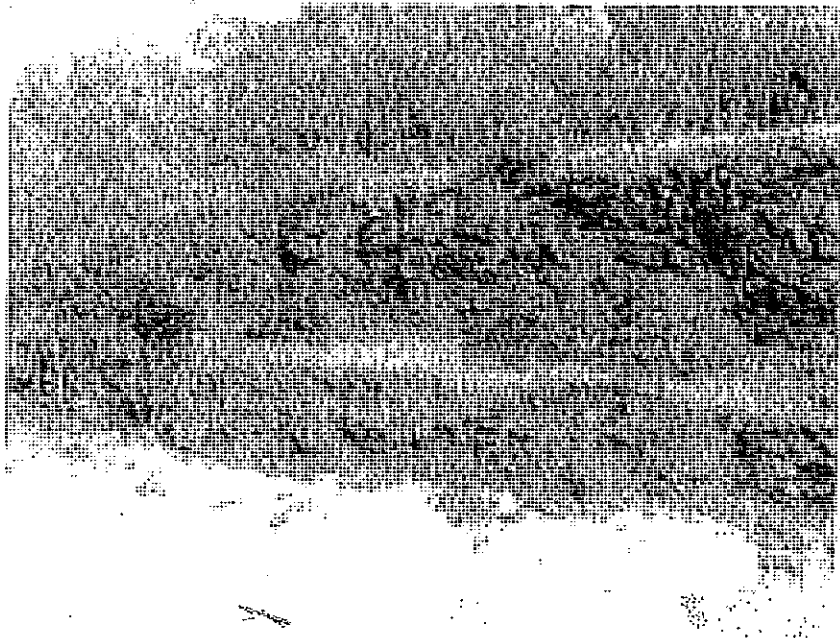




Photo 33 Flow over "drop" in spillway channel

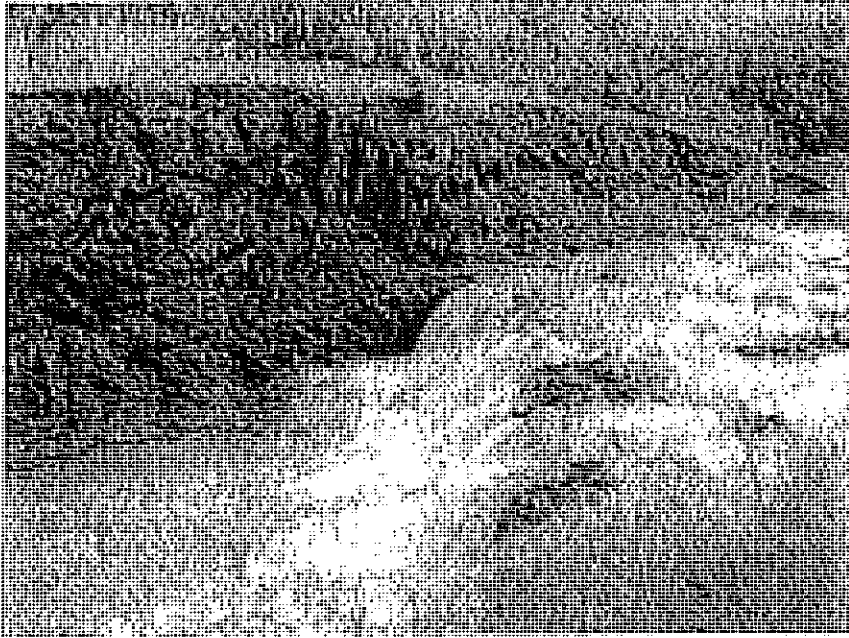


Photo 34 Flow in lower section of spillway chute looking downstream viewed from left bank

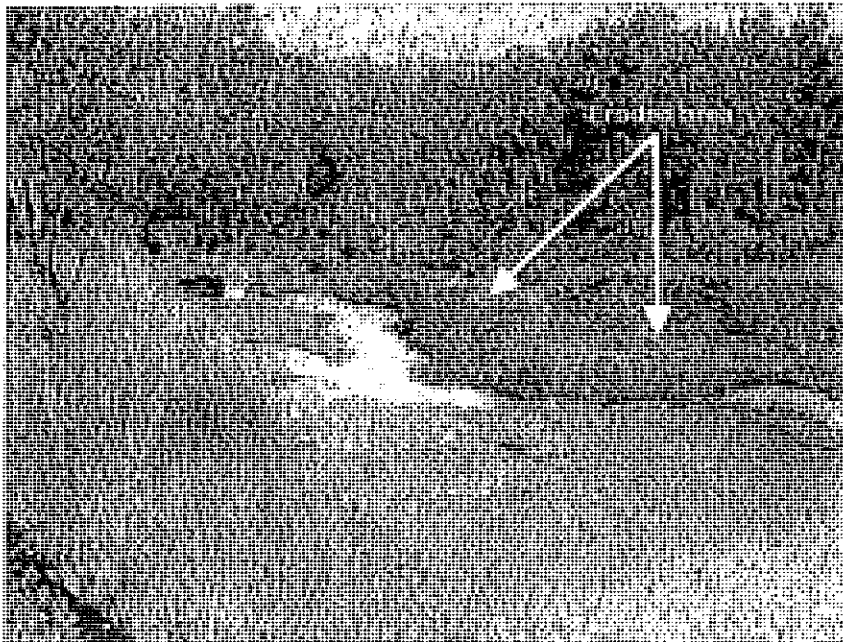




Photo 35 Flow in lower section of spillway chute looking upstream viewed from left bank



Photo 36 Undermining of left side spillway cut

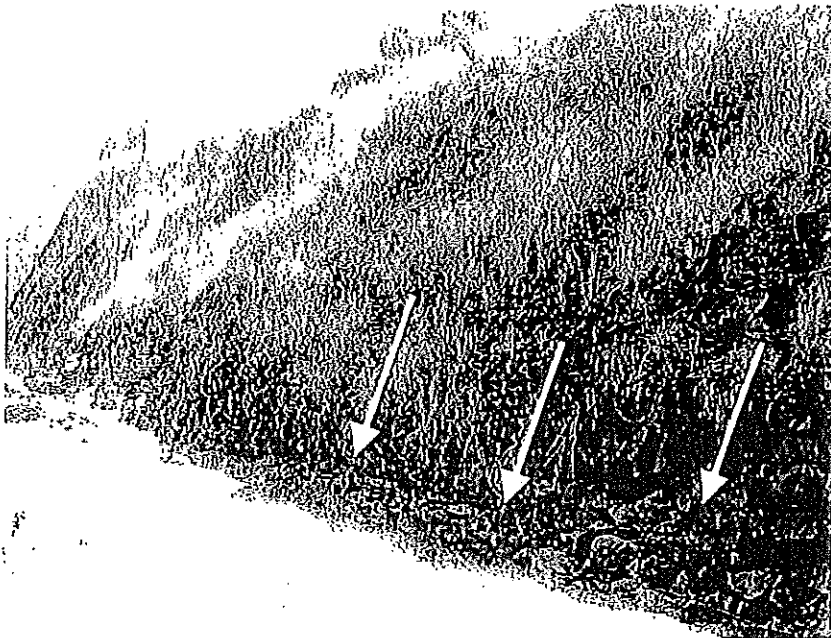




Photo 37 Flow at downstream end of spillway chute looking upstream

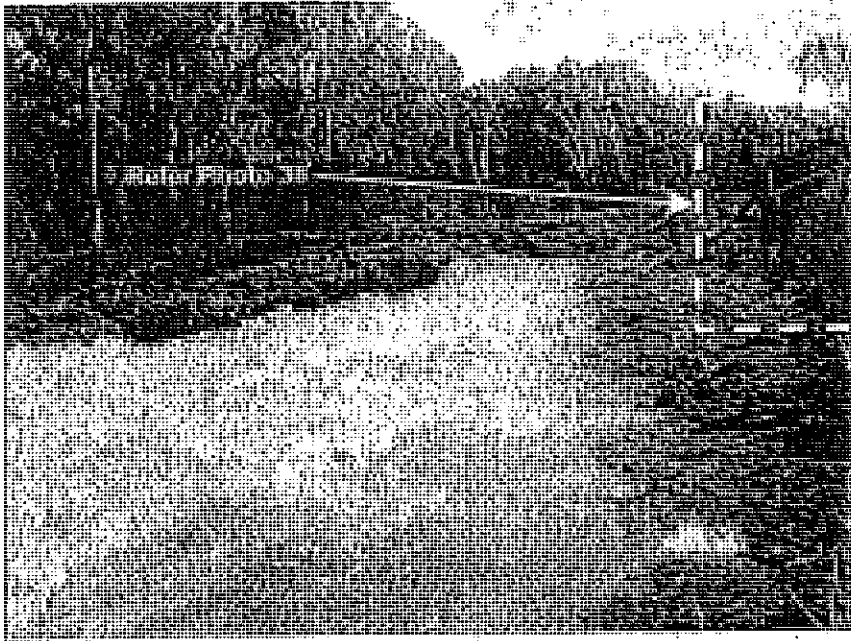


Photo 38 Undermined section of stairs and fence at downstream end of spillway

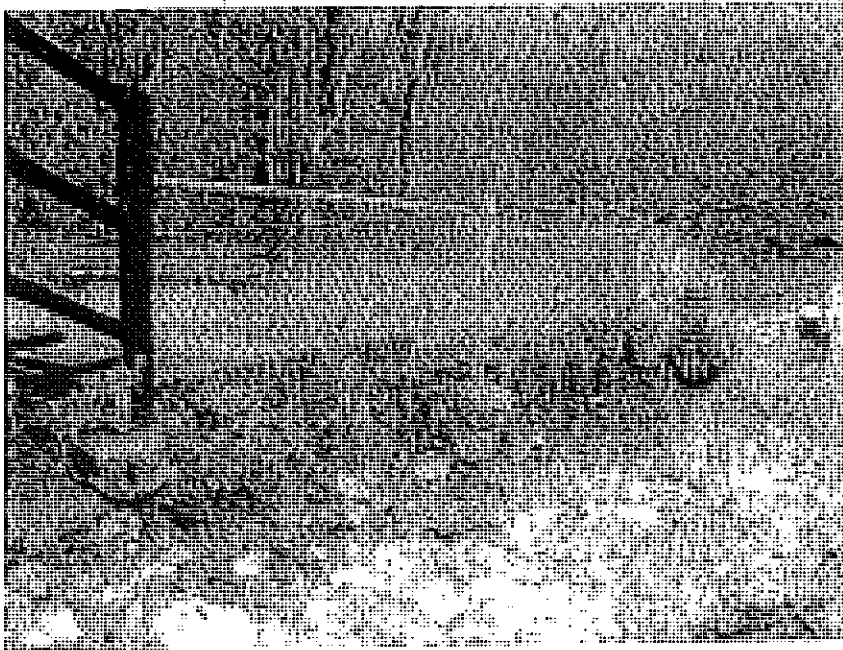




Photo 39 Flow in downstream spillway entering river channel – Photo 1 of 4



Photo 40 Flow in downstream spillway entering river channel – Photo 2 of 4





Photo 41 Flow in downstream spillway entering river channel – Photo 3 of 4



Photo 42 Flow in downstream spillway entering river channel – Photo 4 of 4





Photo 43 Looking upstream along river channel from downstream end of spillway

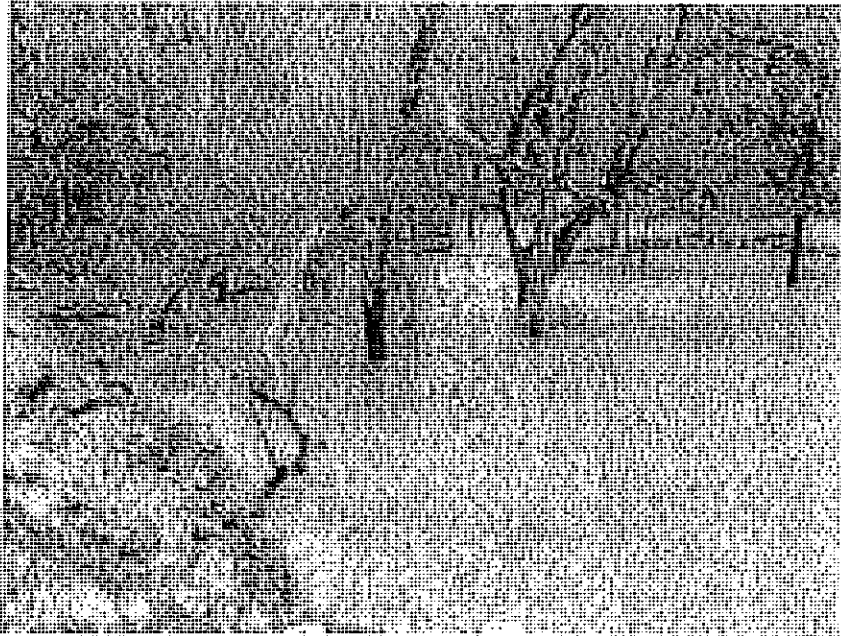


Photo 44 Looking across river channel from downstream end of spillway





Photo 45 Looking downstream along river channel from downstream end of spillway

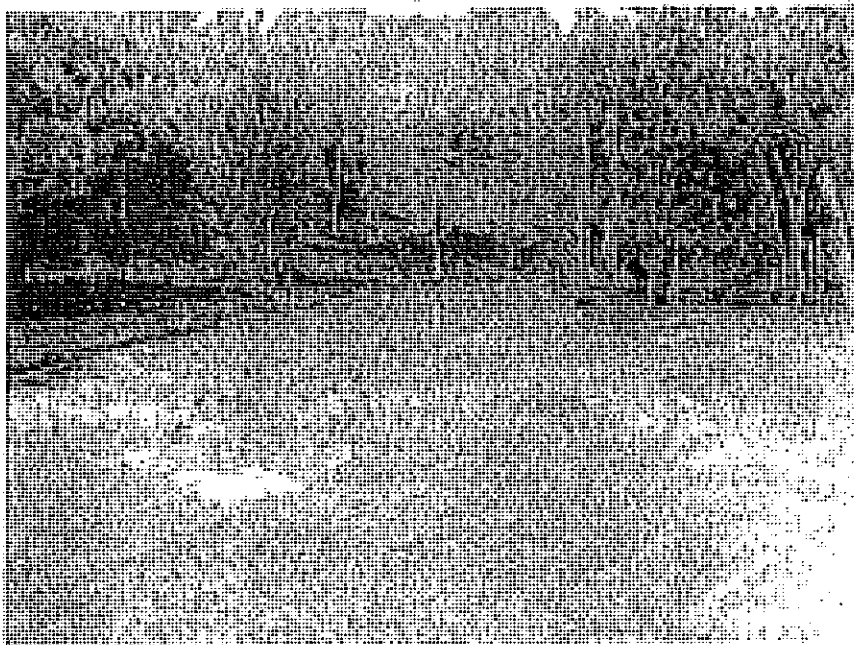


Photo 46 Intake tower viewed from dam crest (Note windows boarded up in case of extreme flooding)

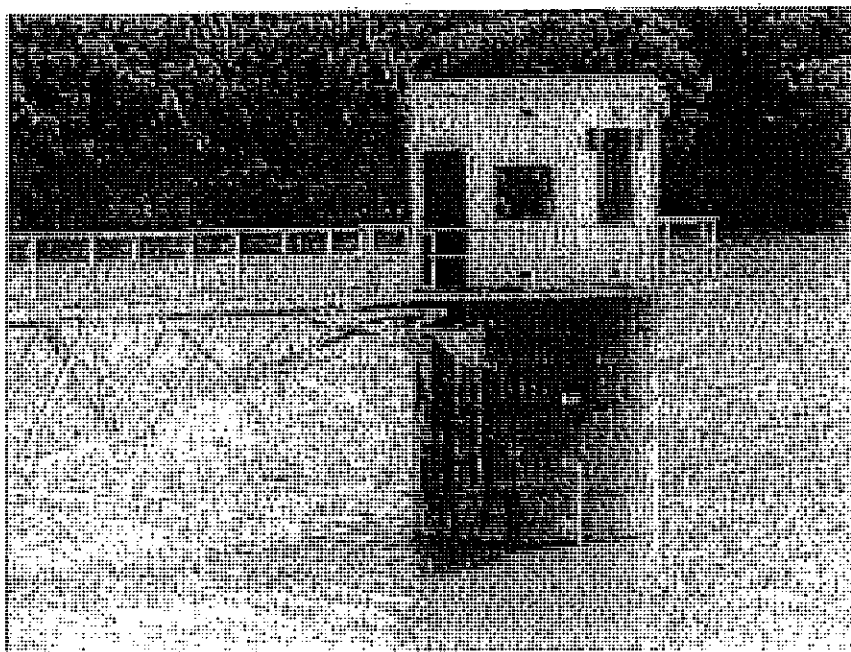




Photo 47 Overview of intake tower bridge from dam crest

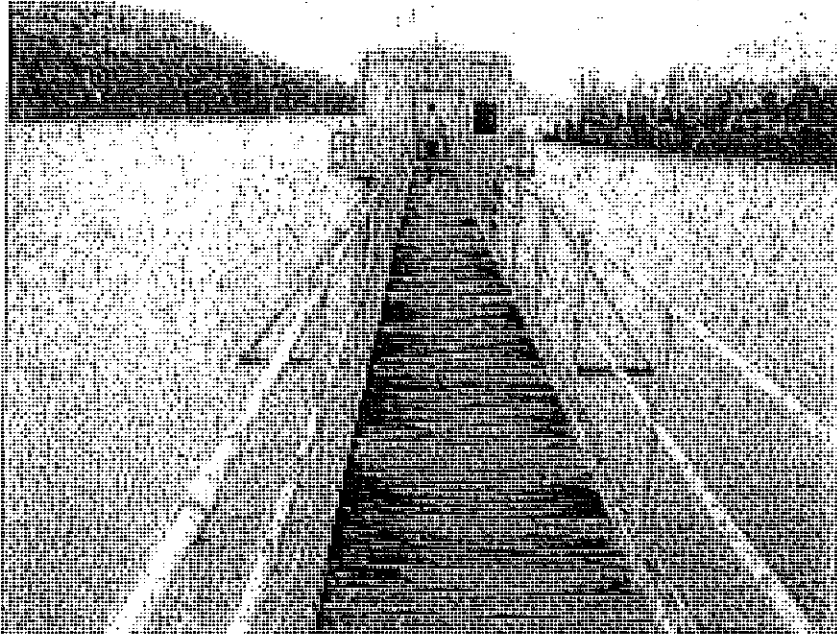


Photo 48 Close-up of bridge decking near intake tower end of bridge

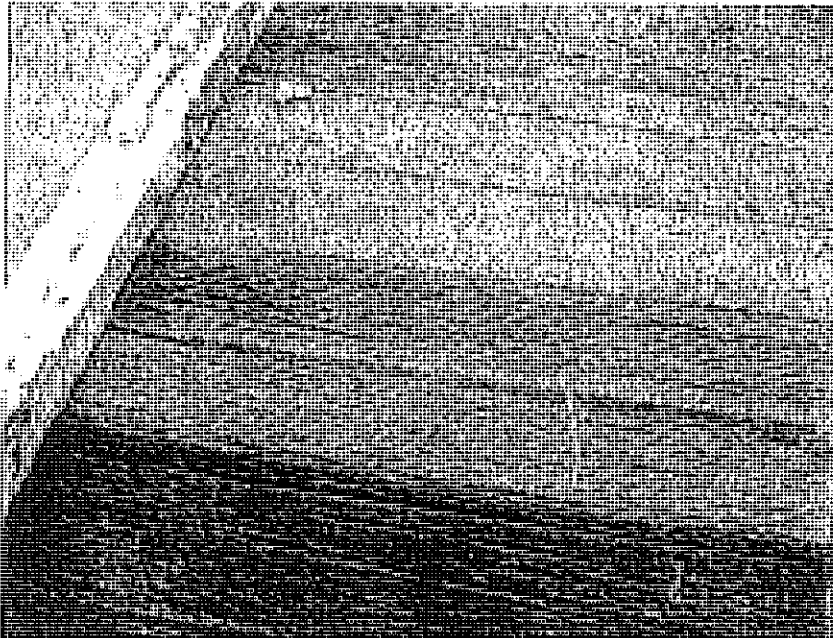




Photo 49 Intake tower bridge substructure viewed from intake tower

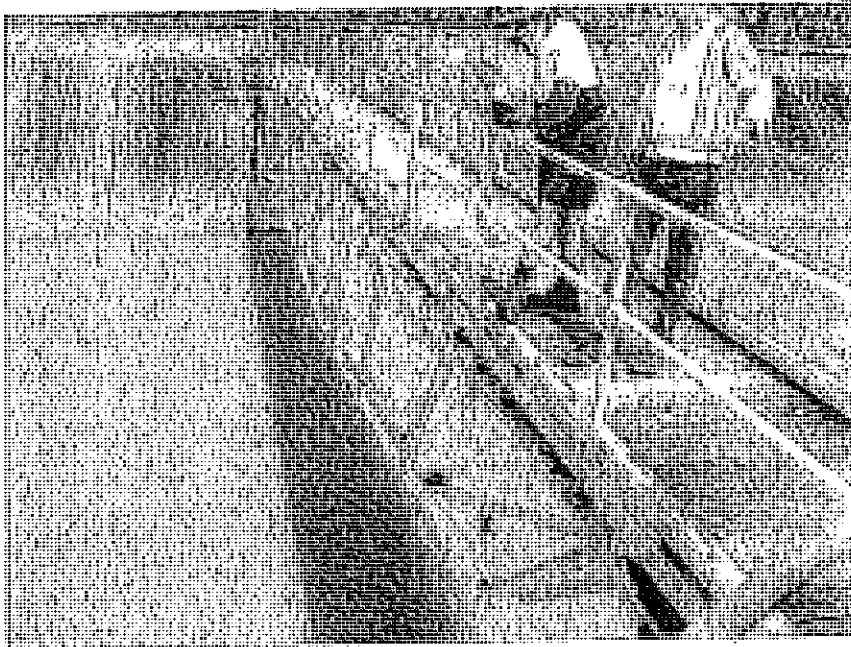
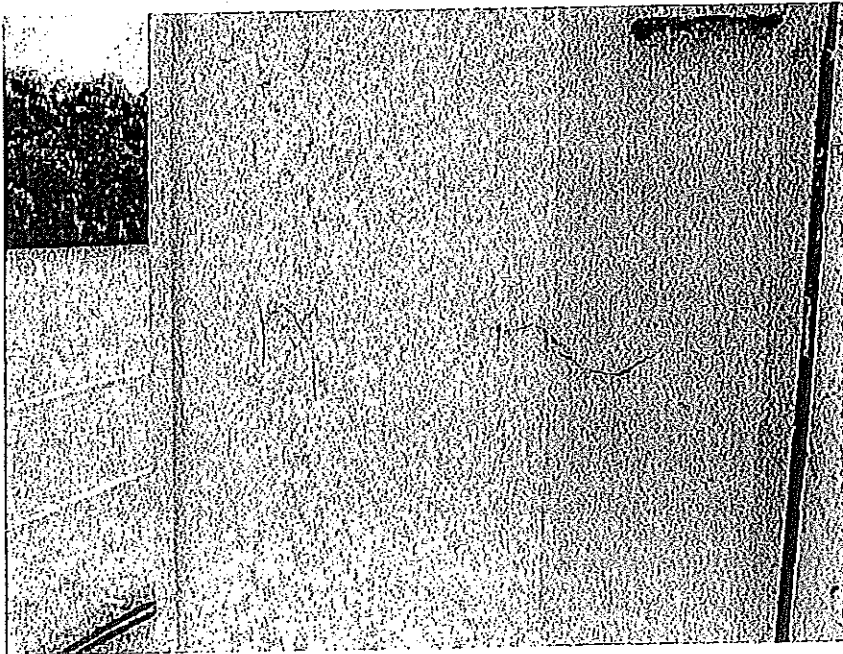


Photo 50 Crack around intake tower at mid-height between bridge deck and roof





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		Name	Signature	Name	Signature	Date
0	J Willey	M. Barker	<i>M Barker *</i>	J Williams	<i>J Williams *</i>	10/02/11
1	J Willey	M Barker	<i>M Barker *</i>	J Williams	<i>J Williams *</i>	10/02/11

* Indicates signed original on file