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**public works**  
Department:  
Public Works  
REPUBLIC OF SOUTH AFRICA

# OSHOEK SITE CLEARANCE

## CIVIL ENGINEERING STATUS QUO REPORT

DRAFT REPORT  
REVISION 00  
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## RECORD OF REVISIONS

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## EXECUTIVE SUMMARY

Delta Built Environment Consultants (Delta BEC) was appointed by the National Department of Public Works (DPW) to render civil infrastructure professional services for Oshoek Port of Entry. The status quo was determined through site inspections and a topographical survey.

### POTABLE WATER RETICULATION

The water reticulation network currently caters for the area sufficiently, although there is no municipal connection for the area. An area is fully dependent on the borehole system which has sufficient yield for the current demand.

### SEWER RETICULATION

The sewer reticulation network is in a good working condition with no notable concerns raised or picked up during site investigations. The sewer network does not experience blockages as no manhole has been found overflowing on site. The wastewater treatment works (WWTW) do not show any signs of being overloaded in terms of organic loading and overspill during peak hours, a new perimeter fence will need to be erected around the maturation ponds and reed beds.

### STORMWATER

The stormwater on the site is managed through a series of channels and an underground pipe network which discharges into the open grassland on the northern end of the study area. The stormwater network requires urgent maintenance especially on the discharge outlet and earth channels.

### ROADS, PARKING AND PAVEMENT

The road network is in a fair condition with minor concerns. A section of the entrance has edge breaks on the left-hand side towards the entrance of the border post. The parking is in a good condition although sections of it still requires remarking.

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# 1 INTRODUCTION

## 1.1 BACKGROUND

Delta BEC has been appointed by the DPW for the condition assessment of Oshoek border post. The appointment is for professional services for civil and structural engineering. The first deliverable is the status quo report which will encompass the following aspects:

- Water distribution network
- Sewer reticulation network
- Stormwater reticulation network
- The condition of roads, pavements and parking within the border post.

## 1.2 PURPOSE OF REPORT

The purpose of this report is to present Delta BEC's assessment of the status quo, addressing the civil infrastructure services in terms of water, sewer, roads and stormwater. This report will provide the client with a professional assessment of the status of Oshoek port of entry infrastructure; this will enable the client to make an informed decision on the remedial and upgrade plans.

## 1.3 STRUCTURE OF REPORT

The report comprises the following sections:

- Section 2: Description of the site
- Section 3: Status quo
- Section 4: Conclusion.

## 2 DESCRIPTION OF THE SITE

### 2.1 LOCALITY

Oshoek port of entry is situated in Mpumalanga. The study area is located on Oshoek No. 212-IT. It lies within the jurisdiction of the Gert Sibanda District Municipality, in particular within the Chief Albert Local Municipality. The property is partially developed with most of the area currently utilised. The study area has a size of 39.5 Ha.

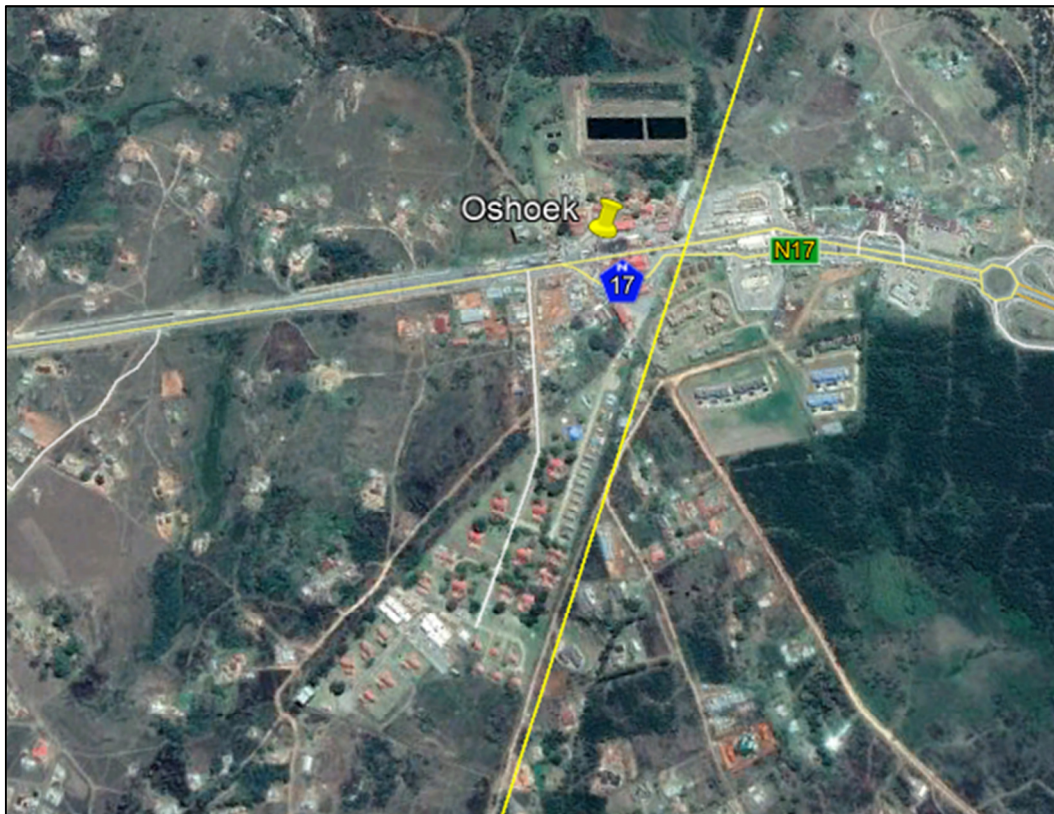


Figure 2-1: Oshoek port of entry site location



### 3 CIVIL ENGINEERING STATUS QUO

This section will describe the following items in greater detail:

- Potable water reticulation
- Fire water reticulation
- Sewer reticulation
- Wastewater treatment works
- Stormwater reticulation
- Roads, pavement and parking.

#### 3.1 POTABLE WATER RETICULATION

The study area has two elevated tanks that receive water from two boreholes. Based on the test results that were provided by Virtual Consulting Engineers the safe abstraction of the boreholes is as follows:

- Borehole 1 (Site Office) can deliver 1.5 litres/sec at 12 hours with a total of 64800 liters/day
- Borehole 2 (next to fence) can deliver 0.5 litres/sec at 24 hours with a total of 43200 litres/day.

The first elevated tank has a capacity of 441.25 m<sup>3</sup> and a second one with a capacity of 245.14 m<sup>3</sup> that supplies the potable water reticulation. There is a disinfectant dosing room (sodium hypochlorite) located below the two elevated tanks for dosing borehole water before discharging into the elevated storage tanks.

#### 3.2 FIRE WATER RETICULATION

The existence of a firewater network was confirmed on site with fire-hydrants, a fire-water storage tank and firehose reels.

An existing fire water layout was received from Virtual Consulting Engineers. The fire water reservoir receives water from the two boreholes located on site. The layout indicates two on-ground reservoirs, one with a 65.371m<sup>3</sup> capacity and the second 50.85m<sup>3</sup>. The reservoir 50.85m<sup>3</sup> does not seem to be connected to any network connecting to it, there also isn't a supporting pump.

Further investigations are required to determine the purpose for the construction of the storage tank.

The existing water storage capacity is not sufficient for the fire risk category.



**Figure 3-1: Two elevated potable water tanks, firewater tank and fire pump station**



**Figure 3-2: A borehole**



**Figure 3-3: Fire water hydrant and hose reel**



**Figure 3-4: Disinfectant Dosing room**

### 3.3 SEWER RETICULATION

Oshoek border post utilises the conventional gravity sewer system. Based on site investigations and a topographical survey, the following is deduced of the internal reticulation:

- A network of sewer pipelines
- Non-overflowing manholes,
- The network drains to a WWTW in the north-eastern boundary of the study area.

The sewer reticulation network is in a good working condition, with no overflowing manholes, and all are seemingly in order. The image below depicts one of the non-overflowing manholes:





Figure 3-5: Non-overflowing manhole

### 3.4 WASTEWATER TREATMENT WORKS

The port of entry has its own private WWTW within their premises. A schematic layout of the WWTW is shown below as taken from the site's maintenance room.

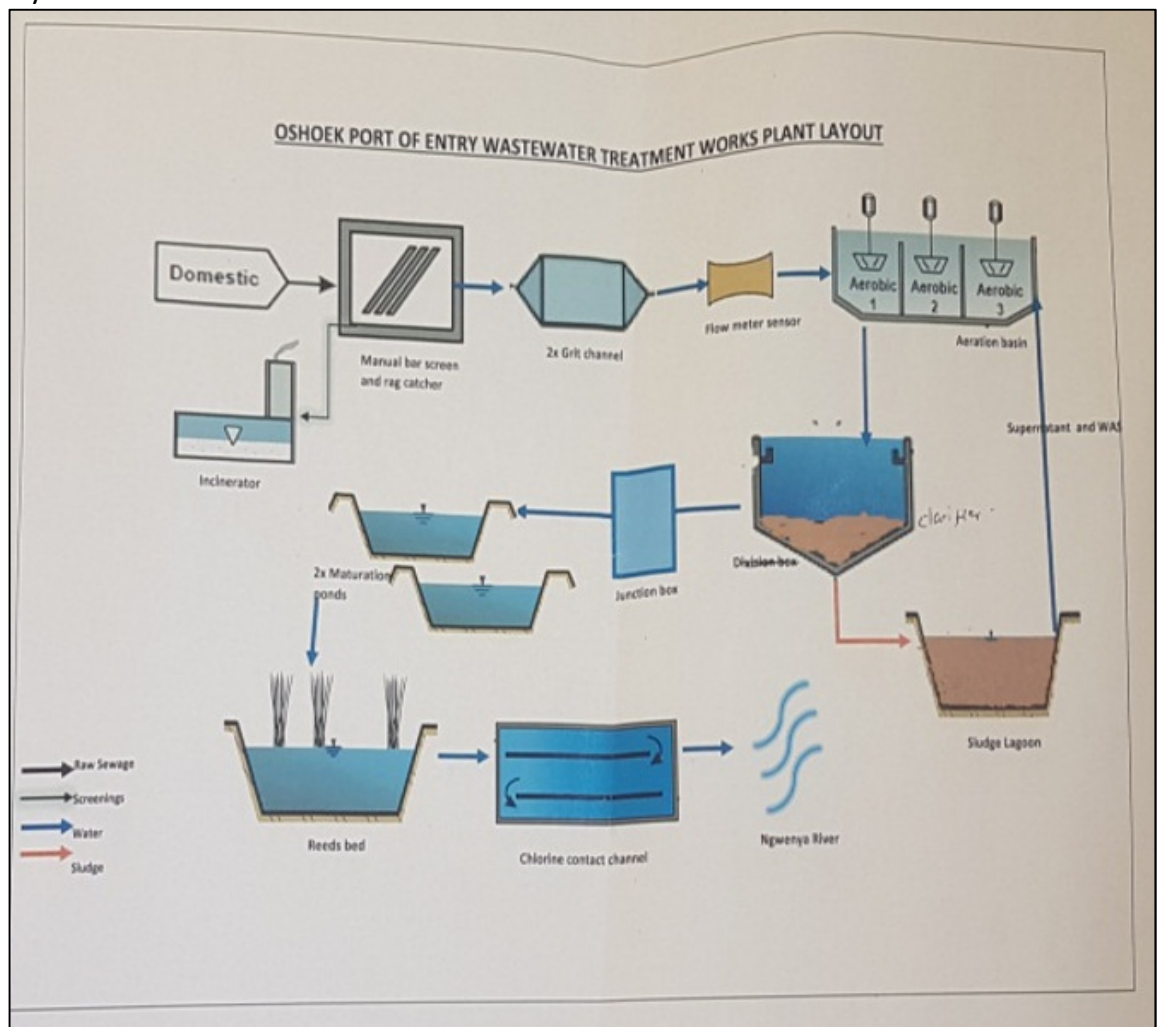


Figure 3-6: Schematic layout of the WWTW

The WWTW consist of the following units and their functions:

- Manual bar screen (with rag catcher) - the purpose of having a bar screen is to remove large objects such as rags and plastics from wastewater.
- Two grit channels - the function of the grit channel is to slow down the flow so that solids such as sand and eggshells will settle out of water.
- Flow meter - purpose is to measure the total inflow to the WWTW at different time.
- Aeration basin (three compartments) - the function of this unit is pumping air into a tank, which promotes the microbial growth in the wastewater. The microbes feed on the organic material forming flocs which can easily settle out.
- Clarifier - the function of this unit is to remove solid that is heavier than wastewater and suspended solids called scum.
- Sludge Lagoon - its purpose is to store the collected sludge from the clarifier
- Two maturation ponds - the function of this unit is to remove pathogens, nutrients and algae.
- Reeds bed - are aquatic plant based systems which allow bacteria, fungi and algae to digest the wastewater
- Chlorine contact channel - function is to inactivate harmful microorganisms to humans.

The WWTW shows no sign of overflow or being highly loaded in terms of organic loading.

There were just a few minor concerns about the operation of the plant, during the site visit. It was noted that the WWTW is not functioning as it was designed to operate. A few of the concerns are mentioned below:

- The aeration basin is being used as the sludge lagoon
- Animals have access to the reeds bed for grazing, that reduces the functionality of the unit.

The perimeter fence around the maturation ponds and reed bed has reached its design life span and animals around the area have access to the ponds.

Effluent from the WWTW is being discharged into Ngwenya River downstream on the northern side of a study area. The samples of the discharged effluent were not available; a discharge outlet was not accessible to check if the effluent complies with effluent discharge standards.



Figure 3-7: WWTW Inlet headworks



Figure 3-8: WWTW Settling tank



Figure 3-9: WWTW maturation ponds



Figure 3-10: WWTW aerobic tank used as a drying bed

### 3.5 STORMWATER RETICULATION

Oshoek border post has a number of stormwater side channels and pipe networks around the site that direct excess stormwater during heavy rain. Sections of the stormwater network are no longer functional and require urgent maintenance. These sections are completely filled with silt. In other sections the grid inlet is completely blocked, thus reducing the capacity of the system.

Silt build up on an open earth channel suggests that the channel is not self-cleansing and therefore the channel will need to be redesigned to the adequate slope. Earth channels need to be cleaned regularly.

The images indicate the condition of the stormwater network.





**Figure 3-11: Earth channel overgrown with grass**



**Figure 3-12: Blocked grid inlet**



**Figure 3-13: Grouted stone pitching with silt deposition**



**Figure 3-14: Kerbs forming a channel along the segmented block paving**

### 3.6 ROADS, PAVEMENT AND PARKING

The Oshoek border post has a ring network of block paved roads and asphalt paving. The parking lots are also paving block paved.

The road network is in a fair condition with just minor concerns. Certain sections of the road network are not maintained with grass growing over the paving blocks.



Figure 3-15: Parking bays



Figure 3-16: Internal roads still in a good condition



Figure 3-17: Segmented paving block that is overgrown with grass



Figure 3-18: Asphalt internal road still in a good condition

## **4 CONCLUSION**

This report has provided Delta BEC status quo assessment of the Oshoek border post. Data was gathered during site investigations. There were a few concerns raised during the infrastructure inspection which is summarised below:

### **4.1 WATER RETICULATION**

The borehole supplying the study area with potable water has sufficient capacity for the current demand. The network is in a good operational condition.

### **4.2 FIRE WATER RETICULATION**

The study area does not have sufficient fire water storage as stipulated by the per The Human Settlement Planning and Design Guideline, the area is categorised as moderate risk area.

### **4.3 SEWER RETICULATION**

The sewer reticulation network drains to a WWTW located within the study area. The sewer reticulation network operates satisfactorily with no evident signs of blockages such as overflowing manholes.

### **4.4 WASTE WATER TREATMENT WORKS**

The study area has a maturation pond treatment works. The WWTW is operating satisfactorily with no evident signs of spillage from overloading. Concerns have been raised that the WWTW is not operating as per design with the aeration pond being utilised as sludge bed.