APPENDIX 27

AIRCRAFT REFUELLING FACILITIES REPORT

KANTEY & TEMPLER
CONSULTING ENGINEERS
ESTABLISHED 1953

MASTERPLAN FOR AIRCRAFT REFUELLING FACILITIES: CAPE WINELANDS AIRPORT

OCTOBER 2024

K&T PROJECT REFERENCE: 16736P

REVISION 5

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Details of this report

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0	2022/10/14	Draft (Concept Design)
1	2022/11/30	Revised and updated as per Client Comments
2	2023/05/31	Updated based on NACO forecasts
3	2024/03/25	Updates as per comments on Draft EIA Scoping Report
4	2024/08/08	Updated with site layout changes
5	2024/10/02	Including Avgas forecast figures and diesel bulk storage / handling

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For and on behalf of Kantey & Templer (Pty) Ltd

For and on behalf of

Kantey & Templer (Pty) Ltd

Approved by: Willem van Tonder

Signed:

Position: Executive Associate

Date: 2024/10/02

EXECUTIVE SUMMARY

Cape Winelands Airport (CWA) has purchased Fisantekraal Airport and are planning on upgrading the airport in line with their business and development masterplan. K&T have been appointed to develop a fuel masterplan as well as a conceptual layout for aircraft refuelling facilities.

Based on our calculations, the fuel demand (Jet-A1) in CWA's opening year would be approximately 27 million litres (2029), which would gradually increase over the following years, more than doubling to 57 million litres in 9 years (2038), and increasing to approximately 86 million litres over the next 12 years (2050). Furthermore, in 2027 the fuel demand for Avgas would be approximately 400 000 litres, increasing annually about 10% for first five years, before slowing to about 2.5%pa from 2035 onwards (predicted consumption in 2050 is about 1 million litres). The busy day demand will range between 1.5 kl/day to 3.8 kl/day.

For the CWA airport development, an aviation fuel depot with capacity of 2 000 m^3 is required to always ensure 7x days of buffer stock. It is proposed that the storage capacity be installed as required. Below figure provides an overview of predicted fuel consumption for CWA with the proposed storage capacity required shown.

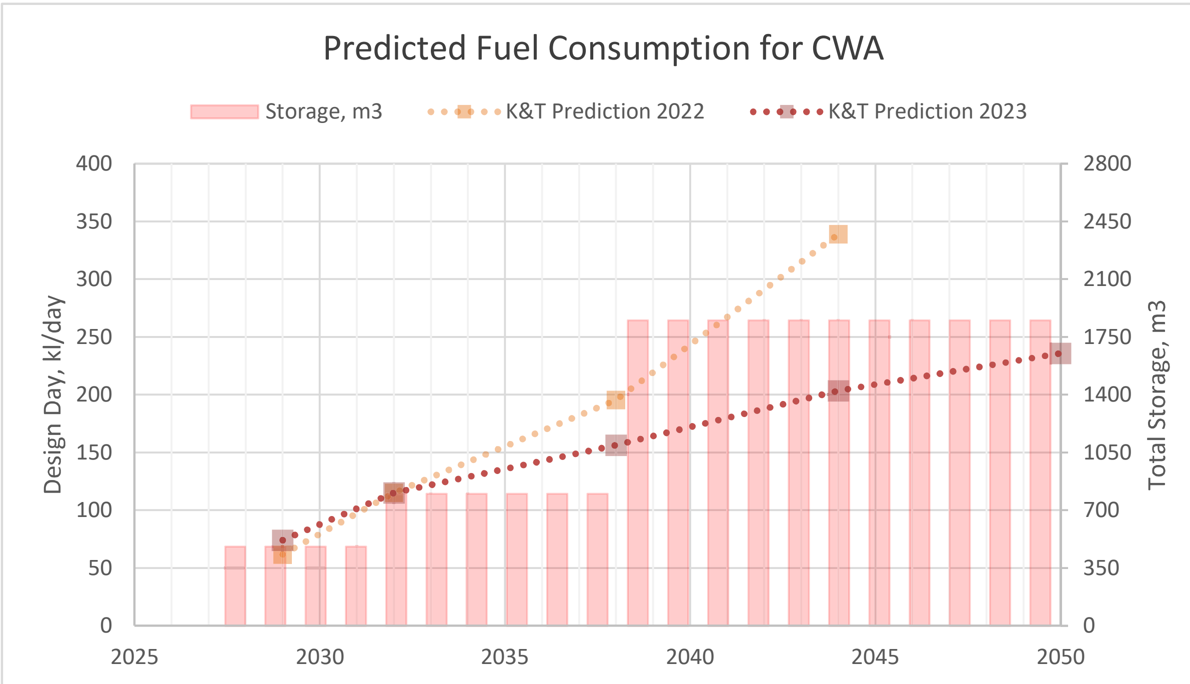

Figure 1.1: Predicted Fuel Consumption for CWA for period 2029 to 2050, with storage capacity

The preferred location for the fuel depot is as close as possible to the apron stands (to limit the travel distance for bowsers to airside and/or feeder pipeline length), with service road for road tankers to limit interactions with and impact on traffic.

The proposed fuel depot concept is described below (required plot size measures about 70m by 85m):

- All fuel received by road tankers,
- Dedicated road receipt facility with 2x bays (with pump, meter, and filters),
- Total required (phased approach) storage capacity, 2 000 m^3:
    i. Jet-A1: 10x 80 m^3 horizontal tanks, and 3x 350 m^3 vertical storage tanks,
    ii. Avgas: 2x 30 m^3 and 1x 9 m^3 double-walled (FireGuard or similar) horizontal tanks,
    iii. Diesel: 2x 23 m^3 vertical storage tanks (supply for backup generators),

- As shown in figure above, start with 6x 80 m^3 horizontals in 2028, install another 4x 80 m^3 horizontals by 2032, then construct and commission the three vertical tanks by 2038,
- The Jet-A1 and diesel tanks provided with vents open to atmosphere (typical for Class II products),
- The Avgas tanks provided with pressure-vacuum vents to limit release of vapours during normal operations (Avgas is a Class IA product), and emergency vent bursting disks,
- All tanks located within a concrete-bunded area for secondary containment, connected to oily-water separator,
- A hydrocarbon liquid and vapour detection system will be installed in main bunded areas (tanks and pump bays),
- Dedicated bowser filling & testing facility (with pump and filters),
- Administrative / office building (approx. 200 sqm),
- Workshop (approx. 200 sqm) with sufficient parking for depot and bowser vehicles,
- In terms of firefighting, only hydrants and portable foam monitors are allowed for (the fuel depot's worst-case demand is estimated to be 2 500 l/min with minimum of 150 m^3 water available to fight the fire – to be confirmed during detailed engineering),
- Plane refuelling strategy: by means of bowsers only; however, it is recommended to allow for culverts to install a future 150NB feeder pipeline and hydrant pits if / when required,

For general aviation (Avgas users), a kerbside refuelling strategy are proposed. Allowed for in concept design: 1x 9 m^3 double-walled horizontal tank (FireGuard or similar) located Airside with 1x dispenser where small privately-owned planes can taxy to, park and refuel without the need to call on bowser truck. The bulk receipt of Avgas and filling into bowser would be at the fuel depot described above.

Based on discussions (2024/09/06) with CWA and Electrical Engineering Lead, it was agreed to include the storage / handling of bulk diesel at the fuel farm. The airport development will be provided with backup generators distributed over the site where required (total installed capacity 10 MVA). Each generator will be provided with a day tank (located underneath engine within skid, details to be confirmed). Final diesel consumption volumes are dependent on Eskom grid availability and demand profile, but it has been estimated to be about 4.4 kl/day. Following the same strategy as for the aviation fuels, ensure 7x days of buffer stock, the concept design now includes: 2x 23 m^3 vertical storage tanks, with conical bottoms (to periodically test for water), dispensing pumps with meter and hose reel. Small bowser trucks will collect diesel from bulk depot and regularly top-up each generators' day tank.

The airport development is also be provided with a commercial / retail service station providing petrol and diesel. This facility would consist of the following: 4x 23 m^3 underground storage tanks with 2x islands, structural steel canopy with forecourt, small shop building with ablution facilities for staff. The proposed location (to be confirmed) is currently along the Western perimeter road of the airport development.

Refer to Appendix E for project cost estimates.

ABBREVIATIONS AND GLOSSARY

Apron	An area of an airport where aircraft are parked and refuelled
ASTM	American Society for Testing Materials. Grade and quality specifications for petroleum products are determined by ASTM test methods
Bridger	Tank truck used to supply aviation fuel from one storage area to another, such as refinery to terminal or terminal to airport.
Coalescer	The first stage of a filter / separator is called a coalesce. It filters out solid particles and causes small free water droplets in the fuel to form into large droplets, which will settle out by gravity.
Custody transfer	An event where fuel passes from one entity / operator to another.
CTIA	Cape Town International Airport
Day tank	A tank sized to contain approximately one day's worth of fuel, based on the specified consumption rates of the equipment (backup generators, boilers, burners, etc.) or process.
EIA	Environmental Impact Assessment
Fast flush	Refers to an effective water draw-off from storage tanks.
Filter monitor	A vessel containing water absorbing elements that will continuously remove solids and free water from aviation fuels. With proper maintenance, it also provides a positive shut-off of flow if the level of free water or solids in the fuel system is unacceptable.
Filter / Separator (FWS)	A vessel with two stages of filtration and water separation, through which fuel passes to remove dirt and water. The first stage (coalescer) removes dirt and coalesces water; the second stage (separator) prevents residual water droplets that have not yet settled from leaving the vessel with the fuel. See coalescer.
Fueller	Refers to the equipment used for fuelling (e.g. mobile refuelling truck).
Hydrant	An in-ground fixed fuelling system designed to permit the transfer of fuel.
Hydrant servicer	A fuelling vehicle that connects to the hydrant system to deliver fuel to an aircraft. Sometimes referred to as simply servicer.
IATA	International Air Transport Association
JIG	Joint Inspection Group
Microfilter	A filter specifically designed to remove only dirt particles from a fuel stream. Typically used upstream of Filter Water Separators (FWS) in high dirt environments to prolong the life of the FWS elements.

MHI	Major Hazardous Installation
NERSA	National Energy Regulator of South Africa
Pax	Used in the context of this report to refer to airline passengers
Relaxation time	The time required to allow any build-up of static electricity within the fuel to dissipate. This is calculated by including volumetric capacity in a fuel handling system, which increases the residence time (downstream of any charge generating equipment such as filters) for the purpose of dissipating, or losing, static electricity charge, before the fuel discharges from the fuel system into a tank, truck or aircraft.
Separator element	The second-stage cartridge in a Filter Water Separator (FWS) that allows passage of fuel but rejects fuel water droplets. The separator element is downstream of the coalesce cartridge. See Filter / Separator.
Ullage	Measurement of the space remaining from the hatch down to the fuel level.
Uplift	The quantity of fuel transferred to an aircraft.
Visijar	A clear glass container with a lid, which is permanently connected to a sample point to facilitate a visual appearance check, and to minimize skin contact with fuel. Also known as a closed-circuit sampler.
Working tank	The fuel storage tank being used to supply fuel to fuelling trucks or a hydrant system.

MASTERPLAN FOR AIRCRAFT REFUELLING FACITIES:
CAPE WINELANDS AIRPORT (FISANTEKRAAL AIRFIELD)
CONCEPT DESIGN REPORT

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1. INTRODUCTION

Cape Winelands Airport (CWA) has purchased Fisantekraal Airport and are planning on upgrading the airport in line with their business and masterplan. CWA appointed Kantey & Templer (K&T) to provide consulting engineering services for the Fuel Storage aspect of the development as well as providing input into the Air Emissions Licence which is required as part of the EIA approval process.

1.1 TERMS OF REFERENCE

Our understanding of the overall scope work for the consultant based on the above project scope of work includes the following:

a) Validation of forecasts for passenger and air traffic movements and developing forecasts for Jet-A1, Avgas and fuel for a commercial / retail service station,
b) Assessing and defining the optimum storage capacities for each of the products taking into account production and supply chain logistics including regional and national production and contingency planning for the products in line with the IATA Guidance on Airport Fuel Storage Capacity Edition 1,
c) Develop a plan defining the sizing of the facilities and possible locations taking into account the traffic forecasts for the ultimate development of the airport,
d) The storage facility should be of a modular nature in order for the storage capacity to be grown with increase in demand and size of the airport,
e) Develop conceptual design options for the storage, receipting facilities including number and types of tanks, fuel supply to aircraft solutions, optimal sizing of all facilities as well as the specification of safety, environmental, regulatory and operational requirements. Conceptual design to include general layout drawings, P&ID’s for product, firefighting and drainage,
f) Develop conceptual design for the commercial fuel facilities (retail service station) including layout drawing and P&ID,
g) Engineering support to EIA practitioner including generating specifications related to environmental protection.

The above scope of work is to be divided into two Stages with specific deliverables which are provided below:

1.1.1 Project Stage 1

Table 1.1: Services related to Stage 1 of this project / report

ID	Detailed Services	Deliverables
1	Finalisation of the terms and scope of the agreement	Inception report including the validation of the traffic forecasts, the developed projected demand and optimum storage facilities for each of the products required for the airport.
2	Confirmation of the project and functional requirements.	
3	Determine the availability of data, drawings and plans relating to the project including traffic forecasts	

1.1.2 Project Stage 2

Table 1.2: Services related to Stage 2 of this project / report

ID	Detailed Services	Deliverables
1	Agree documentation programme with principal consultant involved	Prepare and issue concept design report
2	Confirm the concept design options and criteria for assessing them.	
3	Set up and lead concept design meetings.	
4	After selection of the preferred option, prepare initial concept design and related documentation.	
5	Refine and assess the concept design to ensure conformance with all regulatory requirements and consents.	
6	Liaise, co-operate and provide necessary information to the client and principal consultant.	Prepare and issue budgetary cost estimates

1.2 ASSUMPTIONS

We have based our proposal on the following assumptions:

a) Availability of expected passenger growth and air traffic movement predictions for the airport, for period under review (2026 to 2050),
b) For de-bottlenecking, we will consider the fuel receipt, filters, storage and pumps as well all aspects of the value chain and installation including fuel supply chains to the airport,
c) The conceptual design will incorporate preliminary hydraulic input into pipe sizing, pump sizing and equipment sizing, however detailed hydraulic analysis of the piping network including stress analysis will form part of the detailed design stage of the project.
d) The cost estimates will be Class 4 (such as high-level cost estimate of 50%).

1.3 OVERVIEW OF METHOD(S)

Our methodology to conduct this masterplan study is described below:

1.3.1 Process data (related to pax / ATM and actual sales volumes)

a) Review all available information on the proposed airport development,
b) Review ATM / pax forecasts (per international, regional, domestic, and unscheduled as provided by CWA) and translate them to fuel consumptions,
c) Meet and discuss with CWA representatives responsible for traffic forecasts and general airport master planning,

1.3.2 Fuel consumption modelling

a) Develop fuel consumption model,
b) For each category (international, regional, domestic, and unscheduled), define a representative “mission”, based on type of plane, payload, range, etc.),
c) Develop 15 year fuel consumption forecast for airport fuel depot,
d) Configure fuel consumption forecasts into the following parameters:

- Yearly fuel consumption (Ml/annum),
- Peak month (Ml/month),
- Busy Day (Ml/day),
- Design Day (Ml/day), and
- Design hour (m^3/hr).

1.3.3 Review output and prepare recommendations

a) Identify all throughput-related bottlenecks (receipt, storage and/or loading),
b) Prepare and develop recommendations to address these bottlenecks,
c) Prepare concept design report,
d) Prepare high-level cost estimate and project design / construction schedule,

1.3.4 Presentation and Reporting

a) Compile fuel development master plan report for airport,
b) Prepare and present formal fuel master plan to stakeholders.

1.4 DISCLAIMER

Although care has been taken to ensure the accuracy and completeness of the information contained in these guidelines, K&T is not responsible for any loss or damage resulting from reliance on any inaccurate information contained in this document.

1.5 DISTRIBUTION AND INTENDED USE

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2. FUEL UPLIFT ANALYSIS (JET-A1)

2.1 AIR TRAFFIC MOVEMENT (ATM) AND PASSENGER FORECASTS

The following information was received from CWA (updated as be NACO forecasts):

Table 2.1: Forecast numbers for Air Traffic Movements, ATM (arrivals and departures)

Air Traffic Movements	**Year**				
ONE-WAY (Arrivals or Departures)	**2029**	**2032**	**2038**	**2044**	**2050**
Domestic	3 200	5 050	7 450	9 475	11 150
International	2 375	3 850	4 925	6 000	6 900
Regional International	-	-	-	-	-
Total	**5 575**	**8 900**	**12 375**	**15 475**	**18 050**
Air Traffic Movements	**Year**				
TWO-WAY (Arrivals and Departures)	**2029**	**2032**	**2038**	**2044**	**2050**
Domestic	6 400	10 100	14 900	18 950	22 300
International	4 750	7 700	9 850	12 000	13 800
Regional International	-	-	-	-	-
Total	**11 150**	**17 800**	**24 750**	**30 950**	**36 100**
Air Traffic Movements	**Year**				
ANNUAL CODE SPLIT (2-Way)	**2029**	**2032**	**2038**	**2044**	**2050**
Domestic:	Detail not available				
B (Embraer ERJ135 or similar)					
C (Boeing 737-400 or similar)					
International:					
B (Embraer ERJ135 or similar)					
C (Boeing 737-400 or similar)					
E (Airbus A350-900 or similar)					
Regional International					
B (Embraer ERJ135 or similar)					
Air Traffic Movements	**Year**				
DAILY CODE SPLIT (2-Way)	**2029**	**2032**	**2038**	**2044**	**2050**
Domestic:	Detail not available				
B (Embraer ERJ135 or similar)					
C (Boeing 737-400 or similar)					
International:					
B (Embraer ERJ135 or similar)					
C (Boeing 737-400 or similar)					
E (Airbus A350-900 or similar)					
Regional International					
B (Embraer ERJ135 or similar)					

Notes:
1. Make and model of plane added (refer to Section 2.5)
2. Daily code split is annual split divided by 365 (does not factor in seasonal fluctuations),
3. Regional International category was incorporated into the international category,

Table 2.2: Forecast numbers for expected passengers (arrivals and departures)

Passengers	**Year**				
ONE-WAY (Arrivals or Departures)	2029	2032	2038	2044	2050
Domestic	440 000	660 000	1 005 000	1 320 000	1 605 000
International	415 000	585 000	745 000	890 000	1 010 000
Regional International	-	-	-	-	-
Total	**855 000**	**1 245 000**	**1 750 000**	**2 210 000**	**2 615 000**
Million pax per annum (MPPA)	0.855	1.25	1.75	2.21	2.62
Passengers	**Year**				
TWO-WAY (Arrivals and Departures)	2029	2032	2038	2044	2050
Domestic	880 000	1 320 000	2 010 000	2 640 000	3 210 000
International	830 000	1 170 000	1 490 000	1 780 000	2 020 000
Regional International	-	-	-	-	-
Total	**1 710 000**	**2 490 000**	**3 500 000**	**4 420 000**	**5 230 000**
Million pax per annum (MPPA)	1.71	2.49	3.50	4.4.2	5.23

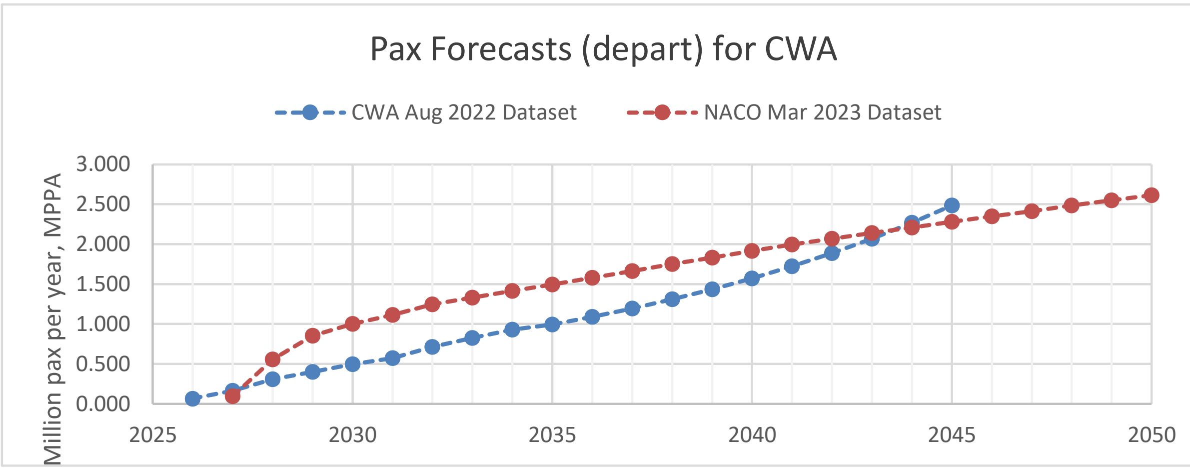


Figure 2.1: Predicted pax (depart) for CWA for period 2029 to 2050

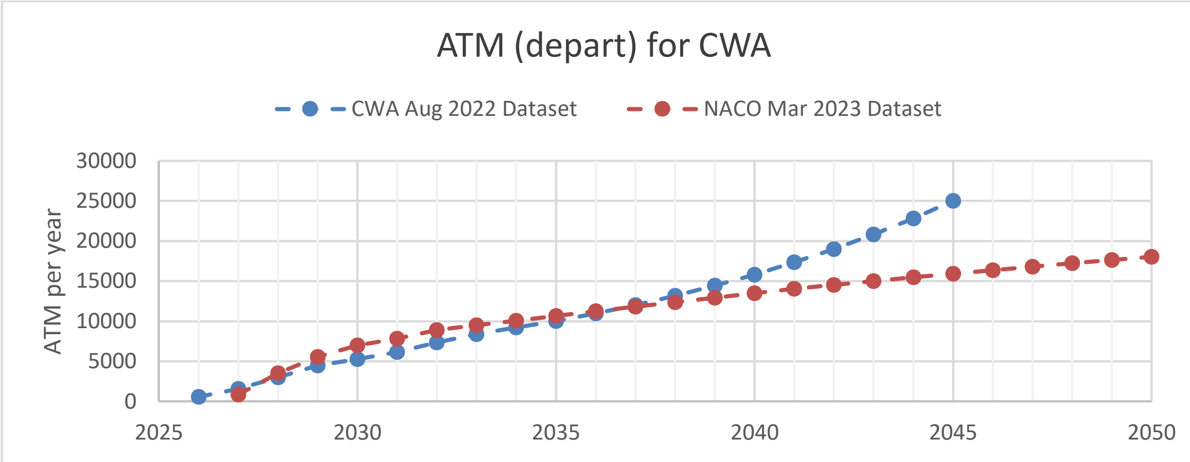


Figure 2.2: Predicted ATM (depart) for CWA for period 2029 to 2050

2.2 DESTINATION AND ROUTES

2.2.1 Domestic Routes

Based on available information, the following domestic destinations would be serviced (measured from CWA, the longest distance is 1600 km and the average distance 1050 km):

Johannesburg (JNB)
Durban (DUR)
Port Elizabeth (PLZ)
Johannesburg (HLA)
Bloemfontein (BFN)
George (GRJ)
East London (ELS)
Kimberley (KIM)
Hoedspruit (HDS)
Upington (UTN)
Skukuza (SZK)
Nelspruit (MQP)
Plettenberg Bay (PBZ)

2.2.2 International Routes

Based on available information, the following international destinations would be serviced (measured from CWA, the longest distance is 5200 km and the average distance 3850 km):

Victoria Falls (VFA)
Harare (HRE)
Addis Ababa (ADD)
Port Louis (MRU)
Luanda (LAD)
Bulawayo (BUQ)
Maputo (MPM)
Lusaka (LUN)
Dar-es-Salaam (DAR)
Zanzibar (ZNZ)
Nairobi (NBO)
Livingstone (LVI)
Blantyre (BLZ)
Lagos (LOS)
Victoria (SEZ)

2.2.3 Regional International Routes

Based on available information, the following regional international destinations would be serviced (measured from CWA, the longest distance is 1600 km and the average distance 1450 km):

Windhoek (WDH)
Walvis Bay (WVB)
Maun (MUB)
Gaborone (GBE)

2.3 FUEL CONSUMPTION (PER MISSION)

K&T developed an aviation fuel consumption model for several of modern planes, including but not limited to: Embraer ERJ135, Embraer E190, Airbus A320neo, Airbus A320-200, Boeing 737-400, Airbus A350-900, Boeing 747-400, and Boeing 777-300. This model is based on plane-specific data, such as engine efficiency at cruise speed, Lift / Drag ratio, Operating Empty Weight, Max Take-off Weight, etc., and mission-specific input, such as payload, and range.

Based on the destination options (domestic, international, and regional international), the ATM / pax numbers, a representative mission, consisting of plane, payload (number of passengers) and range, is selected for each.

The results are presented in table below:

Table 2.3: Predicted Fuel Consumption (per Mission)

Destination	Code	Plane	Pax	Range	Fuel Factor	Fuel Burn
-	-	-	-	km	kg/pax/km	litres
Domestic	B	ERJ135	35	1500	0.016894	1 102
	C	B737-400	120	1500	0.025169	5 628
	B	ERJ135	35	3000	0.016894	2 204
International	C	B737-400	120	4000	0.025169	15 008
	E	A350-900	300	5000	0.016876	31 446
Regional International	B	ERJ135	35	1500	0.016894	1 102

2.4 DESIGN PARAMETERS

Then, based on provided forecasted ATM numbers, the predicted fuel consumption per mission (refer to Table 2.3), the design parameters for the airport fuel depot are calculated. Upon receipt of the NACO forecasts, a modifier factor was introduced to adjust the earlier output to match the updated information.

The results are presented in table below:

Table 2.4: Fuel Consumption and Design Parameters (Jet-A1)

Design Parameters (for each year)			Year				
ID	Description	Unit	2029	2032	2038	2044	2050
1	Yearly consumption	Ml/annum	26.9	41.9	57.0	74.1	86.0
2	Peak month	Ml/month	3.14	4.89	6.65	8.65	10.03
3	Busy day	kl/day	104	161	219	285	330
4	Design day	kl/day	74	115	156	203	236
5	Design hour	m^3/hr	37	58	78	102	118
6	Buffer	days	7.0	7.0	7.0	7.0	7.0
7	Storage Required	m^3	519	806	1095	1423	1651

Notes:
1. All forecasts based on departing ATM's,
2. Only for Jet-A1,
3. Based on code split provided, minimize error on departing pax,
4. Assume peak to average of 1.4 (Western Cape tourist season, Nov to Feb),
5. Assume planes to depart can refuel at destination airports,
6. Departing ATM/day average not actual (e.g. 0.3/day = 2x per week),
7. Buffer capacity (days) based on 5x day industry practice + 2x day contingency stock,

2.5 REVIEW AND DISCUSSION OF RESULTS

The fuel consumed per design day (Jet-A1) for the period 2026 to 2050 is presented below. The following guideline envelope is also shown on the same graph: 15%pa and 25%pa growth for the first 5 years, followed by 4%pa and 5%pa growth for the next 10 years, and 1%pa and 2%pa growth for the remainder.

Several factors impact the overall fuel consumption predictions, loosely grouped as follows:

a) Plane-related factors: improvements related to the engine efficiencies, improvements related to payload and design of each plane, plane configuration (high density vs low density), etc.
b) Airport management: selection of destinations / routes, long-haul vs short-haul, type of planes (modern vs older technology) used by airline contracts, passenger load factor, etc.

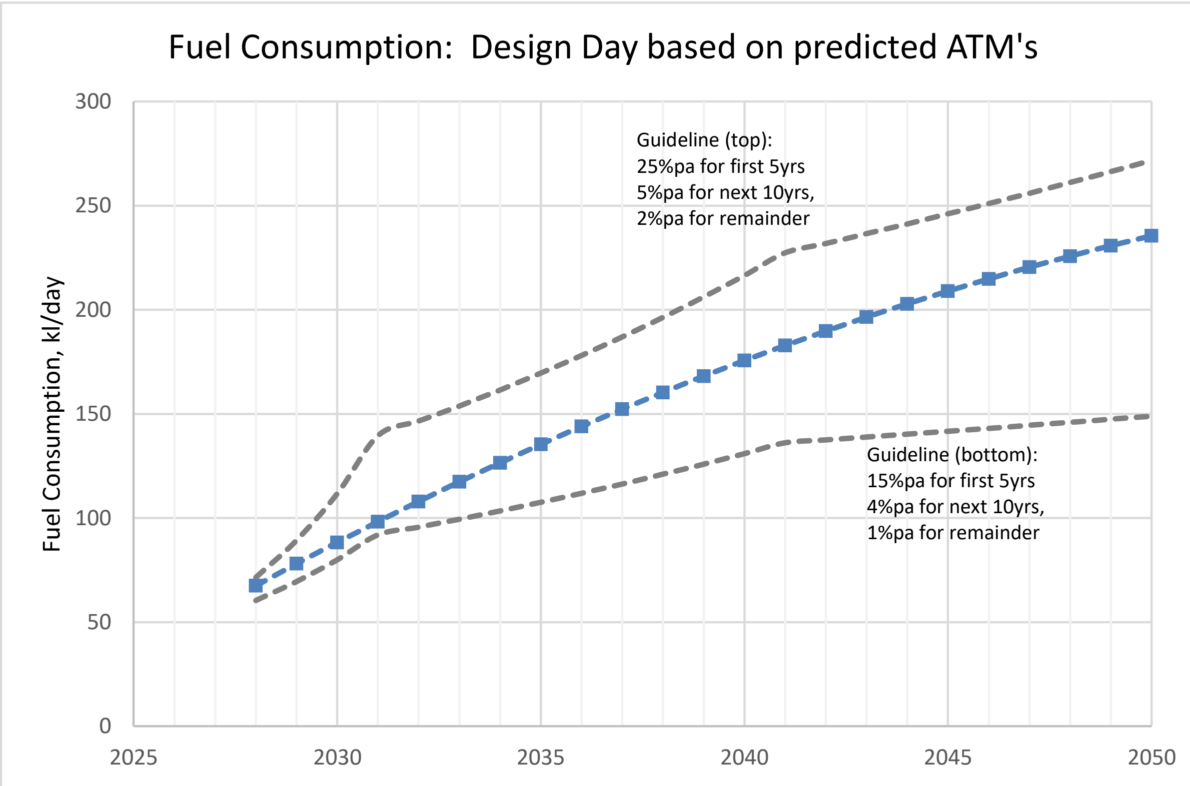


Figure 2.3: Fuel Consumption (Design Day) for the period 2029 to 2050

The fuel consumption per design day for the period 2029 to 2050 follows the provided ATM's. It makes sense to consider a phased approach to optimally match the fuel demand with provided facilities. For example, construct and install all fuel-related facilities to cover the first 10 years, but also add all the supporting infrastructure to relatively easy expand where needed (additional pumps, tanks, pipeline system, etc.) during the second 10 years.

Our concept design described in the next section is based on this phased approach.

3. CONCEPT DESIGN OF FUEL-RELATED FACILITIES

3.1 LOCATION

The Cape Winelands Airport will be located approximately 9 km to the North-East on the outskirts of Durbanville, Western Cape. It is proposed to locate the fuel depot about 400 m to the North of the main terminal building and control tower.

Coordinates:

Latitude: S 33°45’38.06”
Longitude: E 18°44’07.84”

Figure 3.1: Aerial photograph of CWA airport development with proposed location for fuel facilities

The following section provides a brief overview of the proposed fuel-related facilities at the Cape Winelands Airport (Fisantekraal Airfield).

3.2 RECEIPT

3.2.1 Road Receipt Facility

All fuel to be received by road and offloaded by road tankers. Order road tankers from Astron Energy refinery in Milnerton, the storage terminals (BP or Engen) in Montague Gardens, or Burgan Cape Terminal in Cape Town harbour. Deliveries should not take more than 1x day from order placed.

The fuel depot's receipt facilities are described below:

a) Depot provided with dedicated road receipt facility with entrance / exit for road tankers,
b) Two receipt bays (both left-side offloading), each provided with 1x receipt point (hoses and API dry-break couplers),
c) Three receipt pumps (details provided in table below),
d) Provide for custody transfer metering,
e) Provides with a quick sampling tank for quality control,
f) Two horizontal filter vessels (one for Jet-A1 and another for Avgas), each with limiting capacity of 1 500 l/min,

Table 3.1: Summary of proposed receipt / loading pumps (Phase 1 and 2)

Pump No.	Function	Service	Make & Model	Motor, kW	Speed, rpm	Flow, l/min	Head, m
001	Receipt	Jet-A1	-	-	-	750	40
002	Receipt			-	-	750	40
003	Receipt/Loading	Avgas				750	40
004	Loading/Filling	Jet-A1	-	-	-	1 500	40
005	Loading/Filling		-	-	-	1 500	40
XXX	Drain QFTNo1		-	-	-	200	25
XXX	Drain QFTNo2		-	-	-	200	25
XXX	Drain QFTNo4	Avgas	-	-	-	200	25

3.2.2 Pipeline Receipt

Not applicable.

3.2.3 Rail Receipt

Not applicable.

3.3 STORAGE TANKS (PHASE 1 TO PHASE 5)

3.3.1 Phase 1 (2029): Storage Tanks

The storage tanks and associated infrastructure is described below:

a) Phase 1 consists of 6x horizontal tanks with total storage capacity of 480 m^3 (sufficient to provide 7x days buffer stock for first 5 years of operation),
b) Provide each with Automatic Tank Gauging (ATG) and independent overfill protection,
c) Each tank fitted with floating suction, sufficiently sized for at least 1 500 l/min,
d) The Jet-A1 tanks will be provided with vents open to atmosphere (typical for Class II product storage tanks),
e) Provide the horizontal tanks with one shared Quick Flush Tanks (QFTNo1),
f) Skin valves provided with thermal relief valves (TRV's) that reliefs back to relevant QFT,
g) For secondary containment, the horizontal tanks (Jet-A1) all share a common bunded area with concrete floor and walls (the vertical tanks should be provided with own),
h) Hydrocarbon liquid and vapour detection system in main bunded areas,
i) Access stairs and walkways,

Table 3.2: Summary of storage tanks (Jet-A1 only) – Phase 1 only

Tank No.	Type	TE	Service	Dia., m	Lght., m	Design, m^3	Operation, m^3
01	Horizontal tank (SANS 10131), with supporting cradles	2028	Jet-A1	3.0	11.8	83	80
02		2028		3.0	11.8	83	80
03		2028		3.0	11.8	83	80
04		2028		3.0	11.8	83	80
05		2028		3.0	11.8	83	80
06		2028		3.0	11.8	83	80
					TOTAL	**-**	**480**

3.3.2 Phase 2 (2032): Storage Tanks

The storage tanks and associated infrastructure is described below:

a) Install 4x horizontal tanks with capacity of 320 m^3, to bring the total installed capacity to 800 m^3. The combined capacity should be sufficient to provide at least 7x days buffer stock for the next 5 years of operation,
b) Provide each with Automatic Tank Gauging (ATG) and independent overfill protection,
c) Each tank fitted with floating suction, sufficiently sized for at least 1 500 l/min,
d) The Jet-A1 tanks will be provided with vents open to atmosphere (typical for Class II product storage tanks),
e) Provide the additional horizontal tanks with one shared Quick Flush Tank (QFTNo2),
f) Skin valves provided with thermal relief valves (TRV's) that reliefs back to relevant QFT,
g) For secondary containment, the horizontal tanks (Jet-A1) all share a common bunded area with concrete floor and walls (the vertical tanks should be provided with own),
h) Hydrocarbon liquid and vapour detection system in main bunded areas,
i) Access stairs and walkways,

Table 3.3: Summary of storage tanks (Jet-A1 only) – Phase 2 only

Tank No.	Type	TE	Service	Dia., m	Lght., m	Design, m^3	Operation, m^3
07	Horizontal tank (SANS 10131), with supporting cradles	2031	Jet-A1	3.0	11.8	83	80
08		2031		3.0	11.8	83	80
09		2031		3.0	11.8	83	80
10		2031		3.0	11.8	83	80
					TOTAL	**-**	**320**

3.3.3 Phase 3 (2038): Storage Tanks

a) Install additional 3x vertical storage tanks, each with capacity of 350 m^3, to bring the total installed capacity to 1 850 m^3.
b) The combined capacity should be sufficient to provide at least 7x days buffer stock for the next 20 years of operation,
c) The tanks would be of the fixed roof type, constructed to API650, with concrete foundation (piling requirement[1] to be confirmed during detailed engineering),
d) The proposed dimensions and capacities of the tankage are listed in the table below:
e) Each tank fitted with floating suction, sufficiently sized for at least 3 000 l/min,
f) The Jet-A1 tanks will be provided with vents open to atmosphere (typical for Class II product storage tanks),
g) Provide each tank with ATG and independent overfill protection,
h) The three vertical tanks provided with one dedicated Quick Flush Tank (QFTNo3),
i) Skin valves provided with thermal relief valves (TRV's) that relieves to relevant QFT,
j) For secondary containment, the vertical tanks are provided with their own bunded area - concrete floor and walls approximately 1.8m high,
k) Hydrocarbon liquid and vapour detection system in main bunded areas,
l) Access stairs and walkways,

Table 3.4: Summary of storage tanks (Jet-A1 only) – Phase 3 only

Tank No.	Type	TE	Service	Dia., m	Hght., m	Design, m^3	Operation, m^3
14	Vertical storage tank (API 650), with concrete foundation	2037	Jet-A1	5.65	14.0	400	350
15		2037		5.65	14.0	400	350
16		2037		5.65	14.0	400	350
					TOTAL	**-**	**1 050**

3.3.4 Phase 4 (2044): Storage Tanks

Not applicable.

3.3.5 Phase 5 (2050): Storage Tanks

Not applicable.

[1] Based on preliminary discussions with Geotechnical Specialist, it is unlikely that piling be required, and that minimum soil conditioning be required for the tank foundations.

3.4 LOADING

3.4.1 Bowser Filling & Testing Facility

For the first 15 years, it should be possible to deliver all fuels to the planes by means of bowser and the related facilities are described below:

a) The depot is provided with dedicated bowser filling & testing facility with separate entrance / exit for all bowsers,
b) Provided with two loading / filling pump (details provided in table above),
c) One horizontal filter vessel (limiting capacity of 1 500 l/min),
d) The loading pumps is connected to hydrant pit valve (located on the island),
e) To test the vehicle equipment (bowser and dispensers), the facility is provided with 2x 60NB underwing and 2x 60NB bottom filling connectors, to pump through a master meter to calibrate the onboard meters and to pressure test the hoses (the facility is piped back to the bulk storage tanks),
f) Provides bowser filling & testing facility with a quick sampling tank (quality control).

3.4.2 Apron Pipeline & Hydrant Pits

From 2038 onwards (based on fuel consumption predictions, refer to Figure 2.3), the fuel related infrastructure should supply between 156 and 219 kl/day (of Jet-A1) to about 34x departing planes. This demand can be met with bowser vehicles; however, a roundtrip could be 20 min (travel to depot, connect hoses, start pump, fill bowser, disconnect hoes, and return to apron stands, etc.).

The proposed concept design includes the provision of a feeder pipeline (150NB) to service the apron stands. Allow for dedicated apron pump and vertical coalescer filters (with total limiting capacity 3 000 l/min). The refuelling strategy (bowsers only vs apron pipeline and hydrant pit valves) will be confirmed during Detailed Engineering.

The fuel depot's apron pump and filter facilities are described below (Phase 3 only):

a) Two apron loading pumps (details provided in table below),
b) Two vertical filter vessels (duty / standby, each with capacity of 3 000 l/min),
c) Filters provided with flow control valves on discharge to ensure regulated flow and limit linear velocities through filter cartridges,
d) Valve chamber (VC1) with actuated expanding plug valves to quickly isolate the feeder pipeline in the event of emergency (emergency shut-down valve, ESD),
e) Valve chambers (VC2, VC3 and VC4) are provide with maintenance isolation valves,
f) Allow for 12x apron stands, each provided with hydrant pit valve and isolation valve located in 460NB bottom-entry hydrant pit boxes (to standard EI 1584).
g) Each pit valve to be provided with low-point drains and high-point vents,
h) Based on the proposed routing of feeder pipeline (refer to drawings in Appendix B), the total linear length of the 150NB pipeline is 1 910 m, terminating at VC4.

Table 3.5: Summary of apron and other pumps installed (as part of Phase 3)

Pump No.	Function	Service	Make & Model	Motor, kW	Speed, rpm	Flow, l/min	Head, m
006	Apron loading	Jet-A1	-	-	-	3 000	80
007	Apron loading			-	-	3 000	80
XXX	Drain QFTNo3		-	-	-	200	25

3.4.3 Vehicles

It is proposed that the airport be serviced by:

a) one 18 000 litre bowser truck (Jet-A1), with filling rate approx. 650 l/min,
b) one 9 000 litre bowser trucks (Jet-A1), with filling rate approx. 450 l/min,
c) one 4 500 litre bowser truck (Avgas), with filling rate approx. 450 l/min,
d) one 4 500 litre bowser truck (bulk diesel), with filling rate approx. 450 l/min,
e) one dispenser vehicle (also known as a hydrant servicer), with filling rate approx. 1 800 l/min (only if the feeder pipeline and hydrant pits are installed),
f) a slops trailer to collect from pipeline low-points (also, only required if the feeder pipeline and hydrant pits are installed).

3.5 AVGAS STORAGE & HANDLING FACILITIES

3.5.1 General

The Avgas storage (total storage capacity, 60 m^3) and handling facilities are briefly discussed below:

a) 2x 30 m^3 double-walled horizontal tanks (FireGuard or similar),
b) The tanks should be provided with pressure-vacuum vents (PV vents) to limit release of vapours during normal operations (Avgas is a Class IA product), and emergency vent bursting disks.
c) Each tank provided with ATG and independent overfill protection (level switch interlocked with actuated inlet valve).
d) The Avgas tanks will be located within own bunded area, with concrete floors and walls. Avgas tanks are installed with slope for water collection.
e) Hydrocarbon liquid and vapour detection system in main bunded areas,
f) Each tank is connected to a shared quick flush tank (QFTNo4).
g) The Avgas receipt pump and filter (limiting capacity of 750 l/min) could be located next to the road receipt facilities, next to the Jet-A1 pumps and filters.

The bulk receipt of Avgas and filling into bowser would be at the bulk fuel depot described above. The same pump and filter be used to fill bowsers.

3.5.2 Refuelling (General Aviation only)

For general aviation (Avgas users), a kerbside refuelling strategy is proposed. Allowed for in concept design: 1x 9 m^3 double-walled horizontal tank (FireGuard or similar) located Airside with 1x dispenser where small privately-owned planes can taxy to, park and refuel without the need to call on bowser truck.

Table 3.6: Summary of storage tanks (Avgas)

Tank No.	Type	TE	Service	Dia., m	Lght., m	Design, m^3	Operation, m^3
11	Double-walled tank, FireGuard or similar	2027	Avgas	2.3	7.45	-	30
12		2027		2.3	7.45	-	30
13		2027		1.82	3.70	-	9
					TOTAL	**-**	**69**

3.6 BULK DIESEL STORAGE & HANDLING FACILITIES

The airport development will be provided with backup electrical generators, distributed all over the site where required. The total installed capacity would be approximately 10 MVA. The actual fuel consumption (diesel) is dependent on the availability of Eskom grid and the demand profile, but it has been estimated to be about 4.4 kl/day.

Following on the same strategy as for the aviation fuels, ensure 7x days of buffer stock, the concept design includes:

a) Diesel receipt by means road tanker using the vehicle's PTO pump,
b) 2x 23 m^3 vertical storage tanks with supporting legs, mounted on concrete foundation,
c) The tank bottoms will have conical bottoms to periodically test and sample for water,
d) Each tank provided with ATG and independent overfill protection (level switch interlocked with actuated inlet valve).
e) Tanks provided with vents open to atmosphere (typical for Class II product storage tanks),
f) For secondary containment, the two diesel tanks will be installed on concrete floor and walls about 1 m high (separate to the Jet-A1 and Avgas bunds),
g) Dispensing pumps (gear or rotary vane, to be confirmed) with positive displacement meter and hose reel (flow rate capacity 200 l/min). The same pumps will be used to circulate the diesel through cartridge filters (particulate and water guard),
h) Access stairs and walkways,

Table 3.7: Summary of storage tanks (diesel)

Tank No.	Type	TE	Service	Dia., m	Hght., m	Design, m^3	Operation, m^3
17	Vertical storage tank (SANS 10131), conical bottom with support legs	2027	Diesel	2.4	5.2	-	23
18		2027		2.4	5.2	-	23
					TOTAL	**-**	**46**

A small bowser truck (4 500 litre capacity) will then collect diesel from bulk depot and regularly (as and when required) top-up each generators' day tank.

3.7 OILY-WATER DRAINAGE

The storage tanks will all be located in concrete bunded area as secondary containment. Bund A for the 10x horizontals tanks (Jet-A1), Bund B for the 3x vertical tanks, Bund C for the 2x Avgas horizontal tanks, and Bund D for the 2x diesel tanks.

The bund walls surrounding the vertical tanks (Bund B) would be approximately 1.8m in height to achieve the required containment volume: 110% of largest tank. The outlet valves of these bunded areas will be valved (normally close) and routed to a three-stage gravity / plated oily-water separator. All the other areas where fuel be handled (road tanker receipt and bowser loading) and accidental / operational spillages are possible, will be provided with a concrete hardstanding as spill containment area, also routed to the separator. The concept design allows for these areas to be provided with canopies to prevent / limit rainwater from entering the oily-water drainage system. The outlet of the separator is valved in locked close position and connected to the sewer system.

3.8 FIREFIGHTING SYSTEM

The airport's firefighting team would be the first responder. Emergency Response Plan to be developed during detail engineering.

The fuel depot will be provided with hydrants connected to the airport firefighting ring main (it is assumed sufficient volume, flow and pressure available). Furthermore, the depot would be provided with portable foam monitors, ensure sufficient foam stocks and hoses. The buildings (office block and workshop) provided with automatic sprinkler system, hose reels and handheld fire extinguishers as per code. The fuel handling areas (road tanker receipt and bowser loading facilities) provided with deluge sprinkler systems.

Based on our review, the water demand of the worst-case scenario would be approximately 2 500 l/min with minimum of 150 m^3 available to fight the fire. No allowance for water reservoir and booster pumps within the proposed plot boundaries (for bulk fuel depot).

3.9 COMMERCIAL / RETAIL SERVICE STATION

The airport should be provided with a commercial / retail service station (diesel and petrol only), consisting of the following:

a) Building (small shop, staff room, refuse room, etc.) approx. 100 sqm,
b) Forecourt incl. 2x island structural steel canopy, complete with pump & tank installation, paving, site lighting, spill slabs, pollution collection tanks, compressor, etc.
c) 4x 23 m^3 underground storage tanks (composite bonded type),
d) Corporate branding signage, ATG's and fuel management system,
e) Oily-water interceptor separator.

3.10 OTHER

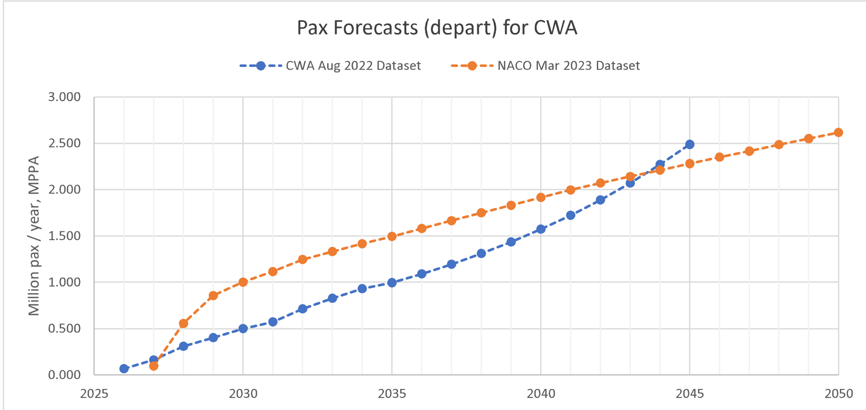
Besides the fuel-related infrastructure, the depot is provided with the following:

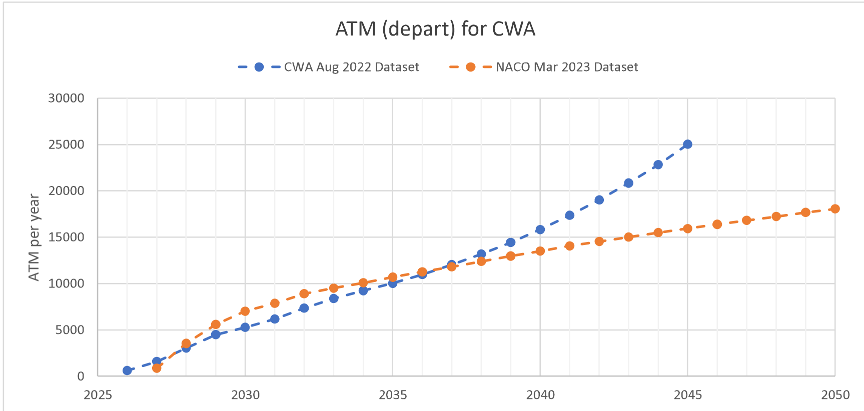
- General admin / office building (approx. 200 sqm),
- Workshop and parking shed (approx. 200 sqm),
- Shaded parking bays for the bowser vehicles (and future dispensers),
- CCTV system with access-controlled security gates,
- Security fence with guard huts located at entrance and exit.

APPENDIX A: FUEL CONSUMPTION SUMMARY SHEET

Document: Summary data table for ATM/pax and fuel consumption
Project: CWA Master Plan Fuel Development
K&T Reference: 16736P
Revision: 1

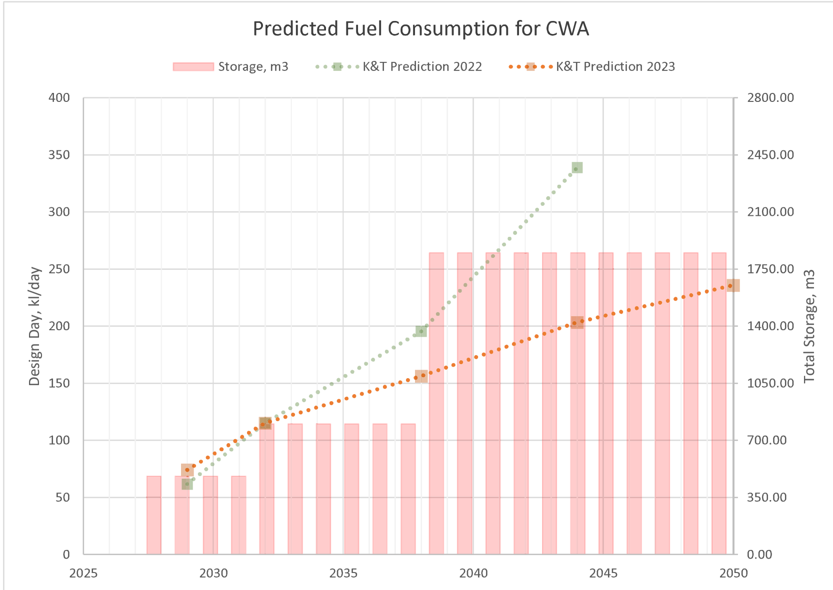
		2029	2032	2038	2044	2050
CWA Aug 2022 Dataset						
Pax (departing only)						
domestic	pax	257 949	466 447	913 436	1 583 220	-
international	pax	124 522	198 947	314 892	545 790	-
regional	pax	19 802	46 634	80 557	139 626	-
Sum	**pax**	**402 273**	**712 028**	**1 308 885**	**2 268 636**	-
MPPA	*MPPA*	*0.402*	*0.712*	*1.309*	*2.269*	
ATM's (departing only)						
domestic		2498	4457	8297	14380	-
international		1601	2184	3642	6312	-
regional		375	702	1233	2136	-
Sum		**4474**	**7343**	**13171**	**22829**	-
pax per ATM						
domestic		103.3	105	110	110	
international		77.8	91	86	86	
regional		53	66	65	65	
NACO Mar 2023 Dataset						
Pax (departing only)						
domestic	pax	440 000	660 000	1 005 000	1 320 000	1 605 000
international	pax	415 000	585 000	745 000	890 000	1 010 000
regional	pax					
Sum	**pax**	**855 000**	**1 245 000**	**1 750 000**	**2 210 000**	**2 615 000**
MPPA	*MPPA*	*0.855*	*1.245*	*1.750*	*2.210*	*2.615*
ATM's (departing only)						
domestic		3200	5 050	7 450	9 475	11 150
international		2375	3 850	4 925	6 000	6 900
regional						
Sum		**5575**	**8 900**	**12 375**	**15 475**	**18 050**
pax per ATM						
domestic		137.5	131	135	139	143.9
international		174.7	152	151	148	146.4



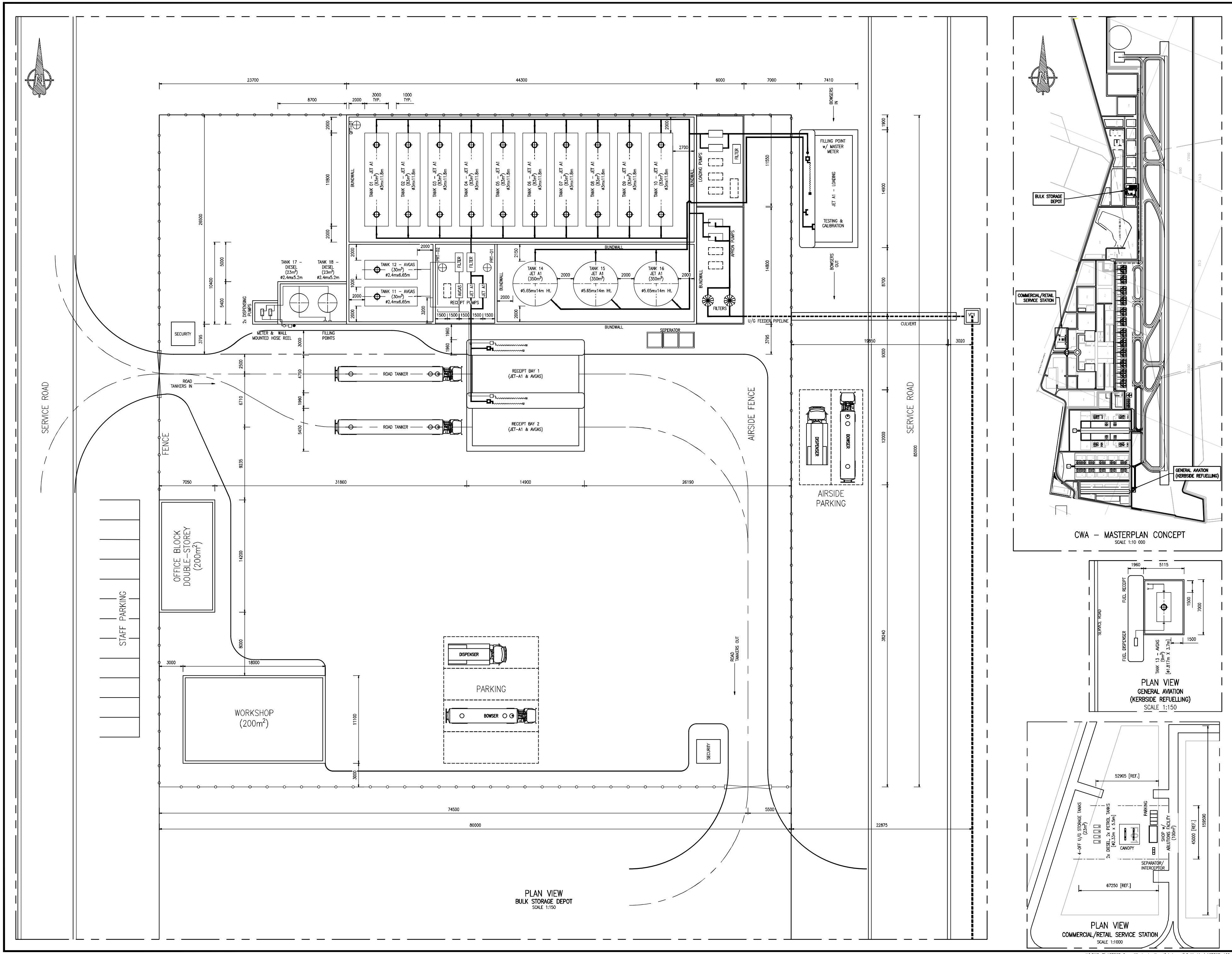


Document: Summary data table for ATM/pax and fuel consumption
Project: CWA Master Plan Fuel Development
K&T Reference: 16736P
Revision: 1

		2029	2032	2038	2044	2050
K&T Prediction 2022						
Fuel (Ml per year)						
domestic	Ml/year	10.45	17.55	34.01	58.95	-
international	Ml/year	11.58	23.61	35.91	62.24	-
regional	Ml/year	0.41	0.77	1.36	2.35	-
Sum	**Ml/year**	**22.44**	**41.93**	**71.28**	**123.55**	-
Fuel (kl per day)						
domestic	kl/day	28.64	48.09	93.22	161.55	-
international	kl/day	31.97	64.87	98.52	170.87	-
regional	kl/day	1.13	2.13	3.72	6.46	-
Sum	**kl/day**	**61.74**	**115.09**	**195.46**	**338.88**	-
Design Parameters:						
Yearly consumption	Ml/annum	22.44	41.93	71.28	123.55	-
Peak month	Ml/month	2.62	4.89	8.32	14.41	-
Busy day	kl/day	86	161	274	474	-
Design day	kl/day	62	115	195	339	-
Design hour	m3/hr	31	58	98	169	-
Buffer	days	5.00	5.00	5.00	5.00	-
Storage Required	m3	308.7	575.4	977.3	1694.4	-
K&T Prediction 2023						
Modifier	*%*	*120.00*	*100.00*	*80.00*	*60.00*	-
Yearly consumption	Ml/annum	26.93	41.93	57.02	74.13	85.99
Peak month	Ml/month	3.14	4.89	6.65	8.65	10.03
Busy day	kl/day	104	161	219	285	330
Design day	kl/day	74	115	156	203	236
Design hour	m3/hr	37	58	78	102	118
Buffer	days	7	7	7	7	7
Storage Required	**m3**	**519**	**806**	**1095**	**1 423**	**1 651**
Proposed Config.:	Each, m3			Number of tanks:		
Horizontal	80	6.00	10.00	10.00	10.00	10.00
Vertical	350	0.00	0.00	3.00	3.00	3.00
Total Storage		**480.00**	**800.00**	**1850.00**	**1850.00**	**1850.00**



APPENDIX B: DRAWINGS



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REFERENCE DRAWINGS:
16736P-101 VALVE CHAMBER LAYOUT

NOTES:

REV	DESCRIPTION	DR.	CHKD	APP.	DATE
F	DIESEL TANKS ADDED	SW	WvT	GT	02/10/2024
E	SERVICE STATION LOCATION UPDATED	SW	DJ	GT	21/08/2024
D	UPDATED SITE LAYOUT	SW	DJ	GT	08/08/2024
C	UPDATED / REVISED	MJ	WvT	GT	21/08/2023
B	UPDATED / REVISED	DS	WvT	GT	31/05/2023
A	ISSUED FOR REVIEW	SW	WvT	GT	01/02/2022

	INITIALS	SIGN	DATE
DESIGNED	WvT		
DRAWN	SW		
CHECKED	WvT		
PROJECT ENG.	WvT		
APPROVED	GT		

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CLIENT
CAPE WINELANDS AIRPORT

PROJECT
CAPE WINELANDS AIRPORT

TITLE
SITE LAYOUT

SCALE : AS SHOWN A0

DRAWING No. 16736P-100 REV F

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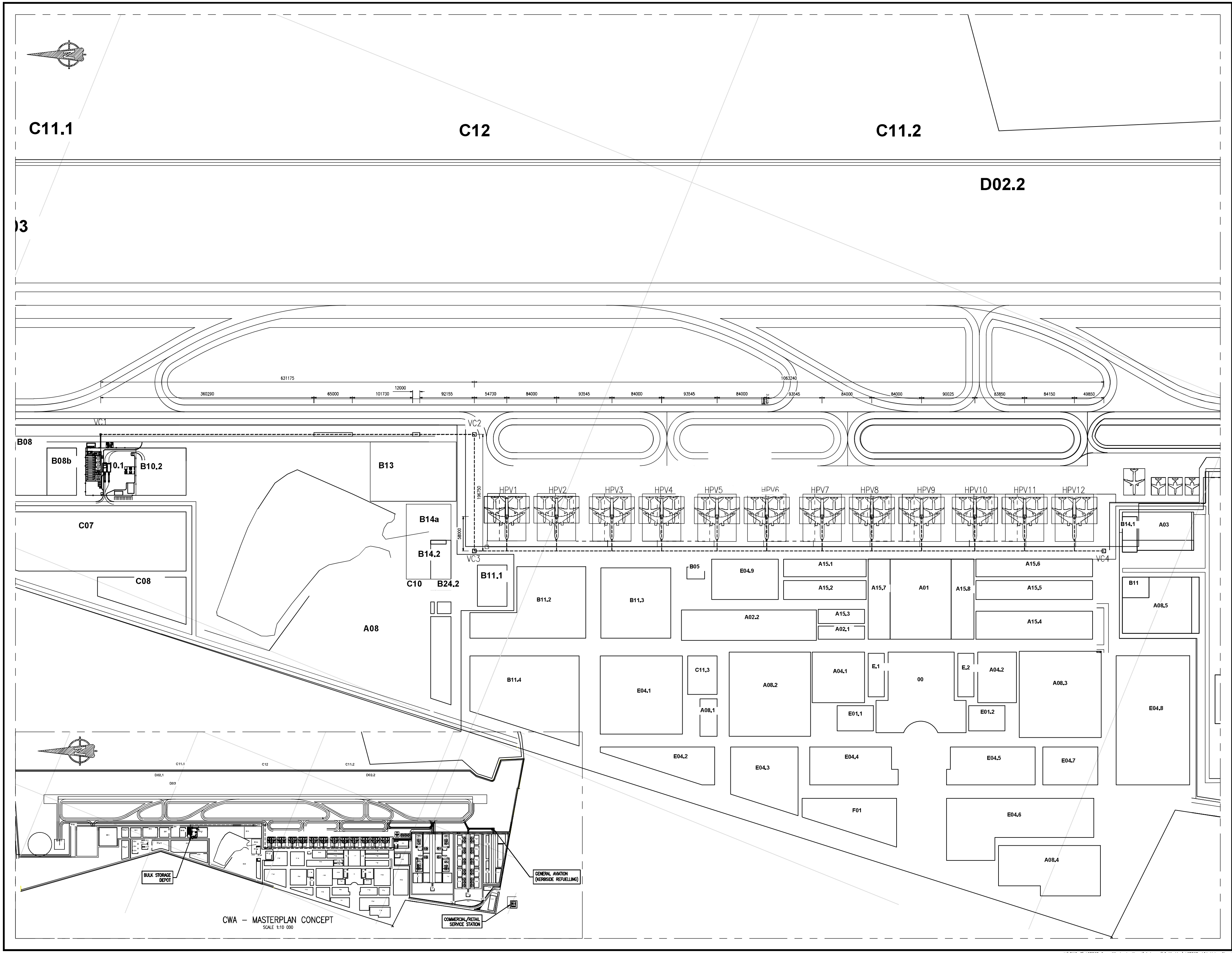

REFERENCE DRAWINGS:
16736-100 SITE LAYOUT

NOTES:

REV	DESCRIPTION	DR.	CHKD	APP.	DATE
E	UPDATED SITE LAYOUT	SW	DJ	GT	02/10/2024
D	UPDATED SITE LAYOUT	SW	DJ	GT	08/08/2024
C	ISSUED FOR REVIEW	MJ	WvT	GT	26/03/2024
B	ISSUED FOR REVIEW	MJ	WvT	GT	31/01/2024
A	ISSUED FOR REVIEW	MJ	WvT	GT	15/08/2023

	INITIALS	SIGN	DATE
DESIGNED	WvT		
DRAWN	MJ		
CHECKED	WvT		
PROJECT ENG.	WvT		
APPROVED	GT		

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PROJECT
CAPE WINELANDS AIRPORT

TITLE
VALVE CHAMBER LAYOUT

SCALE : 1:2000 A0

DRAWING No. 16736P-101 REV E

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APPENDIX C: COMMENTS AND RESPONSES ON CONCEPT REPORT (REV1)

Comments and responses on CWA Concept Design Report (Rev1):

ID	Comments (CWA or other):	K&T Response:	K&T Update:
1	*I understand the 4 horizontal tanks are gauged in line with delivery bowsers i.e. able to receive two deliveries of 40k litres to fill. During operations are you able to use the full 80k litres in a/the tank or would there be an unusable component and if so what percentage/quantum of the 320kl?*	Generally, you have 1x tank "receiving" and 1x tank "settling", with the other two tanks available for buffer stock / refuelling. Assume settling period 24hrs.	For Phase 1 (2029), allowed for 6x horizontal tanks, to be constructed either simultaneously or as required.
2	*Receipt bays, will they operate independently i.e. full redundancy in the event of a unforeseen breakdown or maintenance.*	One receipt bay should handle 8x road tankers per day. Full redundancy available.	Same as before.
3	*Buffer stock levels must be sized in terms of increased reliance on import product and delays associated with shipment, the same applies for refinery product where in recent times we have seen increased issues with both timeous deliveries and quality of product. I would think 5-7 days must be considered to protect uninterrupted operations, we will have to understand the premium attached to this holding stock.*	Agreed. Based on our review you have about. 30Ml of Jet-A1 storage capacity in greater Cape Town.	Increased buffer capacity to 7x days (5x days as per standard industry practice and another 2x days for contingency stock – deviation destination)
4	*We are positioning ourselves as a main diversion airport, narrow and wide bodies, should this be factored into our calculations, what is best practice? Could that also inform a larger quantum of buffer stock?*	Noted. Fuel supply for diverted planes, proposed facilities should handle refuelling request of 100kl (A350/B777 return trip of 12000km). Normal refuelling activities would be impacted, but acceptably disrupted. Frequency of diverted planes unknown.	See above, buffer capacity increased to 7x days.
5	*Bowser capacity and operations as proposed for first phase, number of aircraft that will be serviced per hour for larger aircraft i.e. C,D and E, noting filling of aircraft and refilling of bowsers in-between.*	Noted.	No changes.
6	*What will be the procedure for a under spec batch/tank, will the fuel be removed off-site for re-blending or can that happen on site?*	Return to source.	No changes.
7	*A satellite commercial facility airside will significantly reduce security gate movements and searches, then again most airside*	Agreed. Current design concept has refuelling facility located airside, all bulk	No changes.

ID	Comments (CWA or other):	K&T Response:	K&T Update:
	vehicles will/should be battery powered.	storage tanks and pumps located landside.	
8	*Final position in terms of Master Plan key, cannot afford later relocation, we also need to keep in mind that future supply by rail line in close proximity is possible and likely.*	Future supply by rail: rail receipt with pipeline connected to bulk storage facility (same as ORTIA) sensible. However, please note we do not currently have a functional rail loading facilities in the greater Cape Town.	No changes.
9	*Page 1 to 6 has an October header. From that page onwards its a September header. I think this is an error.*	Corrected.	No changes.
10	*You have the A350-900 range at 5000km. Is that specific for this document and the routes we are looking at?*	Table 2.3 presents K&T input assumptions (plane, pax, distance to travel, etc.) specific for CWA to match your ATM/pax/routes. Used 5000km as representative range for this category (International Code E). The range of the A350-900 is about 15000km.	Code split not available for the NACO forecasts.
11	*You mention the 777-300 as one that has been modelled. Is this then part of the A350-900 or similar? I assume so as its not mentioned again.*	We have modelled both (A350-900 and 777-300), selected A350-900 specific for this report.	Noted.
12	*I know Cape Town has 5 days of buffer stock. Is your allowance of 2 days not too low for phase 1 (3.3.1)?*	You do have multiple Jet-A1 supply options, all with delivery period of approx. 1x day. The proposed layout makes it easy to pull the construction date for vertical tanks earlier if required.	Increased total storage capacity for Phase 1: 480kl Phase 2: 320kl Phase 3: 1050kl Phase 4: 0 Phase 5: 0 to bring total capacity to 1850kl (or approx. 7x days buffer stock).

APPENDIX D: RESPONSES TO COMMENTS ON DRAFT EIA SCOPING REPORT

Project:	Cape Winelands Airport Development
K&T ref.	16736P
Date:	19/02/2024
Rev.	0

	Comments from City of Cape Town (29 January 2024)			
Ref		**Description**	**Comment**	**Response**
6.1		Fire and Rescue	Risk assessment in terms of the Major Hazard Installation regulations needs to be provided by an AIA	Agreed, MHI required.
8.9.1		AEL - Bulk Depot	The proposed expansion (design capacity of 2000m3) triggers listed activity. An application for an AEL is required.	Agreed, AEL required.
8.22		AEL - Service Station	an AEA will not be required for the retail fuel service station	Noted
8.23		AEL - Service Station	Air quality impact as a result of fugitive VOC's must be minimised. It is recommended that Vapour Recovery Systems be installed onto fuel dispensing nozzles at the refuelling pumps.	Noted
8.24		AEL - Service Station	A site specific Leak Detection and Repair (LDAR) programme must be developed	Design and construction according to SANS 10089 Part 3
8.25		AEL - Service Station	All breather vents from underground tanks must be positioned to not cause nuisance to human health.	Design and construction according to SANS 10089 Part 3
8.26		AEL - Service Station	An overfill protection device in tank filling pipe work to prevent overfill.	Design and construction according to SANS 10089 Part 3
12.6		Catchment and River Management	Emergency management procedures must be in place and accessible to address any hydrocarbon spillage (during construction, operational phase and closure)	Agreed.
12.7		Catchment and River Management	Effluent from the oil separators must drain into the sewer system.	Agreed.
12.8		Catchment and River Management	Heavy vehicles use must address the risk of hydrocarbon spills (during constrcution, operational phase and closure).	Agreed.
12.9		Catchment and River Management	Early spillage detection systems must form part of the aircraft refuelling facilities.	Apron hydrant feeder pipeline system designed with leak detection / monitoring system.
	Comments from Country Fair (07 December 2023):			
Ref		**Description**	**Comment**	**Response**
14		Location of service station	Proposed location of commercial / retail service station as set out on the Phase 1 and Phase 2 plans, we note that same is roughly 300m from one of our client's farms and chicken houses.	Noted.
14		Dealing with MHI	The storage of such vast quantities of fuel (for both retail sales and aviation fuels), would make the project a MHI and we do not see provision for an MHI report.	Agreed, MHI required.
	Comments from Garden Cities (05 December 2023):			
Ref		**Description**	**Comment**	**Response**
2.3		Bulk Fuel Storage	Bulk fuel storage facilities should have robust spill containment systems	Design and construction according to SANS 10089 Part 1 and SANS 10131
2.3		Bulk Fuel Storage	Facilities must have well-defined spill response plans in place	Agreed, to be developed during detail engineering prior to operational phase.
2.3		Bulk Fuel Storage	Leak detection - regular monitoring and maintenance of storage tanks and associated piping	Agreed.
2.3		Bulk Fuel Storage	Soil contamination due to leaks and how it will impact the identified wetlands	Noted
2.3		Bulk Fuel Storage	Air emission - designs need to incorporate venting systems to reduce harmful vapours into atmosphere	Agreed, AEL required.
2.3		Bulk Fuel Storage	Maintain accurate records of fuel storage, handling and disposal activities to demonstrate compliance with environmental regulations.	Noted.

APPENDIX E: COST ESTIMATES

CONFIDENTIAL

APPENDIX F: MHI/QRA TERMS OF REFERENCE

RISCOM (PTY) LTD 2002/019697/07
Approved Inspection Authority: Major Hazard Installation (OHS Act 1993)

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1st of February 2024

RISCOM Reference: SAV-24017-P0
Recipient Reference: K&T reference 16736P

Willem van Tonder
Kantey & Templer
P O Box 3132
Cape Town
8000

Dear Sir,

RE: RISK ASSESSMENT FOR THE CAPE WINELANDS AIRPORT

We thank you for the opportunity to provide a proposal and quotation for conducting a risk assessment for the proposed Cape Winelands Airport (CWA) situated in Cape Town.

Background

Kantey & Templer has requested a risk assessment for inclusion in an EIA for the fuels tank farm of the proposed Cape Winelands Airport. The tank farm will have the following design:

- Throughput (design day): 74kl/day (in 2029) to 200kl/day (2044),
- Two bay road receipt,
- Storage (Jet-A1): 10x 83kl horizontals and 3x 350m^3 vertical tanks,
- Storage (Avgas): 2x 30kl double-walled horizontal Tanks,
- Into-place refuelling: by means of bowsers,
- Provision for future apron pumps + feeder pipeline + hydrant pit valves (11x off in total),

Avgas and Jet fuel are flammable liquids and can result in fire and explosion hazards.

These hazardous components each have potential to cause an off-site incident in the event of an accidental release.

Legislation

Risk assessments are conducted when required to do so by law or by companies wishing to determine the risks of the facility for other reasons, such as insurance. In South Africa, risk assessments are carried out under the legislation of two separate acts, each with different requirements. These are discussed in the subsections that follow.

National Environmental Management Act (No. 107 of 1998; NEMA) and its Regulations

Risk assessments regarding public health and safety from major incidents under the NEMA act are associated with environmental impact assessments (EIA) and must be performed in accordance with the act. In this instance, impacts on the environment must be evaluated and mitigation proposed by the specialist conducting the investigation. The specialist must be independent and must demonstrate competency but does not require accreditation.

Section 30 of the NEMA act deals with the control of emergency incidents where an incident is defined as an "unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed". NEMA goes further by giving instructions with regard to reporting such an incident and limiting the effects of such an incident regarding risks to public health and the environment. The identification and mitigation of potential Section 30 incidents is thus crucial in the risk assessment of the project.

This differs from a Major Hazard Installation (MHI) risk assessment done under the Occupational Health and Safety Act (No. 85 of 1993; OHS Act) where the specialist must be an accredited approved inspection authority (AIA), must act on behalf of the Department of Labour and may suggest generic mitigation only (see Subsection 1.1.2). MHI risk assessments undertaken in terms of the OHS Act must also cover mandatory list of elements covered in the MHI regulations. RISCOM (PTY) LTD uses its accreditation by the South African National Accreditation System (SANAS) as an approved inspection authority to demonstrate competency. RISCOM risk assessments are performed in accordance with an accredited quality management system.

The Occupational Health and Safety Act No. 85 of 1993 and its Major Hazard Regulations

The OHS Act and its MHI regulations (2022) requires employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a MHI or a quantity of a substance which may pose a risk (our emphasis) that could affects the health and safety of employees and the public, to conduct a risk assessment in accordance with the legislation. Further to this, prior to construction, the Department of Labour requires a MHI risk assessment to be undertaken by an organisation approved by the Department of Labour.

In accordance with legislation, the risk assessment must be done by an approved inspection authority registered with the Department of Labour and accredited by the South African Accreditation Systems (SANAS).

An MHI risk assessment is a critical factor in the approval of a project involving bulk quantities of hazardous substances. The results of such an assessment will also be used for town planning around the facility and incorporated into the emergency planning of the area.

It should be noted that the Department of Labour requires a MHI risk assessment prior to construction, providing the site is an MHI. The MHI risk assessment is not a requirement for EIA approval. However, despite a successful EIA submission, the project may be rejected by the local authorities under Subregulation 9 of the MHI regulations as given.

Proposed Methodology

From a risk assessment perspective there are normally two external factors that will give authorisation for project approval. Firstly, the EIA phase determines if there are any fatal flaws that will prevent the project proceeding, and secondly an MHI risk assessment will determine if the project can be constructed and operated with all risks to employees and public at an acceptable level.

At the EIA phase it is acknowledged that some work has been done by the owner regarding design, layout, use of chemicals or fuels, etc. The owner also acknowledges that approval of the EIA does not automatically give authorization for construction or operation. For example, the owner must meet statutory and municipal bylaws in regards to building plans, etc.

In the EIA phase the risk assessment should have a statement from a professional person covering:

1. The identification of potential NEMA Section 30 incidents;
2. The determination of whether the proposed project likely to be considered an MHI;
3. If found to be an MHI, the determination of whether the proposed project would meet the requirements of the MHI regulations and whether the risks could be engineered or managed to an acceptable level;
4. The determination of whether there any factors that will prevent the project from proceeding to the next phase of construction or alternatively whether the project could continue under certain conditions or with mitigation;
5. The determination of whether there are any special requirements that the local authorities should be aware of when evaluating the proposal.

Generally, at the EIA phase there is insufficient detailed information to complete an MHI risk assessment in full accordance with the MHI regulations. For example, emergency plans have not been developed and final designs have not been completed. Under the circumstances a risk assessment would be conducted generally in accordance with the prescribed topics of the MHI regulations.

The definition of risk is consequence multiplied by frequency measured in units of fatalities per person per year. A risk assessment considers both consequence and frequency. For a particular layout, the consequence normally remains unchanged, while frequency may change with mitigation.

The proposed risk assessment will assess the consequence of major events with the extent of the impact. Risks will be calculated based on the detail available and some assumptions. Excessive risks (as per international criteria) will be highlighted with some mitigation suggestions to reduce risks to international criteria.

By definition, an EIA proposes mitigation that must be addressed in the final designs. Thus, the final designs are expected to be different from the designs presented during the EIA. Similarly, the risk assessment done at the EIA phase cannot be submitted as a MHI risk assessment as the designs and layouts are subject to change after the EIA.

The risk assessment for the proposed facility would be quantitative and would calculate absolute values to benchmark risks to international criteria. The risks will either be unacceptable, acceptable with mitigation or acceptable without further mitigation.

The risk assessment will be based on SANS 1461. The consequence and risks would be calculated using software with inputs into Gexcon's RISKCURVES.

In order to comply with legislation two risk assessments would need to be developed.

The first would be for the EIA study and would be an unaccredited report. The report would be formatted in such a way that it could be converted into a MHI risk assessment prior to construction. This report may not be suitable for submission as a MHI risk assessment as it may not fully match legal requirements.

The second risk assessment would be required prior to construction and would be done under the OHS Act and its MHI regulations. This report would be an SANAS accredited report and would include recalculations for the changes indicated by the Environmental Authorisation and would include all the required elements of the MHI regulations not completed in the EIA risk assessment such as evaluation of emergency planning. This quotation covers only the EIA risk assessment.

Quality

The Occupational Health and Safety Act of 1993 (Act No. 85 of 1993; the OHS Act) requires that an approved inspection authority (AIA) complete all MHI risk assessments. Michael Oberholzer of RISCOM is an AIA practitioner for MHI risk assessments, as per the statutory requirements.

While the risk assessment for EIA submission is not an accredited report, RISCOM's accreditation establishes their capacity to produce an accurate and weighty report.

Furthermore, each report is reviewed to a high standard of quality including such elements as:

- The requirements of applicable legislation;
- The requirements of the AIA accreditation where applicable;
- The ISO/IEC 17020 standard for Inspection Bodies where applicable, which incorporates many the elements of the ISO/IEC 9001 standard;
- Professional presentation and language essentials.

Scope

RISCOM will conduct a quantitative risk assessment (QRA) of the airport fuel facilities and associated infrastructure at Cape Winelands Airport, according to the background described:

The scope of the risk assessment will include:

1. Review of preliminary designs of proposed processing units, inventories, routing and transport conditions for all alternatives;
2. Development of accidental spill and fire scenarios for the facility;
3. Using generic failure rate data (for tanks, pumps, valves, flanges, pipework, gantry, couplings and so forth), determination of the probability of each accident scenario;
4. For each incident developed in Step 3, determination of consequences (such as thermal radiation, domino effects, toxic-cloud formation and so forth);
5. For scenarios with off-site consequences (greater than 1% fatality off-site), calculation of maximum individual risk (MIR), taking into account all generic failure rates, initiating events (such as ignition), meteorological conditions and lethality.

This information will then be used to identify any shortcomings and to rank the risks for possible risk reduction programmes.

The results of the assessment will be tabled in a document addressing some or all of the topics listed in the MHI regulations and would not be adequate for submission as a MHI risk assessment. It should also be noted that the risk assessment will not constitute an environmental risk assessment covering topics such as pollution.

The risk assessment will exclude natural events such as earthquakes and floods.

Cost, Schedule and Exclusions

The cost for conducting a risk assessment according to the proposal and deliverables as described in this letter is:

	Description	Hours	Cost / hour	**Cost (ZAR)**
	EIA			
1	**General**			
	Site visit			
	Purchase meteorological data			
	Preparation of meteorological data			
2	**Fuel Facilities for CWA**			
	Develop Failure Rates and Incident Scenarios			
	Consequence Modelling and Analysis of Results			
	Maximum Individual Risks			
	Societal Risks			
	Report			
	Courier declaration			

4	**Public Meeting**			
	Airfare			
	Meeting (1 day)			
	Car Hire			
	Accommodation& Meals			
	Sub Total:			
	VAT			
	TOTAL			

Additional work requested by the client will be done on a separate contract.

It is estimated that the report will be completed within 6-8 weeks after a valid order has been placed and all requested information has been delivered to RISCOM (to facilitate this kindly take note of Schedule A). The commencement date will be a mutually agreeable date to both parties.

The cost covers one electronic copy of the report.

This quotation is valid for 30 days from the date of issue.

The payment schedule is 30 days after invoice.

The cost for converting an EIA risk assessment to a MHI risk assessment would be approximately half of the professional fees, providing no significant changes to the process, layout or inventories.

The cost of completing the scope of work as described in this document excludes the following items:

- The cost of obtaining specific information relating to the facility and site, process and equipment, such as drawings, copies and prints; such information is to be supplied free of charge to RISCOM as per Schedule A;
- Development of emergency plans;
- HAZOP studies and other safety reviews;
- Specific personnel protection equipment required for specified areas;
- Attendance of public meetings;
- Other subsidiaries or other company located on the power station site.

I trust this meets with your consideration. Should there be any further requirements or queries, please do not hesitate to contact me.

Yours faithfully,

For RISCOM (PTY) LTD

M P Oberholzer Pr. Eng.
Director

SCHEDULE A

INFORMATION REQUESTED FROM THE CLIENT

The following information, where available, is requested for the completion an accurate risk assessment report for EIA submission:

1. A **plot plan** to scale;
2. **Piping and instrumentation diagrams (P&ID)** of installations that contain or convey the hazardous components described in the background of the letter;
3. **Material safety data sheets (MSDSs)** of all hazardous components described in the background of the letter;
4. **An inventory of bulk hazardous components** to be stored on site, with details of storage vessels, such as number, volume, type and orientation;
5. A **process description**;
6. **Details of delivery vehicles**, including type, volume and frequency of delivery;
7. **Details of process and transport pipelines**, including maximum operating pressure, maximum operating temperature, pipe diameter, details of valves, pipe length between shut-off valves, maximum pump rate, shut-off period, details of pigs, pipe route including reducing stations, slabs, depth of cover, year of construction and ground moving likelihood (high, medium, low);
8. **Details of the bulk storage vessels,** showing the type, design code, contents, storage pressure and temperature, height, diameter, working volume, nozzle details, venting details, material of construction and whether tanks are inerted or blanketed;
9. **Details of tank containment** (bund), showing bund dimensions, contained volume, distance to other tanks, installations and boundaries;
10. **Process flow diagrams,** showing material balance, temperature and pressure;
11. **Details of any safety measures**, codes and standards in place.

While RISCOM makes every effort to make progress from the agreed date of commencement, if the information that is necessary is not provided there will be unavoidable delays in releasing the finalised report.

CURRICULUM VITAE (CV) FOR PROPOSED PROFESSIONAL STAFF

MICHAEL PAUL OBERHOLZER

Proposed Position: Risk Assessor

Name of Company: RISCOM (PTY) LTD

Name of Staff: Michael Paul Oberholzer

Profession: Chemical Engineer

Date of Birth: 20 August 1959

Years with Company: 21

Nationality: South African

Membership in Professional Societies:

- Registered Professional Engineer (Registration No.: 910085) with the Engineering Council of South Africa
- Member of the South African Institute of Chemical Engineers
- Charted Chemical Engineer Institute of Chemical Engineers (UK) (Registration No: 20561539)
- Approved Inspection Authority for Major Hazard Installation (MHI) Risk Assessments, South Africa
- Technical Steering Committee for Risk Assessments

Key Qualifications:

Michael Oberholzer is currently director of RISCOM. He is a registered professional engineer and holds a BSc (Chemical Engineering) from the University of the Witwatersrand (1982). Mike has over 20 years of experience with Dow chemicals and Sentrachem in all aspects of project implementation. This includes Process Engineering Manager, Project Manager and Commissioning Manager. Since leaving Dow, Mike has concentrated on process safety and has completed a number of risk assessments studies and process hazard analyses in various industries, including assignments in the chemical, petrochemical, agrochemical, mining, offshore oil and gas and food industries.
A selection of relevant projects is included in the following sections.

NUCLEAR

2008 to present	Safety report for marine and land-based incidents for proposed nuclear sites
2008	Safety report for aircraft accidents into nuclear facility
2008	Appointed to conduct risk assessment of fuel plant, Pelindaba
2006	Risk assessment of tank farm for PBNR
2005	Consequence analysis of fuel plant layout, Pelindaba
2003–2005	Chairman of HAZOP studies for PBNR

LNG

Lead Process Engineer for quantitative risk assessment of:

2022	The LNG Facility at the BUA Cement Facility at Sokoto, Northern Nigeria
2020	Importation and Distribution of liquid natural gas (LNG) into the COEGA SEZ
2020	The proposed Tema terminal from LNG to VRA in Ghana, West Africa
2020	LNG importation, storage and transportation for SRK
2020	LNG importation, storage and power production for SE Solutions
2020	LNG based power plant for Mulilo
2014	LNG importation and storage facilities for the CSIR in the Western Cape
2016	LNG based power plant, Western Cape
2016	LNG importation and transportation for Delta Natural Gas

OIL AND GAS

Lead Process Engineer for quantitative risk assessment of:

2022	The Natural Gas Pipeline from Tokaradi to Tema
2021	The Puma Energy Depot at Walvis Bay, Namibia
2021	The Proposed Novo LNG Hub at the Highveld Industrial Park near Emalahleni, Mpumalanga Province
2021	MHI risk assessment of the Sunrise Energy LPG overland pipeline at Saldanha Bay
2021	MHI risk assessment of the Sunrise Energy LPG terminal at Saldanha Bay
2021	MHI risk assessment of the OTMS Pipelines at Saldanha Bay, Western Cape
2019	Fire risk assessment for SamCol, Mozambique
2019	Occupied building risk assessment for Tema Fuel Company, Ghana
2019	Fire risk assessment for Thebe Unico, Durban
2019	LPG pipeline changes as part of the Port of Berbera, Somiland
2017	Fire risk assessment for condensate tanks, Kenya
2015	A natural gas pipeline for the Transnet in Durban North
2014	LNG facilities for the CSIR in the Western Cape
2014	CNG overland pipeline in Groutville, KwaZulu-Natal
2013	LPG installations for NGK, Cape Town
2013	LPG installations for Easigas (Port Shepstone)
2013	LPG installations for Sunrise Energy in Saldanha Bay
2012	LPG installations for Trellidor, Durban
2011	LPG installations for Afripak, Durban
2010–2011	LPG installations for Monsanto, Brits and Groblersdal
2010	LPG installations for Air Liquide
2009	A compressed natural gas plant, Gauteng
2004-2005	The Egoli Gas depots in Langlaagte and Cottesloe

Lead Process Engineer for:

2006	An emergency plan and oil spill contingency for Petronas, with regards to offshore drilling (Mozambique)
2006	Determination of hazardous areas from releases of H_2S from vents and pipelines
2005	Flare studies for Total facilities in Angola The studies consisted of calculating the radiation from flares at various locations and the subsequent evaluation of the safety distances from the flares The studies included air dispersion for H_2S in the event of flameout

TANK FARM AND FLAMMABLE STORAGE AND TRANSPORTATION

Lead Process Engineer for quantitative risk assessment of:

2021	MHI risk assessment of the Cape Ocean terminal at the Saldanha Bay IDZ
2021	MHI risk assessment of the Bayer facility in Brits, North West
2021	75 MW thermal dual fuel facility near Kathu, Northern Cape
2020	Ola Energy LPG Terminal in Mombasa, Kenya
2020	X-Storage facility in Beira, Mozambique
2020	MHI risk assessment of the Saldehco Pipelines in Saldanha Bay, Western Cape
2020	MHI risk assessment for the Teraco data centre in Brackengate, Cape Town
2020	MHI risk assessment for a data centre in Atlantic Hills, Cape Town
2020	MHI risk assessment for a data centre at the Film Studios, Cape Town
2020	MHI risk assessment for a centre in Brackengate, Cape Town
2019	EIA risk assessment for new tank farm, Coega
2019	MHI risk assessment for OTGT, Coega
2018	Bulk tank farm and LPG facility at Coega
2018	LPG facility for Monsanto at Brits
2017	New fuel depot and import pipeline at Durban
2017	New fuel depot at Alrode
2017	Fire risk assessment at fuel storage tanks, KwaZulu Natal
2017	LPG and liquid tank farm in Tema, Ghana
2017	LPG facility in Kenya
2016	The OTGC facility in Cape Town
2016	LPG facility for Monsanto at Groblersdal
2015	A bulk crude-oil tank farm for Oil tanking MOGS in Saldanha Bay
2014	The First Rand Bank data centre facilities in Pretoria and Johannesburg
2014	The Vopak facility in the Island View Complex in Durban
2014	The Econ Oil facility in Marble Hall, Limpopo
2014	An occupied building risk assessment of BP facilities in Mozambique
2013	The Air BP facility in East London
2013	A crude storage facility at Saldanha Bay
2013	VSAD Terminal Lesedi at Heidelberg
2012	Kenmare Moma Mine in Mozambique
2012	Golder Africa study for tank farm (LPG and other fuels) near Heidelberg, Gauteng
2012	CSIR study for tank farm (LPG and other fuels) at Coega, Eastern Cape
2011-2012	BP fuel depots at Langlaagte and Pretoria
2010	Transnet Pipelines fuel depots around South Africa
2008	Multi-product tank farms in the Island View Complex in Durban
2007	Petroleum tank farm in the Western Cape
2005	An overland pipeline near Mossel Bay
2005	Holcim waste fuel blending
2004	Petroleum tank farms in Island View Complex in Durban and the Western Cape

WAREHOUSING

Lead Process Engineer for quantitative risk assessment of:

2020	MHI risk assessment for the Arch Wood protection facility in Port Shepstone
2017	Warehouse for Lonza, Chloorkop
2017	Storage of hazardous goods at Umbogintwini, KwaZulu Natal
2017	Storage of hazardous goods, Johannesburg

POWER PLANTS

Lead Process Engineer for quantitative risk assessment of:

2022	The Proposed 1000 MW Gas to Power Plant – Zone 13 at Coega, Eastern Cape Province
2022	MHI risk assessment of the proposed Canelands Gas to Power Plant at Canelands, KwaZulu Natal
2022	The Proposed Phakwe Power Plant at Richards Bay, KwaZulu Natal
2022	The HDF Renewable Energy Power Plant at Swakopmund, Namibia
2022	The Puma Energy Depot at Walvis Bay, Namibia
2022	The proposed Sokoto Gas to Power Plant at the Cement Company of Northern Nigeria
2021	The proposed Impofu Wind Farm battery storage (West) near Clarkson
2021	The proposed Impofu Wind Farm battery storage (North) near Clarkson
2021	The proposed Impofu Wind Farm battery storage (East) near Oyster Bay
2021	Mulilo Total gas to power plant at the Coega SEZ
2021	Engie gas to power plant at the Coega SEZ
2021	320 MW Phinda Power plant at Richards Bay, KwaZulu Natal
2020	Newcastle gas engine power plant at Newcastle, KwaZulu Natal
2020	315 MW Gas engine power plant at Saldanha Bay
2020	200 MW Gas-to-Power plant at Atlantis, Western Cape
2020	1000 MW Gas-to-Power plant Zone 13 at Coega, Eastern Cape
2020	1000 MW Gas-to-Power plant Zone 10 (North) at Coega, Eastern Cape
2020	1000 MW Gas-to-Power plant Zone 10 (South) at Coega, Eastern Cape
2020	MHI risk assessment of the Richards Bay Gas power 2 plant in Richards Bay
2020	The proposed Coal to Urea project at Emalahleni, Mpumalanga
2020	The proposed Nseleni Independent floating power plant at the port of Richards Bay
2018	EIA risk assessment for new power plant, Richards Bay
2016	LNG based power plant, Western Cape
2015	An Eskom power plant in the Free State
2013	A refurbished power plant in Maputo, Mozambique
2012	Matla power station in the Witbank areas
2012	Energy recovery project for Anglo American
2010	Coal-based power plants in the Witbank areas
2009	Coal-based power plants in the Waterberg areas
2008	Proposed gas-fired power plants in Mozambique
2008	The conversion of the peaking power to a CCGT plant located at Atlantis, Western Cape
2006	Coal-based power plants near Witbank and Vaal South
2006	Proposed peaking power plants in KZN and Eastern Cape
2006	The expansion of the peaking power plant located at Atlantis, Western Cape
2005	The EcoElecrica Independent Power Generation Project at Mittal Steel in Vanderbijlpark
2004	Iscor Power Project at Vanderbijlpark

FOODS AND BEVERAGES

Lead Process Engineer for quantitative risk assessment of:

2021	MHI risk assessment of the Chill Beverages International facility in Stellenbosch
2017	Johnson & Johnson static ignition study, in Cape Town
2014-2016	The Spar distribution centres in the South Rand, North Rand, Western Cape and Eastern Cape
2015	A soya crushing facility for Russell Stone Protein in Bronkhorstspruit
2014	The Sasko Bakery facility in Bloemfontein
2014	The Peninsula Beverage Company facility in Cape Town
2014	The Chill Beverages International facility in Stellenbosch
2014	The Kynoch fertilizer facility in Endicott, Gauteng
2013-2014	The Coca-Cola Fortune facilities in Port Elizabeth, Port Shepstone and Polokwane
2013	The Quantum Food chicken processing plant at Hartesbeesfontein

FOODS AND BEVERAGES

2013	The ABI bottling facility in Johannesburg reviewed
2013	The new Unilever ice cream factory facilities at Chloorkop
2011	The Rainbow Chickens processing plant, Rustenburg
2010	The Famous Brands facility in Midrand
2010	The McCain Foods facility in George
2010	The Coca-Cola Canners facility in Germiston
2005	The ABI bottling facilities in Johannesburg, Midrand and Pretoria

CHEMICALS AND MANUFACTURING

Lead Process Engineer for quantitative risk assessment of:

2023	The Anglo-American Hydrogen Production Development Platform Project at the Mogalakwena Mine, Limpopo
2023	MHI risk assessment of the review for Trellidor, Phoenix, KwaZulu Natal
2022	The Fishwater Flats Wastewater Treatment Works Biogas Project at Port Elizabeth
2022	MHI risk assessment of the Belgotex Floorcoverings LPG Installation in Pietermaritzburg, KwaZulu Natal
2022	MHI risk assessment of the MAHLE Behr Facility in New Germany, KwaZulu Natal
2022	MHI risk assessment of the Lanxess Facility in Merebank, Durban
2022	MHI risk assessment of the Solvpac Facility in Ladysmith
2022	MHI risk assessment of the Innovative Water Care SA Holding Pty Ltd Facility at Chloorkop in Kempton Park
2022	MHI risk assessment of the Dow Chemicals in New Germany, KwaZulu Natal
2022	MHI risk assessment of the Isegen Facility at Isipingo, KwaZulu Natal
2021	MHI risk assessment of the FFS refiners' facility in Prospecton, KwaZulu Natal
2021	MHI risk assessment of the Belgotex Floorcoverings LPG Installation in Pietermaritzburg, KwaZulu Natal
2021	MHI risk assessment of the Emalahleni Water Reclamation Plant
2021	The Caustic Soda Make-up Plant in Chloorkop, Kempton Park
2021	MHI risk assessment for the Tweefontein water reclamation plant located near Ogies
2020	MHI risk assessment for Foskor, KwaZulu Natal
2019	MHI risk assessments for Isegen, Durban and Germiston.
2017	Relocation of chemical plant from Port Shepstone to Cato Ridge
2016	A-Gas storage and handling facility in Cape Town
2016	NCP chlor-alkali facility at Chloorkop
2016	The Arch Water Products facility at Chloorkop
2015	Two SA Calcium Carbide facilities in KwaZulu-Natal
2015	The Arch Wood Protection facility in Port Shepstone
2015	The Arengo ethanol plant in Cradock
2015	A water reclamation facility at the Optimum Colliery in Mpumalanga
2014	The Foskor facility in Richards Bay
2013	The Eagle Inks facility in Pinetown
2013–2016	New bio-generation plants converting animal waste to electricity
2013	The Unilever facility in Phoenix, Durban
2013	A rapid wall facility in Richards Bay
2013	The Transnet Rail Engineering facilities in Germiston and Uitenhage
2012	The BAE Systems Land Systems facility in Alrode
2012	The CONSOL Glass facility in Nigel
2012	An ArcelorMittal polyurethane facility
2012	Isegen facilities at Durban and Germiston
2012	A MAP plant in Richards Bay
2012	An occupied building risk assessment and hazardous area classification for Synthomer, Durban
2012	New hydrogen fluoride and aluminum fluoride plant in Richards Bay
2012	The Chevron lubricant manufacturing facility

CHEMICALS AND MANUFACTURING

2011	Steel plant in Witbank
2011	Steel plant in Saldanha Bay
2011	Platinum refinery in Springs
2011	New hydrogen fluoride and aluminum fluoride plant in Gauteng
2010	Steel plant in Cato Ridge
2010	A bulk argon storage facility in Johannesburg
2009	An aluminum fluoride plant in KwaZulu-Natal
2009	Shell Chemicals, Durban
2009	The Unico facility in Durban
2008	The Revertex facility in Durban
2007	A new chlor-alkali facility in the Eastern Cape
2002–2008	Ammonia refrigeration plants throughout South Africa
2007	Alkylation plant in KwaZulu-Natal
2006	The Element Six facility in Springs
2006	The Singisi Forest Products wood product facility in Kokstad
2006	The Lanxess facility in Merebank, Durban
2006	A 900 t butane storage facility in Durban This study considered fires and explosions from an accidental loss of containment of material
2005	Impala Platinum BMR expansion This included the consequent modelling of fires and explosions of flammable liquid and gases as well as air dispersion of toxic gases
2005	NCP Chlorchem expansion This included the consequent modelling of fires and explosions of flammable liquid and gases as well as air dispersion of toxic gases
2005	The Dow Chemical Company facilities at Canelands, Chloorkop, Sasolburg and Berlin This included the consequent modelling of fires and explosions of large flammables and toxic gases
2004	The Magalies Water purification plant at Vaalkop

REFINERIES

Lead Process Engineer for quantitative risk assessment of:

2009	A refinery expansion in Suriname
2006	Fire zoning classification of Saudi Aramco's Luberef facility, Saudi Arabia. The study defined the fire zones as per the requirements of Saudi Aramco
2006	Building risk assessment of the Saudi Aramco Luberef facility, Saudi Aramco. The study consisted of a full quantitative risk assessment as per API 752
2005	PetroSA refinery near Mossel Bay

HAZOP AND LOPA/SIL STUDIES

HAZOP Chairman for:

2010 to present	BP Southern Africa covering depots at Langlaagte, Pretoria, East London and Cape Town
2023	The ENPC Strategic Fuel Reserve Facility at Phuzamoya in Eswatini
2023	All the Systems at the Shell Kroonstad Depot in the Free State
2023	Overfill Protection on Storage Tanks at the Shell Rocky Drift Depot
2023	All the Systems at the Shell Alrode Depot in Alberton, Gauteng
2023	The Piping Changes at the Bidvest Tank Terminal Bulk Liquid, Handling and Storage Facility at Island View
2023	The Tank Emergency Shut Down Valves at the Total Energy Depots

HAZOP AND LOPA/SIL STUDIES

2023	The Venetia Stormwater Management Project near Musina, Limpopo
2022	The New Firefighting System at Berth 9 at the Port of Durban
2022	The Systems at the Shell Alrode Depot in Alberton, Gauteng
2022	The Total Energies Island View Terminal Tank 644 Conversion from Diesel to ULP
2022	The HFO and MFO Road Tanker Loading Project at the Shell Island View Terminal
2022	The HFO and MFO Road Tanker Loading Project at the Shell Island View Terminal
2022	The Natcos Berth 9 Line Replacement at the Island View Complex, Durban
2022	The Rail Gantry Project at the Horizon Terminals in Djibouti
2022	FRA for the TPL Jet A-1 Facility at the OR Tambo International Airport
2022	The VIVO Energy Depot Locate in Windhoek, Namibia
2022	The VIVO Energy Depot Locate in Tsumeb, Namibia
2022	The Brix ACRW Sinter Plant in Cato Ridge, KwaZulu Natal
2022	The New Firefighting Pumps at the Engen Depot in Montague Gardens, Cape Town
2022	The Importation and Storage of Caustic Soda at the Unico Tec Facility at Island View in Durban
2022	The Engen SDCO Depot Located at Elliot, Eastern Cape
2022	The New Firefighting System at the Engen SDCO Depot in Elliot, Eastern Cape
2022	The New Firefighting System at Puma Blantyre, Malawi
2022	The Firefighting Upgrade at the Engen SDCO Depot Located at Aliwal North, Eastern Cape
2022	The Kanengo Depot Extension at Lilongwe, Malawi
2022	The Total Energies Gantry Secondary Shut Down Valves
2022	The Astron Energy Depot for the VRU Piping at East London
2022	The Butane Tank Conversion at the Bidvest Tank Terminal Bulk Liquid, Handling and Storage Facility at Richards Bay
2022	The Totalgaz Depot at Chamdor, Gauteng
2022	The Totalgaz Depot at Blackheath in Cape Town
2022	The Total Gantry Secondary Shut Down Valves
2022	The Total IVT Rail Siding Upgrade at the Island View Terminal in Durban
2021	The Puma HFO Terminal at Matola, Mozambique
2021	The Puma Energy Terminal at Walvis Bay, Namibia
2021	The Biodiesel Blending Project at the Shell Depot in Witbank
2021	Valve Replacement at the Shell Depot at Alrode, Gauteng
2021	The MLA Stripping Pump Project, Island View in Durban
2021	The Engen SDCO Depot Located at Elliot, Eastern Cape
2021	The Shell Kroonstad Depot ULP Conversion Project, Free State
2021	The Firewater Pump House Changes at the Airports Company South Africa at the Cape Town International Airport
2021	The Valve Operation Tank at the Shell Mossel Bay Depot
2021	The Totalgaz Depot at Blackheath in Cape Town
2021	The Totalgaz Depot at Polokwane
2021	The Totalgaz Depot at Chamdor, Gauteng
2021	The Pump House changes at the Engen Terminal, East London
2021	The Engen Aliwal North depot at Aliwal North, Eastern Cape
2021	The tank 10 repairs, modification and upgrade project at the Shell depot at Alrode
2021	The West Coast petroleum (SDCO) depot build review at Morreesburg
2021	The Total IVT rail siding upgrade project in Durban
2021	The Shell Witbank Depot firefighting compliance project
2021	The Idwala Carbonates Ore Sorter project in Port Shepstone
2021	Process Hazard Analysis for firefighting at the Engen SDCO in Vryburg
2021	Adjustment of the set pressure of the crude line surge relief valve at the Natcos Fynnland site 2 at the Island View complex in Durban
2021	Process Hazard Analysis for remedial work at the Engen terminal in Vryburg
2021	Natcos Fynnland site tie-in to the multiple product pipeline at the Island View complex in Durban
2021	Process Hazard Analysis for remedial work at the Engen SDCO in Queenstown
2021	Process Hazard Analysis for a fire protection upgrade at Rheinmetall Denel Munition in Somerset West and Wellington, Cape Town

HAZOP AND LOPA/SIL STUDIES

2020	LRP to Diesel change over at the Total Island View terminal in Durban
2020	Shell Rocky Drift depot additive underground tank replacement project at White River
2020	T-009 MOV changes at the Shell depot at Alrode
2020	The Bushveld Electrolyte company's vanadium electrolyte plant in East London
2020	Shell Island view terminal VRU rail connection project located in Durban
2020	Underground additive tank replacement at the Shell depot located at Alberton
2020	Underground additive tank replacement at the Shell depot located at Mossel Bay
2020	Shell Rocky Drift Tank 03 conversion project in White River
2020	Process Hazard Analysis for the AIR BP Beira depot underground tank replacement in Beira
2020	Bidvest bank terminal bulk liquid, handling and storage facility (LPG section) in Richards Bay
2020	Fire Hazard Assessment of the Indy Oil facility in Pietermaritzburg
2020	Biodiesel storage and blending pipeline upgrade at the Shell depot in Witbank
2020	Biodiesel storage and blending pipeline upgrade at the Shell depot in Alberton
2020	Underground tank replacement for the Shell depot in Polokwane
2020	New HFO tank farm at Mali (completed using teleconferencing)
2020	Automation of the road gantry at the Puma depot in Malawi
2020	Tank changes for the Puma depot at Matola, Mozambique
2020	Extension of the fuel lines at Cape Town International Airport
2020	Changes to the additive tanks at the Shell depot at Kroonstad
2020	Changes to the Shell depot at Kroonstad
2019	Automation of the tank inlet valves at the Shell depot, Alrode
2019	New LNG facility at Tema, Ghana
2019	New fuel tank for Puma Energy, Malawi
2019	New tank for SamCol, Mozambique
2019	Fertilizer blending facility and warehouse, Durban
2019	Astron berth changes, island View
2019	ULP product line changes at the Shell depot, Witbank
2019	Dust HAZOP for Johnson & Johnson, Cape Town
2019	Revalidation of BP depot at East London
2019	Revalidation of BP depot at Pretoria
2018	Changes to ULP tank at the Shell depot in Witbank
2018	New diesel tank farms for Vivo, at the port and mine in Guinea (completed using Teleconferencing)
2018	New double walled tanks at the Total depot, Alrode
2018	Diesel tank for Total, Aldag
2018	Changes to the Oily Water System at BP Cape Town
2018	Firefighting system upgrades at the Total depot, Ladysmith
2018	New LPG facility at Richards Bay
2017	Changes to acrylates storage at Vopak, Island View Complex, Durban
2017	New fuel tanks for Vopak at the Island View Complex, Durban
2017	Pipeline changes for Total at the Island View Complex, Durban
2017	New LPG facility at Coega
2016	Vopak tank farms at Island View, Durban
2016	Engen depots in Namibia
2016	A reactor upgrade at the Engen facility in Durban
2015	An ice-cream factory for Unilever at Chloorkop
2015	The national multi-product pipeline for Transnet in Durban
2015	Fuel transport pipelines for Oiltanking MOGS in Saldanha Bay
2014	The Enerwaste medical waste facility in Waltloo, Pretoria
2014	The Tongaat-Hulett Starch mill in Germiston
2014 to 2016	The VTTI Burgan Oil facility in Cape Town
2013	The Sunrise Energy LPG terminal in Saldanha
2013	The SimsGas facility in Chamdor
2013	The Vanchem Vanadium Products facility in Emalahleni
2013	The ArcelorMittal facility in Newcastle

HAZOP AND LOPA/SIL STUDIES

2013	The Proxa brine treatment facility in New Vaal
2010	Sasol projects at Secunda and Sasolburg
2007–2010	A chrome chemical facility, KZN
2007	Chlorine expansion, Gauteng
2007	LOPA study for a large LPG installation and chemicals, Durban
2004–2004	Project upgrades at petroleum tank farms
2003–2005	Proposed nuclear installation at PBMR
2002–2004	Chevron on eight oil platforms off the coast of Cabinda

Education:

BSc (Chemical Engineering), University of the Witwatersrand, South Africa, 1982

Employment Record:

2002 to present Director, RISCOM, South Africa
Involved in process safety consulting including MHI risk assessments and facilitating process hazard analysis studies (HAZOP, SIL & LOPA)

2001–2002 Managing Member, Penoc Consulting, South Africa
Involved in Process Engineering Project Management and Process Safety Consulting for various projects

1995–2001 Process Manager for Dow Chemicals, South Africa
Managed the cost estimation, project approvals, process designs and commissioning of various plants within the group

1993–1995 Technical Manager for Sentrachem, Durban South Africa
Managed the Technical Department of a facility conducting technical investigations, projects and continual plant improvements

1986–1993 Process Engineer for Sentrachem, Germiston, South Africa
This involved conducting plant investigations, design of new plants, installing and commissioning new equipment

Languages:

	Speaking	**Reading**	**Writing**
English (first)	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Average

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this data correctly describes me, my qualifications and my experience.

Date: 23rd of March 2023

Full name of staff member: Michael Paul Oberholzer

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RISCOM* (PTY) LTD is a consulting company specialising in process safety and performing tasks such as:

- Risk assessments (of transportation and buildings and to client requirements);
- Major Hazard Installation (MHI) risk assessments;
- Facilitating hazard and operability (HAZOP) studies, failure mode and effects analyses (FMEAs), layer of protection analyses (LOPAs) and other process hazard analyses (PHAs);
- Safety audits and accident investigations;
- Fires and explosion modelling;
- Air dispersion simulations.

RISCOM is an approved inspection authority (AIA) for the conducting of Major Hazard Installation risk assessments in accordance with the OHS Act 85 of 1993 and the Major Hazard Installation regulations (July 2001). In order to maintain our status of AIA, RISCOM is accredited by the South African National Accreditation System (SANAS) in accordance with the IEC/ISO 17020 quality management system. The accreditation consists of a number of elements including technical competence and third party independence.

The independence of RISCOM is demonstrated by the following:

- RISCOM does not sell or repair equipment that can be used in the process industry;
- RISCOM does not have any shareholding in processing companies nor companies performing risk assessment functions;
- RISCOM does not design equipment or processes.

The director of RISCOM Michael Oberholzer is an AIA practitioner for Major Hazard Installation risk assessments, thus meeting the competency requirements of SANAS for assessments of hazardous materials covering fires, explosions and toxic releases.

While RISCOM is based in South Africa, work has been performed for operations in the Netherlands, Mozambique, Namibia, Angola, Suriname, Israel, Iran and Saudi Arabia as well as and including assignments on offshore facilities. RISCOM has experience in the chemical, petrochemical, iron and steel, pulp and paper, oil and gas, mining and metallurgy, nuclear and food industries.

RISCOM has an extensive client database including locally based and major operating international companies as well as specialised companies performing scientific studies, including environmental impact assessment (EIA) preparation and submission.

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