



**ESKOM HOLDINGS LIMITED**

**PROJECT: ESKOM KUSILE POWER STATION**

**DESCRIPTION: Construction of the Ash Dump Embankment Culvert**

**METHOD STATEMENT – Construct a culvert under the ash dump access embankment as part of the CSY Stream Diversion design to accommodate the 1:100 year, instantaneous flood peak event**

**WMS 5452/110/014 (Rev 1)**

Date: November 2010



**ESKOM KUSILE POWER STATION**

**WMS 5452/110/014 (Rev 1)**

**CONSTRUCTION OF THE ASH DUMP EMBANKMENT CULVERT**

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**ACRONYMS**

CEMP	Construction Environmental Management Plan
EO	Contractor's Environmental Officer
OHSA	Occupational Health and Safety Act
WC	Watercourse Crossing
WMS	Work Method Statement
WUL	Water Use Licence

**APPENDICES**

APPENDIX 1: Drawings

**ESKOM KUSILE POWER STATION**

**WMS 5452/110/014 (Rev 1)**

**CONSTRUCTION OF THE ASH DUMP EMBANKMENT CULVERT**

**1. PROPOSED ACTIVITY:**

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- 1.1 Construct a culvert under the ash dump embankment as part of the Stream Diversion design to accommodate the 1:100 instantaneous flood peak event. The culvert will consist of three parallel Armco KA46 culverts (4.94m diameter) between a concrete inlet and outlet structure.

**2. WHAT WORK IS TO BE UNDERTAKEN**

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- 2.1 The works comprise construction of a three culvert system to pass all clean storm-water that is collected in the Coal Stockyard (CSY) stream diversion channel under the ash dump embankment. The culverts have a capacity to pass the design flow of 83.5 m<sup>3</sup>/s while flowing partially full.

**3. WHERE THE WORKS ARE TO BE UNDERTAKEN**

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- The location of the Ash Dump Embankment Culvert is presented on drawing K5406-036 in Appendix 1.
- The Ash Dump Embankment Culvert is located to the west of the main power station terrace, in the natural streambed, underneath the ash dump embankment.
- The Ash Dump Embankment Culvert is located in the streambed of the non-perennial tributary of the Klipfonteinspruit River. It is positioned in the wetland area and is anticipated to have poor foundation materials. Excavation of unsuitable foundation materials will be required.

**4. START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED**

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- 4.1 Construct Ash Dump Embankment Culvert

START DATE: January 2012  
END DATE: December 2012

**5. HOW THE WORKS ARE TO BE UNDERTAKEN**

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**PANEL B CONSULTANTS JOINT VENTURE**

**5.1 General**

Works will be carried out in accordance with the design drawings and the specifications and in accordance with the following:

- The content of this WMS will be brought to the attention of all persons associated with the project and such measures as are necessary will be put in place to bind these persons to the requirements herein
- A copy of this WMS will be on site with the appropriate personnel at all times
- The general methodology set out in the following sections.

Note: Routine plant maintenance will be done only in the Contractors Yards using the workshop facilities.

Table1: Schedule of Drawings (Refer Appendix 1)

<b>DRAWING NUMBER</b>	<b>REV</b>	<b>DESCRIPTION</b>
5406-036	5	ASH DUMP ACCESS EMBANKMENT CULVERT GA
5406-085	1	ASH DUMP EMB. CULVERT INLET REINFORCEMENT SCHEDULES AND DETAILS SHEET 1
5406-086	1	ASH DUMP EMB. CULVERT INLET REINFORCEMENT SCHEDULES AND DETAILS SHEET 2
5406-088	1	ASH DUMP EMB. CULVERT OUTLET REINFORCEMENT SCHEDULES AND DETAILS SHEET 1
5406-089	1	ASH DUMP EMB. CULVERT OUTLET REINFORCEMENT SCHEDULES AND DETAILS SHEET 2
5406-094	2	ASH DUMP EMB. CULVERT CONCRETE LAYOUT & DETAILS 1/2
5406-095	2	ASH DUMP EMB. CULVERT CONCRETE LAYOUT & DETAILS 2/2

Table 2: Schedule of Applicable Reports

<b>REPORT REF.</b>	<b>DATE</b>	<b>DESCRIPTION</b>
27/2/1/B620/103/6	Jan/09	INTEGRATED WATER USE LICENCE (WUL)
*Wetland Consulting	Aug/09	ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE ESKOM KUSILE POWER STATION PROJECT
4446/401281	Aug/09	PROJECT BRAVO DRAFT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

**5.2 Risk assessment**

All construction activities will be subject to a risk assessment to ensure personnel safety.

## PANEL B CONSULTANTS JOINT VENTURE

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### 5.3 Environmental Assessment

All construction activities will be managed and monitored in accordance with Eskom's formal site environmental specification.

### 5.4 Hours of operation

All construction activities will be carried out between 00:00 and 24:00.

### 5.5 Construction of the Ash Dump Embankment Culvert

- 5.5.1 Temporary construction phase storm-water channels and silt traps will be provided around the Ash Dump Embankment Culvert construction site before construction commences, to divert clean run-off and to manage site storm-water run-off for the control of silt discharge to stream. Because the Ash Dump Embankment Culvert is in the stream course, an upstream diversion dam must be installed, and any water accumulating behind the dam will be either pumped or gravitated around the construction area, per the contractor's design.
- 5.5.2 Excavation into natural ground will be necessary for the Ash Dump Embankment Culvert. Excavated material that is determined by the engineer to be suitable as fill material may be used in the ash dump embankment or other fill areas. However, in the stream bed excavated material is not expected to be suitable as fill. Unsuitable material will be disposed to a formal stockpile.
- 5.5.3 The Ash Dump Embankment Culverts will have a finished gradient of roughly 1.8%. Occasional cleaning of sediment from within the culvert barrels is expected.
- 5.5.4 Topsoil and organic material will be excavated and stockpiled for use in the later dressing of completed embankments at Kusile Power Station, ahead of grassing.
- 5.5.5 The culvert barrels will be provided with a concrete liner to the bottom third of the inner circumference, for protection against damage from larger debris that could enter the structure.
- 5.5.6 The exposed upper two thirds of steel will be coated with an ABE under-body sealer per the supplier's recommendations, to prevent corrosion and increase the life of the structures.
- 5.5.7 The inlet and outlet of the Ash Dump Embankment Culvert will be concrete structures that both secure the culvert barrels and prevent erosion at the entry and discharge points.
- 5.5.8 The Ash Dump Embankment Culvert will be confined within the bounds of the power station perimeter fence.

## 6 ENVIRONMENTAL MANAGEMENT STRATEGY

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### 6.1 Environmental Impact Management

Changes and impacts to hydrology at landscape level; increased erosion and deterioration of water quality (turbidity) are addressed in the construction phase planning of the Ash Dump Embankment Culvert, by the incorporation of sound

## PANEL B CONSULTANTS JOINT VENTURE

environmental design principles as set out in the *Integrated Water Licence Application for the Kusile Power Station Project*. Nevertheless, certain activities and aspects associated with the actual construction of the ash dump embankment culvert and its components according to these designs may still cause impacts as a result of how these activities are undertaken, where, when and the duration thereof. These include:

- Clearing of the Ash Dump Embankment Culvert footprint (including extending activities beyond the maximum impact foot print)
- Establishment and management of the contractor's yard, bulk material storage areas, and topsoil stockpile areas
- Management of construction materials (movement, storage, preparation and handling)
- Management of machinery (movement, storage, maintenance)
- Management of sanitation and waste (movement, storage)
- Management of storm water
- Management of sediment (structures and containment); and
- Rehabilitation.

Possible impacts associated with these activities are listed in Table 3 below along with environmental significance ratings pre- and post mitigation (i.e. indicating effectiveness of the mitigation measures set out in Table 4).

Table 3: Impacts and Significance Ratings

Impact	Environmental Significance	
	Before Mitigation	After Mitigation
Alteration of storm-water flow regimes, including but not limited to:		
~ Concentrated flows	Moderate	Low
~ Sheet flows	Moderate	Low
Deterioration of water quality (mainly turbidity), including but not limited to:		
~ Sedimentation	Moderate	Low
~ Accidental spills (hydrocarbons, other hazardous chemicals)	Low	Low
~ Contamination via storm-water runoff	Low	Low

The measures to manage the above impacts as derived from the documents listed in Table 3 are presented in Table 4.

Table 4: Mitigation Measures

Impact	Measures (What and Where)	When, Duration	Responsibility
General (relevant to all impacts)	Environmental awareness training must be provided for all contractors and workers, appropriate to the activity and addressing the mitigation measures contained in the documents listed in Table 4 as well as in this work method statement	Before construction commences	Contractor's EO
	A maximum impact footprint must be appropriately delineated and sign	Before construction commences	Contractor

**PANEL B CONSULTANTS JOINT VENTURE**

Impact	Measures (What and Where)	When, Duration	Responsibility
	posted		
	Sensitive areas not within the impact footprint must be clearly demarcated and sign posted "No Go"	Before construction commences	Contractor's EO
	Construction camps shall be located outside the extent of any watercourse and must be recovered and removed shortly after construction has been completed – also refer P15 of the CEMP	Ongoing (Removal within 3 weeks of completion of construction)	Contractor
	Machinery and equipment must be kept in good working order	Ongoing (duration of construction phase)	Contractor
Deterioration of water quality (mainly turbidity), including but not limited to: ~ Sedimentation ~ Accidental spills (hydrocarbons, other hazardous chemicals) ~ Contamination via stormwater runoff	Standard best environmental practice housekeeping rules must be applied with regards to refuse management, ablutions, fire prevention etc.) – refer P7-9 of CEMP (Framework EMP)	Duration of crossing construction	Contractor
	Storage, washing and maintenance of equipment and machinery must be undertaken outside the extent of any watercourse and only in demarcated areas where runoff and spills are managed in an environmental sound manner	Ongoing (duration of construction phase)	Contractor
	Sanitation and waste management facilities must be located outside of the extent of a watercourse and must be managed in an environmental sound manner	Ongoing (duration of construction phase)	Contractor
	Materials must be stored outside the extent of any watercourse, and transported and prepared/handled in an environmentally sound manner, in compliance with relevant legislation - discharges into watercourses must be prevented as far as reasonably possible and stockpiles must be protected from erosion	Ongoing (duration of construction phase)	Contractor
	An emergency plan (i.e. measures for prevention, detection, management and reporting) must be prepared for dealing with accidental spills and leaks in compliance with relevant legislation and regulations	Ongoing (duration of construction phase)	Contractor
	Sediment traps and fencing must be utilised to prevent excess levels of sediments entering watercourses from work areas and afterwards disposed of in accordance with Kusile Waste Management Procedures	Ongoing (duration of construction phase)	Contractor
	Contamination of stormwater runoff must be prevented	Ongoing (duration of construction phase)	Contractor
	Stormwater must be diverted into vegetated buffer zones and not directly into surface water – concentrated flows must be prevented and velocities may not exceed 0.5m/s	Ongoing (duration of construction phase)	Contractor

## PANEL B CONSULTANTS JOINT VENTURE

### 6.2 Monitoring and Review Strategy

Monitoring and reporting will be undertaken as set out in Table 5, below. Steps for non-compliance with this method statement are provided for on pages 29-30 of the CEMP.

Table 5: Monitoring and Review Measures

What	Where	When	Responsibility	Reporting Requirements
Monitoring for erosion	Approaches to, and the actual wetland and stream crossings	One weekly inspection, or after a rainfall event	Contractor's EO	Refer WUL, P7 and 8
Monitoring of the movement, storage and handling of construction materials	Active construction sites	Twice weekly inspections	Contractor's EO	
Monitoring of movement of machinery	Active construction sites	Twice weekly inspections	Contractor's EO	
Monitoring of other construction related activities	Active construction sites for the duration of the activity	Twice weekly inspections	Contractor's EO	
Monitoring of water quality (turbidity)	10m downstream of a construction site	The first measurement before construction commences and a second not later than 3 hours after the commencement of construction related activities  Ad hoc measurements must be taken opportunistically during the construction period	Contractor's EO	
Emergency and pollution incidents <sup>1</sup>	All sites	At all times	Contractor's EO	Section 19 and 20 of the National Water Act

<sup>1</sup> Pollution means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it: (a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or (b) harmful or potentially harmful - (aa) to the welfare, health or safety of human beings; (bb) to any aquatic or non-aquatic organisms; (cc) to the resource quality; or (dd) to property

## 7 RESPONSIBILITIES AND PRESCRIBED OCCUPATIONS

The various responsibilities and occupations involved in the execution of this WMS are detailed in the following sections.

### 7.1 Design Engineer

The Design Engineer is Panel B Consultants JV.

The role of the Design Engineer is:

- To design the Kusile Ash Dump Embankment Culvert to the required national and regional standards;



## PANEL B CONSULTANTS JOINT VENTURE

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- To produce the construction drawings to enable the Rail Embankment Culvert to be built;
- To design the temporary construction phase storm-water management facilities;
- To provide a Bill of Quantities for the Kusile Ash Dump Embankment Culvert.

The Design Engineer's responsibilities are:

- To ensure that all designs are supplied correctly and in a timely manner;
- To provide Design Liability Insurance.

### 7.2 Contractor

The role of the Contractor is:

- To construct the Kusile Ash Dump Dirty Dam in accordance with the "approved for construction drawings" and the required specification.
- To provide all safety, quality and environmental paperwork in due time and to the required standard. All work is to be carried out in accordance with the national Occupational Health and Safety Act (OSHA) and environmental authorisations (including the WUL).

The Contractor's responsibility is:

- To produce and maintain the construction programme, whereby prior to construction commencement, the Contractor shall compile, complete and provide a list of anticipated or potential construction delays.

### 7.3 Contractor's Site Manager

The Site Manager for the project will be the Kusile Project.

The role of the Site Manager is:

- To ensure that all personnel, materials and equipment are available and in good order to complete the required works to the required standards.

The Site Manager's responsibility is:

- To programme the works to ensure that the contract is completed within the contract period.

### 7.4 Contractor's Environmental Officer (EO)

The role of the EO is:

- To ensure compliance with the environmental authorisations and CEMP and any other relevant legislation; and
- To pre-empt environmental problems and provide constructive solutions
- To ensure a pre-construction investigation and report on endangered and other species is carried out.

The EO's responsibilities are:

- To monitor the Contractor and the Projects performance against the necessary standards outlined within the legislation; ie R.O.D., EIA, EMP and DWA licence conditions
- To report to and be accountable to the Environmental Monitoring Committee; and
- To report any non-compliance to the relevant authority.

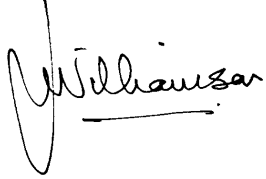
**PANEL B CONSULTANTS JOINT VENTURE**

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**DECLARATIONS:**

**1. DESIGN ENGINEER**

The work described in this Method Statement, if carried out according to the methodology described is satisfactorily mitigated to prevent avoidable environmental harm.



\_\_\_\_\_

JRG Williamson Pr. Eng.

**(Signed)**

**(Print Name)**

**Dated:** 1 November, 2010

**2. SITE MANAGER**

I understand the contents of this Method Statement and the scope of the works required from me.

\_\_\_\_\_

\_\_\_\_\_

**(Signed)**

**(Print Name)**

**Dated:** \_\_\_\_\_

**3. APPROVING AUTHORITY (EO)**

The works described in this method statement are approved

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(Signed)**

**(Print Name)**

**(Designation)**

**Dated:** \_\_\_\_\_

## **APPENDIX 1**

### **DRAWINGS**

**CONSTRUCTION NOTES:**

THE FOUNDATION DESIGN IS BASED ON THE EXPECTED FOUNDATION CONDITIONS. FOLLOWING FULL EXCAVATION, THE GEOTECHNICAL ENGINEER MAY SPECIFY CHANGES TO THE DESIGN IF UNFORESEEN FOUNDATION CONDITIONS ARE ENCOUNTERED.

**FOUNDATIONS**

- EXPECTED FOUNDATION CONDITIONS ARE AS FOLLOWS:  
A RESIDUAL TILLITE AT THE DEPTH OF THE CULVERT FOUNDATION UNDERLAIN BY SOFT WEATHERED DIABASE BEDROCK. CONSOLIDATION OF THE FOUNDATION SOILS IS EXPECTED.
- EXCAVATE UNSUITABLE MATERIAL BELOW THE CULVERT OVER A WIDTH OF 31m UNTIL A SATISFACTORY FOUNDATION WITH 300kPa (MIN) BEARING CAPACITY IS ACHIEVED. ENGINEER MUST BE NOTIFIED IF THE BEARING CAPACITY IS NOT ACHIEVED AT THE DESIGN LEVEL EXCAVATION, ENGINEER WILL SPECIFY IF EXCAVATION CONTINUES OR AN ALTERNATE DESIGN IS ADOPTED.
- FOLLOWING EXCAVATION OF UNSUITABLE MATERIALS, 250mm THICK LIFTS OF STRUCTURAL BACKFILL IS TO BE PLACED AND COMPACTED AS PER THE STRUCTURAL BACKFILL SPECIFICATIONS BELOW, TO A MINIMUM OF 250mm THICK.

**BACKFILLING**

- STRUCTURAL BACKFILL IS TO BE PLACED TO THE EXTENTS SHOWN ON SECTION C AS A MINIMUM. B&V DRAWING S3091 CALLS FOR GROUP A OR GROUP D SOILS FOR THE REMAINDER OF THE RAIL EMBANKMENT.
- THE STRUCTURAL BACKFILL WILL IDEALLY BE A WELL-GRADED ANGULAR SAND AND GRAVEL. UNIFORM SAND OR GRAVEL, MIXED, OR STABILIZED SOILS MAY BE USED IF APPROVED BY THE GEOTECHNICAL ENGINEER, G7 OR BETTER IS REQUIRED.
- THE STRUCTURAL BACKFILL SHOULD CONFORM TO THE FOLLOWING SPECIFICATIONS: MINIMUM GRADING MODULUS (G.M.) 0.8; MAXIMUM PLASTICITY INDEX (P.I.) 10 + 3 G.M.; MINIMUM CBR AT COMPACTED DENSITY 15%; MINIMUM COMPACTED DENSITY (MOD AASHTO) 96% MAXIMUM % PASSING 75 MICRON SIEVE 40%.
- THE FOUNDATION BACKFILL WILL BE PREPARED WITH A 500mm CENTRAL CAMBER TO ENSURE A UNIFORM GRADIENT THROUGH THE CULVERT BARREL AFTER FULL CONSOLIDATION OF THE FOUNDATION SOILS HAS OCCURRED.
- STRUCTURAL BACKFILL WILL BE PLACED AND COMPACTED IN 150mm LIFTS (MAX) ON ALTERNATING SIDES OF THE CULVERT TO ENSURE THOROUGH AND UNIFORM COMPACTION ALONG THE LENGTH OF THE CULVERTS.
- MANUAL PLACEMENT OF FILL UNDERNEATH THE HAUNCHES IS REQUIRED. COMPACTION IS TO BE DONE BY HAND TAMPERS OR SUITABLE MECHANICAL EQUIPMENT.
- COMPACTION IN THE CORRUGATION VALLEYS AND IMMEDIATELY NEXT TO THE PIPE SHOULD BE DONE BY HAND OPERATED METHODS. HEAVY CONSTRUCTION EQUIPMENT SHOULD REMAIN APPROXIMATELY 1000mm FROM THE PIPE; MONITORING OF THE PLUMB AND DIMENSION OF THE STRUCTURE WHEN HEAVY EQUIPMENT IS OPERATING NEARBY IS IMPORTANT TO ENSURE THE STRUCTURAL INTEGRITY OF THE CULVERTS.
- ALL EQUIPMENT SHOULD OPERATE PARALLEL TO THE LENGTH OF THE CULVERTS TO AVOID CREATING AREAS OF UNCOMPACTED BACKFILL.
- THE CONTRACTOR IS REQUIRED TO MAINTAIN DRY FOUNDATION AND BACKFILL CONDITIONS DURING CONSTRUCTION.

**CONCRETE WORKS**

ALL CONCRETE WORKS ARE TO COMPLY WITH ESKOM DOCUMENT NO. 203-770, 'SPECIFICATIONS FOR STRUCTURAL CONCRETE'.

**ARMCO CULVERT SPECIFICATIONS**

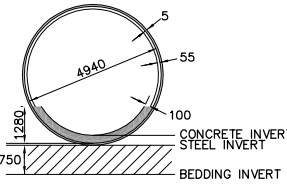
- 3 x MP200 KA46, 362m TOTAL LENGTH
- 5mm PLATE THICKNESS
- STEEL PLATES ARE HOT-DIP GALVANIZED TO SABS 1461 STANDARD.
- 100mm THICK CONCRETE IS TO BE PLACED IN THE BOTTOM THIRD OF THE CULVERT.
- ABE UNDERBODY SEALER IS TO BE APPLIED TO THE EXPOSED INTERNAL STEEL (UPPER TWO THIRDS).
- THE CONTRACTOR MUST COMPLY WITH ALL OF THE SPECIFICATIONS AND REQUIREMENTS STIPULATED BY THE CULVERT MANUFACTURER (SEE STEEL CUT TREATMENT, BOLT TORQUE, ASSEMBLY PROCEDURES, ETC.). REFER TO MANUFACTURER'S DRAWINGS/SPECIFICATIONS.

**TEMPORARY DIVERSION**

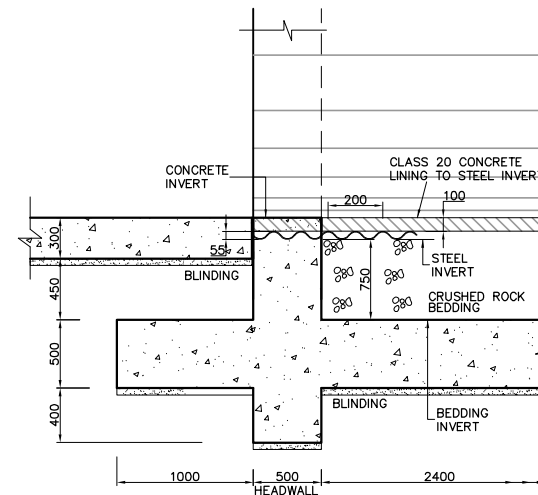
A TEMPORARY DIVERSION EMBANKMENT AND CULVERT OR PUMPING SYSTEM IS TO BE DESIGNED BY THE CONTRACTOR AND CONSTRUCTED UPSTREAM OF THE ASH DUMP ACCESS EMBANKMENT CULVERT. THE TEMPORARY STRUCTURE SHOULD HAVE A 4m WIDE EMBANKMENT AT THE CREST WITH 3:1 DOWNSTREAM AND 2:1 UPSTREAM EMBANKMENT SLOPES.

ASH DUMP EMBANKMENT CULVERT QUANTITIES			
ITEM	UNIT	QUANTITY	
ENTRANCE STRUCTURE CONCRETE	m <sup>3</sup>	160	
ENTRANCE STRUCTURE STEEL	kg	17600	
EXIT STRUCTURE CONCRETE	m <sup>3</sup>	165	
EXIT STRUCTURE STEEL	kg	18150	
ARMCO MP200 KA46, 5mm PLATE	m	250	
INTERNAL CONCRETE LINING	m <sup>3</sup>	529	
ABE UNDERBODY SEALER	l	3743	
500mm OD HALF ROUND CHANNEL	m	64	
HEADWALL RUNOFF DRAIN BOX (x2)	m <sup>2</sup>	1	
STRUCTURAL BACKFILL	m <sup>3</sup>	9122	
CRUSHED ROCK BEDDING	m <sup>3</sup>	1682	

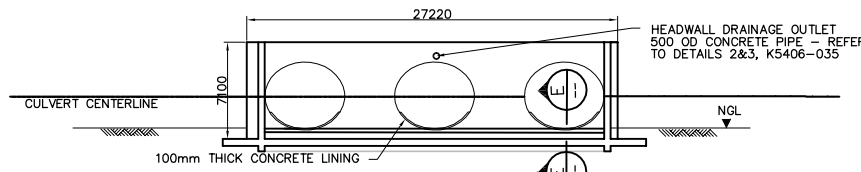
SETTING OUT COORDINATES			
REF. ID	NORTHERN (Y)	EASTERN (X)	
C5	9826.3253	8802.9947	
C6	9842.1660	8793.4418	
C7	9911.3243	8751.7350	
C8	9928.1155	8741.6088	



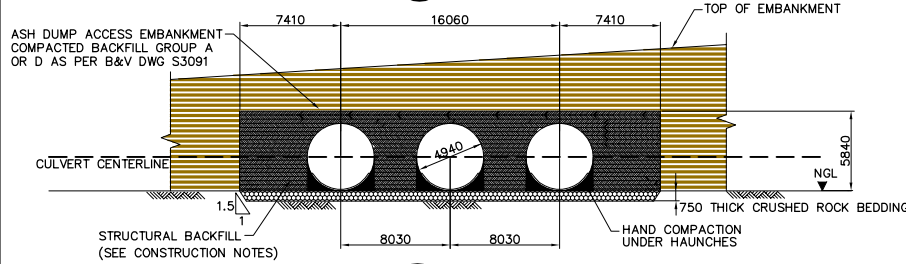
**SCHEMATIC SECTION SHOWING CONCRETE LINING AND BEDDING**  
NOT TO SCALE



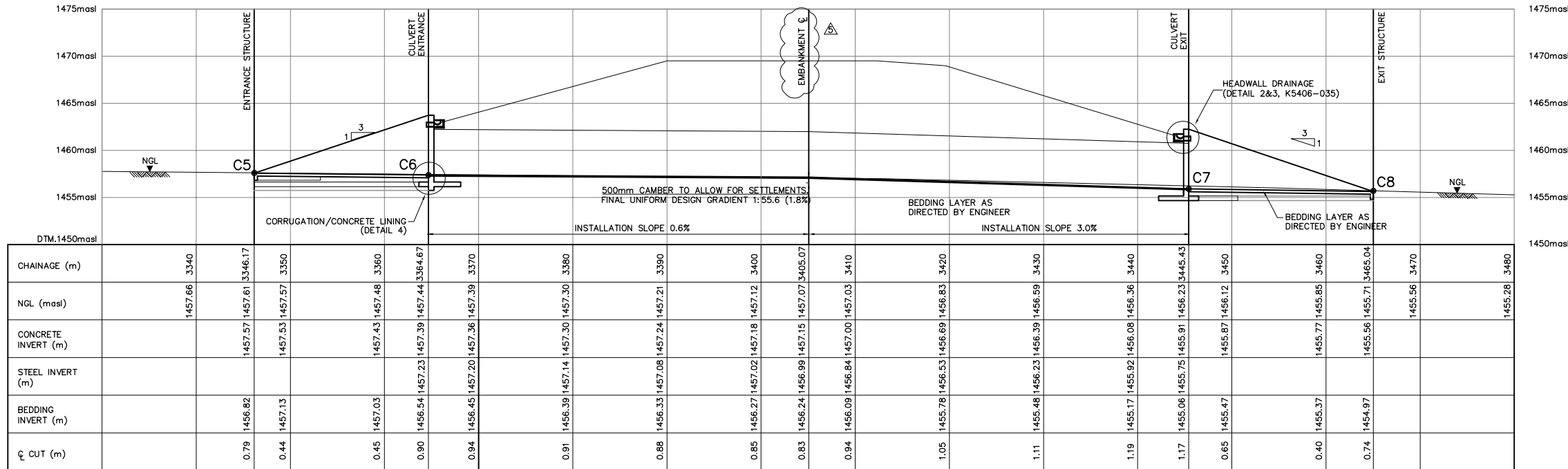
**SECTION E CORRUIGATION/CONCRETE LINING DETAIL 4**  
SCALE 1:20



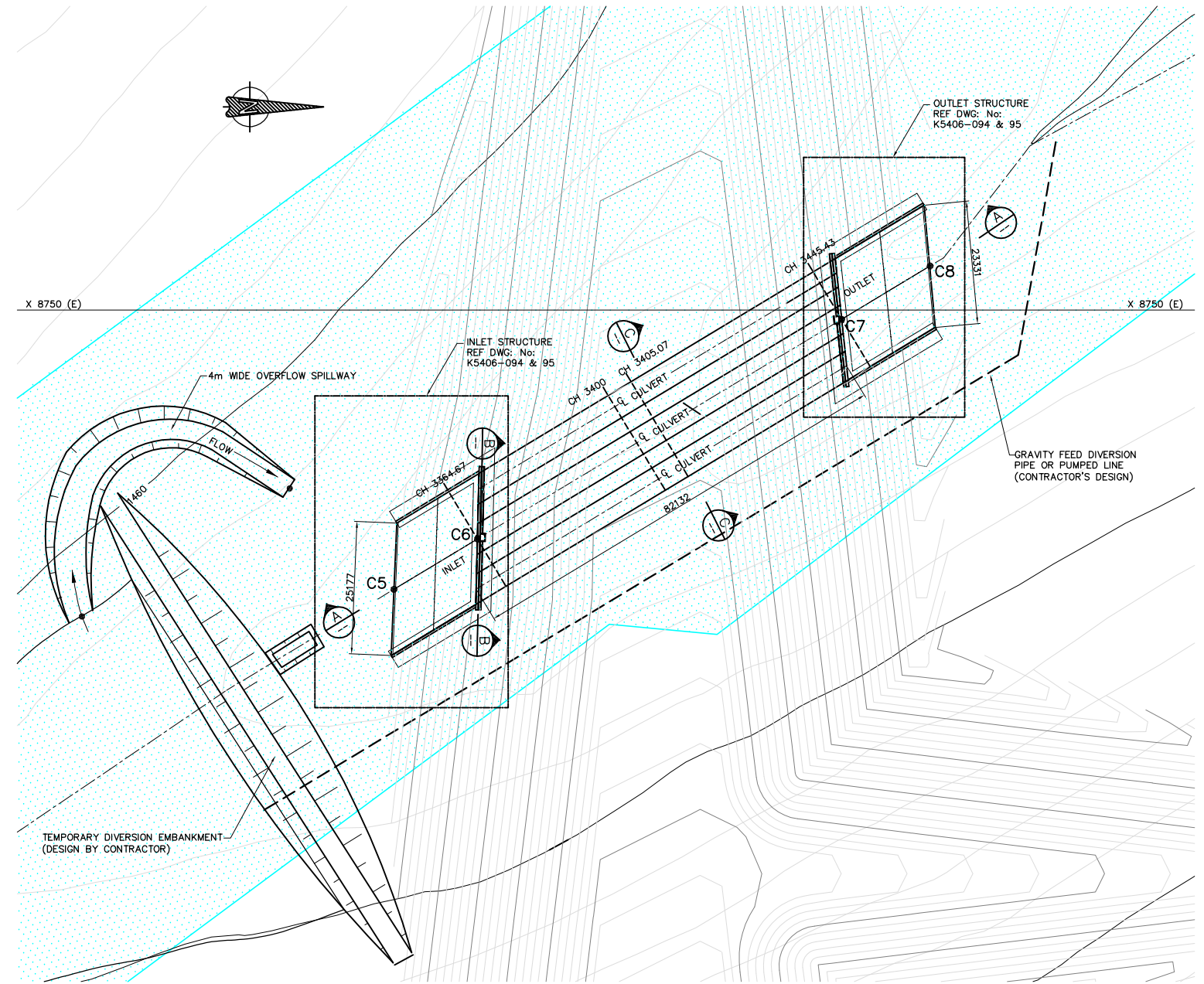
**SECTION B CONCRETE HEADWALL AT ENTRANCE STRUCTURE**  
SCALE 1:200



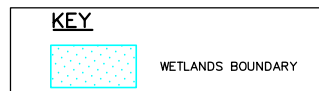
**SECTION C BACKFILL DETAILS**  
SCALE 1:200



**SECTION A CULVERT PROFILE**  
SCALE 1:200

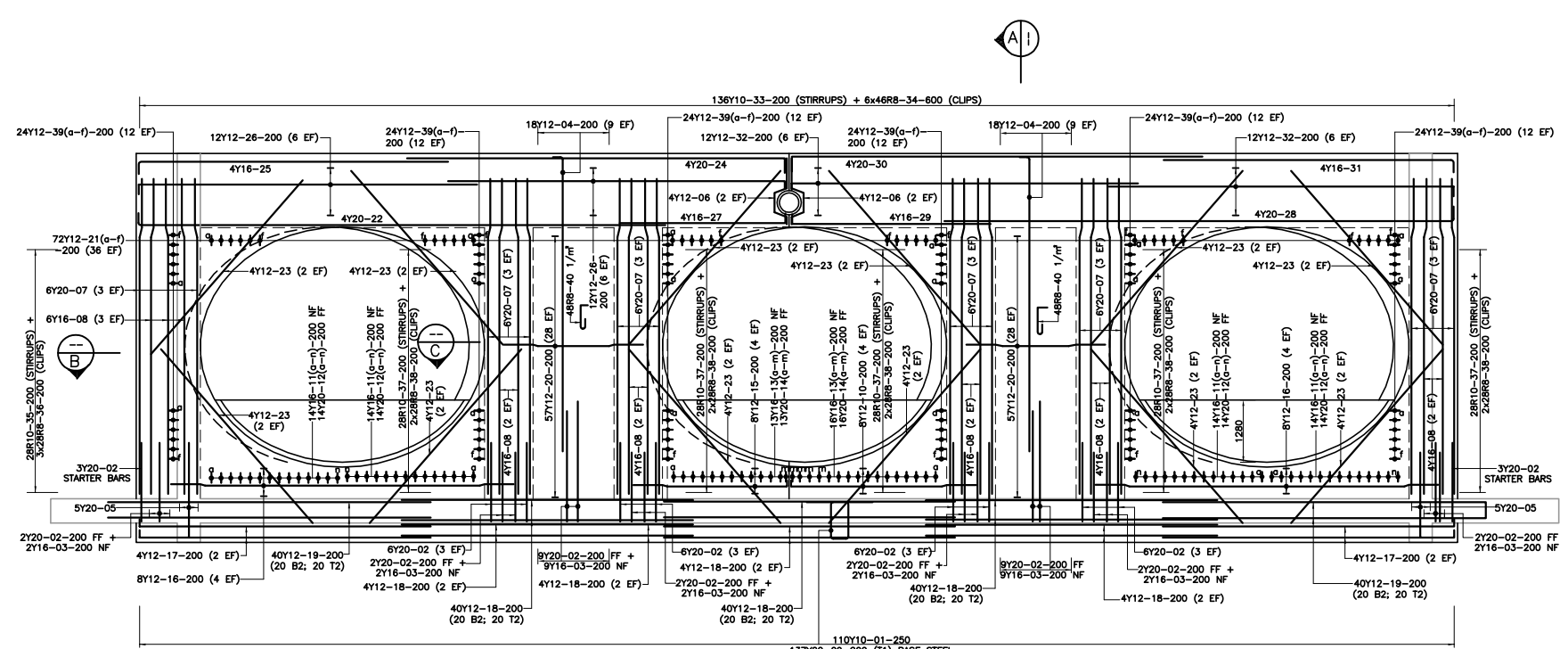


**GENERAL ARRANGEMENT PLAN VIEW (ref: 146838-OGUA-S3007)**  
SCALE 1:400

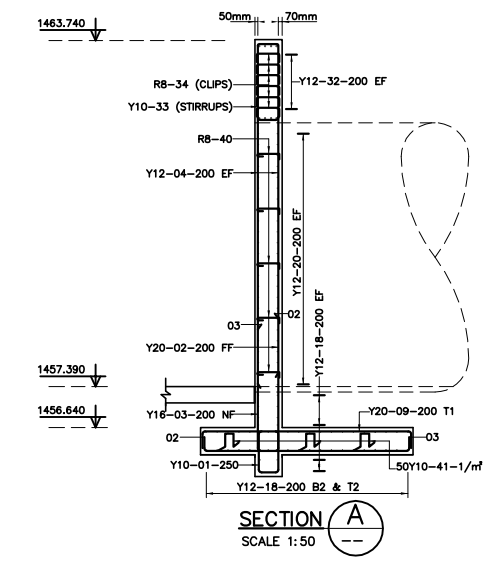


NO.	DATE	BY	CHKD BY	APP'D BY	REVISION
1	15/04/10	JAW	JAW	JAW	ISSUED FOR COMMENT AND APPROVAL
2	21/01/10	JAW	JAW	JAW	ISSUED FOR COMMENT AND APPROVAL
3	26/04/10	JAW	JAW	JAW	ISSUED FOR COMMENT AND APPROVAL
4	15/04/10	JAW	JAW	JAW	ISSUED FOR COMMENT AND APPROVAL
5	15/04/10	JAW	JAW	JAW	ISSUED FOR COMMENT AND APPROVAL

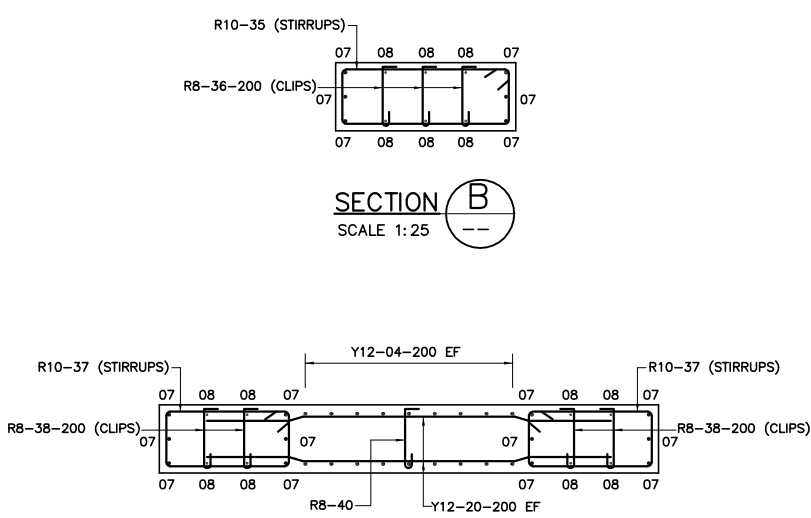
**KUSILE POWER STATION**  
ASH DUMP ACCESS EMBANKMENT CULVERT: GENERAL ARRANGEMENT  
DRG. No. K 5406-036  
SCALE: 0.90/968



**INLET ELEVATION (A)**  
SCALE 1:50

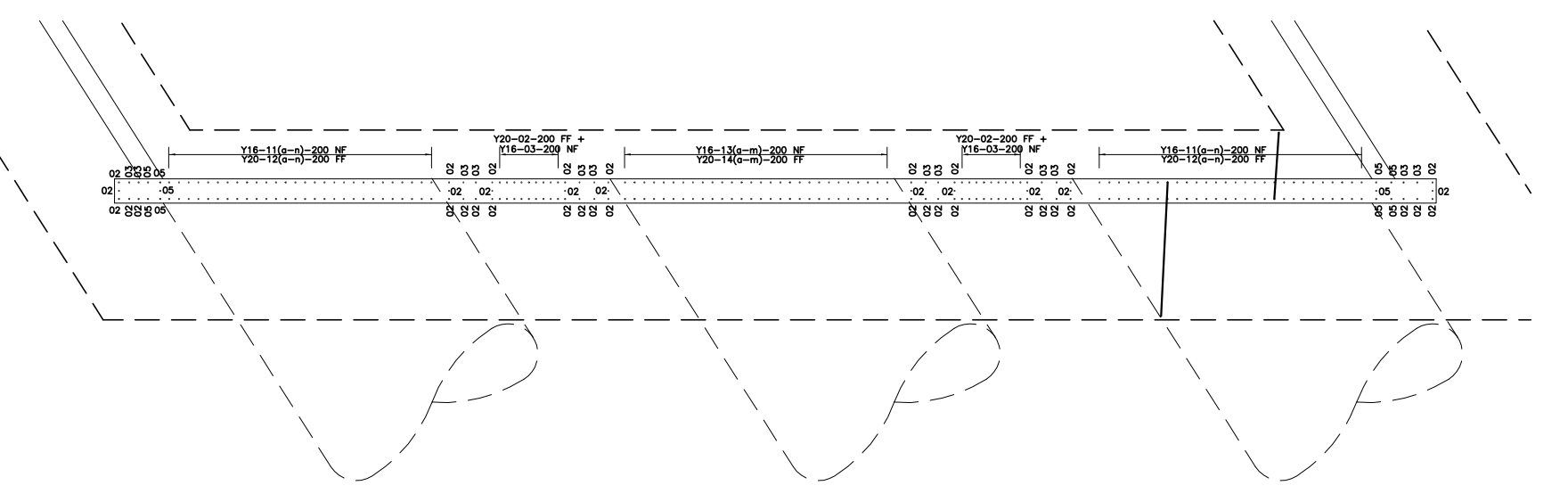


**SECTION A**  
SCALE 1:50



**SECTION B**  
SCALE 1:25

**SECTION C**  
SCALE 1:25



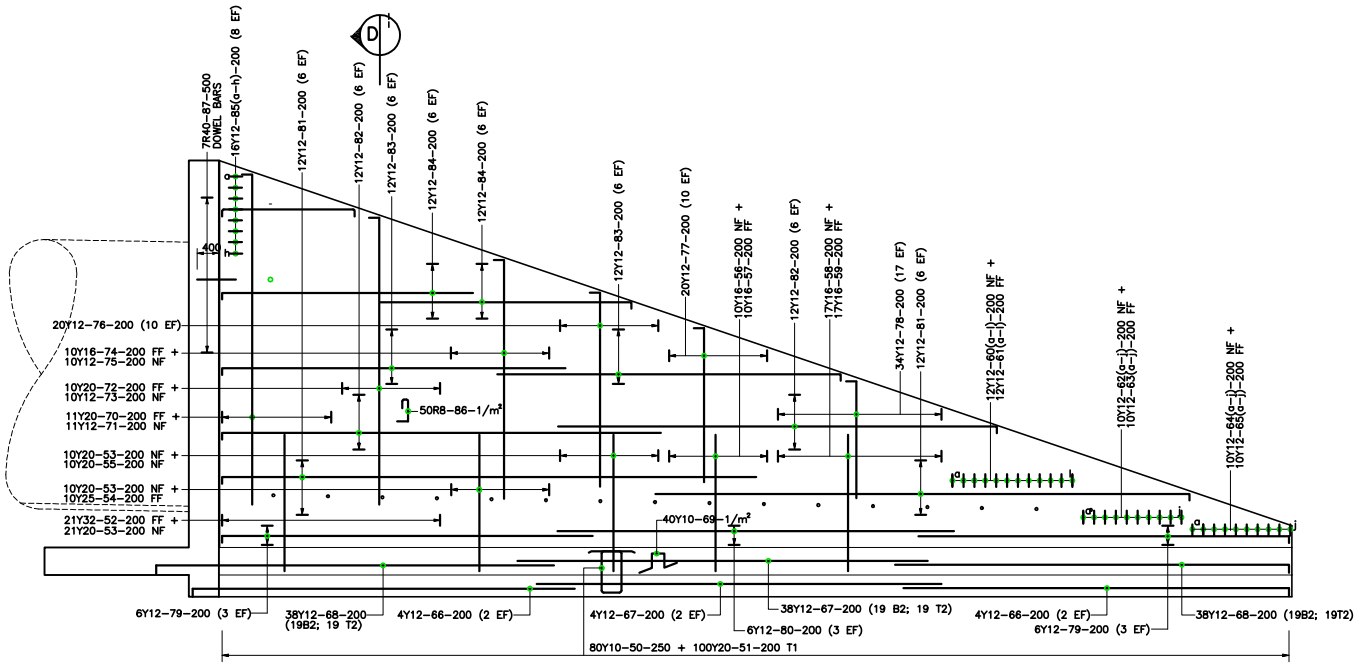
**PLAN ON STARTER BARS (INLET WALL)**  
SCALE 1:50

MEMBER	No OF	BARS PER MEMB	DIA.	LENGTH	TOTAL NUM BER	MARK	S	BENDING				
								A	B	C	D	E/r
INLET RC WALL REINFT.	1	110	Y10	3000	110	01	55	600	760	380	760	(600)
		60	Y20	4100	60	02	38	2500	1380	(300)		
		30	Y16	5300	30	03	38	2300	2750	(300)		
		36	Y12	5100	36	04	34	6000				
		10	Y20	2250	10	05	37	3000(2000)				
		8	Y12	1700	8	06	43	600	260	400	250 (150)	
		36	Y20	6450	36	07	41	5250	200(1000)			
		26	Y16	6450	26	08	41	5250	200(1000)			
		137	Y20	4050	137	09	36	3750				
		8	Y12	3900	8	10	52	600	100	3100	30	
		4	Y16	5500	4	11a	52	200	2750	2450	(200)	
		4	Y18	5200	4	11b	52	200	2750	2150	(200)	
		4	Y16	4950	4	11c	52	200	2750	1900	(200)	
		4	Y16	4800	4	11d	52	200	2750	1740	(200)	
		4	Y16	4600	4	11e	52	200	2750	1580	(200)	
		4	Y16	4500	4	11f	52	200	2750	1450	(200)	
		4	Y16	4400	4	11g	52	200	2750	1350	(200)	
		4	Y16	4300	4	11h	52	200	2750	1250	(200)	
		4	Y16	4200	4	11i	52	200	2750	1180	(200)	
		4	Y16	4150	4	11j	52	200	2750	1120	(200)	
		4	Y16	4100	4	11k	52	200	2750	1080	(200)	
		4	Y16	4100	4	11l	52	200	2750	1050	(200)	
		4	Y16	4050	4	11m	52	200	2750	1020	(200)	
		4	Y16	4050	4	11n	52	200	2750	1000	(200)	
		4	Y20	4200	4	12a	52	250	1380	2450	(250)	
		4	Y20	3900	4	12b	52	250	1380	2150	(250)	
		4	Y20	3650	4	12c	52	250	1380	1920	(250)	
		4	Y20	3500	4	12d	52	250	1380	1740	(250)	
		4	Y20	3300	4	12e	52	250	1380	1580	(250)	
		4	Y20	3200	4	12f	52	250	1380	1450	(250)	
		4	Y20	3100	4	12g	52	250	1380	1350	(250)	
		4	Y20	2900	4	12h	52	250	1380	1250	(250)	
		4	Y20	2850	4	12i	52	250	1380	1220	(250)	
		4	Y20	2800	4	12j	52	250	1380	1180	(250)	
		4	Y20	2750	4	12k	52	250	1380	1150	(250)	
		4	Y20	2750	4	12l	52	250	1380	1120	(250)	
		4	Y20	2750	4	12m	52	250	1380	1100	(250)	
		4	Y20	2750	4	12n	52	250	1380	1080	(250)	
		4	Y20	2750	4	12o	52	250	1380	1050	(250)	
		4	Y20	2750	4	12p	52	250	1380	1020	(250)	
		4	Y20	2750	4	12q	52	250	1380	1000	(250)	
		4	Y20	2750	4	12r	52	250	1380	980	(250)	
		4	Y20	2750	4	12s	52	250	1380	960	(250)	
		4	Y20	2750	4	12t	52	250	1380	940	(250)	
		4	Y20	2750	4	12u	52	250	1380	920	(250)	
		4	Y20	2750	4	12v	52	250	1380	900	(250)	
		4	Y20	2750	4	12w	52	250	1380	880	(250)	
		4	Y20	2750	4	12x	52	250	1380	860	(250)	
		4	Y20	2750	4	12y	52	250	1380	840	(250)	
		4	Y20	2750	4	12z	52	250	1380	820	(250)	
		4	Y20	2750	4	12aa	52	250	1380	800	(250)	
		4	Y20	2750	4	12ab	52	250	1380	780	(250)	
		4	Y20	2750	4	12ac	52	250	1380	760	(250)	
		4	Y20	2750	4	12ad	52	250	1380	740	(250)	
		4	Y20	2750	4	12ae	52	250	1380	720	(250)	
		4	Y20	2750	4	12af	52	250	1380	700	(250)	
		4	Y20	2750	4	12ag	52	250	1380	680	(250)	
		4	Y20	2750	4	12ah	52	250	1380	660	(250)	
		4	Y20	2750	4	12ai	52	250	1380	640	(250)	
		4	Y20	2750	4	12aj	52	250	1380	620	(250)	
		4	Y20	2750	4	12ak	52	250	1380	600	(250)	
		4	Y20	2750	4	12al	52	250	1380	580	(250)	
		4	Y20	2750	4	12am	52	250	1380	560	(250)	
		4	Y20	2750	4	12an	52	250	1380	540	(250)	
		4	Y20	2750	4	12ao	52	250	1380	520	(250)	
		4	Y20	2750	4	12ap	52	250	1380	500	(250)	
		4	Y20	2750	4	12aq	52	250	1380	480	(250)	
		4	Y20	2750	4	12ar	52	250	1380	460	(250)	
		4	Y20	2750	4	12as	52	250	1380	440	(250)	
		4	Y20	2750	4	12at	52	250	1380	420	(250)	
		4	Y20	2750	4	12au	52	250	1380	400	(250)	
		4	Y20	2750	4	12av	52	250	1380	380	(250)	
		4	Y20	2750	4	12aw	52	250	1380	360	(250)	
		4	Y20	2750	4	12ax	52	250	1380	340	(250)	
		4	Y20	2750	4	12ay	52	250	1380	320	(250)	
		4	Y20	2750	4	12az	52	250	1380	300	(250)	
		4	Y20	2750	4	12ba	52	250	1380	280	(250)	
		4	Y20	2750	4	12bb	52	250	1380	260	(250)	
		4	Y20	2750	4	12bc	52	250	1380	240	(250)	
		4	Y20	2750	4	12bd	52	250	1380	220	(250)	
		4	Y20	2750	4	12be	52	250	1380	200	(250)	
		4	Y20	2750	4	12bf	52	250	1380	180	(250)	
		4	Y20	2750	4	12bg	52	250	1380	160	(250)	
		4	Y20	2750	4	12bh	52	250	1380	140	(250)	
		4	Y20	2750	4	12bi	52	250	1380	120	(250)	
		4	Y20	2750	4	12bj	52	250	1380	100	(250)	
		4	Y20	2750	4	12bk	52	250	1380	80	(250)	
		4	Y20	2750	4	12bl	52	250	1380	60	(250)	
		4	Y20	2750	4	12bm	52	250	1380	40	(250)	
		4	Y20	2750	4	12bn	52	250	1380	20	(250)	
		4	Y20	2750	4	12bo	52	250	1380	0	(250)	
		4	Y20	2750	4	12bp	52	250	1380		(250)	
		4	Y20	2750	4	12bq	52	250	1380		(250)	
		4	Y20	2750	4	12br	52	250	1380		(250)	
		4	Y20	2750	4	12bs	52	250	1380		(250)	
		4	Y20	2750	4	12bt	52	250	1380		(250)	
		4	Y20	2750	4	12bu	52	250	1380		(250)	
		4	Y20	2750	4	12bv	52	250	1380		(250)	
		4	Y20	2750	4	12bw	52	250	1380		(250)	
		4	Y20	2750	4	12bx	52	250	1380		(250)	
		4	Y20	2750	4	12by	52	250	1380		(250)	
		4	Y20	2750	4	12bz	52	250	1380		(250)	
		4	Y20	2750	4	12ca	52	250	1380		(250)	
		4	Y20	2750	4	12cb	52	250	1380		(250)	
		4	Y20	2750	4	12cc	52	250	1380		(250)	
		4	Y20	2750	4	12cd	52	250	1380		(250)	
		4	Y20	2750	4	12ce	52	250	1380		(250)	
		4	Y20	2750	4	12cf	52	250	1380		(250)	
		4	Y20	2750	4	12cg	52	250	1380		(250)	
		4	Y20	2750	4	12ch	52	250	1380		(250)	
		4	Y20	2750	4	12ci	52	250	1380		(250)	
		4	Y20	2750	4	12cj	52	250	1380		(250)	
		4	Y20	2750	4	12ck	52	250	1380			

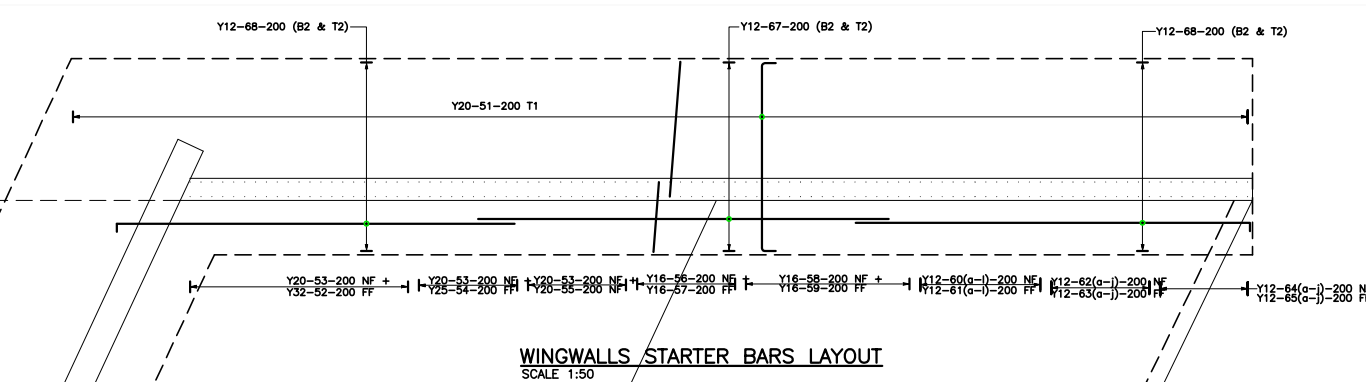




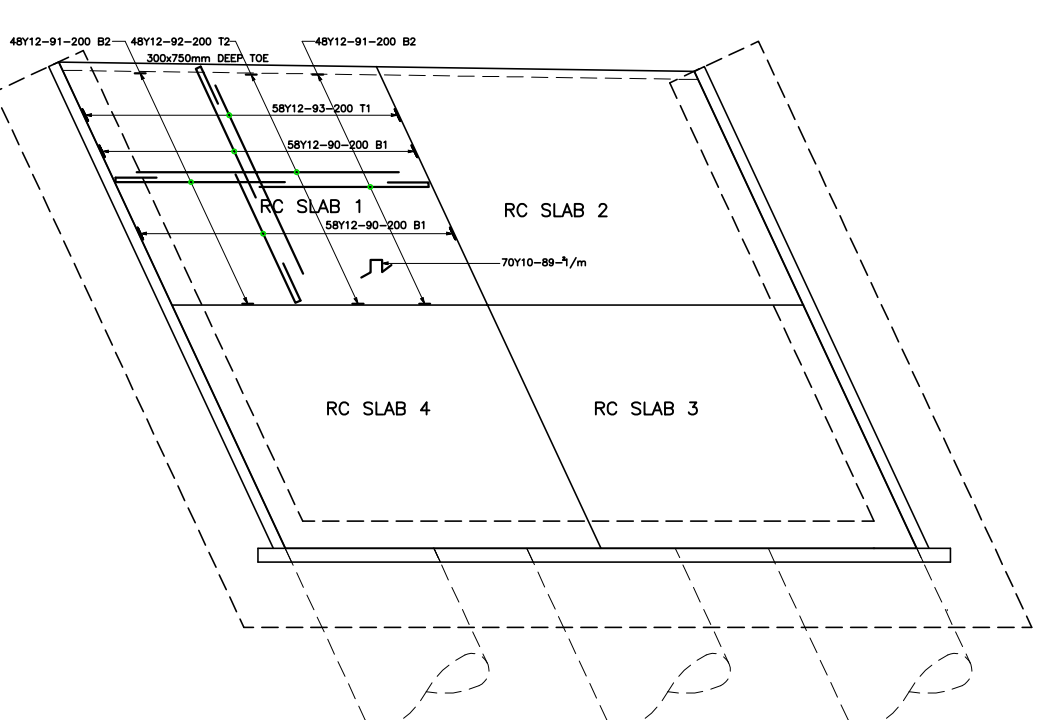




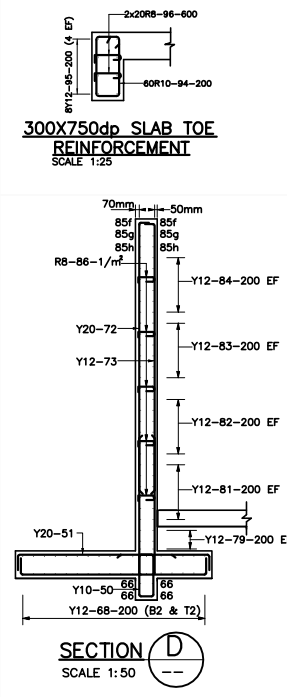
ELEVATION ON WINGWALL REINFORCEMENT(2No. OFF)  
SCALE 1:50



WINGWALLS STARTER BARS LAYOUT  
SCALE 1:50



RC SLAB REINFT. LAYOUT  
SCALE 1:50



300X750dp SLAB TOE REINFORCEMENT  
SCALE 1:25

SECTION D  
SCALE 1:50

MEMBER	No OF	BARS PER MEMB	DIA.	LENGTH	TOTAL NUM-BER	MARK	S	B E N D I N G				
								A	B	C	D	E/r
WINGWALL REINFT.	2	80	Y10	2900	160	50	85	600	760	280	760	(600)
		100	Y20	3750	200	11	35	3460				
		21	Y32	3950	42	32	38	2500	1280	(300)		
		4	Y20	5200	208	34	36	2500	2480	(300)		
		10	Y25	3950	208	34	36	2500	1280	(300)		
		10	Y20	4000	200	35	36	2500	1280	(300)		
		Y16	5200	208	34	36	2500	2480	(300)			
		10	Y16	4000	200	35	36	2500	1280	(300)		
		17	Y18	5200	208	34	36	2500	2480	(300)		
		17	Y18	4000	200	35	36	2500	1280	(300)		
		Y12	5900	120	62	300	2890	2480	(300)			
		Y12	5900	120	62	300	2950	2480	(300)			
		Y12	5750	120	60	300	2750	2480	(300)			
		Y12	5700	120	60	300	2680	2480	(300)			
		Y12	5600	120	60	300	2600	2480	(300)			
		Y12	5550	120	60	300	2550	2480	(300)			
		Y12	5500	120	60	300	2480	2480	(300)			
		Y12	5400	120	60	300	2400	2480	(300)			
		Y12	5350	120	60	300	2340	2480	(300)			
		Y12	5250	120	60	300	2270	2480	(300)			
		Y12	5200	120	60	300	2200	2480	(300)			
		Y12	5150	120	60	300	2140	2480	(300)			
		Y12	4700	120	60	300	2890	1280	(300)			
		Y12	4600	120	60	300	2800	1280	(300)			
		Y12	4550	120	60	300	2750	1280	(300)			
		Y12	4500	120	60	300	2680	1280	(300)			
		Y12	4400	120	60	300	2600	1280	(300)			
		Y12	4350	120	60	300	2550	1280	(300)			
		Y12	4300	120	60	300	2480	1280	(300)			
		Y12	4200	120	60	300	2400	1280	(300)			
		Y12	4150	120	60	300	2340	1280	(300)			
		Y12	4050	120	60	300	2270	1280	(300)			
		Y12	4000	120	60	300	2200	1280	(300)			
		Y12	3950	120	60	300	2140	1280	(300)			
		Y12	3900	120	60	300	2070	1280	(300)			
		Y12	5000	120	60	300	2000	2480	(300)			
		Y12	4950	120	60	300	1950	2480	(300)			
		Y12	4900	120	60	300	1870	2480	(300)			
		Y12	4800	120	60	300	1800	2480	(300)			
		Y12	4750	120	60	300	1750	2480	(300)			
		Y12	4650	120	60	300	1680	2480	(300)			
		Y12	4600	120	60	300	1600	2480	(300)			
		Y12	4500	120	60	300	1520	2480	(300)			
		Y12	4450	120	60	300	1450	2480	(300)			

8	10	12	16	20	25	32	40	TOT	Date	15/04/2010
R									Det. by	V.M.
Y	286	294	784	3098	304	1047		5814	Ref Dwg	K5406-089
TOT	286	294	784	3098	304	1047		5814	Job No	K5406

OUTLET STRUCTURE WING WALL  
Revision 1  
Schedule No B

MEMBER	No OF	BARS PER MEMB	DIA.	LENGTH	TOTAL NUM-BER	MARK	S	B E N D I N G			
								A	B	C	D
WINGWALL REINFT.	2	1	Y12	3850	2	63g	52	300	2070	1280	(300)
		1	Y12	3800	2	63g	52	300	2000	1280	(300)
		1	Y12	3750	2	63c	52	300	1930	1280	(300)
		1	Y12	3700	2	63d	52	300	1870	1280	(300)
		1	Y12	3600	2	63e	52	300	1800	1280	(300)
		1	Y12	3550	2	63f	52	300	1730	1280	(300)
		1	Y12	3500	2	63g	52	300	1660	1280	(300)
		1	Y12	3400	2	63h	52	300	1600	1280	(300)
		1	Y12	3300	2	63i	52	300	1520	1280	(300)
		1	Y12	3200	2	63j	52	300	1450	1280	(300)
		1	Y12	4400	2	64a	52	300	1390	2480	(300)
		1	Y12	4300	2	64b	52	300	1320	2480	(300)
		1	Y12	3900	2	64c	52	300	900	2480	(300)
		1	Y12	3750	2	64d	52	300	770	2480	(300)
		1	Y12	4200	2	64e	52	300	1180	2480	(300)
		1	Y12	4100	2	64f	52	300	1120	2480	(300)
		1	Y12	4100	2	64g	52	300	1050	2480	(300)
		1	Y12	4000	2	64h	52	300	980	2480	(300)
		1	Y12	3900	2	64i	52	300	900	2480	(300)
		1	Y12	3850	2	64j	52	300	850	2480	(300)
		1	Y12	3750	2	64k	52	300	770	2480	(300)
		1	Y12	3200	2	65a	52	300	1390	1280	(300)
		1	Y12	3100	2	65b	52	300	1320	1280	(300)
		1	Y12	3050	2	65c	52	300	1250	1280	(300)
		1	Y12	3000	2	65d	52	300	1180	1280	(300)
		1	Y12	2900	2	65e	52	300	1120	1280	(300)
		1	Y12	2850	2	65f	52	300	1050	1280	(300)
		1	Y12	2800	2	65g	52	300	980	1280	(300)
		1	Y12	2700	2	65h	52	300	900	1280	(300)
		1	Y12	2650	2	65i	52	300	850	1280	(300)
		1	Y12	2550	2	65j	52	300	770	1280	(300)
		8	Y12	7100	16	66	34	7000			
		42	Y12	7500	84	67	20	7500			
		76	Y12	7600	152	68	34	7500			
		40	Y10	1450	80	69	83	300	320	300	(300)
		11	Y20	6200	22	70	34	6050			
		11	Y12	6150	22	71	34	6050			
		10	Y20	5450	20	72	34	5300			
		10	Y12	5400	20	73	34	5300			
		10	Y16	4550	20	74	34	4400			
		10	Y12	4500	20	75	34	4400			
		20	Y12	3700	40	76	34	3500			
		20	Y12	2900	40	77	34	2800			
		34	Y12	2300	68	78	34	2200			
		12	Y12	6900	24	79	34	6800			
		6	Y12	7300	12	80	20	(7300)			

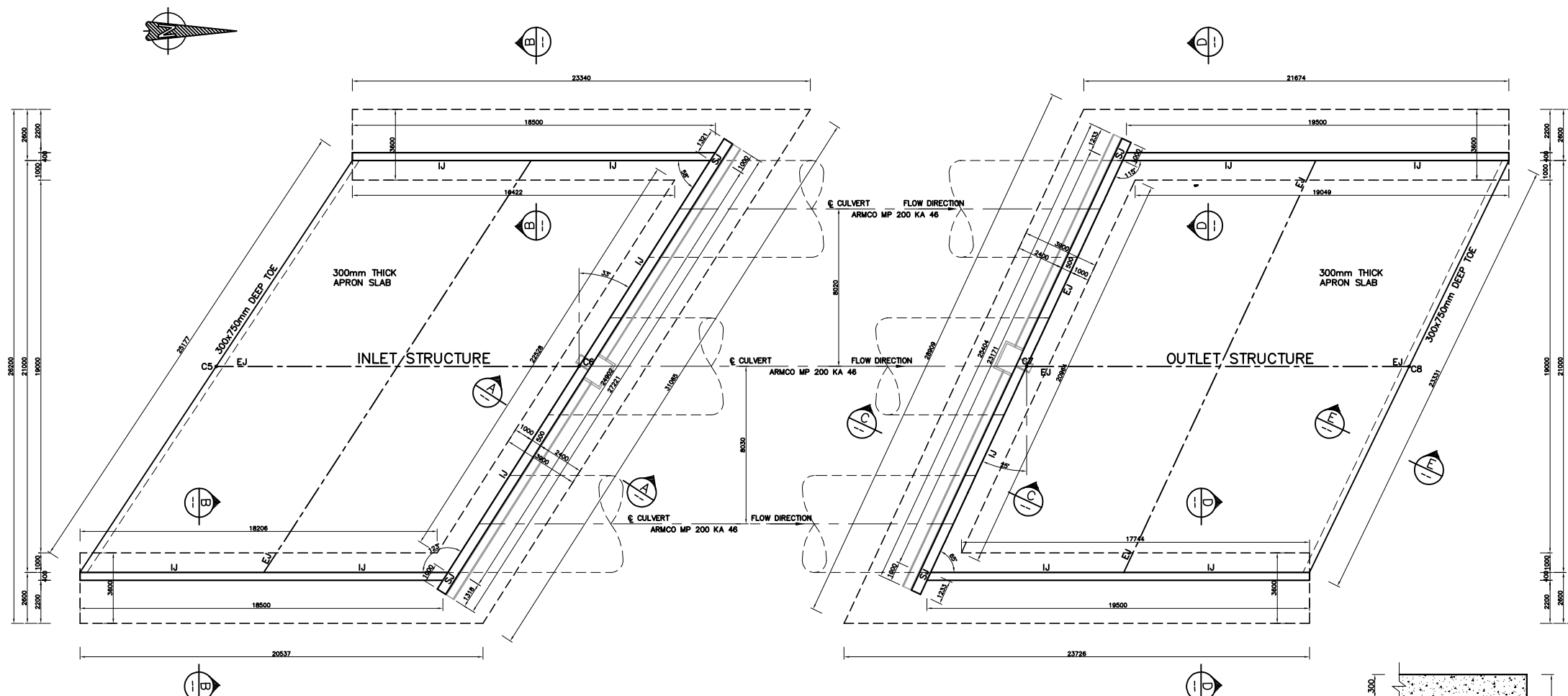
8	10	12	16	20	25	32	40	TOT	Date	15/04/2010
R									Det. by	V.M.
Y	72	2767	144	605				3587	Ref Dwg	K5406-089
TOT	72	2767	144	605				3587	Job No	K5406

OUTLET STRUCTURE WING WALL  
Revision 1  
Schedule No

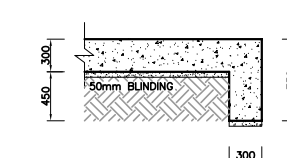


**CONCRETE NOTES:**

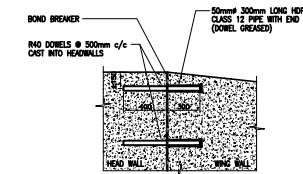
- CONCRETE TO BE GRADE 35/19. MIX DESIGNS FOR CONCRETE TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO COMMENCEMENT OF CONCRETE WORK.
- FINISHING:
  - SMOOTH FINISH TO ALL SHUTTERED SIDES.
  - WOODFLOAT TO TOPS OF WALLS AND SLABS.
  - 25x25mm CORNER FILLETS TO ALL EXPOSED EDGES.
- TOLERANCES TO BE IN ACCORDANCE WITH SANS 1200G CLASS 1.
- COVER TO REINFORCEMENT: AS INDICATED.
- CURING OF ALL CONCRETE SURFACES TO BE DONE USING SAMSON'S WAX BASED WHITE PIGMENTED CURING COMPOUND.
- ALL WORK TO BE CARRIED OUT IN CONFORMANCE WITH THE RELEVANT SABS 1200 SPECIFICATIONS.
- ALL CONCRETE IS TO BE PROPERLY VIBRATED. HEAVING OF CONCRETE TO BE AVOIDED. CASTING OF CONCRETE MUST BE CONTINUOUS.
- ALL WORK TO BE CHECKED BY SUPERVISING ENGINEER PRIOR TO POURING OF CONCRETE (MINIMUM 24 HOURS NOTICE).
- AN ALLOWABLE FOUNDATION BEARING PRESSURE OF 300kPa ON COMPETENT SOIL IS REQUIRED. REMOVE AND REPLACE IN SITU MATERIAL AS REQUIRED.
- ALL DIMENSIONS TO BE CONFIRMED ON SITE.
- ALL STRUCTURES SHALL BE CONSTRUCTED ON A SUB-FOUNDATION CARPET OF 15MPa/19mm BLINDING CONCRETE, NOT LESS THAN 50mm THICK.



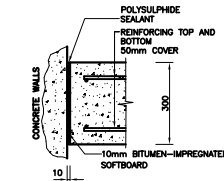
**PLAN ON INLET AND OUTLET STRUCTURES**  
SCALE 1:100



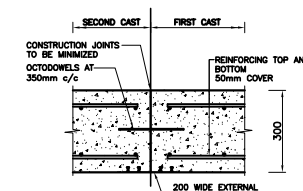
**SECTION E**  
SCALE 1:25



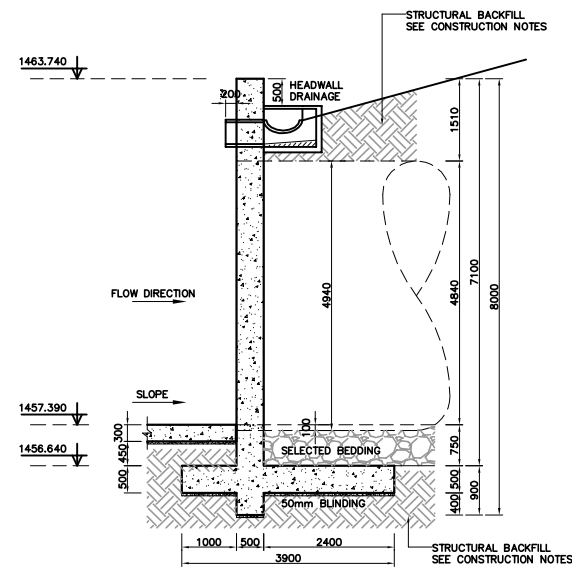
**TYPICAL SLIDING JOINT DETAIL (S.J.)**  
SCALE 1:25



**TYPICAL EXPANSION/ISOLATION JOINT AGAINST ALL STRUCTURES (I.J.)**  
SCALE 1:10

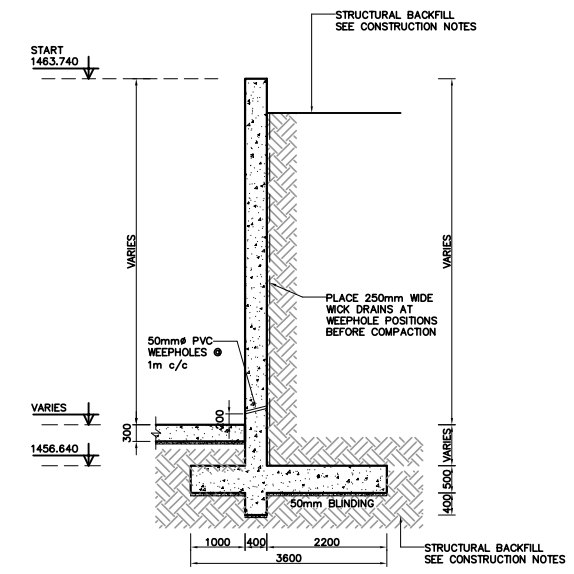


**TYPICAL CONSTRUCTION JOINT IN FLOOR SLABS (C.J.)**  
SCALE 1:10

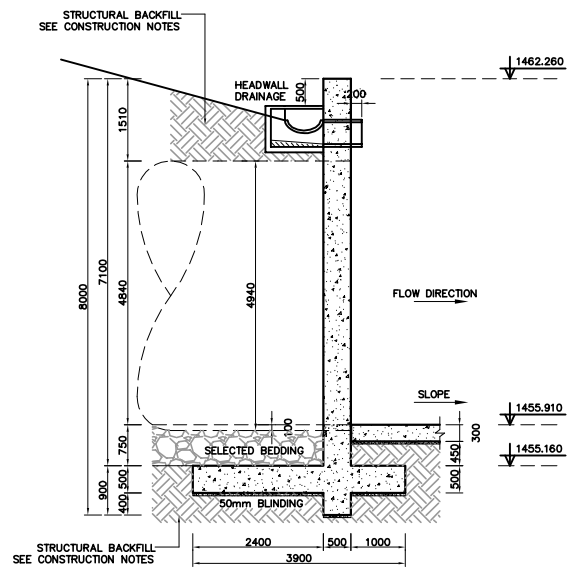


**SECTION A**  
SCALE 1:50

INLET

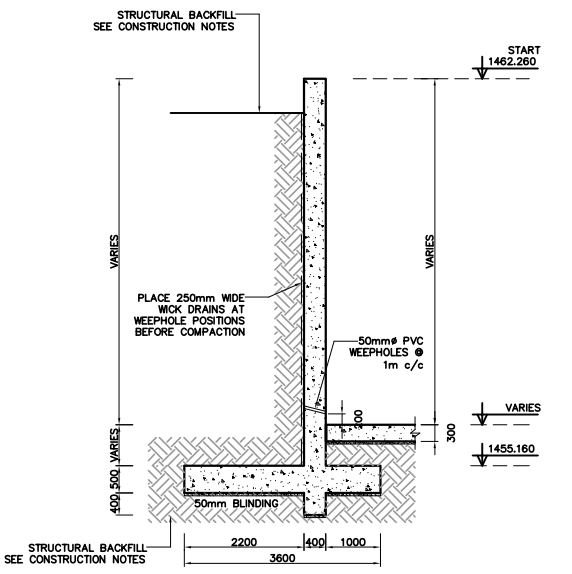


**SECTION B**  
SCALE 1:50



**SECTION C**  
SCALE 1:50

OUTLET



**SECTION D**  
SCALE 1:50

NO.	REV.	DATE	BY	CHKD	APP	DESCRIPTION
1	16/04/10		FB	AS	JFW	ISSUED FOR COMMENT AND APPROVAL
2	28/04/10		FB	AS	JFW	APPROVED FOR CONSTRUCTION
3	17/03/10		FB	AS	JFW	ISSUED FOR COMMENT AND APPROVAL
4	01/12/08		FB	AS	JFW	ISSUED FOR COMMENT AND APPROVAL
5	01/12/08		FB	AS	JFW	ISSUED FOR COMMENT AND APPROVAL

DESIGN APPROVED	DATE	28/04/10
ISSUED	DATE	28/04/10
SCALE	DATE	28/04/10
DRAWN BY	DATE	28/04/10
CHECKED BY	DATE	28/04/10
APPROVED BY	DATE	28/04/10

ESKOM	0.90/968
DRG. No. K 5406-094	REV 2
KUSILE POWER STATION	SHEET 2
ASH DUMP ACCESS EMBANKMENT	AD 2
CULVERT: CONCRETE LAYOUT AND	
DETAILS 1/2	

