NSW Department of Commerce | NSW Water Solutions

Hunter Water Corporation

TILLEGRA DAM DESIGN - CONSULTANCY 361802

Concept Report - Final

VOLUME 2

Report No. DC08201
January 2009

VOLUME 2

Appendix D

Geotechnical Data

Table D1 - Rock Strength

Rock strength is defined by the Point Load Strength Index (Is (50)), and refers to the strength of the rock substance in the direction normal to the bedding.

Term	Is (50)	Field Guide	Approx q_u MPa *
Extremely Weak (EW)		Easily remoulded by hand to a material with soil properties.	
	0.03		0.7
Very weak (VW)		May be crumbled in the hand. Sandstone is "sugary" and friable.	
	0.1		2.4
Weak (W)		A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	
	0.3		7
Medium Strong (MS)		A piece of core 150mm long x 50mm dia. may be broken by hand with considerable difficulty. Readily scored with a knife.	
	1		24
Strong (S)		A piece of core 150mm long x 50mm dia. cannot be broken by unaided hands, may be slightly scratched or scored with knife.	
	3		70
Very Strong (VS)		A piece of core 150mm long x 50mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	
	10		240
Extremely Strong (ES)		A piece of core 150mm long x 50mm dia. is difficult to break with hand held hammer. Rings when struck with hammer.	

* The approximate unconfined compressive strength (qu) shown in the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely and should be calibrated on site.

Table D2 - Stratification Spacing

TERM	SEPARATION OF STRATIFICATION PLANES
Thinly laminated	< 6mm
Laminated	6mm - 20mm
Very thinly bedded	20mm - 60mm
Thinly bedded	60mm - 200mm
Medium bedded	200mm - 600mm
Thickly bedded	600mm - 2m
Very thickly bedded	> 2m

Table D3 - Discontinuity Spacing

TERM	SPACING
Very widely spaced	> 2m
Widely spaced	600mm - 2m
Moderately widely spaced	200mm 600mm
Closely spaced	60mm - 200mm
Very closely spaced	20mm - 60mm
Extremely closely spaced	< 20mm

Table D4 - Aperture of Discontinuity Spacing

The degree to which a discontinuity is open, or to which the faces of the discontinuity have been separated and the space subsequently infilled (such as in a vein, fault or joint).

TERM	APERTURE THICKNESS (Discontinuities, veins, faults, joints)
Wide	> 200mm
Moderately wide	60mm - 200mm
Moderately narrow	20mm - 60mm
Narrow	6mm - 20mm
Very narrow	2mm - 6mm
Extremely narrow	> 0 - 2 mm
Tight	Zero

Table D5 - Summary of Water Pressure Test Results

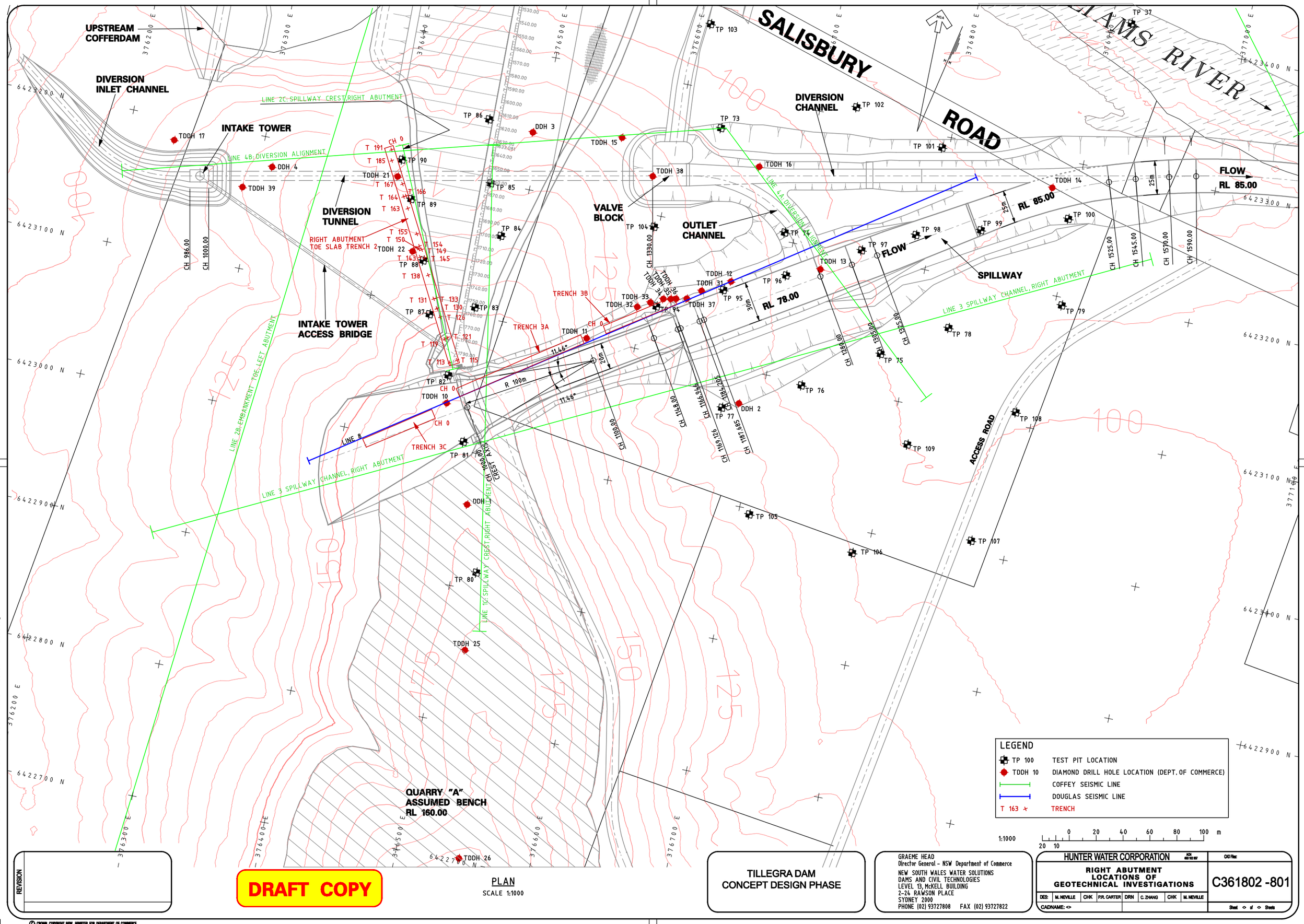
Borehole No	Depth (m) From	Depth (m) To	Depth (m)	Lugeon Value (UL)	Flow Type	Comments
DDH ! (Right Abutment Spillway)	8.70	11.70	3.00	<1	Laminar	Close to wide defect spacing in test section. Fe-stained.
	11.20	17.70	6.50	1	Laminar	Very close to generally moderately wide defect spacing. Fe and Fe/Mn-stained. Minor clay coating on joint at 13.25 to 13.40m.
	17.20	24.03	6.83	14	Washout	Very close (in meta-shale) to generally moderately wide defect spacing. Fe-stained, occasionally Fe/Mn-stained. Rare (minor) carbonate coatings. Sandy clay fill in partings from 19.85 to 20.05m, minor clay coating on parting at 20.17m
	23.20	26.70	3.50	2.5	Washout	Very close defect spacing (in meta-shale) to wide defect spacing. Fe-stained.
	26.20	32.70	6.50	0	NA	Close to generally moderately wide/wide defect spacing. Fe-stained.
	32.20	38.70	6.50	8	Turbulent	Close to generally moderately wide/wide defect spacing. Fe-stained, heavily in several joints from 33.50 to 33.93m. Several joints/parting carbonate coated (34.15 to 34.40, 35.05, 35.44 36.62 and 36.80 to 37.09m).
	38.20	41.70	3.50	5	Turbulent	Moderately wide to wide defect spacing. Fe-stained to 39.75m (then fresh). Carbonate coated at 39.23, 40.20, 40.60 and 40.92m.
	41.20	44.70	3.50	<1	Laminar	Moderately wide to wide defect spacing. Minor Fe-staining from 42.70m. Carbonate coating on joints at 42.51, 42.70 to 42.88, 43.37, and 44.40m.
	44.20	50.70	6.50	30	Washout	Moderately wide to wide defect spacing. Fe-stained. Carbonate coated joints at 44.40 and 46.28m.
	50.20	53.70	3.50	1	Laminar	Moderately wide to generally wide defect spacing. Fe-stained
	53.50	56.50	3.00	<1	Laminar	Generally wide defect spacing. Fe-stained. Carbonate coated joint at 56.10m
DDH 3 (Mid Right Abutment Centreline)	3.83	8.83	5.00	1	Laminar	Very close to wide defect spacing. Fe and Fe/Mn-stained.
	8.33	14.73	6.50	<1	Laminar	Close to wide defect spacing. Fe-stained. Numerous carbonated coated joints.
	14.33	17.73	3.40	15	Washout (Turbulent Flow)	Very close to moderately wide defect spacing. Fe and Fe/Mn-stained.
	17.30	20.80	3.50	10	Washout (Turbulent Flow)	Moderately wide to wide defect spacing. Fe-stained.
	20.30	23.80	3.50	>100	Turbulent	Sheared zone from 21.30 to 22.68m (extremely close/very close defect spacing). Otherwise wide. Fe-stained.
	23.30	26.80	3.50	38	Washout (Turbulent Flow)	Generally close to wide defect spacing. Fe-stained.
	26.30	29.52	3.22	>100	NA	Generally moderately wide to wide defect spacing. Fragmented core recovery from 29.21 to 29.33m. Fe-stained.
	29.83	32.83	3.00	8	Slight Washout	Very close to moderately wide defect spacing. Crushed zone from 31.72 to 31.76m and again at 32.07m (10mm thick). Fe-stained. Clay fill 10mm thick in parting at 30.26m
	32.30	35.83	3.53	7	Turbulent	Very close to moderately wide defect spacing. Fe-stained.
	35.30	38.83	3.53	1.5	Turbulent	Generally moderately wide to Wide defect spacing. Very close defects from 36.02 to 36.42m (partings with joint). Fe-stained to 37m.
	38.30	41.85	3.55	1.5	Turbulent	Very close to very wide defect spacing. Often carbonate coated.

Table G5 Continued - Summary of Water Pressure Test Results

Borehole No	Depth (m) From	Depth (m) To	Depth (m)	Lugeon Value (UL)	Flow Type	Comments
DDH 4 (Upstream Diversion Portal)	3.80	7.20	3.40	12	Laminar	Extremely close to moderately wide defect spacing. Fe and Fe/Mn-stained.
	6.80	10.20	3.40	13	Laminar	Very close to moderately wide defect spacing. Fe and Fe/Mn-stained.
	9.80	13.20	3.40	11	Turbulent	Very close to wide defect spacing. Fe and Fe/Mn-stained.
	12.80	16.20	3.40	4	Dilation	Close to wide defect spacing. Fe and Fe/Mn-stained. Partly carbonate coated joint from 15.80 to 16.08m.
	15.80	22.20	6.40	1	Laminar	Generally moderately wide to wide defect spacing. Very closely spaced joint fragments from 19.77 to 20.00m. Fe and Fe/Mn-stained. Partly carbonate coated joint from 15.80 to 16.08m
	21.80	28.20	6.40	0	NA	Wide to very wide defect spacing. Fe-stained.
	27.80	34.20	6.40	<1	Laminar	Very close to moderately wide defect spacing, ranging to wide from 32.56m. Fe-stained, occasionally Fe/Mn-stained, to 32.75m. Carbonate vein 12mm thick at 30.24m.
	33.80	40.20	6.40	<1	Laminar	Wide to generally very wide defect spacing. Unstained.
DDH 5 (Lower Left Abutment U/S Toe)	3.80	6.82	3.02	1.5	Laminar	Very close to moderately wide/wide defect spacing. Fe-stained.
	6.80	10.83	4.03	32	Laminar	Generally close to moderately wide defect spacing. Fe stained, rarely Fe/Mn-stained.
	10.80	14.75	3.95	24	Laminar	Close to moderately wide/wide defect spacing. Fe-stained to 11.55m. Common (minor) carbonate coating, ranging to fill 5mm thick in partings at 13.99 and 14.02m.
	14.35	17.75	3.40	44	Turbulent	Close to moderately wide/wide defect spacing. Defects generally carbonate coated.
	17.35	20.75	3.40	12	Laminar	Very close to close defect spacing. Includes joint parallel to the core axis from 18.66 to 20.10m. Defects carbonate coated.
	20.35	23.75	3.40	25	Turbulent	Very close to moderately wide defect spacing. Includes an interval of very closely spaced joint fragments from 21.70 to 23.46m. Carbonate coated.
	23.75	26.75	3.00	<1	Laminar	Moderately wide to very wide defect spacing. Minor carbonate coatings.
	26.35	31.65	5.30	12	Turbulent	Very close to wide defect spacing. Carbonate coated.
	31.65	35.75	4.10	4	Laminar	Close to wide defect spacing. Carbonate coated, ranging to fill 4mm thick in joint fragments from 35.10 to 35.23m.

Table G5 Continued - Summary of Water Pressure Test Results

Borehole No	Depth (m) From	Depth (m) To	Depth (m)	Lugeon Value (UL)	Flow Type	Comments
DDH 6 (Middle Left Abutment C/L)	3.80	7.25	3.45	<1	NA	Close to moderately wide defect spacing. Fe and Fe/Mn-stained. Sandy clay coated/fill in defects at 6.10, 6.46 and 7.25m.
	6.80	10.25	3.45	0	NA	Close to moderately wide defect spacing. Fe and Fe/Mn-stained. Clay/sandy clay fill 1 to 5mm thick in joints at 7.25, 8.90 and between 9.15 and 9.35m.
	9.80	13.25	3.45	1	Laminar	Generally very close to moderately wide defect spacing. Includes crushed clayey zone from 11.14 to 11.19m (extremely close defect spacing). Fe and Fe/Mn-stained. Clay fill to 2mm thick in joint/parting fragments between 11.14 and 11.60m.
	12.80	16.25	3.45	<1	Laminar	Extremely close to moderately wide defect spacing. Core loss associated with joint/parting fragments from 15.66 to 15.71m. Fe/Mn-stained.
	15.80	19.25	3.45	3	Laminar	Extremely close to moderately wide defect spacing. Core loss from 18.44 to 18.67m. Narrow crushed zone from 18.08 to 18.11m. Fe and Fe/Mn-stained. Clay coated to sandy clay fill in joint/parting fragments between 16.87 and 17.10m.
	18.80	25.25	6.45	<1	NA	Generally moderately wide to wide defect spacing (very wide from 24.25m). Occasionally Fe and Fe/Mn-stained. Common carbonate coatings.
	24.80	31.25	6.45	<1	Laminar	Generally wide defect spacing. Close to moderately wide from 27.50 to 30.46m. Fe-stained.
	30.80	39.07	8.27	5	Washout	Generally moderately wide to wide defect spacing to 37.94m, then extremely close to moderately wide. Crushed clayey zone associated with parting at 36.28m. Fragmented joint from 38.47 to 38.56m. Fe-stained. Carbonate coated joint at 37.74m.
	38.35	43.25	4.90	<1	Laminar	Extremely close to moderately wide defect spacing to 41.30m, then generally wide. Includes fragmented joint 38.47 to 38.56m. Crushed clayey zone associated with partings from 39.14 to 39.19m. Fe-stained. Minor clay coating with joint fragments and associated partings between 39.95 and 40.53m. Occasional carbonate coatings over the test section.
DDH 7 (Upper Left Abutment)	6.80	10.30	3.50	<1	NA	Extremely close to moderately wide defect spacing. Core loss from 8.43 to 8.53m. Fe and Fe/Mn-stained. Occasional clay coatings.
	9.80	13.30	3.50	0	NA	Generally close to moderately wide/wide defect spacing. Fe and Fe/Mn-stained.
	12.80	16.30	3.50	28	Washout	Generally wide/very wide defect spacing. Fe and Fe/Mn-stained.
	16.30	19.30	3.00	12	Dilation (Turb Flow)	Moderately wide to wide defect spacing. Includes an interval of very close to close joint/parting defects between 16.77 and 17.67m. Fe and Fe/Mn-stained.
	18.80	22.30	3.50	<1	Laminar	Very close to moderately wide defect spacing. Fe and Fe/Mn-stained.
	21.80	25.30	3.50	<1	NA	Generally close to wide defect spacing. Includes an interval of very close joint fragments from 22.17 to 22.58m. Fe and Fe/Mn-stained.
	24.80	28.30	3.50	<1	NA	Close to wide defect spacing. Fe and Fe/Mn-stained.
	27.80	31.30	3.50	<1	Laminar	Moderately wide to wide defect spacing. Includes an interval of very close to close joint/parting defects from 28.88 to 29.54m. Fe and Fe/Mn-stained. Carbonate coating on parting at 28.88m and joint at 30.10m.
	30.80	34.30	3.50	0	NA	Close to wide defect spacing. Fe-stained. Carbonate coated joints at 32.46, from 32.66 to 32.87 and at 33.60m.



PLAN
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REVISION

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 122 037

RIGHT ABUTMENT LOCATIONS OF GEOTECHNICAL INVESTIGATIONS

C361802 -801

DES:	M. NEVILLE	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	M. NEVILLE

CADNAME: <>

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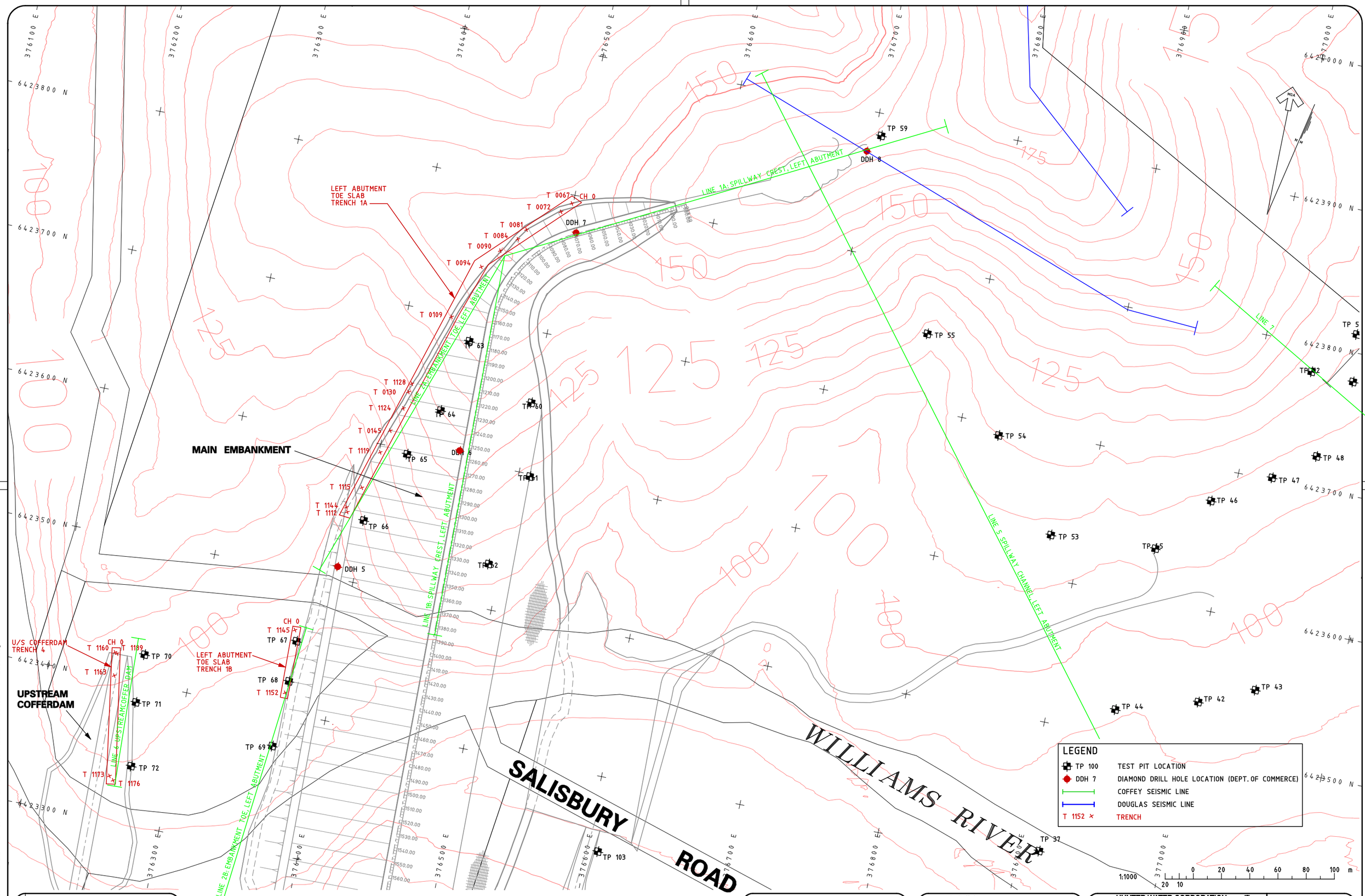

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GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

LEFT ABUTMENT
LOCATIONS OF
GEOTECHNICAL INVESTIGATIONS

C/D File:

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DES:	M. NEVILLE	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	M. NEVILLE

CADNAME: <>

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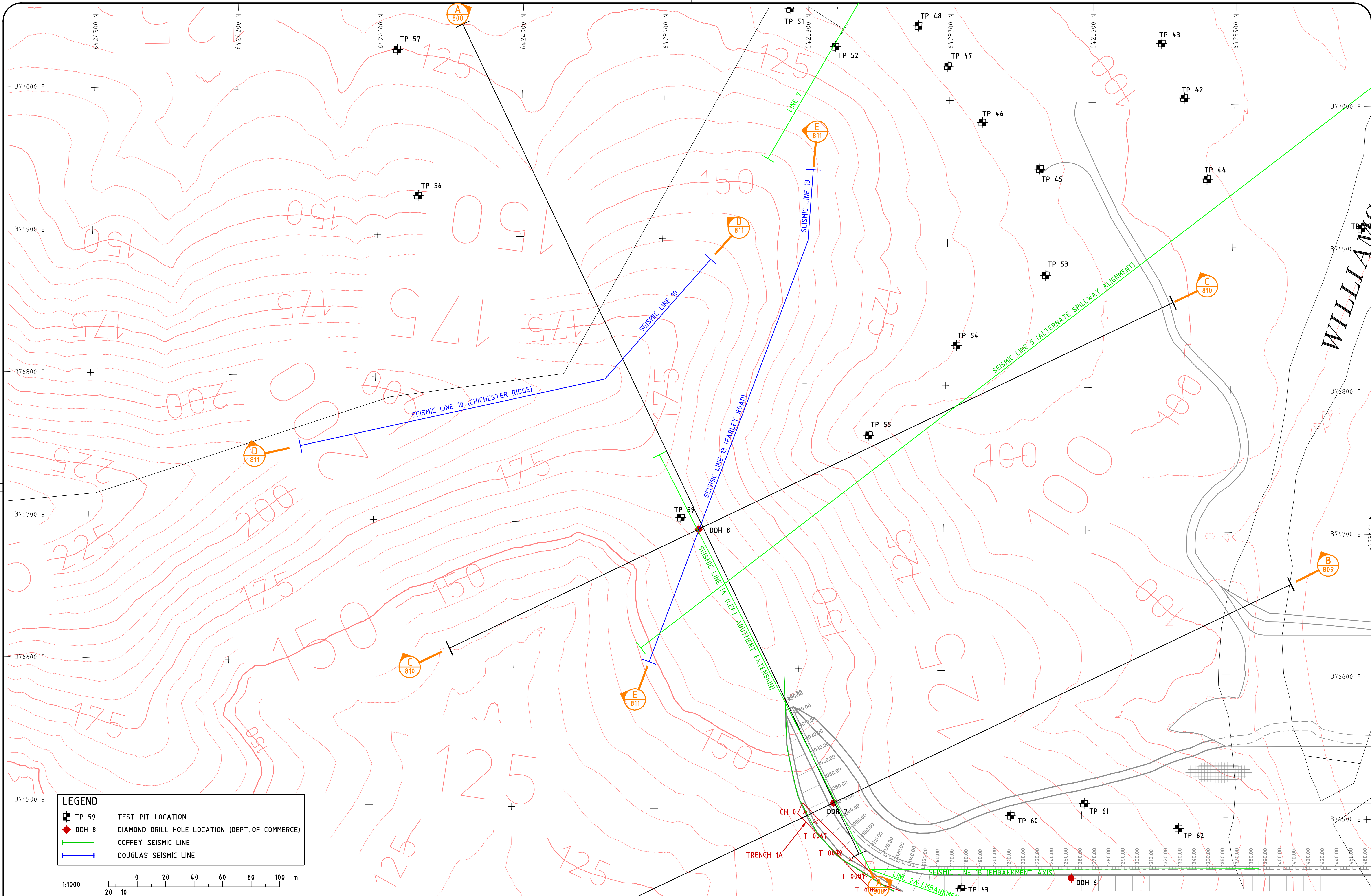

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CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

LEFT ABUTMENT RIDGE LOCATIONS OF GEOTECHNICAL INVESTIGATIONS

DES:	D. JAMIESON	CHK	P.R. CARTER	DRN	H. LU	CHK	D. JAMIESON

CADNAME: <>

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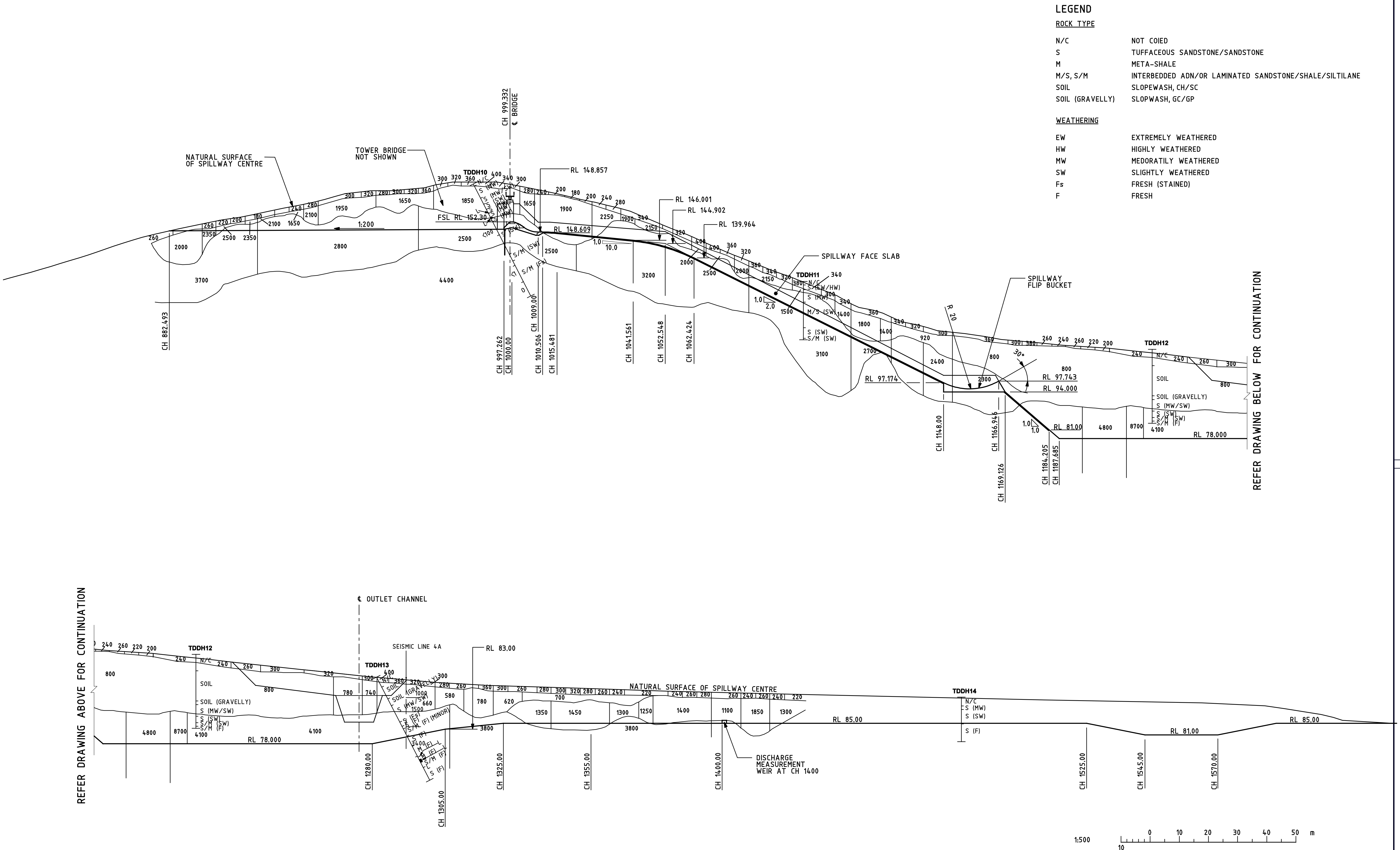

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GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

SPILLWAY SEISMIC REFRACTION INVESTIGATION

C361802 -806

DES: M. NEVILLE | CHK | P.R. CARTER | DRN | C. ZHANG | CHK | M. NEVILLE

CADNAME: <>

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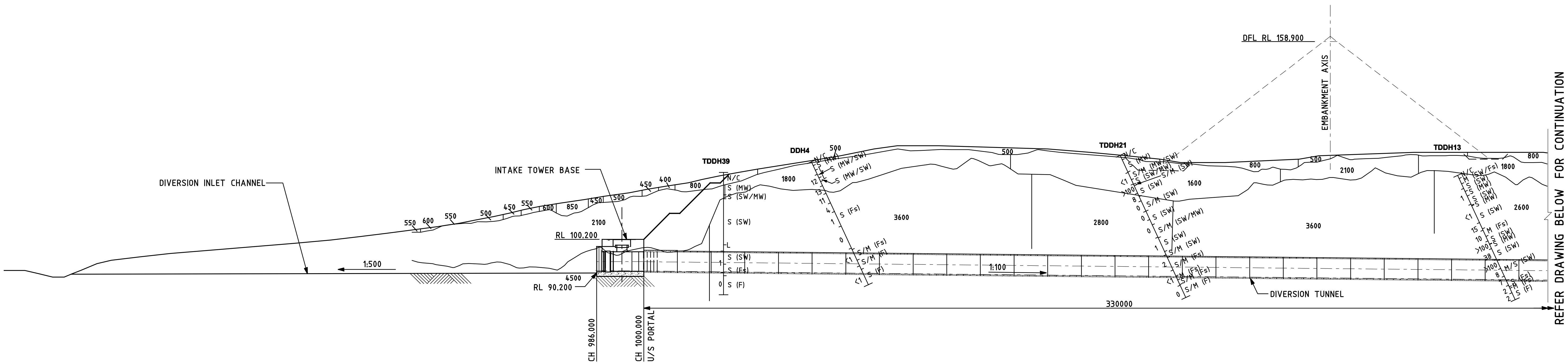

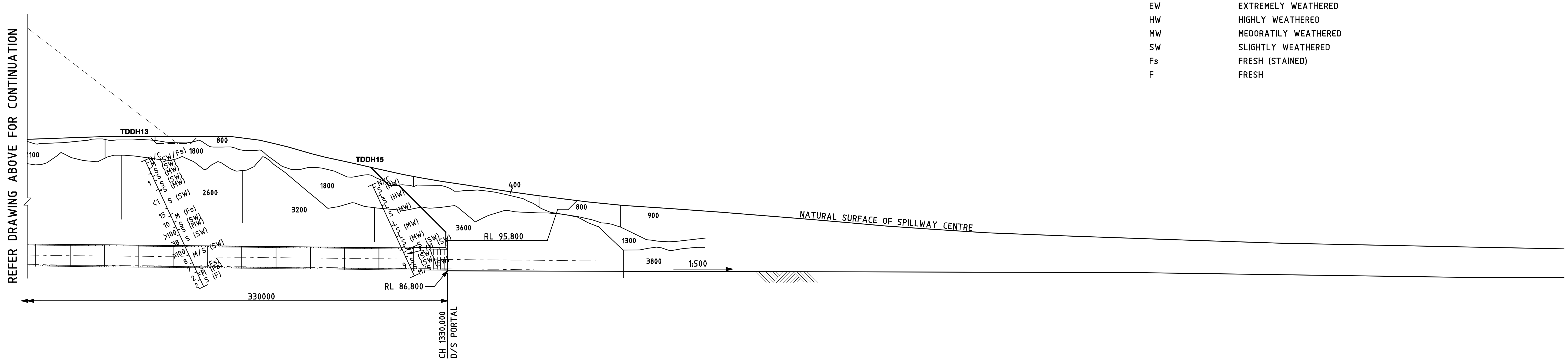

LEGEND

ROCK TYPE

N/C	NOT COIED
S	TUFFACEOUS SANDSTONE/SANDSTONE
M	META-SHALE
M/S, S/M	INTERBEDDED AND/OR LAMINATED SANDSTONE/SHALE/SILTSTONE
SOIL	SLOPEWASH, CH/SC
SOIL (GRAVELLY)	SLOPWASH, GC/GP

WEATHERING

EW	EXTREMELY WEATHERED
HW	HIGHLY WEATHERED
MW	MEDORATILY WEATHERED
SW	SLIGHTLY WEATHERED
Fs	FRESH (STAINED)
F	FRESH

1:500 10 0 10 20 30 40 50 m

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CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

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DIVERSION CHANNEL SEISMIC REFRACTION INVESTIGATION

C361802 -807

DES:	M. NEVILLE	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	M. NEVILLE

CADNAME: <>

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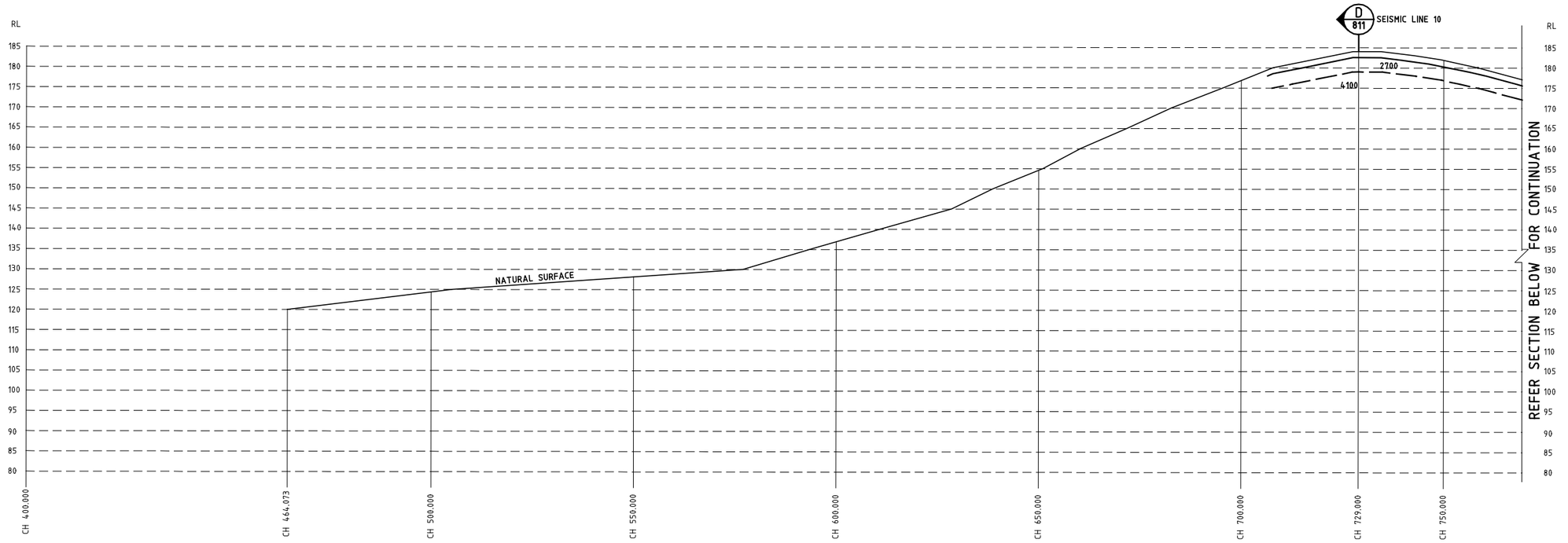

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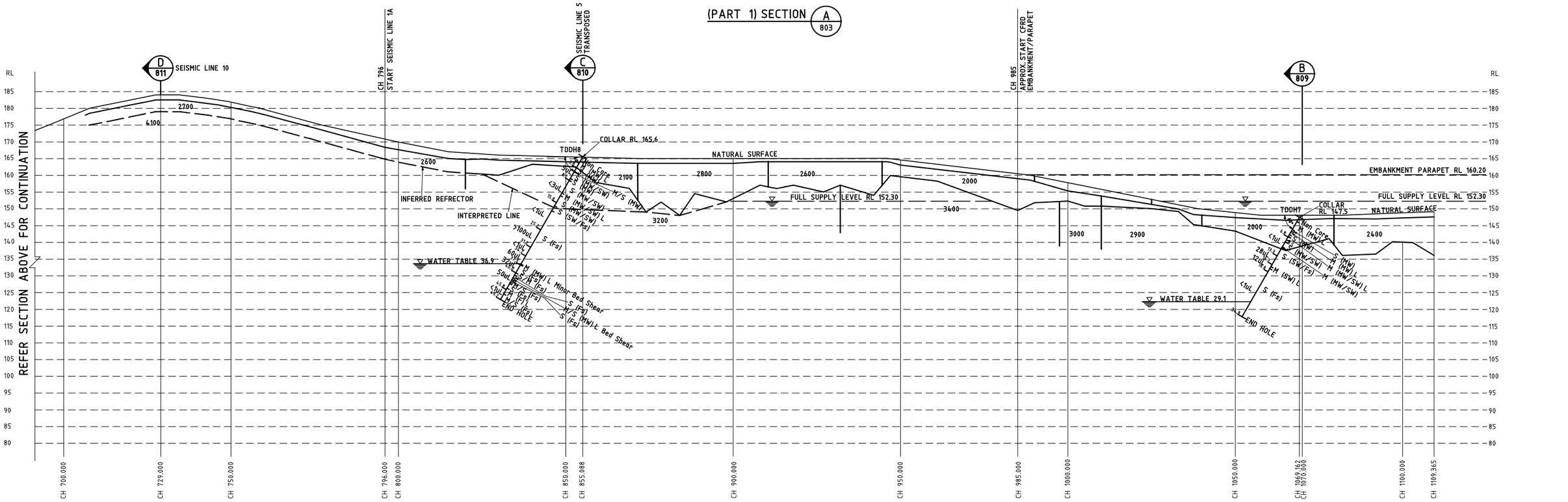

(PART 2) SECTION A 803
SEISMIC LINE 1A

LEGEND

ROCK TYPE

N/C	NOT CORED
S	TUFFACEOUS SANDSTONE
M	META-SHALE
M/S	INTERBEDDED AND/OR LAMINATED META SANDSTONE/META SHALE
SOIL	SLOPEWASH, CH/SC
SOIL (GRAVELLY)	SLOPWASH, GC/GP

WEATHERING

EW	EXTREMELY WEATHERED
HW	HIGHLY WEATHERED
MW	MODERATELY WEATHERED
SW	SLIGHTLY WEATHERED
Fs	FRESH (STAINED)
F	FRESH

1:500 0 10 20 30 40 50 m

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CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 332 057

LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATIONS
Sheet 1 of 4

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DES:	D. JAMIESON	CHK	P.R. CARTER	DRN	H. LU	CHK	D. JAMIESON

CADNAME: <>

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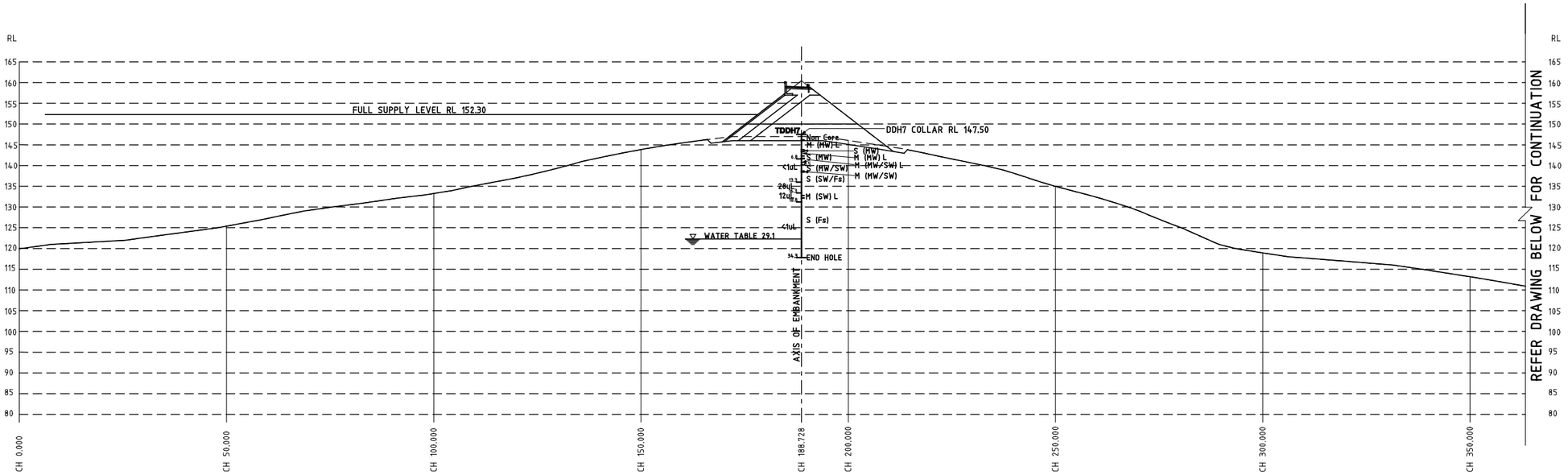

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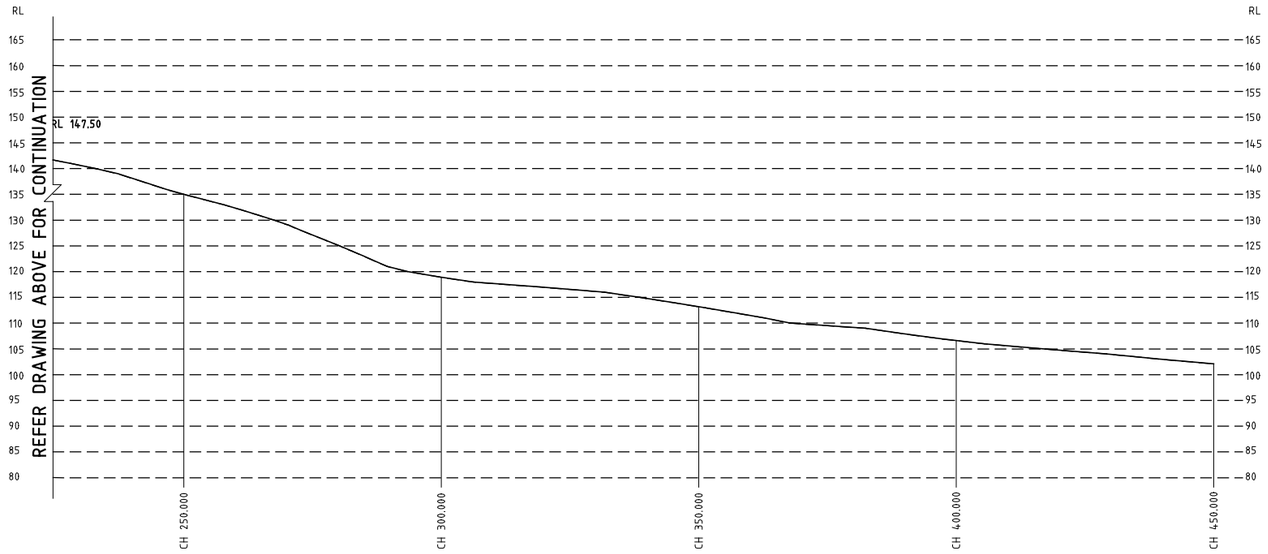

(PART 2) SECTION B 803

LEGEND

ROCK TYPE

N/C	NOT CORED
S	TUFFACEOUS SANDSTONE
M	META-SHALE
M/S	INTERBEDDED AND/OR LAMINATED META SANDSTONE/META SHALE
SOIL	SLOPEWASH, CH/SC
SOIL (GRAVELLY)	SLOPWASH, GC/GP

WEATHERING

EW	EXTREMELY WEATHERED
HW	HIGHLY WEATHERED
MW	MODERATELY WEATHERED
SW	SLIGHTLY WEATHERED
Fs	FRESH (STAINED)
F	FRESH

NOTE:

1. REFER TO DRAWING No. C361802-808 FOR ROCK TYPE AND WEATHERING DESCRIPTION (LEGEND).

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CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce

NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 122 037

LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATIONS
Sheet 2 of 4

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DES:	D. JAMIESON	CHK	P.R. CARTER	DRN	H. LU	CHK	D. JAMIESON

CADNAME: <>

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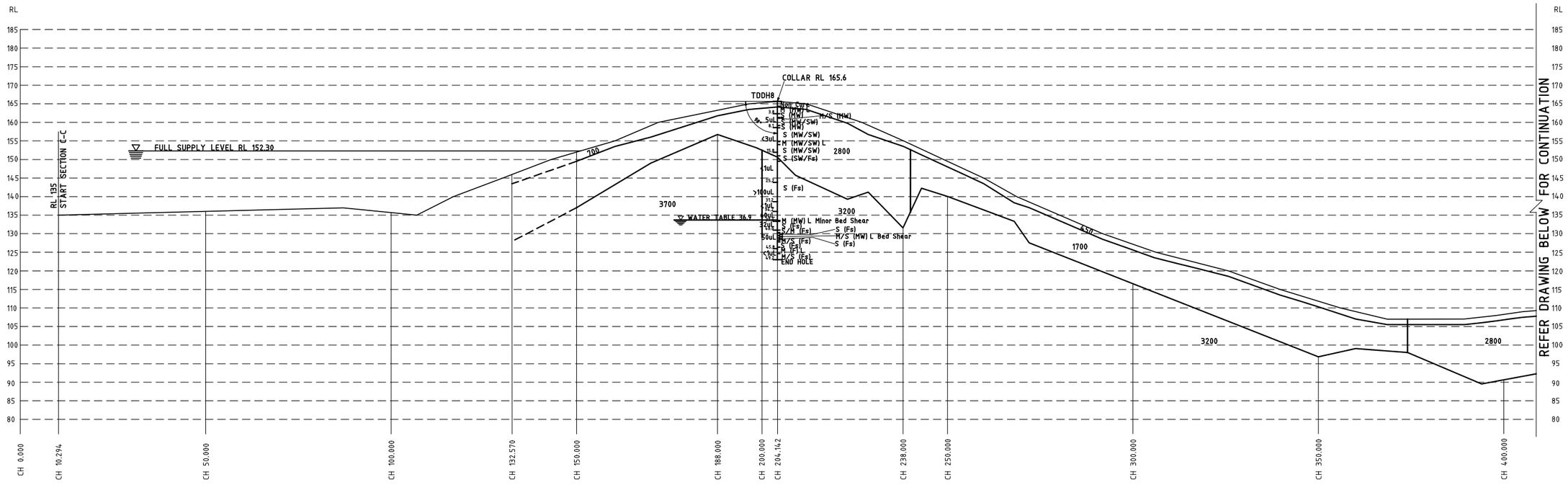

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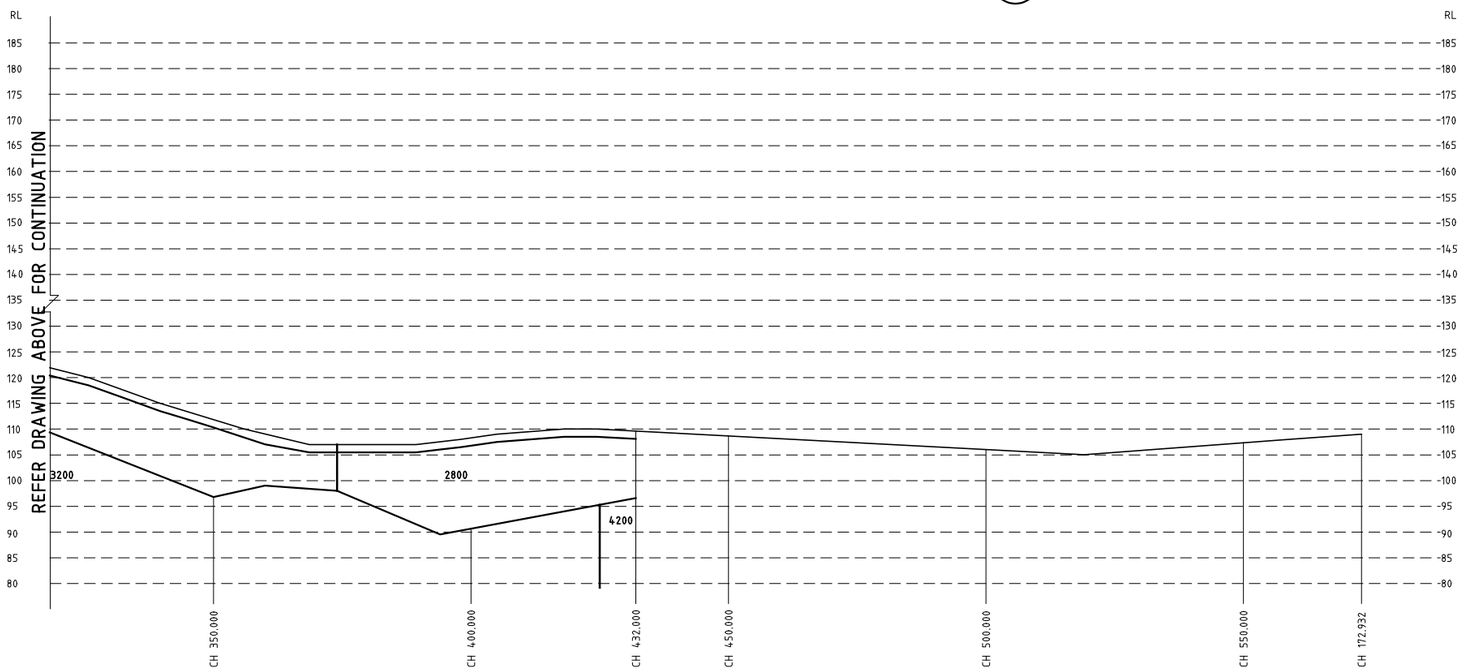

(PART 2) SECTION C
SEISMIC LINE 5 TRANSPOSED 803

NOTE:

1. REFER TO DRAWING No. C361802-808 FOR ROCK TYPE AND WEATHERING DESCRIPTION (LEGEND).

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GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 603 932 607

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Sheet 3 of 4

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DES:	D. JAMIESON	CHK	P.R. CARTER	DRN	H. LU	CHK	D. JAMIESON

CADNAME: <>

Sheet <> of <> Sheets

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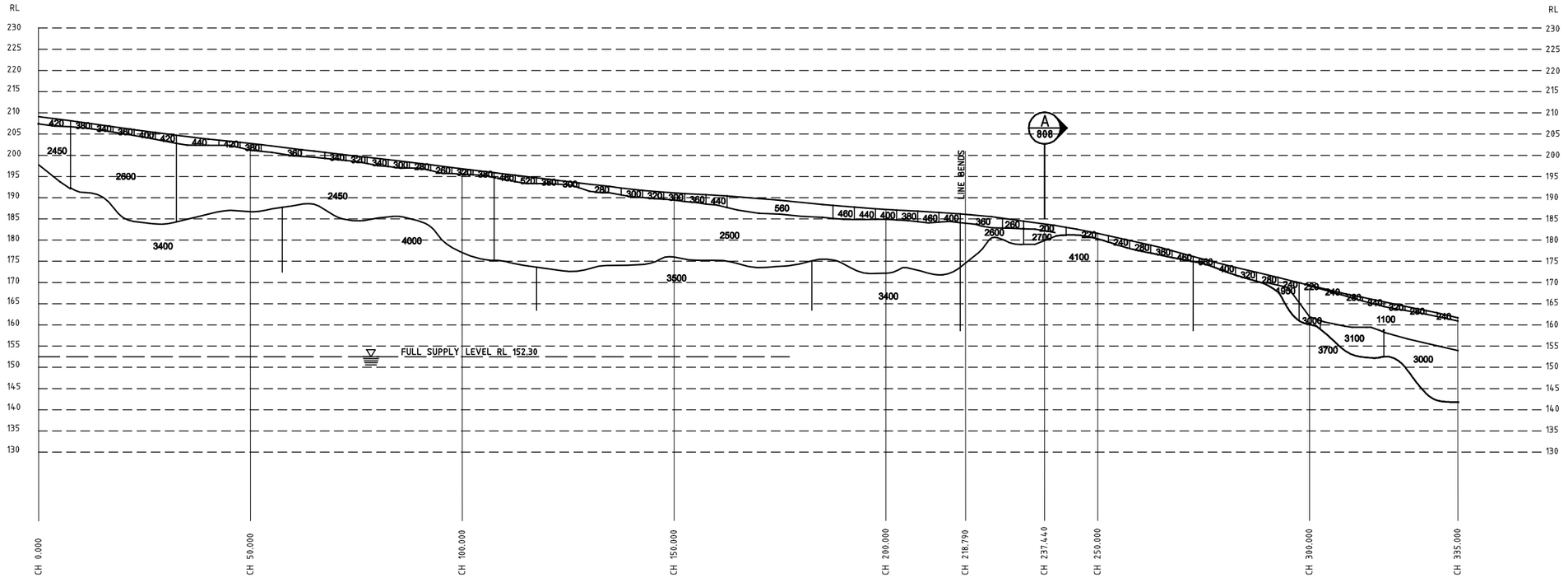
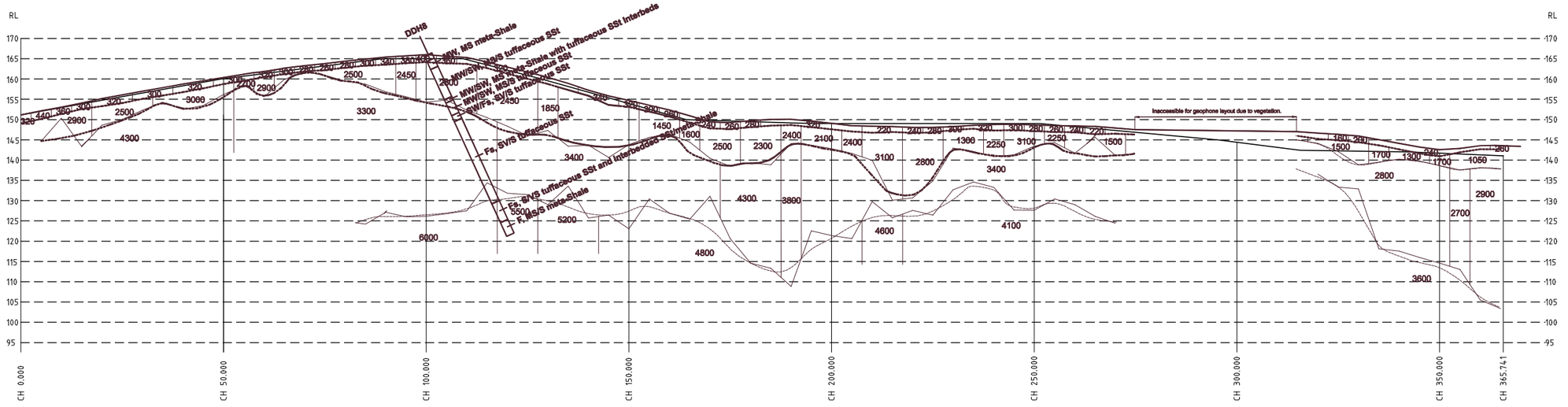


SECTION D 803 SEISMIC LINE 10



SECTION E 803 SEISMIC LINE 13

1:500

0 10 20 30 40 50 m

10

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATIONS
Sheet 4 of 4

C361802 -811

DES:	D. JAMIESON	CHK	P.R. CARTER	DRN	H. LU	CHK	D. JAMIESON

CADNAME: <>

Sheet <> of <> Sheets

B1

SPILLWAY

DDH 4

DDH 39

INTAKE TOWER

TP 70

TP 71

TP 72

DDH 17

UPSTREAM COFFER DAM

DIVERSION INLET CHANNEL

TP 93

TP 92

TP 91

TDDH 27

FUTURE VERTICAL DIAMOND BOREHOLE APPROX. LENGTH 80m

DDH 9

FSL 152.3

TDDH 28

FUTURE VERTICAL DIAMOND BOREHOLE APPROX. LENGTH 100m

QUARRY "B"

SITE BOUNDARY

SITE BOUNDARY

LEGEND

DDH 9 DIAMOND DRILL HOLE LOCATION (DEPT. OF COMMERCE)

TP 72 TEST PIT LOCATION

1:2500

0 50 100 150 200 250 m

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce

NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

QUARRY "B"

C361802 - 812

DES: P.R. CARTER | CHK | D. JAMIESON | DRN | H. LU | CHK | P.R. CARTER

CADNAME: <>

Sheet <> of <> Sheets

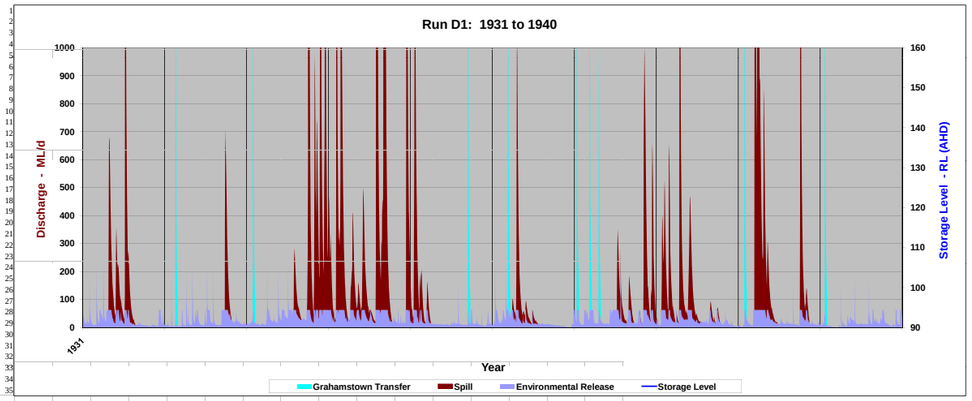
27/01/2009 2:02:10 PM G:\NS\Watertec\Pcad\TILLEGRA\CONCEPT\PTILC812.dgn

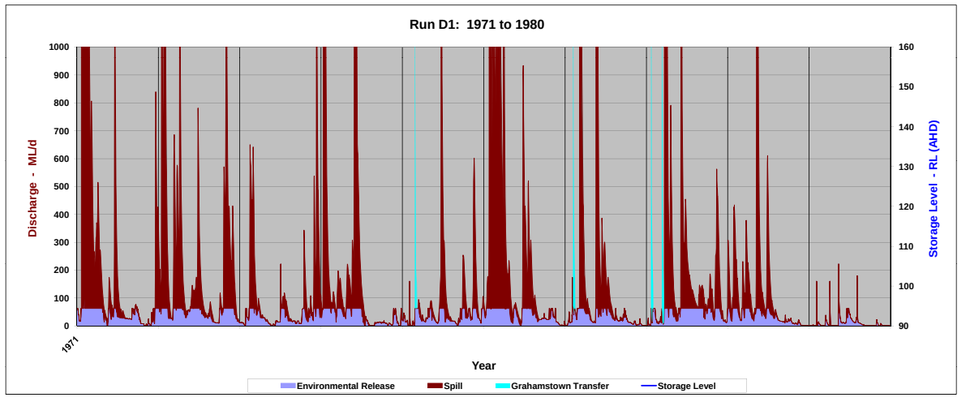
B1

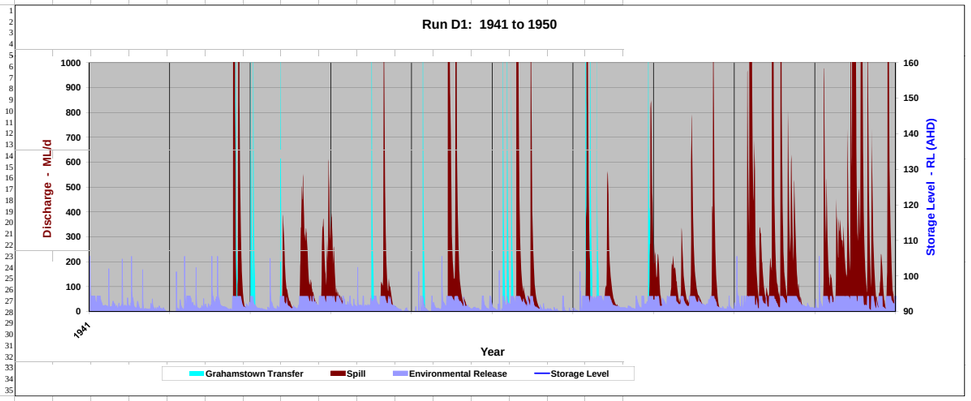
Appendix E

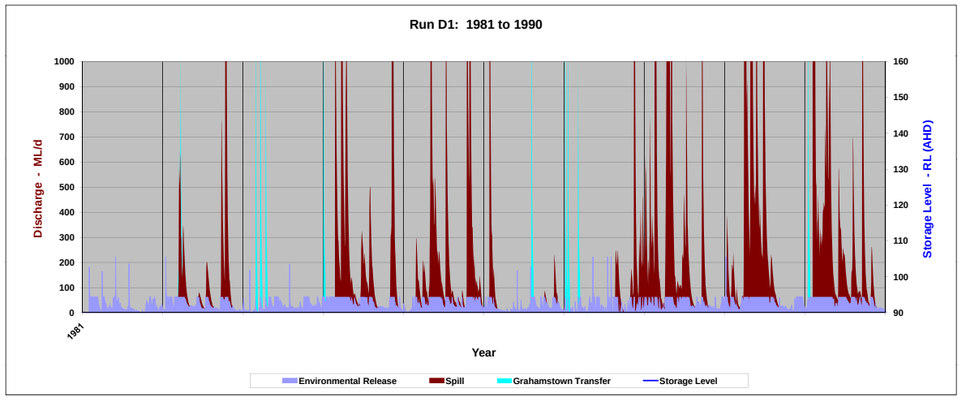
General Data

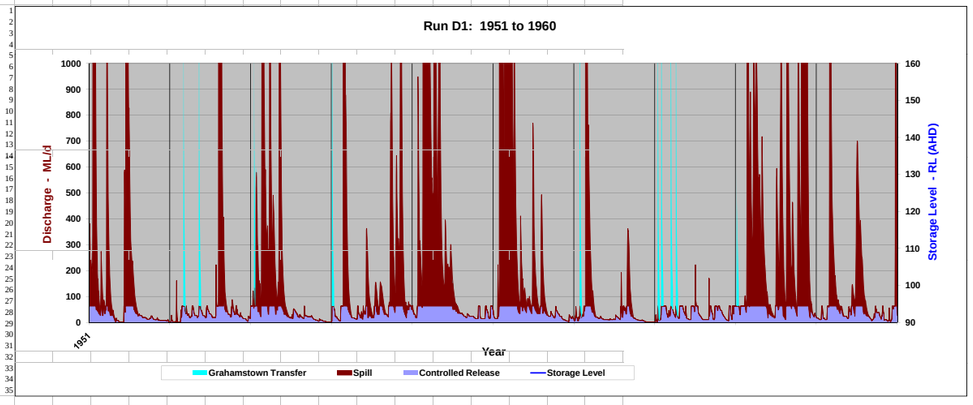
FIGURE H1

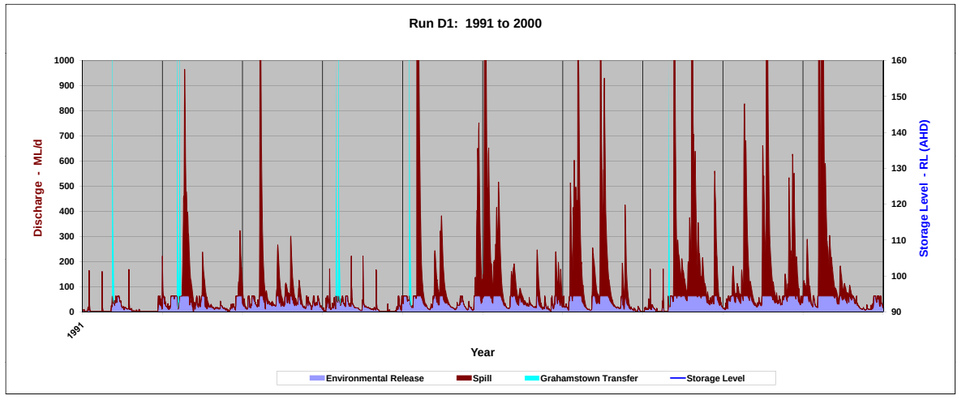


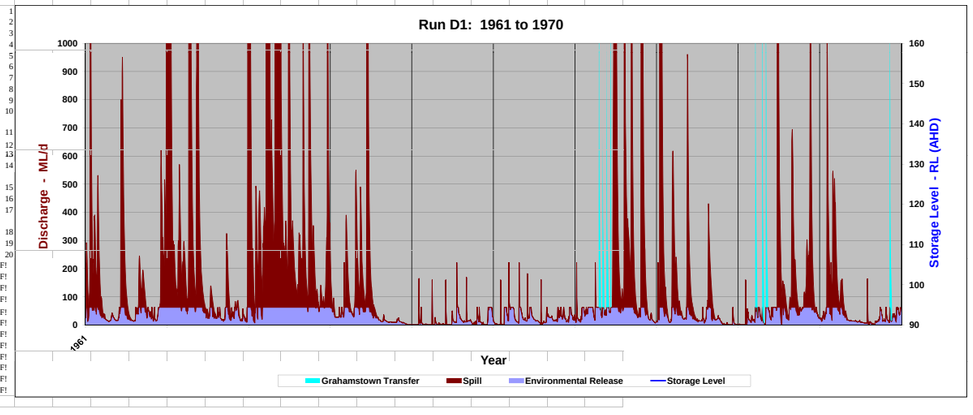


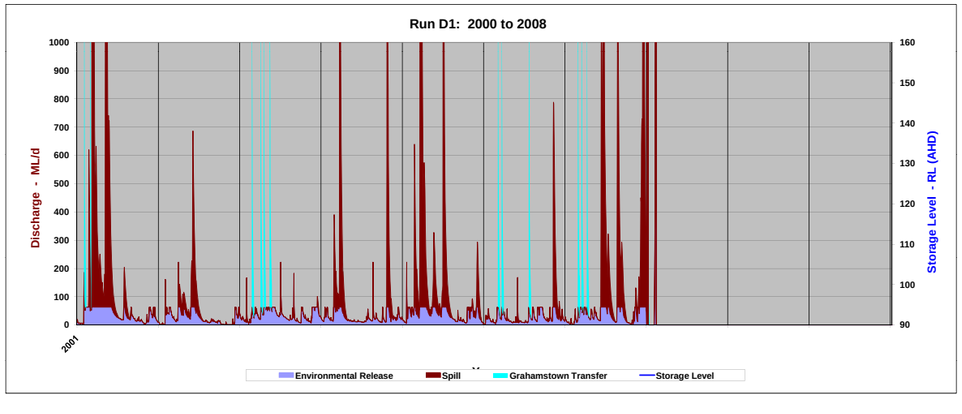










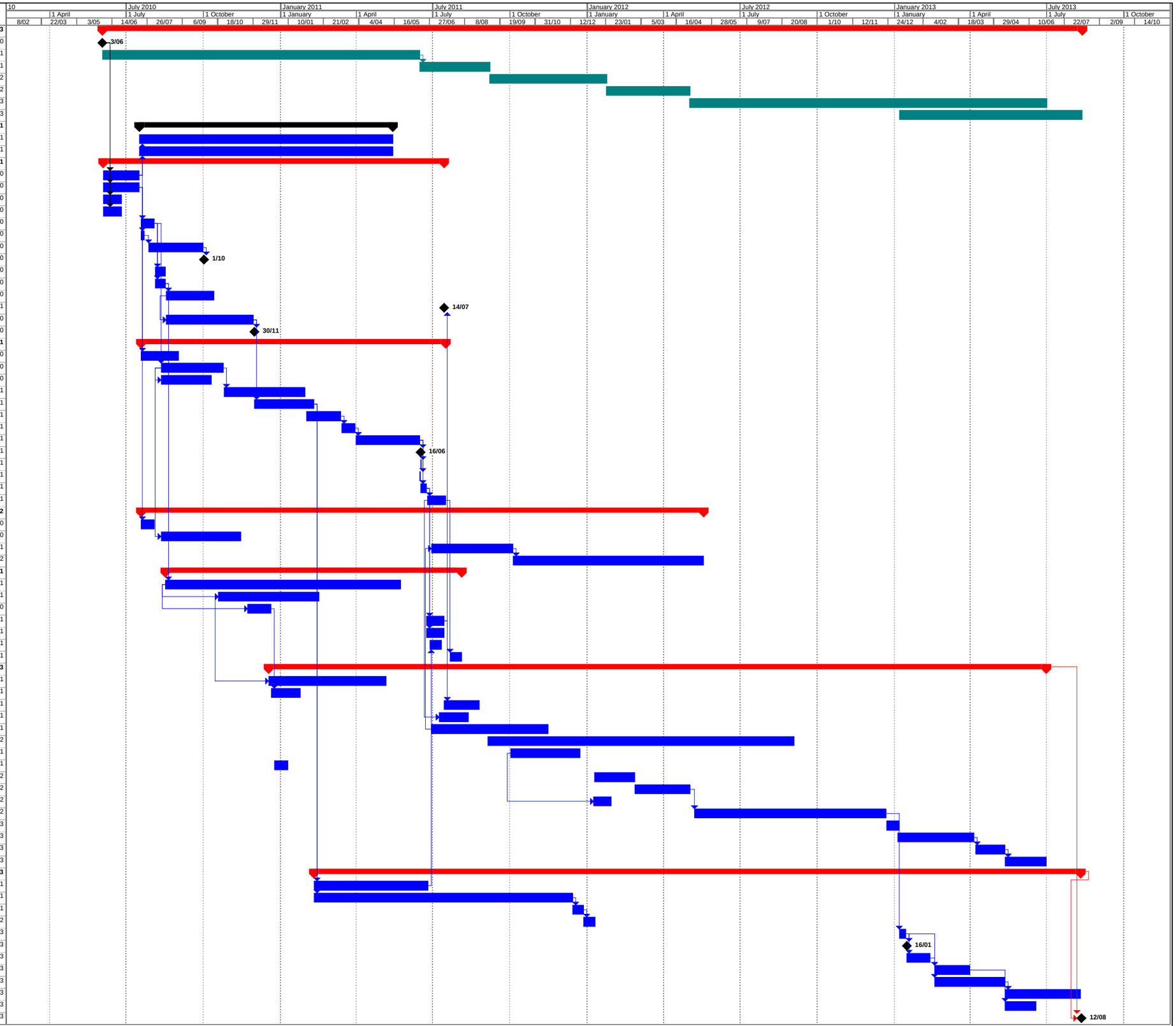


TILLEGRA DAM STORAGE BEHAVIOUR

1931 to 2008

System demand = 90GL/year

ID	Task Name	Duration	Start	Finish
1	**CFRD Program**	**1166.33 days?**	**Thu 3/06/10**	**Mon 12/08/13**
2	AWARD OF CONTRACT	0 days?	Thu 3/06/10	Thu 3/06/10
3	PHASE 1	378 days	Thu 3/06/10	Thu 16/06/11
4	PHASE 2A	83.33 days	Thu 16/06/11	Wed 7/09/11
5	PHASE 2B	139.33 days	Wed 7/09/11	Tue 24/01/12
6	PHASE 2C	99.33 days	Tue 24/01/12	Wed 2/05/12
7	PHASE 2D	425.33 days	Wed 2/05/12	Mon 1/07/13
8	PHASE 3	217.33 days?	Mon 7/01/13	Mon 12/08/13
9	**Road Deviation**	**302 days?**	**Fri 16/07/10**	**Sat 14/05/11**
10	Bridge Over Williams River	302 days?	Fri 16/07/10	Sat 14/05/11
11	Link Road Construction	302 days	Fri 16/07/10	Sat 14/05/11
12	**INITIAL SITE WORK**	**405.96 days**	**Thu 3/06/10**	**Thu 14/07/11**
13	MOBILISATION	43 days	Thu 3/06/10	Fri 16/07/10
14	LOCATE TUNNELLING EQUIPMENT	43 days	Thu 3/06/10	Fri 16/07/10
15	LOCATE BATCH PLANT	22 days	Thu 3/06/10	Fri 25/06/10
16	LOCATE CRUSHING PLANT	22 days	Thu 3/06/10	Fri 25/06/10
17	ENVIROMENTAL CONTROLS	16 days	Mon 19/07/10	Wed 4/08/10
18	CLEAR FOR QUARRY	4 days	Mon 19/07/10	Fri 23/07/10
19	ESTABLISH QUARRY ROADS & BENCHI	65 days	Wed 28/07/10	Fri 1/10/10
20	QUARRY ROCK AVAILABLE	0 days	Fri 1/10/10	Fri 1/10/10
21	SITE ACCESS ROADS	12 days	Thu 5/08/10	Tue 17/08/10
22	GENERAL SITE CLEARING	12 days	Thu 5/08/10	Tue 17/08/10
23	ESTABLISH CRUSHING PLANT	57 days	Wed 18/08/10	Thu 14/10/10
24	AGGREGATES AVAILABLE	0 days	Thu 14/07/11	Thu 14/07/11
25	ESTABLISH BATCH PLANT	104 days	Wed 18/08/10	Tue 30/11/10
26	CONCRETE AVAILABLE	0 days	Tue 30/11/10	Tue 30/11/10
27	**DIVERSION WORKS**	**362.33 days**	**Mon 19/07/10**	**Sat 16/07/11**
28	DELIVER TUNNEL EQUIPMENT	45 days	Mon 19/07/10	Thu 2/09/10
29	EXCAVATION OUTLET CHANNEL	74 days	Thu 12/08/10	Mon 25/10/10
30	EXCAVATION INLET INCLUDE TOWER I	60 days	Thu 12/08/10	Mon 11/10/10
31	EXCAVATE DIVERSION TUNNEL	96 days	Tue 26/10/10	Sun 30/01/11
32	FRP INTAKE TOWER BASE	71 days	Wed 1/12/10	Thu 10/02/11
33	GROUT CURTAIN FROM WITHIN TUNNE	41 days	Tue 1/02/11	Mon 14/03/11
34	600 DIA. BYPASS PIPE	16 days	Tue 15/03/11	Thu 31/03/11
35	CONCRETE LINING DIVERSION TUNNE	76 days	Fri 1/04/11	Thu 16/06/11
36	**TUNNEL AVAILABLE FOR DIVERSION**	0 days	Thu 16/06/11	Thu 16/06/11
37	TEMP. U/S COFFER DAM	1 day	Fri 17/06/11	Sat 18/06/11
38	TEMP. D/S COFFER DAM	1 day	Thu 16/06/11	Fri 17/06/11
39	U/S COFFER DAM EXCAVATION	7 days	Thu 16/06/11	Thu 23/06/11
40	CONSTRUCT U/S COFFER DAM	22 days	Fri 24/06/11	Sat 16/07/11
41	**SPILLWAY**	**669.33 days**	**Mon 19/07/10**	**Fri 18/05/12**
42	CLEAR SPILLWAY	16 days	Mon 19/07/10	Wed 4/08/10
43	EXCAVATE LOWER SPILLWAY	95 days	Thu 12/08/10	Mon 15/11/10
44	EXCAVATE UPPER SPILLWAY	97 days	Wed 29/06/11	Tue 4/10/11
45	CONCRETE TO UPPER SPILLWAY	227 days	Tue 4/10/11	Fri 18/05/12
46	**EMBANKMENT EXCAVATION**	**353 days**	**Tue 17/08/10**	**Fri 5/08/11**
47	DAM ABUTMENT EXCAVATION	280 days	Tue 17/08/10	Tue 24/05/11
48	EXCAVATION / FOUND. FOR U/S TOE S	120 days	Tue 19/10/10	Wed 16/02/11
49	EXCAVATION / FOUND. FOR D/S TOE S	28 days	Tue 23/11/10	Tue 21/12/10
50	EXCAVATION / FOUND. FOR U/S TOE S	21 days	Thu 23/06/11	Thu 14/07/11
51	EXCAVATION / FOUND. FOR D/S TOE S	21 days	Thu 23/06/11	Thu 14/07/11
52	COMPLETE FOUNDATION PREPERATIC	14 days	Tue 28/06/11	Tue 12/07/11
53	COMPLETE FOUNDATION PREPERATIC	14 days	Fri 22/07/11	Fri 5/08/11
54	**EMBANKMENT CONSTRUCTION**	**926 days?**	**Sat 18/12/10**	**Mon 1/07/13**
55	CONSTRUCT U/S TOE SLAB ABOVE RL	140 days	Sat 18/12/10	Sat 7/05/11
56	CONSTRUCT D/S TOE SLAB ABOVE RL	35 days	Tue 21/12/10	Tue 25/01/11
57	CONSTRUCT U/S TOE SLAB BELOW RL	42 days?	Thu 14/07/11	Thu 25/08/11
58	COSTRUCT D/S TOE SLAB BELOW RL S	35 days	Fri 8/07/11	Fri 12/08/11
59	MAIN D/S COFFER DAM TO RL 125 ZON	139 days	Wed 29/06/11	Tue 15/11/11
60	GROUT CURTAIN FOR DAM	365 days	Mon 5/09/11	Tue 4/09/12
61	ROCKFILL TO DAM TO RL 120	83 days	Sat 1/10/11	Fri 23/12/11
62	XMAS CLOSEDOWN	16 days	Fri 24/12/10	Sun 9/01/11
63	ROCKFILL TO DAM RL 120 to RL 135	48 days	Mon 9/01/12	Sun 26/02/12
64	ROCKFILL TO DAM TO RL 135 to 156	66 days	Sun 26/02/12	Wed 2/05/12
65	D/S RIVER BED FILLING	21 days	Mon 9/01/12	Mon 30/01/12
66	CONCRETE FACING	228 days	Mon 7/05/12	Fri 21/12/12
67	XMAS CLOSEDOWN	15 days	Sun 23/12/12	Mon 7/01/13
68	PARAPET WALL	91 days	Fri 4/01/13	Fri 5/04/13
69	COMPLETE ROCKFILL TO DAM	35 days	Mon 8/04/13	Mon 13/05/13
70	CONSTRUCT CREST ROAD	49 days	Mon 13/05/13	Mon 1/07/13
71	**OUTLET WORKS**	**913 days**	**Thu 10/02/11**	**Sun 11/08/13**
72	COMPLETE INTAKE TOWER	136 days	Thu 10/02/11	Sun 26/06/11
73	CONSTRUCT BRIDGE PIERS	308 days	Thu 10/02/11	Thu 15/12/11
74	BRIDGE ABUTMENT ADJACENT DAM	13 days	Thu 15/12/11	Wed 28/12/11
75	INSTALL BRIDGE BEAMS	14 days	Wed 28/12/11	Wed 11/01/12
76	INSTALL STOPLOGS	8 days	Mon 7/01/13	Tue 15/01/13
77	PONDAGE COMMENCED	0 days	Wed 16/01/13	Wed 16/01/13
78	INSTALL FINAL TUNNEL PENSTOCK	28 days	Wed 16/01/13	Wed 13/02/13
79	CONCRETE SURROUND	42 days	Mon 18/02/13	Mon 1/04/13
80	CONSTRUCT VALVE BLOCK	84 days	Mon 18/02/13	Mon 13/05/13
81	INSTALL & COMMISSION PIPEWORK, V	90 days	Mon 13/05/13	Sun 11/08/13
82	DISSIPATOR GROUTING	37 days	Mon 13/05/13	Wed 19/06/13
83	PROJECT COMPLETE	0 days	Mon 12/08/13	Mon 12/08/13



Project: CFRD-Program_3B_3_old
Date: Thu 18/12/08

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

CFRD MATERIAL DISTRIBUTION

		DIVERSION EXCAVATION					SPILLWAY EXCAVATION						EMBANKMENT EXCAVATION		QUARRY B EXCAVATION			STOCKPILE & CRUSHER		
		Channels			Tunnel	Cofferdams	U/S CH 1157			DS CH 1157										
		137,275			12,000	22,275	519,000			356,000			250,000		1,197,571			379,586		
		103,000					163,000													
		OTR	Ripped Rock	Blast Rock	Blast Rock	OTR	OTR & S'wash	Ripped Rock	Blast Rock	OTR & S'wash	Ripped Rock	Blast Rock	OTR	Backhoe Exc	OTR	MW Rock 28%	SW Rock	U/S	D/S	Crusher
Solid m3		19,000	0	84,000	12,000	22,275	55,000	35,000	73,000	242,000	31,000	83,000	125,000	125,000	100,000	431,828	1,097,571			
Factor		0.87	1.20	1.20	1.20	0.87	0.87	1.20	1.20	0.87	1.20	1.20	1.00	1.20	0.87	1.20	1.20			
In Bank m3		16,530	0	100,800	14,400	19,379	47,850	42,000	87,600	210,540	37,200	99,600	125,000	150,000	87,000	518,193	1,317,085	70,000	60,000	249,586
In Bank tonnes																	2,963,441			
Zone 2B	99,830																			99,830
Zone 2A	5,298																			5,298
Zone 3A+3B	973,268																973,268			
Zone 3C	635,193							42,000						75,000		518,193				
Zone 3D	267,437								87,600			93,600					86,237			
Zone 4	123,194																123,194			
Zone 5 U/S	70,000																	70,000		
Zone 5 D/S	60,000																		60,000	
Free Draining Backfill	700																			700
U/S C'dam Zone A	6,380												6,380							
U/S C'dam Zone B	3,320																			3,320
U/S C'dam Zone C	27,500						8,925				18,575									
D/S C'dam Rockfill	18,625										18,625	0							0	
River Fill	80,000									80,000										
River Bank Rock	6,000											6,000							0	
River Bank Filters	2,000																			2,000
To Crusher	224,345			100,800	14,400												134,386			
Concrete Aggregate	101,000																			101,000
U/S Stockpile	70,000												70,000							
D/S stockpile	60,000										0	0	48,620	11,380						
Topsoil, Haul Roads, Waste etc		16,530	0	0	0	19,379	38,925	0	0	130,540	0	0	0	63,620	87,000	0	0	0	0	37,438

Appendix F

Engineering Drawings

N.S.W. DEPARTMENT OF COMMERCE
TILLEGRA DAM CONCEPT DESIGN PHASE

SCHEDULE OF DRAWINGS

DRAWING No.	TITLE
	SCHEDULE OF DRAWINGS
C361802–001	SCHEDULE OF DRAWINGS – Sheet 1 of 3
C361802–002	SCHEDULE OF DRAWINGS – Sheet 2 of 3
C361802–003	SCHEDULE OF DRAWINGS – Sheet 2 of 3
	GENERAL DRAWINGS
C361802–101	LOCALITY
C361802–102	DAM SITE ENVIRONS AND SITE COMPOUND
C361802–103	GENERAL ARRANGEMENT
C361802–104	SETTING OUT CONTROL
C361802–105	CONSTRUCTION SEQUENCES – PHASE 1, 2A & 2B CONSTRUCTION
C361802–106	CONSTRUCTION SEQUENCE – PHASE 2C CONSTRUCTION
C361802–107	(NOT AVAILABLE)
C361802–108	(NOT AVAILABLE)
C361802–109	(NOT AVAILABLE)
	MAIN EMBANKMENT
C361802–201	MAIN EMBANKMENT ARRANGEMENT – Sheet 1 of 2
C361802–202	MAIN EMBANKMENT ARRANGEMENT – Sheet 2 of 2
C361802–203	EMBANKMENT MESH PROTECTION – Sheet 1 of 2
C361802–204	EMBANKMENT MESH PROTECTION – Sheet 2 of 2
C361802–205	CONCRETE FACE & TOE SLAB – CONCRETE & REINFORCEMENT DETAILS – Sheet 1 of 4
C361802–206	CONCRETE FACE & TOE SLAB – CONCRETE & REINFORCEMENT DETAILS – Sheet 2 of 4
C361802–207	CONCRETE FACE & TOE SLAB – CONCRETE & REINFORCEMENT DETAILS – Sheet 3 of 4
C361802–208	CONCRETE FACE & TOE SLAB – CONCRETE & REINFORCEMENT DETAILS – Sheet 4 of 4
C361802–209	PARAPET WALL CONCRETE DETAILS – Sheet 1 of 2
C361802–210	PARAPET WALL CONCRETE DETAILS – Sheet 2 of 2
C361802–211	LEFT ABUTMENT CONCRETE DETAILS
C361802–212	RIGHT ABUTMENT CONCRETE DETAILS – Sheet 1 of 2
C361802–213	RIGHT ABUTMENT CONCRETE DETAILS – Sheet 2 of 2
C361802–214	FOUNDATION & TUNNEL GROUTING – Sheet 1 of 2
C361802–215	FOUNDATION & TUNNEL GROUTING – Sheet 2 of 2
C361802–216	RIDGE GROUTING – Sheet 1 of 3
C361802–217	RIDGE GROUTING – Sheet 2 of 3
C361802–218	RIDGE GROUTING – Sheet 3 of 3
C361802–219	INSTRUMENTATION – Sheet 1 of 2
C361802–220	INSTRUMENTATION – Sheet 2 of 2
C361802–221	ROAD –TYPICAL CROSS SECTION
C361802–222	ROAD –
C361802–223	ROAD –

DRAWING No.	TITLE
	SPILLWAY
C361802–301	SPILLWAY ARRANGEMENT
C361802–302	CREST & UPPER CHUTE DETAILS – Sheet 1 of 2
C361802–303	CREST & UPPER CHUTE DETAILS – Sheet 2 of 2
C361802–304	SPILLWAY LOWER CHUTE & FLIP BUCKET DETAILS – Sheet 1 of 2
C361802–305	SPILLWAY LOWER CHUTE & FLIP BUCKET DETAILS – Sheet 2 of 2
C361802–306	(NOT AVAILABLE)
C361802–307	PLUNGE POOL
C361802–308	DISCHARGE CHANNEL & RIVER JUNCTION – Sheet 1 of 2
C361802–309	DISCHARGE CHANNEL & RIVER JUNCTION – Sheet 1 of 2
C361802–310	SPILLWAY FOOT BRIDGE – Sheet 1 of 3
C361802–311	SPILLWAY FOOT BRIDGE – Sheet 2 of 3
C361802–312	SPILLWAY FOOT BRIDGE – Sheet 3 of 3
	DIVERSION WORKS
C361802–401	DIVERSION WORK ARRANGEMENT & SECTIONS
C361802–402	TUNNEL CONCRETE & REINFORCEMENT DETAILS
	OUTLET WORKS
C361802–501	OUTLET WORKS ARRANGEMENT – Sheet 1 of 2
C361802–502	OUTLET WORKS ARRANGEMENT – Sheet 2 of 2
C361802–503	OUTLET WORKS DEVELOPMENT
C361802–504	INTAKE STRUCTURE – TOWER BASE CONCRETE DETAILS – Sheet 1 of 2
C361802–505	INTAKE STRUCTURE – TOWER BASE CONCRETE DETAILS – Sheet 2 of 2
C361802–506	INTAKE STRUCTURE – STOPLOGS
C361802–507	INTAKE STRUCTURE – TOWER CONCRETE DETAILS
C361802–508	INTAKE STRUCTURE – TOWER PLATFORM CONCRETE DETAILS – Sheet 1 of 2
C361802–509	INTAKE STRUCTURE – TOWER PLATFORM CONCRETE DETAILS – Sheet 2 of 2
C361802–510	INTAKE STRUCTURE – ACCESS BRIDGE GENERAL ARRANGEMENT & CONCRETE SPANS
C361802–511	INTAKE STRUCTURE – ACCESS BRIDGE STEEL TRUSS DETAILS – Sheet 1 of 3
C361802–512	INTAKE STRUCTURE – ACCESS BRIDGE STEEL TRUSS DETAILS – Sheet 2 of 3
C361802–513	INTAKE STRUCTURE – ACCESS BRIDGE STEEL TRUSS DETAILS – Sheet 3 of 3
C361802–514	INTAKE STRUCTURE – STEEL BRIDGE CONCRETE DECK DETAILS
C361802–515	INTAKE STRUCTURE – BRIDGE ABUTMENT & DECK JOINT DETAILS
C361802–516	INTAKE STRUCTURE – BRIDGE PIERS CONCRETE & REINF. DETAILS – Sheet 1 of 2
C361802–517	INTAKE STRUCTURE – BRIDGE PIERS CONCRETE & REINF. DETAILS – Sheet 2 of 2
C361802–518	(NOT AVAILABLE)
C361802–519	(NOT AVAILABLE)
C361802–520	OUTLET WORKS VALVE BLOCK AREA
C361802–521	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 1 of 6
C361802–522	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 2 of 6
C361802–523	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 3 of 6
C361802–524	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 4 of 6
C361802–525	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 5 of 6
C361802–526	OUTLET WORKS VALVE BLOCK CONCRETE DETAILS – Sheet 6 of 6

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2–24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 609 132 837

SCHEDULE OF DRAWINGS
Sheet 1 of 3

CAD File:
C361802 -001

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

Sheet <> of <> Sheets

B1

N.S.W. DEPARTMENT OF COMMERCE
TILLEGRA DAM CONCEPT DESIGN PHASE

SCHEDULE OF DRAWINGS

DRAWING No.	TITLE
	?
C361802–601	
C361802–602	
C361802–603	
	ACCESS ROAD
C361802–701	
C361802–702	
C361802–703	
C361802–704	
C361802–705	
	DAM SITE GEOTECHNICAL INVESTIGATIONS
C361802–801	RIGHT ABUTMENT – LOCATIONS OF GEOTECHNICAL INVESTIGATIONS
C361802–802	LEFT ABUTMENT – LOCATIONS OF GEOTECHNICAL INVESTIGATIONS
C361802–803	LEFT ABUTMENT RIDGE – LOCATIONS OF GEOTECHNICAL INVESTIGATIONS
C361802–804	(NOT AVAILABLE)
C361802–805	(NOT AVAILABLE)
C361802–806	SPILLWAY SEISMIC REFRACTION INVESTIGATION
C361802–807	DIVERSION CHANNEL & TUNNEL SEISMIC REFRACTION INVESTIGATION
C361802–808	LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATION (Seet 1 of 4)
C361802–809	LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATION (Seet 2 of 4)
C361802–810	LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATION (Seet 3 of 4)
C361802–811	LEFT ABUTMENT SEISMIC REFRACTION AND DRILLING INVESTIGATION (Seet 4 of 4)

DRAWING No.	TITLE
	TELEMETRY
WS080061–1	COMMUNICATION PATHS FOR DESKTOP STUDY
WS080061–2	COMMUNICATION PATHS OPTION 1
WS080061–3	COMMUNICATION PATHS OPTION 2
WS080061–4	COMMUNICATION PATHS OPTION 3
WS080061–5	DAM SITE PROPOSED RADIO REPEATER LOCATION
WS080061–6	TELEMETRY REPEATER SITE LAYOUT
WS080061–7	HEAD OFFICE VDU TYPICAL MAIN SCADA DISPLAY
WS080061–8	HEAD OFFICE VDU TYPICAL MAIN SCADA DISPLAY NOTES
	ELECTRICAL
DC8117–01	MAIN SWITCHGEAR & CONTROLGEAR ASSEMBLY SINGLE LINE DIAGRAM – Sheet 1 of 4
DC8117–02	MAIN SWITCHGEAR & CONTROLGEAR ASSEMBLY SINGLE LINE DIAGRAM – Sheet 2 of 4
DC8117–03	MAIN SWITCHGEAR & CONTROLGEAR ASSEMBLY SINGLE LINE DIAGRAM – Sheet 3 of 4
DC8117–04	MAIN SWITCHGEAR & CONTROLGEAR ASSEMBLY SINGLE LINE DIAGRAM – Sheet 4 of 4
DC8117–05	MAIN SWITCHGEAR & CONTROLGEAR ASSEMBLY GENERAL ARRANGEMENT
DC8117–06	VALVE BLOCK BUILDING ELECTRICAL CONTROL ROOM
DC8117–07	OUTLET TOWER SWITCHGEAR & CONTROL ASSEMBLY GENERAL ARRANGEMENT
	?

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2–24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 058 522 837

SCHEDULE OF DRAWINGS
Sheet 2 of 3

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

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C361802 -002

Sheet <> of <> Sheets

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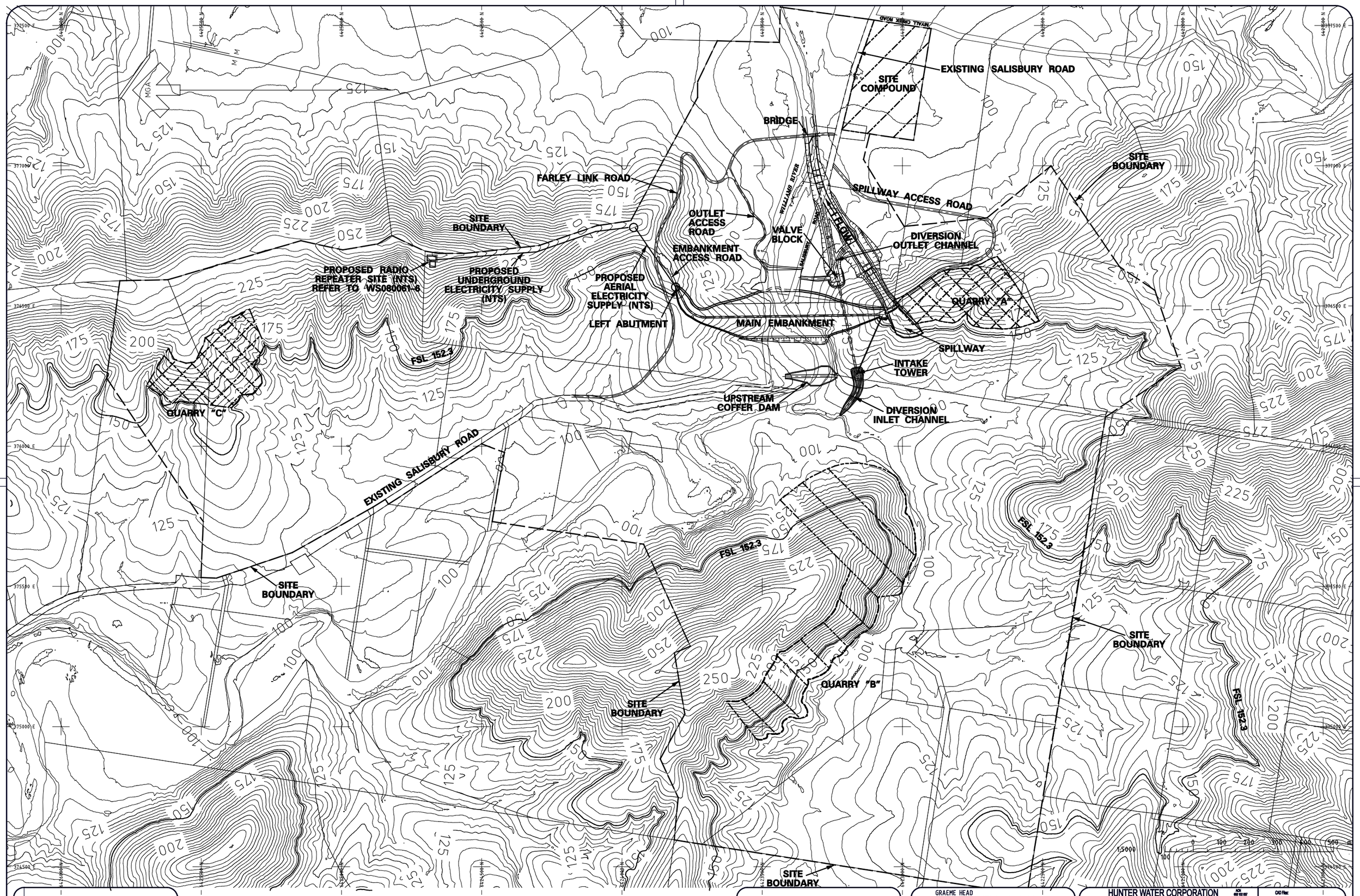

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Director General - NSW Department of Commerce
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DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

DAM SITE ENVIRONS AND SITE COMPOUND

C361802 -102

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

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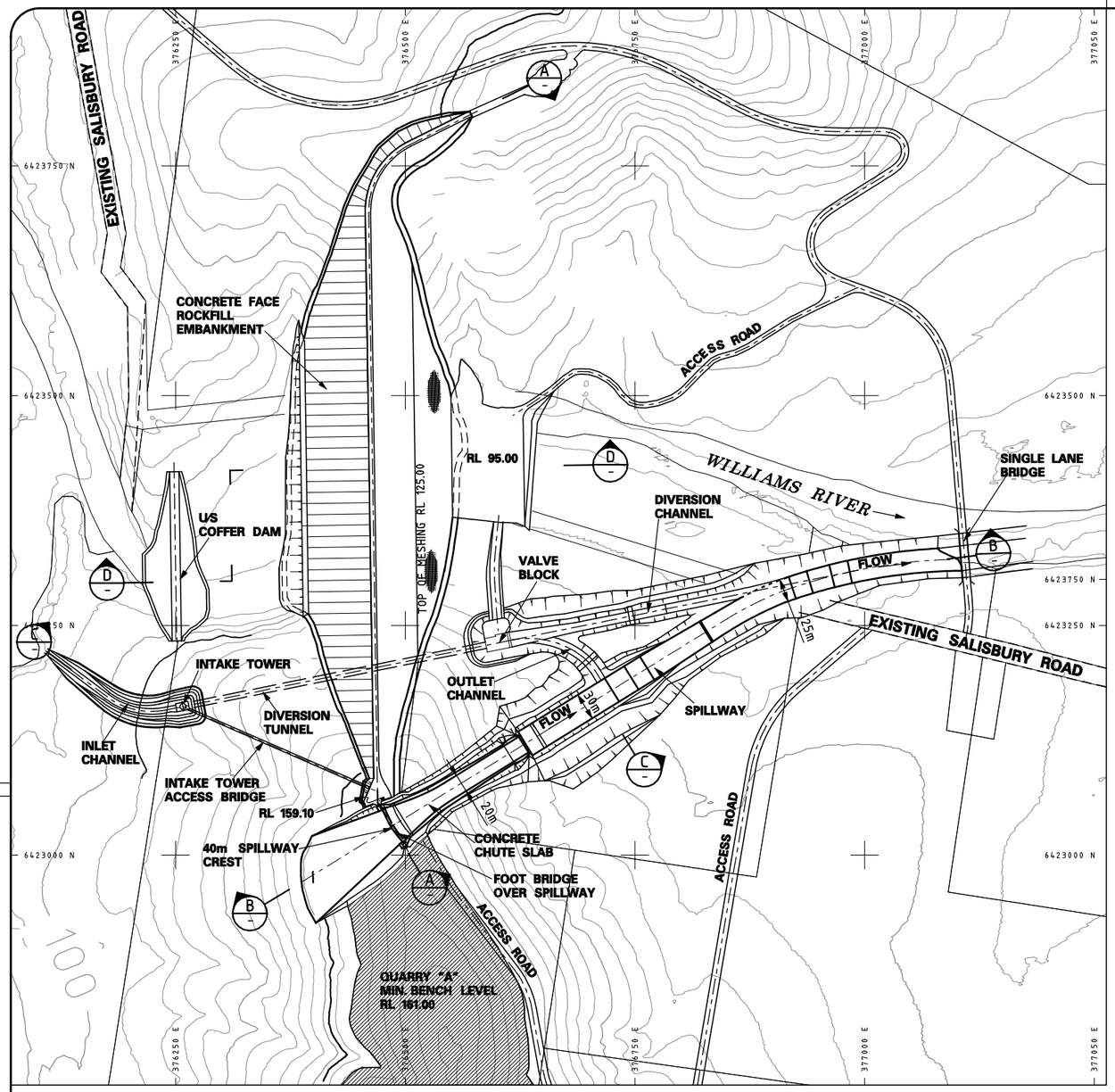

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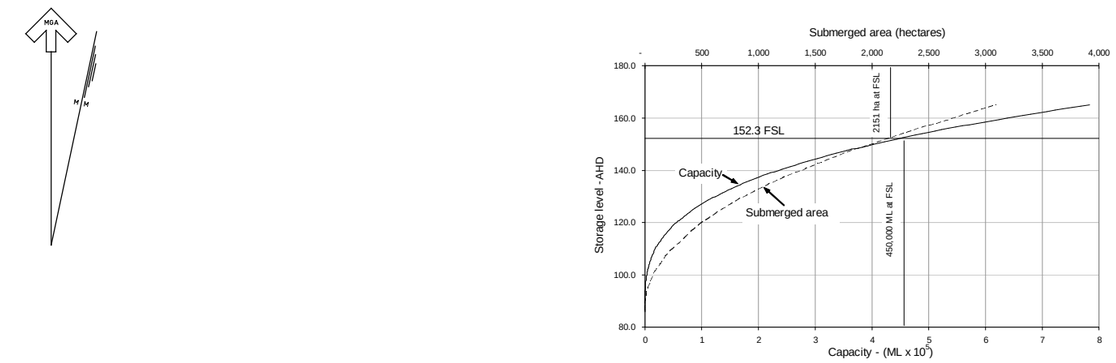

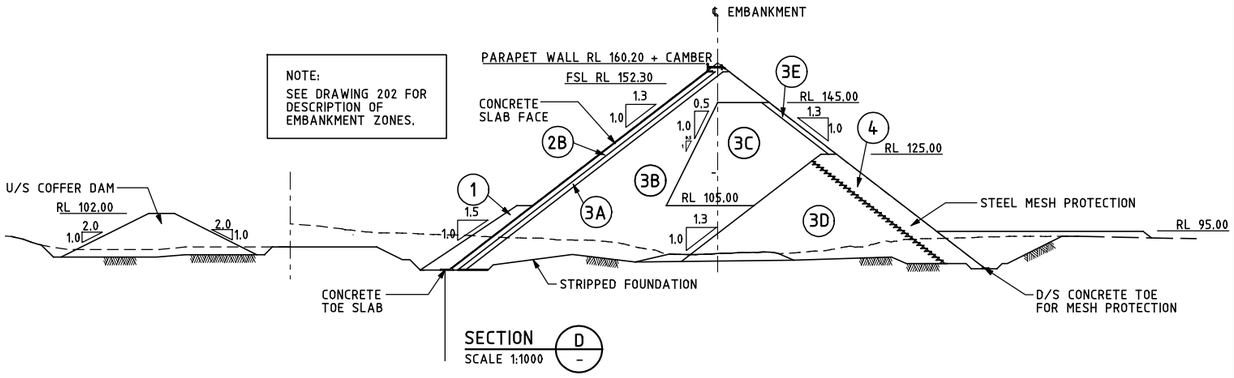

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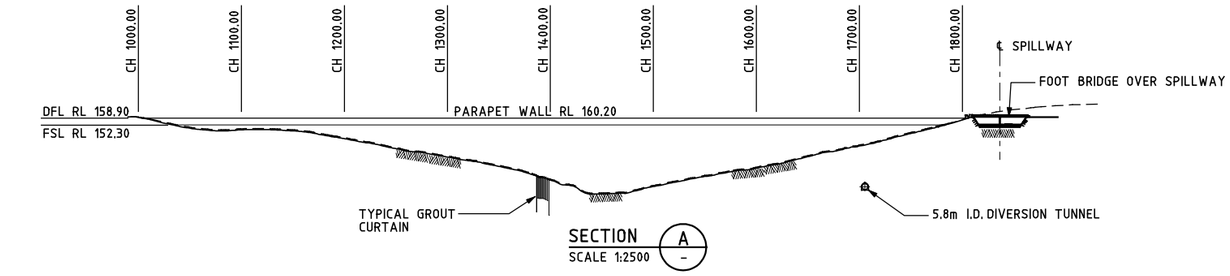

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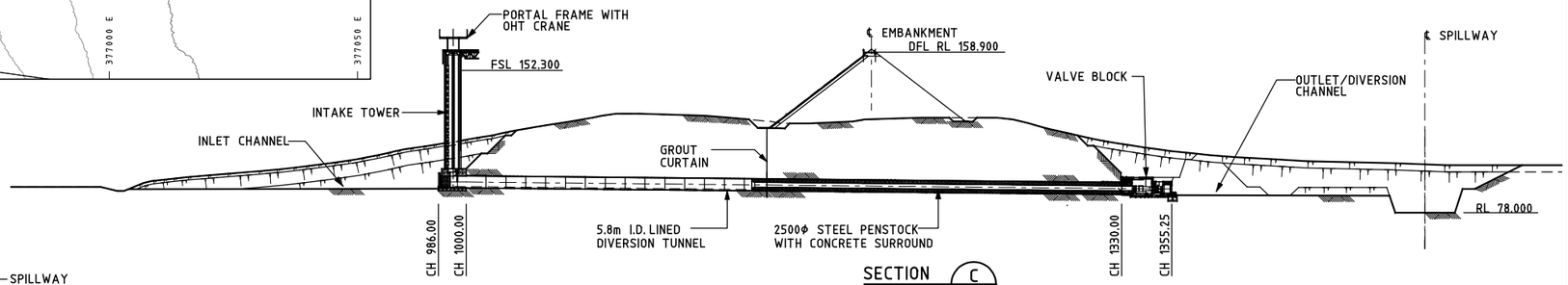

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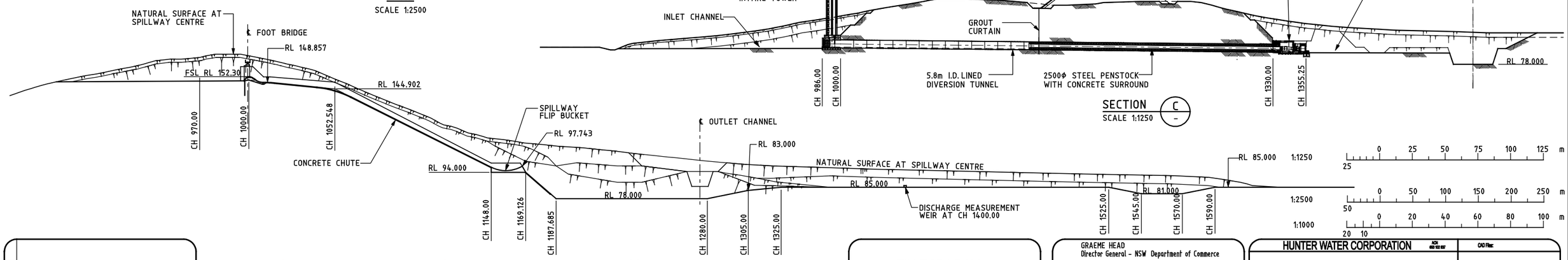

SECTION B
SCALE 1:1000

1:1250 0 25 50 75 100 125 m
1:2500 0 50 100 150 200 250 m
1:1000 0 20 40 60 80 100 m

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 603 932 607

GENERAL ARRANGEMENT

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

CAD File:

C361802 -103

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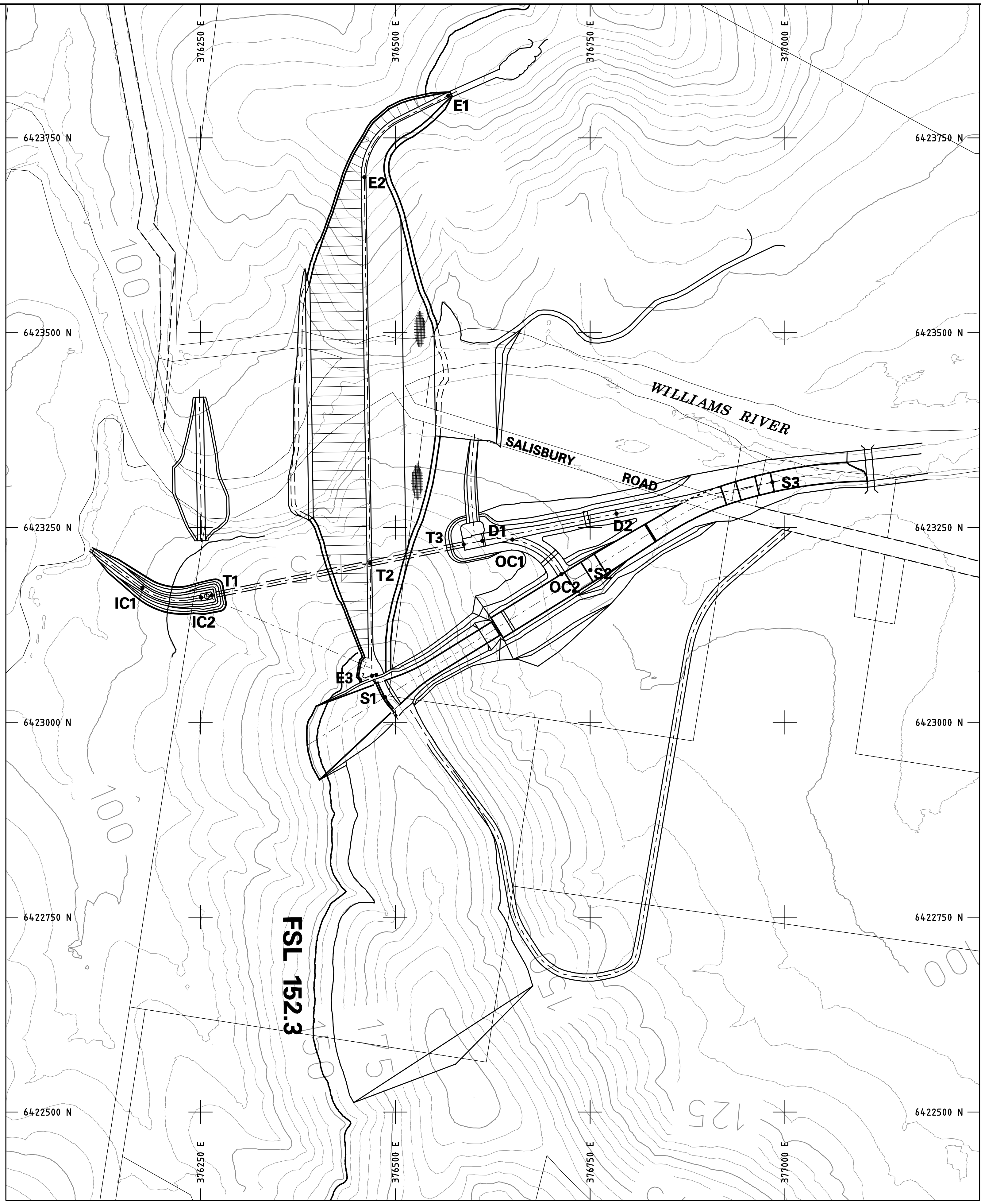
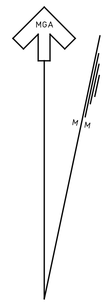
B1





POINT	CHAINAGE	CO-ORDINATES		REMARKS
		EAST	NORTH	
E1	1000	376567.42	6423803.89	EMBANKMENT ℄
E2	1160	376460.37	6423699.33	EMBANKMENT ℄
E3	1800	376470.01	6423059.59	EMBANKMENT ℄
S1	1000	376486.84	6423032.38	SPILLWAY ℄ AT CREST AXIS
S2	1310	376750.49	6423195.44	SPILLWAY ℄
S3	1590	376983.95	6423308.22	SPILLWAY ℄
T1	1000	376264.39	6423162.98	TUNNEL U/S PORTAL ℄
T2	1207.55	376467.83	6423204.07	TUNNEL ℄/EMBANKMENT ℄ (INTERSECTION POINT)
T3	1330	376587.86	6423228.31	TUNNEL D/S PORTAL ℄
D1	1354.25	376611.63	6423233.11	DIVERSION CHANNEL ℄
D2	1530	376783.90	6423267.90	DIVERSION CHANNEL ℄
IC1	907.17	376175.63	6423172.29	INLET CHANNEL ℄ (TANGENT POINT)
IC2	986	376250.67	6423160.21	INLET CHANNEL ℄
OC1		376650.35	6423234.54	OUTLET CHANNEL ℄
OC2		376713.24	6423190.04	OUTLET CHANNEL ℄

1:2500 — 50 0 50 100 150 200 250 m

PLAN

SCALE 1:2500

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TILLEGRA DAM
CONCEPT DESIGN PHASE

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LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

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CAD Files:

SETTING OUT CONTROL

C361802 -104

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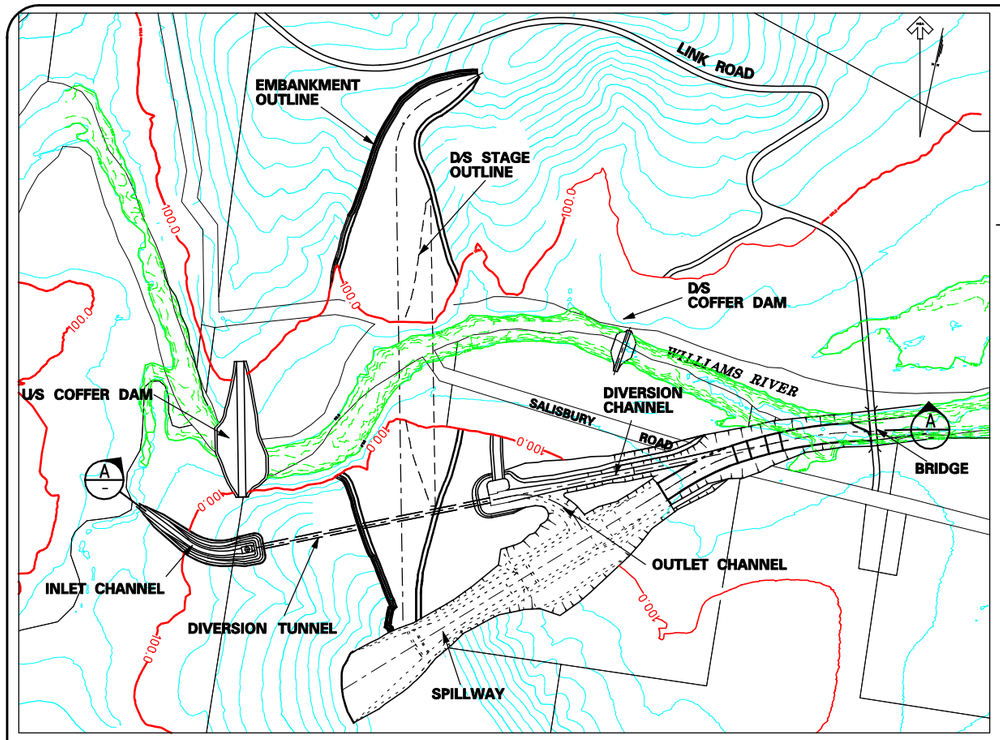

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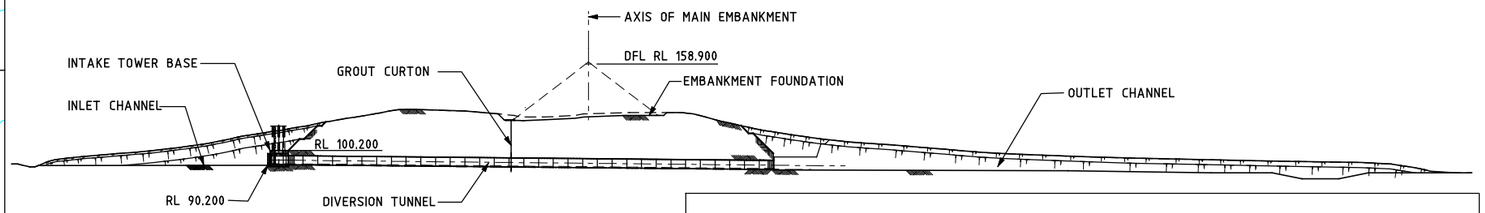


SECTION A
N.T.S.

PHASE 1 – AWARD OF CONTRACT TO DIVERSION OF RIVER THROUGH TUNNEL

This listing is illustrative only and does not include all the work under the contract.

1. Road Deviation

Construction of the link road and bridge over the Williams River.

2. Diversion Works

Excavation of inlet and outlet channels and tunnel with useable material stockpiled for cofferdam and embankment construction;
Concrete lining of the diversion tunnel, installation of 850 mm bypass pipe and construction of the intake tower base;
Over break and curtain grouting of tunnel;
Protective works for diversion through tunnel.

3. Spillway & Quarry:

Complete access road, haul roads preliminary excavations for quarry operations;
Excavation of the spillway discharge channel;

4. Embankment:

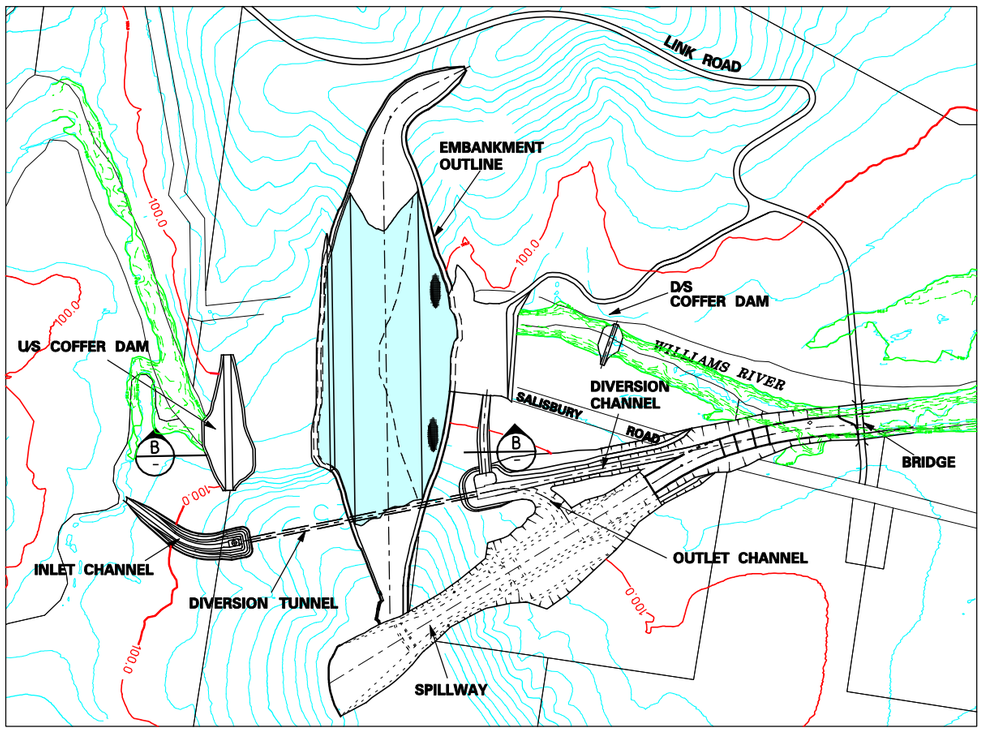
Excavate foundations for embankment and toe slab, place toe slab and grout foundations above river level;
Commence construction of upstream and downstream cofferdams.

5. Cofferdams

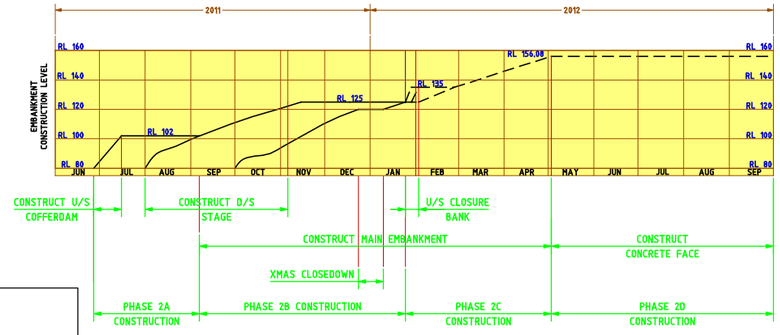
Commence construction of upstream and downstream cofferdam.

6. Diversion

Diversion of the river through the tunnel shall be made by 1st July 2011.



PLAN
N.T.S.



EMBANKMENT CONSTRUCTION PROGRAM 6
N.T.S.

PHASE 2A & 2B – CONSTRUCTION OF EMBANKMENT TO RL 125

This listing is illustrative only and does not include all the work under the contract.

1. Diversion Works

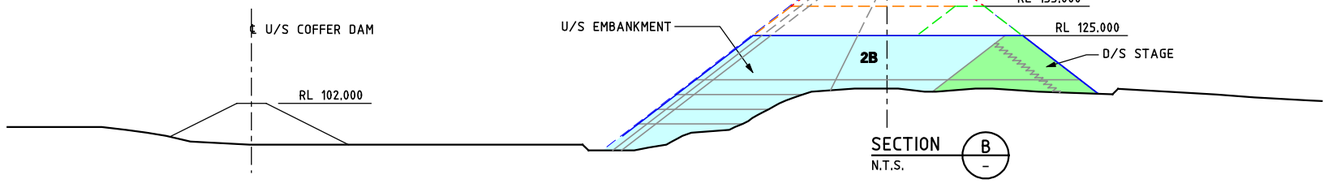
Complete upstream and downstream cofferdams.

2. Spillway & Quarry:

Continue spillway and qurry excavation.

3. Embankment:

Complete foundations in river bed, and toe slab construction.
Construct the Downstream Stage to RL 125 with meshed protection ahead of the upstream embankment fill.
Construct the Upstream embankment fill to RL 125.



SECTION B
N.T.S.

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 202 607

CONSTRUCTION SEQUENCES
PHASE 1, 2A & 2B CONSTRUCTION

CAD File: C361802 -105

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

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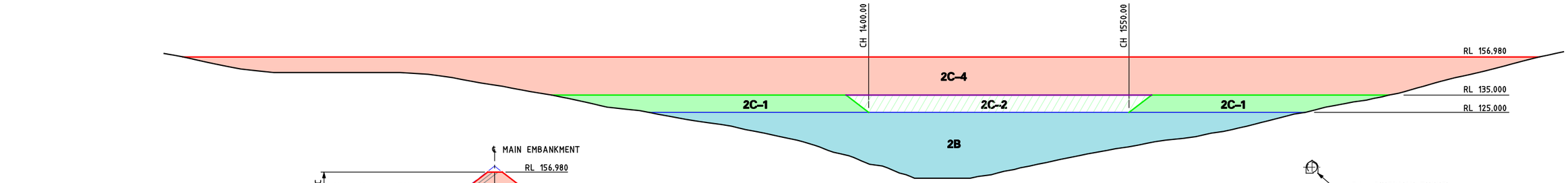
B1



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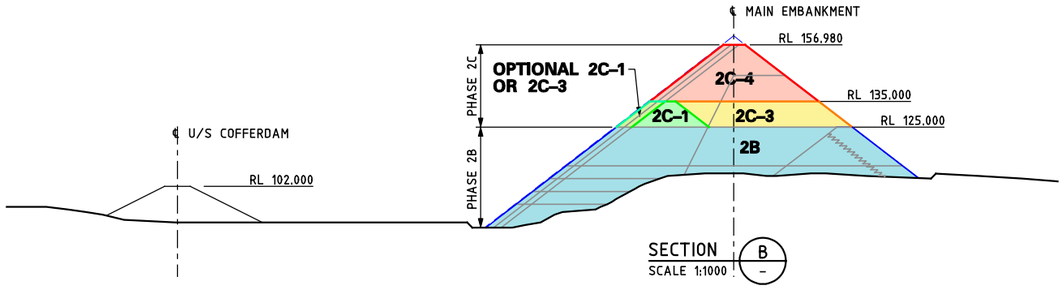

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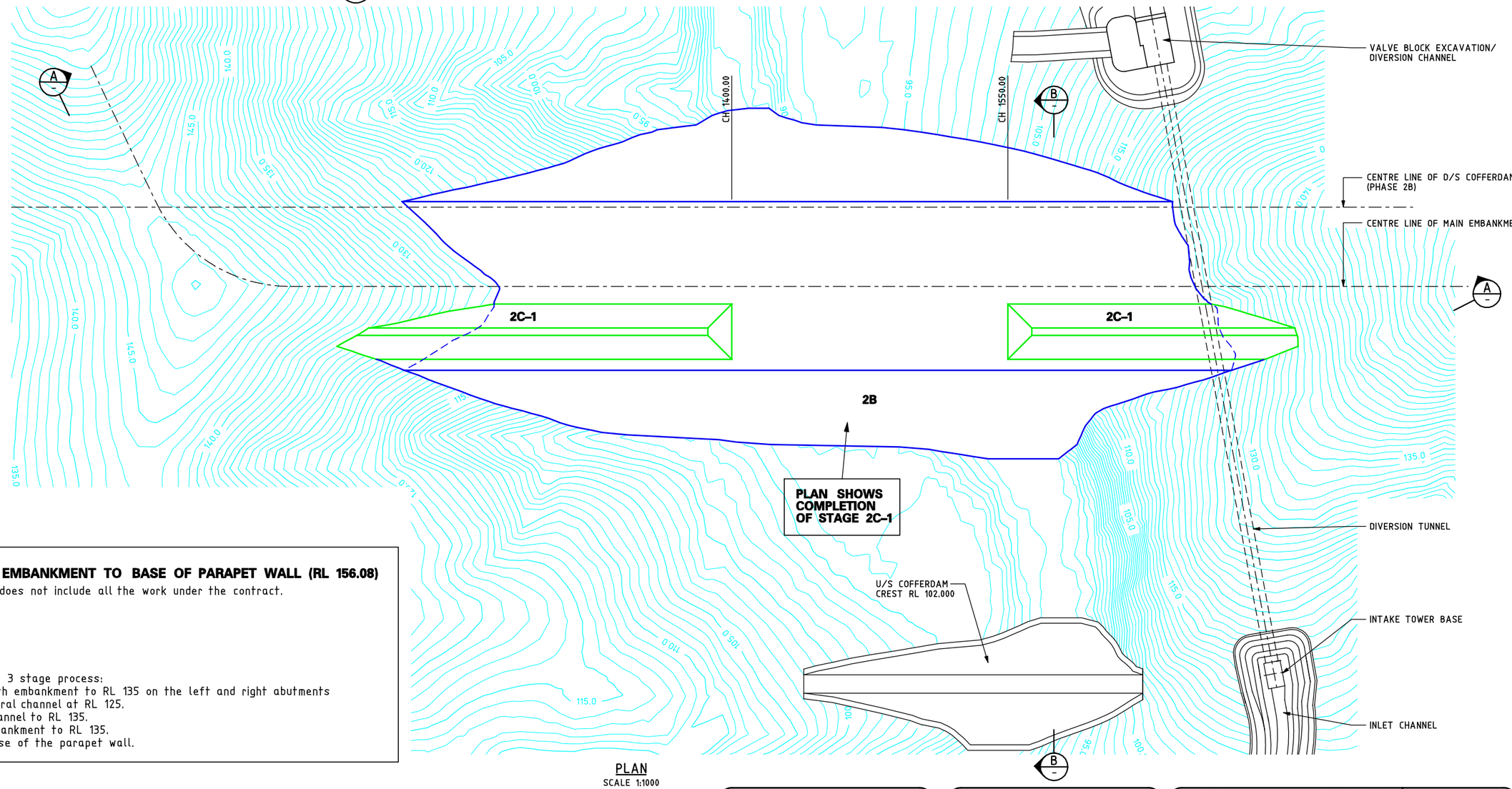

PLAN
SCALE 1:1000

PHASE 2C – COMPLETION OF EMBANKMENT TO BASE OF PARAPET WALL (RL 156.08)

This listing is illustrative only and does not include all the work under the contract.

1. Spillway & Quarry:

Continue excavation
Complete spillway construction.

2. Embankment:

Complete embankment to RL 135 in a 3 stage process:

a) Construct a minimum width embankment to RL 135 on the left and right abutments leaving a 150m wide central channel at RL 125.
b) Close off the central channel to RL 135.
c) Coplete remainder of embankment to RL 135.

Complete the embankment to the base of the parapet wall.

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1:1000 0 20 40 60 80 100 m
20 10

TILLEGRA DAM
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2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 093 162 657

CONSTRUCTION SEQUENCE
PHASE 2C CONSTRUCTION

CAD File: C361802 -106

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

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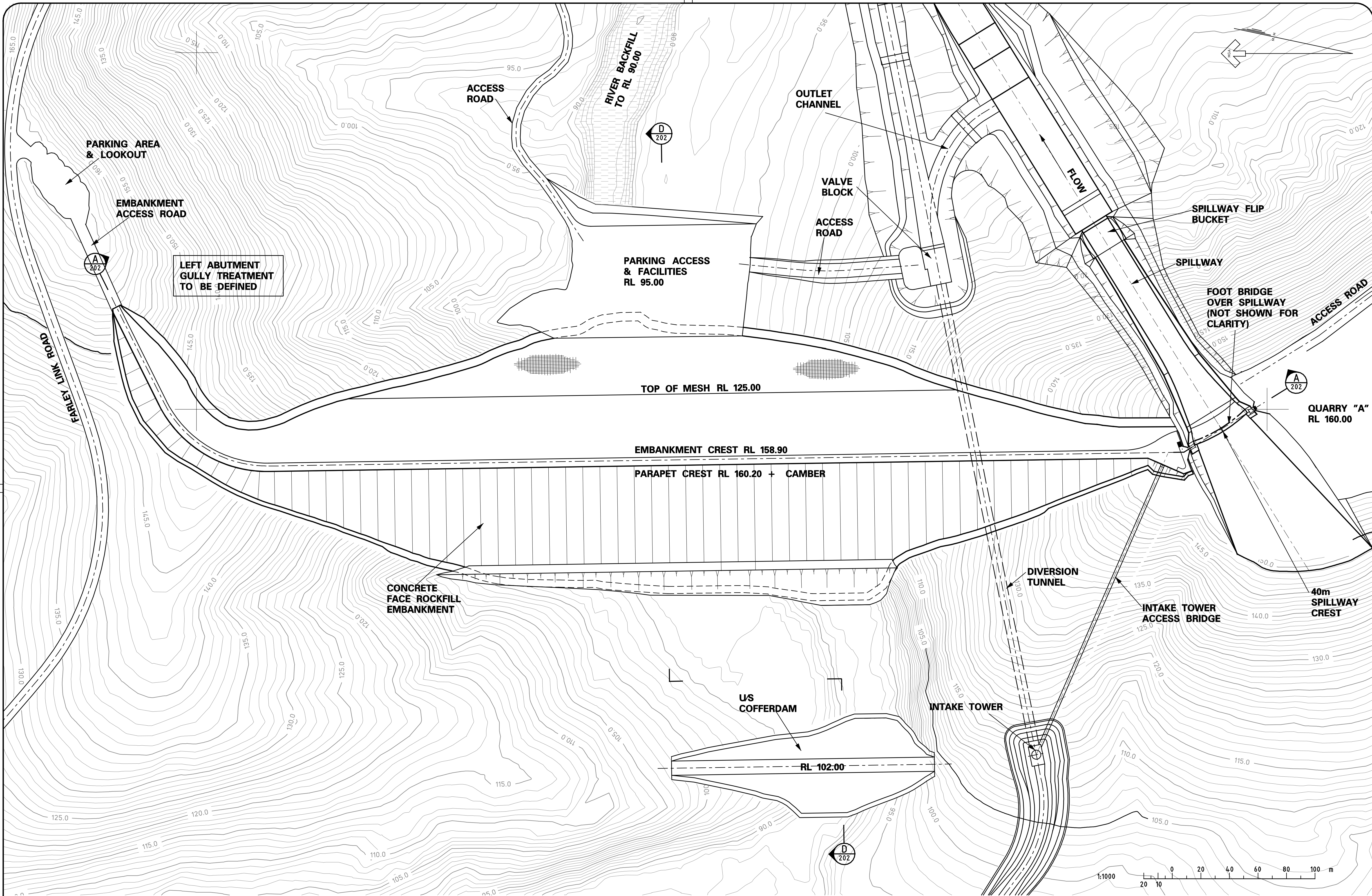

PARKING AREA & LOOKOUT
EMBANKMENT ACCESS ROAD
LEFT ABUTMENT GULLY TREATMENT TO BE DEFINED
FARLEY LINK ROAD
ACCESS ROAD
RIVER BACKFILL TO RL 90.00
PARKING ACCESS & FACILITIES RL 95.00
OUTLET CHANNEL
VALVE BLOCK
ACCESS ROAD
FLOW
SPILLWAY FLIP BUCKET
SPILLWAY
FOOT BRIDGE OVER SPILLWAY (NOT SHOWN FOR CLARITY)
ACCESS ROAD
QUARRY "A" RL 160.00
TOP OF MESH RL 125.00
EMBANKMENT CREST RL 158.90
PARAPET CREST RL 160.20 + CAMBER
CONCRETE FACE ROCKFILL EMBANKMENT
DIVERSION TUNNEL
INTAKE TOWER ACCESS BRIDGE
40m SPILLWAY CREST
U/S COFFERDAM
RL 102.00
INTAKE TOWER
1:1000
0 20 40 60 80 100 m
20 10

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DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

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MAIN EMBANKMENT ARRANGEMENT
Sheet 1 of 2

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

CAD Files:

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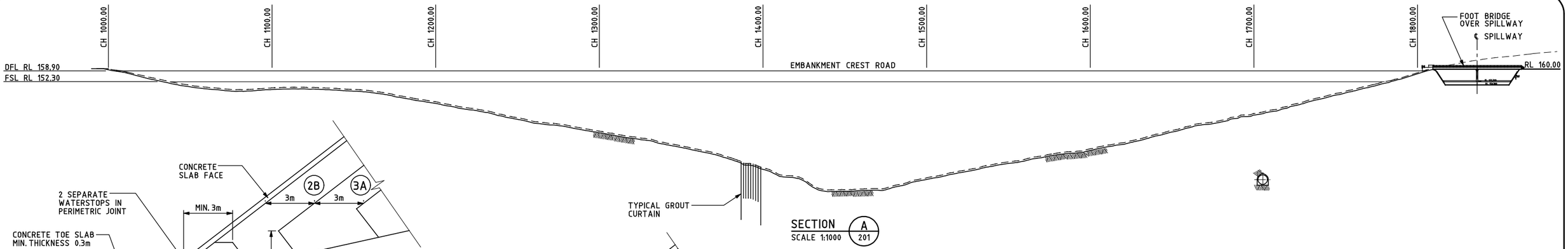
B1



SECTION A / 201
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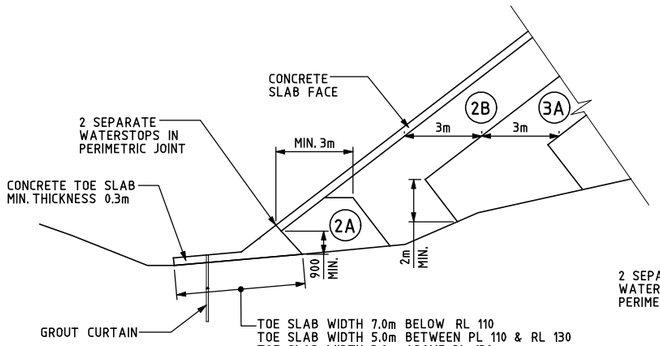
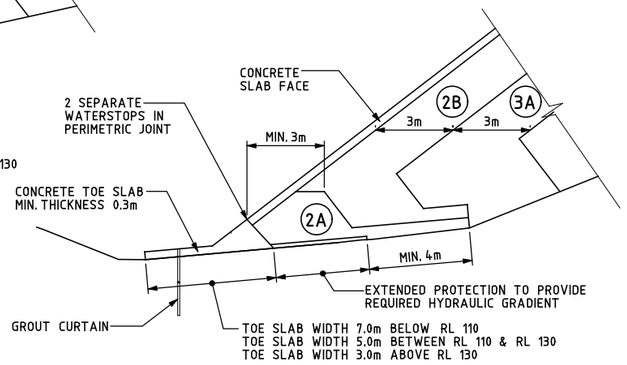
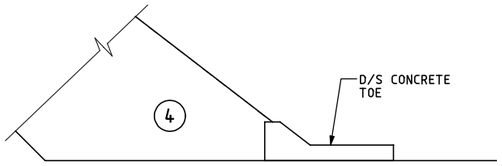


TOE SLAB ON SW TO MW ROCK

DETAIL 2 / –
SCALE 1:100



TOE SLAB ADJUSTMENT FOR MW TO HW ROCK



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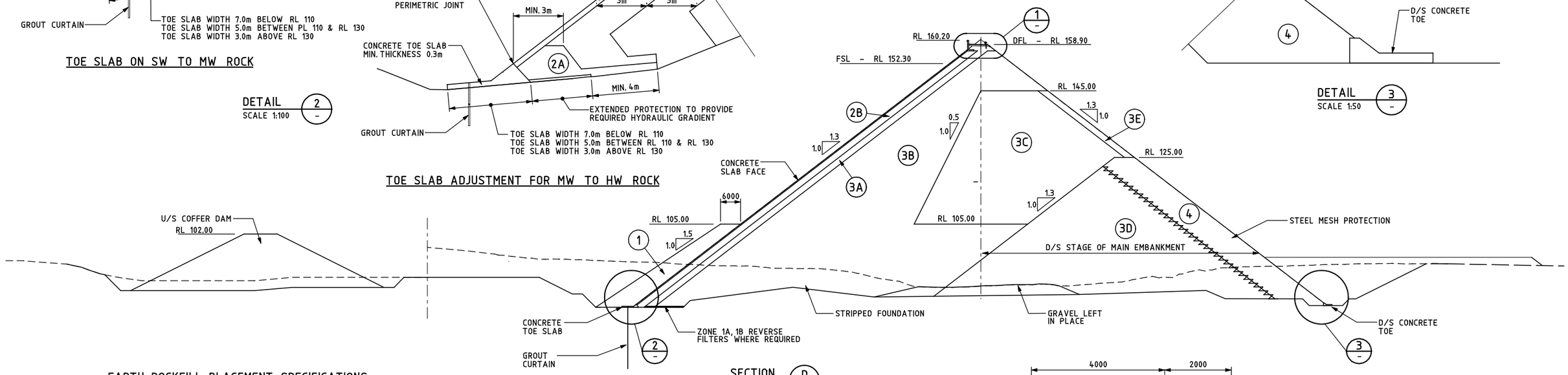

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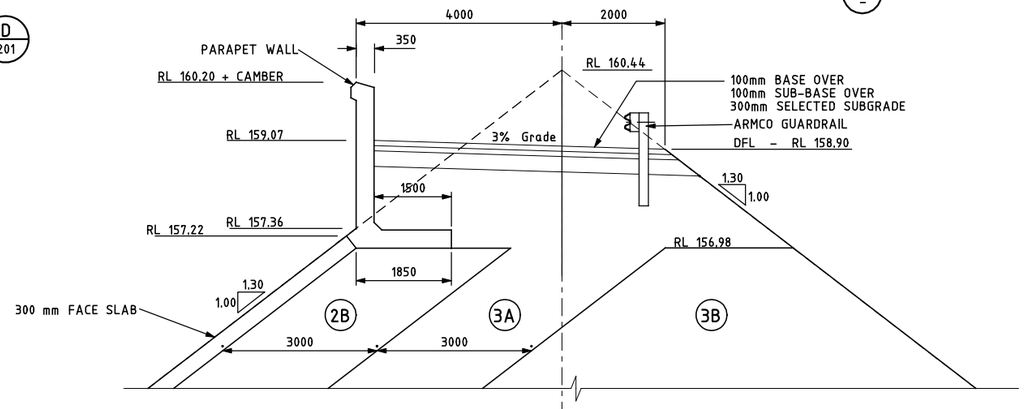

DETAIL 1 / –
SCALE 1:50

EARTH–ROCKFILL PLACEMENT SPECIFICATIONS

ZONE	DESCRIPTION	MATERIAL SPECIFICATION	PLACEMENT SPECIFICATION	QUANTITY m^3
1	U/S IMPERVIOUS ZONE	FINE SILTY MATERIAL COVERING LOWER TOE SLAB AND EXTENDING TO U/S COFFERDAM.	PLACED IN 0.5m LAYERS AND COMPACTED WITH CONSTRUCTION EQUIPMENT	
2A	REVERSE FILTER MATERIALS	PROCESSED FINE FILTER PROVIDING FILTER PROTECTION D/S TOE SLAB WHERE FOUNDATION CONDITIONS WARRANT.	COMPACTED TO A MIN. RD OF 70%	
2B	SEMI–PERVIOUS U/S "CUSHION" ZONE UNDER CONCRETE FACE SLAB	CRUSHED ROCKFILL, MAX. SIZE 75mm, WITH SUFFICIENT SAND SIZES AND FINES TO PROVIDE WORKABILITY AND LOW PERMEABILITY.	PLACED IN 400mm LAYER WITH 4 PASSES U/S BATTER SLOPE COMPACTED WITH A VIBRATING PLATE OR ROLLER AT PER SPECIFICATION	
3A	TRANSITION ROCKFILL	FREE DRAINING SOUND ROCKFILL WITH MAX SIZE OF 0.5m.	WATERED & COMPACTED IN 0.5m LAYERS WITH 4 PASSES	
3B	U/S ROCKFILL ZONE	FREE DRAINING SOUND ROCKFILL WITH MAX SIZE 1.0m.	WATERED & COMPACTED IN 1.0m LAYERS WITH 4 PASSES	
3C	D/S ROCKFILL ZONE	MIXTURE OF MODERATELY WEATHERED AND FRESH ROCK.	WATERED & COMPACTED IN LAYERS AS DETERMINED BY TRIAL EMBANKMENT	
3D	D/S STAGE ROCKFILL ZONE	FREE DRAINING SOUND ROCKFILL WITH MAX SIZE 1.6m.	WATERED & COMPACTED IN 1.6m LAYERS WITH 4 PASSES	
3E	FACING ROCK ON D/S BATTER	SELECTED FRESH LARGE ROCK DOZED TO THE D/S BATTER FACE AND PLACED BY EXCAVATOR.	NOMINAL COMPACTION FROM EXCAVATOR	
4	MESHED ROCKFILL IN MAIN COFFERDAM	SELECTED DURABLE FREE DRAINING ROCKFILL	PLACEMENT TO SUIT DETAILED REQUIREMENTS OF STEEL MESH PROTECTION	

NOTES:

1. LAYER THINKNESS AND LIMITS AS STATER TO BE AFTER COMPACTION.
2. ALL PASSES SHALL BE WITH A 10 TONNE ROLLER.
3. ALL PASSES SHALL BE WITH VIBRATION UNLESS OTHERWISE SPECIFIED.

1:50 0 1 2 3 4 5 m
1:100 0 2 4 6 8 10 m
1:500 0 10 20 30 40 50 m
1:1000 0 20 40 60 80 100 m

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2–24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 093 022 937

MAIN EMBANKMENT ARRANGEMENT
Sheet 2 of 2

CAD File: C361802 -202

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

Sheet <> of <> Sheets

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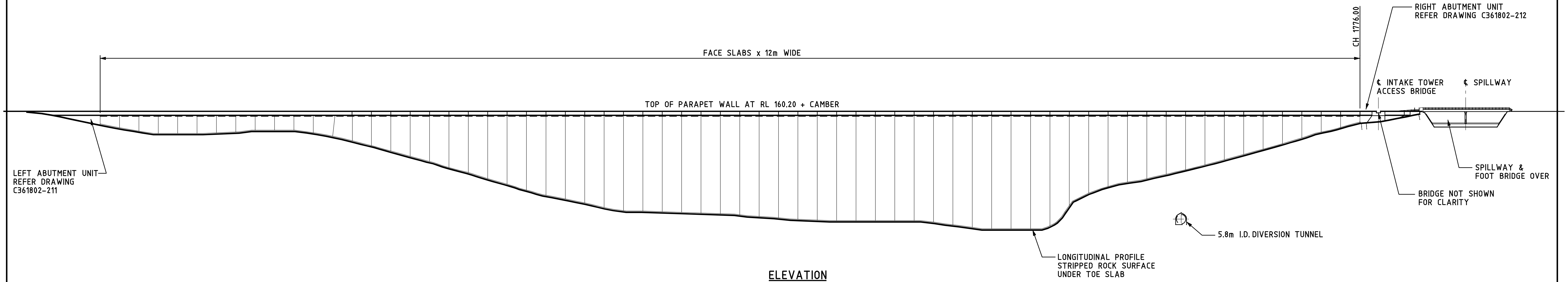
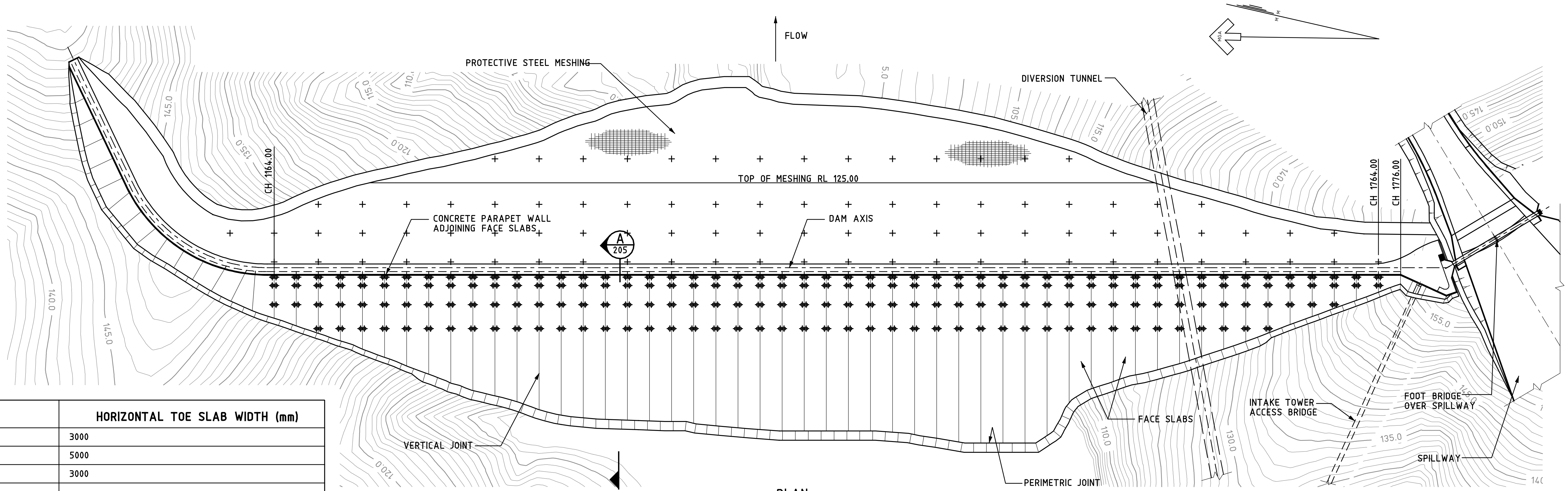


ELEVATION

SCALE 1:1000

AXIS CHAINAGE (m)	CAMBER (mm)
LEFT ABUTMENT TO	0
CH TO CH	
CH TO CH	
CH TO CH	
CH TO CH	



PLAN

SCALE 1:1000

FACE SLAB No.	HORIZONTAL TOE SLAB WIDTH (mm)
1 TO	3000
? TO ?	5000
? TO ?	3000

1:1000 0 20 40 60 80 100 m

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TILLEGRA DAM
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Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

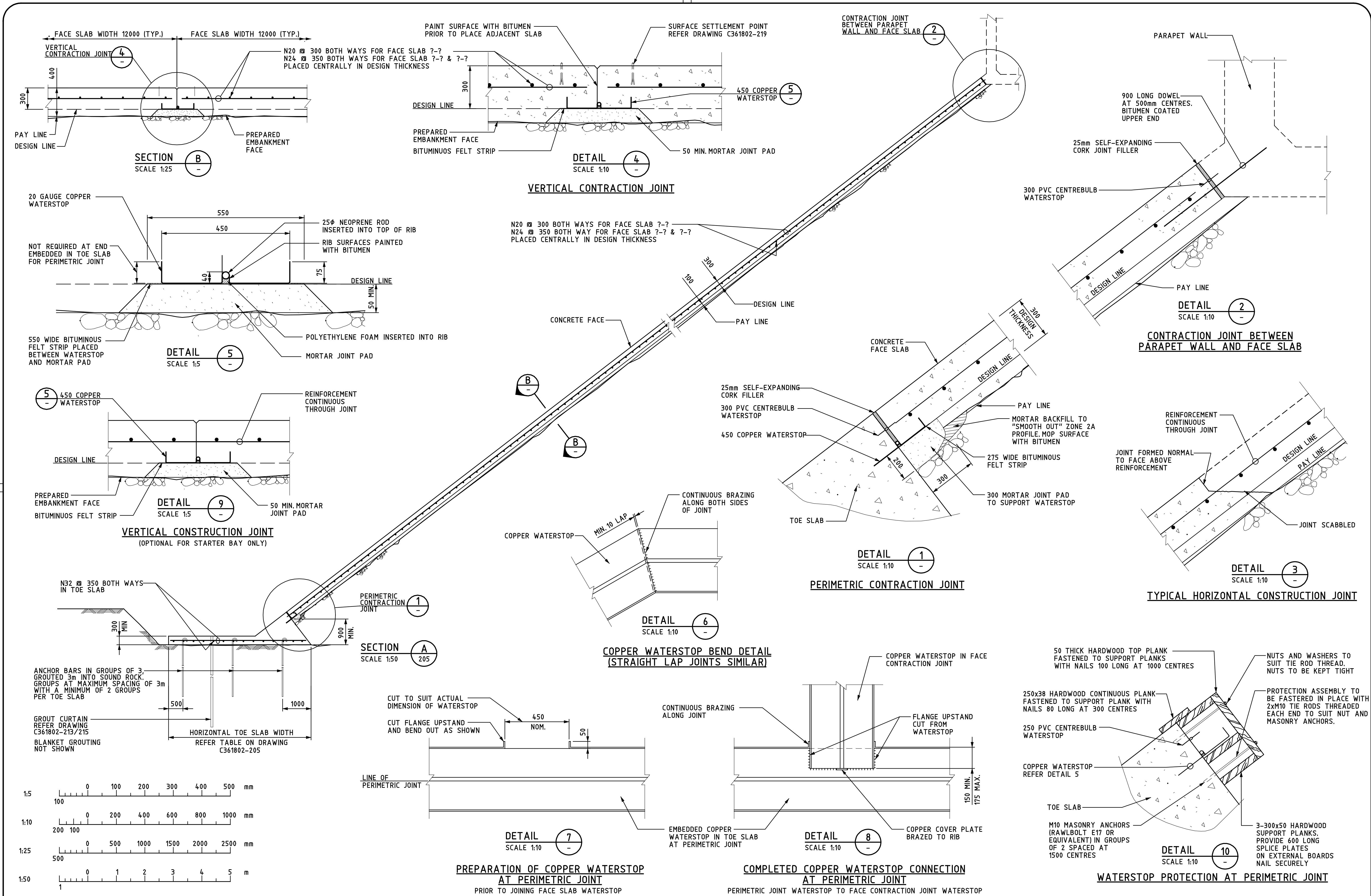
CONCRETE FACE & TOE SLAB -
CONCRETE & REINFORCEMENT DETAILS
Sheet 1 of 4

DES: P.R. CARTER CHK D. JAMIESON DRN C. ZHANG CHK P.R. CARTER

CADNAME: <>

C361802 - 205

B1


FACE SLAB WIDTH 12000 (TYP.)
FACE SLAB WIDTH 12000 (TYP.)
VERTICAL CONTRACTION JOINT 4
N20 @ 300 BOTH WAYS FOR FACE SLAB ?-?
N24 @ 350 BOTH WAYS FOR FACE SLAB ?-? & ?-?
PLACED CENTRALLY IN DESIGN THICKNESS
PAY LINE
DESIGN LINE
PREPARED EMBANKMENT FACE
SECTION B
SCALE 1:25
PAINT SURFACE WITH BITUMEN PRIOR TO PLACE ADJACENT SLAB
SURFACE SETTLEMENT POINT REFER DRAWING C361802-219
450 COPPER WATERSTOP 5
DESIGN LINE
PREPARED EMBANKMENT FACE
BITUMINUOS FELT STRIP
50 MIN. MORTAR JOINT PAD
DETAIL 4
SCALE 1:10
VERTICAL CONTRACTION JOINT
CONTRACTION JOINT BETWEEN PARAPET WALL AND FACE SLAB 2
PARAPET WALL
900 LONG DOWEL AT 500mm CENTRES. BITUMEN COATED UPPER END
25mm SELF-EXPANDING CORK JOINT FILLER
300 PVC CENTREBULB WATERSTOP
DESIGN LINE
PAY LINE
DETAIL 2
SCALE 1:10
CONTRACTION JOINT BETWEEN PARAPET WALL AND FACE SLAB
20 GAUGE COPPER WATERSTOP
550
450
25ϕ NEOPRENE ROD INSERTED INTO TOP OF RIB
RIB SURFACES PAINTED WITH BITUMEN
NOT REQUIRED AT END EMBEDDED IN TOE SLAB FOR PERIMETRIC JOINT
DESIGN LINE
50 MIN
550 WIDE BITUMINOUS FELT STRIP PLACED BETWEEN WATERSTOP AND MORTAR PAD
POLYETHYLENE FOAM INSERTED INTO RIB
MORTAR JOINT PAD
DETAIL 5
SCALE 1:5
N20 @ 300 BOTH WAYS FOR FACE SLAB ?-?
N24 @ 350 BOTH WAY FOR FACE SLAB ?-? & ?-?
PLACED CENTRALLY IN DESIGN THICKNESS
DESIGN LINE
PAY LINE
CONCRETE FACE
450 COPPER WATERSTOP 5
REINFORCEMENT CONTINUOUS THROUGH JOINT
DESIGN LINE
PREPARED EMBANKMENT FACE
BITUMINOUS FELT STRIP
50 MIN. MORTAR JOINT PAD
DETAIL 9
SCALE 1:5
VERTICAL CONSTRUCTION JOINT
(OPTIONAL FOR STARTER BAY ONLY)
CONCRETE FACE SLAB
DESIGN THICKNESS 300
25mm SELF-EXPANDING CORK FILLER
300 PVC CENTREBULB WATERSTOP
450 COPPER WATERSTOP
PAY LINE
MORTAR BACKFILL TO "SMOOTH OUT" ZONE 2A PROFILE. MOP SURFACE WITH BITUMEN
275 WIDE BITUMINOUS FELT STRIP
300 MORTAR JOINT PAD TO SUPPORT WATERSTOP
TOE SLAB
DETAIL 1
SCALE 1:10
PERIMETRIC CONTRACTION JOINT
REINFORCEMENT CONTINUOUS THROUGH JOINT
JOINT FORMED NORMAL TO FACE ABOVE REINFORCEMENT
DESIGN LINE
PAY LINE
JOINT SCABBLED
DETAIL 3
SCALE 1:10
TYPICAL HORIZONTAL CONSTRUCTION JOINT
COPPER WATERSTOP
MIN. 10 LAP
CONTINUOUS BRAZING ALONG BOTH SIDES OF JOINT
DETAIL 6
SCALE 1:10
COPPER WATERSTOP BEND DETAIL (STRAIGHT LAP JOINTS SIMILAR)
N32 @ 350 BOTH WAYS IN TOE SLAB
PERIMETRIC CONTRACTION JOINT 1
300 MIN
900 MIN.
SECTION A
SCALE 1:50
205
ANCHOR BARS IN GROUPS OF 3, GROUTED 3m INTO SOUND ROCK. GROUPS AT MAXIMUM SPACING OF 3m WITH A MINIMUM OF 2 GROUPS PER TOE SLAB
500
1000
GROUT CURTAIN REFER DRAWING C361802-213/215
HORIZONTAL TOE SLAB WIDTH REFER TABLE ON DRAWING C361802-205
BLANKET GROUTING NOT SHOWN
CUT TO SUIT ACTUAL DIMENSION OF WATERSTOP
450 NOM.
CUT FLANGE UPSTAND AND BEND OUT AS SHOWN
50
LINE OF PERIMETRIC JOINT
EMBEDDED COPPER WATERSTOP IN TOE SLAB AT PERIMETRIC JOINT
DETAIL 7
SCALE 1:10
PREPARATION OF COPPER WATERSTOP AT PERIMETRIC JOINT
PRIOR TO JOINING FACE SLAB WATERSTOP
COPPER WATERSTOP IN FACE CONTRACTION JOINT
CONTINUOUS BRAZING ALONG JOINT
FLANGE UPSTAND CUT FROM WATERSTOP
150 MIN. 175 MAX.
COPPER COVER PLATE BRAZED TO RIB
DETAIL 8
SCALE 1:10
COMPLETED COPPER WATERSTOP CONNECTION AT PERIMETRIC JOINT
PERIMETRIC JOINT WATERSTOP TO FACE CONTRACTION JOINT WATERSTOP
50 THICK HARDWOOD TOP PLANK FASTENED TO SUPPORT PLANKS WITH NAILS 100 LONG AT 1000 CENTRES
NUTS AND WASHERS TO SUIT TIE ROD THREAD. NUTS TO BE KEPT TIGHT
250x38 HARDWOOD CONTINUOUS PLANK FASTENED IN SUPPORT PLANK WITH NAILS 80 LONG AT 300 CENTRES
PROTECTION ASSEMBLY TO BE FASTERED IN PLACE WITH 2xM10 TIE RODS THREADED EACH END TO SUIT NUT AND MASONRY ANCHORS.
250 PVC CENTREBULB WATERSTOP
COPPER WATERSTOP REFER DETAIL 5
TOE SLAB
M10 MASONRY ANCHORS (RAWLBOLT E17 OR EQUIVALENT) IN GROUPS OF 2 SPACED AT 1500 CENTRES
3-300x50 HARDWOOD SUPPORT PLANKS. PROVIDE 600 LONG SPLICE PLATES ON EXTERNAL BOARDS NAIL SECURELY
DETAIL 10
SCALE 1:10
WATERSTOP PROTECTION AT PERIMETRIC JOINT
1:5 0 100 200 300 400 500 mm
1:10 0 200 400 600 800 1000 mm
1:25 0 500 1000 1500 2000 2500 mm
1:50 0 1 2 3 4 5 m

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

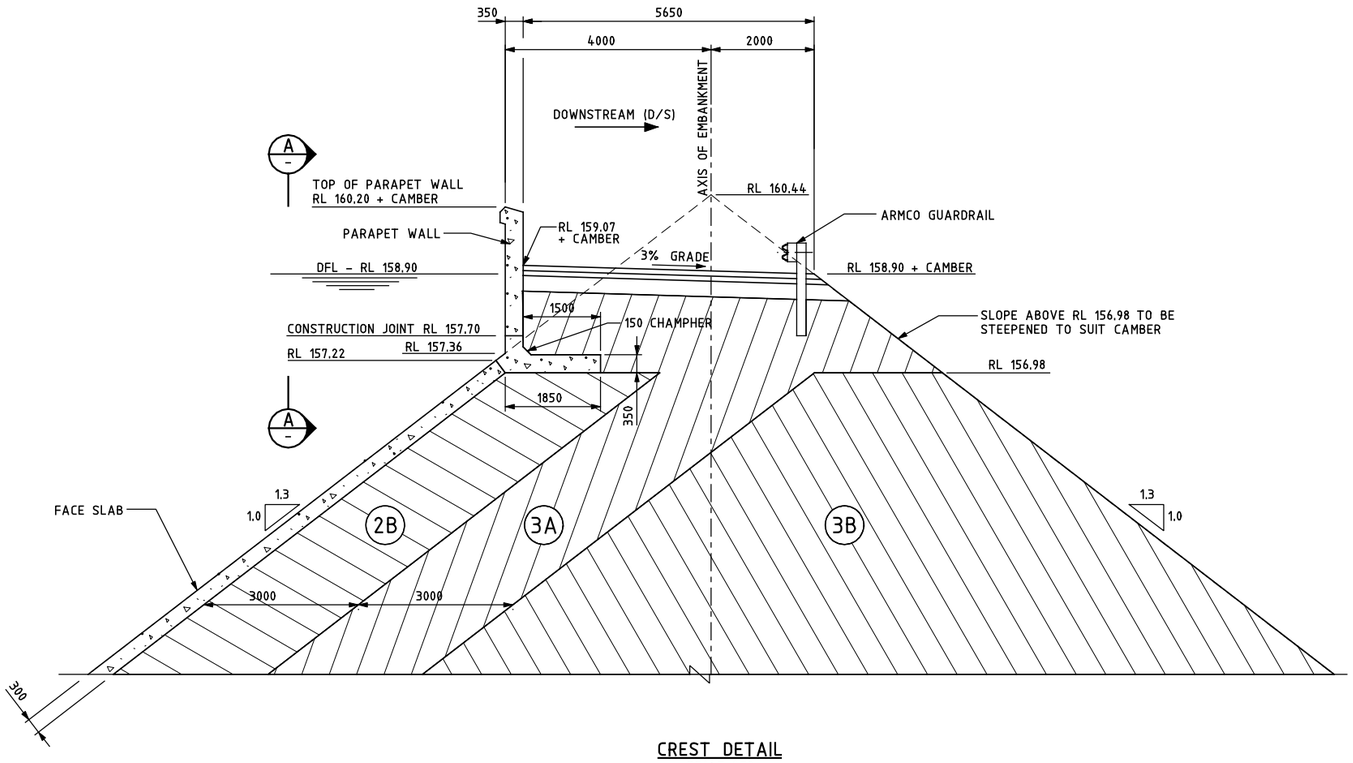
CONCRETE FACE & TOE SLAB – CONCRETE & REINFORCEMENT DETAILS
Sheet 2 of 4

C361802 -206

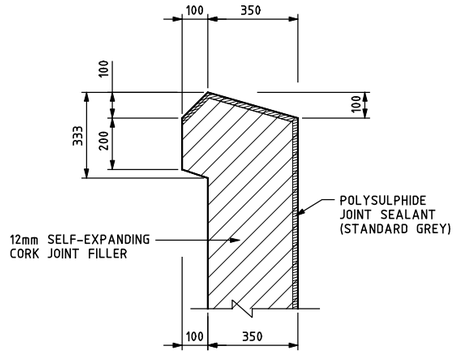
DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

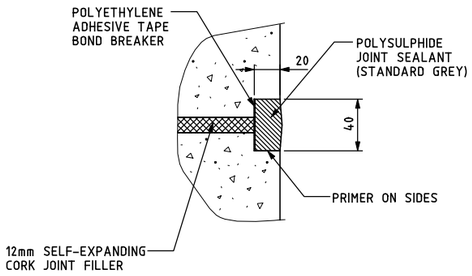
B1



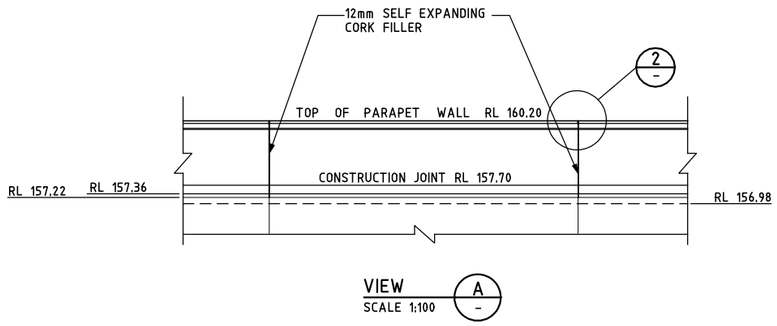
CREST DETAIL
SCALE 1:50



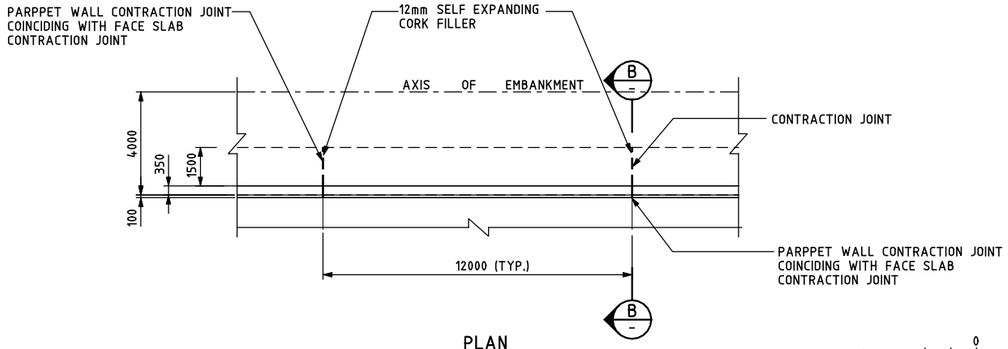
DETAIL 1
SCALE 1:10



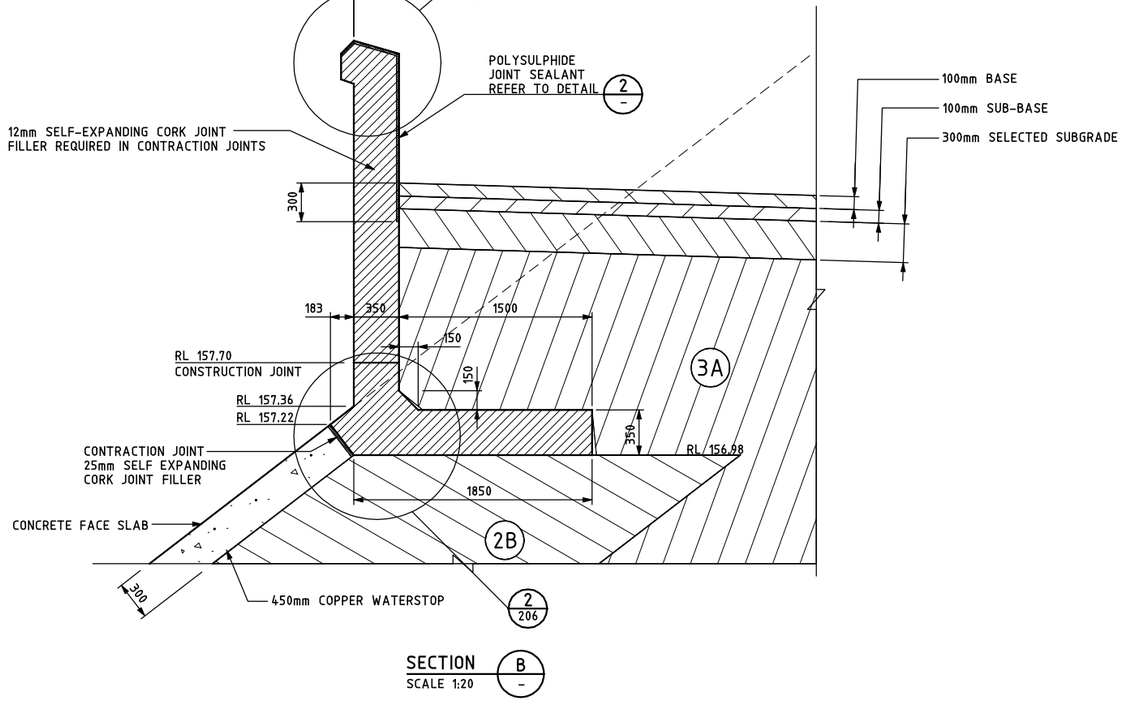
DETAIL 2
SCALE 1:2



VIEW A
SCALE 1:100



PLAN
SCALE 1:100



SECTION B
SCALE 1:20

1:2 0 40 80 120 160 200 mm (40 20)
1:10 0 200 400 600 800 1000 mm (200 100)
1:50 0 1 2 3 4 5 m (1)
1:100 0 2 4 6 8 10 m (2 1)

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
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2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 603 932 607

PARAPET WALL CONCRETE DETAILS
Sheet 1 of 2

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

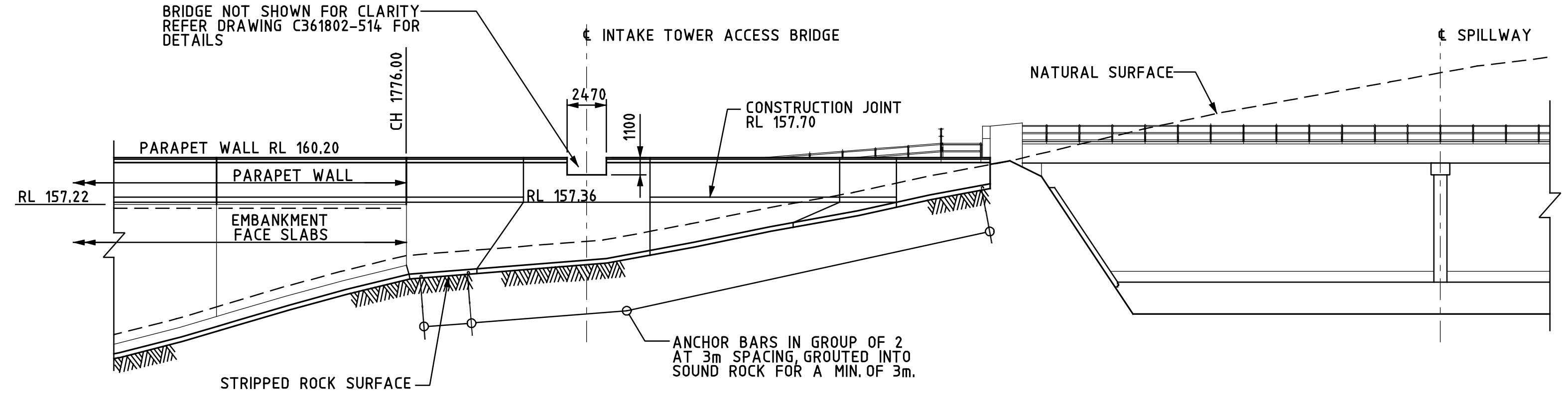
CADNAME: <>

CAD File:

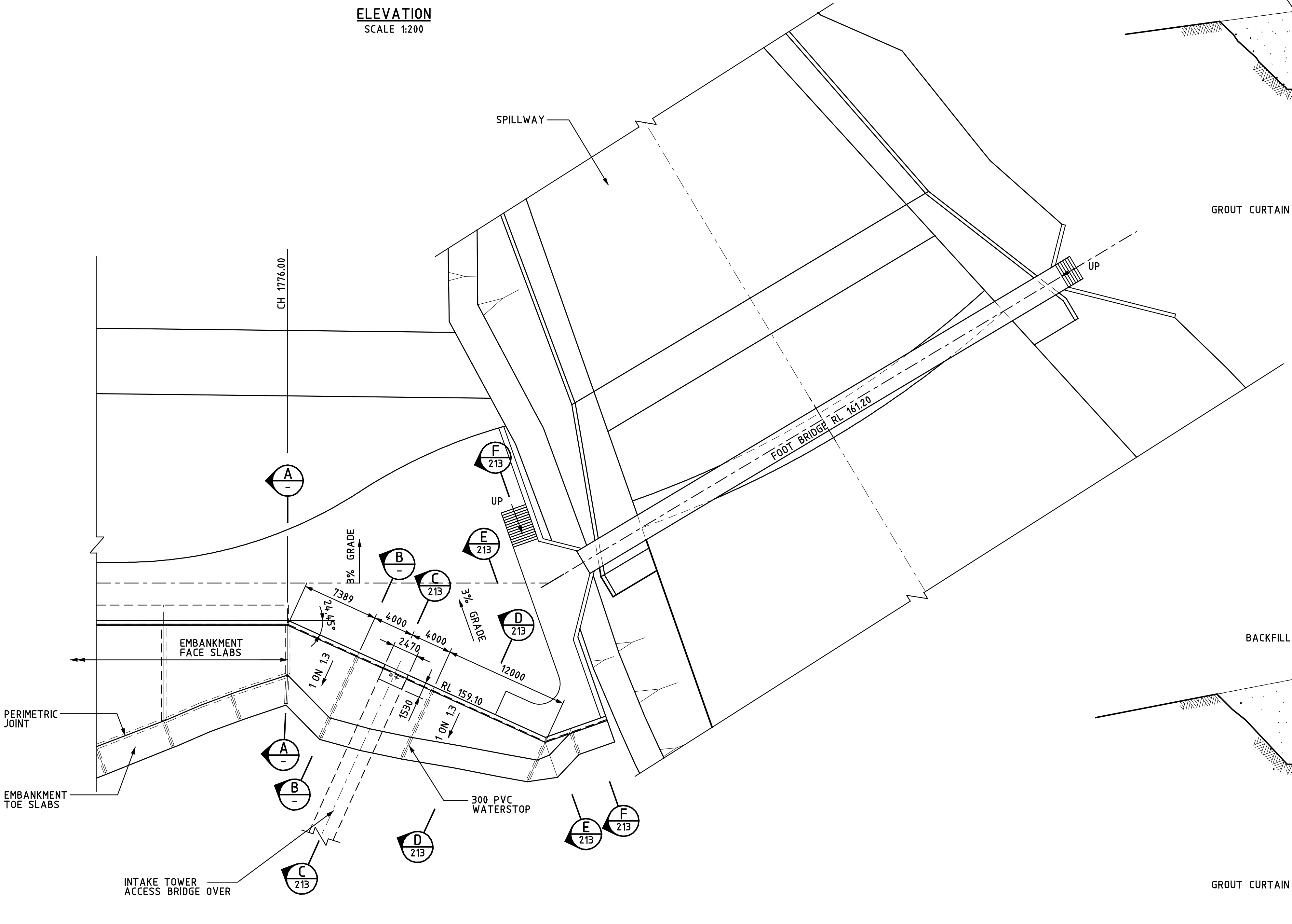
C361802 -209

Sheet <> of <> Sheets

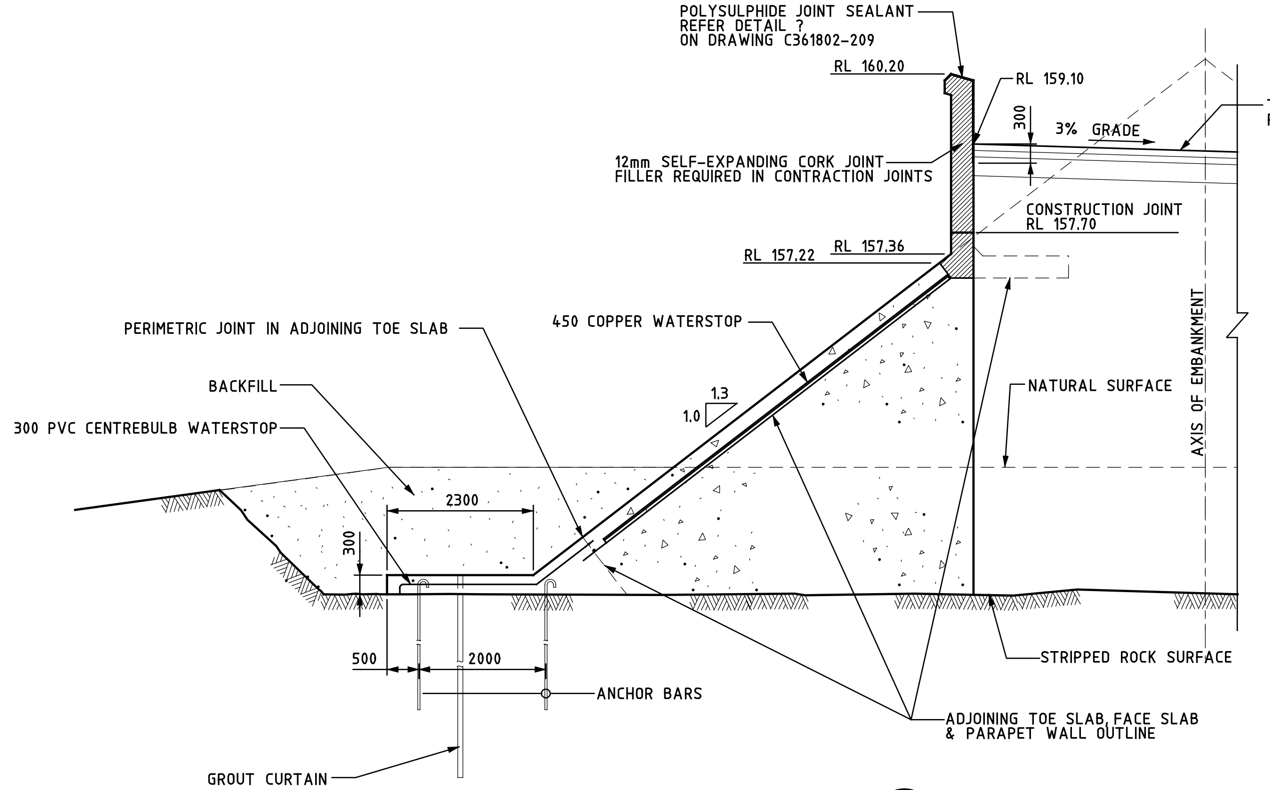
B1



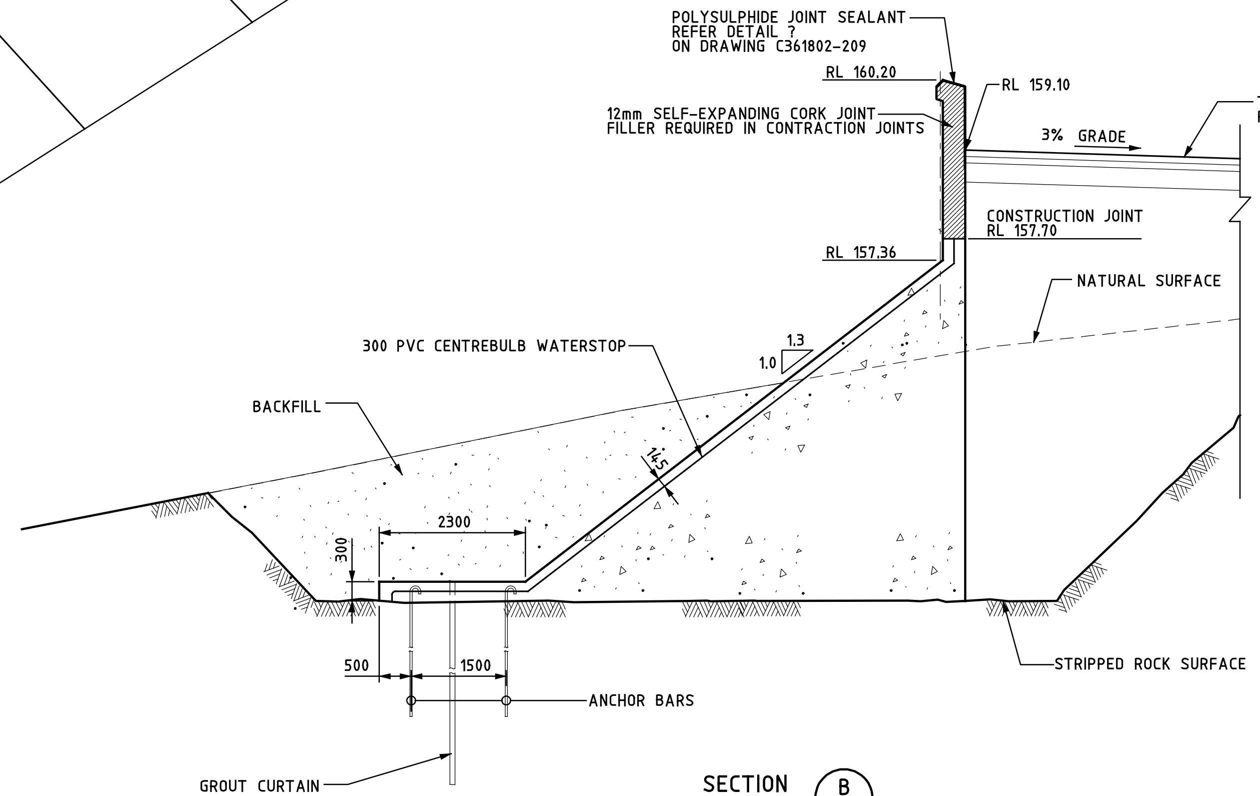
ELEVATION
SCALE 1:200



PLAN
SCALE 1:200



SECTION A
SCALE 1:50



SECTION B
SCALE 1:50

REVISION

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1:50 0 1 2 3 4 5 m
1:200 0 4 8 12 16 20 m

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
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DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

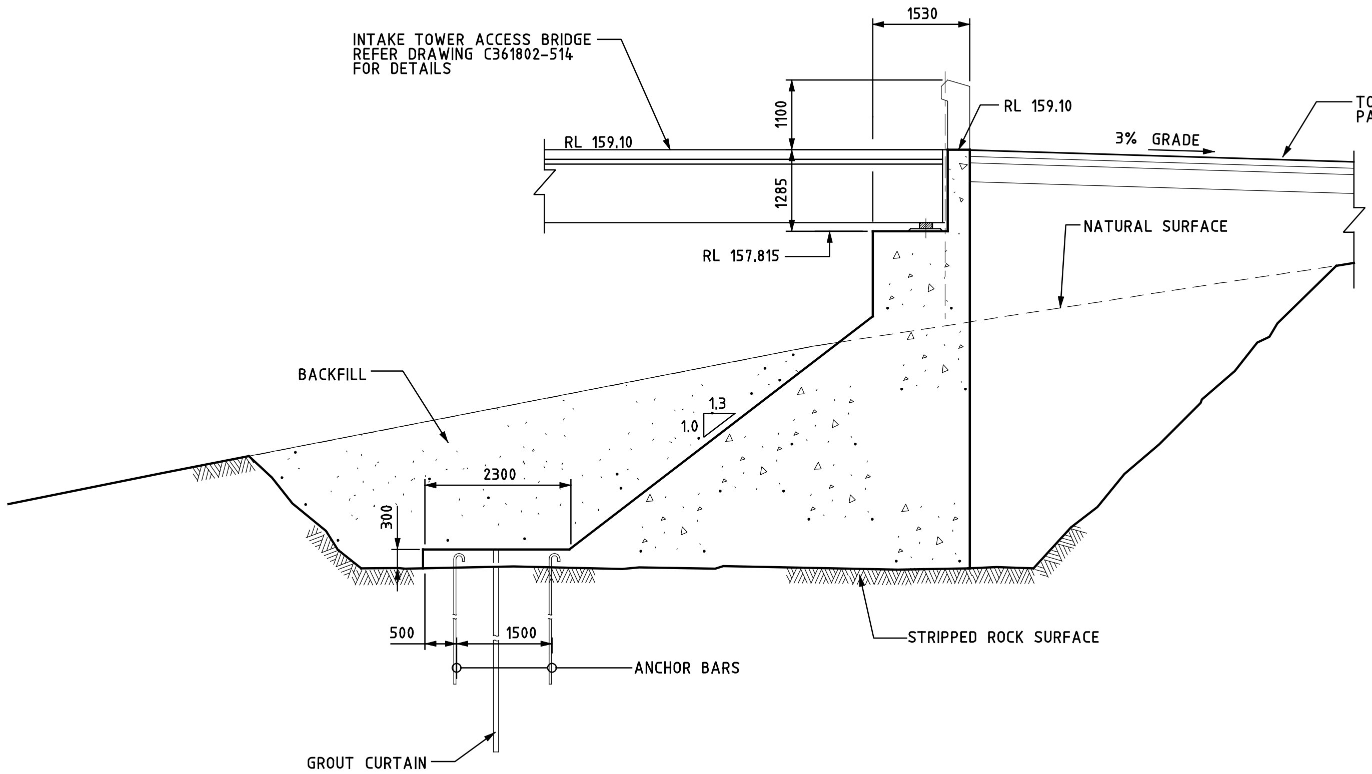
RIGHT ABUTMENT
CONCRETE DETAILS
Sheet 1 of 2

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

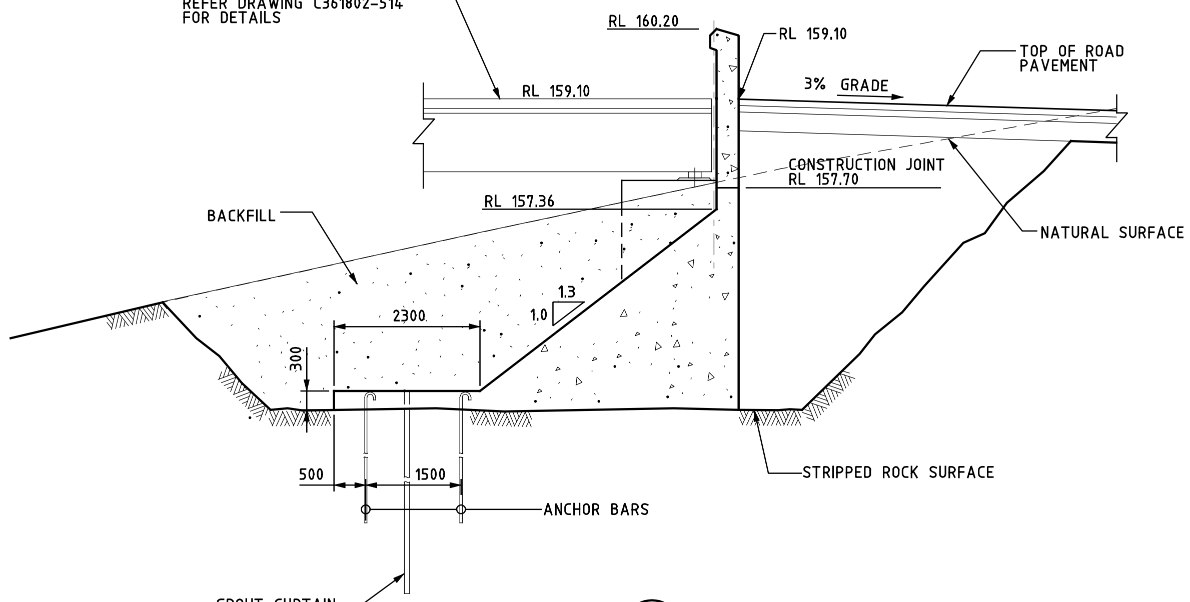
CADNAME: <>

C361802 -212

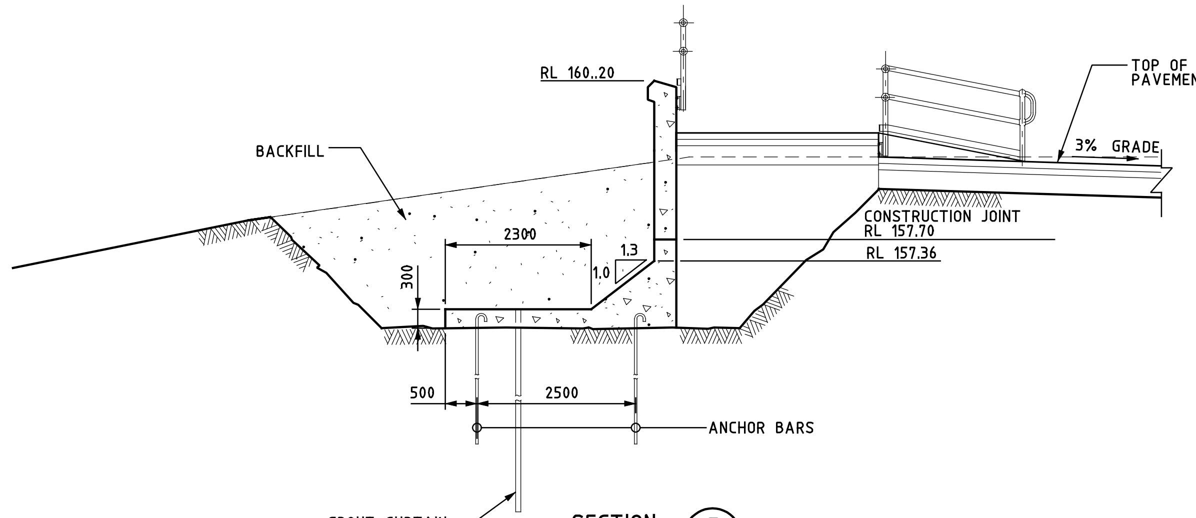
B1



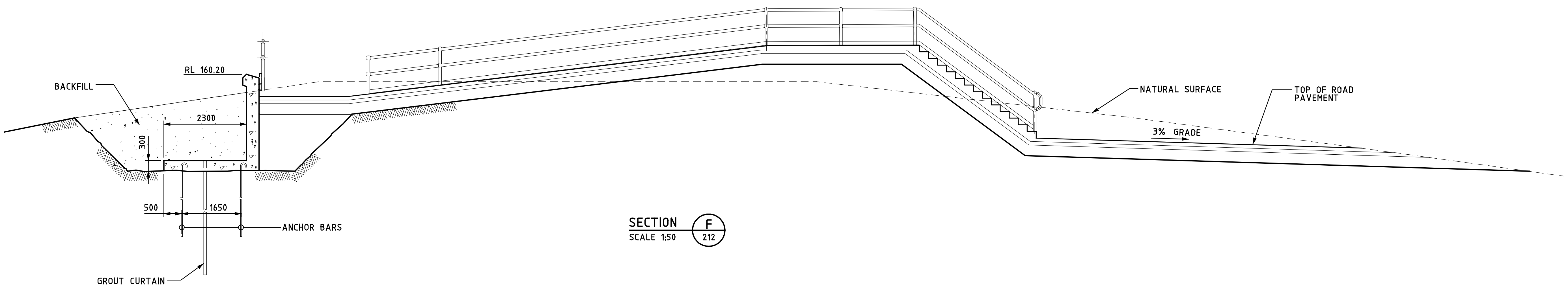
SECTION C
SCALE 1:50
212



SECTION D
SCALE 1:50
212



SECTION E
SCALE 1:50
212



SECTION F
SCALE 1:50
212

REVISION

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1:50 0 1 2 3 4 5 m

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
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DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

RIGHT ABUTMENT
CONCRETE DETAILS
Sheet 2 of 2

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

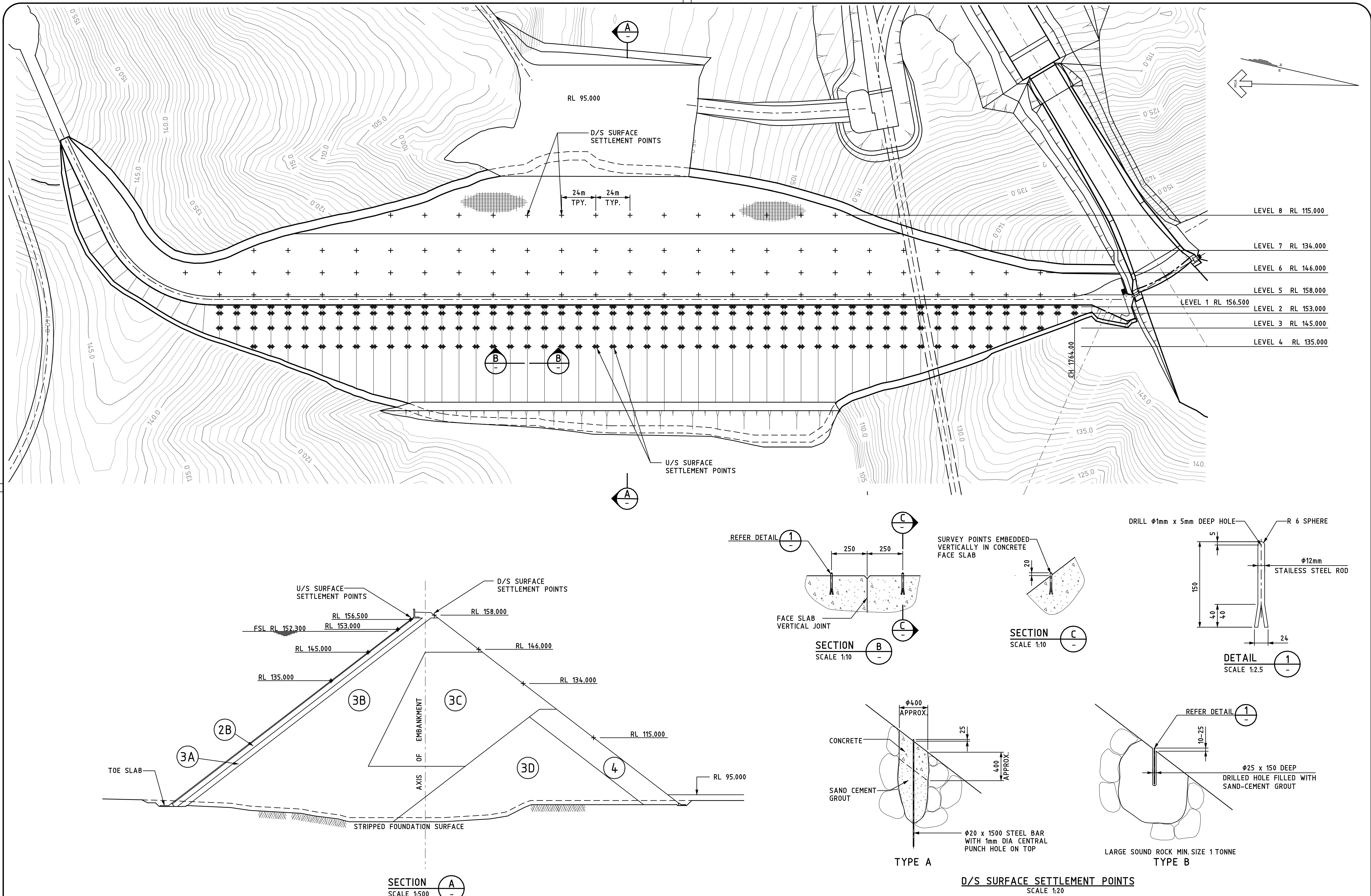
CADNAME: <>

CAD Files:

C361802 -213

Sheet <> of <> Sheets

B1



REVISION

DRAFT COPY

1:1000 — 20 10 0 20 40 60 80 100 m

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
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NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
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2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

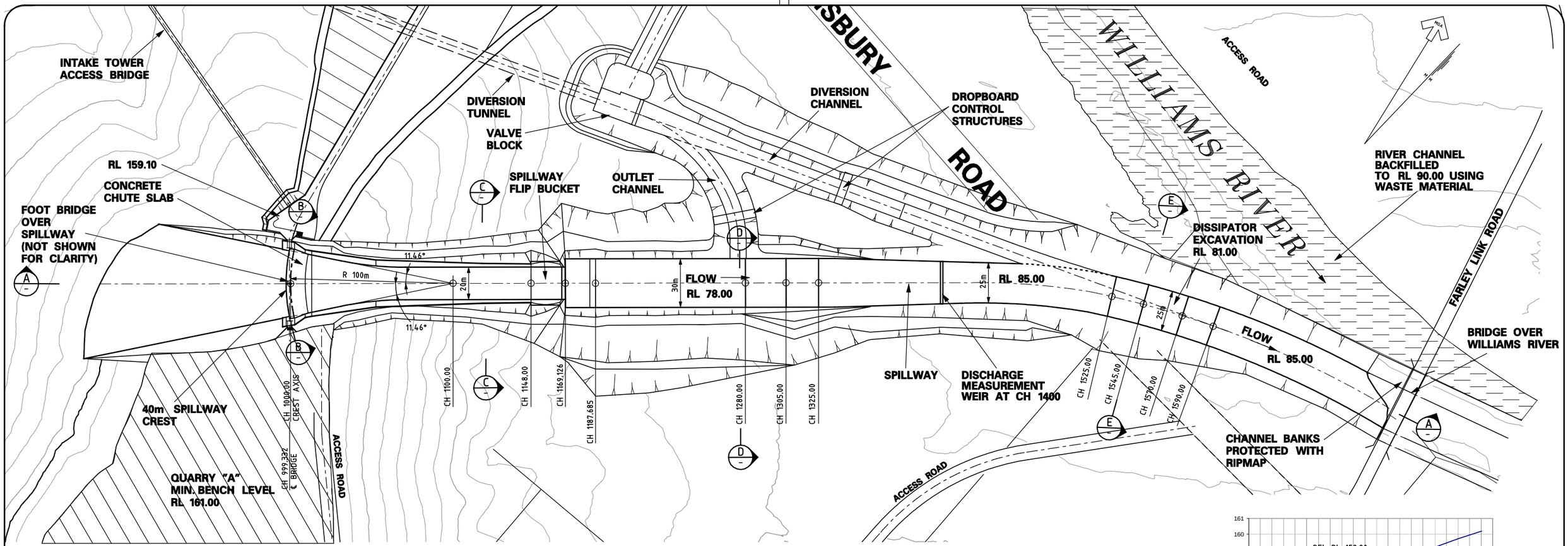
INSTRUMENTATION
Sheet 1 of 2

DES: P.R. CARTER CHK D. JAMIESON DRN C. ZHANG CHK P.R. CARTER

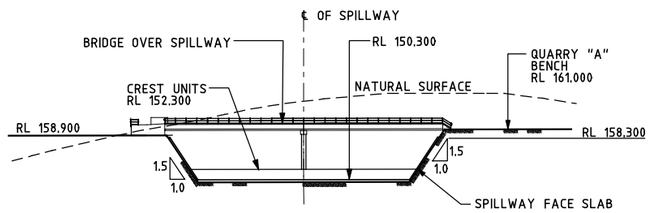
CADNAME: <>

C361802 - 219

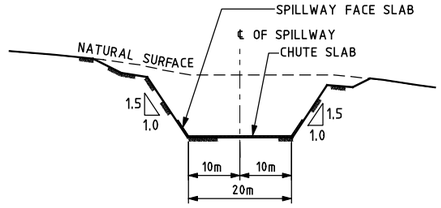
B1



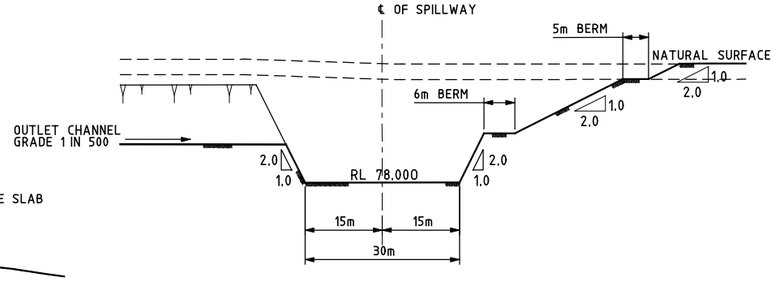
PLAN
SCALE 1:1000



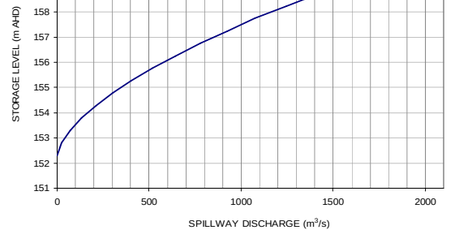
SECTION B
SCALE 1:500



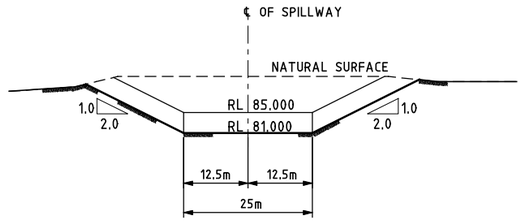
SECTION C
SCALE 1:500



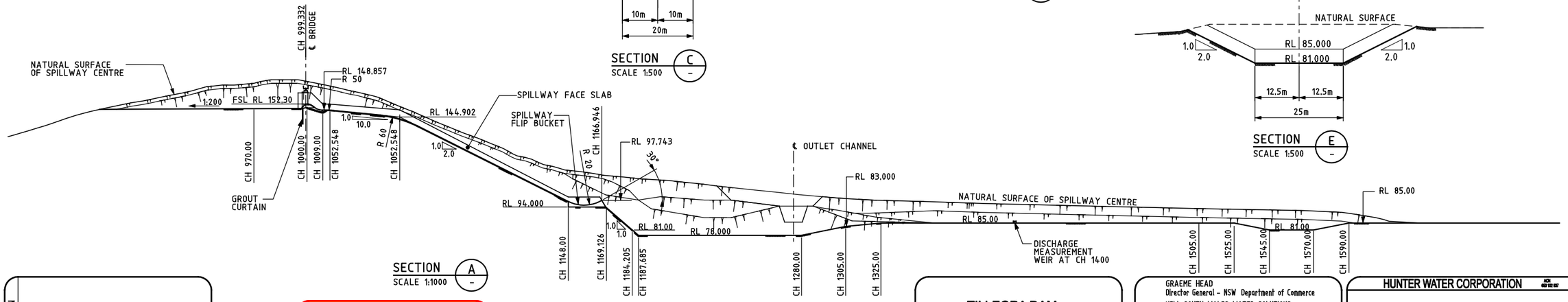
SECTION D
SCALE 1:500



SPILLWAY RATING CURVE



SECTION E
SCALE 1:500



SECTION A
SCALE 1:1000

DRAFT COPY

1:500 0 10 20 30 40 50 m
1:1000 0 20 40 60 80 100 m

REVISION

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
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DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 603 932 607

SPILLWAY ARRANGEMENT

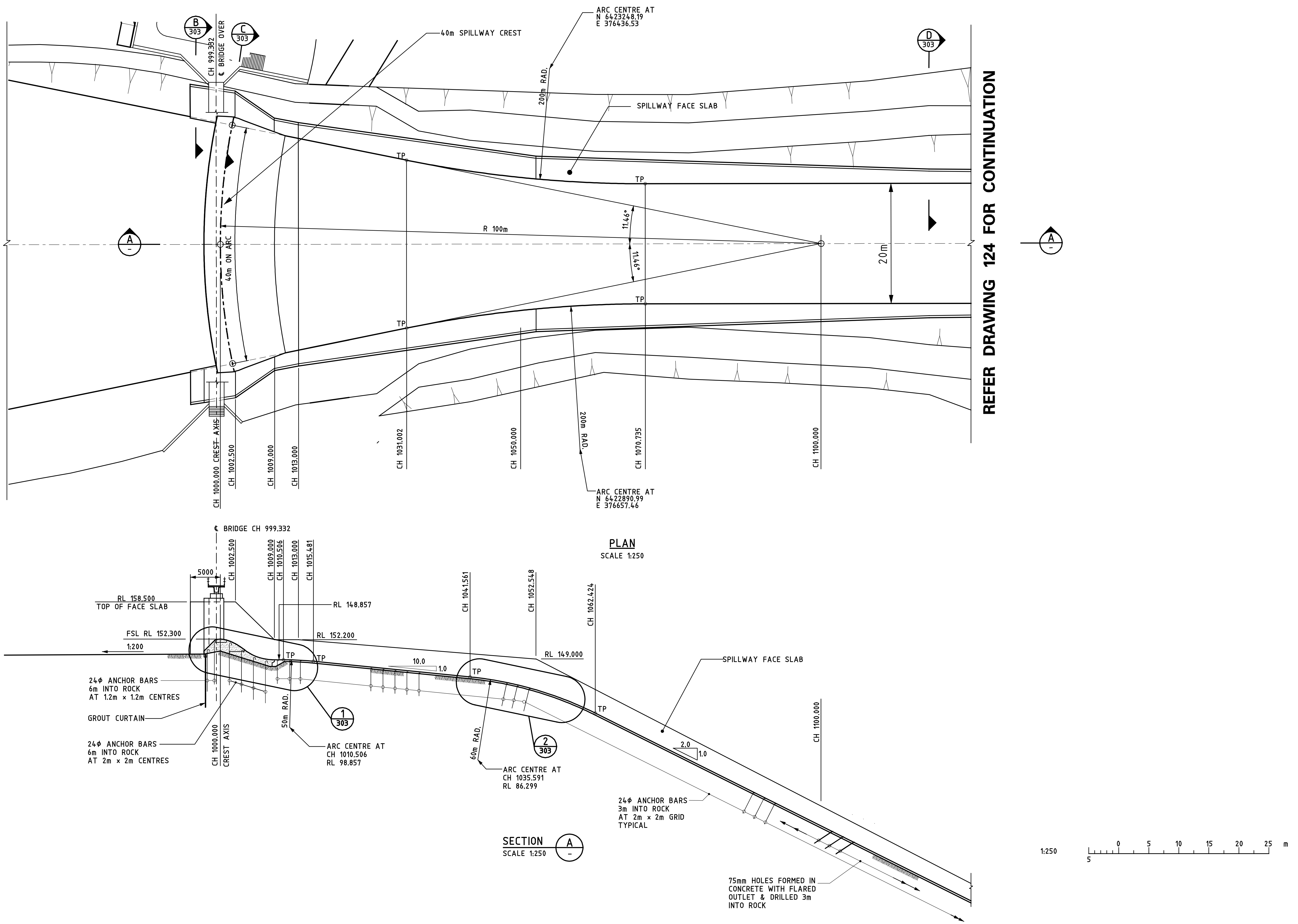
CAD File: C361802 -301

DES:	K. HONG	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	K. HONG

CADNAME: <>

Sheet <> of <> Sheets

B1



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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
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2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

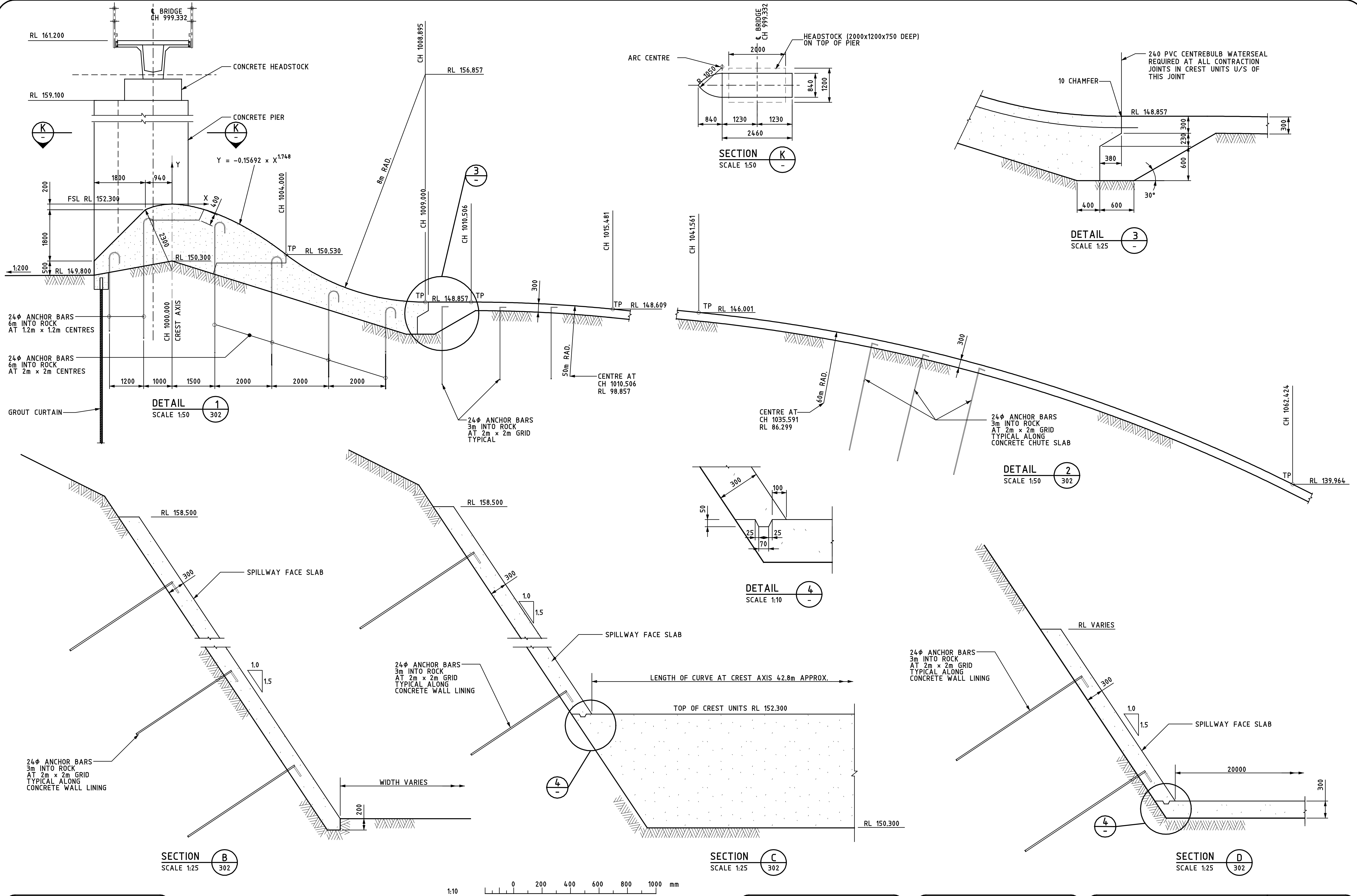
CREST & UPPER CHUTE DETAILS
Sheet 1 of 2

C361802 -302

DES: K. HONG | CHK P.R. CARTER | DRN C. ZHANG | CHK K. HONG

CADNAME: <>

B1



REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NSW WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

CREST & UPPER CHUTE DETAILS
Sheet 2 of 2

C361802 -303

DES: K. HONG | CHK: P.R. CARTER | DRN: C. ZHANG | CHK: K. HONG

CADNAME:

B1

REFER DRAWING 122 FOR CONTINUATION

D 303

E 305

F 305

SPILLWAY FACE SLAB

SPILLWAY FLIP BUCKET

A –

A –

2.0m

CH 1100.00

CH 1148.000

CH 1156.946

CH 1165.807

CH 1166.946

CH 1169.126

CH 1184.205

CH 1187.685

75mm HOLES FORMED IN CONCRETE WITH FLARED OUTLET & DRILLED 3m INTO ROCK

24ϕ ANCHOR BARS 3m LONG INTO ROCK AT 2m x 2m GRID TYPICAL

ARC CENTRE AT CH 1156.946 RL 115.063

SPILLWAY FLIP BUCKET

20m RAD.

30°

RL 99.700

TP RL 97.174

RL 97.743

RL 94.000

RL 81.000

RL 78.000

S 305

24ϕ ANCHOR BARS 5m INTO ROCK AT 2m x 2m GRID TYPICAL FOR FLIP BUCKET

SECTION A –
SCALE 1:250

1:250

0 5 10 15 20 25 m
5

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 058 522 837

SPILLWAY LOWER CHUTE & FLIP BUCKET DETAILS
Sheet 1 of 2

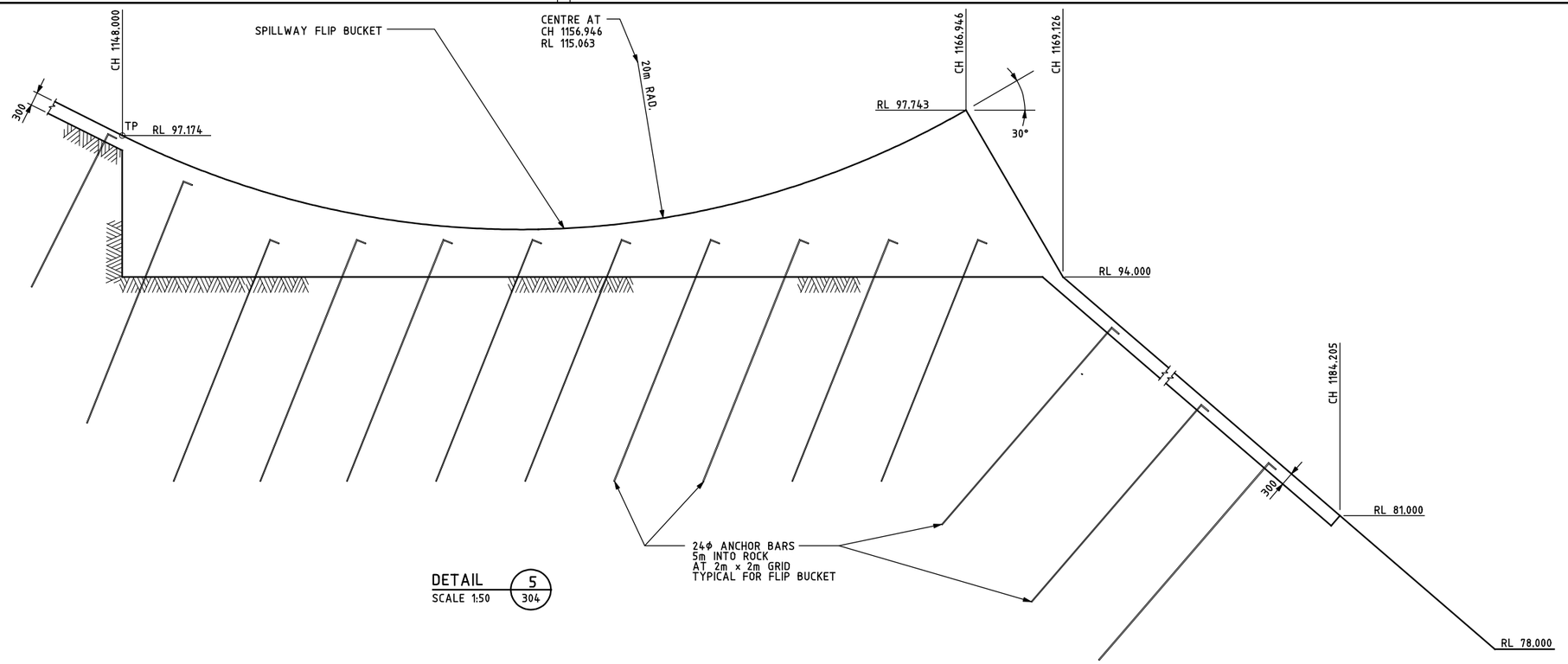
CAD File: C361802 -304

DES:	K. HONG	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	K. HONG

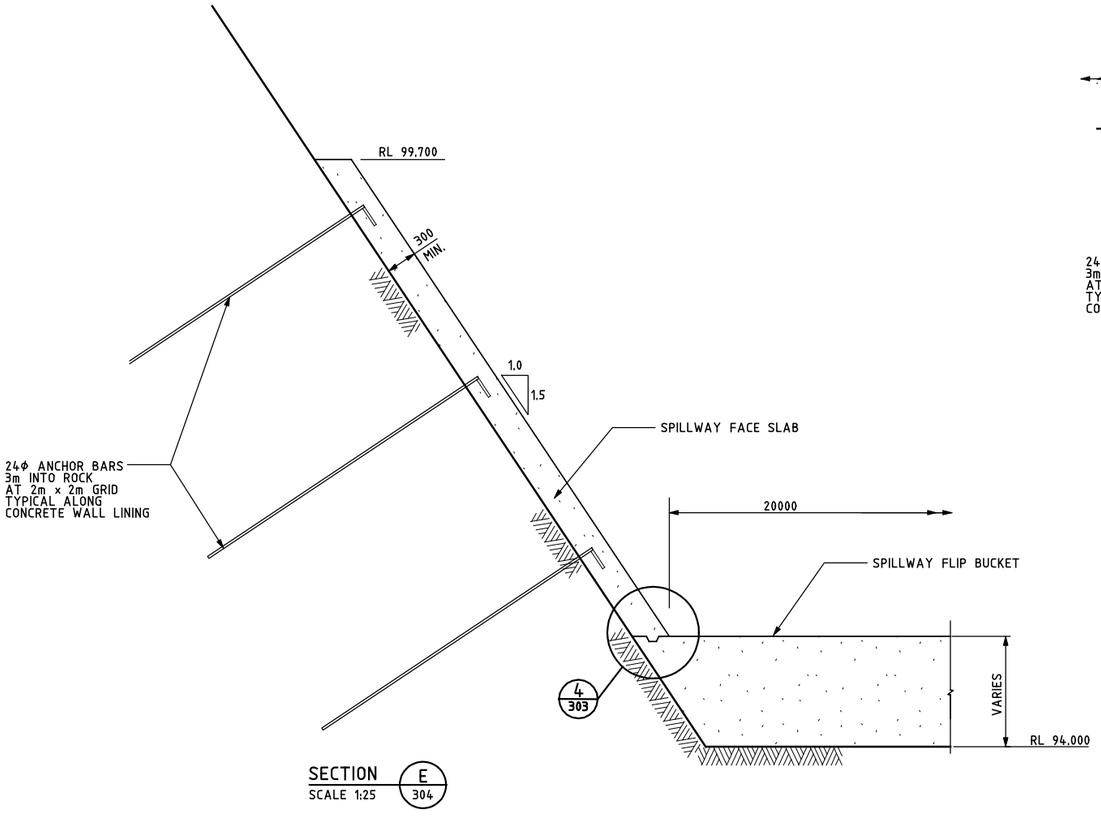
CADNAME: <>

Sheet <> of <> Sheets

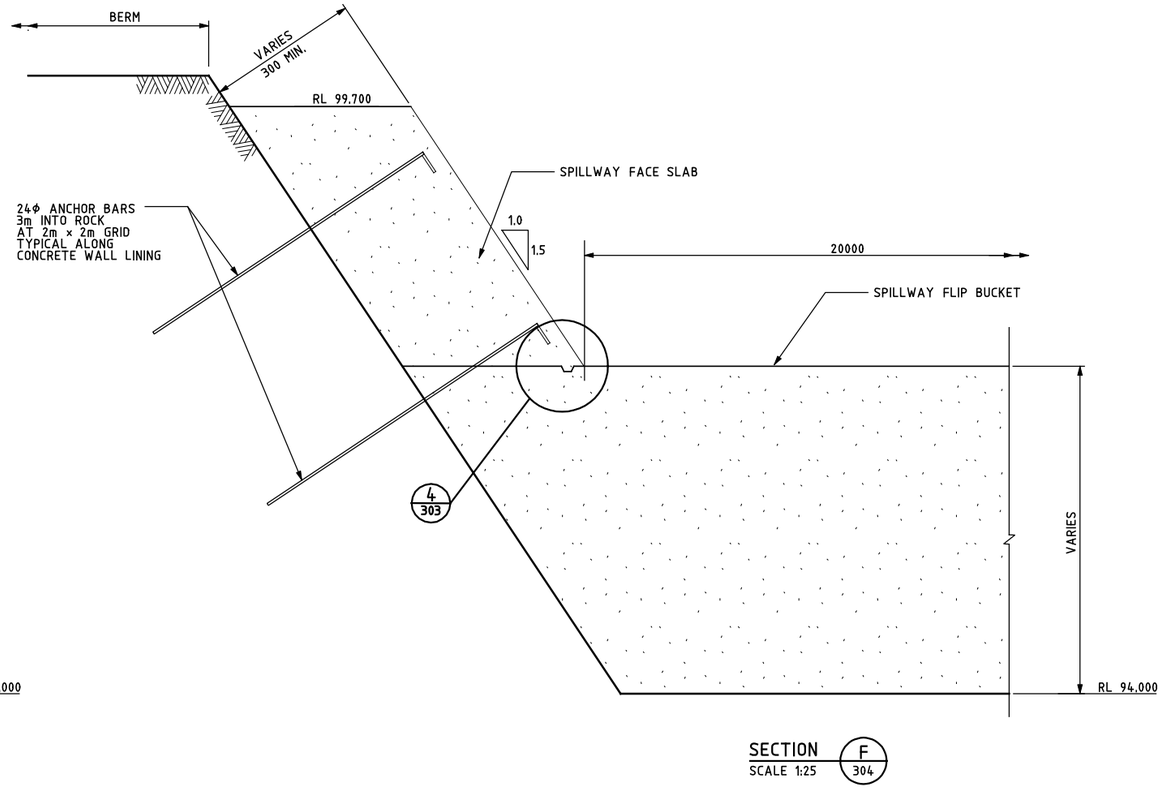
B1



DETAIL 5 / 304
SCALE 1:50



SECTION E / 304
SCALE 1:25



SECTION F / 304
SCALE 1:25

REVISION

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1:25 0 500 1000 1500 2000 2500 mm
500
1:50 0 1 2 3 4 5 m
1

TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 122 037

SPILLWAY LOWER CHUTE
& FLIP BUCKET DETAILS
Sheet 2 of 2

CAD File: C361802 -305

DES:	K. HONG	CHK	P.R. CARTER	DRN	C. ZHANG	CHK	K. HONG

CADNAME: <>

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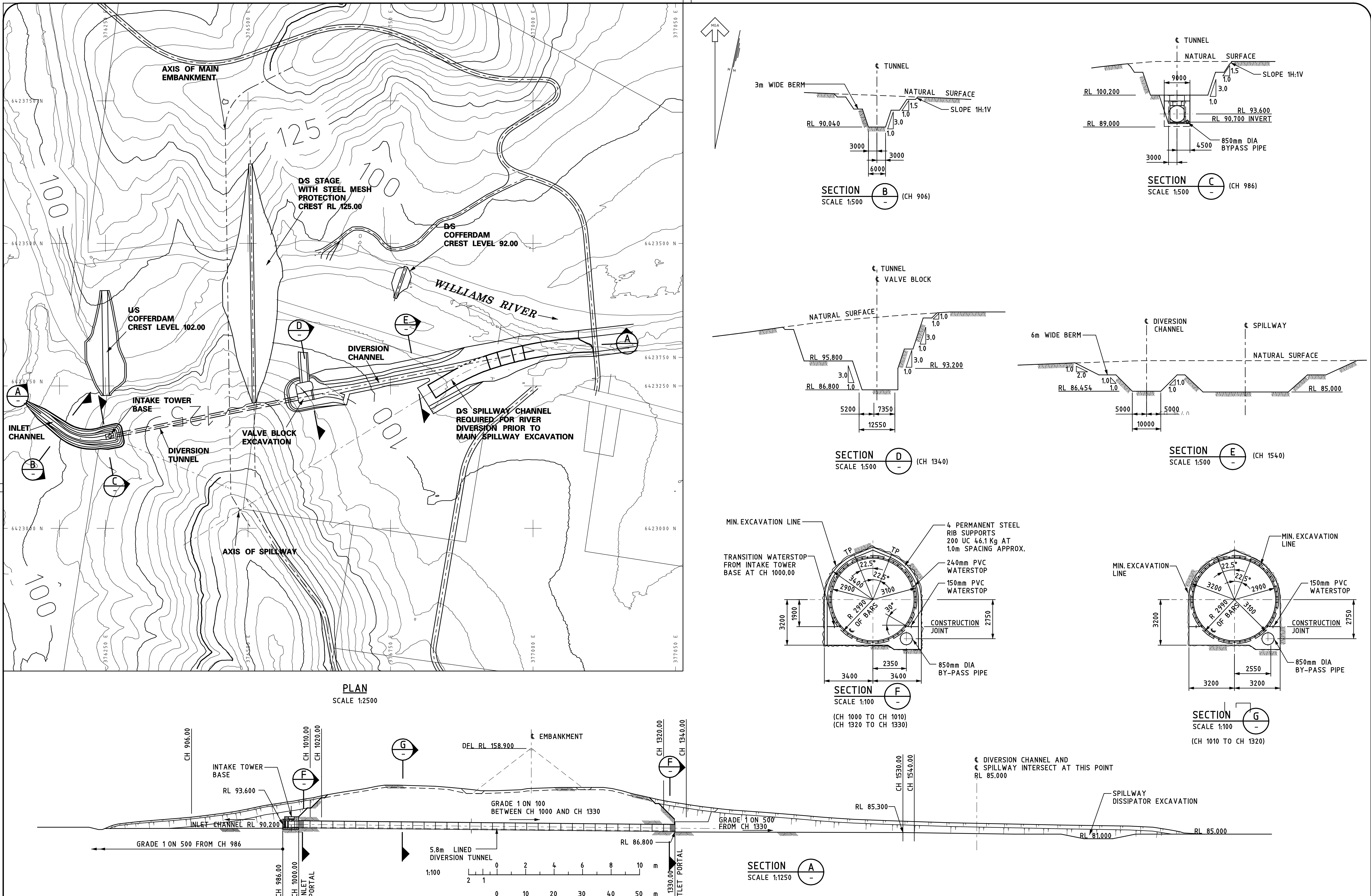
CONSULTANTS DRAWING

B1



REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

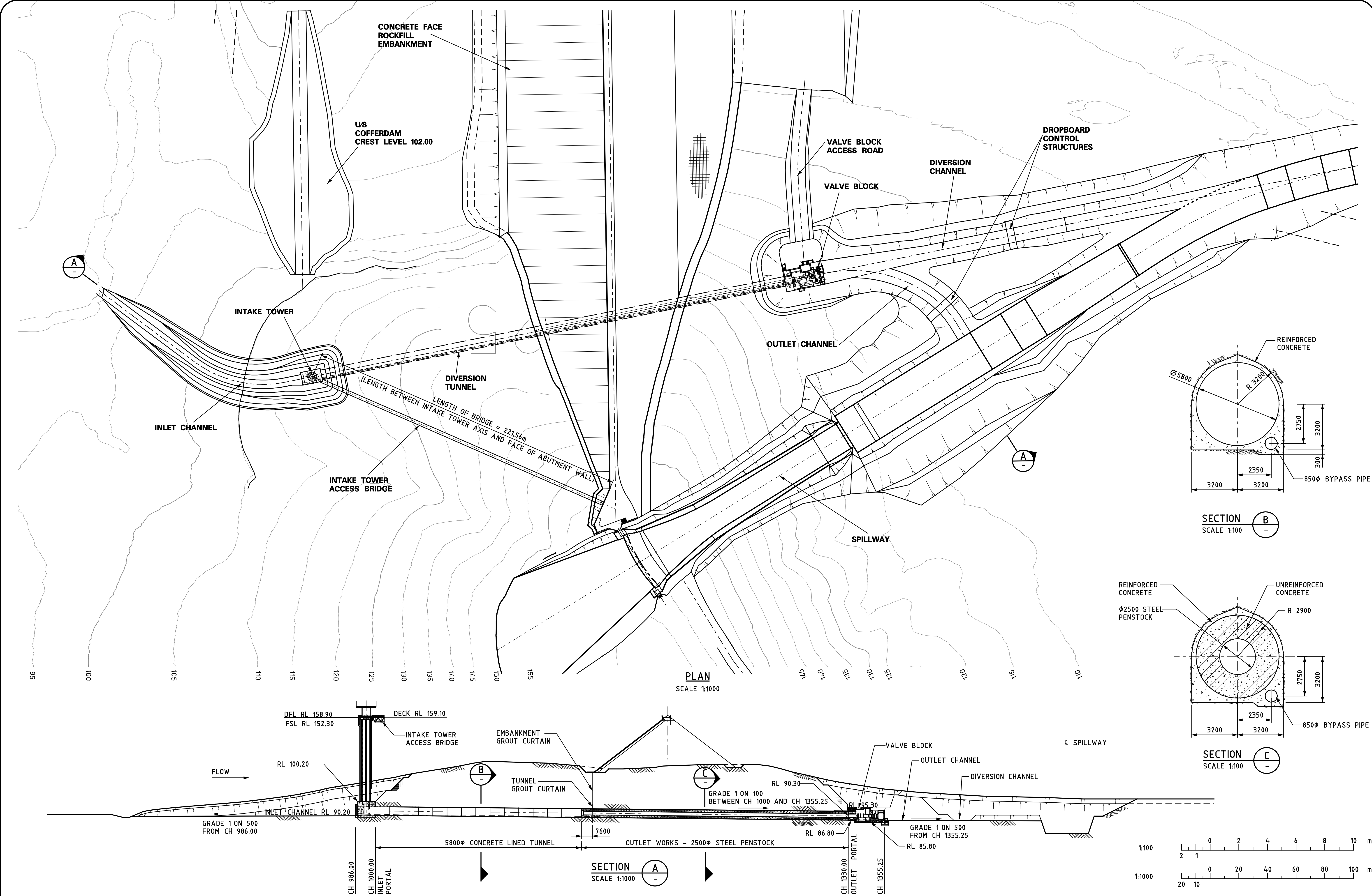
HUNTER WATER CORPORATION

DIVERSION WORK
ARRANGEMENT & SECTIONS

C361802 - 401

DES: P.R. CARTER | CHK: D. JAMIESON | DRN: C. ZHANG | CHK: P.R. CARTER

B1


CONCRETE FACE ROCKFILL EMBANKMENT
U/S COFFERDAM CREST LEVEL 102.00
VALVE BLOCK ACCESS ROAD
VALVE BLOCK
DIVERSION CHANNEL
DROPBOARD CONTROL STRUCTURES
INTAKE TOWER
OUTLET CHANNEL
DIVERSION TUNNEL
INLET CHANNEL
LENGTH OF BRIDGE = 221.56m
(LENGTH BETWEEN INTAKE TOWER AXIS AND FACE OF ABUTMENT WALL)
INTAKE TOWER ACCESS BRIDGE
SPILLWAY
PLAN
SCALE 1:1000
REINFORCED CONCRETE
Ø5800
R 3200
2750
3200
300
2350
3200
3200
850ϕ BYPASS PIPE
SECTION B
SCALE 1:100
REINFORCED CONCRETE
ϕ2500 STEEL PENSTOCK
UNREINFORCED CONCRETE
R 2900
SECTION C
SCALE 1:100
DFL RL 158.90
FSL RL 152.30
DECK RL 159.10
INTAKE TOWER ACCESS BRIDGE
EMBANKMENT GROUT CURTAIN
FLOW
RL 100.20
TUNNEL GROUT CURTAIN
RL 90.30
GRADE 1 ON 100 BETWEEN CH 1000 AND CH 1355.25
INLET CHANNEL RL 90.20
GRADE 1 ON 500 FROM CH 986.00
7600
5800ϕ CONCRETE LINED TUNNEL
OUTLET WORKS – 2500ϕ STEEL PENSTOCK
RL 95.30
RL 86.80
RL 85.80
VALVE BLOCK
OUTLET CHANNEL
DIVERSION CHANNEL
℄ SPILLWAY
GRADE 1 ON 500 FROM CH 1355.25
CH 986.00
CH 1000.00 INLET PORTAL
CH 1330.00 OUTLET PORTAL
CH 1355.25
SECTION A
SCALE 1:1000
1:100
1:1000
m

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TILLEGRA DAM
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Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

OUTLET WORKS ARRANGEMENT
Sheet 1 of 2

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

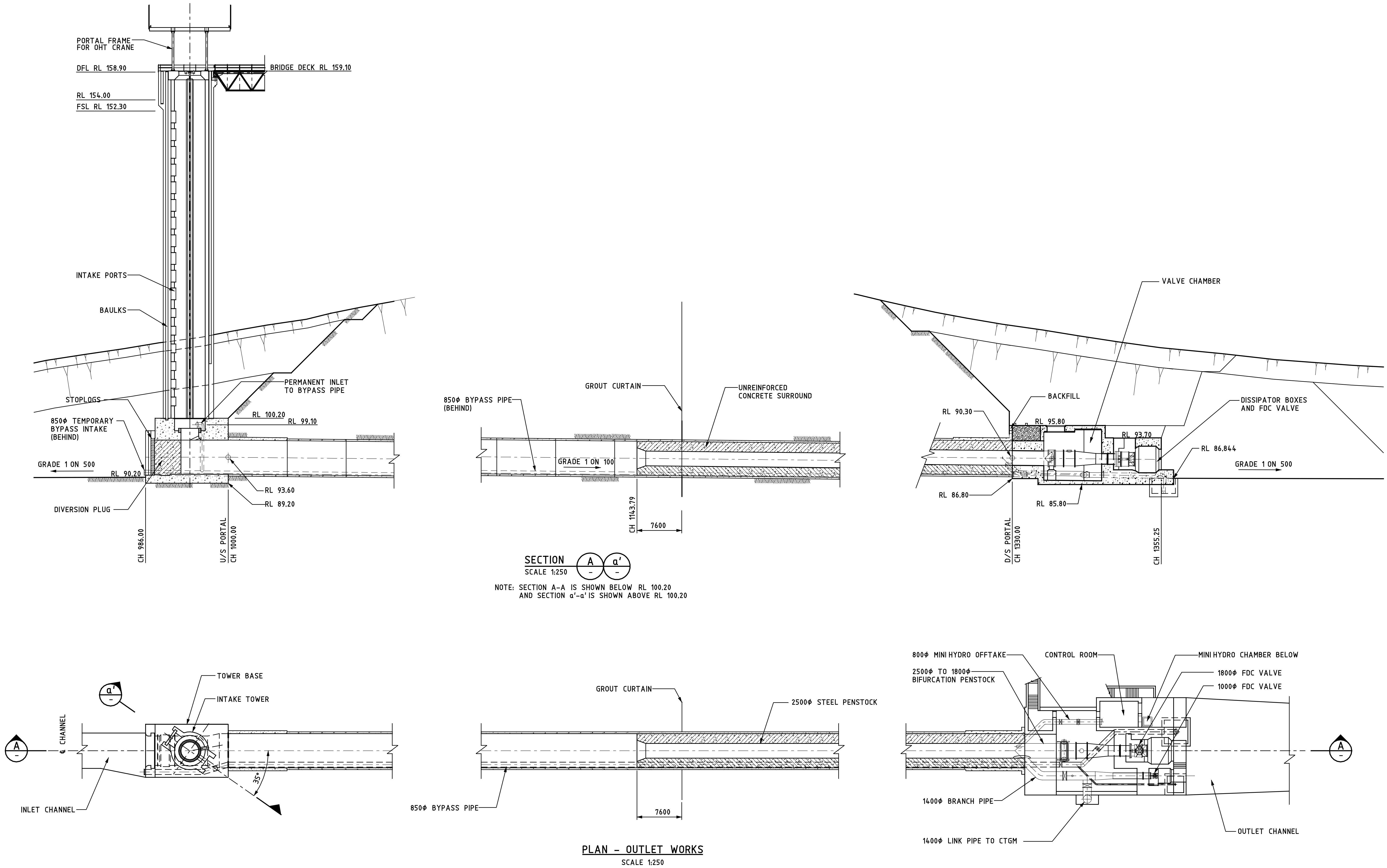
CADNAME: <>

CAD Files:

C361802 -501

Sheet <> of <> Sheets

B1



1:250 — scale bar 5 0 5 10 15 20 25 m

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General – NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

CAD Files:

OUTLET WORKS ARRANGEMENT
Sheet 2 of 2

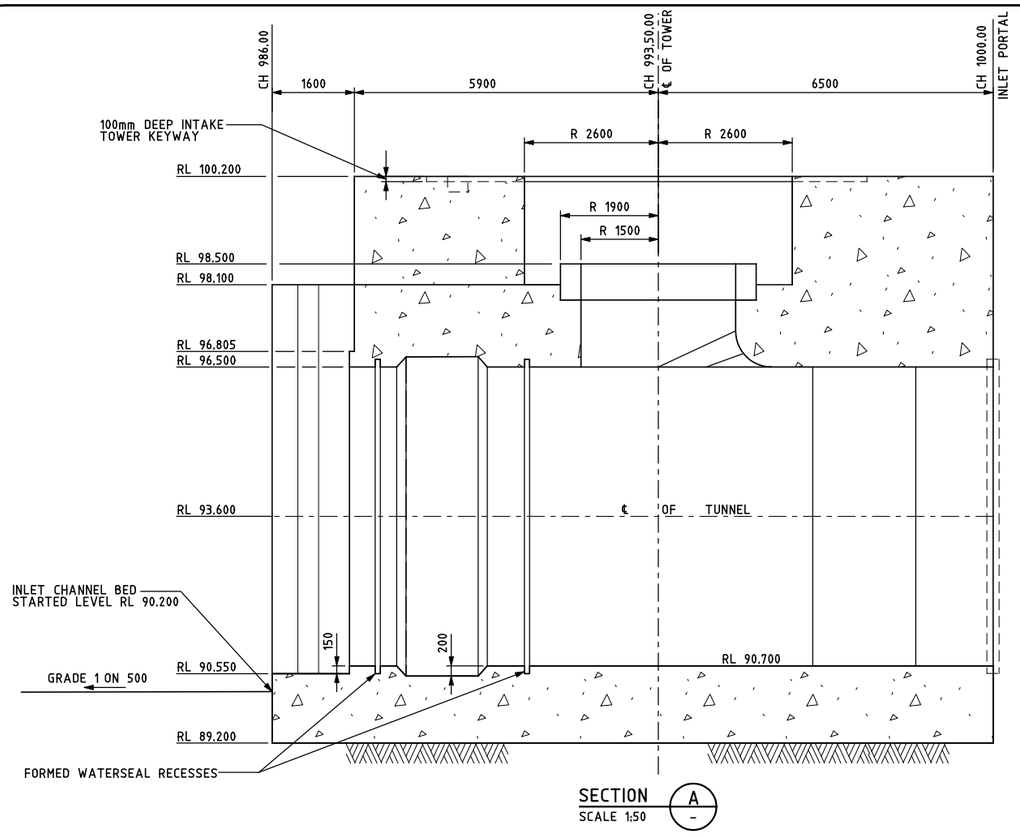
C361802 -502

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

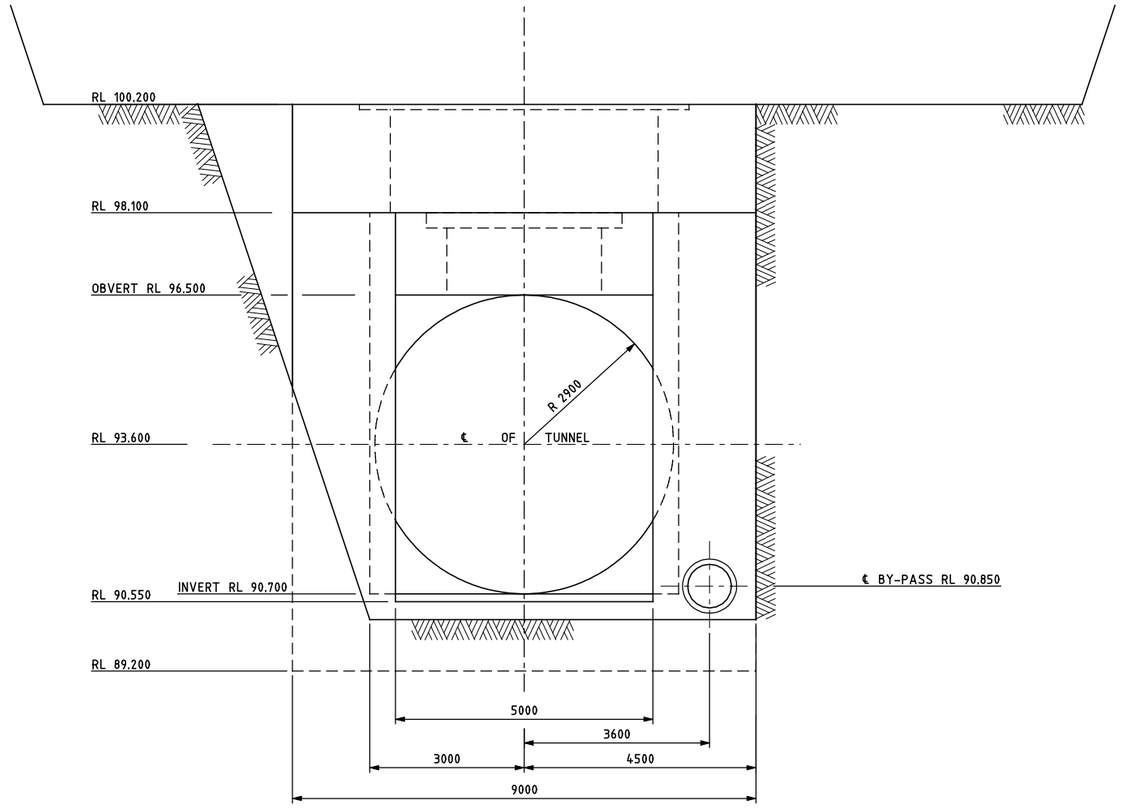
CADNAME: <>

Sheet <> of <> Sheets

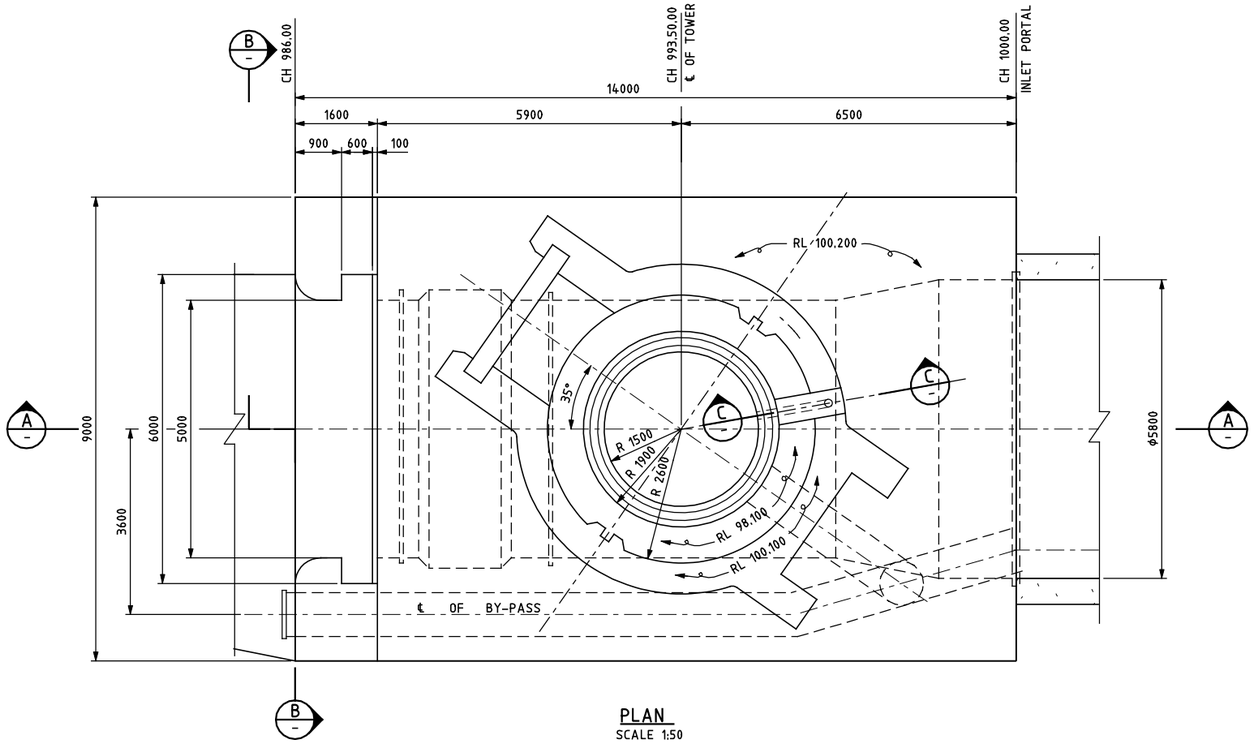
B1



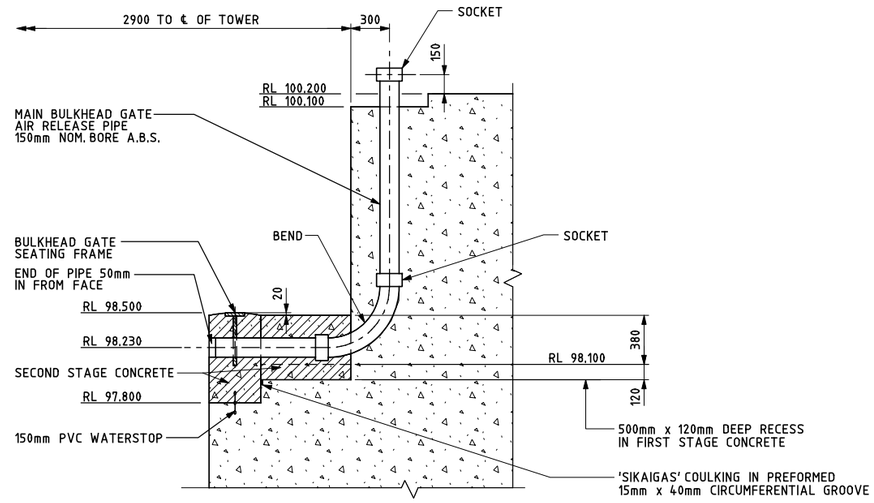
SECTION A
SCALE 1:50



VIEW B
SCALE 1:50



PLAN
SCALE 1:50



SECTION C
SCALE 1:20

1:20 0 400 800 1200 1600 2000 mm
400 200

1:50 0 1 2 3 4 5 m
1

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 603 932 607

INTAKE STRUCTURE
TOWER BASE CONCRETE DETAILS
Sheet 1 of 2

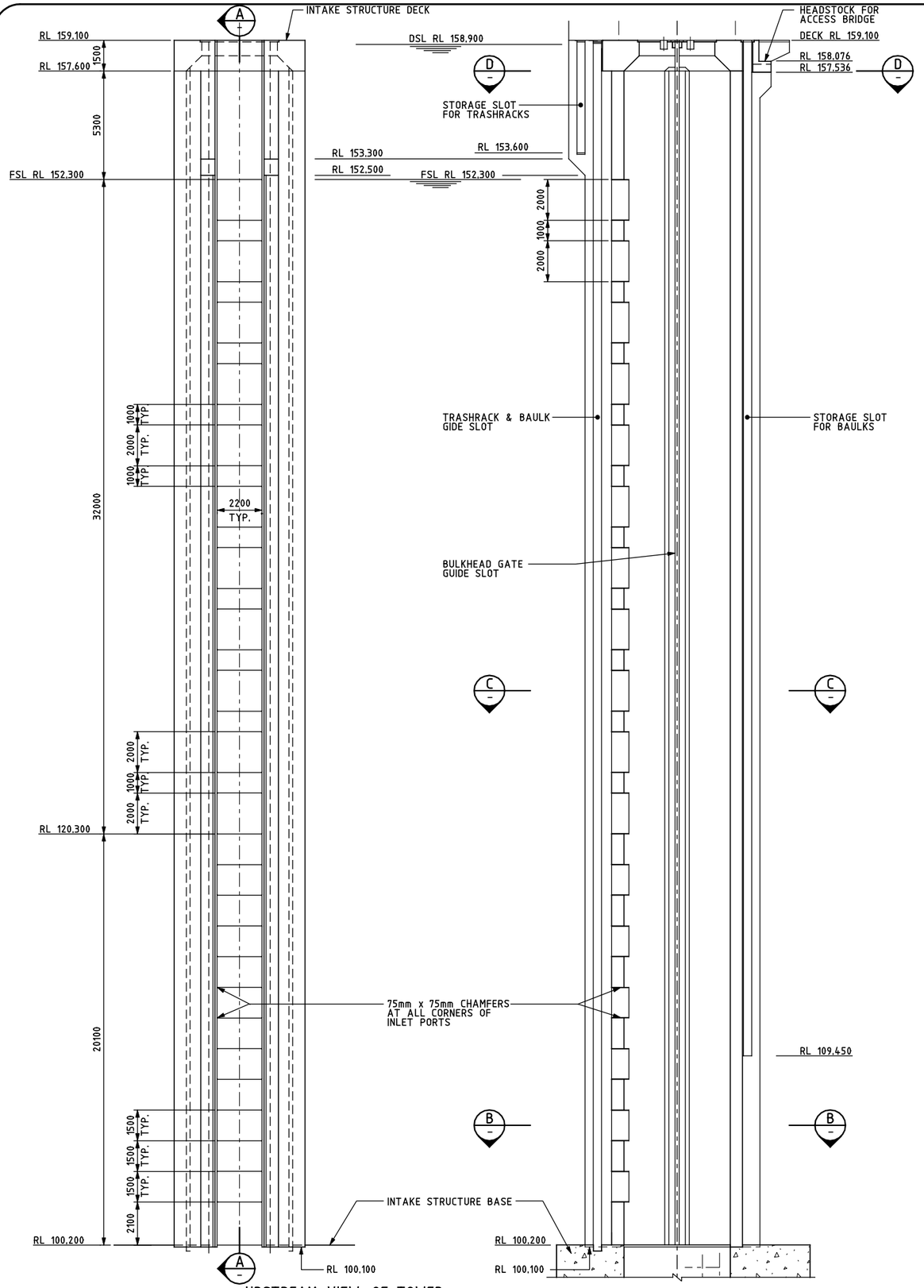
DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

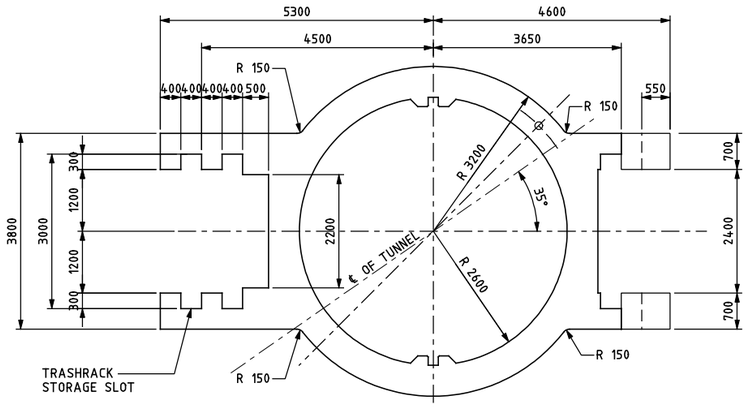
CADNAME: <>

CAD File: C361802 -504

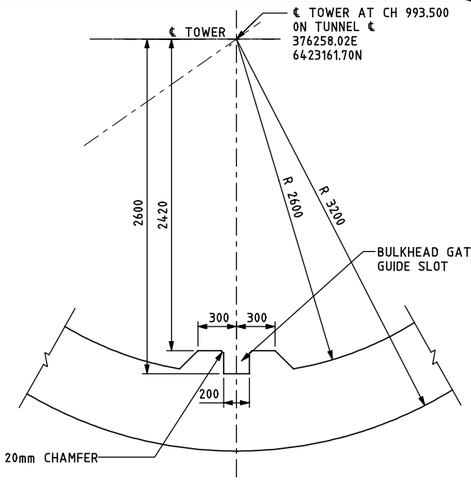
Sheet <> of <> Sheets

B1

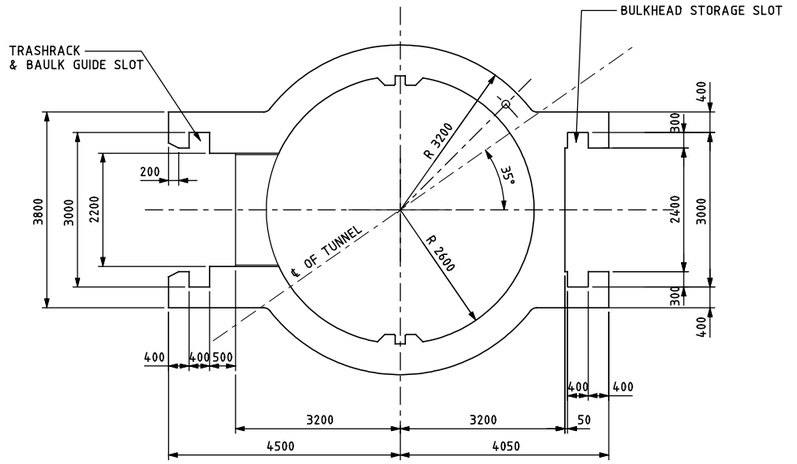




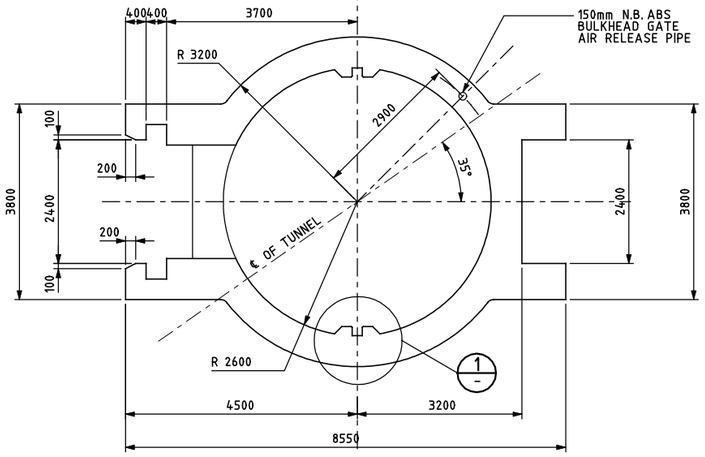
SECTION D
SCALE 1:50



DETAIL 1
SCALE 1:50



SECTION C
SCALE 1:50



SECTION B
SCALE 1:50

1:20 0 400 800 1200 1600 2000 mm (400 200)
1:50 0 1 2 3 4 5 m (1)
1:100 0 2 4 6 8 10 m (2 1)

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 202 607

INTAKE STRUCTURE
TOWER CONCRETE DETAILS

CAD File:

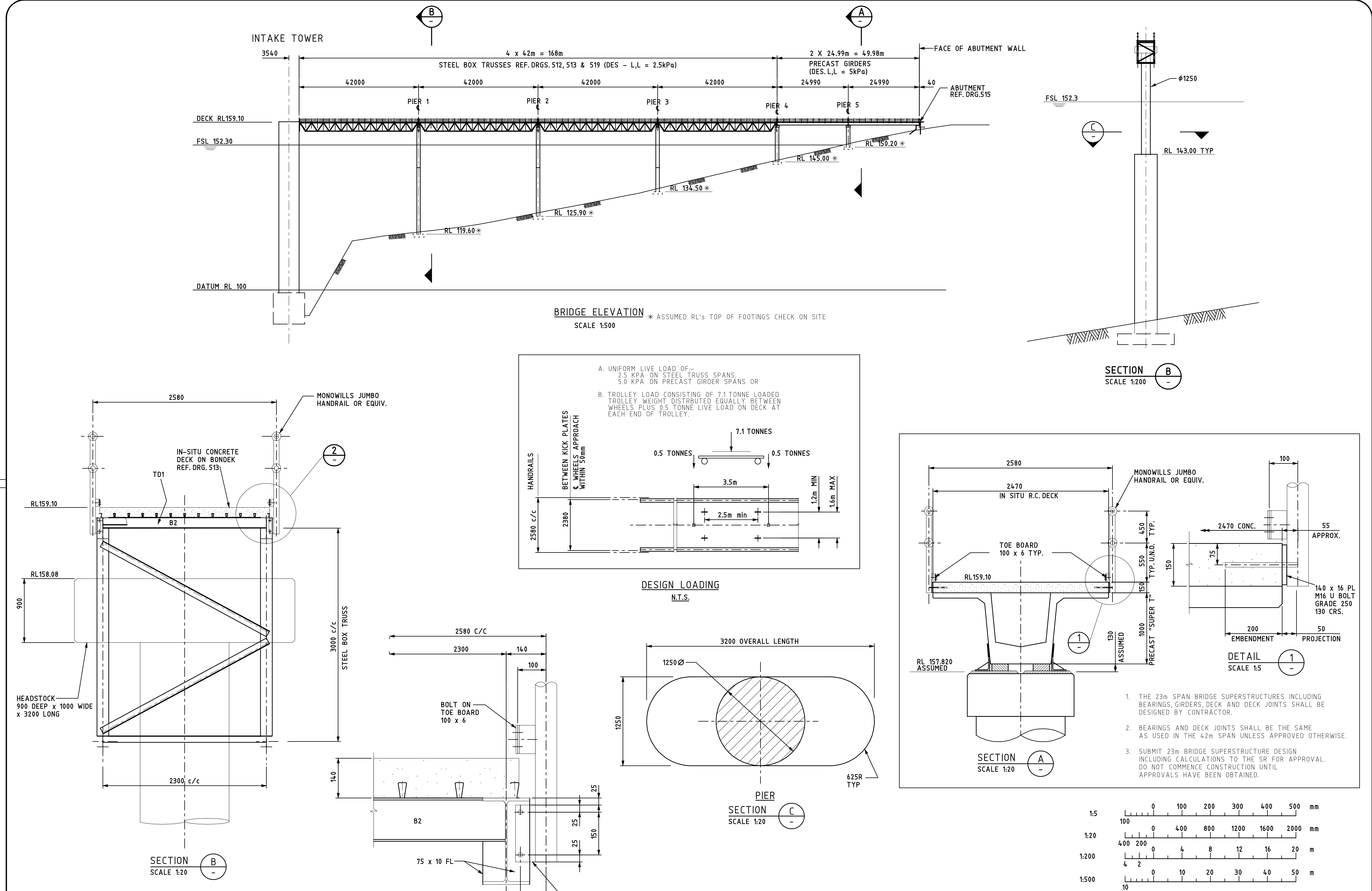
C361802 -507

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

Sheet < > of < > Sheets

B1


INTAKE TOWER
4 x 42m = 168m
STEEL BOX TRUSSES REF. DRGS. 512, 513 & 519 (DES - L,L = 2.5kPa)
2 X 24.99m = 49.98m
PRECAST GIRDERS
(DES. L,L = 5kPa)
FACE OF ABUTMENT WALL
ABUTMENT
REF. DRG.515
3540
42000
24990
40
PIER 1
PIER 2
PIER 3
PIER 4
PIER 5
DECK RL159.10
FSL 152.30
RL 150.20 ✳
RL 145.00 ✳
RL 134.50 ✳
RL 125.90 ✳
RL 119.60 ✳
DATUM RL 100
BRIDGE ELEVATION
✳ ASSUMED RL's TOP OF FOOTINGS CHECK ON SITE
SCALE 1:500
FSL 152.3
ϕ1250
RL 143.00 TYP
SECTION B
SCALE 1:200
A. UNIFORM LIVE LOAD OF:-
2.5 KPA ON STEEL TRUSS SPANS.
5.0 KPA ON PRECAST GIRDER SPANS OR
B. TROLLEY LOAD CONSISTING OF 7.1 TONNE LOADED TROLLEY WEIGHT DISTRBUTED EQUALLY BETWEEN WHEELS PLUS 0.5 TONNE LIVE LOAD ON DECK AT EACH END OF TROLLEY.
7.1 TONNES
0.5 TONNES
0.5 TONNES
3.5m
2.5m min
1.2m MIN
1.6m MAX
HANDRAILS
BETWEEN KICK PLATES
℄ WHEELS APPROACH WITHIN 50mm
2580 c/c
2380
DESIGN LOADING
N.T.S.
2580
MONOWILLS JUMBO HANDRAIL OR EQUIV.
IN-SITU CONCRETE DECK ON BONDEK REF. DRG. 513
TD1
B2
RL159.10
RL158.08
900
3000 c/c
STEEL BOX TRUSS
HEADSTOCK
900 DEEP x 1000 WIDE x 3200 LONG
2300 c/c
SECTION B
SCALE 1:20
2580 C/C
2300
140
100
BOLT ON TOE BOARD 100 x 6
B2
75 x 10 FL
200 X 10 PL
2 M16 8.8/S
25
150
50
90
DETAIL 2
SCALE 1:5
3200 OVERALL LENGTH
1250∅
1250
625R TYP
PIER SECTION C
SCALE 1:20
2580
2470
IN SITU R.C. DECK
MONOWILLS JUMBO HANDRAIL OR EQUIV.
TOE BOARD 100 x 6 TYP.
RL159.10
450 TYP.
550 TYP. U.N.O.
150
1000 PRECAST "SUPER T"
130 ASSUMED
RL 157.820 ASSUMED
SECTION A
SCALE 1:20
100
2470 CONC.
55 APPROX.
75
140 x 16 PL
M16 U BOLT GRADE 250
130 CRS.
200 EMBENDMENT
50 PROJECTION
DETAIL 1
SCALE 1:5
1. THE 23m SPAN BRIDGE SUPERSTRUCTURES INCLUDING BEARINGS, GIRDERS, DECK AND DECK JOINTS SHALL BE DESIGNED BY CONTRACTOR.
2. BEARINGS AND DECK JOINTS SHALL BE THE SAME AS USED IN THE 42m SPAN UNLESS APPROVED OTHERWISE.
3. SUBMIT 23m BRIDGE SUPERSTRUCTURE DESIGN INCLUDING CALCULATIONS TO THE SR FOR APPROVAL. DO NOT COMMENCE CONSTRUCTION UNTIL APPROVALS HAVE BEEN OBTAINED.
1:5
1:20
1:200
1:500
mm
m

REVISION

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GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

INTAKE STRUCTURE - ACCESS BRIDGE GENERAL ARRANGEMENT & CONCRETE SPANS

DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	D STEPHEN	CHK	J. KLAVINS

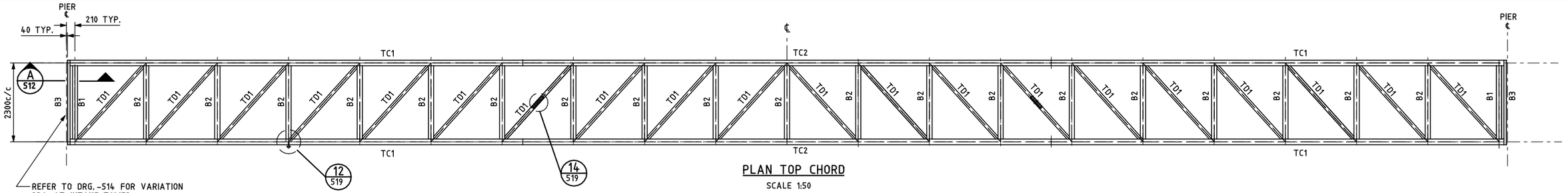
CADNAME: <>

CAD Files:

C361802 -510

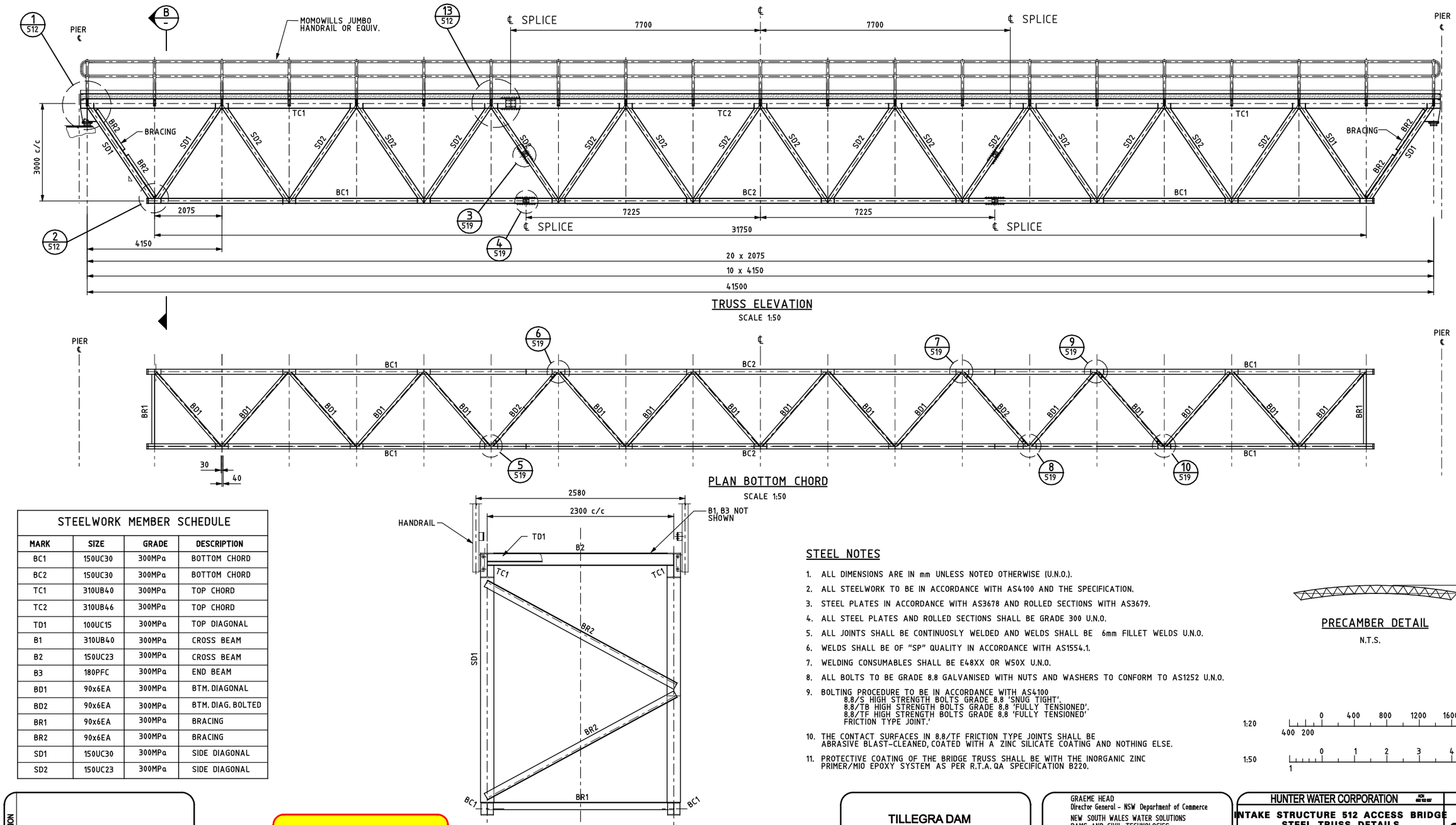
Sheet <> of <> Sheets

B1



PLAN TOP CHORD

SCALE 1:50

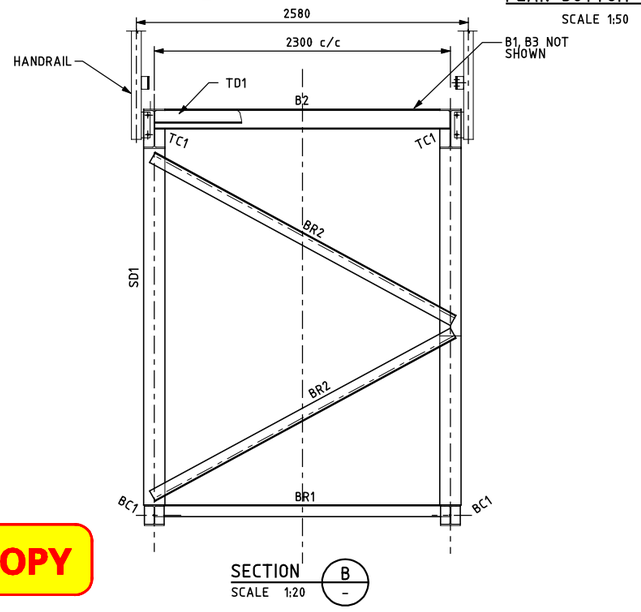


TRUSS ELEVATION

SCALE 1:50

PLAN BOTTOM CHORD

SCALE 1:50



SECTION B

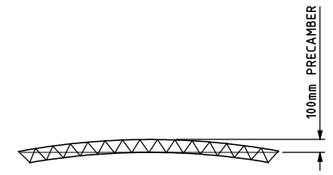
SCALE 1:20

STEELWORK MEMBER SCHEDULE

MARK	SIZE	GRADE	DESCRIPTION
BC1	150UC30	300MPa	BOTTOM CHORD
BC2	150UC30	300MPa	BOTTOM CHORD
TC1	310UB40	300MPa	TOP CHORD
TC2	310UB46	300MPa	TOP CHORD
TD1	100UC15	300MPa	TOP DIAGONAL
B1	310UB40	300MPa	CROSS BEAM
B2	150UC23	300MPa	CROSS BEAM
B3	180PFC	300MPa	END BEAM
BD1	90x6EA	300MPa	BTM. DIAGONAL
BD2	90x6EA	300MPa	BTM. DIAG. BOLTED
BR1	90x6EA	300MPa	BRACING
BR2	90x6EA	300MPa	BRACING
SD1	150UC30	300MPa	SIDE DIAGONAL
SD2	150UC23	300MPa	SIDE DIAGONAL

STEEL NOTES

1. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE (U.N.O.).
2. ALL STEELWORK TO BE IN ACCORDANCE WITH AS4100 AND THE SPECIFICATION.
3. STEEL PLATES IN ACCORDANCE WITH AS3678 AND ROLLED SECTIONS WITH AS3679.
4. ALL STEEL PLATES AND ROLLED SECTIONS SHALL BE GRADE 300 U.N.O.
5. ALL JOINTS SHALL BE CONTINUOSLY WELDED AND WELDS SHALL BE 6mm FILLET WELDS U.N.O.
6. WELDS SHALL BE OF "SP" QUALITY IN ACCORDANCE WITH AS1554.1.
7. WELDING CONSUMABLES SHALL BE E48XX OR W50X U.N.O.
8. ALL BOLTS TO BE GRADE 8.8 GALVANISED WITH NUTS AND WASHERS TO CONFORM TO AS1252 U.N.O.
9. BOLTING PROCEDURE TO BE IN ACCORDANCE WITH AS4100
   8.8/S HIGH STRENGTH BOLTS GRADE 8.8 'SNUG TIGHT'.
   8.8/TB HIGH STRENGTH BOLTS GRADE 8.8 'FULLY TENSIONED'.
   8.8/TF HIGH STRENGTH BOLTS GRADE 8.8 'FULLY TENSIONED' FRICTION TYPE JOINT.'
10. THE CONTACT SURFACES IN 8.8/TF FRICTION TYPE JOINTS SHALL BE ABRASIVE BLAST-CLEANED, COATED WITH A ZINC SILICATE COATING AND NOTHING ELSE.
11. PROTECTIVE COATING OF THE BRIDGE TRUSS SHALL BE WITH THE INORGANIC ZINC PRIMER/MIO EPOXY SYSTEM AS PER R.T.A. QA SPECIFICATION B220.



PRECAMBER DETAIL

N.T.S.

1:20 0 400 800 1200 1600 2000 mm
400 200

1:50 0 1 2 3 4 5 m
1

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
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LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 058 522 057

INTAKE STRUCTURE 512 ACCESS BRIDGE
STEEL TRUSS DETAILS
Sheet 1 of 3

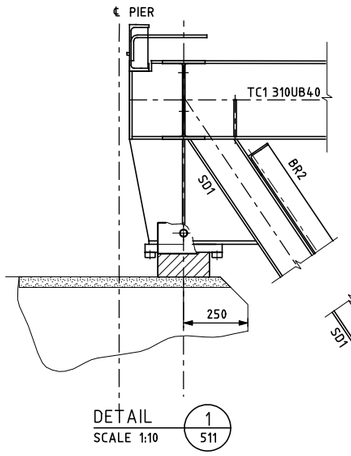
DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	D STEPHEN	CHK	J. KLAVINS

CADNAME: <>

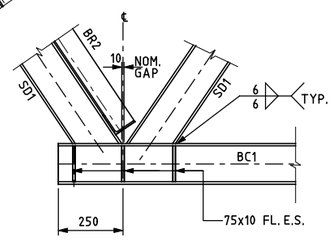
CAD File: C361802 -511

Sheet <> of <> Sheets

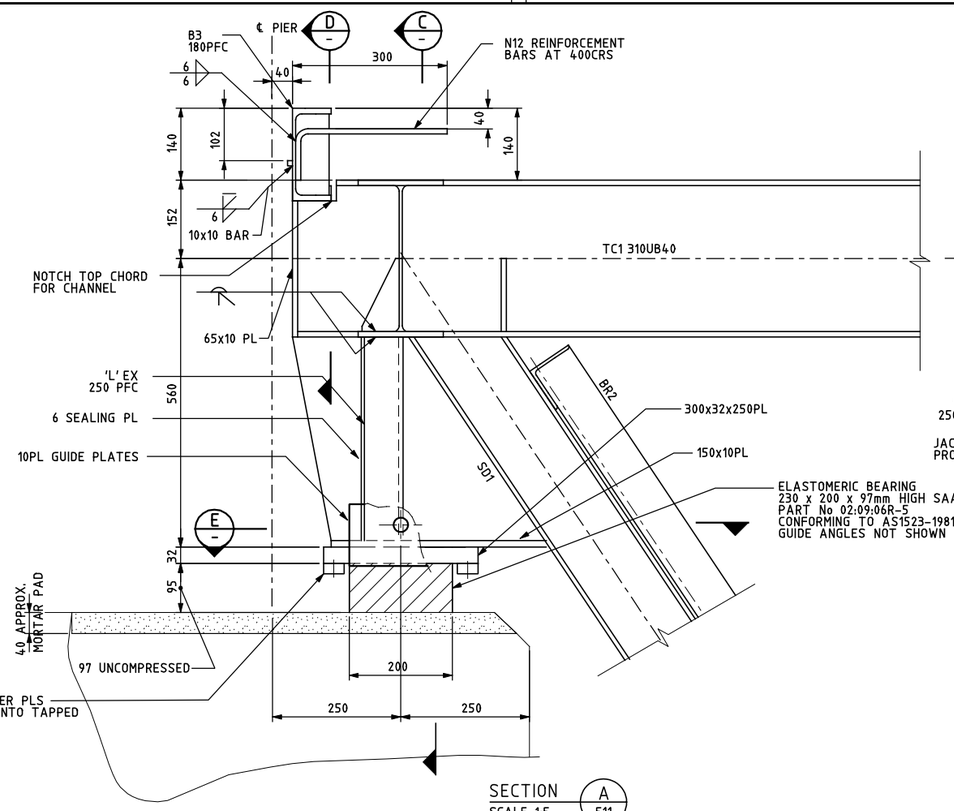
B1



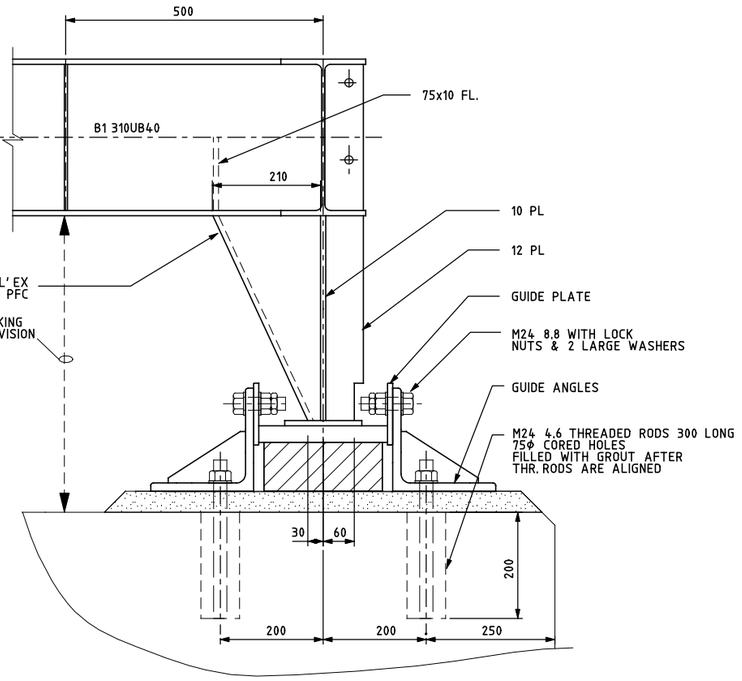
DETAIL 1/511
SCALE 1:10



DETAIL 2/511
SCALE 1:10



SECTION A/511
SCALE 1:5



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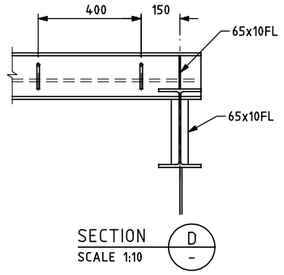
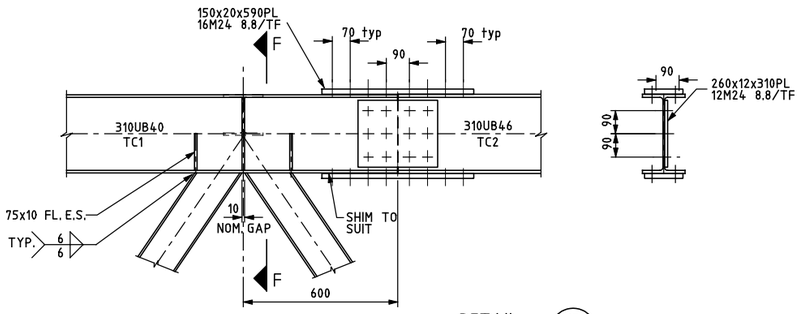
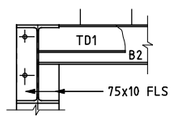
SCALE 1:5



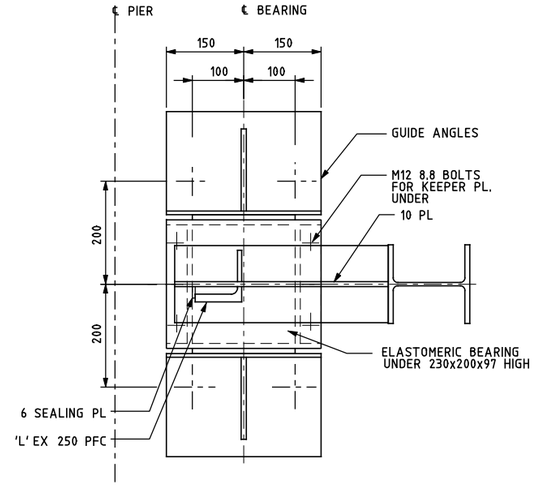
SECTION D/-
SCALE 1:10



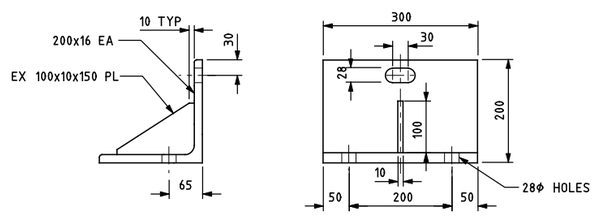
DETAIL 13/511
SCALE 1:10



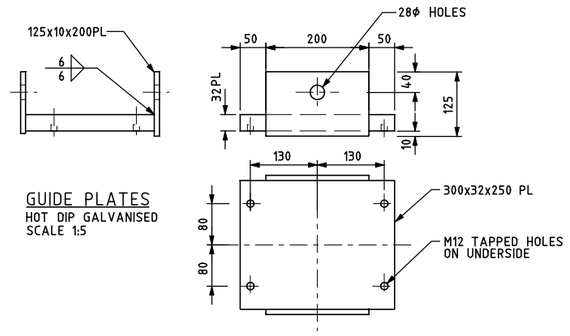
SECTION F-F
SCALE 1:10



SECTION E/-
SCALE 1:5



GUIDE ANGLES
HOT DIP GALVANISED
SCALE 1:5



GUIDE PLATES
HOT DIP GALVANISED
SCALE 1:5

1:5 0 100 200 300 400 500 mm

1:10 0 200 400 600 800 1000 mm

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 122 037

INTAKE STRUCTURE 511 ACCESS BRIDGE
STEEL TRUSS DETAILS
Sheet 2 of 3

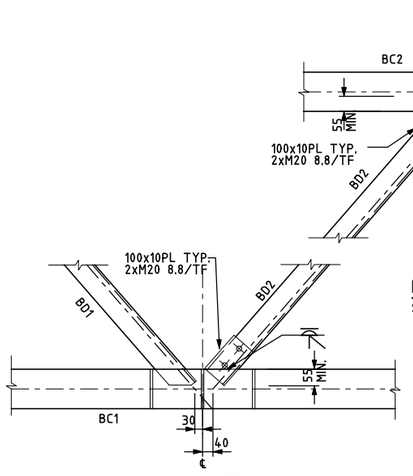
DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	H. LU	CHK	J. KLAVINS
CADNAME: <>							

CAD File:

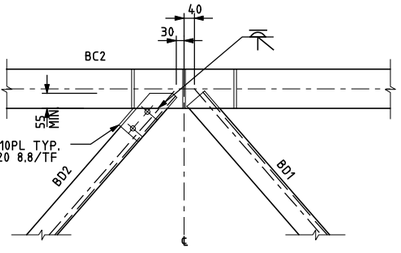
C361802 -512

Sheet <> of <> Sheets

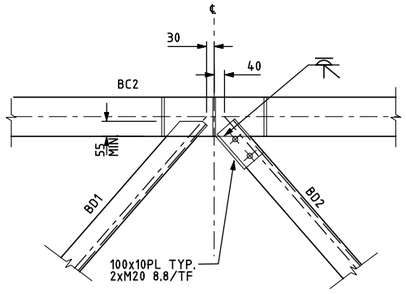
B1



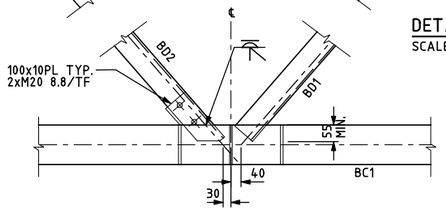
DETAIL 5 / 511
SCALE 1:10



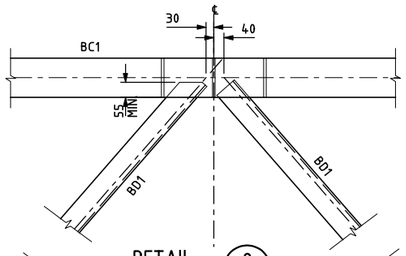
DETAIL 6 / 511
SCALE 1:10



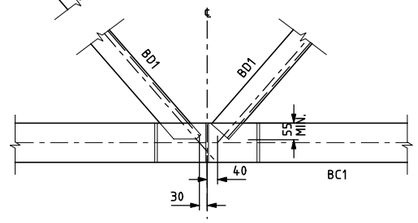
DETAIL 7 / 511
SCALE 1:10



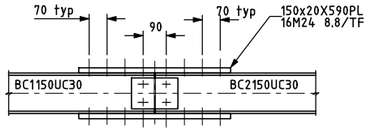
DETAIL 8 / 511
SCALE 1:10



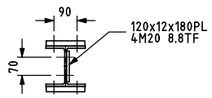
DETAIL 9 / 511
SCALE 1:10

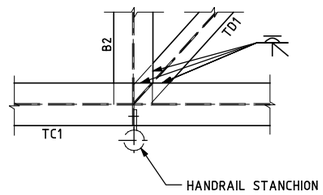


DETAIL 10 / 511
SCALE 1:10

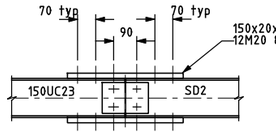


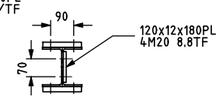
DETAIL 4 / 511
SCALE 1:10



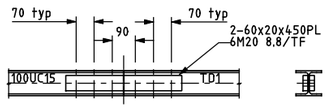


DETAIL 12 / 511
SCALE 1:10





DETAIL 3 / 511
SCALE 1:10



DETAIL 14 / 511
SCALE 1:10

SPLICE DETAILS

1:5 0 100 200 300 400 500 mm

1:10 0 200 400 600 800 1000 mm

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce

NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 122 037

INTAKE STRUCTURE 511 ACCESS BRIDGE
STEEL TRUSS DETAILS
Sheet 3 of 3

CAD File: C361802 -513

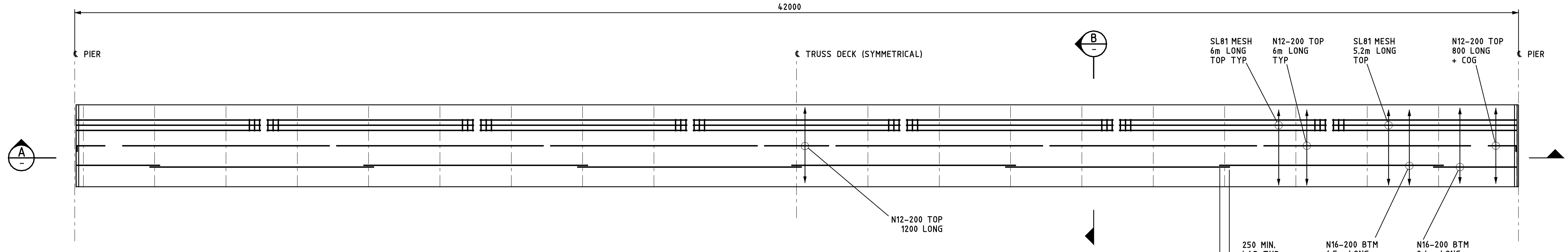
DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	H. LU	CHK	J. KLAVINS

CADNAME: <>

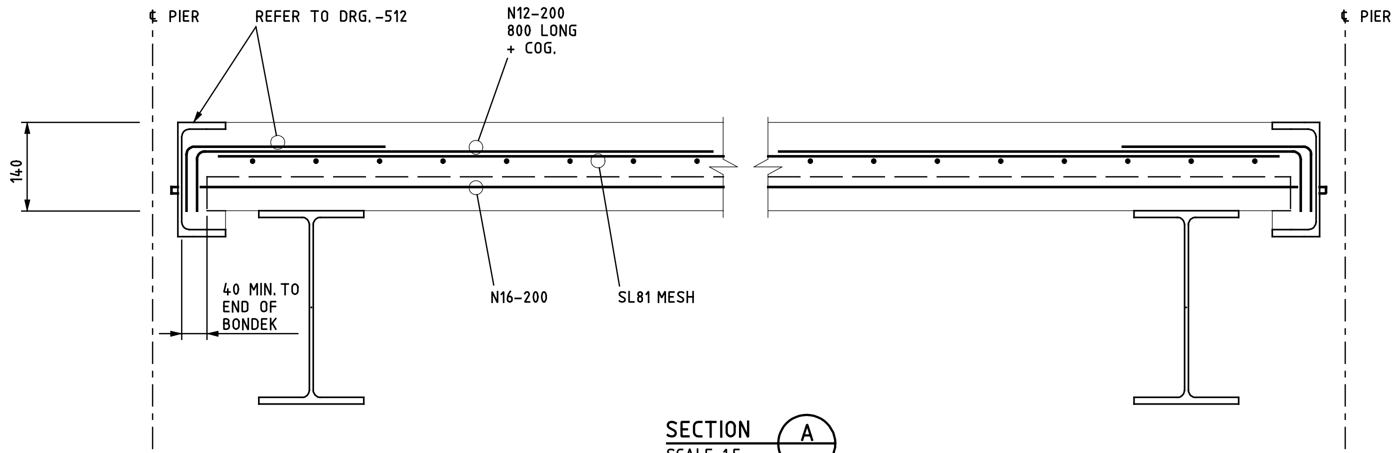
Sheet <> of <> Sheets

B1

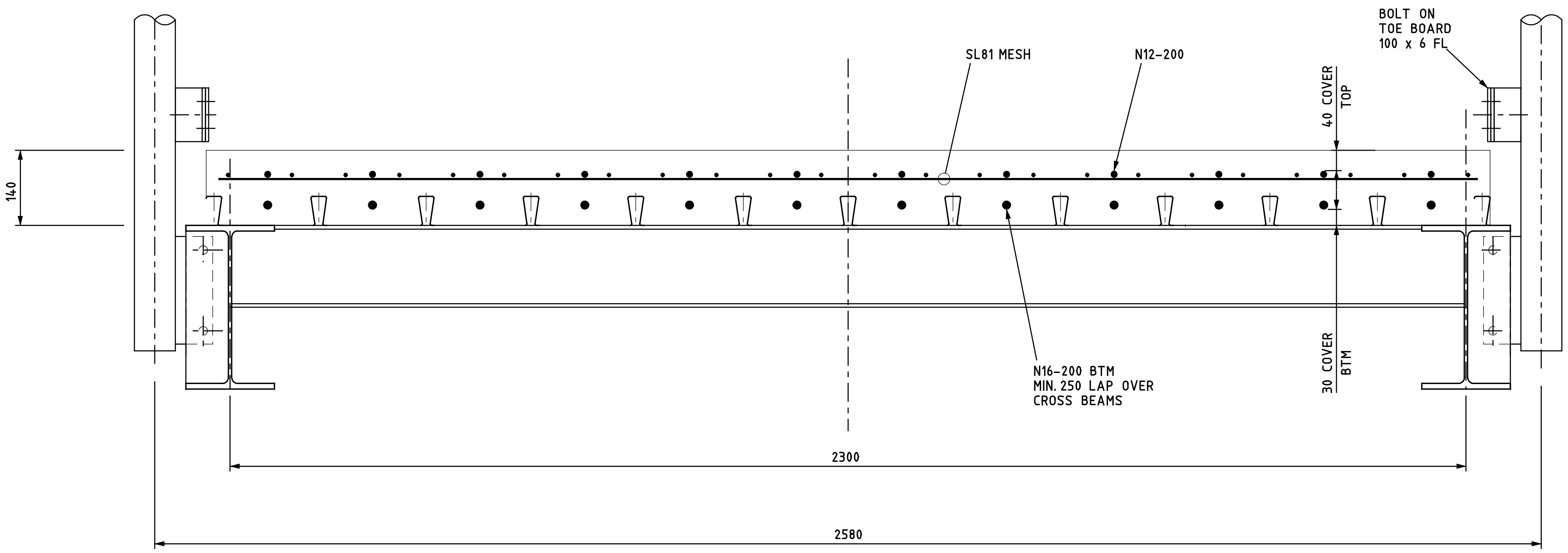
CONSULTATION DRAWING



PLAN TRUSS DECK
SCALE 1:50



SECTION A
SCALE 1:5



SECTION B
SCALE 1:5

FORMWORK NOTES:

1. PERMANENT FORMWORK TO BE BONDEK 0.6mm B.M.T. OR EQUIVALENT.
2. 1 KPa MAX. LL DUE TO STACKED MATERIAL DURING CONSTRUCTION.
3. AT THE END OF SHEETS : USE A FIXING AT EVERY RIB.
4. AT EACH INTERMEDIATE SLAB SUPPORT OVER WHICH THE SHEETING IS CONTINUOUS: USE A FIXING AT THE RIBS ON BOTH EDGES.
5. FIX BONDEK TO TRUSS TOP CHORDS AT 600mm CRS.
6. FIX BONDEK WITH DRIVE NAILS OR SELF DRILLING SCREWS AS PER BONDEK MANUFACTURES RECOMMENDATION.

R.C. NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE (U.N.O).
2. CONCRETE GRADE SHALL BE S32 IN ACCORDANCE WITH THE SPECIFICATION.
3. REINFORCING BARS SHALL BE GRADE 500 AND DUCTILITY CLASS "N" DEFORMED BARS IN ACCORDANCE WITH AS 4671.
4. MESH SHALL BE GRADE 500 AND DUCTILITY CLASS "L" IN ACCORDANCE WITH AS 4671.
5. CONSTRUCTION JOINTS IF REQUIRED SHALL BE LOCATED ONLY OVER THE WEBS OF CROSS BEAMS.
6. THE CLASS OF FINISH SHALL BE U3 (STEEL TROWEL FINISH)

1:5 — 100, 0, 100, 200, 300, 400, 500 mm

1:50 — 1, 0, 1, 2, 3, 4, 5 m

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

CAD Files:

INTAKE STRUCTURE
STEEL BRIDGE
CONCRETE DECK DETAILS

C361802 -514

DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	D STEPHEN	CHK	J. KLAVINS

CADNAME: <>

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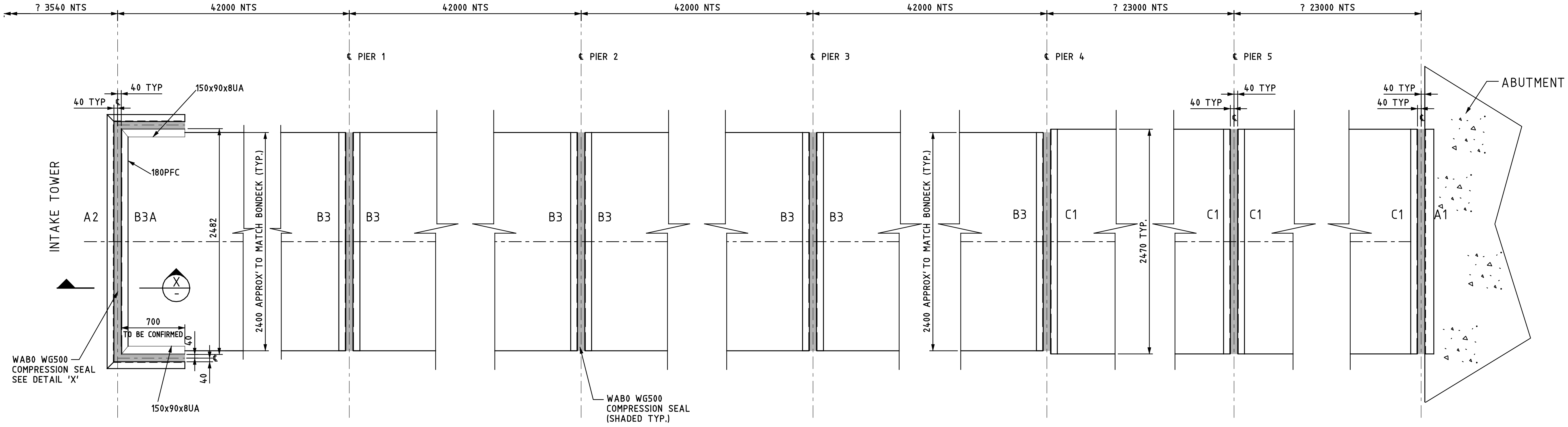
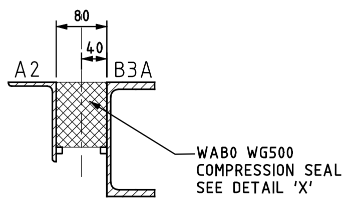
B1

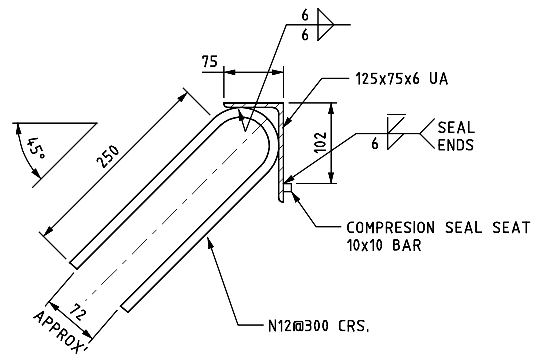


PLAN BRIDGE DECK JOINTS
SCALE 1:20

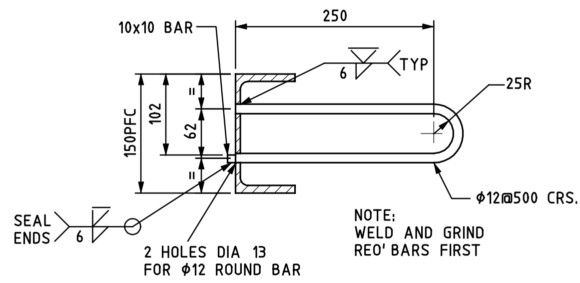


SECTION (X) TYPICAL COMPRESION SEAL GAP
SCALE 1:5

A1	125x75x6 UA	
A2	125x75x6 UA	
C1	150PFC	
B3	180PFC	B3 ON DRG'S. -511 & -512
B3A	180PFC & 150x90x8UA	B3A ON DRG'S. -511 & -512

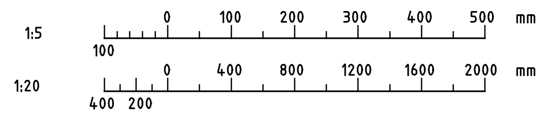


TYPICAL SECTION A1 & A2
PROTECTIVE ANGLES
SCALE 1:5



TYP. SECTION C1
PROTECTIVE CHANNEL
SCALE 1:5

NOTE:
PROTECTIVE CHANNELS AND ANGLES A1, A2, C1 TO BE HOT DIPPED GALVANISED.



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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

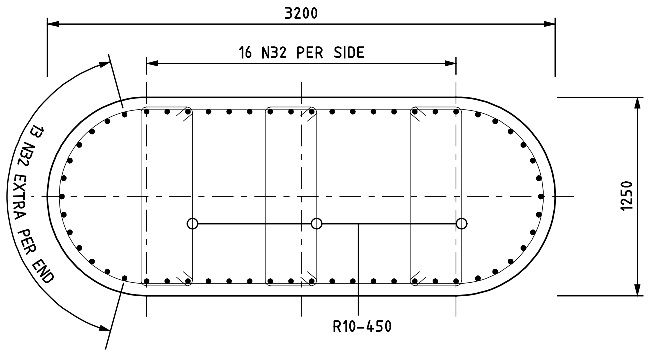
INTAKE STRUCTURE
BRIDGE ABUTMENT AND
DECK JOINT DETAILS

C361802 -515

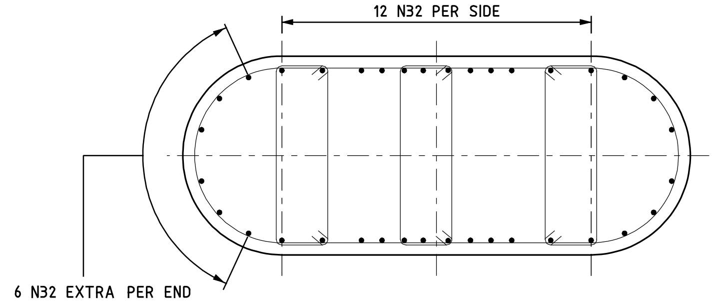
DES: J. KLAVINS | CHK | P.R. CARTER | DRN | H. LU | CHK | J. KLAVINS

CADNAME: <>

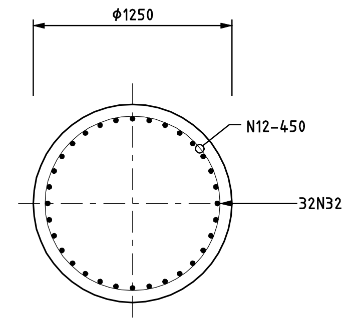
B1



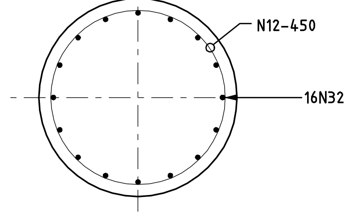
SECTION A
SCALE 1:20



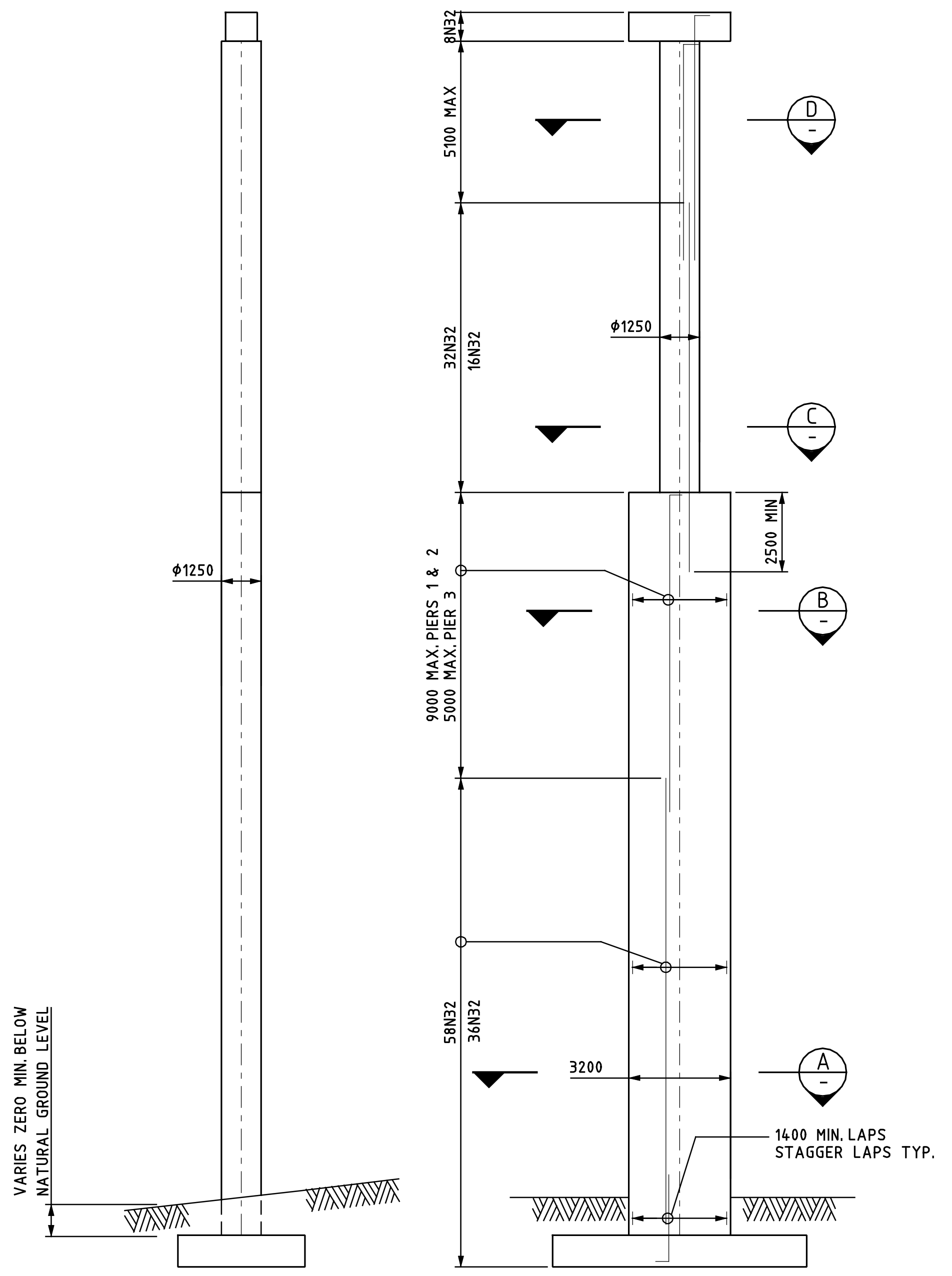
SECTION B
SCALE 1:20



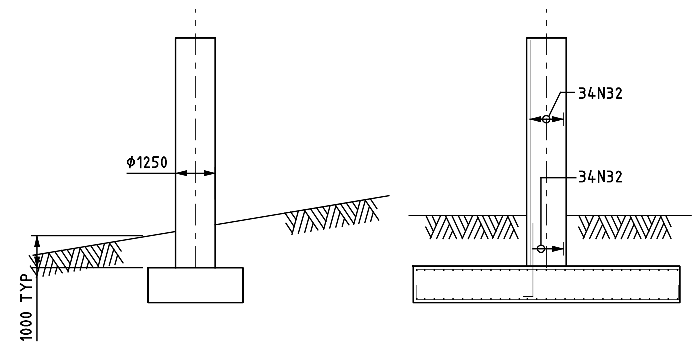
SECTION C
SCALE 1:20



SECTION D
SCALE 1:20



PIER 1
PIER 2 & 3 SIMILAR
SCALE 1:100



PIER 4
PIER 5 SIMILAR
SCALE 1:100

PIER	L (mm)	B (mm)	D (mm)	BARS 'A'	BARS 'B'
1	8000	4000	1000		
2	7600	3800	1000		
3	7600	3400	800		
4	7000	3000	800		
5	6000	3000	800		

FOOTING SCHEDULE

CONCRETE NOTES:

1. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 AND RELEVANT SAA CODES
2. CONCRETE TO HAVE THE FOLLOWING MINIMUM CHARACTERISTIC STRENGTH:
   - HEADSTOCKS Fc' = 40 MPa
   - FOOTINGS, PIERS & ABUTMENTS Fc' = 32 MPa
   - BLINDING CONCRETE Fc' = 20 MPa
3. CLEAR CONCRETE COVER TO REINFORCEMENT SHALL BE:
   - FOOTINGS 75 mm
   - PIERS 75 mm
   - HEADSTOCKS 50 mm
4. HARDENED CONCRETE SHALL BE THOROUGHLY SCABBLED, CLEANED, DAMPENED AND COATED WITH CEMENT SLURRY BEFORE PLACING NEW CONCRETE.
5. REINFORCEMENT DESIGNATED 'N' SHALL BE DEFORMED BARS WITH YIELD STRENGTH Fsy = 500 Mpa AND DUCTILITY CLASS N IN ACCORDANCE WITH AS/NZS 4671
6. REINFORCEMENT DESIGNATED 'R' SHALL BE PLAIN BARS WITH A YIELD STRENGTH Fsy = 250 Mpa AND DUCTILITY CLASS 'N' IN ACCORDANCE WITH AS/NZS 4671
7. REINFORCEMENT SPLICES SHALL ONLY BE MADE IN LOCATIONS SHOWN ON THE DRAWINGS UNLESS THE ENGINEERS APPROVAL IS OBTAINED FOR OTHER LOCATIONS' MINIMUM LAP LENGTHS FOR TENSION SPLICES UNLESS SHOWN OTHERWISE ON THE DRAWINGS ARE:

BAR	LOCATION TOP BARS	OTHER BARS
N12	500 mm	400 mm
N16	650 mm	500 mm
N20	800 mm	650 mm
N24	1050 mm	850 mm
N28	1400 mm	1100 mm
N32	1750 mm	1400 mm

8. DISPLACE BARS WHERE NECESSARY TO AVOID EMBEDDED ITEMS OR SMALL PENETRATION
9. PROVIDE N12 @ 300 MINIMUM CROSS RODS WITH 400 MIN SPLICES TO ALL UNSUPPORTED REINFORCEMENT

1:20 — 400 200 0 400 800 1200 1600 2000 mm
1:100 — 2 1 0 2 4 6 8 10 m

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

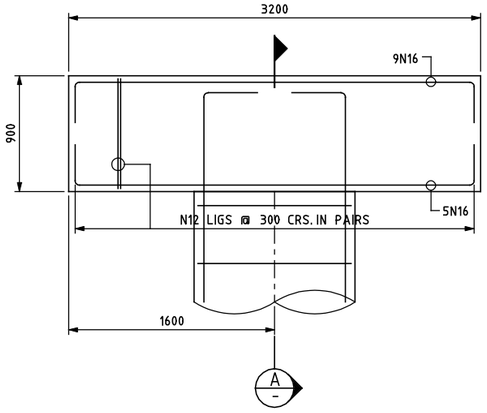
BRIDGE PIERS CONCRETE & REINF. DETAILS
sheet 1 of 2

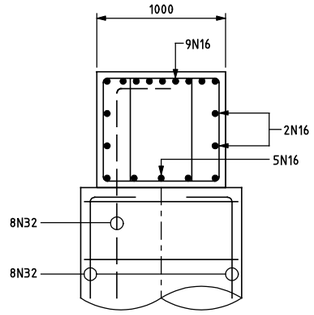
DES: J. KLAVINS | CHK: P.R. CARTER | DRN: H. LU | CHK: J. KLAVINS

CADNAME: <>

C361802 -516

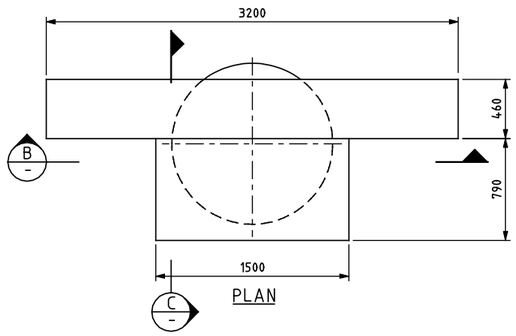
B1



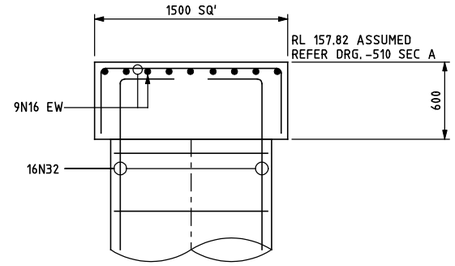


SECTION A
SCALE 1:20

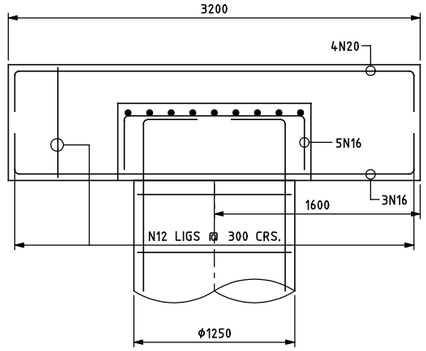
HEADSTOCK
PIERS 1, 2 & 3



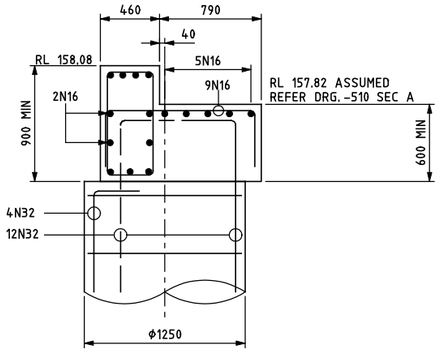
PLAN



HEADSTOCK
PIER 5



SECTION B
SCALE 1:20



SECTION C
SCALE 1:20

HEADSTOCK
PIER 4

1:20

0 400 800 1200 1600 2000 mm
400 200

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

BRIDGE PIERS CONCRETE & REINF. DETAILS sheet 2 of 2

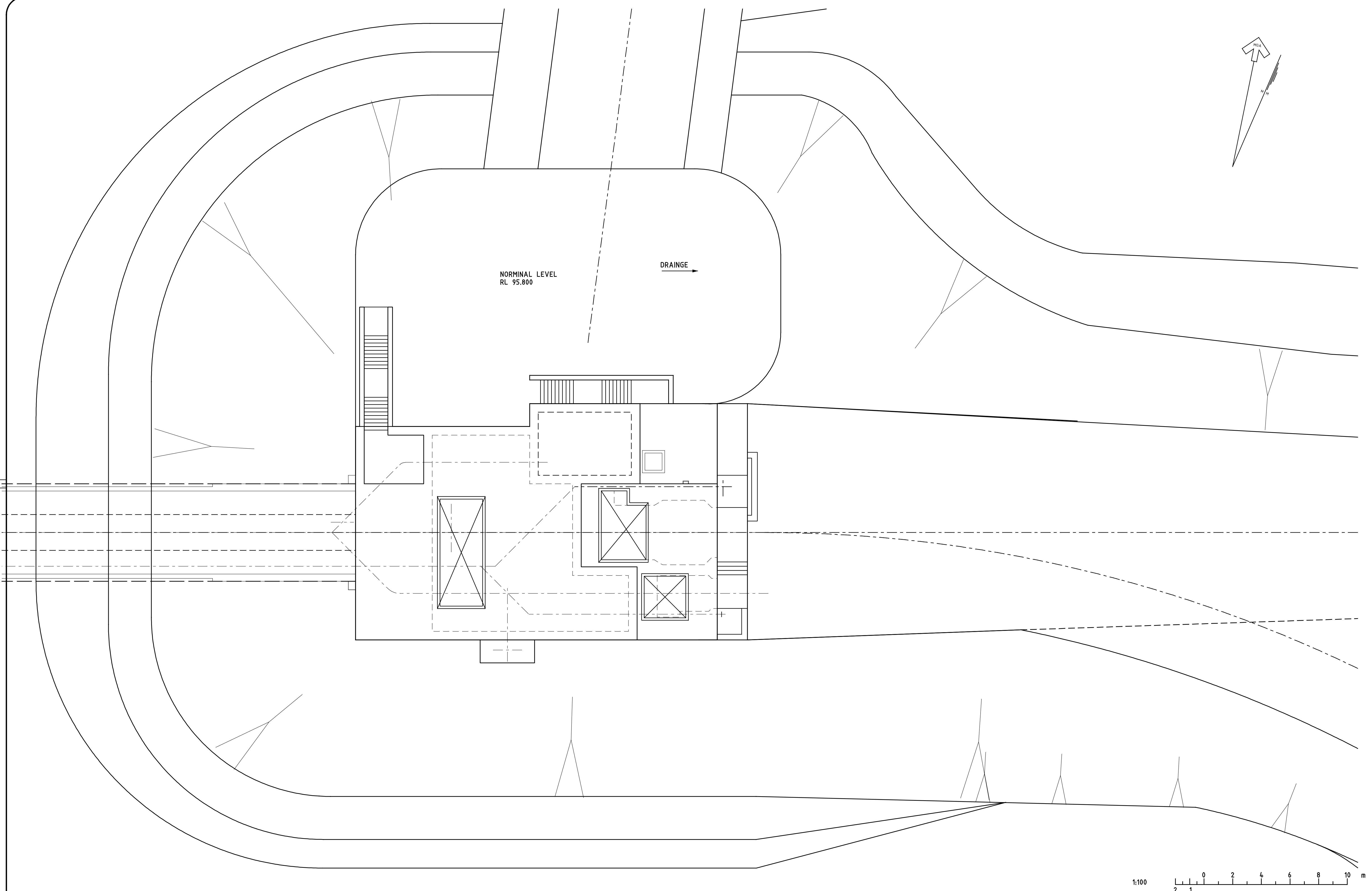
CAD File: C361802 -517

DES:	J. KLAVINS	CHK	P.R. CARTER	DRN	H. LU	CHK	J. KLAVINS

CADNAME: <>

Sheet <> of <> Sheets

B1



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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

OUTLET WORKS VALVE BLOCK AREA

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

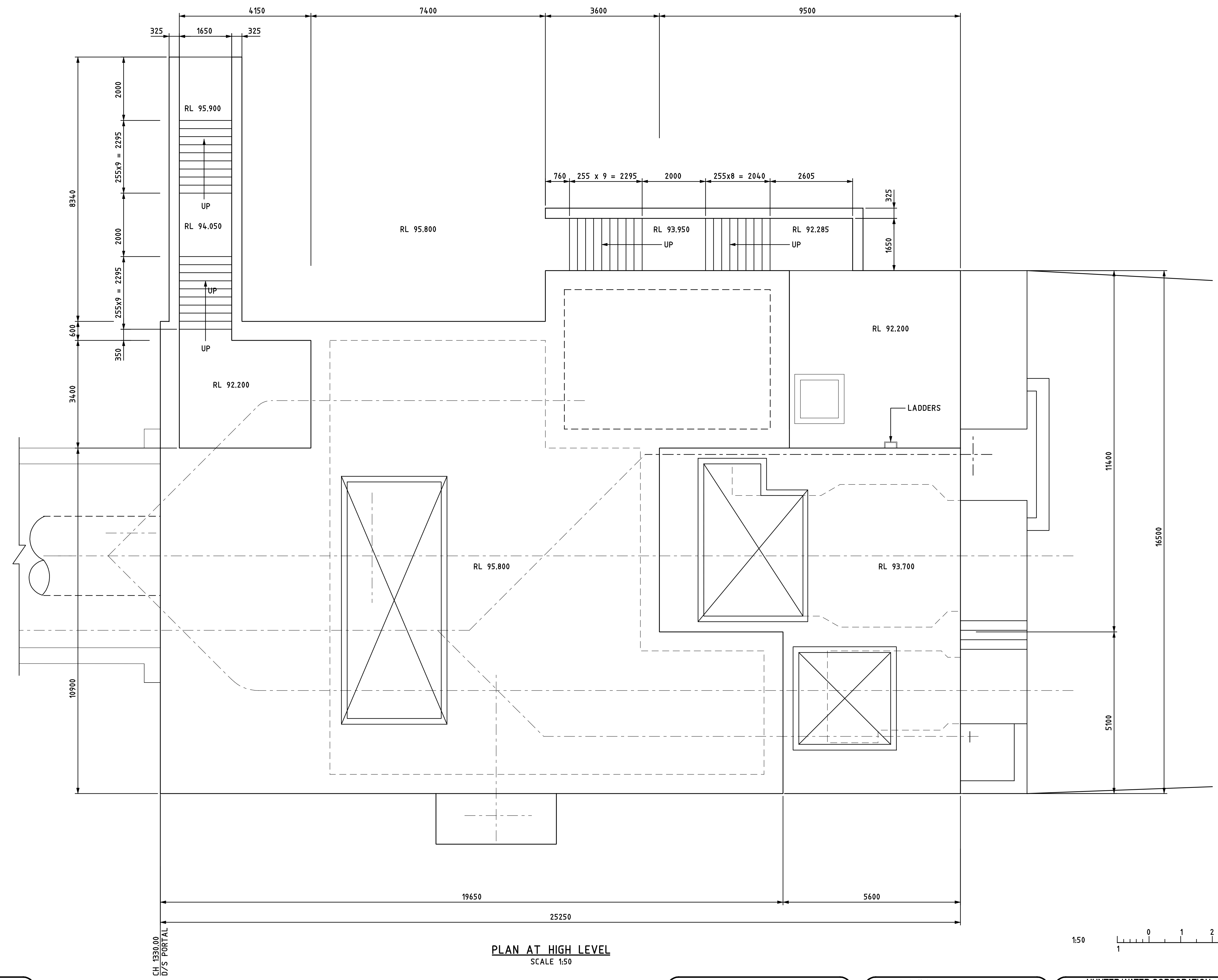
CADNAME: <>

CAD Files:

C361802 -520

Sheet <> of <> Sheets

B1



PLAN AT HIGH LEVEL
SCALE 1:50

1:50 0 1 2 3 4 5 m

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

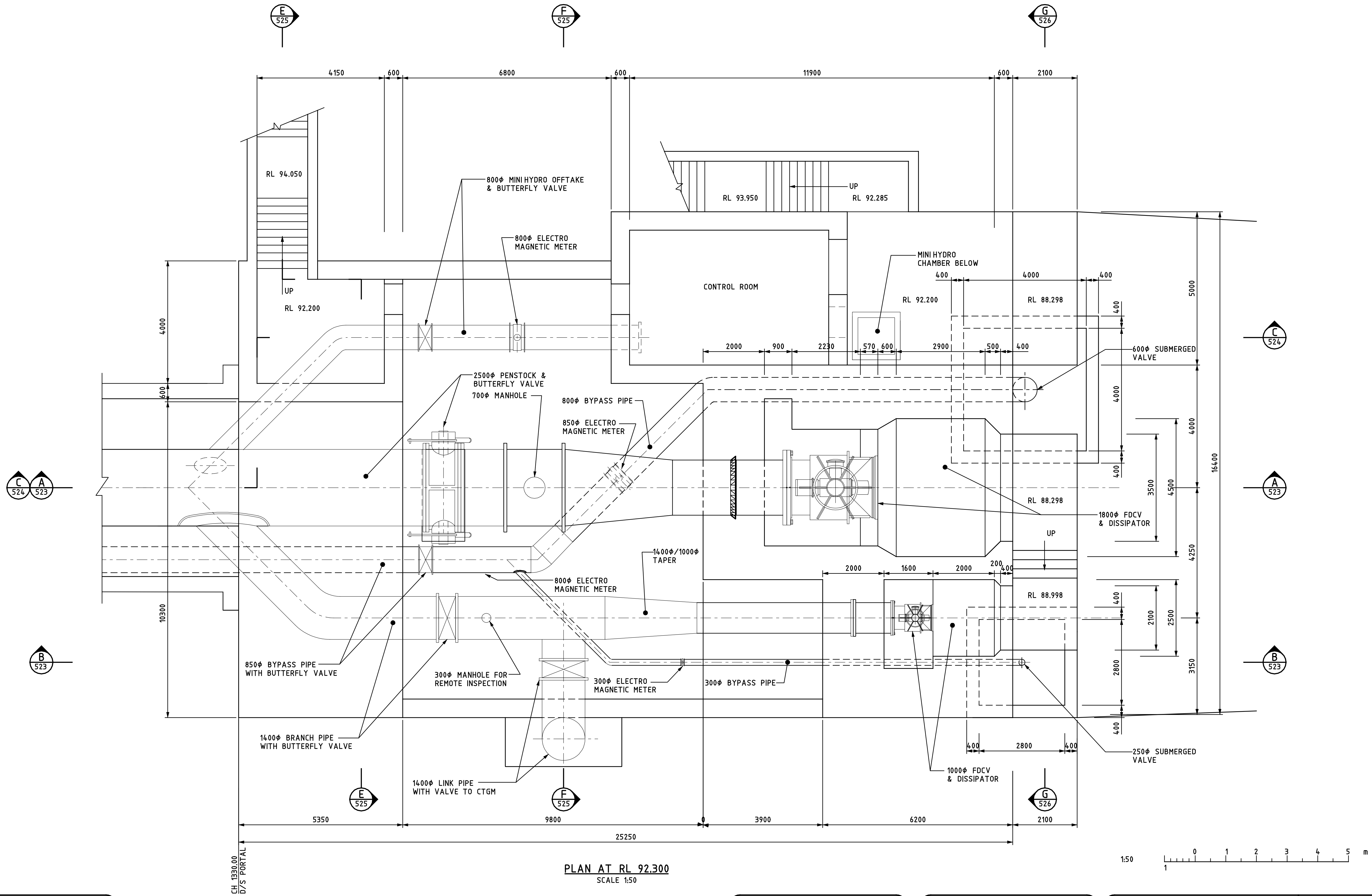
OUTLET WORKS VALVE BLOCK
CONCRETE DETAILS
Sheet 1 of 6

C361802 -521

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

B1



PLAN AT RL 92.300

SCALE 1:50

1:50

0 1 2 3 4 5 m

REVISION

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TILLEGRA DAM
CONCEPT DESIGN PHASE

GRAEME HEAD
Director General - NSW Department of Commerce

NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 053 102 837

OUTLET WORKS VALVE BLOCK
CONCRETE DETAILS
Sheet 2 of 6

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

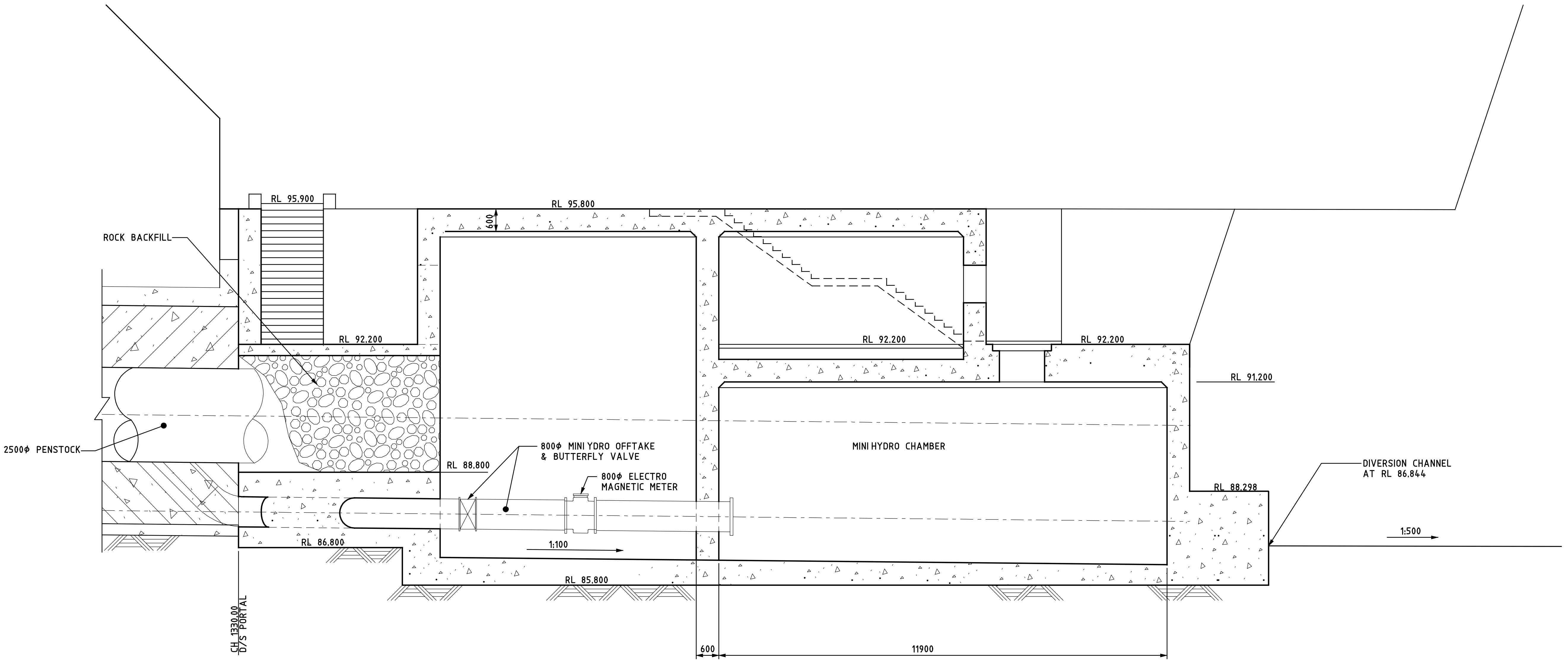
CADNAME: <>

CAD Files:

C361802 -522

Sheet <> of <> Sheets

B1



SECTION C/522
SCALE 1:50

1:50 0 1 2 3 4 5 m

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TILLEGRA DAM
CONCEPT DESIGN PHASE

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Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION

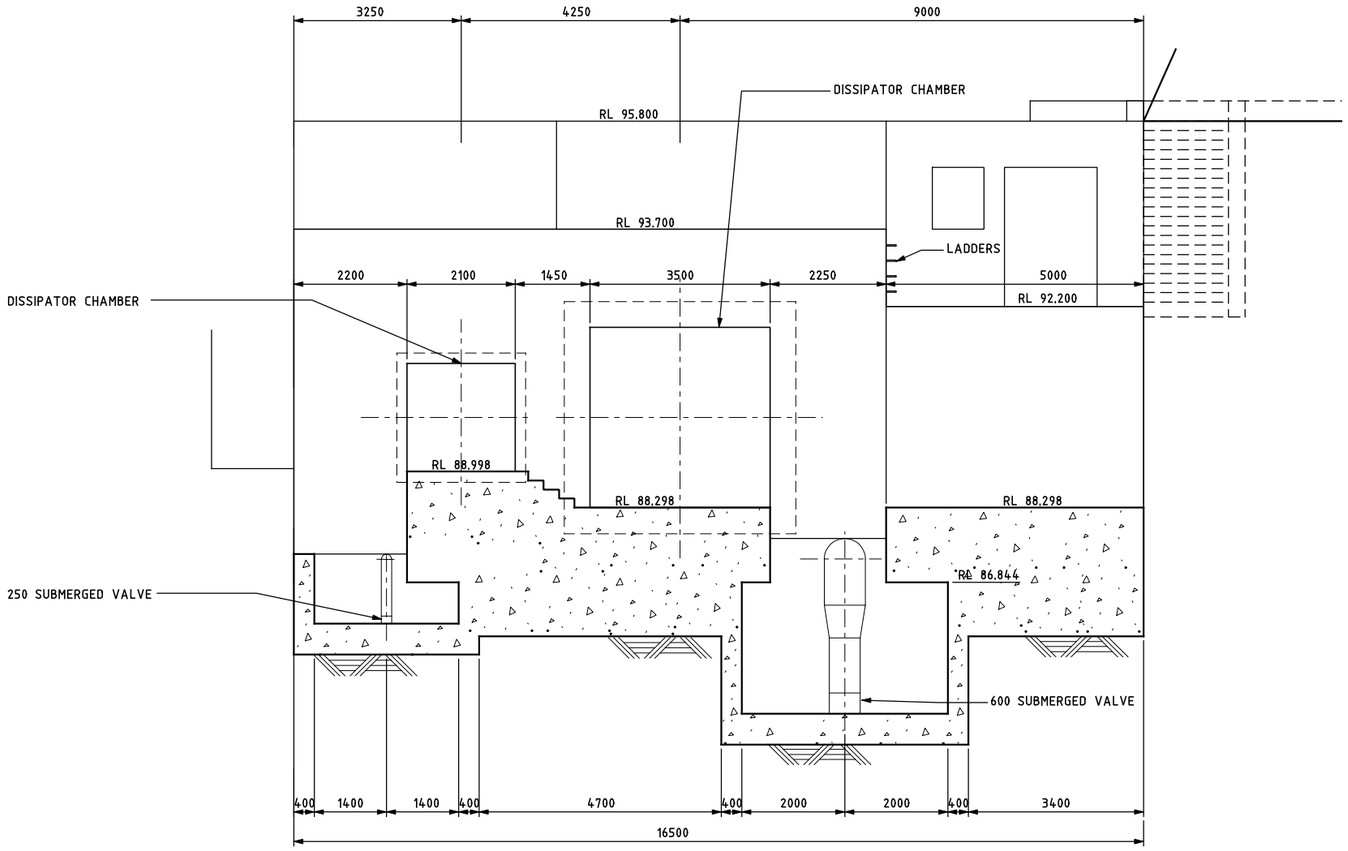
OUTLET WORKS VALVE BLOCK
CONCRETE DETAILS
Sheet 4 of 6

C361802 -524

DES: P.R. CARTER | CHK D. JAMIESON | DRN C. ZHANG | CHK P.R. CARTER

CADNAME: <>

B1



SECTION G
SCALE 1:50 522

1:50 0 1 2 3 4 5 m
1

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TILLEGRA DAM
CONCEPT DESIGN PHASE

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Director General - NSW Department of Commerce
NEW SOUTH WALES WATER SOLUTIONS
DAMS AND CIVIL TECHNOLOGIES
LEVEL 13, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93727808 FAX (02) 93727822

HUNTER WATER CORPORATION ACN 000 202 607

OUTLET WORKS VALVE BLOCK
CONCRETE DETAILS
Sheet 6 of 6

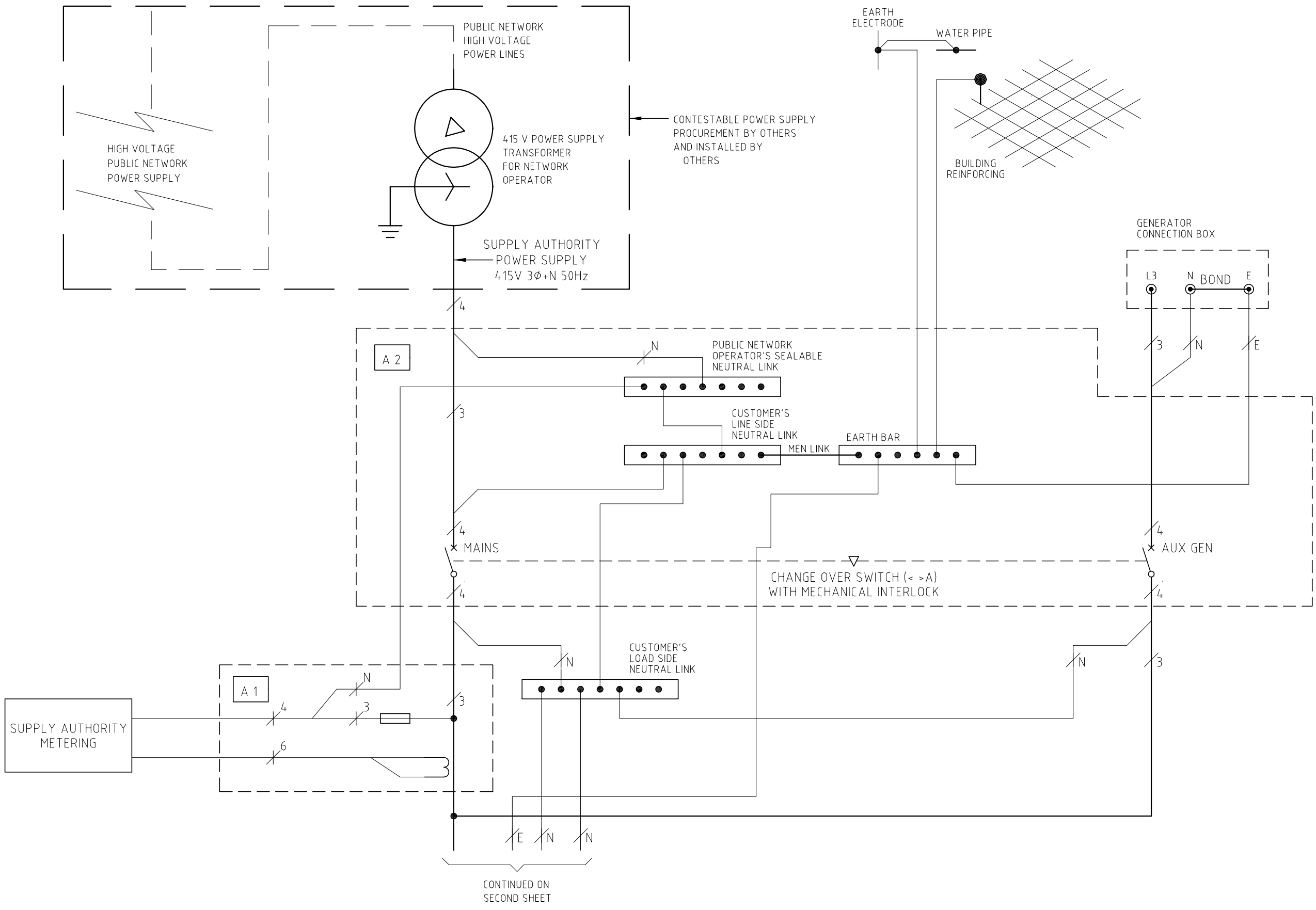
CAD File:
C361802 -526

DES:	P.R. CARTER	CHK	D. JAMIESON	DRN	C. ZHANG	CHK	P.R. CARTER

CADNAME: <>

Sheet <> of <> Sheets

B1



No.	REVISION DETAILS	DWN	DATE	No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	05.09.2008				
1	FIRST DRAFT ISSUE	RH	05.09.2008				
2	SECOND DRAFT ISSUE	RH	04.12.2008				

HUNTER WATER

DESIGNED: RH	DATE: 05.09.2008	COMPANY: HWC
DRAWN: RH	DATE: 05.09.2008	COMPANY: DC
CHECKED: BR	DATE: 05.09.2008	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
MAIN SWITCHGEAR AND CONTROLGEAR ASSEMBLY
SINGLE LINE DIAGRAM-SHEET 1 OF 4

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	01	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE1.dwg

CONTINUED FROM FIRST SHEET

NOTE RE CIRCUIT BREAKERS :
IT IS ASSUMED THAT CASCADE PROTECTION TO THE MINOR CIRCUIT BREAKERS WILL BE PROVIDED BY THE INCOMER CIRCUIT BREAKERS SO THAT THE MSCA WILL ACHIEVE A FAULT RATING AT ITS INCOMING TERMINALS WHICH WILL SUIT THE REQUIREMENTS OF THE PUBLIC ELECTRCITY NETWORK OPERATOR.

C 0
E 1
B 0
E
SD
FCL
AUX CB
V
VS
A
AS
TO VARIOUS NEUTRALS

CONTINUED ON THIRD SHEET

C 3
C 1
C 2
E 2
F 1
F 2
CB
TO EXTERNAL LOADS
TO EXTERNAL UPS
TO INTERNAL UPS - CIRCUITS
TO EXTERNAL UPS - CIRCUITS
CONTINUED ON FOURTH SHEET
FROM UPS
VALVE BLOCK VENTILATION FAN
VALVE BLOCK VENTILATION SUMP PUMP
CONTROLS FOR THE VALVE TO THE TURBINE
CONTROLS FOR THE MAIN FIXED DISSPERSION CONE VALVE AND ITS GUARD VALVE
CONTROLS FOR THE BYPASS FIXED DISSPERSION CONE VALVE AND ITS GUARD VALVE
(INTEGRAL)
M 3~

No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	05.09.2008
1	FIRST DRAFT ISSUE	RH	05.09.2008
2	SECOND DRAFT ISSUE	RH	04.12.2008

HUNTER WATER

DESIGNED: RH	DATE: 05.09.2008	COMPANY: HWC
DRAWN: RH	DATE: 05.09.2008	COMPANY: DC
CHECKED: BR	DATE: 05.09.2008	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
MAIN SWITCHGEAR AND CONTROLGEAR ASSEMBLY
SINGLE LINE DIAGRAM-SHEET 2 OF 4

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	02	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE2.dwg

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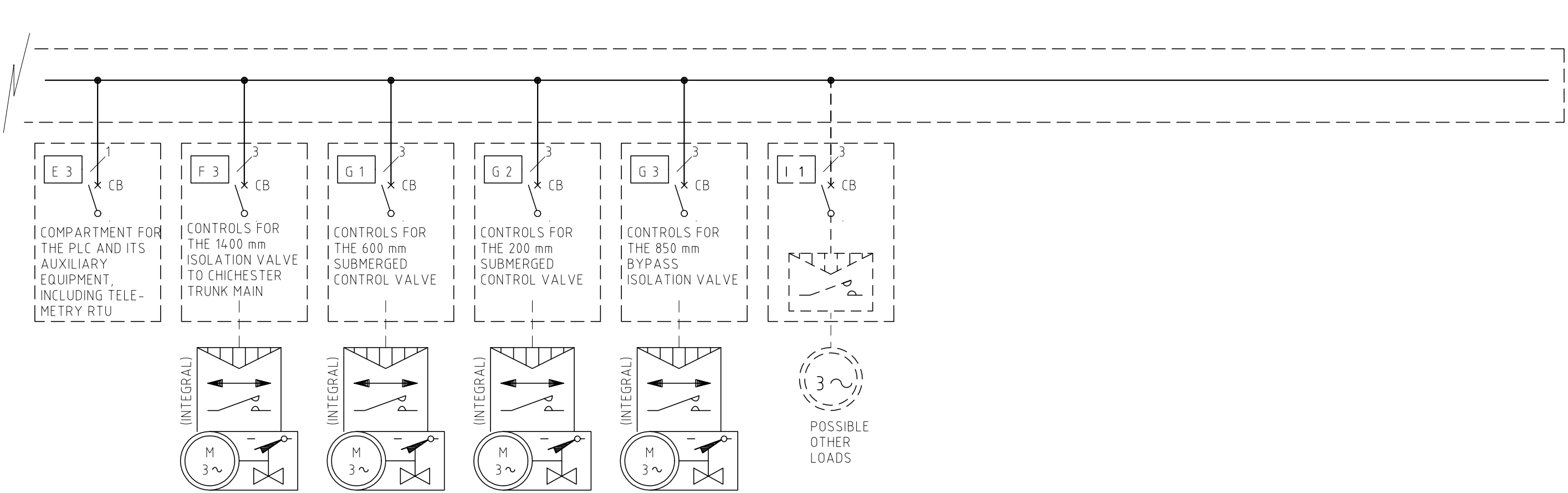

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0	NEW STD DWG SET	RH	05.09.2008				
1	SECOND DRAFT ISSUE	RH	04.12.2008				

HUNTER WATER

DESIGNED: RH	DATE: 05.09.2008	COMPANY: HWC
DRAWN: RH	DATE: 05.09.2008	COMPANY: DC
CHECKED: BR	DATE: 05.09.2008	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
MAIN SWITCHGEAR AND CONTROLGEAR ASSEMBLY
SINGLE LINE DIAGRAM-SHEET 3 OF 4

SIZE	SCALE	DRAWING No.	SHEET	REV No.
A3	N.T.S.	DC8117	03	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE3.dwg

CONTINUED FROM
SECOND SHEET

C 3

3 CB

MAINS SUPPLY
(NORMAL SUPPLY)
DISTRIBUTION
BUSBAR

CB

FROM RESPECTIVE
UPS DISTRIBUTION
CIRCUIT BREAKER
(UPS DB SECTION)

CB

FROM RESPECTIVE
UPS DISTRIBUTION
CIRCUIT BREAKER
(UPS DB SECTION)

CB

CB

CB

LIGHT AND POWER
LOADS OF THE
VALVE BLOCK

TO EXTERNAL
UPS

FROM
UPS

U.P.S. ASSEMBLY

50 Hz

50 Hz

240 V, 1 Ø.

3 CB

UPS
DISTRIBUTION
BUSBAR
(INSTRUMENTS)

CB

CB

TO INSTRUMENTATION
LOADS

TO
TELEMETRY

3 CB

OUTLET TOWER
SWITCHGEAR AND
CONTROLGEAR
ASSEMBLY
(OTSCA)

CB

TO EXTERNAL
LOADS

DAM LEVEL
MEASURING

DAM WATER
CONDITION
MEASURING

3 CB

UPS
DISTRIBUTION
BUSBAR
(INSTRUMENTS)

CB

CB

TO INSTRUMENTATION
LOADS

TO WEIR CONTROL
MONITORING

WEIR LEVEL
MEASURING
EQUIPMENT

3 CB

DOWNSTREAM
MEASURING WEIR
ELECTRICAL
ENCLOSURE
(DMWEE)

CB

CB

TO LOCAL
POWER LOADS

TO HYDRAULIC
MOTOR DRIVES

No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	05.09.2008
1	FIRST DRAFT ISSUE	RH	05.09.2008
2	SECOND DRAFT ISSUE	RH	04.12.2008

No.	REVISION DETAILS	DWN	DATE

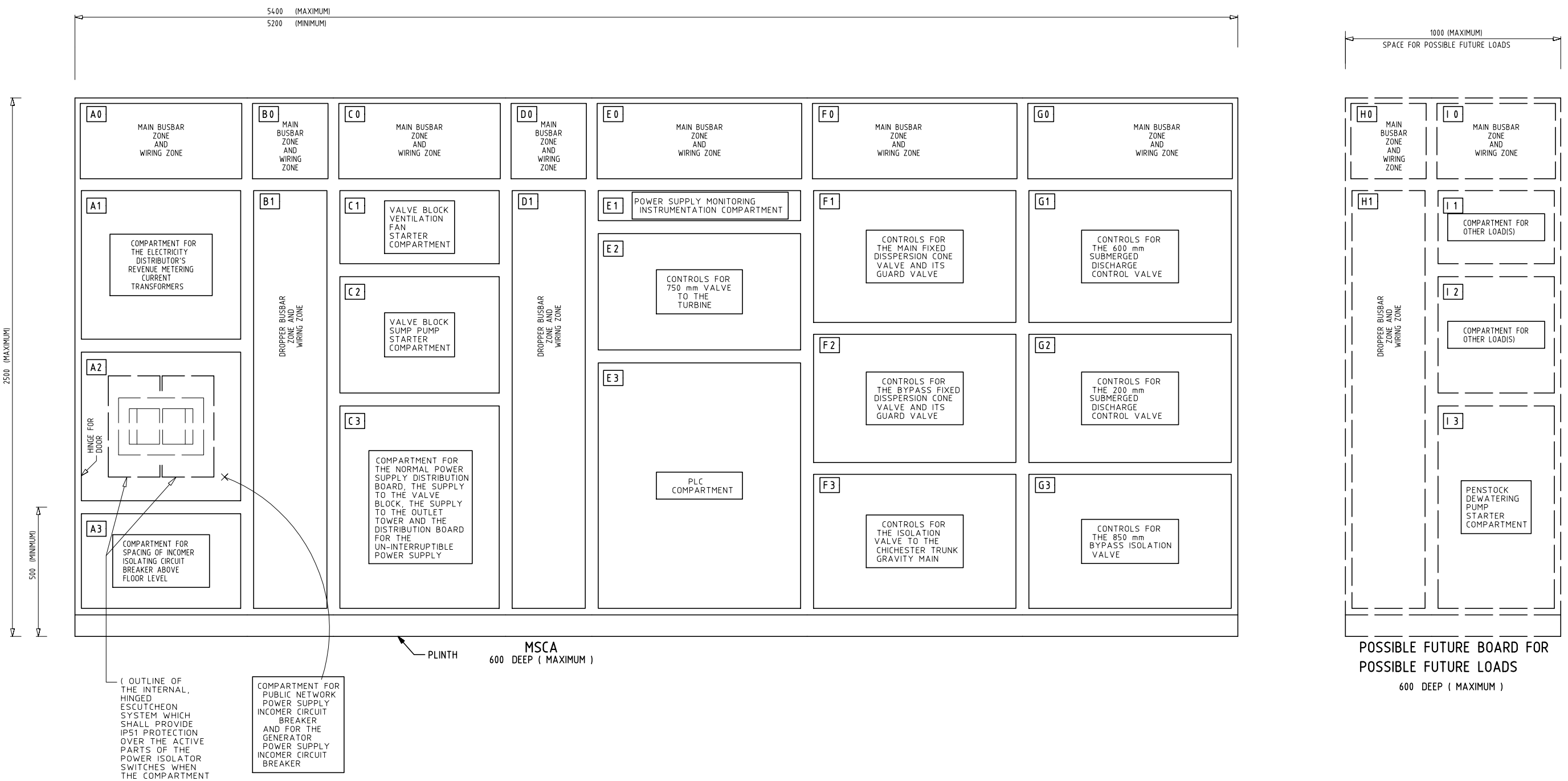
HUNTER WATER

DESIGNED: RH	DATE: 05.09.2008	COMPANY: HWC
DRAWN: RH	DATE: 05.09.2008	COMPANY: DC
CHECKED: BR	DATE: 05.09.2008	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
MAIN SWITCHGEAR AND CONTROLGEAR ASSEMBLY
SINGLE LINE DIAGRAM-SHEET 4 OF 4

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	04	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE4.dwg



NOTES

1 THE MSCA SHALL BE CONSTRUCTED TO HUNTER WATER CORPORATION'S STS 500, CLAUSE 3.3.3 (FORM 3B SCA)

No.	REVISION DETAILS	DWN	DATE	No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	10.09.2008				
1	FIRST DRAFT	RH	10.09.2008				
2	SECOND DRAFT	RH	04.12.2008				

HUNTER WATER

DESIGNED: RH	DATE: 10.09.08	COMPANY: HWC
DRAWN: RH	DATE: 10.09.08	COMPANY: DC
CHECKED:	DATE:	COMPANY:
APPROVED:	DATE:	COMPANY:

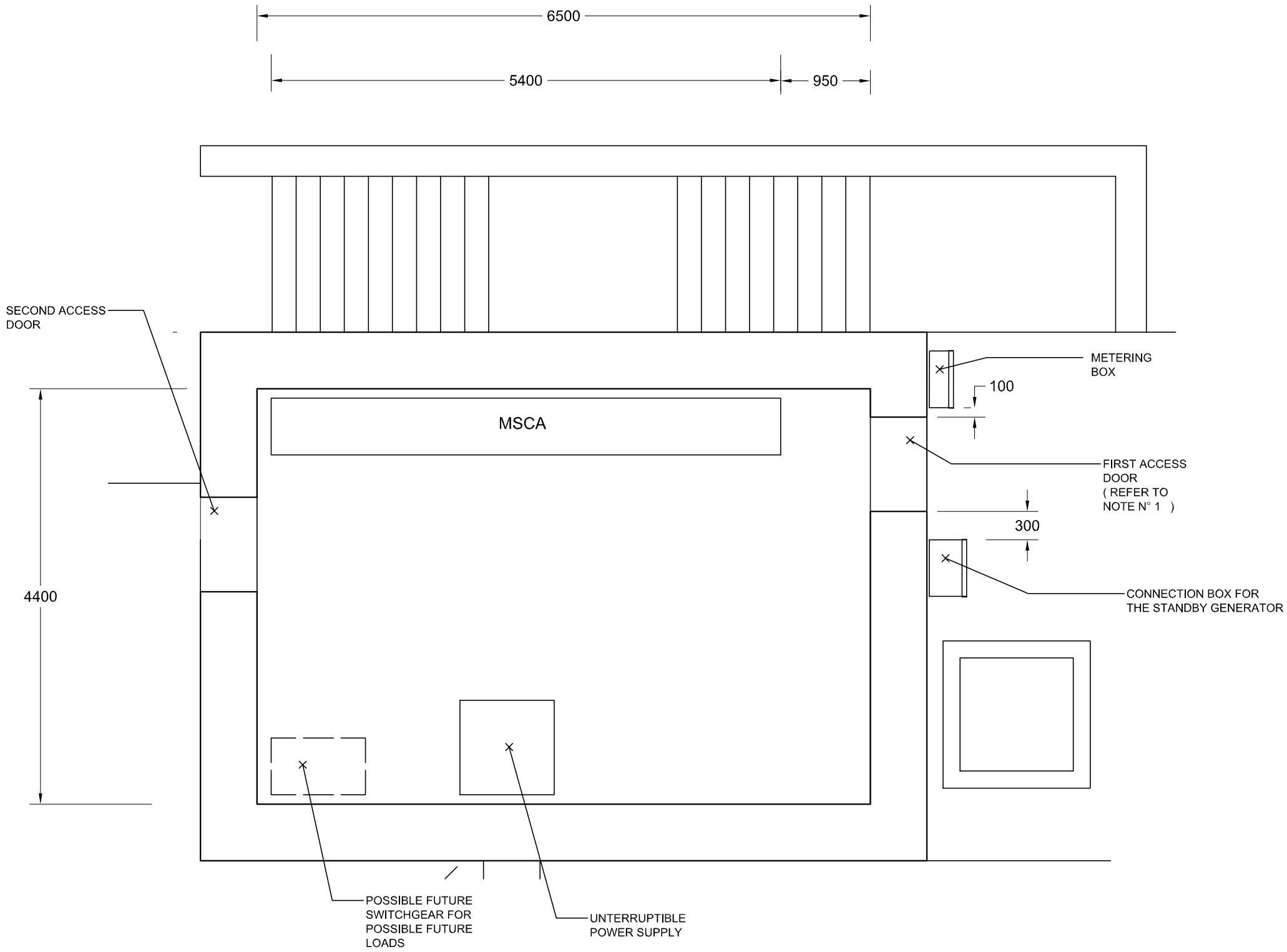
TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
MAIN SWITCHGEAR AND CONTROLGEAR ASSEMBLY
GENERAL ARRANGEMENT

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	05	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE5.dwg

NOTES

1 TWO DOORS WOULD PROVIDE A SAFE MEANS OF ESCAPE IN THE EVENT OF AN ELECTRICAL EXPLOSION OF THE MSCA.
BOTH DOORS SHOULD BE NORMAL WIDTH AND HEIGHT DOORS (2040 mm H AND 820 mm W) . HOWEVER, THE DOOR JAMB OF ONE DOOR SHOULD PROVIDE A CLEAR OPENING HEIGHT OF 2700 mm. THE TOP BETWEEN DOOR LEAF AND THE THE EXTRA-HEIGHT DOOR JAMB SHOULD BE FILLED IN BY A SCREW-RETAINED FILL-IN PANEL. THIS PANEL WOULD BE REMOVED DURING MSCA DELIVERY AND MSCA REMOVAL AS FOR REPAIR AND REPLACEMENT.



1:25 0 500 1000 1500 2000 2500 mm
500
SCALE 1:25

No.	REVISION DETAILS	DWN	DATE	No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	10.09.2008				
1	FIRST DRAFT ISSUE	RH	10.09.2008				
2	SECOND DRAFT ISSUE	RH	04.12.2008				

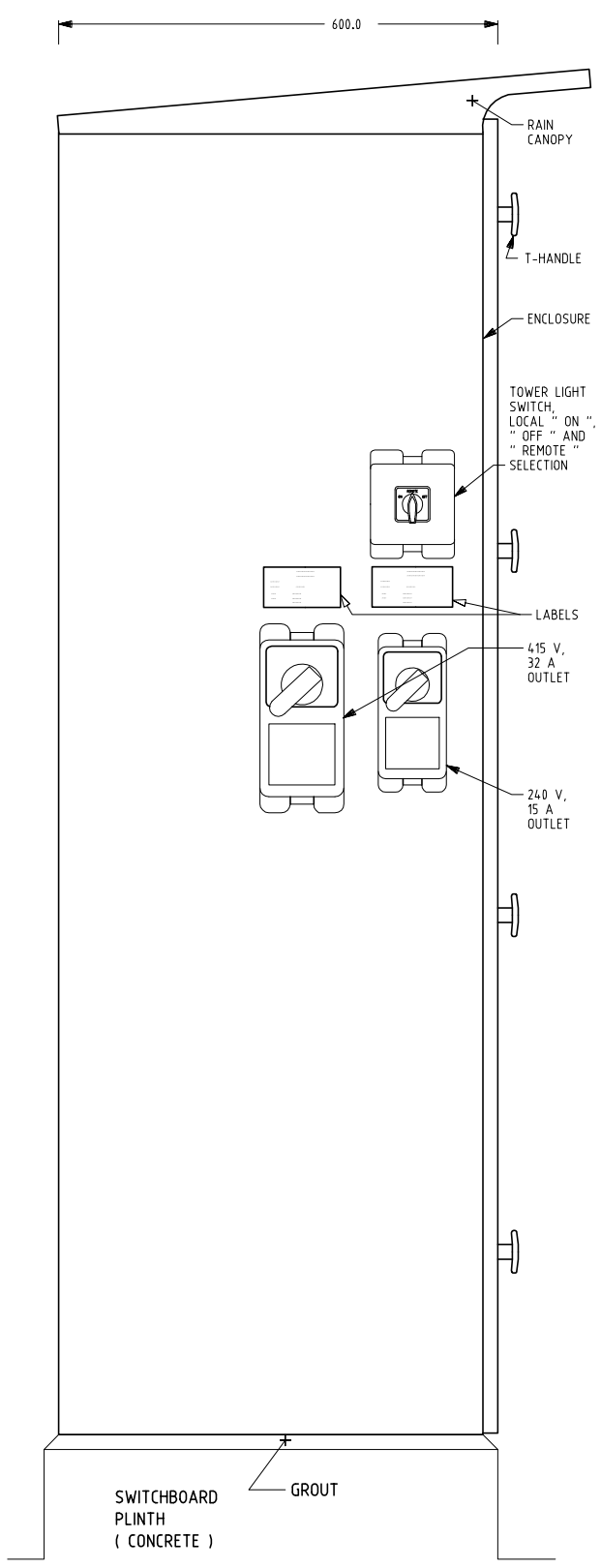
HUNTER WATER

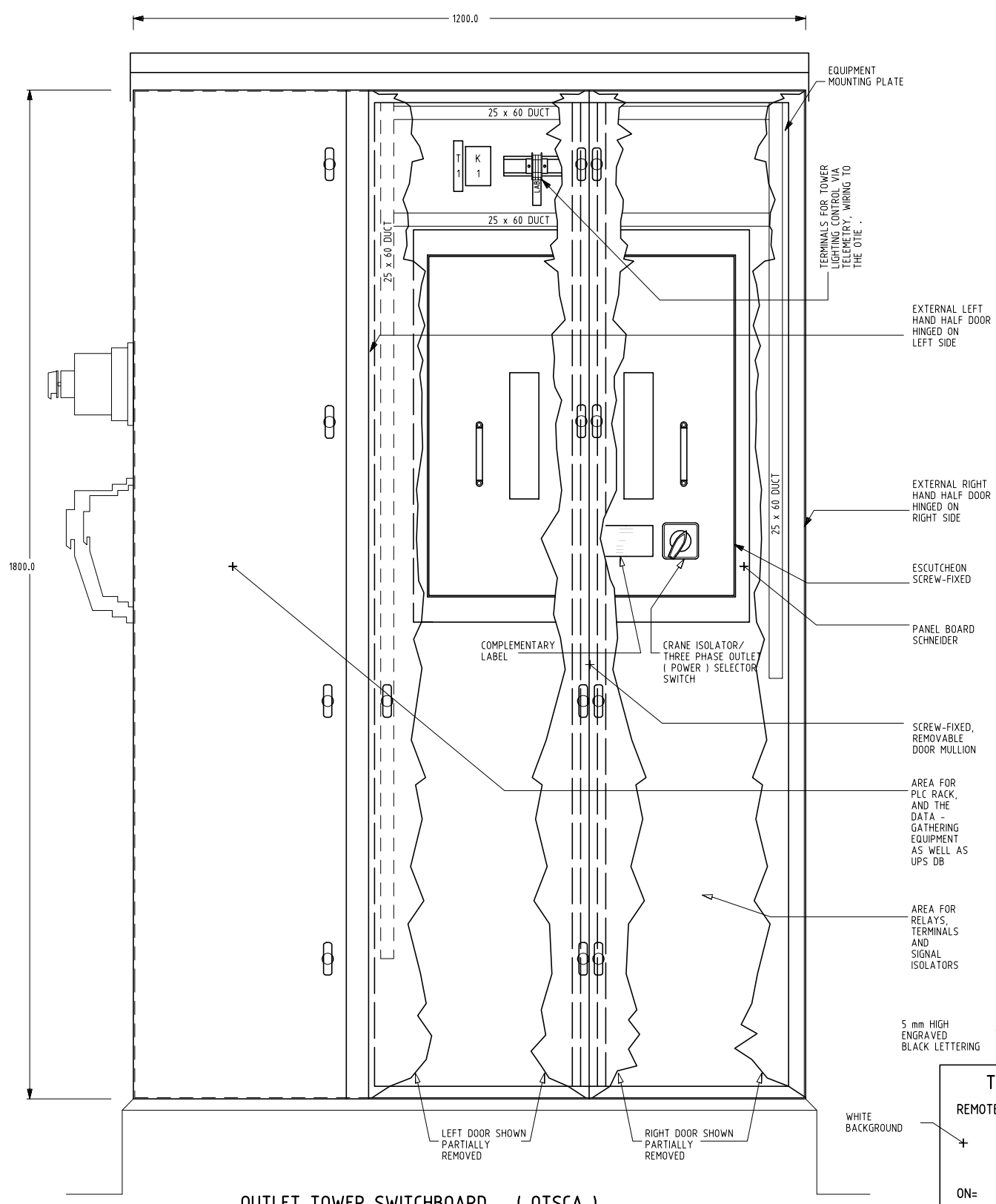
DESIGNED: RH	DATE: 10.09.08	COMPANY: HWC
DRAWN: RH	DATE: 10.09.08	COMPANY: DC
CHECKED: BR	DATE:	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:
TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT, VALVE BLOCK BUILDING
ELECTRICAL CONTROL ROOM
LAYOUT

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	06	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current



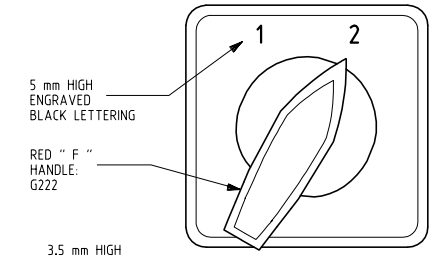


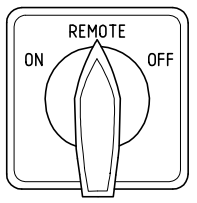
OUTLET TOWER SWITCHBOARD (OTSCA)

1:5 0 100 200 300 400 500 mm

(POWER) SELECTOR SWITCH SPECIFICATIONS			
ITEMS	REQUIREMENT	MANUFACTURER	PRODUCT CODE
CONTACT ASSEMBLY	THREE POLES, 600 VOLTS MINIMUM, 32 A THERMAL MINIMUM, 15 kW AC23, TWO POSITIONS, 60° SWITCHING	K AND N AUSTRALIAN SOLENOID	C26-A222-600
MOUNTING	FOUR HOLE FRONT PROTECTION : IP 65 REAR PROTECTION : IP 42	K AND N AUSTRALIAN SOLENOID	ED
SWITCH ESCUTCHEON	ENGRAVED AS SHOWN, 64 by 64 SQUARE MINIMUM, SILVER BACKGROUND, BLACK LETTERING	K AND N AUSTRALIAN SOLENOID	F072
SWITCH HANDLE	RED, SHAPE AS SHOWN	K AND N AUSTRALIAN SOLENOID	G222

(LIGHT) SELECTOR SWITCH SPECIFICATIONS			
ITEMS	REQUIREMENT	MANUFACTURER	PRODUCT CODE
CONTACT ASSEMBLY/ SWITCH	TWO POLE CHANGEOVER WITH OFF POSITION 250 VOLTS MINIMUM, 10 A THERMAL MINIMUM, 10 A AC2 MINIMUM THREE POSITIONS,	CLIPSAL/ WILCO GERARD INDUSTRIES	7GF20/A519/U
ENCLOSURE	FOUR HOLE MOUNTING MINIMUM PROTECTION : IP 56 REAR PROTECTION : IP 42	CLIPSAL/ WILCO GERARD INDUSTRIES	WMUB
SWITCH ESCUTCHEON	ENGRAVED AS SHOWN,	CLIPSAL/ WILCO GERARD INDUSTRIES	REFER TO ABOVE





3.5 mm HIGH ENGRAVED BLACK LETTERING

COMPLEMENTARY LABEL

CRANE ISOLATOR/THREE PHASE OUTLET (POWER) SELECTOR

HANDLE POSITION	DESCRIPTION
1=	CRANE
2=	32 A 415 V THREE PHASE SOCKET OUTLET

WHITE BACKGROUND

CRANE ISOLATOR/THREE PHASE OUTLET (POWER) SELECTOR SWITCH DETAIL

SCALE 1 : 1

5 mm HIGH ENGRAVED BLACK LETTERING

WHITE BACKGROUND

TOWER LIGHTING CONTROL

REMOTE=	LIGHTS CONTROLLED VIA DATA-GATHERING SYSTEM FROM PUMPING STATION BUILDING
ON=	LOCAL CONTROL SELECTIONS - REMOTE HAS NO EFFECT
OFF=	

TOWER LIGHTING CONTROL (CONTROL) SELECTOR SWITCH DETAIL

SCALE 1 : 1

1:1 0 20 40 60 80 100 mm

20 10

No.	REVISION DETAILS	DWN	DATE	No.	REVISION DETAILS	DWN	DATE
0	NEW STD DWG SET	RH	10.09.2008				
1	FIRST DRAFT ISSUE	RH	07.10.2008				
2	SECOND DRAFT ISSUE	RH	10.10.2008				
3	THIRD DRAFT ISSUE	RH	04.12.2008				

HUNTER WATER

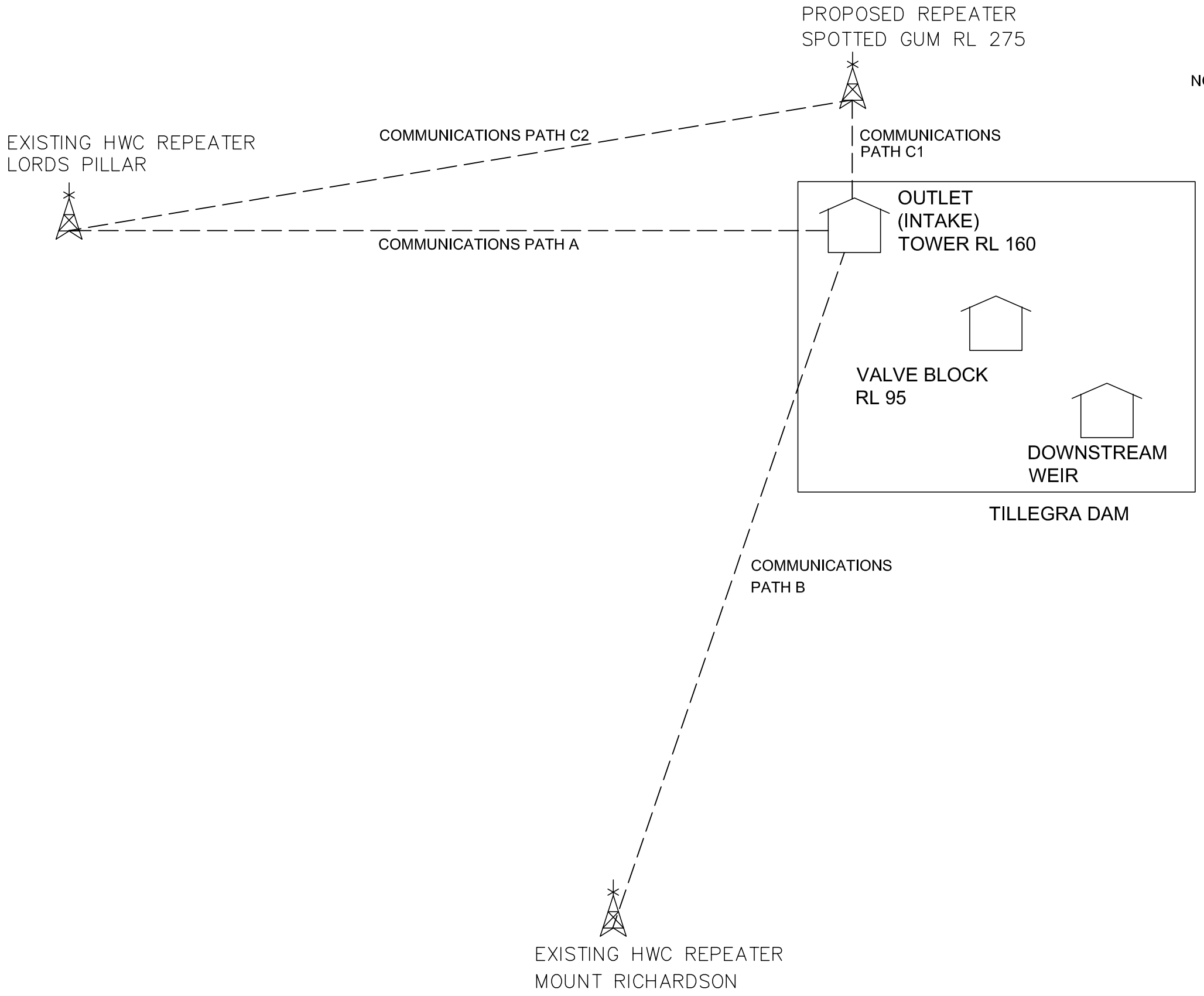
DESIGNED: RH	DATE: 10.09.08	COMPANY: HWC
DRAWN: RH	DATE: 10.09.08	COMPANY: DC
CHECKED: BR	DATE:	COMPANY:
APPROVED:	DATE:	COMPANY:

TITLE:

TILLEGRA DAM
ELECTRICAL SERVICES CONCEPT
OUTLET TOWER SWITCHGEAR AND CONTROL ASSEMBLY
GENERAL ARRANGEMENT

SIZE:	SCALE:	DRAWING No.:	SHEET	REV No.
A3	N.T.S.	DC8117	07	1

FILES STORED IN DECEMBER 2008 IN LAN FOLDER : \\Pws-ho1-nsrv\ho1data0\AESG\IS\M&EWater\People\RUELL\tillegra\concept\drawings\acad2k\hwcmode\current - CAD FILE NAME : eleconceptE7.dwg



NOTES:

1. THE DESKTOP STUDY INDICATES THAT PATH A REQUIRES AN ANTENNA 85 m ABOVE THE TOP OF THE OUTLET TOWER. THE ABOVE CONDITION IS NOT SATISFACTORY.
2. THE DESKTOP STUDY INDICATES THAT PATH B REQUIRES AN ANTENNA 115 m ABOVE THE TOP OF THE OUTLET TOWER. THE ABOVE CONDITION IS NOT SATISFACTORY.
3. THE DESKTOP STUDY OF PATH C1 AND C2 INDICATES THAT USING A REPEATER AT SPOTTED GUM (RL 275) REQUIRES AN ANTENNA ONLY 3 m ABOVE THE TOP OF THE OUTLET TOWER.

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE
NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 14 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK.

DATE ISSUED: NOVEMBER 2008

DESIGNED	F.HAMDEN
VERIFIED	V.J.HYDE
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
COMMUNICATION PATHS FOR DESKTOP STUDY

NO IN SET 8
FILE NO. W3725/00234
DRAWING NO. WS080061-1

565
A1
0 100 200 300 800

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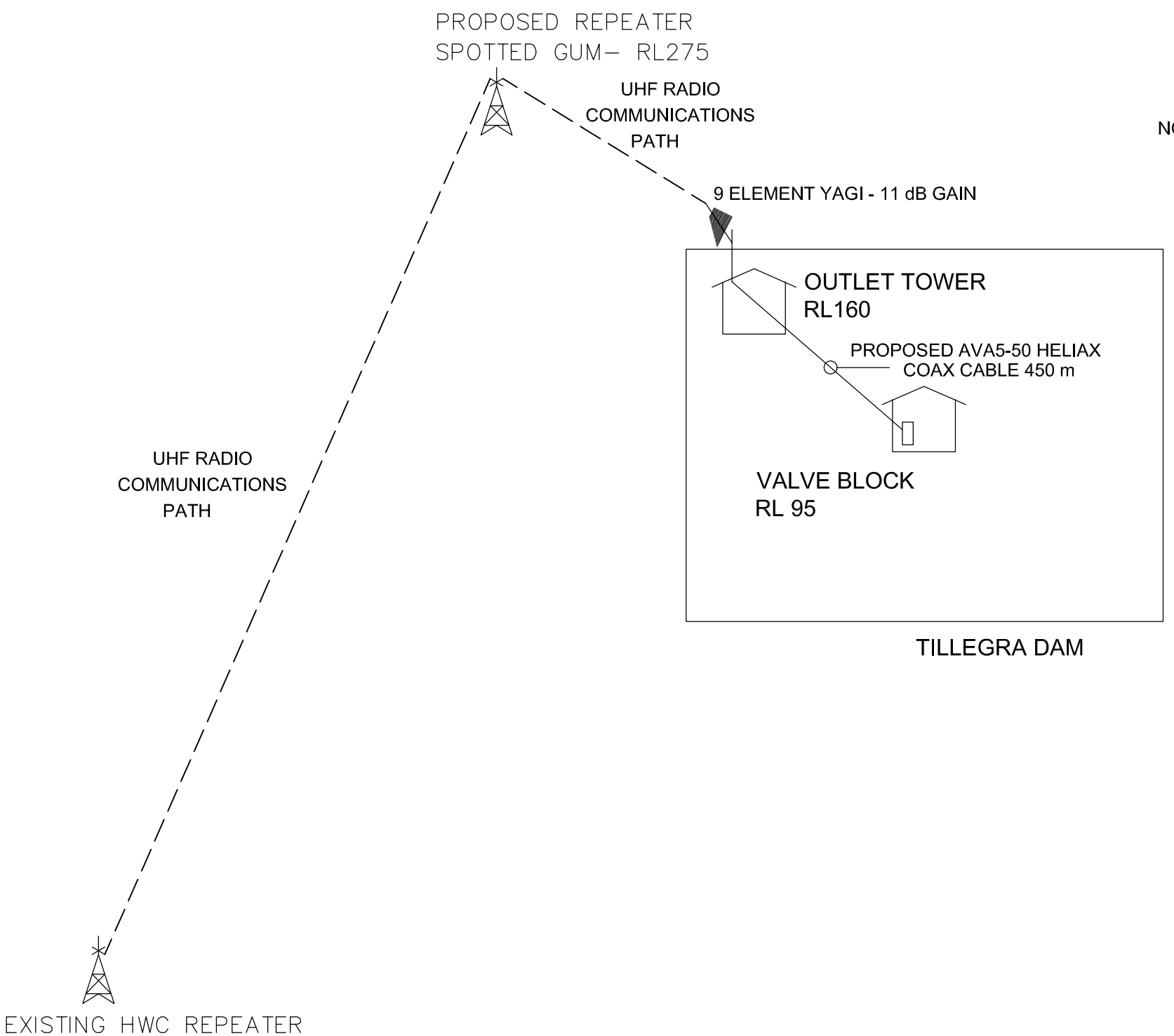

TILLEGRA DAM

NOTES:

OPTION 1 INCLUDES THE FOLLOWING:

1. 450 m COAX CABLE FROM THE ANTENNA TO THE RTU LOCATED IN THE VALVE BLOCK.
2. PDS COMPACT SERIES 500 PLC/RTU IN THE MAIN SCA LOCATED IN THE VALVE BLOCK.
3. COAXIAL CABLE TO BE INSTALLED WITH OTHER CABLES FROM THE VALVE BLOCK TO THE OUTLET TOWER.

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 17 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK.

DATE ISSUED: NOVEMBER 2008

DESIGNED	V.J.HYDE
VERIFIED	J.RAHME
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
COMMUNICATION PATHS OPTION 1

NO IN SET 8

FILE NO. W3725/00234

DRAWING NO. WS080061-2

565

A1 0 800

100 300 200

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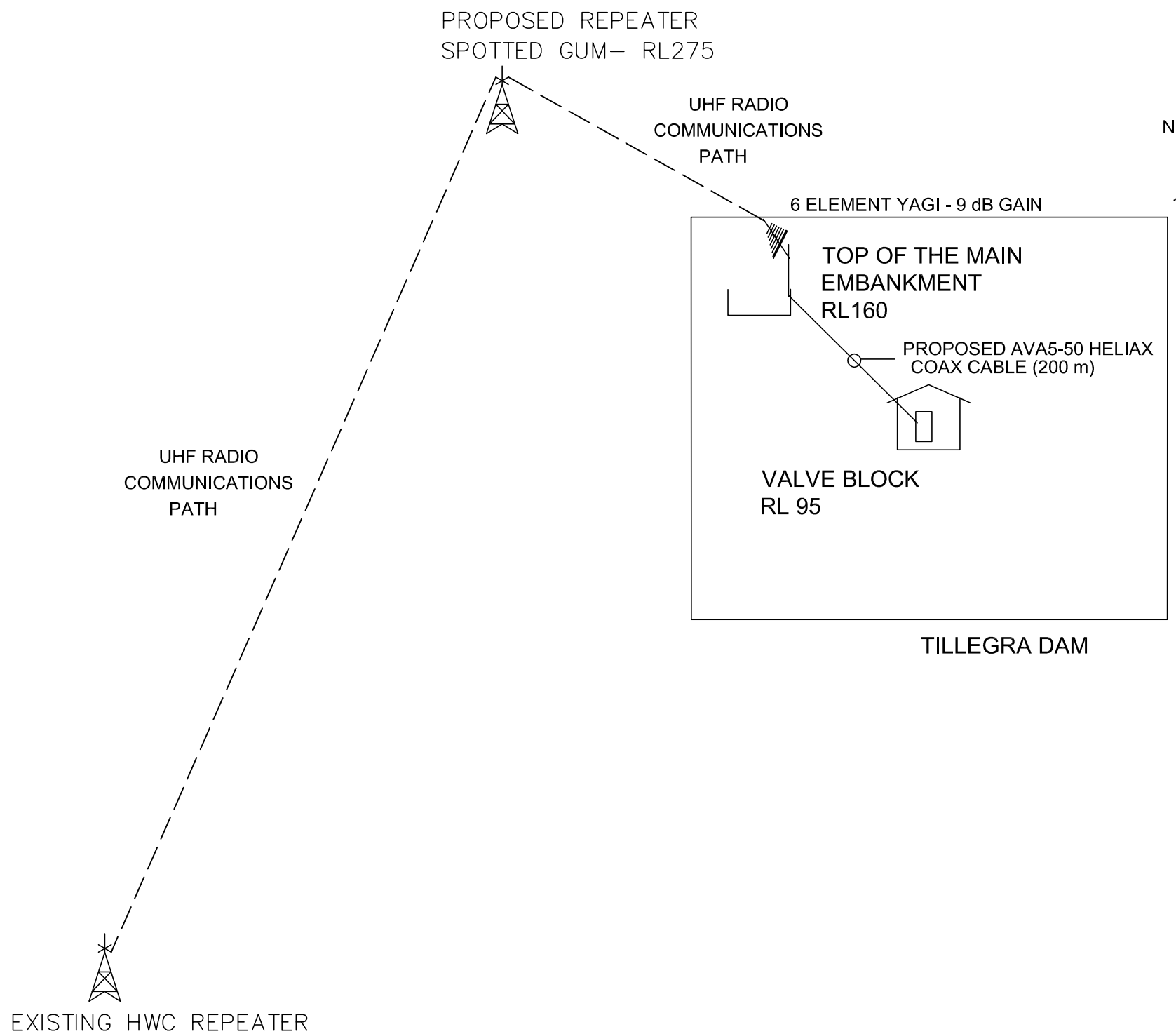

NOTES:

OPTION 2 INCLUDES THE FOLLOWING:

1. 200 m COAX CABLE FROM THE ANTENNA (MAIN EMBANKMENT) TO THE RTU LOCATED IN THE VALVE BLOCK.
2. PDS COMPACT SERIES 500 PLC/RTU IN THE MAIN SCA LOCATED IN THE VALVE BLOCK.
3. COAXIAL CABLE TO BE INSTALLED SEPARATELY IN CONDUIT FROM THE VALVE BLOCK TO THE MAIN EMBANKMENT.

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 17 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK .

DATE ISSUED: NOVEMBER 2008

DESIGNED	V.J.HYDE
VERIFIED	J.RAHME
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
COMMUNICATION PATHS
OPTION 2

NO IN SET 8

FILE NO. W3725/00234

DRAWING NO. WS080061-3

565

A1 0 100 300 200 800

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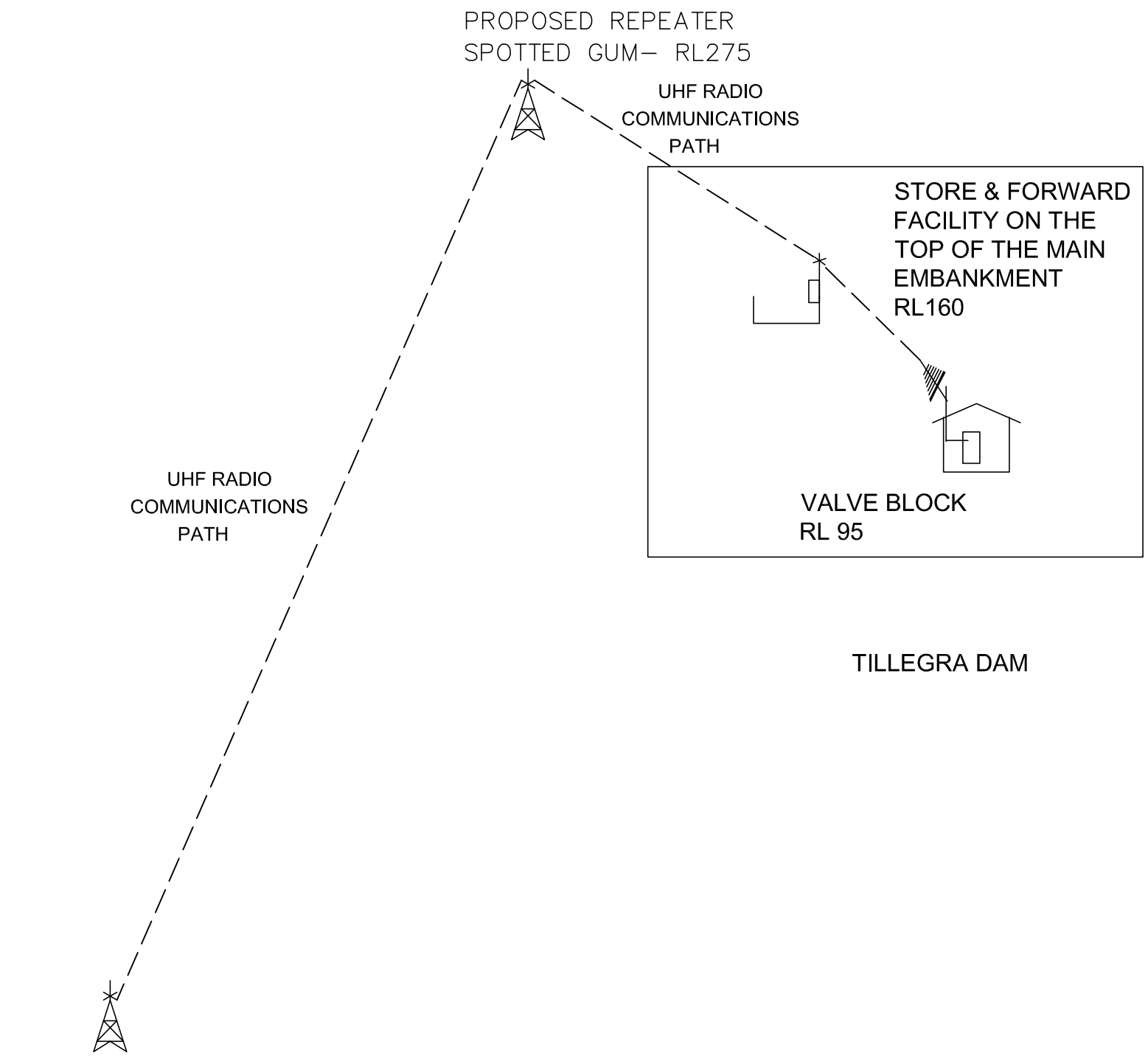

NOTES:

OPTION 3 INCLUDES THE FOLLOWING:

1. AN ADDITIONAL MAINS POWERED STORE & FORWARD FACILITY TO BE LOCATED ON THE MAIN EMBANKMENT.
2. PDS COMPACT SERIES 500 PLC/RTU IN THE MAIN SCA LOCATED IN THE VALVE BLOCK.

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 17 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK .

DATE ISSUED: NOVEMBER 2008	
DESIGNED	V.J.HYDE
VERIFIED	J.RAHME
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
COMMUNICATION PATHS
OPTION 3

NO IN SET 8

FILE NO. W3725/00234

DRAWING NO. WS080061-4

565

A1 0 800

100 300 200

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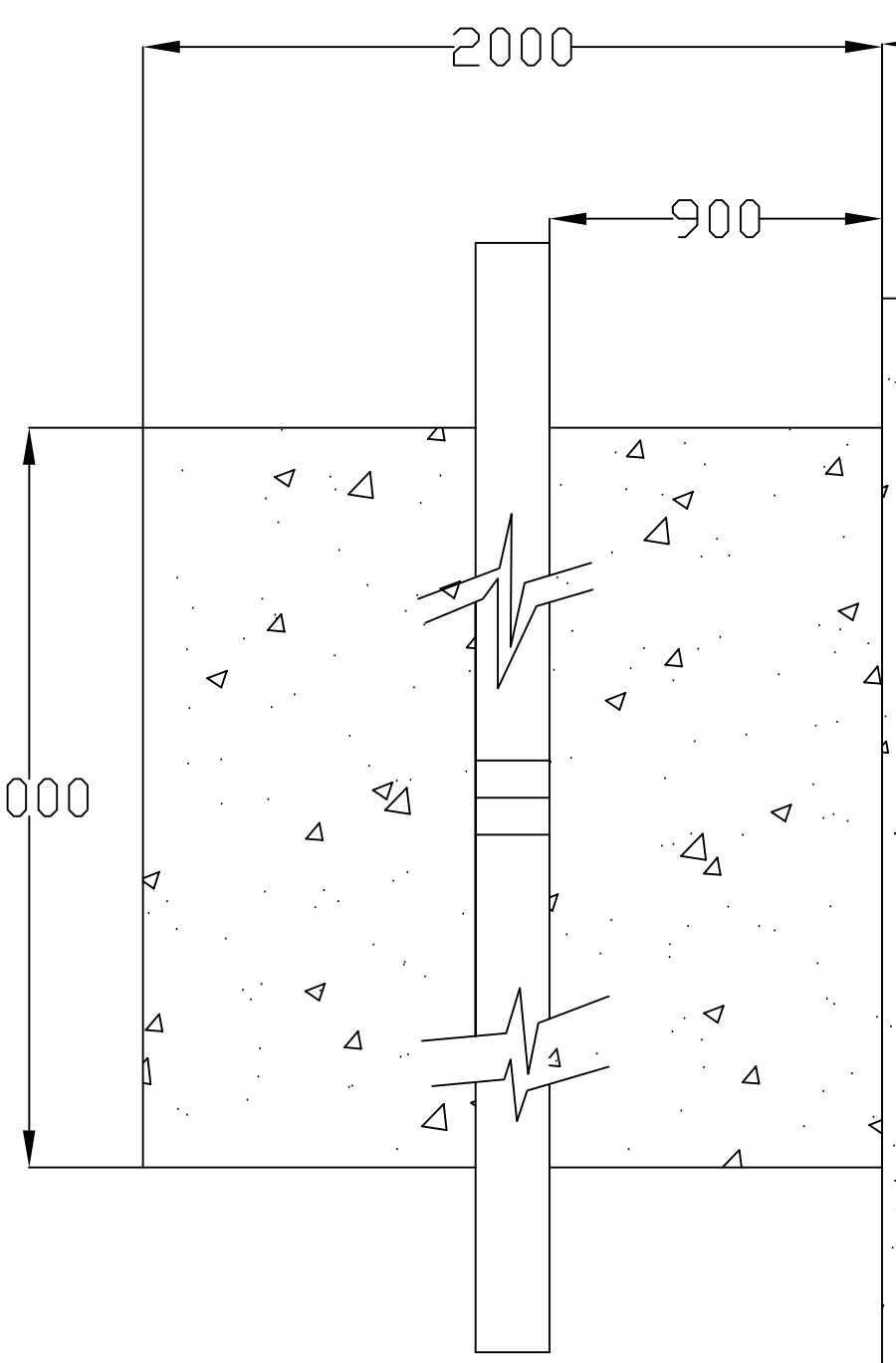
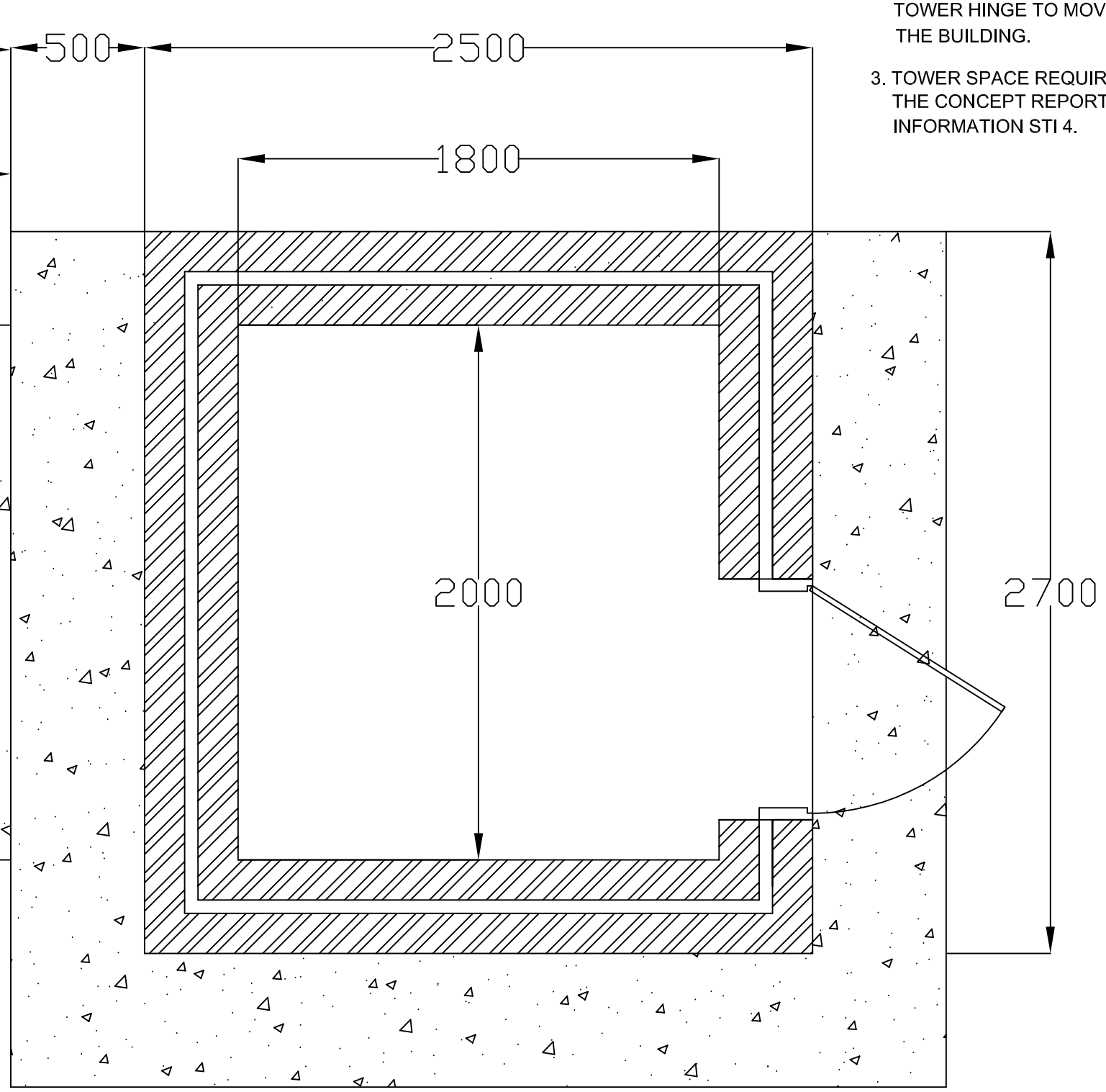
NOTES:

1. TYPICAL REPEATER BRICK BUILDING 2700 x 2500 WITH CONCRETE PATH 500 X 100
2. TYPICAL CONCRETE FOR TOWER 2000 x 2000 X 300. TOWER HINGE TO MOVE THE TOWER PARALLEL TO THE BUILDING.
3. TOWER SPACE REQUIREMENTS HAVE BEEN SHOWN IN THE CONCEPT REPORT SUPPLEMENTARY TELEMETRY INFORMATION STI 4.



PLAN VIEW OF THE TOWER
(NOT RAISED)



PLAN VIEW OF REPEATER BUILDING

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 17 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK .

DATE ISSUED: NOVEMBER 2008

DESIGNED	V.J.HYDE
VERIFIED	J.RAHME
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT

TELEMETRY REPEATER
SITE LAYOUT

NO IN SET 8
FILE NO. WS3725/00234
DRAWING NO. WS080061-6

565
A1
0 100 200 300 800

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SHORT CUT KEYS & ALARM DISPLAY

OUTLET TOWER DIGITAL SIGNALS

OUTLET TOWER SCA MAINS POWER FAIL	N
OTSCA FIBRE OPTIC LINK FAIL	N
OTSCA SECURITY ALARM	N

OUTLET TOWER ANALOG SIGNALS

SIGNAL	CONTINUOUS	ON REQUEST	STATUS
DAM WATER LEVEL		X	110.00 RL AT 10 AM ON THE 12-01-2011
DO FROM HLS		X	56 ppm AT 10.10 AM ON THE 12-01-2011
TEMP FROM HLS		X	24 C AT 10.20 AM ON THE 12-01-2011
TURBIDITY FROM HLS		X	45 ppm AT 10.25 AM ON THE 12-01-2011
DO FROM LLS		X	26 ppm AT 10.10 AM ON THE 12-01-2011
TEMP. FROM LLS	X		24 C
TURBIDITY FROM LLS		X	25 ppm AT 10.30 AM ON THE 12-01-2011

SPOTTED GUM UHF RADIO REPEATER DIGITAL SIGNALS

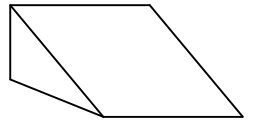
MAINS POWER FAIL	N
DC BATTERY LOW	N
SECURITY ALARM	N
RADIO REPEATER FAIL ALARM	N
SURGE PROTECTION ALARM	N
TELEMETRY LINK (TO MT. RICHARDSON) FAIL ALARM	N

EXISTING ANALOG SIGNAL FROM RADIO REPEATER

SIGNAL	CONTINUOUS	ON REQUEST	STATUS
UPSTREAM GAUGING STATION WATER LEVEL	X		105.00 RL

DOWNSTREAM WEIR DIGITAL SIGNALS

DOWNSTREAM WEIR SCA MAINS POWER FAIL	N
DOWNSTREAM WEIR FIBRE OPTIC LINK FAIL	N
DOWNSTREAM WEIR SECURITY ALARM	N



DOWNSTREAM WEIR

DOWN STREAM WEIR POP UP - MONITOR X

DIGITAL SIGNALS

HYDRAULIC EQUIP AVAILABLE FOR REMOTE CONTROL	Y
HYDRAULIC EQUIP IS FAULT FREE	Y
HYDRAULIC EQUIP IS OPERATIONAL	Y

SIGNAL	CONTINUOUS	ON REQUEST	STATUS
WEIR FLOW	X		10.2 L/S
WEIR POSITION	X		75 %

DOWN STREAM WEIR POP UP - CONTROL X

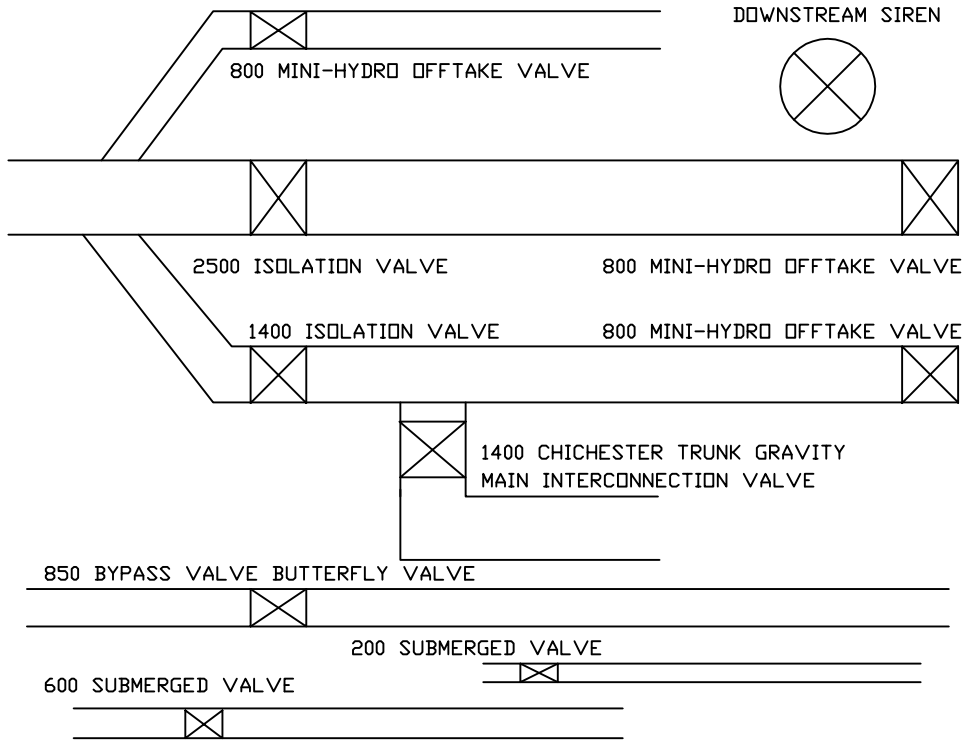
- RAISE WEIR
- LOWER WEIR
- STOP RAISE/LOWER

VALVE BLOCK DIGITAL SIGNALS

MSCA PHASE FAILURE	N
CONTROL ROOM HIGH TEMPERATURE ALARM	N
CONTROL ROOM SECURITY ALARM	N
CONTROL ROOM PLC FAIL ALARM	N
CONTROL ROOM RTU FAIL	N
UPS SUMMARY ALARM	N
VENT FAN STARTER NOT FAULTY	Y
SUMP PUMP IS AVAILABLE FOR AUTO RUNNING	Y
SUMP NOT FLOODED	Y
RTU COMMUNICATION FAIL	N
FIBRE OPTIC COMMUNICATION FAIL	N

VALVE BLOCK ANALOG SIGNALS

SIGNALS	CONTINUOUS	ON REQUEST	STATUS
SEEPAGE WEIR FLOW		X	2 L/S AT 10.05 AM ON THE 12-01-2011



850 BYPASS BUTTERFLY VALVE POP UP - MONITOR X

DIGITAL SIGNALS

AVAILABLE FOR REMOTE CONTROL	Y
VALVE CLOSING	N
VALVE CLOSED	Y
VALVE OPENING	N
VALVE OPENED	N
VALVE FAULT	N

SIGNAL	CONTINUOUS	ON REQUEST	STATUS
FLOW	X		0.0 L/SEC
TOTAL FLOW	X		100.919 ML

850 BYPASS BUTTERFLY VALVE POP UP - CONTROL X

- CLOSE
- OPEN
- RESET VALVE FAULT

DOWNSTREAM SIREN POP UP - MONITOR X

- ACTIVATED 10.35AM 12-1-2011

DOWNSTREAM SIREN POP UP - CONTROL X

- ACTIVATE

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

NSW WATER SOLUTIONS - ELECTRICAL GROUP
LEVEL 14, McKELL BUILDING
2-24 RAWSON PLACE
SYDNEY 2000
PHONE (02) 93728162
FAX (02) 93727933

DATE SIGNED 17 NOV 2008

THE ORIGINAL OF THIS DRAWING WAS SIGNED BY THE PERSONS WHOSE INITIALS APPEAR IN THE TITLE BLOCK.

DATE ISSUED: NOVEMBER 2008

DESIGNED	V.J.HYDE
VERIFIED	J.RAHME
APPROVED	B.RUELL SENIOR ELECTRICAL ENGINEER

NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
HEAD OFFICE VDU
TYPICAL MAIN SCADA DISPLAY

NO IN SET 8
FILE NO. W3725/00234
DRAWING NO. WS080061-7

565
A1
0 100 200 300 800

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NOTES

1 ON THE TYPICAL PROPOSED MAIN SCADA DISPLAY SHOWN ON DRAWING WS080061-7

(A) DIGITAL SIGNALS ARE EITHER 'ON' INDICATED WITH A 'Y' OR 'OFF' INDICATED BY A 'N'. THE STATUS SHOWN IS FOR NORMAL OPERATION.

(B) FOR ANALOG SIGNALS, AN 'X' INDICATES THE OPERATOR SELECTION. THE SELECTION IS MADE BY CLICKING WITH THE CURSOR IN THE ALLOCATED AREA. 'CONTINUOUS' FOR REGULAR UPDATING ON EACH POLL, AND 'ON REQUEST' FOR DATA ONLY WHEN REQUESTED.

(C) 'ON REQUEST' DATA WILL ALWAYS BE TIME STAMPED AT THE RTU..

(D) ALL MONITORING & CONTROL DATA ASSOCIATED WITH THE VALVES, DOWNSTREAM WEIR, & SIREN IS AVAILABLE VIA 'POP UP MENUS' AS FOLLOWS:
D1. SINGLE CLICKING WITH THE CURSOR ON A VALVE, WEIR OR SIREN, BRINGS UP THE 'MONITOR POP UP'.
D2. DOUBLE CLICKING WITH THE CURSOR ON A VALVE, WEIR OR SIREN, BRINGS UP THE 'CONTROL POP UP'.

(E) THE 'POP UP' IS 'CLOSED' BY CLICKING WITH THE CURSOR ON THE 'X' IN THE TOP RIGHT HAND CORNER OF THE 'POP UP'.

2 TO GENERATE THE 'POP UP' DISPLAYS SHOWN ON DRAWING WS080061-7,

(A) THE OPERATOR WILL HAVE TO SINGLE & DOUBLE CLICK THE 'WEIR ICON'.

(B) THE OPERATOR WILL HAVE TO SINGLE & DOUBLE CLICK THE '850 BYPASS BUTTERFLY VALVE ICON'.

(C) THE OPERATOR WILL HAVE TO SINGLE & DOUBLE CLICK ON THE 'SIREN ICON'.

MK	DETAILS OF AMENDMENTS	APPROVED	DATE

GRAEME HEAD
DIRECTOR - GENERAL - NSW DEPARTMENT OF COMMERCE

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NSW Department of Commerce

TILLEGRA DAM
TELEMETRY CONCEPT
HEAD OFFICE VDU
TYPICAL MAIN SCADA DISPLAY NOTES

NO IN SET 8

FILE NO. W3725/00234

DRAWING NO. WS080061-8

565
A1
0 100 200 300 800

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