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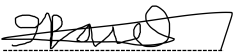
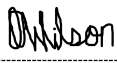
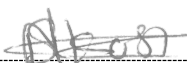


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1. Introduction

Tutuka Power Station is a coal fired power station and has 3600MW installed capacity and was constructed in the mid 1980's. The Tutuka Power Station is located within the Standerton magisterial district, approximately 21 km northeast of the town Standerton in the Mpumalanga Province.

The dirty water drainage at the station has recurring blockages which results in ash, water and steam flowing into the cable tunnels and station's MV switchgear rooms thus posing a safety and production risk to the station. Blockages inside the dirty water drains pose a risk of further compromising the structural integrity of the concrete pipes with the possibility of developing sinkholes, pollution to underground water and unwanted leakages and overflows. Furthermore, the outside drainage also has recurring blockages, which prevents the stormwater and dirty water drainage system running effectively and efficiently.

The drainage system at Tutuka Power Station consist of underground concrete piping, trenches, concrete culverts, concrete surface channels and earth channels. It is critical for the Tutuka Power Station drainage system to be unblocked and CCTV inspected regularly.

In addition to the station drains, the power station's sewage network is also experiencing blockages, this is evident by the minimal inflow at the Tutuka sewage treatment plant. The unblocking and CCTV inspection scope of work must also cover the approximately 8km sewage network.

2. Supporting Clauses

2.1 Purpose

The purpose of this document is to outline the scope of work required to establish a long-term contract (As and when required) for the Unblocking & CCTV Inspection of the Tutuka Drainage and Sewage Systems, and Maintenance of Tutuka Stormwater Channels.

2.2 Applicability

This document shall apply to Tutuka Power Station only.

2.3 Effective date

The effective date will be from the authorisation date.

2.4 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.4.1. Normative

- [1] 240-57127951: Standard for the Execution of Site Investigations
- [2] ECSA Code of Conduct for Registered Persons: Engineering Profession Act, 2000, (Act No.46 of 2000)

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- [3] National Water Act, 1998 (Act No. 36 of 1998)
- [4] 0.61/00077 Rev 8. Storm Water Drainage Layout
- [5] National Environmental Management Act, Act 107 of 1998
- [6] National Environmental Management Act, Act 107 of 1998
- [7] National Environmental Management: Waste Act, Act 59 of 2008
- [8] 240-85549846 Standard for Design of Drainage and Sewerage Infrastructure
- [9] 32-1034: Eskom's Procurement and Supply Chain Management Procedure
- [10] Occupational Health and Safety Act (No. 85 of 1993)
- [11] ISO 9001: 2015 Quality Systems Standard
- [12] National Water Act of 1998 (Act 36, of 1998)
- [13] Regulation 1179 of Act 85 of 1993 (Hazardous substance) Act 15 of 1977
- [14] National Environmental Management: Waste Act 59 of 2008
- [15] SANS 1200 – Standards
- [16] SANS 791 - Unplasticized poly(vinyl chloride) (PVC-U) sewer and drainpipes and pipe fittings
- [17] SANS 677 - Concrete non-pressure pipes
- [18] SANRAL Drainage Manual (2013). Pretoria; South Africa National Road Agency Ltd
- [19] SANS 1200 – Standard Specifications for Civil Engineering Construction, various

2.4.2. Informative

- [1] Tutuka Water Use Licence (Licence No: 08/C11K/ABCFGI/1016)
- [2] 0.61/00077 Rev 8. Storm Water Drainage Layout
- [3] 0.61/00076 Rev 31 Dirty Water Drainage
- [4] 0.61/00133 Rev 3 Drainage GA. Road. Dirty. Storm Water. Sewer
- [5] 0.61/00134 Rev 1 Dirty Water Drainage. North of Terrace.
- [6] 0.61_13921_REV_2-Ash dump clean water dam south
- [7] 0.61_55339 Common Plant CCW Drainage System P&ID
- [8] 21.61_55329 Common Plant West Water Treatment Plant Dirty Drains System P&ID
- [9] Eskom Tutuka - Power Station Drainage Drawings
- [10] 0 61/55330 Common Plant Station Drain System PID
- [11] Jeffers & Green Tutuka Rain Readiness Report September 2014
- [12] 240-144332407 Standard for Eskom Power Stations Concrete Remedial Work [2]
- [13] 0.61/02821/REV 16 WTP Drains and Manholes
- [14] 0.61/02822/REV 7 WTP Drainage and Manhole Detail
- [15] 0.61/04099/REV 1 West Pipe Trench Layout

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- [16] 0.61/55328 Demin Regen Effluent Drains P&ID
- [17] 0 61/130 Rev 13 Tutuka Sewage General Layout
- [18] 21.61/55323 Tutuka Sewage Drain System P&ID
- [19] 0 61/135 Rev 3 North Terrace General Sewage Layout
- [20] 0 61/1748 Rev 2 South and East Terrace General Sewage Layout
- [21] 0.61/136 Rev 3 South Terrace Sewage Layout
- [22] 21.61/55323 Tutuka Sewage Treatment and Water Recovery System P&ID
- [23] 0.61/02821_Rev 16 WTP Drains and Manholes
- [24] 0.61/2822_Rev 7 Drainage and Manhole Detail
- [25] 0.61_04099_Rev 1 West Pipe trench Layout
- [26] 0.61/02773-Rev7: Water treatment plant Building plan on Column Bases, Trenches, Tunnels and Sumps
- [27] 0.61/02762-Rev2: WTP building Demin Plant pipe trench layout
- [28] 0.61/02857-Rev2: Cable tunnel East Concrete Details
- [29] Tutuka Power Station Sewer Network Conditional Assessment & Remedial Work, Rev 2, Intah Solutions, November 2020

2.5 Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.6 Abbreviations

| Abbreviation | Explanation |
|---------------------|--------------------------------------|
| CCTV | Closed-Circuit Television |
| NWA | National Water Act |
| DWD | Dirty Water Dam |
| ECSA | Engineering Council of South Africa |
| BDV | Blow Down Vessel |
| ISO | International Standards Organisation |
| N/A | Not Applicable |
| P&ID | Piping and Instrumentation Diagram |
| QIP | Quality Inspection Plan |
| SANS | South African National Standards |

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2.7 Roles and Responsibilities

2.7.1 Civil Maintenance

- Responsible to coordinate the works, and for all contract management and liaising with the contractor
- Responsible for supervising the works being executed at all times

2.7.2 Civil Engineering

- Compiles scope of work for the Unblocking & CCTV inspection of the Station Drains and Outside Station Drains
- Conducts technical evaluation, as per the issued technical evaluation strategy

2.7.3 Principal Contractor

- As per OHS Act (85/1993)
- Executes scope of work issued by the Employer

2.7.4 Tutuka Environmental

- Ensures that environmental legislation and standards are adhered to, and environmental practices are implemented at all times during execution of the works.

2.7.5 Tutuka Quality

- Ensures that quality legislation and standards are adhered to, and quality practices are implemented at all times during execution of the works.

2.7.6 Tutuka Safety

- Ensures safety legislation and standards are adhered to, and that safety practices are implemented at all times during execution of the works.

2.8 Process for Monitoring

The tender committee will adjudicate the tender evaluation and contract appointment.

The Contractor will compile a QCP, which will ensure the works are executed within the relevant technical, and SHEQ requirements, as well as specified duration including a program/gantt chart.

2.9 Related/Supporting Documents

As per section 2.4

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3. Constraints

3.1 General Constraints

- a) A compulsory site tender briefing session/scope clarification meeting to be conducted and if the Tenderer/Contractor does not attend or send a technical representative to the meeting, that Tenderer/ Contractor will be disqualified.
- b) All technical queries to be directed to Civil Engineering.
- c) Contractor to provide returnable schedules in accordance with the technical evaluation strategy issued by the Employer.
- d) All works to be executed in accordance with standards referenced under section 2.4.
- e) Deliverables/objectives of this works includes but not limited to:
 - i. Submit detailed method statement and material data sheet for Employer's Civil Engineers to approve before commencement of the works.
 - ii. Submit detailed programme/plan including tasks to be executed, date of completion for each task and amount of time needed to complete task for Employer to approve before commencement of the works.
 - iii. Submit detailed QCP, which ties in with the submitted method statement, signatories to be Contractor, Eskom civil maintenance, Eskom civil engineer, and Eskom quality. QCP must be submitted to Civil Maintenance, Civil Engineering and Civil Quality to approve before commencement of works.
 - iv. Conduct all necessary site investigation and assessments to enable effective execution of the scope of work.
 - v. Execute scope of work of the Unblocking & CCTV inspection of the Tutuka Drainage and Sewage Systems, and Maintenance of Tutuka Stormwater Channels
 - vi. Submit thorough report detailing investigation and assessment findings
- f) Call-out response time is 1 hour and team roster to be handed in one week upfront
- g) The Contractor is responsible to supply transport for his staff on site as per the Employer's requirement. Staff will not be allowed to walk from one job to another
- h) The Contractor shall appoint a Site Manager with minimum of 4 years work experience in maintaining same/similar drainage systems as listed in Section 4 of this document. The Site Manager to give technical assurance at all times and manage the contract on behalf of the Contractor. If not available, the delegate/stand-in must be appointed in writing by the Contractor to ensure continuity of the works
- i) Contractor's tools, machinery, equipment and execution of work shall not impair the operation at the specified Station Dams or access to the station and/or neighbouring site areas
- j) During execution of the scope of work, Contractor to share the site with other contractor/s conducting operation and maintenance tasks
- k) Contractor is responsible to provide their own measures to secure machinery, equipment, materials, and resources on site

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3.2 Site Constraints

- i. Stormwater manholes located along the access road with high vehicle traffic movement
- ii. Inaccessible stormwater and sewage manholes due to aging and bond between manhole covers and concrete/sediments/ash. The Contractor supplies their own access equipment, machinery, tools, labour and skills/specialist to access and execute the required works.
- iii. Poor lighting in the WTP Cable tunnels, access is possible via a cat-ladder located in a locked Shelter inside the WTP building, there are live cables mounted on the walls.
- iv. Permit requirements and PPE for accessing manholes.
- v. Variance between site configurations captured on As-built drawings and physical configuration site layout of the station drains, stormwater channels and sewage system.
- vi. Hard/cemented ash in pipelines may require specialised machinery and/or equipment, skills and resources to penetrate through and unblock the drains
- vii. The flow in the sub-surface drains is by gravity and there are no isolations. Continuous inflow of storm water/surface runoff and dirty water may be encountered through the station drains during execution of the works. All works to be executed while the dirty water drains are in operation. Isolation will not be provided. The Contractor to provide all necessary equipment, machinery, tools, labour and skills/specialists to ensure that the flow of water does not disrupt and/or hinder the execution of the required works.
- viii. During execution of the scope of work, Contractor to share the site with other contractor/s conducting operation and maintenance tasks.
- ix. The Contractor's tools, machinery, equipment and execution of work must not impair the operation or access to the station.
- x. Sewage manholes located along the road with high vehicle traffic movement
- xi. Inaccessible and continuous 300mm diameter sewer pipe fixed inside a 1500mm diameter storm water drain along MH11A to MH21A, as illustrated under drawing 0.61/130 rev 13 [23].
- xii. Due to the operational philosophy of the Power Station, there will be a constant flow of water through the storm water drain. The volume and flowrate of the constant flow of water through the stormwater drain is unknown.
- xiii. High flow of storm water and dirty water is encountered through the stormwater pipe during operation of the East units 1-3 and rainy season.
- xiv. Isolations will not be provided for the stormwater and sewage system. The Contractor to provide all necessary equipment, machinery, tools, labour and skills/specialists to ensure that the flow of water does not disrupt and/or hinder the execution of the works (i.e. site investigation, assessment, inspection, analysis, and repair and replacement works).

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- xv. Abnormal and unknown unknown flowing into the sewage pits/pump. Reference can be made to drawing 21.61/55323 [24] for the original design process flow configuration associated with the sewage pits/pump stations that support Tutuka Power Station sewage system. Isolations will not be provided, The Contractor to provide all necessary equipment, machinery, tools, labour and skills/specialists to ensure that the flow of water does not disrupt and/or hinder the execution of the works (i.e. site investigation, assessment, inspection, analysis, and repair and replacement works).
- xvi. All works to be executed while the sewage system is in operation. Isolation will not be provided. The Contractor to provide all necessary equipment, machinery, tools, labour and skills/specialists to ensure that the operation of the sewage system does not disrupt and/or hinder the execution of the works (i.e. site investigation, assessment, inspection, analysis, and repair and replacement works).

4. Site Description

Tutuka Power Station comprises of several drainage systems which is broken up into station drains and outside station drainage. Listed below are the different area which form part of the station drains and outside station drainage.

4.1 Unit 1-6 Boiler Basement

The boiler basement is located on the 0m level of Tutuka power station, the boiler basement consists of floor washing (surface) trenches, which collects run off water and ash via the surface trenches which are covered by steel gratings along the length of the trenches. These trenches are often blocked and overflow onto the basement floor, which causes excess water, and mud to regularly collect on the basement floors, floor ashing also has a major impact on these trenches being blocked, therefore it is important for these trenches to be unblocked and cleaned in order to maintain the order of the plant. Figure 1 below shows the trenches for Unit 1, Contractor to take note that the figure below is the layout of trenches for 1 unit, the unblocking and cleaning of trenches will be done for unit 1-6, the layout of the trenches is repetitive across all six units.

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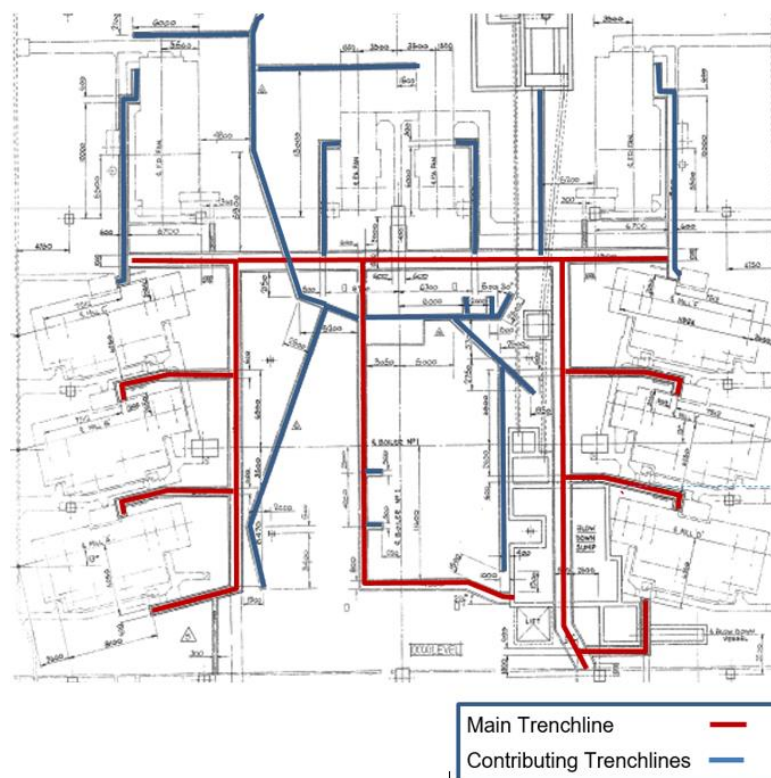


Figure 1: The trenches for Unit 1 (Drawing 0.61_02385_REV_6 Boiler 0ml Trench layout)

4.2 Unit 1-6 Cable Tunnels

Tutuka Power Station is equipped with cable tunnels for each unit 1-6, there are storm water channels present in the cable tunnels which require to be unblocked regularly due to ash build up. There is a main drain at each cable tunnel where unblocking and CCTV inspections can be done, Contractor to arrange access with Civil maintenance when working in the cable tunnels, there are limited drawings available for the cable tunnel area hence the Contractor will be responsible for conducting their own assessment of the drainage system.

4.3 Unit 1-6 Quenching and Recovery Sumps

There are quenching sumps and recovery sumps at Tutuka Power Station for each of the 6 Units, these sumps are often blocked and overflow due to the build-up of ash in the pipelines, Figure 2 below shows the system of flow for the quenching and recovery sumps. The quenching sump receives hot water from the BDV, which then goes through three sections present in the quenching sump for cooling to take place, from the quenching sump, the water reports to the recovery sump where it then reports to the main drain line of the Dust Handling plant. Blockages can cause these sumps to overflow and in some cases, backflow, which results in steam ingress into the switchgear, rooms at Tutuka Power Station, this could possibly result in a Unit trip, which affects production

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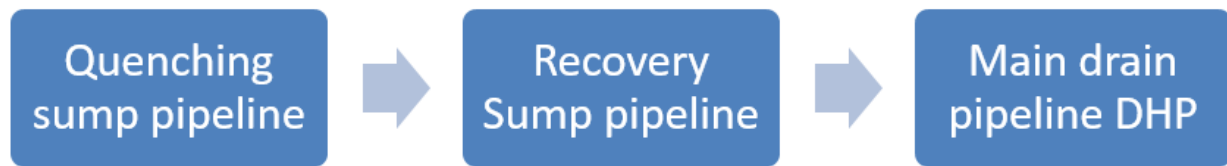


Figure 2: System Operation Process

4.4 Ash Recovery Silt Traps

Tutuka power station has one silt trap for each unit and a total of 6 ash recovery silt traps. They are located between the dust hoppers at the dust handling plant and the Induced Draught Fans at the southern part of the station as seen in Figure 3.



Figure 3: Ash Recovery Silt Traps

The function of these ash recovery silt traps is to collect and allow ash water to stagnate leading to sedimentation of the ash. The silt is then removed on an as and when needed basis. The water then cascaded into an overflow compartment to a pipe which transports the water to the SD3 Station Drain mentioned in Section 4.7.4 and shown in Figure 16. Furthermore, Figure 4 & 5 displays the Ash Recovery Silt Trap layout and outlet pipe respectively.

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Figure 4: Layout of Ash Recovery Silt Trap



Figure 5: Outlet Pipe to Station Drains

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4.5 Water Treatment Plant(WTP) Station Drains & Pipe Trenches

Tutuka Power Station has its own Water Treatment Plant (WTP) where it purifies raw water for portable water and demineralized water. Demineralization is the process of removing ions from water. Demineralized water is used to generate steam at the unit boilers. There are three Demin trains at the Water Treatment Plant. The trains are made up of cation bed (where positive ions are removed), anion beds (where negative ions are removed), mix beds (where remaining (-) and (+) ions are removed, degas sumps (where gases are removed) etc. The WTP is located at the west side of the station close to unit one as shown in Figure 6.



Figure 6: Water Treatment Plant

The drainage system at the WTP is fundamental in ensuring the plant runs in an optimal way. The WTP floor is equipped with pipe drains and trenches to drain away water spillages occurring at the WTP building [26 & 27]. The detailed drainage system and configuration drawings are listed in Section 2.4.2(13-16). Furthermore water leaks from the WTP also end up in the pipe trenches. Figure below shows the cross-section of the concrete pipe trenches with dimensions.



Figure 7: Cross-Section of the Concrete Pipe Trenches

Furthermore, the large concrete lined pipe trench between the water treatment plant and the access road at the east of the station contains vegetation and blockages which are required to be removed. It is crucial that this pipe trench is maintained as many important service pipes are located within it. This concrete lined pipe trench route can be seen in Figure 8. Water inflow in this pipe trench is mainly from leaks from the pipes located within it and this water then flows into the station drains and eventually into the Dirty Water Dam.

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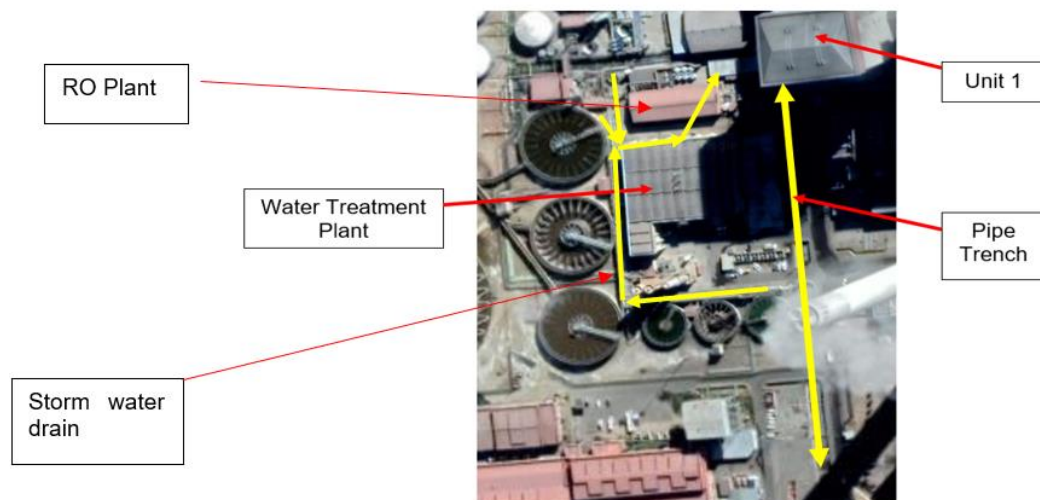


Figure 8: Pipe Trenches

A similar trench [Figure 9] is located adjacent the RO plant, the Contractor to refer to drawing no. [25]. In addition to these trenches, there is a buried storm water drainage system as indicated in Figure 8 above. This drainage system falls under the Contractor's Scope of CCTV inspection and unblocking. The Contractor to refer to drawing no. [23&24] for the actual details of the drainage system.



Figure 9: Pipe Trenches

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4.6 Water Treatment Plant(WTP) Building Cable Tunnels

There are also Cable tunnels underneath the Water Treatment Plant building. These tunnels are equipped with trenches along the edges as shown in drawing no. [26, 27 & 28]. Accumulation of debris in these trenches has been witnessed. The debris hinder the smooth drainage of any water that find its way to these tunnels. The Contractor to inspect these and unblock as and when required. In addition, aggressive water from the WTP processes has made its way to these trenches and damaged the concrete surface of the trenches. The damage is visible on the abovementioned trenches, however, due to access constraints, the drainpipe downstream these trenches (north of WTP building) cannot be inspected visually, CCTV inspection is required to determine the incurred damage in the internal of this pipe.

4.7 Ash Dump Drainage

The ash dump is located to the east of the power station along the R38 Bethal Road. The ash dump is responsible for storing ash, which is a by-product of the power generation process. The ash is transported to the ash dump via a network of conveyor belts, which are pivotal to the operation of the ash dump. Furthermore, the drainage systems at the ash dump need to be managed effectively to ensure the plant runs in an optimal way. All channels and drainage located outside the Ash Dump will form part of this Scope of Work such as Ash Dump CWD 3 and only the sections of the Ash Dump DWC and Ash Dump CWD 2 which are located outside the Ash Dump as shown in Figure 10.

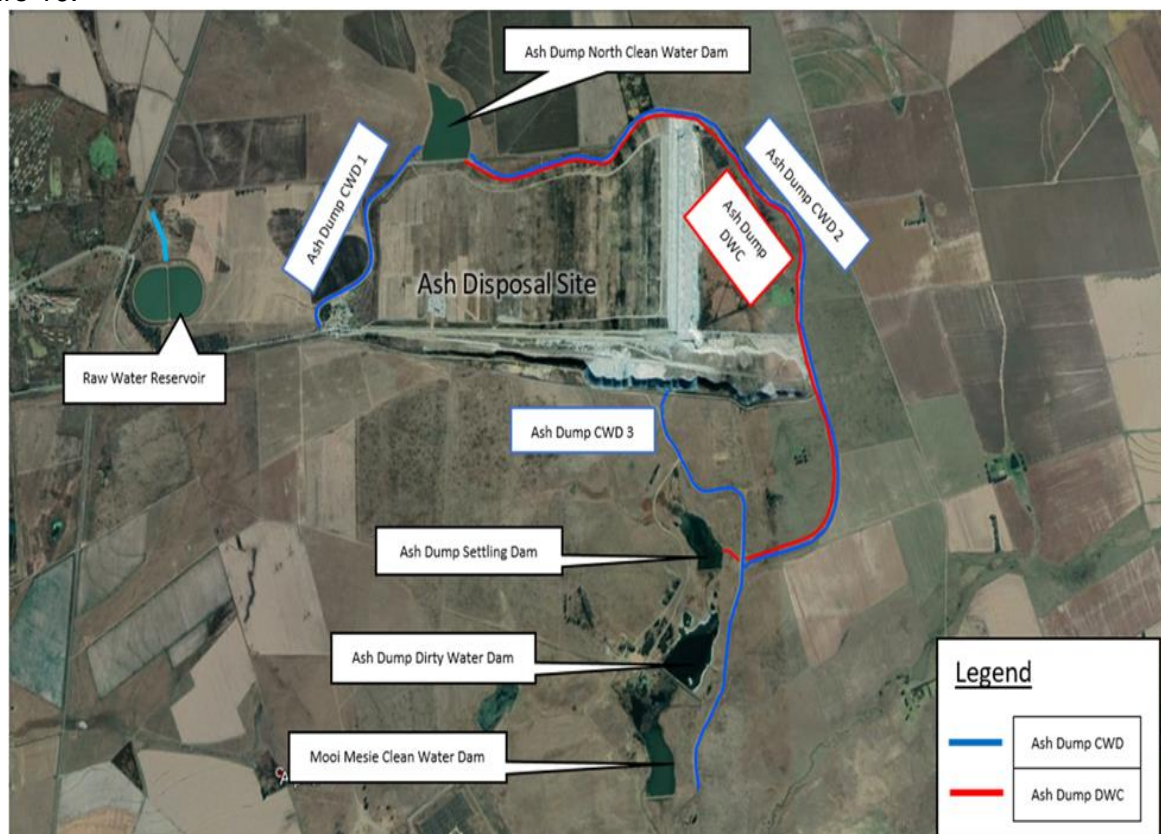


Figure 10: Ash Dump Open Drainage Channels Layout

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4.8 Coal Plant Drainage

The Coal Plant is located to the northwest of the power station. The Coal Plant at Tutuka Power Station plays a pivotal role to the production of power, which further emphasizes the importance of efficient and effective operations at the Coal Plant. Furthermore, the drainage systems at the coal plant needs to be managed effectively to ensure the plant runs in an optimal way. The function of the coal stockyard is to store coal and later transport it to the station via a network of conveyor belts. The perimeter of the coal stockyard contains concrete and earth channels, which collect and divert water from the coal stockyard to the coal stockyard dam. The red lines in Figure 11 illustrates the location of these channels. It is fundamental there are no blockages along these channels and that water flows smoothly to the coal stockyard dam at all times



Figure 11: Channels at the Coal Stockyard

Furthermore, there are also drains located along the access road at conveyors 12, 13, 14 and 15. This entire drainage network falls within this scope of work and will be required to be unblocked. Figure 12 displays the location of a portion of this drainage network. Stormwater and water from cleaning operations at conveyors 12,13,14 & 15 flow into these drains and then later flows via an underground pipe into a dam at the New Denmark Mine which is located towards the northeast of the coal stockyard. The water from the dam is then pumped back into the station. It is crucial that these drains and the underground pipe are unblocked and CCTV inspections are executed.

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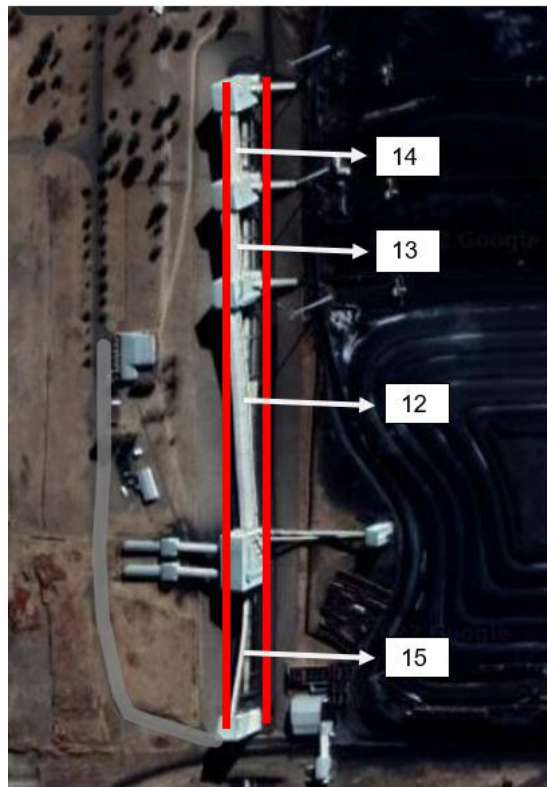


Figure 12: Coal Stockyard Drainage at Conveyors 12, 13, 14 and 15

4.9 Outside Station Drainage leading to Terrace Dams

The terrace dams at Tutuka PS are composed of the North Clean Dam, DB Thermal Dam, Steinmuller Dam and the Dirty Water Dam. These dams form part of the dirty water drainage system and water recovery system at Tutuka Power Station. The drainage leading to the Terrace Dams are comprised of concrete channels, earth channels and concrete pipes. All drainage structures leading to the terrace dams will form part of this scope. Further details on the drainage leading to the respective terrace dams are seen below.

4.9..1 North Clean Dam

The North Clean Dam is located to the north side of the station. The dam is also a catchment of any overflowing water from cooling tower 3 & 6 and rainwater, which enters the dam via concrete and earth, channels which are trapezoidal in shape. The blue lines in Figure 13 illustrates the location of these channels.

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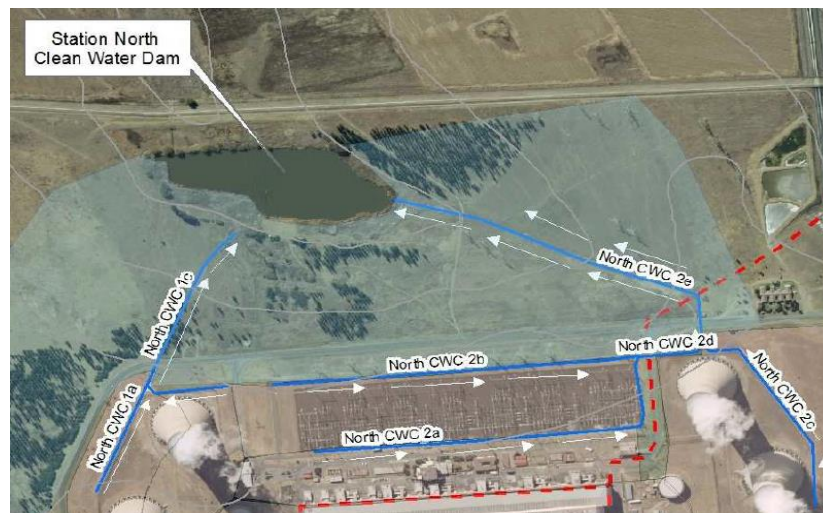


Figure 13: Channels Leading to North Clean Dam

4.9..2 DB Thermal Dam

The DB Thermal Dam is located within the perimeter of the power station at the southwest of the station. The dam is a catchment of any overflowing water from cooling tower 1 & 2, rainwater, ash & coal settling ponds overflow and air heater washing tanks overflow, which enters the dam via concrete and earth channels, which are trapezoidal in shape and concrete pipes when crossing access roads. The red lines labelled DBT1a, DBT1b and DBT2 in Figure 14 illustrates the location of these channels.



Figure 14: Channels Leading to DB Thermal Dam

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4.9..3 Steinmuller Dam

The Steinmuller Water dam is located within the perimeter of the power station at the southeast of the station. The dam is a catchment of any overflowing water from cooling tower 4 & 5, rainwater, mine transfer house (wet coal and washing effluent), coal settling ponds overflow and water leaks from the dust suppression pipe to ash disposal, which enters the dam via concrete and earth channels, which are trapezoidal in shape and concrete pipes when crossing access roads. The red lines labelled SM1a, SM1b, SM1c and SM1d in Figure 15 illustrates the location of these channels.



Figure 15: Channels Leading to Steinmuller Dam

4.9..4 Dirty Water Dam (DWD)

The Dirty Water Dam (DWD) is located towards the west of the station not far from the East Gate at Tutuka Power Station and forms part of the dirty water drainage system. The main source of water inflow into the DWD is from the station drains, which lead to the dam via network of concrete channels and pipes. Figure 16 displays the dirty water dam and water recovery system. The dotted lines labelled SD1, SD1, SD3, SD4 and SD5 in Figure 17 illustrates assumed underground pipelines, which lead to the screw pump house. The water thereafter flows via underground pipelines and concrete channels to the sedimentation ponds after which it flows to the oil skimming plant via concrete channels and eventually to the Dirty Water Dam. Furthermore, the detailed drawings and layouts for the dirty water drainage leading to the DWD are listed in section 2.4 of this document.

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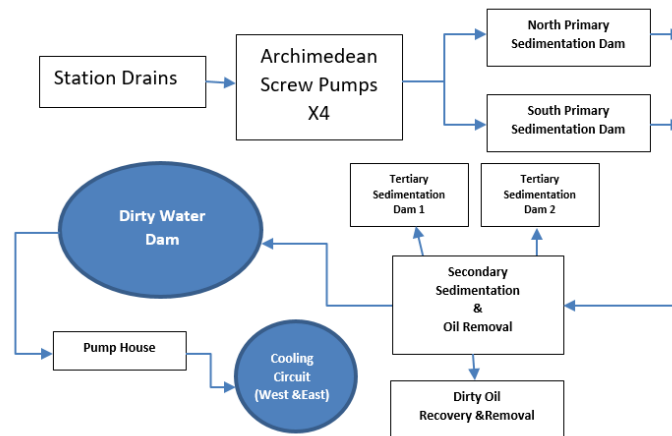


Figure 16: Dirty Water Dam and Recovery Systems

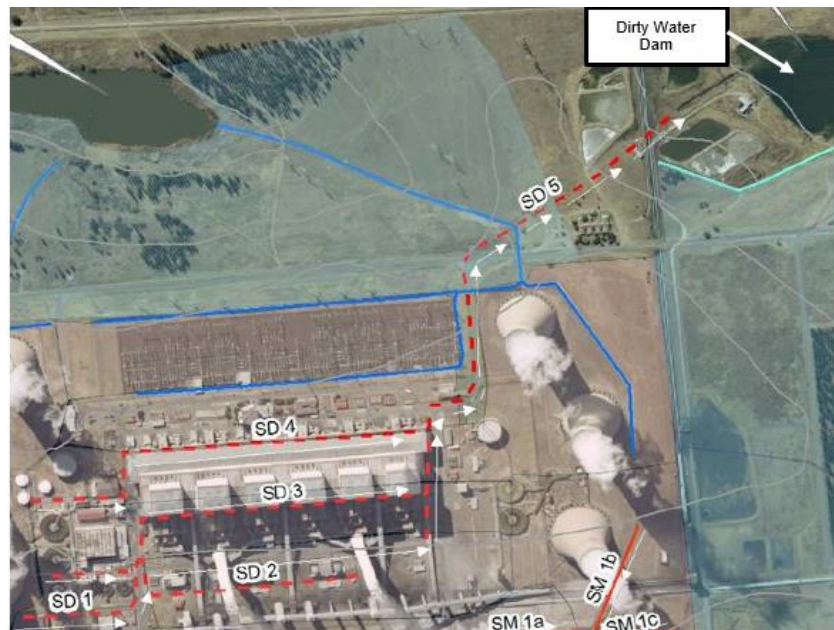


Figure 17: Station Drain Pipelines leading to DWD

4.10 Tutuka Sewage System

Tutuka sewage treatment plant supports the station. The sewage treatment plant is owned by Eskom and located within Eskom's properties. The Tutuka Power Station sewage treatment plant is an activated sludge wastewater treatment works (WWTW) using a simple extended aeration process.

The WWTW has the following process modules:

- Small inlet work with manual raked screen and degritters
- A single aeration reactor

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- One secondary clarifier
- 8 drying beds
- Maturation pond
- Granular chlorinator



Figure 18: Tutuka Sewage Treatment Plant

The hydraulic capacity of the plant is estimated at 1MI/d based on the secondary clarifier diameter, which does not correlate with the reported design capacity of 2 MI/d. Tutuka Sewage Treatment Plant is managed and operated by Tutuka Power Station Chemical Services Department. Currently the sewer discharge volumes reaching the Tutuka Sewage Treatment Plant are suspected to be lower than the sewage volume discharging from the power station due to possible blockages or collapsed hanged fixed 300mm diameter fixed. The sewer pipe diameters approximately range from a minimum 150 to a maximum 1000mm, with pipe material varying from PVC, concrete, clay and asbestos. Figure 19 below is an overview of the estimated 8km Tutuka sewage network, this figure must be read in conjunction with the Sewage treatment plant drawings listed under section 2.4.2. During Execution of the works, the contractor is to determine the exact configuration and dimensions of the sewage network.

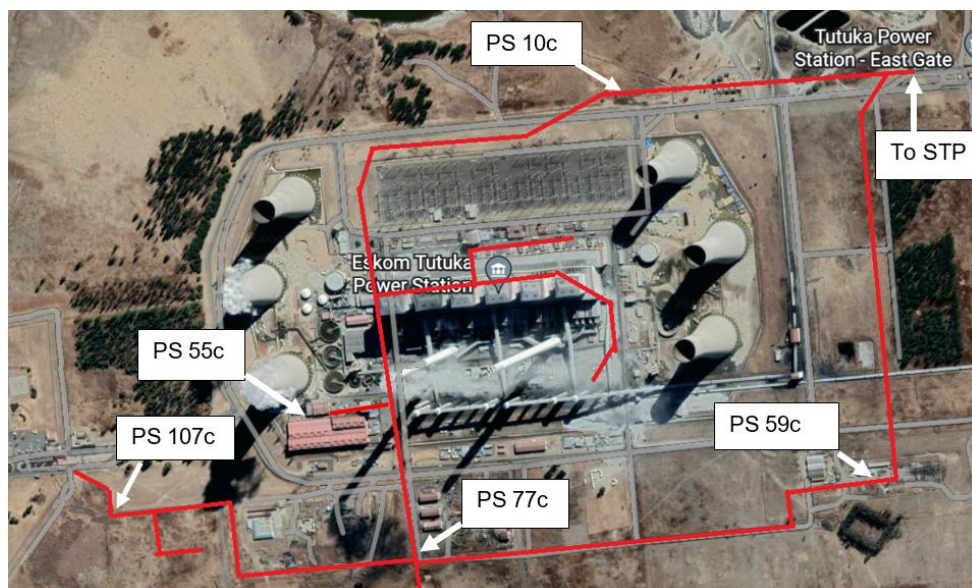


Figure 19: Tutuka Sewage Network Overview

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4.11 TT01 & TT02 Emergency Ashing Areas

TT01 and TT02 are areas responsible for store ash under emergency circumstances when the conveyors transporting ash out of the station are off-line. They are located to the Southeast of the station. Figure 20 displays the location of TT01 and TT02.



Figure 20: Location TT01 & TT02

The drainage of TT01 and TT02 are composed of concrete channels which lead to silt traps. The function of these silt traps are to collect and allow ash water to stagnate leading to sedimentation of the ash. The silt is then removed on an as and when needed basis. The water then overflows eventually leading to the Dirty Water Dam via the station drains. These respective silt traps are to be cleaned on an as and when required basis.

The water from the Silt Traps at TT02 are pumped to concrete channels which lead to the coal and ash settling ponds. The water from the coal and ash settling ponds are then pumped to the station drains where it finally ends up at the Dirty Water Dam. The water from the TT01 Silt Trap is channelled to the station drains where it finally ends up at the Dirty Water Dam.

4.12 Coal Silos Drains and Silt Traps

Tutuka Power Station consist of six coal silos which store coal for us in the station. The location of the six silos are at the south of the station as seen in Figure 20 which are labelled 1-6. The drainage at the silos are comprised of shallow concrete drains which lead to silt traps. Each silo is surrounded by shallow concrete drains which lead to a silt trap [Figure 21 & 22]. The water stored in the silt traps then overflows to concrete v-drains which lead to the coal and ash settling ponds [Figure 23 & 24]. The water from the coal and ash settling ponds are then pumped to the station drains where it finally ends up at the Dirty Water Dam

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Figure 21: Tutuka Power Station Coal Silos 1-6



Figure 22: Concrete Drains Surrounding Each Coal Silo

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Figure 23: Silt Trap at Each Silo

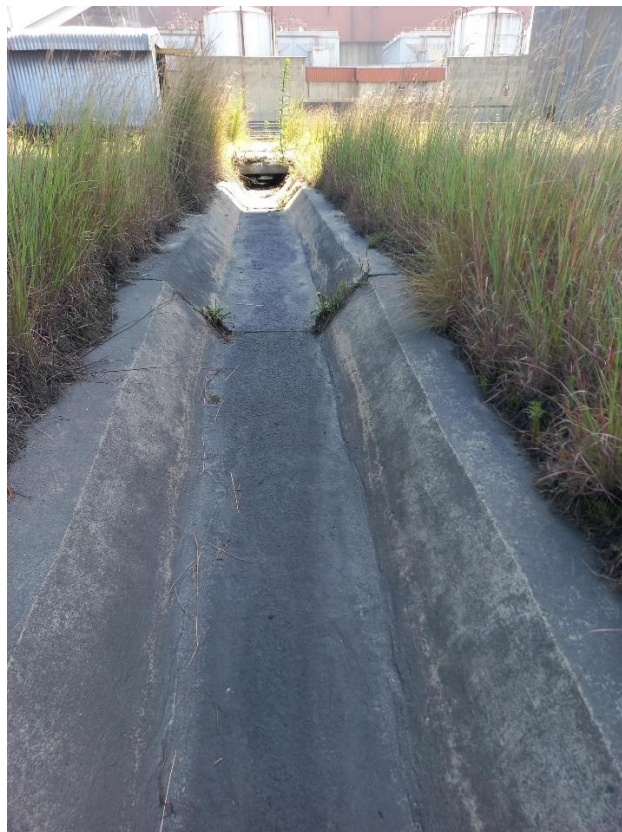


Figure 24: Concrete V-Drains from Silt Traps to Coal & Ash Settling Ponds

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5. Scope of Work

The scope of work is associated with a long-term contract (As and when required) for the Unblocking & CCTV Inspection of the Tutuka Drainage and Sewage Systems, Maintenance of Tutuka Stormwater Channels and Silt Traps

The boundary of the dirty water drains, trenches, channels and silt traps includes but not limited to:

- Unit 1-6 Boiler basement
- Water Treatment Plant Station Drains & Pipe Trenches
- Unit 1-6 Cable tunnels
- Ash Recovery Silt Traps
- Unit 1-6 Quenching and Recovery Sumps
- Ash Dump Drainage
- Coal Plant Drainage
- Outside Station Drainage leading to Terrace Dams
- Tutuka Sewage System
- TT01 & TT02 Emergency Ashing Areas
- Coal Silos Drains and Silt Traps

5.1 Activities Required for All Sub-Surface Drains and Silt Traps

The Contractor should perform the following activity for all the pipe work and trenches as per dirty water drainage drawings [2.2] and section 4.

- a) Contractor to conduct all necessary assessments to establish structural condition, configuration, sub-surface drain dimensions, flow and direction of the dirty water drainage system.
- b) Contractor will be responsible for opening and closing of all the manholes.
- c) Contractor must acquire the correct permits and PPE to access manholes before the works commence
- d) Contractor must consult with the contract manager (Eskom Civil Maintenance) with regards to water tap off points
- e) Contractor to note that unblocking works include the execution of unblocking works throughout the entire dirty water drainage system at Tutuka Power Station.
- f) Before commencing with unblocking works, Contractor to execute CCTV inspection and identification of blocked dirty water drains and trenches and provide results in the form of a report.

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- g) Contractor to be equipped with cutting nozzles and any necessary specialized machinery, equipment, skills and resources to penetrate through the hard ash internal segments of the pipeline and unblock the drain as well as high pressured machinery to ensure that the ash is efficiently removed. Contractor to be equipped with the correct amount of machinery and equipment as well as labour to execute the works in the required time frame
- h) Contractor to unblock dirty water drains and trenches, as per identified blocked areas.
- i) Contractor to provide all Equipment, Machinery and labour (skilled and general) which must be effective to remove wet ash, cemented/hardened ash(clinkers) and slurry water or any other blockages inside the dirty water drains and trenches.
- j) Contractor to execute CCTV inspections verifying blockages removed from the dirty water drains and trenches once unblocking is completed and provide results in the form of a report detailing the effectiveness of unblocking works. CCTV inspections to be done in conjunction with the unblocking works, CCTV should be on site at all times for the duration of the unblocking
- k) Contractor to conduct all necessary testing and commissioning verifying achievement of unblocking and CCTV inspecting at all the areas stated in this scope of work, which form part of the dirty water drainage system.
- l) Contractor to dispose of waste at Tutuka Ash Disposal Site. The quantity of waste (tonnage) to be recorded and waste to be logged at the Ash Disposal site. Employer's Representative to arrange access to the Ash Disposal site.
- m) Contractor to submit signed PDF reports detailing findings, recommendations and repair method statement. Employer's Civil Engineer to approve submission made by the Contractor. This should be a detailed report and video footage of the CCTV inspection
- n) Contractor to submit all CCTV inspection findings to specify blockages, internal pipe condition, pipe material, diameter, flow direction, invert level, abnormalities/deviations, etc.
- o) Contractor to note that sub-surface drains including pipes that may be broken, cracked and/or badly damaged shall be replaced/refurbished. Contractor to submit a method statement detailing repair works. The method statement to be submitted to the Employer's Civil Engineer for approval prior to the commencement of any work.
- p) Silt Traps are to be cleaned on an as and when required basis.

5.2 Activities Required for Concrete and Earth Channels

- a) Contractor to conduct all necessary assessments to establish structural condition, configuration, flow and direction of the channels.
- b) Contractor to inspect and identify blockages and vegetation present at all channels and provide results in the form of a report.
- c) Contractor to note that all inflow pipes leading to the channels form part of the unblocking works and the necessary inspections and works will apply as listed above.
- d) Contractor to unblock channels as per identified blocked areas.
- e) Contractor to provide all Equipment, Machinery and Labour (skilled and general) which must be effective to remove all blockages in the channels.

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- f) Contractor to execute inspections verifying blockages removed from the channels once unblocking is done and provide results in the form of a report detailing the effectiveness of unblocking works
- g) Contractor to conduct all necessary commissioning verifying achievement of unblocking works.
- h) Contractor to dispose of waste at Tutuka Ash Disposal Site. The quantity of waste (tonnage) be recorded and waste to be logged at the Ash Disposal site. Employer's Representative to arrange access to the Ash Disposal site
- i) Contractor to submit digital reports detailing findings, recommendations and repair method statement. Employer's Civil Engineer to approve submission made by the Contractor.
- j) Contractor's inspection findings to specify blockages, concrete and earth channel condition, material, dimension, orientation, flow direction, invert level, abnormalities/deviations/defects, etc.
- k) Contractor to note that concrete channel sections that may be broken, cracked and/or badly damaged shall be cut out and replaced/refurbished with suitable grout, fresh concrete etc. Concrete works shall be done in accordance with 240-144332407 Standard for Eskom Power Stations Concrete Remedial Work [2]. Contractor to submit a method statement detailing repair works detailing the supply and installation of the concrete repair works and associated testing requirements. The method statement to be submitted to the Employer's Civil Engineer for approval prior to the commencement of any work.
- l) Contractor to remove vegetation growing in concrete channel joints and cracks from the roots to prevent re-growth
- m) Contractor to remove vegetation growing over concrete channels at the concrete edges and disposed of. All undesirable vegetation to be removed from the roots.
- n) Dimensions of several channels can be seen in Annexure A. Where dimensions are unknown, the contractor will be required to obtain these dimensions during the site assessment.

5.3 Activities Required for Tutuka's Sewage System

All necessary detailed site investigations, structural assessments, inspections, and analysis of the sewage system from Tutuka Power Station to Tutuka Sewage Treatment Plant. No excavation launch pits to be conducted. Contractor to execute site investigations, structural assessments, inspections, analysis of the sewage system, and unblocking of the sewage pipelines using trenchless technology methods. Existing manhole chambers to be utilised as accessing points. The site investigations, assessments, inspections and analysis includes but not limited to the following key focus points:

- i. Underground service detection and subsurface screening with ground penetrating radar to be executed.
- ii. Sewage pipes and dirty drainage, manhole structures, pit sumps, pumps, and valves
- iii. Determining flow direction of sewer network and flows at manholes and pit sumps
- iv. Identifying and determining blockages, failure mechanisms, operational deficiencies, and reduced flows in the pipeline, manholes, pit sumps, pumps, and sewage system in general
- v. Unblocking of sewer network with HP jet machine and/or vacuum truck to alleviate flow through the sewage system, cleaning of manhole infrastructure and pit sumps. This is inclusive of removing rubble and other foreign objects. In accordance with issued drawings, unblocking and CCTV inspection includes but not limited to
 - a. Sewage pipes and manholes discharging into sewage pit 59C

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- b. Sewage pipe and manholes between sewage pit 59C and the Tutuka Sewage Treatment Plant
 - c. Sewage pipes and manholes discharging into sewage pit 107C
 - d. Sewage pipes and manholes between sewage pit 107C and sewage pit 10C
 - e. Sewage pipes and manholes between sewage pit 107C and sewage pit 77C
 - f. Sewage pipes and manholes discharging into sewage pit 77C
 - g. Sewage pipes and manholes between sewage spit 77C and sewage spit 10C
 - h. Sewage pipes and manholes discharging into sewage pit 55C
 - i. Sewage pipes and manholes between sewage pit 55C and sewage pit 10C
 - j. Sewage pipes and manholes discharging into sewage pit 10C
 - k. Sewage pipes and manholes between sewage pit 10C and Tutuka Sewage Treatment Plant.
- vi. Anchoring support for overhanging sewer drainage network
 - vii. Cracks in the connections of bracing components; and
 - viii. Safety of walkways, handrails, cat ladder,
 - ix. Determining flow analysis, capacity/volume and efficiency of the sewage network, pumps, and sewage system in general from Tutuka Power Station to the Tutuka Sewage Treatment Plant. This to determine the actual capacity/volume of sewage conveyed through the sewage network from Tutuka PS to Tutuka sewage treatment plant.
 - x. Identify wet areas around the pit sumps and manholes. Where applicable, identify settlements of paving around structures
 - xi. Identify "wet cracks" (visible outflow of water) on the external faces of the structures. "Dry cracks" with Calcite deposits are not critical but must be quantified for future reference.
 - xii. Identify the areas of structural distress > 0.5mm and large deflections/ settlements)
 - xiii. Identify and quantify the areas of exposed aggregates, spalled concrete and corroded reinforcement
 - xiv. Where applicable, identify abrasive areas on the scraper support surfaces
 - xv. Identify weathered and damaged joint sealants
 - xvi. Identify and quantify cracks in brickwork and plastered surfaces

5.4 Site Rehabilitation

Contractor is responsible to conduct any identified and/or relevant site rehabilitation that may be incurred during execution of every task order to unblock and CCTV inspect the Tutuka Drains and Sewage System, and Maintenance works executed on the trenches and channels.

6. Labour, Materials and Machine/Equipment

The Contractor shall be responsible for the supply and delivery of all materials, tools, equipment, tools, machinery, labour, and specialist skills necessary to execute the required works. All equipment and machinery must be in working order. Contractor to conduct calibration tests on all tools machinery, and equipment. Contractor to submit valid calibration certificates submitted Employer's approval before commencing with works. Contractor to submit method statement together with material/product data sheet for Employer's Civil Engineer to approve before commencement of works.

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Contractor to provide their own resources to secure security of tools, materials, and machinery/equipment that will be stored on site. Employer will not be liable to account for any costs related to damages or theft of Contractor's tools, materials, and machinery and equipment.

7. Quality Control and Assurance

The Contractor shall develop and implement a system for quality verification records, including site investigation Plans, Record Books (Data Books) as specified in the Tutuka Quality Specifications.

Routine checks and inspections to be conducted as per Contractor's Quality Control Plan (QCP), illustrating defined intervention assessment points. Before commencement of the works, the Contractor:

- a) Submits QCP for the Employer to review and approve before commencement of any works. The QCP include witness, hold, test, inspection points and signatories to be included are the Contractors Supervisor, Eskom Civil Maintenance, Eskom Civil Engineer and Eskom Quality.
- b) Compiles and present detailed proposal of executing the required works to the Employer, for Employer (i.e Civil Engineering, Civil Maintenance, Civil Quality, etc.) to approve. This to be inclusive of methodology, organogram, machinery and equipment to be used for every task order issued.

8. Configuration Management

All documents supplied by the *Contractor* shall be subject to Eskom's approval. The language of all documentation shall be in English.

All project documents must be submitted to the Employer's Representative with transmittal note. In order to portray a consistent image, it is important that all documents used within the project follow the same standards of layout, style and formatting as described in the Work Instruction. The *Contractor* is required to submit documents as electronic and hard copies and both copies must be delivered to the *Eskom Representative* with a transmittal note.

9. DOCUMENT RETURNABLES

The contractor shall produce and submit a project plan, project quality plan, organogram, detailed method statement, QCP, safety file for approval prior to the commencement of work. The Contractor to conduct induction and medicals prior to commencement of work.

These documents should contain the following information, which is not limited to -

- a. Project Programme: Indication of the different activities applicable for the execution of the required works from site establishment to handover as well as the time period allocated for each activity
- b. Project Quality Plan: Highlight the activity or standard which shall be used to ensure quality materials and workmanship
- c. Organogram: Indication of all the core staff (i.e. Site Manager, Safety Officer, etc.) who will be involved in the execution of the required works. Names and qualifications to be specified.

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- d. Method Statement: Detailed method statement specifying sequence of activities, skills, labour, materials, tools, equipment, machinery and testing procedures applicable for the execution of the required work.
- e. QCP: Must indicate relevant hold, surveillance and witness points for the Contractor and Employer
- f. Drawing format for all drawings to comply with Microstation. The creation, issuing and control of all Engineering Drawings will be in accordance to the latest engineering drawing requirements. Drawings issued to Eskom will be a minimum of one hardcopy and an electronic copy. All Contractor is required to submit are electronic drawings in Micro Station (DGN) format and scanned drawings in PDF format. No drawings in TIFF, AUTOCAD or any other electronic format will be accepted. Drawings issued to Eskom may not be "Right Protected" or encrypted.

9.1 Programme

The Contractor is to submit a detailed program of the works 1 week after being awarded the contract. The programme must clearly demonstrate to complete the works in the shortest possible, effective from the order/contract appointment. The program submission must be in soft copy pdf.

The project programme to specify the different activities applicable for the execution of the required works from site establishment to handover as well as the time period allocated for each activity.

10. Acceptance

This document has been seen and accepted by:

| Name | Designation |
|---------------------|------------------------------------|
| Nompumelelo Dlamini | Civil Engineering Manager |
| Imraan Patel | Civil Engineer |
| Sipho Thango | Senior Civil Engineer |
| Clarissa Chetty | Civil Engineer |
| Doctor Nkosi | Civil Engineer |
| Nathi Mabaso | Auxiliary Engineering Manager |
| Nthabiseng Ntoampe | Chemical Services Manager |
| Ntombifuthi Ngcobo | Engineering Manager |
| Simo Dlamini | MMD Outside Plant Manager (Acting) |
| Rhulani Lowani | Outside Plant Maintenance Manager |
| Myke Banda | Quality Officer-Civil Plant |
| Sephiwe Bambo | Environmental Officer |
| Monica Mokgawa | Environmental Manager |
| Thokozani Maseko | Safety Manager |
| David Sindane | Senior Advisor Quality Engineering |
| Lungile Maswanganyi | Dirty Water Dam Recovery Manager |
| Lyborn Xivambu | GMR2 Compliance Manager |

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| Name | Designation |
|--------------|--------------------------|
| Puleng Khabo | Risk & Assurance Manager |

11. Revisions

| Date | Rev. | Compiler | Remarks |
|------------------|-------------|--------------------------------|--|
| 22 February 2022 | 0 | C Chetty I Patel | Document issued for review |
| 28 February 2022 | 1 | C Chetty I Patel | Final Document |
| 31 August 2022 | 2 | C Chetty I Patel D Nkosi | Document inclusive of the Tutuka sewage network submitted for Review |
| 19 April 2023 | 3 | C Chetty I Patel D Nkosi | Final Document inclusive of the Tutuka sewage network |

12. Development Team

The following people were involved in the development of this document:

- Clarissa Chetty
- Imraan Patel
- Doctor Nkosi

13. Acknowledgements

N/A.

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14. Annexure A

Table 1: Channel Dimensions at Respective Areas at Tutuka Power Station

| Channel Name | Channel Shape | Depth (m) | Bottom Width (m) | Top Width (m) | Capacity | Compliance |
|------------------------------|---------------|-----------|------------------|---------------|----------|------------|
| SD CWD A | Rectangular | 1.7 | 3.2 | 3.2 | 16.90 | Compliant |
| North CW Dam 1a | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| North CW Dam 1b | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| North CW Dam 1c | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| North CW Dam 2b | Trapezoidal | 0.8 | 1.0 | 2.7 | 3.10 | Compliant |
| North CW Dam 2c | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| North CW Dam 2d | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| North CW Dam 2e | Trapezoidal | 1.0 | 1.0 | 3.2 | 4.85 | Compliant |
| Ash Dump CWD 1 (approximate) | Trapezoidal | 1.5 | 3.0 | 7.0 | 17.76 | Compliant |
| Ash Dump CWD 2 (approximate) | Trapezoidal | 1.5 | 3.0 | 7.0 | 17.76 | Compliant |

* All channel are checked against an assumed slope of 0.01 m/m and Mannings Roughness Coefficient of 0.03

Table 2: Channel Dimensions at Respective Areas at Tutuka Power Station

| Channel | Channel Shape | Depth (m) | Bottom Width (m) | Top Width (m) | Capacity (m³/s) | Compliance |
|----------|---------------|--|------------------|---------------|-----------------|------------|
| DBT 2 | Trapezoidal | 1.5 | 1.5 | 4.0 | 13.52 | Compliant |
| SM 1a | Trapezoidal | 1.7 | 1.0 | 3.7 | 11.70 | Compliant |
| SM 1b | Trapezoidal | 1.5 | 1.5 | 4.0 | 11.90 | Compliant |
| SM 1d | Trapezoidal | 1.5 | 1.5 | 4.0 | 11.90 | Compliant |
| SD 1 | Pipe | Sub-Surface Drain (Unknown Dimensions) | | | | Unknown |
| SD 2 | Pipe | Sub-Surface Drain (Unknown Dimensions) | | | | Unknown |
| SD 3 | Pipe | Sub-Surface Drain (Unknown Dimensions) | | | | Unknown |
| SD 4 | Pipe | Sub-Surface Drain (Unknown Dimensions) | | | | Unknown |
| SD 5 | Pipe | Sub-Surface Drain (Unknown Dimensions) | | | | Unknown |
| CS DW A1 | Trapezoidal | 0.9 | 1.15 | 2.75 | 3.79 | Compliant |
| CS DW A2 | Trapezoidal | 0.9 | 1.15 | 2.75 | 3.79 | Compliant |
| CS DW A3 | Trapezoidal | 0.9 | 1.15 | 2.75 | 1.79 | Compliant |
| CS DW B1 | Trapezoidal | 1.4 | 1.0 | 2.5 | 6.16 | Compliant |
| CS DW B2 | Trapezoidal | 1.4 | 1.0 | 2.5 | 6.16 | Compliant |
| CS DW B3 | Trapezoidal | 1.4 | 1.0 | 2.5 | 6.16 | Compliant |
| CS DW C | Trapezoidal | 1.9 | 1.5 | 4.0 | 15.67 | Compliant |

* Assumed channel slope of 0.01 m/m (1 % Slope) and Mannings roughness coefficient of 0.02

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