Client:
Delmon Mining and Civils
Plot 76 Paddock Wood,
Joan Road
Meyerton
1873

Professional Service Provider:

MSW Consulting
28 St Patricks Road
Pietermaritzburg
3201

DESIGN REPORT FOR THE FITMENT OF A DN500 GATE VALVE TO EXISTING DN600 PENSTOCK ON SLIME DAM AT THARISA MINERALS

Date: 15 August 2023 **Version: 1.0**

DOCUMENT CONTROL				
AUTHORISATION	**ORGANISATION**	**NAME**	**SIGNATURE**	**DATE**
PREPARED BY:	MSW	D. Hodgkinson		August 2023
CHECKED BY:	MSW	P. Vivier		August 2023
APPROVED BY:	Delmon Mining & Civils	G. Neill		
APPROVED BY:				
APPROVED BY:				
APPROVED BY:				

AMENDMENT CONTROL		
VERSION	**DESCRIPTION**	**DATE**
1.0	For Comment	August 2023

Table of Contents Page No.

Abbreviations

DM&C	Delmon Mining and Civils
MSW	MSW Consulting
PCP	Pre-stressed Concrete Pipe
PSP	Professional Services Provider

1 TERMS OF REFERENCE

Delmon Mining and Civils (DM&C) approached MSW Consulting (MSW) to prepare the design for the fitment of a DN500 isolating valve (Wedge Gate Valve) to an existing DN600 penstock.

Upon instruction from DM&C, MSW approached Mr. Stephan Barkhuizen of Epoch Resources for detailed information to inform the design. This information was kindly provided.

2 PURPOSE OF THIS REPORT

The purpose of this report is to:

- Furnish Curriculum Vitae of the designers (See Annexure A)
- Summarize our understanding of the assignment.
- Document assumptions made in developing the design.
- Indicate proposed specifications.

3 UNDERSTANDING OF THE ASSIGNMENT

It is our understanding that the intention is to slip-line a portion of the existing DN600 penstock with a DN500 epoxy lined steel pipe fitted with a terminal gate valve that discharges into an energy dissipation structure. The gate valve would remain in a NORMALLY OPEN position and would only be CLOSED in an emergency situation. Pedestrian access should be provided to the manually operated DN500 valve.

4 DESIGN APPROACH

Our design and key assumptions are summarized in the table below.

Table 1: Design Assumptions and Calculations

THARISA MINERAL EXPANSION			
FITMENT OF DN500 GATE VALVE TO STEEL SLIPLINE WITHIN DN600 OUTFALL PIPELINE			
ITEM	**DN500 OUTFALL**	**UNIT**	**COMMENT**
PROPERTIES			
SGfluid	3		Typically 2.6 to 2.8
Esteel	200000	MPa	
SIGMAsteel	1.08E-05	/oC	
Dt (30-10)	20	oC	of encased pipe
Poissons Ratio	0.27		
Concrete / Soil Friction	0.5		Tan27deg
ELEVATIONS			
Top Water Level	1242	mamsl	Dwg 144-001-040 s1 of 2 Rev 1
Energy Dissipator Level	1203	mamsl	Dwg 144-001-053 Rev 0
Static Head	39	m	
Static Pressure	117	mWG	mWaterGauge
VALVE & FLANGE DETAILS			
Gate Valve	**DN500*PN16**		**Wedge Gate Valve to SANS664**
Flange Drilling			**SANS 1123 Table 1600/3**
STEEL PIPE DETAILS			
OD	508	mm	Steel
ID	497	mm	
Wall Thickness	5.52	mm	6mm Nominal - 8% negative tolerance (SANS 719)
HOOP STRESS			
Hoop	52	MPa	
LONGITUDINAL STRESS (Concrete encased pipe)			
Restrained @ Valve	26	MPa	=50% of Hoop stress
Poisson's 0.27* Hoop	14	MPa	
Thermal	43	MPa	
EFFECTIVE STRESS	**98**	MPa	=(Hoop^2 + Sigma(Long)^2)^0.5
GRADE OF STEEL			
X42	289	MPa	Ultimate Yield Stress
X52	357	MPa	Ultimate Yield Stress
EFFECTIVE / UYS %	**Standard: Effective Stress <55% UYS**		
X42	34%		Use Grade X42
X52	27%		
LONGITUDINAL FORCE (F) TRANSFERRED TO CONCRETE PIPE /ENCASEMENT			
Static Head	117	mWG	
IDconcretepipe	600	mm	
Force F	**326.4**	**kN**	
RESISTANCE TO LONGITUDINAL FORCE			
Encasement X-section	1.32	m2	
Encasement weight / m	31.74	kN/m	
Length to resist Force F	20.6	m	Friction coeff concrete /Soil = 0.5
Embedded length provided	23.25	m	This length is considered conservative as:
			1) The average specific gravity of the retained fluid will be <3.0
			2) No overburden or side resistance assumed.
			3) No continuity in the encasement long. steel (BM A1) assumed. Continuity of this steel is able to resist the entire force and thus would mobilize the entire reinforced encasement.
Shear Stress at steel grout interface	0.0089	N/mm2	<<< 0.35N/mm2

5 PROPOSED SPECIFICATIONS

The following specifications are proposed:

Wedge Gate Valves : SANS 664

Steel Pipe Manufacture : SANS 719 augmented by:

- 100% fluoroscope / ultrasonic of all SAW welds.
- 100% radiography of butt welds.
- 100% dye penetration of fillet welds.
- Where weld defects are detected, they shall be adjudicated in accordance with API 5L and, if necessary, repaired in accordance with the requirements of API 1104.

Epoxy Coating and Lining : See Annexure B.

6 DRAWINGS

The drawing indicating the proposed installation of DN500 Gate Valve in the DN600 penstock is included as Annexure C.

7 AUTHORIZATION FOR CONSTRUCTION

The works is hereby authorized for implementation in accordance with this proposal and as amended hereunder:

7.1 AMENDMENTS

For and on behalf of Client:

Designation:

Name: Signature: Date:

For and on behalf of Delmon Mining & Civils

Designation:

Name: Signature: Date:

ANNEXURE A
CURRICULUM VITAE

MSW CONSULTING

D W Hodgkinson, Pr Eng

Abbreviated Curriculum Vitae

Profession
Civil Engineer

Current Position
Managing Director: MSW Consulting

Date of Birth
5 September 1955 (Queenstown, South Africa)

Established MSW Consulting
2006

Nationality
South African

Academic Qualifications
BSc (Civil), University of Natal, 1978

Professional Associations
Professional Engineer, Engineering Council of South Africa (ECSA),
Pr Eng: 900471
Member of Water Institute of South Africa (WISA)

Specialisation
Water Treatment, Bulk Water Distribution; Water infrastructure rehabilitation

Languages
English /Afrikaans

Appointments
- 1979 – 1980 : South African Defence Force
- 1980 – 1982 : Department of Water Affairs (Engineer-in-Training)
- 1983 – 2004 : Umgeni Water (Engineering Manager)
- 2005 – 2006 : Principal Engineer: UWP Consulting (Pty) Ltd, SA (Pietermaritzburg)
- 2006 – Date : MSW Consulting

Contact Details
Phone: 033 3950920
Mobile: 082 847 5280
Fax : 033 3950921
E-mail : don@mswconsulting.co.za

Key Experience

- Design and project management of Water Treatment Plants and Bulk Water Conveyance Systems.
- Rehabilitation of water conveyance infrastructure including prestressed concrete (PCP) pipelines.

Projects: Water Treatment / Sludge Dewatering (Design and Management)

- 132 Ml/d Water Treatment Plant for Port Harcourt "New City", Rivers State Nigeria (Gibb Africa : R500m SA value: 2013)
- 3 Ml/d Water Treatment Plant for Port Harcourt "New City" temporary water supply to Hospital and University (Gibb Africa: US$ 4.5m; 2013)
- 80 Ml/d Upgrade to Mhlathuze Water's Nsezi Water Treatment plant comprising (Mhlathuze Water: R200m: 2009 to 2011) :
  - 205 Ml/d raw water pumpstation (4*680kW immersible pumps)
  - 1200DN *5500m welded steel rising main.
  - 80 Ml/d * 48m diameter clari-flocculator & rapid gravity filter complex.
  - 80 Ml/d Dissolved Air Flotation plant as well as chemical dosing.
- 55 Ml/d (205 Ml/d to 260Ml/d) Upgrade to Mhlathuze Water's Nsezi Water Treatment plant comprising (Mhlathuze Water: R278m: 2020 to 2023) :
  - DN1800/1500/1200 inter-connecting pipework
  - 2 * 48m diameter clari-flocculator & rapid gravity filter complex.
  - 4 * Dissolved Air Flotation units as well as chemical dosing.
  - 4 * 120m2 Rapid Gravity Filters.
  - 2Ml Chlorine contact tank.
  - 2Ml Backwash recovery tank and pump station.
  - SCADA System
- Maphumulo Bulk Water Supply System including 12 Ml/d WTP and raw and bulk water rising mains for Umgeni Water (Umgeni Water R180m : 2010- 2012)
- 20 Ml/d Mandlakazi Water Treatment Plant (Zululand DM: R76m: 2014)
- Design co-ordinator of the 250 Ml/d Midmar Waterworks, raw water and potable water transfer system; Howick, KwaZulu Natal (Umgeni Water: R 270 million , 1996)
- 20 Ml/d Mthonjaneni Water Treatment Plant (Uthungulu DM: R45m: 2006)
- Durban Heights Water treatment Plant sludge dewatering system comprising gravity thickeners and decanter centrifuges (6 Ml/d and 30 tonne /day Dry solids) (Umgeni Water: R6m: 1998)

Projects: Rehabilitation of Water Infrastructure (Design & Management)

- Rand Water Prestressed Concrete Pipelines (PCP) ranging from DN1800 to DN1200 * ~200km: Engineering Evaluation and Integrity Management Reports for A14, A15, B04, B05, B06, B07, F30, F32, G25, G28, G29, G30, O1 and O2 Pipelines (Cornet Kinsbergen / Rand Water: 2015 to 2016).
- Rehabilitation of 30Ml/d Water Treatment Plant in Onitsha, Anambra State, Nigeria (PCI Africa : US$18m: 2014).
- Rehabilitation of Umgeni Water's '53 PCP Pipeline (DN700*34km) from Ferncliffe to Umlaas Road (Rand Water Services / Umgeni Water: R30m: 2006)
- **Gamtoos Government Water Supply Scheme. (2006-2010: DWS (R90.0m):**
  - Risk assessment and development of rehabilitation strategy.
  - Rehabilitation of the following elements of infrastructure:
    - Rehabilitation of Moolman and Robert Scott reinforced concrete siphons (2400DN * 300m & 1600DN * 800m): Slip-lining and fitment of mechanical seals.
    - Rehabilitation of Line 16 Siphon (2400DN * 1000m): mechanical seals and lining. of Patterson Siphon (1600DN * 400m): Slip lining, lining and mechanical seals
- **Gamtoos Government Water Supply Scheme. (2006-2010: DWS (R103.5m):**
  - Steel replacement of Hankey Pre-stressed Siphon 1800DN * 3200m
  - Steel replacement of Milton pre-stressed Siphon: 1900DN * 1000m
  - Steel replacement of De Koning Siphon 1900DN * 700m)
- Rehabilitation of 114Ml/d Candy Moore Filter Plant at Durban Heights Waterworks, Durban, KwaZulu Natal (R 5,4 m , 1998)

Projects: Bulk Water Conveyance (Design and Management)

- "57 Potable Water Pipeline Augmentation", comprising some 22km's of 1000/800/600NB continuously welded steel pipeline; KwaZulu Natal (Umgeni Water: R80m, 1994)
- Eston Pipeline 600DN *16km (Umgeni Water: R22m 1995)

P Vivier, B Eng Honours, Pr Eng

Abbreviated Curriculum Vitae

Profession
Structural Engineer
(Pr Eng - 20180206)

Current Position
Director, Structural Engineer

Date of Birth
22 October 1990

Nationality
South African

Academic Qualifications
- B.Eng (Civil), University of Pretoria, 2012
- B.Eng.Honours (Structural), University of Pretoria, 2015

Specialisation
Structural Design (Steel and R.C), Bridge Design, Detailing, Structural Inspections and Rehabilitation, Contract Documentation, Contract Management, Deterioration Modelling, Transient Analysis, Finite Element Method Analysis.

Languages
English / Afrikaans

Appointments
- 2013 – 2015 : SMEC South Africa (Design Engineer / Contract/Quality Engineer) Pretoria.
- 2016 – 2016 : SMEC South Africa (Design Engineer / Assistant Resident Engineer), Durban
- 2016 - Date : MSW Consulting.

Contact Details
Phone: 033 395 2177
Mobile: 072 170 2177
Fax : 033 395 0921
E-mail : pierre@mswconsulting.co.za

Key Experience

- Risk assessment and deterioration modelling of prestressed concrete pipelines.
- Structural appraisal and rehabilitation development.
- Design and detailing of reinforced concrete bridges, major culverts, water retaining structures, and various other structures.
- Transient Analysis.
- Water/sewer steel pipeline stress analysis.
- Finite Element Method (FEM) Analysis of structures, pipelines, and pipe bridges.
- Contract Management and Quality Assurance.
- Development of Tender and Construction Contract Documents, Quantities, Specifications, and Drawings.

Selected Recent Relevant Projects

2020-current. Structural Lead Engineer for the Augmentation of the Nsezi WTW to 260Ml/d (Clari-flocculators, DAF, Filters, Inlet structure, Chlorine contact tank, etc) (R320m)

2020-current. Structural design and transient analysis for Ozwathini/Maphumulo RBWSS (iLembe/Umgeni Water) R150 M

2020. Structural design of Mhlabatshane WTW upgrade to 16Ml/d (inlet works, raw water reservoir, flocculation, clarifiers, filters, potable water reservoir, solids removal plant, etc.)

2019-2021. Engineer for the construction of Mandlakazi Phase 5.5B BWSS R65 M (Zululand DM)

2019-2021. Structural supervision of Hluhluwe 6Ml/d WTP and design of 5Ml command reservoir (UKDM)

2018-current. Structural Design Engineer for the Rehabilitation of Infrastructure within the Umgeni Water Nagle and Wiggins Systems. – Structural Inspections, reporting, construction specifications, rehabilitation design for structures and Prestressed Concrete Pipelines, New & Old Degremont WTP upgrade design. R1.1 B. (Umgeni Water)

2018. Condition assessment and rehabilitation design on concrete pipelines in the Gamtoos Valley (GIB)

2018-2019. Engineer for construction of Booster pump-station (500kVa & 500kl Reservoir), R17 M (Zululand DM)

2018. Structural Engineer for the supervision of Ph.5.1 & Ph.5.5A BWSS (pipelines and reservoirs), R35 M & R105 M (Zululand DM).

2017-2018. Detailed Design of 20Ml reinforced concrete, buried reservoir as part of the Ladysmith BWSS (Uthukela DM)

2016-current. Structural Lead Design and Transient Analysis for Mandlakazi RWSS Ph.5. Detailed design of reservoirs (50kl to 4Ml), thrust blocks, site layouts, pumphouse, etc.

2016-2017. Detailed design of monolithic cast in-situ Rapid Gravity filter with *Worxmanzi proflor* panels – Constructed at Lower Tugela WTW (50 Ml/day), Midmar WTW upgrade (100 Ml/day), Mandlakhazi WTW (20 Ml/day), Makoma (32Ml/day), and Mikomfwa (19.2Ml/day) (Eaucon & Various)

2016-2018. Risk assessment, deterioration modelling, Finite Element Method (FEM) Analysis, and repair mode for various existing prestressed concrete pipelines (Rand Water)

2016. Detail Design of Port bell single span precast beam and slab bridge, Kampala, Uganda – R 28 M. (Kampala Capital City Authority)

2016. Construction supervision of Flanders Drive post-tension voided deck bridge widening, Durban – R20 M. (Tongaat Hulett)

2016. Design of substructures for Cornoubia Boulevard bridge (4 Span precast beam and slab) – R100 M. (Tongaat Hulett / Ekuruleni Municipality)

2015. Detail Design of Integrated Rapid Transport Network roadside structures, Pretoria – R2.6 B. (Ekurhuleni Metropolitan Municipality)

2015. Quality Inspections of the manufacturing of steel girders for Senqu River incrementally launched steel bridge, Lesotho – R130 M. (Government of Kingdom of Lesotho)

2013-2015. Design and quality/contract management of the construction of Ressano Garcia Weigh Bridge and infrastructure, Maputo, Mozambique - R43 M. (TRAC)

2014-2015. Detail Design of the widening of existing bridges for the Rustenburg, Rustenburg – R31.7 M. (Rustenburg Integrated Network Joint Venture)

2013-2015 Detail Deign of the widening of bridge B2064 (13m voided deck), Limpopo – R14 M. (Road Agency Limpopo)

2013-2014. Detail Design of the widening of major culvert for new R21 K220 interchange, Johannesburg – R20 M. (M&T Developments)

ANNEXURE B
EPOXY COATING AND LINING SPECIFICATION

B: PIPE COATING AND LINING: SOLVENT BASED EPOXY

B.1.1 Utilization

This coating system shall generally be used on fittings and specials >DN250 installed in chambers and along pipelines and where coating facilities are not conducive to the application of solvent free epoxy.

B.1.2 Specification

B.1.2.1 General

This specification covers the application of the solvent based epoxy for external coating and internal lining of fittings or specials.

All applicator personnel shall receive accredited training from a Technical Representative of the supplier of the epoxy product in the safe use and application of the product. The training shall be specific to the task executed. The Technical Representative will be required to visit site from time to time to ensure consistent and correct usage of the product.

B.1.2.2 Equipment

All equipment shall satisfy the following criteria:

- Water, oil traps and filters will be fitted to ALL compressors and blast cleaning equipment.
- Blast cleaning will not be allowed to contaminate coating operations or the coated surface during the coating period.
- All inspection equipment must be calibrated with current certificates.

All equipment and tools required for the application of the coating system will be subject to the approval of the Client.

B.1.2.3 Product

The Product shall:

- Be transported, handled and stored in such a manner as to prevent damage.
- Be stored in well ventilated dry areas at temperatures ranging from 10º to 25ºC.
- Be a surface tolerant, glass flake filled, two components, solvent based epoxy and shall be suitable for use on potable water pipelines and tanks.
- Minimum solids content after mixing shall be 85% m/m
- Have excellent resistance to corrosion in corrosive environments.
- Have excellent adhesion to dry and wet blasted and manually prepared surfaces.
- Be a low fire hazard.
- Be available in contrasting colours.
- Have excellent adhesion properties to mild steel.
- Have excellent resistance to abrasion.

- Have good chemical resistance to mild acids and alkalines.
- Specific gravity : >1.4

B.1.2.4 Surface Preparation

- All deleterious matter, oils and greases shall be removed using a degreasing agent if necessary to achieve a water break-free surface. The use of solvent to remove oils or grease is not permitted.
- All welds shall be ground smooth to a convex profile. Internal weld bead shall be <1mm and external weld bead shall be < 2mm.
- All weld splatter shall be removed.
- New Steel: Grit blast to Sa 21/2 (ISO 8501:1988): Profile 60-80µm (peak to valley)
- Rehabilitation work: St 2. Mechanical equipment may be used provided that the specified performance is achieved and that burnishing does not occur.

B.1.2.5 Application

- Mixing of components shall be by low-speed mechanical mixer. Mixing shall take approximately 2 minutes and the product shall be streak free upon completion.
- Application shall take place IMMEDIATELY after mixing.
- Required Substrate temperature : 15º C to 40º C and shall be at least 3º C above dewpoint. Pre-heating of the substrate by propane torch or induction coil to achieve the temperature range is permitted.
- Touch Dry : 8 hours
- Full Cure : 7 days @ 25ºC
- Over-coating time : @ 15ºC : 20 hrs Minimum
- : @ 30ºC : 6 hrs Minimum
- Application shall be by brush, proprietary application pad or airless spray. All welds and sharp edges shall be stripe coated and followed by two coats (~250µm DFT/coat) to ensure that the minimum DFT = 400µm is achieved.

B.1.2.6 Performance

The completed coating shall be:

- Run, drip and sag free.
- The entire section shall be 100% free of holidays when tested with a wet sponge at 2400V.
- The minimum DFT shall be 400µm save for flange faces where the following criteria shall apply:
- Particular care shall be exercised to ensure that there are no runs or drips at bolt holes.
- The maximum DFT shall be < 80µm and the flange profiling shall be clearly evident over the full width and circumference of the flange.

B.1.2.7 Repair Procedure

- **Major Defects:** Will be rejected and the entire fitting or special shall be grit blasted to specification and re-coated.
- **Minor Defects:** The coating at minor defects shall be lightly abraded with 100grit emery paper and re-coated. Upon completion a 20mm wide lightly abraded halo shall be visible around the repair. All repair work shall be re-tested upon completion.

B.1.2.8 Topcoat

A UV resistant topcoat shall be applied where indicated.

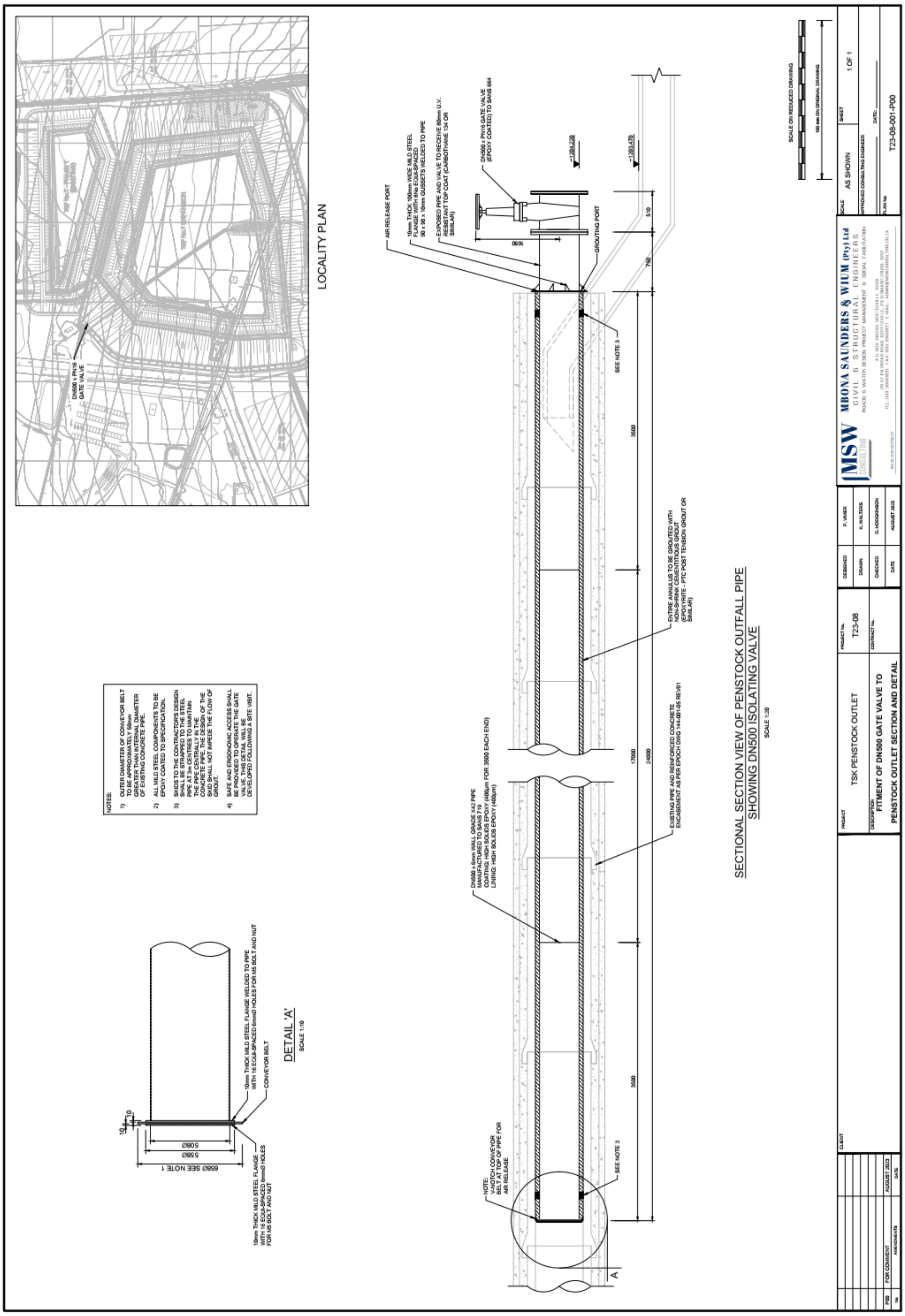
The epoxy coated fitting shall be cleaned to achieve a water break free surface and dried with compressed air. The epoxy coated fitting shall be lightly rubbed down with 100 grit emery paper and then receive one coat of compatible primer (the primer may be omitted if so recommended by the supplier) and at least two coats of UV resistant topcoat (Carbothane 134 ® or similar) to achieve a drip, run, streak and blemish free surface with a minimum DFT = 80µm. The colour of the topcoat shall comply with the Client's colour coding standard.

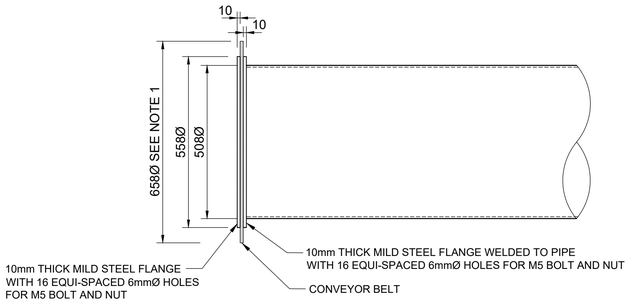
B.1.2.9 Safety

The following PPE is required as a minimum. PPE shall comply with the Contractor's Risk Assessment:

- Eye Protection
- Hearing Protection
- Dust masks
- Gloves

ANNEXURE C
PROPOSED INSTALLATION OF DN500 GATE VALVE IN THE DN600 PENSTOCK
(Full size Drawing under separate cover)


LOCALITY PLAN
DN500 x PN16 GATE VALVE
SECTIONAL SECTION VIEW OF PENSTOCK OUTFALL PIPE
SHOWING DN500 ISOLATING VALVE
SCALE 1:20
DETAIL 'A'
SCALE 1:10
NOTES:
AIR RELEASE PORT
GROUTING PORT
SEE NOTE 3
CONVEYOR BELT
TSK PENSTOCK OUTLET
T23-08
FITMENT OF DN500 GATE VALVE TO
PENSTOCK OUTLET SECTION AND DETAIL
MBONA SAUNDERS & WIUM (Pty) Ltd
CIVIL & STRUCTURAL ENGINEERS
AS SHOWN
1 OF 1
T23-08-001-P00
AUGUST 2023
FOR COMMENT

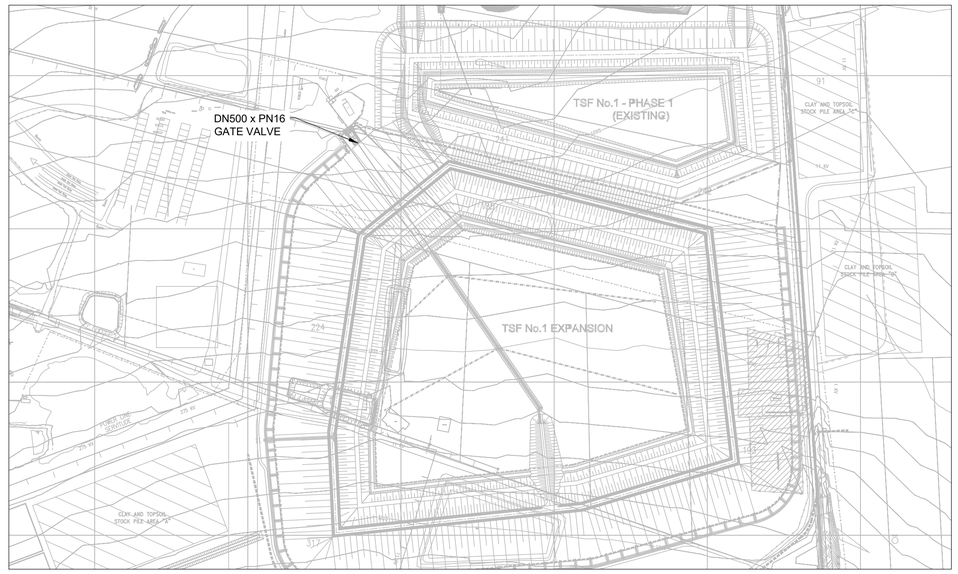


DETAIL 'A'

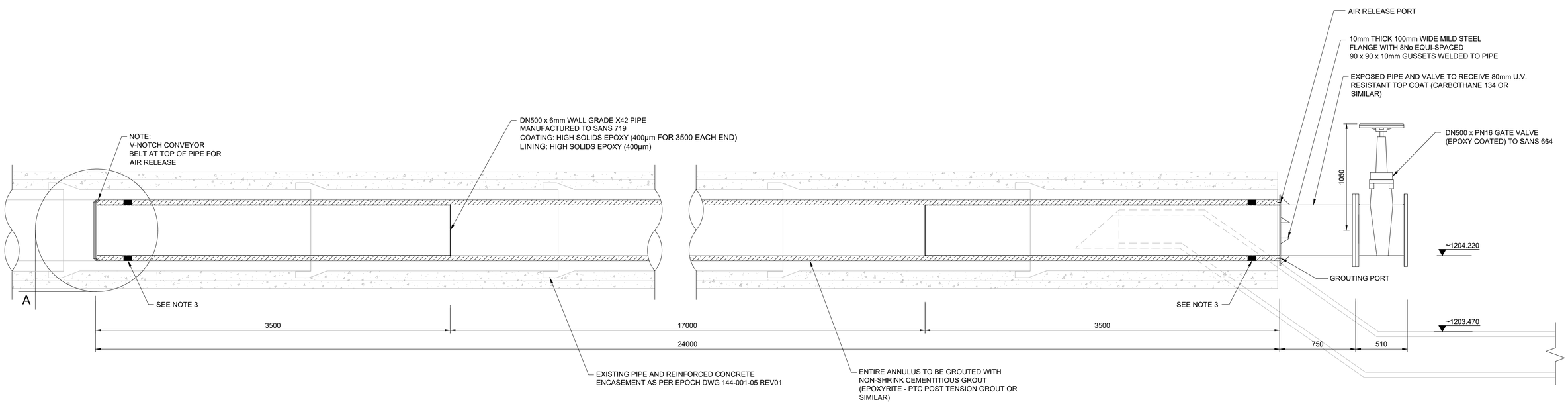
SCALE 1:10

NOTES:

1) OUTER DIAMETER OF CONVEYOR BELT TO BE APPROXIMATELY 50mm GREATER THAN INTERNAL DIAMETER OF EXISTING CONCRETE PIPE.
2) ALL MILD STEEL COMPONENTS TO BE EPOXY COATED TO SPECIFICATION.
3) SKIDS TO THE CONTRACTOR'S DESIGN SHALL BE STRAPPED TO THE STEEL PIPE AT 3m CENTRES TO MAINTAIN THE PIPE CENTRALLY IN THE CONCRETE PIPE. THE DESIGN OF THE SKID SHALL NOT IMPEDE THE FLOW OF GROUT.
4) VALVE SUPPORT AND SAFE AND ERGONOMIC ACCESS SHALL BE PROVIDED TO OPERATE THE GATE VALVE. THIS DETAIL WILL BE DEVELOPED FOLLOWING A SITE VISIT.
5) THE INTERNAL BORE OF THE DN600 CONCRETE PIPE SHALL BE HIGH PRESSURE CLEANED TO REMOVE ALL DELETERIOUS MATTER PRIOR TO COMMENCEMENT OF THE SLIP LINING OPERATION.



LOCALITY PLAN



SECTIONAL SECTION VIEW OF PENSTOCK OUTFALL PIPE SHOWING DN500 ISOLATING VALVE

SCALE 1:20

SCALE ON REDUCED DRAWING

100 mm ON ORIGINAL DRAWING

No	AMENDMENTS	DATE
P00	FOR COMMENT	AUGUST 2023

CLIENT

PROJECT: TSK PENSTOCK OUTLET

PROJECT No.: T23-08

DESCRIPTION: **FITMENT OF DN500 GATE VALVE TO PENSTOCK OUTLET SECTION AND DETAIL**

CONTRACT No.:

DESIGNED	P. VIVIER
DRAWN	K. WALTERS
CHECKED	D. HODGKINSON
DATE	AUGUST 2023

MSW CONSULTING
MBONA SAUNDERS & WIUM (Pty) Ltd
CIVIL & STRUCTURAL ENGINEERS
ROADS & WATER DESIGN, PROJECT MANAGEMENT & SOCIAL FACILITATION
P.O. BOX 100293, SCOTTSVILLE, 3209
28 ST PATRICKS ROAD, SCOTTSVILLE, PIETERMARITZBURG, 3201
TEL: 033-3950920 FAX: 033-3950921 E-MAIL: ADMIN@MSWCONSULTING.CO.ZA
REG NO. 2015/057235/07

SCALE: AS SHOWN

SHEET: 1 OF 1

APPROVED CONSULTING ENGINEER

DATE: 22-08-2023

PLAN No: T23-08-001-P00