4 PROJECT DESCRIPTION

This Chapter provides a technical description of the proposed facility and also provides an overview of the planned Project activities and location.

4.1 LOCATION

The Eastern Mole is located within the Port of Cape Town which is a large multi-purpose port located in Table Bay on the Western Cape coast, Cape Town, South Africa. According to Transnet, the port is the second busiest port in South Africa, after Durban and specialises in the handling of fruit and agricultural produce. The Eastern Mole, which is earmarked for the proposed development (see Figure 4.1), is vacant at present.
4.2 SITE OVERVIEW

The following project description is taken from engineering feasibility work undertaken by Kantey and Templer (Pty) Ltd and Fabri Consulting Engineers (1).

The site is split into two plots. Plot 1 is the road loading and office area and plot 2 is the tank storage area. The plots are split by FFS Refiners (Pty) Ltd (FFS) oil storage facility.

The terminal is now expected to be supplied by an above ground 10 inch pipeline, approximately 900m in length, operating at about 6 bar pressure (the pipeline is designed for a pressure of 15 bar) connected to the main import pipeline servicing the Joint Bunkering Services (JBS) from the Chevron Refinery. The terminal can also be supplied by ship from the Eastern Mole Berth 2 located adjacent to the FFS site. While the jetty will be operated by Burgan Oil, all fire protection for the jetty will be the responsibility of TNPA.

Burgan Oil has recently secured a long term storage contract with a major oil company which will significantly contribute to the secured viability of the Project.

*Figure 4.2* shows the preferred and final layout (Alternative Layout 3) for Plot 1 (road loading facility), which will have the following infrastructure components:

- Five off two arm bottom loading gantries complete with additive injection and ethanol/ fatty-acid methyl ester (also known as FAME or biodiesel) blending facilities;
- Two off additive storage tanks and pump skids (Automotive Gas Oil (AGO Diesel) additive and unleaded petrol (ULP) additive);
- Fire / foam pump station;
- Fire water / foam tank;
- Office block;
- Guard house;
- 2.4 m high security fence complete with truck entrance / exit gates and emergency exits;
- Vapour Recovery Unit (VRU); and
- Associated lighting and closed circuit television (CCTV).

*Figure 4.3* shows the preferred layout (Alternative Layout 3) for Plot 2 (product storage), which will comprise of the following components:

- Three off bunded storage areas;
  - Bund A will contain three ULP storage tanks and three AGO storage tanks all 26mØ x 18.9mH - total combined working capacity of 54,000m³

(1) Fabri Consulting Engineers. 2014. VTTI-0105-0005-C-Functional Description. 30 April 2014.
- Bund B will contain four AGO storage tanks all 31.2mØ x 18.9mH - total combined working capacity of 52,000m³
- Bund C will contain one Ethanol storage tank and one Bio Fame storage tank both 11.65mØ x 18mH - total combined working capacity of 3,400m³
- Import/export manifold;
- Road loading pump bay AGO – six off 2,000 l/m pumps;
- Road loading pump bay ULP – five off 2,000 l/m pumps;
- Motor Control Centre (MCC) and Generator building;
- 2.4 m high security fence complete with truck entrance / exit gates and emergency exits;
- Associated lighting, closed circuit television (CCTV) and bund access roads; and
- An above ground 10 inch 900m pipeline operating at about 6 bar pressure (designed for 15 bar pressure).

Solar panels with power packs will be installed on the lighting fixtures the power for the lights. Solar panels will also be installed on the office building roofs for power output. Rainwater will be collected in water tanks for the flush toilets to be installed.

The FSS facility is located between plots 1 and 2. The existing road that currently surrounds the site will be extended to match the existing road outside the new boundary area of plot 2 in order to keep access to the existing factory at the end of Eastern Mole Road (see Figure 4.4).

The facility will also have the following components:

- Fuel System;
- Fire Protection System; and
- Electrical System.

A site photolog is contained in Annex B.
Figure 4.2  Plot 1 Preferred Layout Alternative 3

Source: Fabri Consulting Engineers. 2014. VTTI-0105-2011- PLOT 1 LAYOUT
Figure 4.4  Overlay of Plot 2 Preferred Layout Alternative 3 over current site

Source: K&T Consulting Engineers. 2013.
4.3

**PRODUCT STORAGE**

4.3.1

**Tank Feed**

A new above ground about 900m long and 10 inch diameter section of pipeline is expected to feed the product storage tanks from other oil facilities. The new pipeline will originate from one of two places on the Eastern Mole Berth. These two options will be referred to Option A and Option B and will originate at Tanker Berth 2, either connected to the JBS import manifold or connected directly to the Chevron Refinery pipeline import manifold at JBS respectively. The pipeline will run aboveground alongside the Eastern Mole Berth service road and enter the Burgan Oil terminal past the nearby FFS facility, terminating at the Burgan Oil import fuel manifold. At this stage for the proposed new section of pipeline it is assumed a metering skid will be required but no pigging station will be needed. There is an existing pipeline currently installed on the Eastern Mole to connect the existing jetty loading arms on the tanker berths to the Chevron Refinery via a booster pup station.

The pipeline will transfer both diesel and petrol to the terminal and is expected to perform transfers not more than twice per month. The operating details of the pipeline are shown in Table 4.1. The layouts of the two additional piping options are shown in Figure 4.5 and Figure 4.6.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Diesel</th>
<th>Petrol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Diameter (mm)</td>
<td>254</td>
<td>254</td>
</tr>
<tr>
<td>Operating Pressure (barg)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Operating Flowrate (m³/h)</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Days in Use per Month</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The new pipeline will be located within a culvert. In-out product balances will be monitored, and flow rate metres installed. The pipeline will be inspected regularly.
Figure 4.5  Burgan Oil Import Pipeline Layout Option A
The product storage tanks can also be filled via ship offloading at Eastern Mole Berth 2. This system will be comprised of two marine loading arms mounted to the berth structure. These loading arms will supply the import manifold where an operator can select the appropriate tank to be filled.

K&T have calculated the ship off loading flow rates when decanting at the Eastern Mole Berth 2. It has been assumed that all ship tankers are able to off-load its product within 36 hours and that the largest product supply is 50,000m³. Table 4.2 illustrates the different flow rates for each product per arm and the different variables included to arrive at this flow rate. The maximum expected product throughput is 805,000m³/yr.

### Table 4.2 Ship off loading rates

| Decanting at berth | Maximum product off-load Diesel | 50,000 m³ | m³ |
|--------------------|--------------------------------|------------|
| Maximum product off-load Petrol | 50,000 m³ |
| Maximum product off-load IP | 50,000 m³ |
| Maximum time for ship at berth | 36 Hrs |
| Setting up time | 4 Hrs |
| Pumping time | 32 Hrs |
| Flow per arm Diesel | 15,625 Ltr/min |
| Flow per arm Petrol | 15,625 Ltr/min |
| Pipeline flow rate | 500 m³/hr |

The diagram below (Figure 4.7) illustrates the flow of fuel from the tanker ships into the storage tank area.

### 4.3.2 Tank Allocation/Bund Storage

The storage tanks will be founded on a raft type foundation reinforced by concrete piles. This will be required due to the poor ground conditions as the area is on reclaimed ground, where uncontrolled dumping has taken place (rubble, RC slab, tyres, rubbish etc). The tank allocation is shown in Table 4.3 below.

### Table 4.3 Tank Allocation

<table>
<thead>
<tr>
<th>Tank Number</th>
<th>Product</th>
<th>Size (mØ x mH)</th>
<th>Working Capacity m³</th>
<th>Nominal Capacity m³</th>
<th>Main Bund</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ULP</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>3</td>
<td>ULP</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>ULP</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>AGO</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>AGO</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>6</td>
<td>AGO</td>
<td>26 X 18.9</td>
<td>9,000</td>
<td>9,780</td>
<td>A</td>
</tr>
<tr>
<td>7</td>
<td>AGO</td>
<td>31.2 x 18.9</td>
<td>13,000</td>
<td>14,075</td>
<td>B</td>
</tr>
<tr>
<td>8</td>
<td>AGO</td>
<td>31.2 x 18.9</td>
<td>13,000</td>
<td>14,075</td>
<td>B</td>
</tr>
<tr>
<td>9</td>
<td>AGO</td>
<td>31.2 x 18.9</td>
<td>13,000</td>
<td>14,075</td>
<td>B</td>
</tr>
<tr>
<td>10</td>
<td>AGO</td>
<td>31.2 x 18.9</td>
<td>13,000</td>
<td>14,075</td>
<td>B</td>
</tr>
<tr>
<td>11</td>
<td>ETHANOL</td>
<td>11.65 x 18</td>
<td>1,700</td>
<td>1,845</td>
<td>C</td>
</tr>
<tr>
<td>12</td>
<td>BIO FAME</td>
<td>11.65 x 18</td>
<td>1,700</td>
<td>1,845</td>
<td>C</td>
</tr>
</tbody>
</table>
The proposed facility is expected to have a total working volume tank capacity of approximately 109,400 m³ with the following tankage capacities:

- Diesel (AGO): 4 × 13,000 m³ + 3 × 9,000 m³ tanks
- Petrol (ULP): 3 × 9,000 m³ tanks
- Ethanol: 1 × 1,700 m³ service tank
- Bio Fame: 1 × 1,700 m³ service tank

The proposed facility will have a total nominal tank capacity of approximately 118,000 m³.

Bunds have been designed to contain 110 percent of the nominal capacity of the largest tank contained within the bund. To achieve this bund walls are required to be 2.5m high for the ULP/AGO bund (bund A) and 2.1m high for the AGO/Ethanol/FAME bund (bunds B and C). The Ethanol storage tank will be an internal floating roof (IFR) tank, increasing the safety of storage for this product.

All storage tanks will be designed and built to meet the *API 650 Appendix E Seismic Design of Storage Tanks* standard in order to cater for seismicity.

### 4.3.3 Tank Gauging

An automated tank gauging system will be installed to cover each product tank, additive tank and the fire water tank. The gauging system will consist of tank instrumentation, a communications interface unit and a link into the site digital control system (DCS) operator computer interface.

Each tank will have a tank gauge and temperature element installed. Information on the tank product level and temperature readings will be transmitted to a tank side indicator and the communications interface unit located within the office building. The type and manufacturer of tank gauge technology to be used will be determined at a later stage once the required accuracy and availability of technical support in the area has been established. It is known that a commonly used gauge in Southern Africa is an ENRAF 854 type servo gauge. This gauge is accurate to approximately 0.4mm, and normally deemed sufficiently accurate to be used for custody transfer purposes.

The communications interface unit takes the communications link from the tank gauges and transmits this to the DCS which then displays information on the computer interface. This unit also provides hard wired relay outputs for the following items:

- Low low level from any product tank;
- High level from any product tank; and
- High high level from any product tank.
The low level outputs are interlocked with the associated product pumps to prevent the pumps running dry and the high and high high level outputs are covered by the tank overfill protection described below.

The site DCS computer interface will provide tank level and temperature information in the control room and will be configured to provide a range of ‘soft’ alarms for each tank on the interface itself, as follows:

- Maximum working level;
- High level;
- Minimum working level;
- Low level; and
- Low low level.

**4.3.4 Tank Overfill Protection**

Burgan Oil has assumed that the overfill prevention system on the product storage tanks will be deemed by the hazard and operability (HAZOP) and layer of protection analysis (LOPA) studies as an instrumented protective function (IPF). This system will meet the requirements of a specified safety instrument level (SIL) established in the LOPA study and will be managed in line with the process safety lifecycle requirements. The design of the overfill protection system, the number and type of equipment and hardware required will be confirmed during the detailed design stage. The system will be safety integrity level (SIL) 1 compliant.

The overfill prevention philosophy for each product storage tank consists of alarms generated from the tank gauging system with alarms and a trip function generated from the independent tank overfill prevention system. The independent tank overfill prevention system for each tank is composed of a High high level switch, logic, fail close remotely operated shutoff valves (ROSOVs) located tank side on the tank inlet and outlet lines and terminal alarms.

The tank gauging generated High level alarm creates an audible and visual alarm in the control room for each tank through the DCS computer interface. The High level alarm from each tank also activates the common tank High level horn and beacon located in the terminal area and the common tank High level short message service (SMS) alarm message sent to the remote alarm device located on the jetty. The tank gauging generated High high alarm from each tank activates the common tank High high level horn and beacon located on the jetty.

The tank overfill protection system High high level switch is a radar type gauge that monitors the tank level and transmits this information to the logic on a 4-20mA signal. The High high level trip point is set within the logic and upon activation will close the ROSOVs on the tank in question and activate an alarm on the site annunciator panel. The tank level reading from each High
high level switch is provided to the DCS, enabling the information to be viewed on the DCS computer interface. A comparison between the High high level switch reading and the tank gauge reading can be made.

In order to prevent possible damage to the pipework or pumps in operation as a result of increased pressures within the system due to product surging in the pipework, the closing speed of all ROSOVs will be limited.

4.4 **PRODUCT PUMPING**

4.4.1 **Pumps**

Tanks will all have gravity feed lines installed to product specific pump suction manifolds at the product pump bays (see Figure 4.7). Discharge of the pumps will have dedicated discharge pipework that will branch to the road loading area and also to the tank inlet pipework for inter tank transfers.

Branch connections to the road loading gantries will go out with plot 2 (product storage area) via pipeline servitudes located North/East of the terminal perimeter fence linking plot 1 and 2 together.

The number of pumps provided will vary depending upon anticipated product demand, but may include:

- Road loading pump bay AGO – 6 off 2,000 l/m pumps
- Road loading pump bay ULP – 5 off 2,000 l/m pumps
- Ethanol/Bio Fame pump bay – 4 off 100 l/m pumps

The above pump quantities are inclusive of standby pumps.

All pumps will be identical to minimise possible disruption in the event of pump failure or maintenance.

4.4.2 **Motor Control**

Product pump motor control can be either controlled manually from locally positioned start stop control stations or automatically via the site DCS. Each pump will have a motor starter positioned in the motor control centre (MCC) which will include start stop control, overload protection and short circuit protection. The site DCS will take pump start request inputs from the road gantry load controllers and signal the appropriate product pump motor starter. All pumps will run on timers and pump start selection will be controlled from the DCS. Run status and availability will be displayed on the DCS computer interface.
Figure 4.7 Product Flow Design
4.5 ROAD LOADING GANTRIES

Road tankers will enter the truck loading area through a security entry point on the south west of the plot 1, and exit through a security exit point downstream of the depot on the north west side of plot 1 (see Figure 4.2). Tankers will then drive north west to plot 2 and turn at the circle at the end of the Eastern Mole road (see Figure 4.3), to then run in a south east direction to exit the Eastern Mole. The throughput analysis conducted as part of the K&T Feasibility Study indicates an average of 75 trucks per day (see Annex G). The traffic assessment was based on a maximum of 120 trucks per day in a 24 hour period.

There will be six tanker loading bays each with two loading arms. The loading bays will consist of concrete islands with packaged unit steelwork gantries consisting of a covered roof, and multiple counterbalanced loading arms.

Each gantry will have the following main equipment:

- Counter balance loading arms;
- Flow meters;
- Control valves;
- Flow controller;
- Basket filters;
- Vapour stack;
- Load controllers;
- Bio Fame and Ethanol Blending; and
- Additive injection

The loading facility will also have overspill prevention and earthing protection, which will directly stop the on-going loading operation if triggered.

4.5.1 Gantries Load Controller

The loading of road tankers will be controlled by load controllers and metering equipment designated to each loading arm. The load controllers will be located on the gantries and connected to the site automation system, enabling the identity of the driver to be registered and loading permission granted before loading commences. This connection also allows pre-programmed loads from the driver’s company system to be entered into the load controller for individual drivers via the terminal automation system’s internet based ERP connection. All loads not pre-programmed will be entered into the load controller by the driver prior to loading.

Following the loading of a road tanker all volumes are logged in the automation system for bill of lading printing, as well as stocks and accounting purposes. The load controllers control the flow of product on a batch load process where the load is controlled to a preset flow rate. Each load controller is capable of controlling up to three loading arms simultaneously. Control is
achieved by a flow control valve and feedback to the load controller from a
flow meter. The flow meter provides accuracy to a fiscal level and is used for
throughput accounting and stocks control purposes. The control valve is a
digital electro hydraulic set-stop type where the hydraulic medium used is the
product line pressure. A temperature element will provide feedback to the
load controller allowing temperature compensation calculations to be
accurately made. Each loading arm will be suitable for a maximum flow rate
of 2250 l/min.

Basket filters will be installed on each meter stream to protect the flow meters
and control valves. Loading will not be permitted unless the vapour-
collection hose has been connected to the vehicle and there is a free passage
for the displaced vapours to flow from the vehicle into the vapour-collection
system.

4.5.2 Gantries Overfill Protection

Burgan Oil assumes that the overfill prevention system of the road tankers
will be deemed by the HAZOP and layer of protection analysis (LOPA)
studies as an instrumented protective function (IPF). This system will meet the
requirements of a specified safety instrument level (SIL) established in the
LOPA study, and be managed in line with the process safety lifecycle
requirements. The design of the overfill protection system and the number
and type of equipment and hardware required will be confirmed during the
detailed design stage. The system will be SIL1 compliant.

The road tanker overfill system comprises of a common Earth Overfill System
(EOS) per gantry, the road tanker instrumentation, logic and a fail close
remotely operated shutoff valve (ROSOV) on each gantry loading arms.
The EOS on each gantry is connected to the road tanker through a plug and
socket arrangement which provides the road tanker with an earth connection
as well as connecting the system to the high level switches in each
compartment, the road tanker air low pressure switch and the vapour hose
connection switch. If any of these monitored circuits becomes false then the
EOS unit becomes unhealthy. This in turn closes a ROSOV on each of the
gantry loading arms to prevent the flow of product and also removes the
permissive to load signal from the load controllers. Manual activation of the
ESD system through push buttons located on each gantry will also close the
gantry ROSOVs and remove the permissive to load signal from the load
controllers.

In the event that product flow is not prevented following an overfill of the
road tanker compartment the product will enter the tanker vapour system and
flow down the gantry vapour hose connection and into the vapour knock out
pot. Activation of the level switch within this knock out pot will create an ESD
which stops all pumps on site.
4.6 **SHIP LOADING**

The facility will also cater for the loading of oil and fuel products onto ships berthed at the Eastern Mole.

4.7 **ADDITIVE INJECTION**

Additive will be injected into the individual loading arms upstream of the arm metering equipment. The additive injection will be performed by smart injectors, injecting metered shots of additive throughout the load at a typically interval of 100 litres of loaded product. This process ensures that the additive is dosed to the correct rate and correctly mixed throughout the load. The smart injectors communicate to the gantry load controllers to establish the injection rate, when to inject, to transmit alarms and to provide injected volumes. The injection rate required for each load is transmitted from the terminal automation system via the gantry load controllers and is established from the driver identification.

Smart injectors receive a pressurised additive from the additive pumps skids that are fed from the additive storage tanks. Each pump skid has two positive displacement pumps operating on a duty standby setup with the duty pump changed at the end of each pump operation. The pump skids will have a return line to tank and a pressure sustaining valve to ensure that the correct pressure is maintained on the skid outlet throughout the fluctuating injection demands from the gantries. Pressure relief will be installed on the outlet of each pump to protect against dead heading the positive displacement pumps. The pump skids will have instrumentation to provide protection that shuts down the pump skid on a loss of flow and a loss of pressure.

4.8 **BLENDING**

Bio-ethanol and Bio-fame will be blended into the individual petrol and diesel loading arms upstream of the arm metering equipment. This will be achieved by blending skids located on each gantry in a side stream blending process. Each loading arm that has biofuel blended into it will have a dedicated blend stream on the gantry blending skid that controls the biofuel blending. The blend streams consist of a blend controller, a flow control valve and a flow meter. Each blend controller communicates to the load controller to establish permissive signals, alarms and blended totals. Due to the accuracy required a hard wired repeated pulse signal from the loading arm flow controller is provided to the blend controller.

The blending skids are supplied with pressurised Bio-ethanol and Bio-fame from pressurising pump skids. These consists of duty standby variable speed centrifugal pressurising pumps, a flow control valve, a pressure transmitter and a return line to tank. This ensures that the correct biofuel pressure is always sustained with differing numbers of loading arms. A single pump
demand to the Bio-ethanol and Bio-fame pump skids are provided when one or more petrol or diesel loading arms are loading.

4.9    FIRE PROTECTION

4.9.1 Fire Protection Arrangement

For the firefighting system, fresh water will be supplied to the depot from Transnet. Approximately 1,500m³ will be required to fire fight the worst case scenario fire for one hour. Additional water supply from Transnet’s sea water system could also be available.

The fresh water firefighting system will have the following features:

- Fire Pump Station;
- Fire Water Distribution;
- Tank Foam Facilities;
- Tank Cooling;
- Bund Foam; and
- Bunds.

**Fire Pump Station**

- Three fire water pumps: two duty pumps with a pressure of 12,250 litres/minute and one standby with a pressure of 12,250 litre/minute;
- Two foam pumps: one duty pump with a pressure of 470 litres/minute and one standby pump with a pressure 470 litres/minute;
- 26m³ of foam stocks \(^{(1)}\) stored on site;

Additionally, a tie in from the port firefighting foam system has been incorporated into the firefighting in an event of an emergency.

**Fire Water Distribution**

A 200cm diameter fire water ring main around all three portions of the site has been catered which will be used for the portable firefighting equipment if necessary.

**Tank Foam Facilities**

- All tanks will be fitted with foam top pouring systems;
- Manifolds will be located at a safe distance away from the tanks and these valves will be manually operated; and
- Testing facilities will be incorporated into the system.

\(^{(1)}\) Equivalent to one hour of foam water
Tank Cooling

- All tanks will be fitted with tank cooling rings with one mini ring on the roof of the tank and one main ring running around the perimeter of the tank;
- Manifolds will be located at a safe distance away from the tanks and these valves will be manually operated; and
- The valves for the tank cooling will be automated valves that can be controlled from the control room.

Pump Manifold

- The pump manifold will be protected against fire by fire detection and monitoring.

Bund Foam

- All bunds will be fitted with fixed bund foam pourers;
- Manifolds will be located at a safe distance away from the tanks and these valves will be manually operated; and
- The valves for bund foam pourers will be automated valves that can be controlled from the control room.

Bunds

- Bund walls will be constructed with a bund capacity of 110 percent of the tank;
- All bund floors will be sealed with concrete;
- Bunds will drains which are controlled via pipes and valves;
- Tanks have been sub-divided into intermediate bund areas; and
- Underflow/ overflow weirs are installed to control flow from one sub-division to the next.

Additionally, the road loading gantry area will have an automated overflow system.

4.9.2 Fire Alarm System

A zoned fire alarm system will be installed will consist of the following:

- Break glass units situated throughout the terminal;
- Break glass units and smoke alarms within the office building;
- Fire alarm panel located in the control room;
- An early detection smoke alarm system in the switch room and MCC; and
- Fire alarm sirens within the office building and site areas.

The break glass units will be separated into 10 detection zones, located in the following areas:
• Road load gantry entrance and exit;
• Pump skid;
• Bund entrance / exits;
• Office building;
• Workshop;
• Site exit; and
• MCC / switchroom.

In addition to the above early smoke detection systems installed, the MCC/switchroom will be linked into the fire alarm system and will have its own zone. The fire alarm sirens will be located on the office building roof, road loading area and tank farm area to inform personnel when a site evacuation is required. The activation of the office building fire alarm zone will also interlock to the air conditioning. Activation of the fire alarm system will create a site emergency shutdown.

4.10 DRAINAGE SYSTEMS

The following Site Drainage System has been designed by K&T Consulting Engineers (1), with the purpose of providing an understandable overall site drainage philosophy.

From a drainage perspective the site has been separated into three portions:

• Land Portion A includes the offices, road gantry, fire pump room and water reservoir (see Figure 4.8);
• Land Portion B includes the bulk storage tanks, import manifold, export manifold, export pumps with associated spill slabs, bundwalls and bund floor sealing (see Figure 4.9); and
• Land Portion C which includes the overnight road tanker parking area.

4.10.1 Drainage

Drainage streams have been segregated as follows.

1. Oily water (OW)

This would be drainage from the ‘dirty’ areas where accidental spillages could occur. Such areas include the road loading gantry, pump bay and VRU spill slab. The drainage from these areas will be collected via a separate drainage system and discharged to a three chamber oily water separate (see Figure 4.10). The separator outlet will be valved and will discharge into the foul sewer. Oil build up in the separator will be pumped into an Ultra-spin unit (see Figure 4.11), which will separate the oil from the water and collect the oil recovered in a tank for later disposal. Clean water from the Ultra-spin unit will be

discharged into the foul sewer system. Any substantial hydrocarbon product spill collected inside the primary chamber of the separator will be pumped out by an approved hydrocarbon removal contractor as required, and will then be discharged off site.

2. Occasionally Oil Contaminated (OCC)

Water falling on the concrete hard standing area within the fenced area, excluding the road receipt loading facility and VRU spill slab, will be deemed ‘clean’, except for possible minor contamination (such as oil leaks from vehicles). These areas will be graded towards central to low areas and all storm water will be piped to the First Flush Basin (FFB), which will be designed to retain a volume equal to [the area of the ‘hardstanding’ area] x [4mm] = 7.6m$^3$. The remainder of the runoff will be directed straight to the eastern Mole stormwater system. After a storm event, the water in the FFB will be pumped to the site separator.

3. Clean Stormwater (SW)

Storm water runoff from the undeveloped areas ie gravel surface areas, car park area and roof drainage will be designed for a 1:10 year storm event. This storm water will be discharged off the site to the closest TNPA natural clean storm water system.

All sewer water will flow into the existing Eastern Mole sewer line.

Each Land Portion has been analysed in the context of the above drainage streams, as described below.

*Land Portion A*

Land Portion A will contain oily water, occasionally oil contaminated and clean storm water drainage streams.

Oily Water (OW); the drainage from the road loading gantry and VRU spill slab will be drained into the OW drainage stream.

Occasionally Oil Contaminated (OCC); the water falling on the concrete hard standing area within the fenced area, excluding the road receipt loading facility and VRU spill slab, will be deemed ‘clean’, except for possible minor contamination such as oil leaks from vehicles. This stream will be drained into the OCC drainage system.

Clean Stormwater (SW); runoff from undeveloped areas such as the gravel surface areas, car park and roof drainage will be designed for a 1:10 year storm event and will be discharged off site to the nearest natural clean water system (SW).
Land Portion B

Land Portion B will contain oily water, occasionally oil contaminated and clean storm water drainage streams.

Oily Water (OW); the drainage from the road receipt spill slab will be drained into the OW drainage stream.

Occasionally Oil Contaminated (OCC); drainage from the bunded areas, import manifold, export manifold and pump slabs will be drained into the OCC drainage stream.

Clean Stormwater (SW); runoff from the undeveloped areas such as the gravel surface areas will be designed for a 1:10 year storm event. This water will be discharged off site to the closest natural clean water system (SW).

Land Portion C

Land Portion C will contain occasionally oil contaminated and clean storm water drainage systems.

Occasionally Oil Contaminated (OOC); this will be drained form the truck parking area into the OOC drainage system.

Clean Stormwater (SW); the storm water runoff from the undeveloped areas such as the gravel surface will be designed for a 1:10 year storm event. This water will discharge off site to the closets natural clean water system (SW).
Figure 4.8  Land Portion A Drainage Philosophy

Source: K&T Consulting Engineers. 2013
Figure 4.9  Land Portion B Drainage Philosophy

Source: K&T Consulting Engineers. 2013
4.10.2 *Flows*

*Uncontrolled flow into the stormwater system*

The estimated peak flows during a 1:10 year storm event are as follows.

- Land Portion A: +- 3,300l/min
- Land Portion B: +- 4,200l/min
- Land Portion C: +- 2,500l/min

The estimated clean stormwater discharge into the Eastern Mole stormwater system after a 1:10 year storm event for a duration of 60 minutes is as follows.

- Land Portion A: +- 60cu.m
- Land Portion B: +- 130cu.m
- Land Portion C: +- 50cu.m

*Controlled flow into the sewer system*

The estimated controlled flow through the oily water separator into the sewer system is as follows.

- Land Portion A: +- 135l/min
- Land Portion B: +- 585l/min

The estimated treated oily water discharged into the Eastern Mole sewer system after a 1:10 year storm event for a duration of 60 minutes is as follows.

- Land Portion A: +- 20cu.m
- Land Portion B: +- 425cu.m

4.10.3 *Three Chamber Oil-Water Separators*

It is proposed that two oily water separators will be installed at the development. One of the oily water separators will be located at the main storage area, and the second separator will be located within the road gantry area.

The separators would be installed to treat contaminated surface runoff and unintentionally contaminated water from the fuel storage terminal more specifically the bund area. This is to ensure that contaminant concentrations are within the limits for disposal to the sewer. It is anticipated that the throughput capacity of the separator would be no more than 15,000m³ per annum and approximately 9m³ per day per separator.

The separator is designed as a one in ten year intensity rainfall separator with three chambers. The oily water separators will have the following capacities: two meters wide by one and a half meters in depth. The primary chamber will be three meters in length, the secondary chamber two meters in length.
and the tertiary chamber one meter in length. If any severe fuel spill occurs within the bunded area, the spill will be pumped out by an appropriate hydrocarbon removal contractor. Additionally, the separator will be constructed in reinforced concrete and will be designed according to SANS 10089.

The Figure 4.10 below illustrates the process that occurs in an oily water separator. The oily water separators to be installed on site would be used to treat contaminated water. The Ultraspin Technology to be used, is able to remove <10mg/l of oil and grease, without the use of chemicals.
Figure 4.10   Oily Water Process Diagram
4.10.4 Ultraspin Oil-water Separator

The Ultraspin separator produces a separation force of more than 1000 times the force of gravity, thereby separating smaller oil droplets to 15-microns in size from oily water.

The oily water is pumped into the large diameter end. This initiates a spinning vortex. This spinning vortex is accelerated as it moves down the tapered separation tube flinging the heavier water to the outside walls while the lighter oil moves to the centre. The separated oil is removed and the treated water is discharged out the other end of the tube.

Additionally, all water released from the separator will be tested before discharge. The figure below shows a diagram of the process of oil water separation within the Ultraspin Separator as shown in Figure 4.11.

Figure 4.11 Ultraspin Separator

![Ultraspin Separator Diagram](image-url)
4.10.5 *First Flush Basin (FFB)*

The purpose of the FFB is to collect the first 4mm of runoff from the OOC areas, excluding the bunded areas. Once the FFB has reached full capacity (such as after a storm event), the excess runoff will bypass the FFB and drain into the nearest natural clean water system. A pump will be installed next to the FFB in order to pump the ‘dirty’ water if required to the first chamber of the oily water separator.

4.11 *ELECTRICAL SYSTEMS*

Currently there is no confirmation on the power supply that will feed to the site. This may be of median voltage and consist of a transformer and associated switchgear to provide the low voltage required, or be a low voltage feed.

The main distribution board will be split into two halves and contain a maintained and non maintained side. An air circuit breaker tripped from activation of the site emergency shutdown (ESD) system will feed the non maintained side and enable all power to the non maintained feeds to be removed. This non maintained side of the distribution board will feed all the pumps via the site motor control centre (MCC).

An uninterruptible power supply (UPS) system will be installed to feed all components that have been identified as requiring power in an emergency situation or sensitive to fluctuations in the supply voltage including a selection of local area lighting. The UPS autonomy time will be established during the detailed design stage. The UPS design will take the time period to safely shutdown the site systems and evacuate the site into consideration. The UPS will include a bypass switch to allow for maintenance of equipment and in case of failure and the UPS DB will have surge protection included for when it is supplied in this nature.

4.12 *TERMINAL AUTOMATION*

A distributed control system (DCS) will be installed. This will include the main server rack located in the office building equipment room, remote inputs outputs (I/O) located in the switchroom and office building equipment room, site entrance / exit card readers and a series of operator interface computers.

The main server rack will hold the servers operating the DCS software and include for redundant servers and backup facilities. The rack will also hold the communications interfaces that will allow the system to talk to the remote I/O, the card readers, the tank gauging system and the road and rail load controllers. The servers will be connected to the internet to allow communication with a host / ERP system and for remote system support.
The remote I/O allows hard wired signals from the pump control, remotely operated shutoff valve (ROSOV) status and tank High high switch level status to be connected to the DCS with the required logic programmed within.

Card readers located at all site and office entrance and exits will log the card holder’s information on the system before providing a signal to open the appropriate entrance.

Operator interfaces will allow the DCS interface to be viewed and controlled. The DCS interface will provide control, status feedback and control alarms on the following site systems:

- Road loading including the road tanker overfill system;
- Pump control;
- Tank gauging;
- Tank High high switch level status;
- Bill of lading (BOL) printer cabinets; and
- ROSOV status.

In addition to the DCS, site business process software will be installed. Server racks for the business process software will also be located within the office building equipment room that will communicate with the DCS. The business process system will perform all business and stocks facilities operations. The servers will be connected to the internet to allow communication with a host / ERP system.

4.13 SITE ALARMS

All non-critical control alarms are to be handled by the DCS interface. All site alarms deemed as critical or not control based will alarm on the site annunciator panel. This will be located within the control room and provide a visual and audible alarm through a ‘lamp box’ type interface. While the alarms will be able to be silenced, the reset of an alarm can only be achieved once the alarm input has been removed. This system will include a data logger which will provide a time and date stamp log of all alarms and resets.

4.14 EMERGENCY SHUT DOWN

An emergency shutdown (ESD) system will be installed that will be activated from either the fire alarm system or any ESD push button that are located in the following areas:

- Road load gantry entrance and exit;
- Pump skid area;
- Bund entrance / exits;
- Control room;
- MCC / switchroom; and
• Site exit

The ESD panel will be located within the switchroom and consist of relay logic, local lamps for system status and reset functionality. The ESD system will have one level of activation with the following functionality:

• Stopping of all site pumps by tripping the main distribution board ESD circuit breaker feeding the MCC and all non-maintained supplies;
• Stopping of road loading by removing the permissive to load signal to the road gantry controllers and closing all gantry shutdown valves;
• Closing of the site separator outlet automated valve; and
• Alarm activation on the site annunciator panel in the control room.

4.15 CLOSED CIRCUIT TELEVISION (CCTV)

CCTV will be installed at the site to cover the site perimeter, site entrance and exit, and road loading gantries. All CCTV will be recorded and viewing and control of all cameras will be possible both in the control room and security hut. The CCTV that covers the road loading gantries will be located outside the hazardous area and have the facility to zoom in with adequate clarity. All cameras will have telemetry allowing movement and zooming from both the control stations. Each control station will consist of one large overview screen showing a small image from all cameras and one small spot screen that can be used to view individual camera images one at a time.

4.16 LIGHTING

Perimeter and general area lighting at the site will be provided by lighting towers, each consisting of four 400W HQI spot lights. These lighting towers will be fed in such a way that a loss of one circuit will not turn off all the stop lights on each tower. The control of the lighting towers will be from a timer and light detection sensor enabling the lighting to automatically turn on at a given light level between a given time period. This control circuit will form part of the lighting distribution board and an override switch will be provided. High bay 400W hydrargyrum quartz iodide (HQI) fittings will supplement the area lighting towers under the canopies covering the road loading gantries.

The local area lighting will be covered by twin 6’ fluorescent fittings. The hazardous area rated fittings will cover the following areas:

• Bund entrance and exits;
• Tank side valves;
• Tank instruments;
• Oily Water Separator;
• Pump platform; and
• Road gantries;
The non-hazardous area twin 6’ fluorescent fittings will cover the following areas:

- Firefighting equipment; and
- Fire water tank.

A feed from the UPS will be installed into the lighting control panel. This will allow a selection of the local area lighting to continue to be lit following a loss of power.

4.17  **PROJECT PHASES AND ACTIVITIES**

4.17.1  **Construction**

It is estimated that the construction phase will last for approximately 18 to 22 months. The estimated construction time for each task of the development is listed below:

- Site Preparation: two weeks;
- Piling: 40 weeks;
- Tank foundations: 60 weeks;
- Tank construction: 75 weeks;
- Bund walls: 35 weeks;
- Bund floor sealing: 35 weeks;
- Fire protection systems: 53 weeks;
- Product pumps and piping: 63 weeks;
- Loading gantry: 20 weeks;
- Offices: 20 weeks;
- Electrical works: 35 weeks; and
- Commissioning: 12 weeks.

4.17.2  **Operation**

Once the site is complete and operational it is expected that the facility will have a lifespan of approximately 40 years or more. The operation of the facility will create employment opportunities for 19 staff members in total. Waste resulting from the operation of the facility will include oily water and general office waste.

4.17.3  **Decommissioning**

Once the facility reaches the end of its lifespan, the facility will be decommissioned. After this time, the site will be rehabilitated in accordance with best practice at the time of decommissioning.
4.18 SERVICES AND UTILITIES

The following services and utilities are available at the boundary of the site.

4.18.1 Water

There is a 160mm diameter ring feed around the perimeter of the site supplying fresh water.

4.18.2 Sewage and Stormwater Disposal

A pump sump is available on site to remove sewage, and a stormwater system will be designed to remove stormwater.

4.18.3 Salt Water Fire Main

A salt water fire main (250mm pipe pressurized by fire-fighting pumps capable of supplying 17 bar pressure) runs adjacent to the site.

4.18.4 Access Road

A ten meter wide access road exists on one side of the road, however, the turn off intersection into the site, needs to be construction.

4.19 CONSIDERATION OF ALTERNATIVES

4.19.1 Site Location Alternatives

Alternative site locations in South Africa were considered early on by shareholders of the Burgan Oil fuel storage and distribution facility. Alternative site locations included the ports of Durban and Richard’s Bay. However, no commercial site opportunities were available at the time at either of these ports. Therefore the ports of Durban and Richard’s Bay were excluded from any further analysis.

Saldanha Bay was also evaluated as a potential site alternative. However, considering the distance from Saldanha Bay to the major demand centre for fuel products in the region, namely Cape Town, this site alternative was excluded from further analysis for economic and transportation logistics reasons. Table 4.4 shows the fuel storage facilities evaluated in the Cape Town area.
Table 4.4  Fuel Storage Facilities Evaluated in Cape Town Area

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Operator</th>
<th>Location</th>
<th>Capacity (km³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Town Harbour Tank Farm</td>
<td>FFS Refiners Pty Ltd</td>
<td>Port of Cape Town</td>
<td>10</td>
</tr>
<tr>
<td>Cape Town Bulk Storage</td>
<td>FFS Refiners Pty Ltd</td>
<td>Port of Cape Town</td>
<td>4</td>
</tr>
<tr>
<td>Joint Bunkering Services</td>
<td>BP/Chevron/Shell/Engen</td>
<td>Port of Cape Town</td>
<td>41</td>
</tr>
<tr>
<td>Strategic Fuel Fund Association (SFF) Milnerton</td>
<td>SFF affiliate of Central Energy Fund</td>
<td>Milnerton</td>
<td>1,268</td>
</tr>
<tr>
<td>Chevron Refinery (storage)</td>
<td>Chevron</td>
<td>Milnerton</td>
<td>650</td>
</tr>
<tr>
<td>Engen</td>
<td>Engen</td>
<td>Montague Gardens</td>
<td>64</td>
</tr>
<tr>
<td>BP Cape Town</td>
<td>BP</td>
<td>Montague Gardens</td>
<td>80</td>
</tr>
</tbody>
</table>

The spare capacity available at the SFF Milnerton tank farm was investigated. However, given that current imports are also from Saldanha Bay, this alternative was deemed not feasible for economic and transportation logistics reasons.

The Port of Cape Town was investigated as an alternative. From Table 4.4 above Burgan Oil determined that there was a relatively low level of storage capacity at the Port of Cape Town. It was found that the Eastern Mole has existing petroleum handling facilities and this development fits with current Cape Town Port activities in the vicinity and minimizes the construction footprint (ie there is not a requirement to construct an additional pipeline from the Cape Town Port as the Chevron Pipeline already serves this purpose). Furthermore, an advantage of locating a storage and distribution facility at the Port of Cape Town is that fuel can be received from tankers and ships.

The feasibility of this alternative was further supported by the open tender process that the Transnet National Ports Authority (TNPA) ran for a fuel storage and distribution facility in the port boundaries. Burgan Oil tendered for this opportunity and won the tender to develop a fuel storage and distribution facility at the Eastern Mole in the Port of Cape Town (the preferred site).

4.19.2  Site Layout Alternatives

A number of layout alternatives have been considered during the engineering design and EIA process for the proposed liquid bulk storage and distribution facility. Many iterations of preliminary engineering drawings have been completed for layout alternatives. The three main site layout alternatives that resulted from the iterative process are outlined briefly below.

The first site layout alternative (Site Layout Alternative 1) includes designing the site according to SANS 10089 which is less stringent in their requirements of safety distances between tanks than the Transnet National Ports Authority
(TNPA) Guidelines on Fuel Storage at the harbour (see Figure 4.12). This would allow the distribution and storage facility to have a total storage capacity of approximately 110,000m³.

The second site layout alternative (Site Layout Alternative 2) would follow the Transnet National Ports Authority (TNPA) Guidelines on Fuel Storage at the harbour (see Figure 4.13). These guidelines are more conservative with their specifications of safety distances between tanks. The increased safety distances between the tanks would allow the facility to have a total storage capacity of 78,000m³.

The third site layout alternative (Site Layout Alternative 3) is the preferred and final layout (see Figure 4.2, Figure 4.3 and Figure 4.4). This site layout alternative is as a result of discussions with and approval from TNPA to have the layout design according to SANS 10089 and not the Transnet National Ports Authority (TNPA) Guidelines on Fuel Storage. This site layout allows for a total storage capacity of 118,000m³ and a total working volume tank capacity of approximately 109,400m³. It is this preferred and final layout that is described in detail in this chapter.

4.19.3 Technological Alternative

No alternative technologies have been considered. Fuel storage vessels can be stored either aboveground or underground and underground storage tanks are not a feasible option given the proposed location and the volumes anticipated for the Project.

4.19.4 No-Go Alternative

The no-go alternative is the option of not implementing the activity or executing the proposed development. Assuming that the storage and distribution facility will not be developed at the proposed site, Cape Town Port would continue to have inadequate fuel storage facilities and the mandate stated by the DoE would not be met. The opportunity to improve the efficiency in the logistical fuel supply chain would be lost and TNPA would also lose the opportunity of maximizing use of this portion of the port. The site is currently unoccupied, and the economic stimulus the proposed development has the potential to create would not occur. There would also be no potential negative environmental and risk impacts which may be associated with the proposal.
Figure 4.12  Site Layout Alternative 1
Figure 4.13 Site Layout Alternative 2