Hendrina Green Hydrogen and Ammonia Facility, Mpumalanga
Transport Impact Assessment
(EIA phase)

April 2023
REVISION 1

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VERIFICATION PAGE	Qual-frm-026
	Rev 14

TITLE:
Hendrina Green Hydrogen and Ammonia Facility (Mpumalanga)- Transport Impact Assessment

JGA REF. NO.	DATE:	REPORT STATUS
5397-03-EIA	18-04-2023	Revision 1

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SYNOPSIS

Preparation of a Traffic Impact Assessment as part of the Environmental Impact Assessment (EIA) of the proposed Hendrina Green Hydrogen and Ammonia Facility.

KEY WORDS:

Transport Impact Assessment, renewable energy, green hydrogen, Ammonia

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.

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Filename:	X:\Projects - (In-progress)\5397 Enertrag Mpumalanga WEF (IW)\Report\Hendrina Green Hydrogen and Ammonia Project -18-04-2023_.docx

Report template version: 2017-10-30

Hendrina Green Hydrogen and Ammonia Facility, Mpumalanga

Transport Impact Assessment

TABLE OF CONTENTS

TABLES

FIGURES

ANNEXURES

1 INTRODUCTION

1.1 Project background

ENERTRAG South Africa (hereafter "ENERTRAG SA") is a subsidiary of the German-based ENERTRAG AG, a hydrogen and renewable energy developer founded in 1992. ENERTRAG AG has an established track-record of renewable energy projects around the world, comprising over 100 wind turbines with an installed capacity of over 760MW, and over 500 employees. Current projects are in Germany, United Kingdom, France, Poland, Bulgaria and Belarus.

ENERTRAG SA was established in 2017, with the intention to investigate and develop renewable energy projects in South Africa. The transition from coal-based energy supply to renewables in the Country is inevitable, as coal resources are depleted, coal-based power stations reach the end of their economic life and considering international obligations and commitments to reduced emissions. The Project development area is blanketed with numerous coal prospecting and mining rights. Coal mining and energy derived from coal mining is the likely alternative to the Project. ENERTRAG SA are developing renewable energy projects to contribute to the Just Transition that promises to decarbonise South Africa's energy sector and aims to:

- replace coal-based electricity with renewable electricity
- decarbonise different sectors of the economy through the replacement of fossil-based hydrogen and ammonia with green hydrogen and ammonia.

ENERTRAG SA proposes to develop the Hendrina Renewable Energy Complex, the complex comprises of five separate projects. The projects are:

- Hendrina North Wind Energy Facility (up to 200MW) over 3 600ha;
- Hendrina South Wind Energy Facility (up to 200MW) over 2 900ha;
- Hendrina North Grid Infrastructure (up to 275kV) – 15km;
- Hendrina South Grid Infrastructure (up to 275kV) – 16km;
- Green Hydrogen and Ammonia Facility (up to 25ha).

Each of these projects are being assessed, as part of the Complex development, and involve the undertaking of Listed Activities identified in the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) and as such require an Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) before being undertaken.

This report pertains specifically to the Green Hydrogen and Ammonia Facility (hereafter "the Project"). The Project is being developed for private off-take by nearby mining and industrial operations.

1.2 Terms of reference

JG Afrika (Pty) Ltd was appointed by ENERTRAG SA, to provide a Traffic Impact Assessment (TIA) for the EIA phase of the proposed Hendrina Green Hydrogen and Ammonia facility in Mpumalanga.

This TIA is aimed at determining the traffic impact of the proposed land development and whether the development traffic can be accommodated by the existing road network.

The Terms of Reference for this study include the following:

General:

- A description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- A description and evaluation of environmental issues and potential impacts (including direct, indirect, cumulative impacts and residual risks) that have been identified;
- Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the EIA Report;
- A statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts;
- A comparative evaluation of the identified feasible alternatives and nomination of a preferred alternative;
- Any aspects conditional to the findings of the assessment which are to be included as conditions of the Environmental Authorisation;
- This must also include any gaps in knowledge at this point of the study. Consideration of areas that would constitute “acceptable and defendable loss” should be included in this discussion.
- A reasoned opinion as to whether the proposed project should be authorized;
- Summary of the positive and negative impacts and risks of the proposed project and identified alternatives; and
- Mitigation measures and management recommendations to be included in the Environmental Management Programme.

Specific:

- Extent of the transport study and study area;
- The proposed development;
- Trip generation for the facility during construction and operation;
- Traffic impact on external road network;
- Accessibility;
- Transport requirements;
- Assessment of internal roads and site access;
- Assessment of freight requirements and permitting needed for abnormal loads; and
- Traffic accommodation during construction.

1.3 Approach and Methodology

The report deals with the traffic impact on the surrounding road network in the vicinity of the site during the:

- Construction and installation of the facility;
- Operation and maintenance of the facility during the operational phase; and
- The decommissioning phase.

This transport study was informed by the following:

<u>Project Assessment</u>

- An initial meeting with the client to gain sound understanding of the project;
- Overview of project background information including location maps, component specifications and any resulting abnormal loads to be transported; and
- Research of all available documentation and information relevant to the proposed facility.

The transport study considered and assessed the following:

<u>Traffic and Haul Route Assessment</u>

- Estimation of trip generation;
- Discussion on potential traffic impacts;
- Assessment of possible haul routes between port of entry / manufacturing location; and
- Construction, operational (maintenance) and decommissioning vehicle trips.

<u>Site layout, Access Points and Internal Roads Assessment per Site</u>

- Description of the surrounding road network;
- Description of site layout;
- Assessment of the possible access points onto the site; and
- Assessment of the proposed internal roads, if available

1.4 Information Sources

The following guidelines have been used to determine the extent of the traffic study:

- TRH26 South African Road Classification and Access Management Manual, COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 1), COTO, August 2012
- TMH 16 South African Traffic Impact and Site Traffic Assessment Manual (Vol 2), COTO, February 2014
- Google Earth Pro
- Transnet port terminals web site (www.transnetportterminals.net)
- Mpumalanga Road asset Management System (http://www.mp-rams.co.za/rams/rams.html)

1.5 Assumptions, Knowledge Gaps and Limitations

The following assumptions, knowledge gaps and limitations apply:

- This study is based on the project information provided by the client.
- According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300mm and total maximum length 10 500mm. It is envisaged that for this project, the inverter, transformer, and switchgear will be transported to site in containers on a low bed truck and trailer. A mobile crane and the transformer transport are the only abnormal load envisaged for the site. The crane will be utilised for offloading equipment, such as the transformers.
- Maximum vertical height clearances along the haulage route are 5.2m for abnormal loads.
- If any elements are manufactured within South Africa, these will be transported from their respective manufacturing centres, which would be either in the greater Cape Town area, Johannesburg, or possibly Pinetown/Durban.
- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Material for the construction of internal access roads will be sourced locally as far as possible.
- Abnormal loads expected are:
    - Water Treatment Unit (to be delivered to site in modular units)
    - Electrolyser Unit (to be delivered to site in modular units)
    - Air Separation Unit (to be delivered to site in modular units)
    - Ammonia Processing Unit (to be delivered to site in modular units)
    - Liquid Air Storage System (LAES) (to be delivered to site in modular units)
    - Liquid Ammonia Storage Tank (to be delivered to site in modular units)
    - Hydrogen Storage Tank (to be delivered to site in modular units)
- Port of entry is envisaged to be the Port of Richards Bay.
- The construction period is estimated at 24 months.

2 Description Of The Affected Environment

2.1 Project Location

The Project is located 17km west of Hendrina, in the Steve Tshwete Local Municipality, of the Nkangala District Municipality, Mpumalanga Province. Three alternative project locations are being investigated for the development of the proposed Project:

Site Alternative 1 is located on Portion 3 of the Farm Dunbar 189IS, at the site of an old, abandoned farmyard and has three powerline options from the associated Hendrina North and South Wind Energy Facilities ("WEF") as follows:

- Powerline option 1 is up to 2km in length, to the Hendrina North WEF substation Option 1 on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 7km in length, to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 1.5km in length, to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS.

Water supply to the Site:

- constructing a new pipeline (up to 16km) from the Komati Power Station

Site Alternative 2 is located on Portion 3 of the Farm Dunbar 189IS and Portion 18 of the Farm Weltevreden 193IS, adjacent to the proposed Hendrina South WEF substation and has three powerline options from the associated wind farms as follows:

- Powerline option 1 is up to 3km in length to the Hendrina North WEF Option 1 substation on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 8km in length to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 0.5km in length to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS;

Water supply to the Site:

- constructing a new pipeline (up to 16km) from the Komati Power Station

Site Alternative 3 is located on Portions 14 and 15 of the Farm Weltevreden 193IS and has three powerline options from the associated wind farms as follows:

- Powerline option 1 is up to 5km in length to the Hendrina North WEF Option 1 substation on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 5km in length to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 7km in length to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS.

Water supply to the Site:

- constructing a new pipeline (up to 16km) from the Komati Power Station

The Project, and associated water pipeline and powerlines, is proposed over the following farm portions.

Table 2-1: Farm Portions affected by the Project Alternatives

Parent Farm	Farm No	Portion No
Facility Alternative Site 1		
Dunbar	189IS	3
Facility Alternative Site 2		
Dunbar	189IS	3
Weltevreden	193IS	18
Facility Alternative Site 3		
Weltevreden	193IS	14
Weltevreden	193IS	15
Associated pipelines and powerlines may affect portions of the following land parcels:		
Bultfontein	187IS	1
Bultfontein	187IS	2
Bultfontein	187IS	3
Bultfontein	187IS	4
Bultfontein	187IS	6
Bultfontein	187IS	10
Bultfontein	187IS	14
Dunbar	189IS	0
Dunbar	189IS	1
Dunbar	189IS	2
Dunbar	189IS	4
Dunbar	189IS	5
Dunbar	189IS	6
Dunbar	189IS	7
Geluk	26IS	6
Geluk	26IS	7
Hartebeestkuil	185IS	3
Komati Power Station	56IS	0
Wilmansrust	47IS	1
Wilmansrust	47IS	3
Wilmansrust	47IS	9

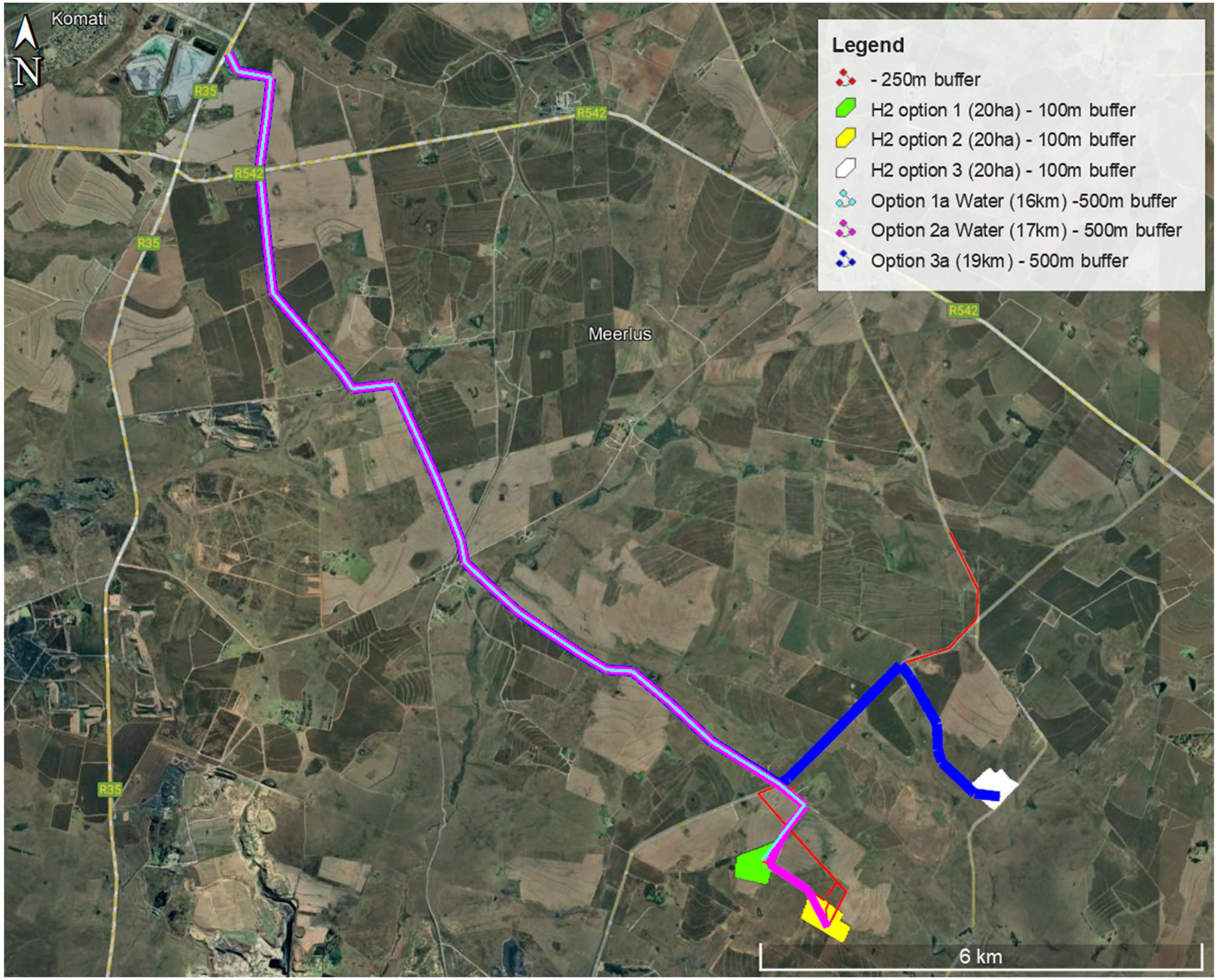

Figure 2-1: Locality Map

2.2 Surrounding road network

The roads in the surrounding road network in the vicinity of the site are typically classified to aid in understanding the functions of these roads. Based on road function and class, access spacing and appropriate road design standards for proposed connecting roads can be established. The road classifications adopted in South Africa are outlined in the COTO's South African Road Classification and Access Management Manual (TRH26), (2012).

In general, there are two types of roads, mobility roads and access/activity roads. These roads are further classified based on their setting (i.e., rural and urban) with rural roads using some mobility roads for local functions due to limited networks of roads and larger access spacing requirements. Based on TRH26, the main functions of rural mobility and access/activity roads are as follows:

a) The main function of rural mobility roads is to connect areas that are large traffic or strategically important generators. These generators typically include cities, towns, villages, rural settlements, border posts, mining areas, seaports, airports, large game and nature parks, other mobility roads, etc.

b) The main function of rural access/activity roads is to provide access to individual properties, whether farms, settlements, mines, tourist areas, game and nature parks, heritage sites, etc. Animals and farm equipment should not be allowed on mobility roads but can be accommodated on access/activity roads provided that appropriate measures are introduced to manage their impact.

Mobility and access/activity roads are further classified by number based on their function. Road Classes 3 to 5 are located in the vicinity of the Project.

Class R3 rural minor arterials typically carry inter-district traffic between: Small towns, villages and larger rural settlements; Smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight and other traffic in the district (public transport and freight terminals, railway sidings, small seaports and landing strips);Very small or minor border posts; Tourist destinations; Other Class 1, 2 and 3 routes; and Smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

Class R4 rural collector roads form links to local destinations. Class R4 routes do not carry through traffic but only carry traffic with an origin or destination along or near the road. Class R4 routes typically give access to smaller rural settlements, tourist areas, mines, game and nature parks and heritage sites. The roads can also provide direct access to large farms. Collector roads can also be provided within larger rural settlements to provide a collector function in such settlements.

Class R5 rural local roads provide direct access to smaller individual properties such as within rural settlements, as well as small to medium sized farms in rural areas. They serve no other purpose than to give such access.

Figure 2-2 provides an overview map of the surrounding road network.

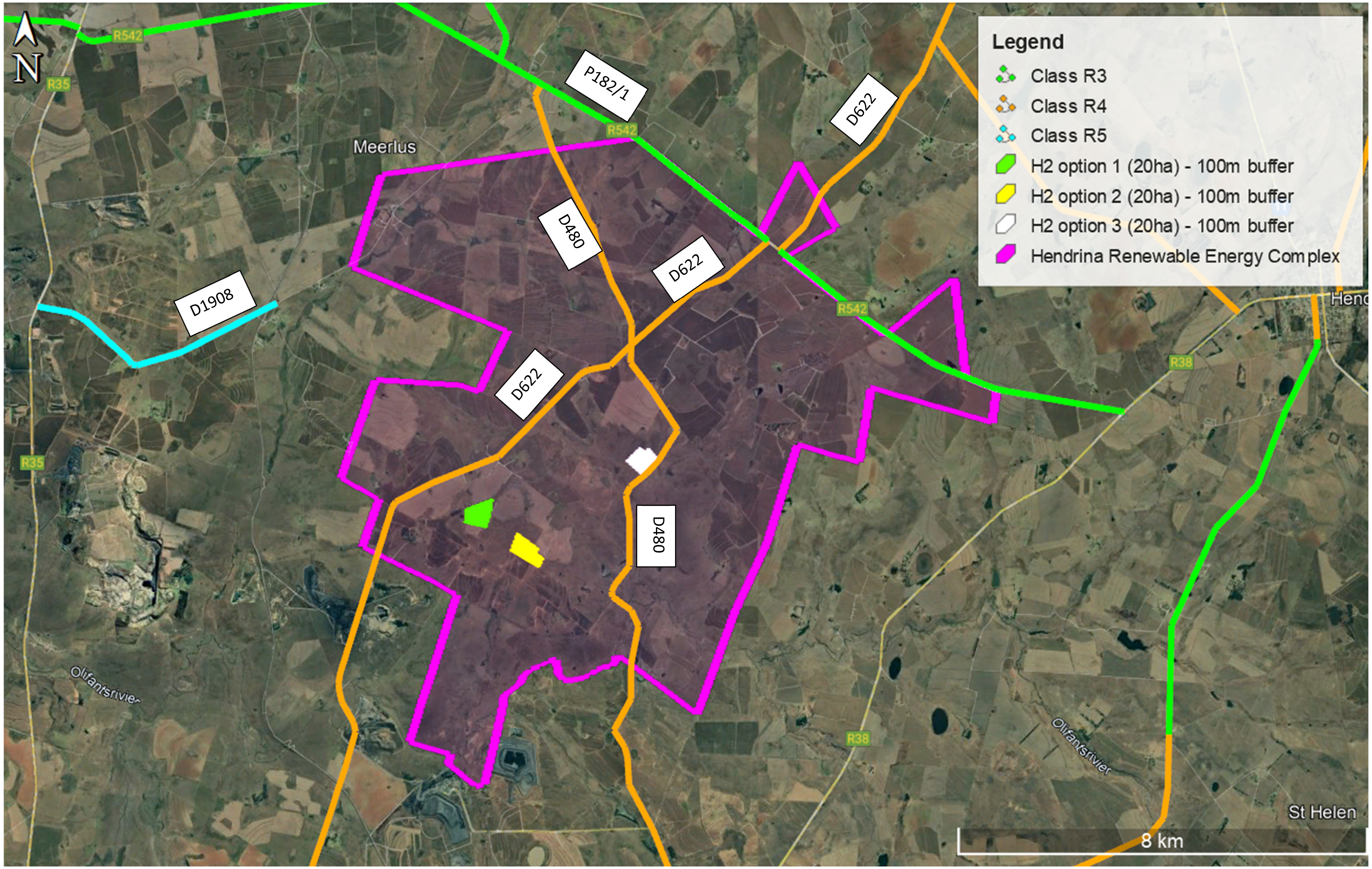

Figure 2-2: Road Network

2.3 Traffic volume information

Based on the Mpumalanga Road Asset Management System, the 2019 Annual Average Daily Traffic (AADT) on the D622 and D840 road sections surrounding the green hydrogen and ammonia site options is rated as low to medium. The AADT on the D480 road section located north of the site is rated as low (i.e. D480_170) , and the P181/1 road section north of the site (i.e. P182/1_040 to P182/1_050) is rated as high (see **Figure 2-3** and **Table 2-2).** Traffic congestion is therefore expected on the P181/1 road section north of the site, while the D622 and D480 road sections in the vicinity of the site are expected to have some capacity. Traffic congestion mitigation measures are therefore strongly encouraged during the construction stage.

Table 2-2: Traffic Data summary (Year 2019)

Road_No#	Road_link_	from_km	to_km	length_km	2019 AADT	Surface	Traffic volume category
P182/1+	P182/1_010+	0	13.25	13.25	2280	paved	High
P182/1+	P182/1_020+	13.25	15.4	2.15	1701	paved	Medium
P182/1+	P182/1_030+	15.4	24.03	8.63	62	paved	Low
P182/1+	P182/1_040+	24.03	24.94	0.91	2270	paved	High
P182/1+	P182/1_050+	24.94	30.34	5.4	2189	paved	High
P182/1+	P182/1_060+	30.34	30.64	0.3	1875	paved	Medium
P182/1+	P182/1_070+	30.64	38.33	7.69	1737	paved	Medium
D480+	D480_140+	55.73	57.34	1.61	181	gravel	Medium
D480+	D480_150+	57.34	60.21	2.87	91	gravel	Low-Medium
D480+	D480_160+	60.21	70.97	10.76	91	gravel	Low-Medium
D480+	D480_170+	70.97	76.49	5.52	15	gravel	Low
D622+	D622_030+	12.73	15.99	3.26	429	paved	Low
D622+	D622_040+	15.99	25.27	9.28	504	paved	Low-Medium
D622+	D622_070+	25.27	31.08	5.81	503	paved	Low-Medium
D622+	D622_080+	31.08	34.35	3.27	531	paved	Low-Medium
D622+	D622_090+	34.35	39.53	5.18	199	paved	Low
D622+	D622_100+	39.53	40.64	1.11	199	paved	Low
D622+	D622_110+	40.64	47.34	6.7	199	gravel	Medium
D622+	D622_112+	47.34	47.41	0.07	199	paved	Low
D622+	D622_115+	47.41	47.48	0.07	199	paved	Low
D622+	D622_120+	47.48	55.93	8.45	199	gravel	Medium

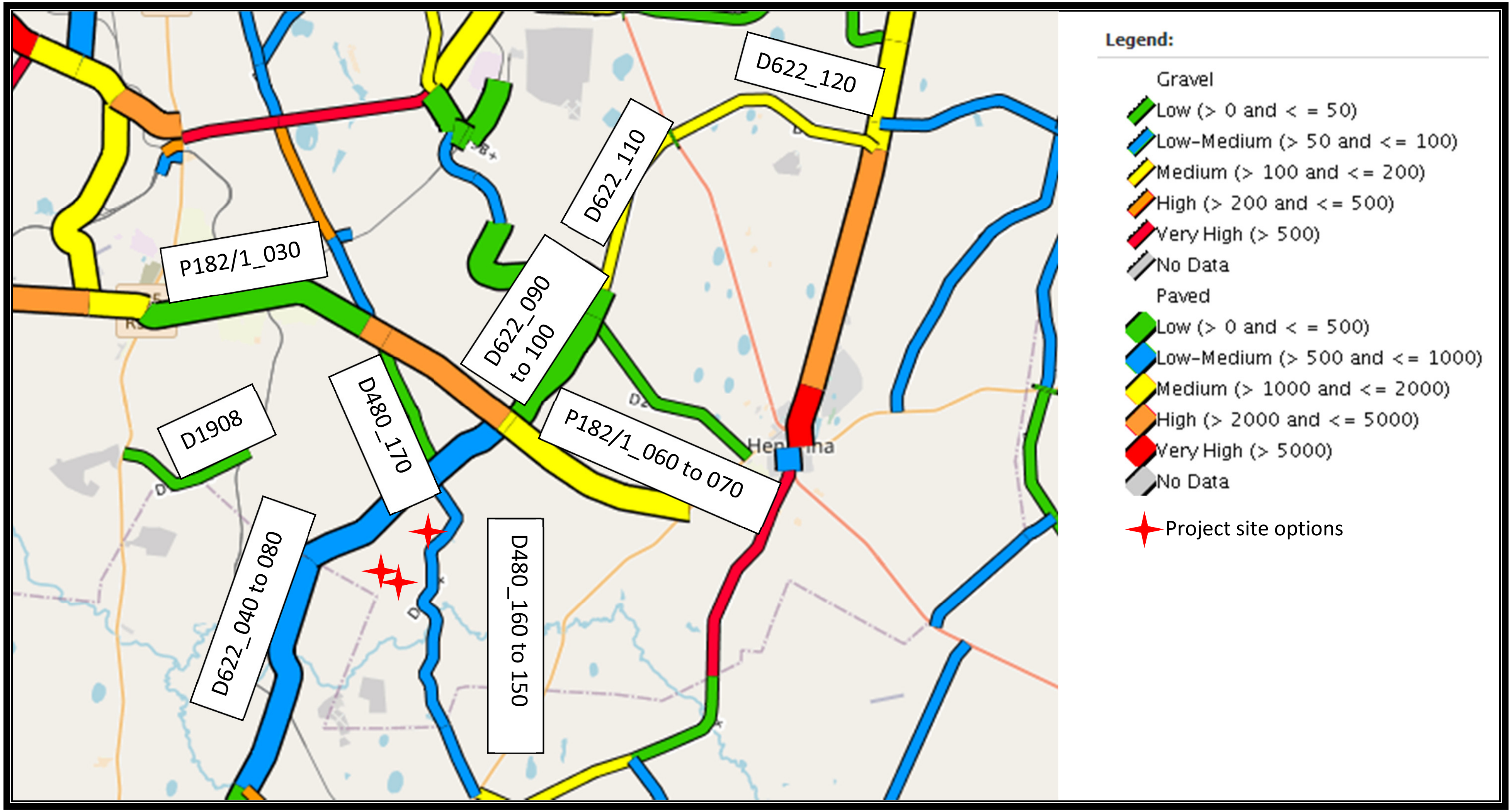

Figure 2-3: Traffic Data Information (year 2019)

2.4 Internal Roads

The geometric design and layout for the internal roads from the access points needs to be established to accommodate vehicles expected to access the site. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. If gravel roads are to be utilised in any way, it needs to be ensured that gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

The geometric design constraints encountered due to the terrain should be taken into consideration by the geometric designer. Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow ease of travel for larger transport load vehicles.

2.5 Access requirements

2.5.1 Access location

The Hendrina green hydrogen facilities are located on farm portions that connect to provincial Class 4 roads. The H2 options 1 and 2 can be accessed off an existing gravel road (see access point 01 in **Figure 2-4**) while the H2 option 3 can be accessed via a proposed access 02.

Proposed access 01 is located at an existing access thus access spacing issues are not envisaged. Proposed access 02 is located more than 600m away from any formal existing access points. This meets the minimum access spacing requirements as set out in the TRH26 minimum access spacing guidelines for rural access points on Class 4 roads.

The gravel access roads may need to be upgraded to accommodate vehicle access needs during construction and operation of the site.

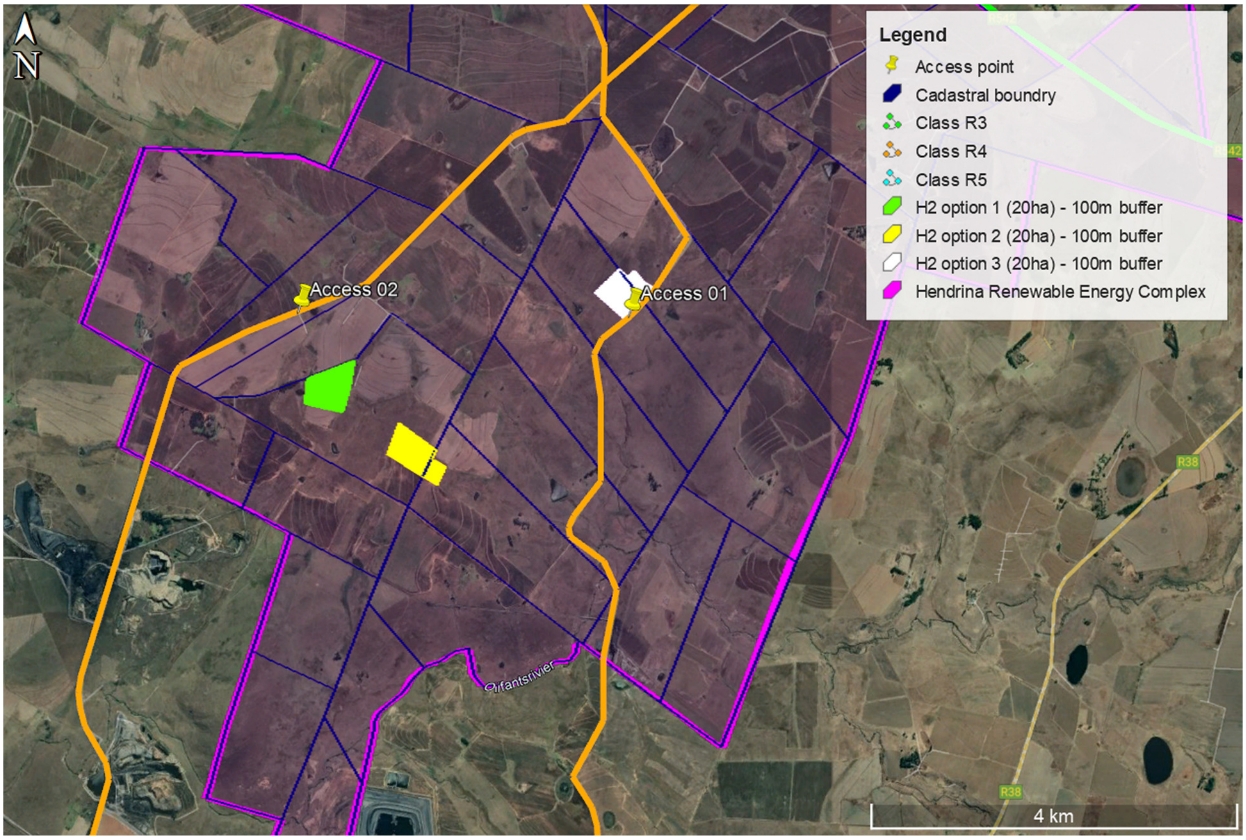

Figure 2-4: Site Access Roads

- Traffic safety:
  Access points should allow for sight distances as prescribed by appropriate road design guidelines for the design speed. To maintain sight lines, sight triangles should be kept clear of obstructions, including street furniture and landscaping elements. However, objects less than 0.6m in height, such as street signs, may be placed in the triangle.

  It is recommended that appropriate signage and markings are provided to alert road users of access points ahead. The road reserve needs to be maintained to prevent obstructions to sight lines. Additionally, road upgrades may be required along existing access roads to accommodate expected vehicles.

  All road markings and signage need to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

2.5.2 Stacking distance

Site access points to facilities are often controlled by gates or boom. To mitigate the impact of the vehicles queuing on the external road network, it is recommended to accommodate a stacking distance/queue length at the access. Queue length is the access road length between the access control and the road edge of the external connecting road.

TMH 16 Volume 2 provides guidelines on accessing queue length. The following considerations have to be made when considering queue length:

- Traffic ratio (i.e., Traffic ratio= $\frac{Total\ volume\ /PHF}{Service\ flow\ rate} x100$)

- The total volume would be the maximum peak hour volume estimated for the site during operation.

- The Peak Hour Factor (PHF) compares the traffic volume during the busiest 15-minutes of the peak hour with the total volume during the peak hour.

  (i.e., PHF= $\frac{Peak\ hour\ volume}{(peak\ 15\ minute\ volume\ within\ the\ peak\ hour\ )x4}$)

  To determine this value, one needs traffic data. In leu of available traffic data typical values can be utilised, however this affects the accuracy of the results.

- Service flow rates as outlined in **Table 2-3** below.

Table 2-3: Access control service flow rates

Access control type	Service flow (vph)
Swipe magnetic card	480
Remote controlled gates	450
Ticket dispenser: Automatic	390 -450
Ticket dispenser: Push button	220 - 360
Pin number operated gates	150
Pay fee on entry	120
Cell-phone operated gates (gate opens when a call is received)	100
Manual recording, Visitor completes form	80
Intercom operated gates (visitor contacts resident by intercom)	50

- Assuming 21 peak hours trips, a typical rural PHF of 0.88 as suggested by the highway capacity manual and a service flow rate of 80 (i.e., Manual recording, Visitor completes form), the traffic ratio will be 30.

Once the traffic ratio is calculated for the site access, **Figure 2-5** can be utilised to determine the required storage or stacking length (i.e., number of vehicles to be accommodated in the queue length).

At an estimated traffic ratio of 30 and one access lane anticipated (i.e., 1 channel), a storage length of 2 is recommended for the site (i.e., 2 x 6m passenger vehicle staking length = 12m stacking distance)

90th Percentile queue length (vehicles per channel) at controlled accesses						
Storage (Vehs)	Traffic ratio (Percentage) for different Numbers of Channels					
N_{Que}	1 Channel	2 Channel	3 Channel	4 Channel	5 Channel	6 Channel
1	23	58	97	140	188	235
2	39	94	155	220	292	363
3	49	115	186	261	341	421
4	56	128	205	283	367	449
5	61	137	216	297	382	466
6	65	143	224	306	392	476
7	68	147	229	312	399	484
8	70	151	233	317	403	489
9	71	153	236	321	407	493
10	73	155	239	324	410	496

Figure 2-5: TMH 16 Vol 2 Queue length at controlled access points

It is anticipated that larger abnormal loads will visit the site during the construction stage. A traffic management plan can be used to minimise the impacts of such vehicles on the surrounding road network. For example, abnormal load vehicle access can be scheduled such that the access is fully open with no access control in place during abnormal load delivery.

2.6 Transporting Other Plant, Material and Equipment

The nearest towns in relation to the proposed project site are Hendrina, Komati, Bethal, Middelburg and Emalahleni. It is envisaged that most materials, water, plant, services and people will be procured within a 50km radius of the proposed site.

Concrete batching plants and quarries in the vicinity could be contracted to supply materials and concrete during the construction phase, which would reduce the impact on traffic on the surrounding road network. Alternatively, mobile concrete batching plants and temporary construction material stockpile yards could be commissioned on vacant land on or near the proposed site. Delivery of materials to the mobile batching plant and the stockpile yard could be staggered to minimise traffic disruptions.

A batching plant is being authorised as part of the WEFs and will be used if the construction schedule runs con-currently with the green hydrogen and ammonia plant.

3 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO THE STUDY

3.1 Typical transportation vehicles

The vehicle types needed during the construction of the facility can be inferred from the infrastructure expected on site. The facility comprises the following components as summarised in **Table 3-1** below. These parameters are based on the assumption that an up to 150MW electrolyser is installed (maximum).

Table 3-1: Facility Components

No.	Component	Footprint (Ha)	Storage Capacity (m^3 / tons)	Maximum Throughput (m^3 / tpa)	Conversion	Note
1	Water Reservoir	2	6 800 / 6 800	800 / 800	Density of water taken as 1 000 kg/m3	Process and utilities water
2	Water Treatment Unit	1.5	N/A	192 000 / 192 000	Density of water taken as 1 000 kg/m3	Process and utilities water
3	Electrolyser Unit	1	N/A	(1 239 157 – 301 932 367) / 20 000	Density of hydrogen can be 16.14kg/m3 at 200 barg and 25 °C or 0.06624 kg/m3 at 0 barg and 90 °C depending on the operating conditions of the unit.	Hydrogen Output Oxygen Output
4	Air Separation Unit	0.5	N/A	92 905 405 / 110 000	The density of air taken as 1.184 kg/m3	Air Input
5	Ammonia Processing Unit	2	N/A	149 253 / 100 000	The density of liquid ammonia taken 670 kg/m3 at -33 °C at 1 atm	Ammonia Output
6	Liquid Air Storage System (LAES)	1	3 983/ 3 505	460 227 / 405 000	The density of liquid nitrogen taken 880 kg/m3 at -33 °C at 1 atm	Nitrogen Storage
7	Liquid Ammonia Storage Tank	2	2 273/ 1 523	261 194 / 175 000	The density of liquid ammonia taken as 670 kg/m3 at -196 °C at 1 atm	
8	Hydrogen and Oxygen Storage Tank Farm	12	59 566/ 800	5 576 208 / 90 000	A density of 16.14kg/m^3 for hydrogen at 200 barg and 25 °C. Oxygen density estimated at liquid boiling point and 1 atmosphere pressure, totaling 1141 kg/m^3.	Hydrogen and Oxygen storage (combined tank farm), i.e., feedstock storage
9	Ancillary infrastructure	3	n/a	n/a	n/a	Includes temporary and permanent laydown areas, parking, offices and other related infrastructure.
	Total Footprint	**25**				

Associated infrastructure further include:

- Electrical infrastructure required for power supply to the facility.
- Temporary and permanent laydown areas required for temporary storage and assembly of components and materials.
- Access road/s to the site and internal roads between project components, with a width of up to up to 6m wide respectively.
- Fencing and lighting.
- Lightning protection.
- Telecommunication infrastructure.
- Stormwater channels.
- Water pipelines
- Offices.
- Operational control centre.
- Operation and Maintenance Area / Warehouse / workshop.
- Ablution facilities.
- A gate house.
- Control centre, offices, warehouses.
- Security building.

The following vehicle types are typically utilised during the construction of green hydrogen and ammonia facilities:

Green Hydrogen and Ammonia Facility

- Conventional trucks within the freight limitations to transport building material to the site
- Convectional truck within the freight limitations for the transport of steel water tank components (i.e., corrugated steel sheets, brackets etc)
- Abnormal vehicle delivery of large-scale components such as nitrogen, hydrogen and oxygen storage tanks.

Grid/power Line:

- Conventional trucks within the freight limitations to transport building material to the site,
- Light vehicles and buses transporting workers from surrounding areas to site,
- Drilling machines and other required construction machinery being transported by conventional trucks or via self-drive to site, and
- The transformer transported in an abnormal load,
- Abnormal mobile crane for assembly on site,
- Transmission tower sections transported by abnormal load.

3.2 Transportation requirements

3.2.1 Legislative and Permit Requirements

Key legal requirements pertaining to the transport requirements for the abnormal loads are:

- Abnormal load permits, (Section 81 of the National Road Traffic Act 93 of 1996 and National Road Traffic Regulations, 2000),
- Port permit (Guidelines for Agreements, Licenses and Permits in terms of the National Ports Act No. 12 of 2005), and
- Authorisation from Road Authorities to modify the road reserve to accommodate turning movements of abnormal loads at intersections.

3.2.2 Abnormal Load Considerations

Abnormal permits are required for vehicles exceeding the following permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996) and the National Road Traffic Regulations, 2000:

- Length: 22m for an interlink, 18.5m for truck and trailer and 13.5m for a single unit truck
- Width: 2.6mHeight: 4.3m measured from the ground. Possible height of load – 2.7m.
- Weight: Gross vehicle mass of 56t resulting in a payload of approximately 30t
- Axle unit limitations: 18t for dual and 24t for triple-axle units
- Axle load limitation: 7.7t on the front axle and 9t on the single or rear axles

Any dimension / mass outside the above limits will be classified as an Abnormal Load and will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

In addition to the above, the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

There are bridges and culverts along the National and Provincial routes, which need to be confirmed for load bearing capacity and height clearances. However, there are alternative routes which can be investigated if the selected route or sections of the route should not be feasible.

Any low hanging overhead lines (lower than 5.1m), e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles.

3.2.3 Further Guideline Documentation

The Technical Recommendations for Highways (TRH) 11: "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outlines the rules and conditions that apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.

The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power / mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the Road Traffic Act and the relevant regulations.

3.2.4 Permitting – General Rules

In general, the limits recommended in TRH 11 are intended to serve as a guide to the Permit Issuing Authorities. It must be noted that each Administration has the right to refuse a permit application or to modify the conditions under which a permit is granted. It is understood that:

a) A permit is issued at the sole discretion of the Issuing Authority. The permit may be refused because of the condition of the road, the culverts and bridges, the nature of other traffic on the road, abnormally heavy traffic during certain periods or for any other reason.
b) A permit can be withdrawn if the vehicle upon inspection is found in any way not fit to be operated.
c) During certain periods, such as school holidays or long weekends an embargo may be placed on the issuing or permits. Embargo lists are compiled annually and are obtainable from the Issuing Authorities.

3.2.5 Load Limitations

The maximum load that a road vehicle or combination of vehicles will be allowed to carry legally under permit on a public road is limited by:

- the capacity of the vehicles as rated by the manufacturer,
- the load which may be carried by the tyres,
- the damaging effect on pavements,
- the structural capacity on bridges and culverts,
- the power of the prime mover(s),
- the load imposed by the driving axles, and
- the load imposed by the steering axles.

3.2.6 Dimensional Limitations

A load of abnormal dimensions may cause an obstruction and danger to other traffic. For this reason, all loads must, as far as possible, conform to the legal dimensions. Permits will only be considered for indivisible loads, i.e., loads that cannot, without disproportionate effort, expense, or risk of damage, be divided into two or more loads for the purpose of transport on public roads. For each of the characteristics below there is a legally permissible limit and what is allowed under permit:

- Width,
- Height,
- Length,
- Front Overhang,
- Rear Overhang,
- Front Load Projection,
- Rear Load Projection,
- Wheelbase,
- Turning Radius, and
- Stability of Loaded Vehicles

3.3 Transporting facility components

The following summary is provided to outline the facility components expected for the site as described in the project description provided for this project.

3.3.1 Water Reservoir

Water will be stored in a water reservoir with a footprint of up to 1.5ha. The water reservoir will have a capacity of approximately 6800m^3. It is proposed that three water reservoirs will be located on site. Each reservoir will have a diameter of up to 25m and a height of 6m (maximum height up to 15m).

The water reservoirs will consist of a reinforced concrete or steel cylindrical tanks (refer to **Figure 3-1**).

Figure 3-1: Typical water reservoir (left concrete, right steel tank ~ 6m).

The concrete tank is typically built on site with concrete brought in via concrete mixer. The Steel tank is also typically built on site using steel sheets connected to brackets on site. The building materials for the construction of both water revisor options can be delivered via Conventional trucks within the freight limitations.

Bulk water infrastructure from the Usuthu Water Scheme currently feeding the surrounding coal mines and power stations (specifically Eskom Komati Power Station) will be utilised for construction and operational water. Initial water results indicate good quality supply in sufficient quantities is available. This option is the preferred water sourcing for the development due to excess water being available at the Power Station's water reservoirs.

3.3.2 Electrolyser

It is proposed that the Green Hydrogen Facility will consist of 15 sets of 10MW electrolysers. Each electrolyser unit will be powered through its own set of transformers and rectifiers.

The number of components, and the delivery vehicles required to transport the unit components is unknown at this stage.

Figure 3-2: Example of an Electrolyser Unit (Nel Proton PEM)

3.3.3 Air separator unit

The air separation until will occupy a footprint of up to 0.5ha and the intake tower will have a maximum height of up to 40m (due to the height of the 'cold box' – the tallest vertical component of the air separation unit).

The air separation unit will have a maximum capacity of up to 110,000 tpa. Alternative technologies exist (including Pressure Swing Adsorption (PSA) and Membrane Separation Technologies) and are being evaluated; the most efficient process will be implemented in the final project design.

The number of components, and the delivery vehicles required to transport the unit components is unknown at this stage.

Figure 3-3: Example of an Air Separation Unit (Linde ECOGAN Containerized System)

3.3.4 Ammonia Processing Unit

Typical components of an ammonia production plant include compressors, filters, reactor chamber and beds, heat exchangers, water storage vessels, condensers, separators, circulators, absorbers and gas release valves.

If the full 20,000 tpa of green hydrogen generated by the electrolyser is directed to this process, this will produce up to 100,000 tpa of liquid, green ammonia for market.

The number of components, and the delivery vehicles required to transport the unit components is unknown at this stage.

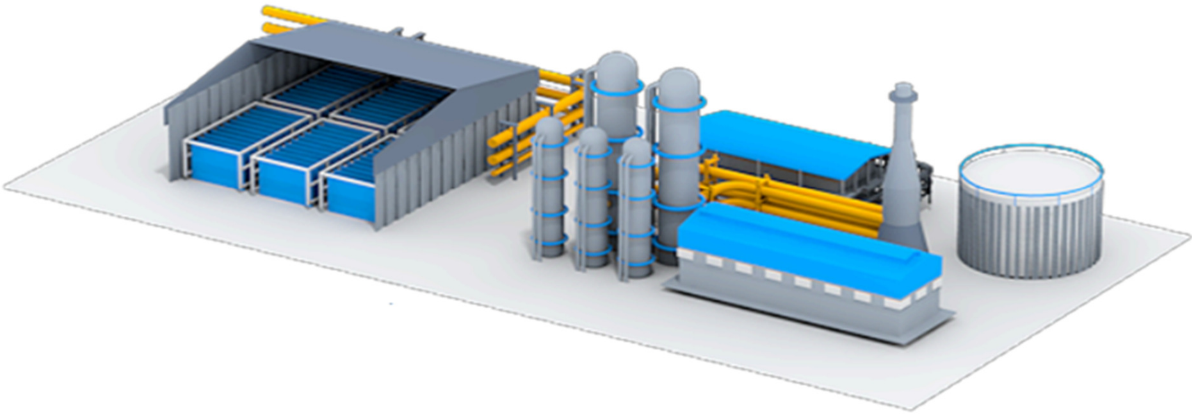

Figure 3-4: Example of integrated hydrogen and ammonia complex (ThyssenKrupp)

3.3.5 Liquid Air Energy System (LAES) for Nitrogen production:

Liquid air energy will be used to liquefy nitrogen for storage, energy and feedstock requirements. Liquid air energy is the use of liquefied air, nitrogen, oxygen and even hydrogen to store Energy.

Components in the LAES include compressors, ambient and cryogenic heat exchangers, expansion valves, storage vessels, pumps, small turbines and generators.

The number of components, and the delivery vehicles required to transport the unit components is unknown at this stage.

3.3.6 Storage

3.3.6.1 Nitrogen gas storage

Nitrogen will be stored (7-14 days) as a liquid with in large cylindrical cryogenic storage tanks with a combine volume of approximately 4 100 tons of nitrogen. It is proposed that the facility will house **up to two** cylindrical cryogenic storage tanks. Each tank will have a diameter of up to 14m and a height of up to 15m with a capacity of up to 2032 tons. The diameter and weight falls within abnormal load category.

It is therefore envisaged that the Nitrogen tank will travel via abnormal load.

Figure 3-5: Cryogenic storage tanks

3.3.6.2 Ammonia gas storage

Green ammonia will be stored as anhydrous liquid ammonia, using similar storage equipment as that utilised for storage of Liquid Natural Gas (LNG), i.e. in a storage tank farm (refer **Figure 3-6**). These tanks are typically made of steel which is assembled on site.

Figure 3-6: Cryogenic ammonia storage tanks

3.3.7 Hydrogen

Hydrogen is stored in vertical or horizontal storage bullets. Compressed hydrogen can be storage as a gas or in liquid form. Compressed hydrogen can be stored at ambient temperature. Up to 800 tons of hydrogen will be stored at the facility, in conjunction with that of the oxygen stored on site, in a tank farm of up to 12 ha. The facility will house up to <u>20 horizontal pressure bullets</u> for the storage of hydrogen. Each bullet will have a diameter of up to 4m and a length of up to 15m.

The tank dimensions fall within the abnormal load limits.

Figure 3-7: Compressed Hydrogen Storage – horizontal tank

3.3.8 Oxygen

Oxygen will be stored in vertical or horizontal storage bullets and stored under high-pressures. The tanks have a vacuum-insulated double wall consisting of two concentric vessels, a steel inner tank and an outer jacket in carbon steel. Up to 800 tons of oxygen will be stored at the facility, in conjunction with that of the hydrogen stored on site, in a tank farm of up to 12 ha. It is proposed that the facility will house up to <u>16 vertical cryogenic storage bullets</u> for the storage of oxygen. Each bullet will have a diameter of up to 4m and a length of up to 15m.

Figure 3-8: Cryogenic storage tanks – vertical tanks.

4 IDENTIFICATION OF KEY ISSUES

4.1 Identification of Potential Impacts/Risks

The potential impacts to the surrounding environment expected to be generated from the development traffic is traffic congestion and associated noise and dust pollution. This will be true for the construction, operation and decommissioning phase.

It must be noted that:

- The significance of the impacts is expected to be higher during the construction and decommissioning phase because these phases generate the highest development traffic.

- Traffic impacts are typically assessed for the operational stage as the long-term road infrastructure demand. The construction and decommissioning phase are expected to produce a high development traffic volume and a traffic management plan document is often compiled and managed throughout these phases to help manage traffic during these phases.

- It will be assumed in the trip estimations that there are 22 working days in a month which will result in (12 months x 22 days= 264 annual working days). For a two-year construction period, this results in 528 days of construction.

4.1.1 Construction phase

This phase includes the transportation of people, construction materials and equipment to the site. This phase also includes typical construction activities such as clearing the site, constructing facility infrastructure (buildings, roads, etc) and ancillary construction works. This phase will temporarily generate the most development traffic.

Nature of impact:

The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network as well as the associated noise and dust pollution, as well as road surface impact due to the increase in traffic.

Estimated peak hour traffic generated by the site:

Trip generation during construction is difficult to accurately estimate as it depends on the construction programming, availability of materials, and the size of vehicles used to transport materials. The following estimate is provided to give an idea of the expected traffic:

1. **<u>Traffic during the Construction of facility:</u>**

a) **Material delivery:** Concrete for foundations (cement, sand, stone deliveries to batching plant) – The concrete for the foundation is estimated at 20 000m^3 which is estimated to generate 1926 total trips.

Assuming a 24-month construction phase, material delivery will be spread over the assumed construction preparation and civil works period (i.e., 264 working days or 50% of construction period), and the peak hour trips in rural environments are typically 20-40% of the average daily traffic. The estimated daily trips are 8 veh/h and the peak hour trips are estimated at **4 veh/h** (i.e., 1926 total trips/264 days=8 trips/day. Then 8 trips/day x 40%= 4 peak hour trips).

b) **Construction machinery:** This includes cranes for component assembly, heavy vehicles required for earthworks and roadworks. These vehicles are expected to have negligible traffic impact as they will arrive on site in preparation for construction. Once on site, these vehicles will produce internal site traffic with minimal effect on the external road network.

c) **Component delivery:** An estimated total component delivery trips of 55 is assumed for the project.

Table 4-1: Estimated component delivery trips

Component	Trips
Water Reservoir (to be delivered to site)	1
Water Treatment Unit (to be delivered to site in modular units)	4
Electrolyser Unit (to be delivered to site in modular units	8
Air Separation Unit (to be delivered to site in modular units)	10
Ammonia Processing Unit (to be delivered to site in modular units)	20
Liquid Air Storage System (LAES) (to be delivered to site in modular units)	10
Liquid Ammonia Storage Tank (to be delivered to site in modular units)	1
Hydrogen Storage Tank (to be delivered to site in modular units)	1
Total Trips	**55**

Assuming a 24-month construction phase, and that the component delivery will occur over 212 days (40% of construction period) spread out across the construction period, and the peak hour trips in rural environments are typically 20-40% of the average daily traffic. The estimated daily trips are 1 veh/h and the peak hour trips are estimated at **1 veh/h** (i.e. 55 tips / 212 delivery days=1 veh/day. Then 1 veh/day x 40% =1 peak hour trips).

d) **Site personnel and workers**: It is estimated that 200 workers can be expected during the construction period. Ten percent (10%) of the workforce is estimated to travel by private car with an average 1.5 persons occupancy, and 90% of the workforces is assumed to travel by minibus taxi at a 15 person per vehicle occupancy. This results in 12 minibus taxis and 14 passenger vehicles expected to be generated by worker trips. If 40% of the daily trips is expected to occur during the peak hour, **11 peak** hour trips can be expected for worker trips.

Based on the above **16 peak hour trips** are estimated for the site during the construction of the facility.

2. **Traffic during the Construction of Grids/Power lines:**

a) **Material and component delivery:** Vehicle trips from material and component delivery vary depending on the construction task/program, fuel supply arrangements, as well as distance from the material source to the site. Not enough detail about the powerline is known at this stage to provide an estimated trip generation volume for material and component traffic.

The materials and most components expected for the powerline construction can generally be transported by normal heavy load vehicles. Project planning can be used to reduce delivery trips during peak hours. In addition to this, using a mobile batch plant as well as temporary construction material stockpile yards near the proposed site can also reduce peak hour trips.

The transmission tower sections, and transformer are expected to be transported by abnormal load. The number of tower sections and transformer units is unknown thus the number of abnormal loads cannot be estimated.

b) **Construction machinery:** this includes cranes for pylon/tower assembly, heavy vehicles required for earthworks etc.
These vehicles are expected to have a negligible impact on the traffic operations of the surrounding road network as they will arrive on site in preparation for construction. Once on site, these vehicles will produce internal site traffic with minimal effect on the external road network.

c) **Site personnel and workers:** Based on information obtained from similar projects it is assumed that 50 to 70 workers can be expected on site per workday for the powerline construction.
Minibus taxis have a maximum capacity of 15 passengers and assuming approximately 20% highly skilled personnel will travel by means of passenger vehicles, the following trips are assumed:

- for the skilled personnel a maximum of 10 trips are expected (estimated 1.5 passenger vehicle occupancy).
- The remaining 56 workers can travel by minibus taxis (i.e., 4 trips).

Assuming 40% of the trips will occur during the peak hour, a maximum of **6 peak hour site personnel trips** is assumed for the purposes of this assessment.

4.1.2 Operational Phase

This phase includes the operation and maintenance of the development and its supporting infrastructure throughout its life span.

Nature of impact:

The nature of the impact expected to be generated at this stage would be traffic congestion and delays on the surrounding road network, and the associated noise and dust pollution, as well as road surface impact due to the increase in traffic.

Estimated peak hour traffic generated by the site:

a) **<u>Operational Staff traffic:</u>** It is estimated that 25 permanent employment opportunities will be created during the operational phase. If it is further assumed that 20-40% of the average daily traffic occurs during the peak hour. An estimated **10 peak hour traffic trips** are assumed for staff commuter trips.

b) **<u>Hydrogen and oxygen gas delivery trips:</u>** up to 20,000 tons per annum (tpa) of green hydrogen and up to 40 000 tpa of green oxygen are estimated for production. The oxygen obtained as part of the hydrogen production process may be released or stored and sold as a by-product. The hydrogen may be directed to the Ammonia production plant or be stored and sold to interested parties directly.

   Assuming 20t of oxygen capacity per truck, an average 264 working days a year, 40 000 tpa of oxygen produced, and the peak hour trips in rural environments are typically 20-40% of the average daily traffic. The estimated daily number of trucks for oxygen delivery is 8 veh/h while the peak hour vehicles are estimated at **4 veh/h** (i.e., 40 000 tpa/ 20t trucks=2000 trucks/year; 2000 trucks per year / 264 working days per year =8 trips/day; then 8 daily trips x 40% = 4 peak hour trips).

   Not much information is available on how the Hydrogen will be transported (i.e., pipeline or land transport). Based on the assumptions made for the oxygen delivery above, and an estimated 20,000 tons per annum (tpa) of green hydrogen envisaged for production, approximately **2 veh/h** can be assumed for Hydrogen for delivery during the peak hour (i.e., 20 000 tpa/ 20t trucks=1000 trucks/year; 1000 trucks per year / 264 working days per year =4 trips/day; then 4 daily trips x 40% = 2 peak hour trips).

c) **Ammonia gas delivery trips:** Liquid Ammonia may readily be transported via road, rail or a combination of the two by means of Standard pressurised road tanker or ISOtainer (for road transport options), or via pressured rail container (Isotank).

Assuming: Use of 40ft pressured tanker trucks or trucks with ISOtainer capability (20ft length each). Volumes will be up to 24 tons per truck load depending on pressured tanker or Isotainer, therefore ***12 daily 24-ton ISOtainer truck trips are envisaged***.

If it is further assumed that 20-40% of the average daily traffic occurs during the peak hour. An estimated **5 peak hour traffic trips** are assumed for ammonia delivery.

The total estimated peak hour trips during the operational phase is 21 veh/h.

4.1.3 Decommissioning phase

This phase will have similar trip generation volumes, impacts and mitigation measures as the Construction Phase.

4.2 Impact Assessment

The potential impacts to the surrounding environment expected to be generated from the development traffic is traffic congestion and associated noise and dust pollution. This will be true for the construction, operation and decommissioning phase.

It must be noted that Traffic Impact Assessments are aimed at assessing impacts of the traffic volume generated by the site on the surrounding road network capacity, as such, it is not intended to assess the environmental impacts associated with traffic generation/congestion. Although traffic generation has an environmental impact, the assessment of these environmental impacts as presented in this report are only indicative. This assessment of the environmental impacts is aimed at providing input for the environmental aspects of the study.

4.2.1 Potential Impact (Construction Phase or Decommissioning Phase)

Nature of the impact

- Noise and dust pollution associated with traffic associated with increased traffic.

Table 4-2: Noise impact (Construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise Pollution	Increase in noise due to increase in traffic.	Construction	Negative	moderate	3	2	3	2	4	**40**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	2	3	**24**	**Low**
				Significance		N/A						

Table 4-3: Dust impact (Construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust Pollution	Decrease in ambient air quality due to dust	Construction	Negative	moderate	3	2	3	2	4	**40**	**Moderate**
				Significance		N/A						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	1	3	2	3	**24**	**Low**
				Significance		N/A						

4.2.2 Potential Impact (Operational Phase)

Nature of the impact

- Noise and dust pollution associated with traffic, as well as potential road surface damage associated with increased traffic.

Table 4-4: Noise impact (Operational stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Noise pollution	Increase in noise due to increase in traffic.	Operation	Negative	moderate	2	1	3	4	3	**30**	**Low**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
				Negative	moderate	1	1	1	4	2	**14**	**Very low**
				Significance		**N/A**						

Table 4-5: Dust impact (Operational stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 2:	Dust pollution	Decrease in ambient air quality due to dust	Operation	Negative	moderate	2	1	3	4	3	**30**	**Low**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
				Negative	moderate	1	1	1	4	2	**14**	**Very low**
				Significance		**N/A**						

4.2.3 Potential Impacts during the Decommissioning Phase

This phase will have a similar impact as the Construction Phase (i.e., traffic congestion, air pollution and noise pollution) as similar trips/movements are expected.

4.2.4 Cumulative Impacts

To assess the cumulative impact, it will be assumed that the proposed Hendrina Wind Energy Facility (WEF) and the Hendrina Green Hydrogen and Ammonia Facility, would be constructed at the same time. It must be noted that this is a conservative approach.

4.2.4.1 Construction phase

The total estimated construction peak hour trips are summarised in **Table 4-6** .It must however be noted that this is a conservative estimate, and the likelihood of the facilities being constructed at the same time is low because the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Table 4-6: Estimated Cumulative construction trips.

Developments	**Megawatt**	**Estimated peak hour construction traffic (excluding abnormal loads)**
Hendrina WEF	360	60
Hendrina Green Hydrogen and Ammonia	N/A	16
Total peak hour trips		**76**

Table 4-7: Noise cumulative impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Noise pollution	Increase in noise due to increase in traffic.	Construction	Negative	moderate	3	3	3	3	4	**48**	**Moderate**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	2	3	3	3	**30**	**Low**
				Significance		**N/A**						

Table 4-8: Dust cumulative impact (construction stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
Impact 2:	Dust pollution	Decrease in ambient air quality due to dust	Construction	Negative	moderate	3	3	3	3	4	**48**	**Moderate**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating
				Negative	moderate	2	2	3	3	3	**30**	**Low**
				Significance		**N/A**						

4.2.4.2 Operational phase

The total estimated operational peak hour trips are summarised in **Table 4-9**.

Table 4-9: Estimated Cumulative operational trips.

Developments	Megawatt	Estimated peak hour traffic
Hendrina WEF	360	20
Hendrina Green Hydrogen and Ammonia	N/A	21
Total peak hour trips		**41**

Table 4-10: Noise cumulative impact (Operational stage):

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Noise pollution	Increase in noise due to increase in traffic.	Operation	Negative	moderate	3	2	3	4	3	**36**	**Moderate**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
				Negative	moderate	2	1	3	4	2	**20**	**low**
				Significance		**N/A**						

Table 4-11: Dust cumulative impact (Operational stage)

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 2:	Dust pollution	Decrease in ambient air quality due to dust	Operation	Negative	moderate	3	2	3	4	3	**36**	**Moderate**
				Significance		**N/A**						
						Post-Mitigation						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
				Negative	moderate	2	1	3	4	2	**20**	**low**
				Significance		**N/A**						

4.2.5 Mitigation measures

4.2.5.1.1 Construction and Decommissioning stage

Noise and dust pollution, as well as gravel road wear and tear during the construction phase cannot be completely mitigated. Where possible, the following mitigation measures can be utilised to significantly reduce the impact:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of gravel roads during the construction phase, as required.
- The use of mobile batch plants and quarries near the site would decrease impacts of material delivery trips.
- Manufacturing some components on site
- Use of on-site borrow pits for material sourcing.
- Staff and general trips can occur outside of peak traffic periods as far as possible.
- Use of high occupancy vehicles to transport workers can reduce traffic volumes.
- the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Accommodating on site storage for components and materials to allow for practical scheduled delivery outside of peak hours.
- Periodic maintenance of the gravel roads utilized during the construction phase. This maintenance will require liaising with the provincial authority charged with maintaining the road to determine the appropriate maintenance level, extent and frequency.

4.2.5.1.2 Operational stage

The operational phase is not envisaged to generate high development traffic. Noise and dust pollution, as well as gravel road wear and tear are not expected to be significant when compared to the construction phase.

It must however be noted that these impacts cannot be completely mitigated. Where possible, the following mitigation measures can be utilised to significantly reduce the impacts:

- Transport of oxygen, hydrogen, and ammonia can be staggered, and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of internal gravel roads as required.
- Maintenance of internal roads to maintain good riding quality.

4.2.6 No-go alternative

The no-go alternative implies that the proposed development does not proceed. This would mean that there will be no negative environmental impacts and no traffic impact on the surrounding network. However, this would also mean that there would be no socio-economic benefits to the surrounding communities, and it will not assist government in meeting energy demands. **Hence, the no-go alternative is not a preferred alternative.**

5 CONCLUSION AND RECOMMENDATIONS

5.1 Impact Assessment

The potential traffic and transport related impacts for the construction, operational and decommissioning phases of the proposed Hendrina Green Hydrogen and Ammonia Facility were identified and assessed.

- The main impact on the external road network will be during the construction and decommissioning phase. Both these phases are temporary in comparison to the operational period. The impacts during these phases include noise and dust pollution, as well as road surface wear and tear due to the increase in traffic. The road surface wear and tear is more prevalent for gravel roads.

  With the exception of abnormal loads, it is estimated that 16 peak hour trips will be generated during the construction phase. The noise and dust impacts are expected to be negative in character with a moderate significance rating pre-mitigation and a low significance rating post mitigation.

  The decommissioning phase is expected to have a similar impact to that of the construction phase.

- During operation, it is expected that the same nature of impacts as the construction phase will occur however at a significantly lower degree of significance. This is as a result of the lower development traffic expected during the operational phase when compared to the construction and decommissioning phases.

  it is estimated that 21 peak hour trips will be generated during the operational phase. The noise and dust impacts are expected to be negative in character with a low significance rating pre-mitigation and a very low significance rating post mitigation.

- To assess the cumulative impact, it was assumed that the proposed Hendrina Wind Energy Facility (WEF) and the Hendrina Green Hydrogen and Ammonia Facility, would be constructed at the same time. It must be noted that this is a conservative approach.

  During the construction, operational and decommissioning phase, a moderate significance rating is estimated pre-mitigation and a low significance rating post mitigation.

5.2 Potential impact mitigation measures

The potential mitigation measures mentioned in the construction and decommissioning phases are as follows:

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of all impacted gravel roads during the construction phase, as required.
- The use of mobile batch plants and quarries near the site would decrease impacts of material delivery trips.
- Manufacturing of certain components on site
- Use of on-site borrow pits for material sourcing.
- Staff and general trips can occur outside of peak traffic periods as far as possible.
- Use of high occupancy vehicles to transport workers can reduce traffic volumes.
- the preferred routes for abnormal load travel should be surveyed prior to construction to identify any problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification. After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, to ensure that the vehicle can travel without disruptions. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Accommodating on site storage for components and materials to allow for practical scheduled delivery outside of peak hours.
- Periodic maintenance of the gravel roads utilized during the construction phase. This maintenance will require liaising with the provincial authority charged with maintaining the road to determine the appropriate maintenance level, extent and frequency.

The potential mitigation measures mentioned in the operational phase are as follows:

- During the operational phase transport of oxygen, hydrogen, and ammonia can be staggered, and trips can be scheduled to occur outside of peak traffic periods.
- Dust suppression of internal gravel roads as required.
- Maintenance of internal roads to maintain good riding quality.

5.3 Access considerations

The Hendrina green hydrogen facilities are located on farm portions that connect to provincial Class 4 roads. The following is noted regarding the access points:

- Access spacing:
  Two access points are proposed for the site. Both access points are not envisaged to have access spacing limitations.
- Sight lines:
  Access points should allow for sight distances as prescribed by appropriate road design guidelines for the design speed. To maintain sight lines, sight triangles should be kept clear of obstructions, including street furniture and landscaping elements. However, objects less than 0.6m in height, such as street signs, may be placed in the triangle.

- Road signage:
  Appropriate signage and markings as per South African Road Traffic Signs Manual (SARTSM) recommendations and standards.

Both of the proposed access points are acceptable from an access spacing perspective however, the sight line and road signage recommendations below should be considered.

The three facility site options are considered feasible from a traffic and transportation perspective provided that the recommendations outlined in the report are adhered to

6 FINAL SPECIALIST STATEMENT

Traffic impact assessments are generally assessed for the operation phase of a development. It is envisaged that the proposed green hydrogen and ammonia facility will generate less than 50 peak hour trips. This is expected to result in an insignificant traffic impact.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

7 REFERENCES

- Google Earth Pro
- Road Traffic Act, 1996 (Act No. 93 of 1996)
- National Road Traffic Regulations, 2000
- Transnet Port Information – https://www.transnetportterminals.net
- Mpumalanga Road asset Management System - http://www.mp-rams.co.za/rams/rams.html
- SANS 10280/NRS 041-1:2008 - Overhead Power Lines for Conditions Prevailing in South Africa
- The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads

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Annexure A: Environmental Impact Assessment Methodology

IMPACT ASSESSMENT METHODOLOGY

SCOPING PHASE

REPORTING REQUIREMENTS

- Project Description
- Legislative Context (as applicable)
- Assumptions and limitations
- Description of Baseline Environment – including sensitivity mapping
- Identification and high-level screening of impacts
- Plan of Study for EIA

HIGH-LEVEL SCREENING OF IMPACTS AND MITIGATION

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and, consequence (**Table 0-3**), where the latter is based on general consideration to the intensity, extent, and duration.

The scales and descriptors used for scoring probability and consequence are detailed in **Table 0-3** and **Table 0-2** respectively.

Table 0-1: Probability Scores and Descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Table 0-2: Consequence Score Descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.

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3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

Table 0-3: Significance Screening Tool

CONSEQUENCE SCALE

PROBABILITY SCALE		**1**	**2**	**3**	**4**
	1	**Very Low**	**Very Low**	**Low**	**Medium**
	2	**Very Low**	**Low**	**Medium**	**Medium**
	3	**Low**	**Medium**	**Medium**	**High**
	4	**Medium**	**Medium**	**High**	**High**

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (**Table 0-4**) has been applied according to the nature and significance of the identified impacts.

Table 0-4: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	**Positive Impacts (+ve)**
Negligible	**Negligible**
Very Low	**Very Low**
Low	**Low**
Medium	**Medium**
High	**High**

EIA PHASE

REPORTING REQUIREMENTS

- Project Description
- Legislative Context (as applicable)
- Assumptions and limitations
- Description of methodology (as required)
- Update and/or confirmation of Baseline Environment – including update and / or confirmation of sensitivity mapping
- Identification and description of Impacts
- Full impact assessment (including Cumulative)
- Mitigation measures
- Impact Statement

Ensure that all reports fulfil the requirements of the relevant Protocols.

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[1], indirect[2], secondary[3] as well as cumulative[4] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[5] presented in **Table 0-5**.

Table 0-5: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes

[1] Impacts that arise directly from activities that form an integral part of the Project.
[2] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[3] Secondary or induced impacts caused by a change in the Project environment.
[4] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[5] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 1** below.

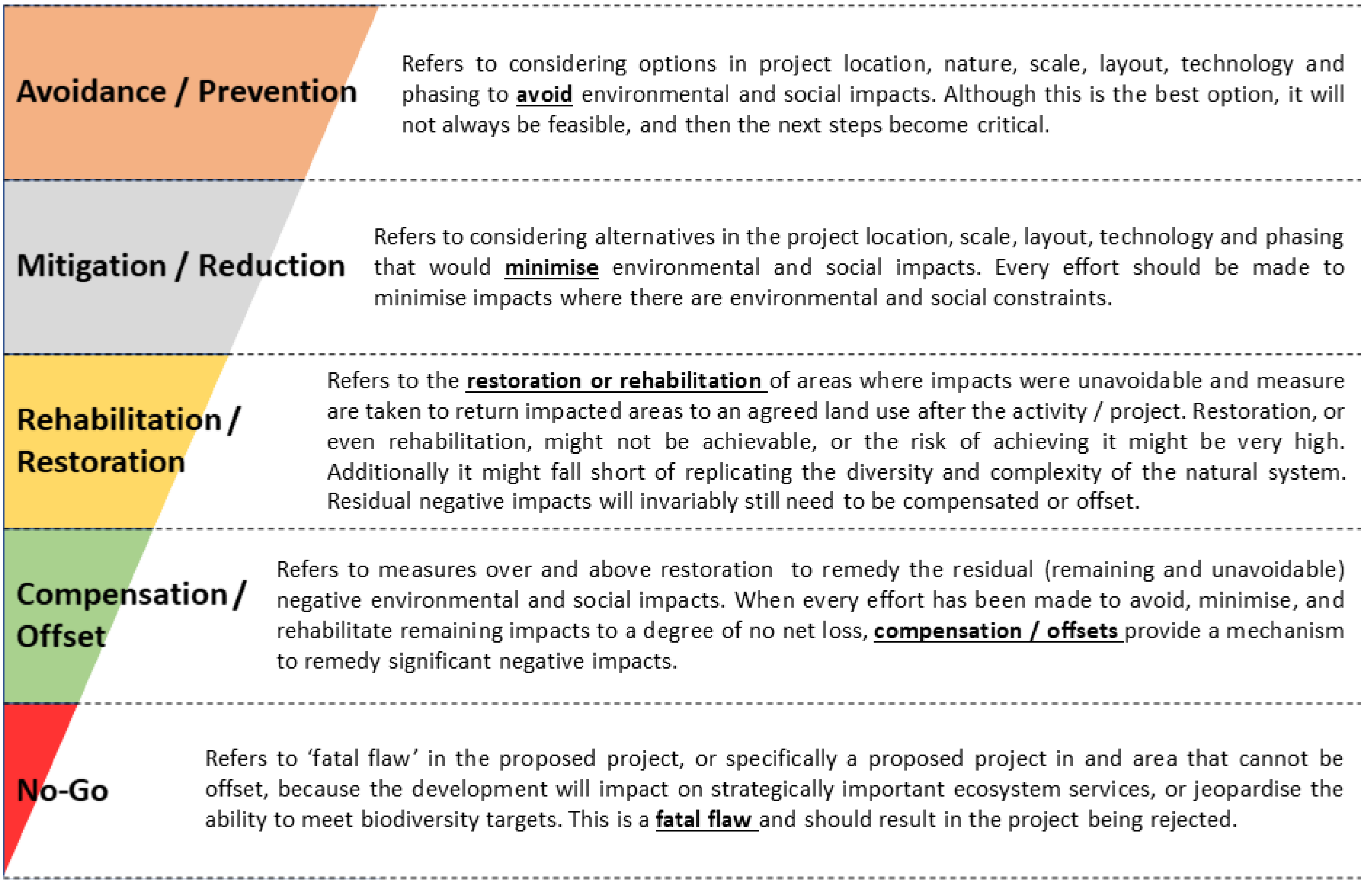

Figure 1: Mitigation Sequence/Hierarchy

Annexure B: SPECIALIST EXPERTISE

ADRIAN WESLEY NATHANIEL JOHNSON

Position in Firm	*Associate and Manager: Traffic and Transportation*
Area of Specialisation	*Traffic and Transportation Engineering*
Qualifications	*PrTechEng, Master of Transport Studies, BSc (Hons) (Applied Science: Transport Planning), BTech Civil Engineering*
Years of Experience	*18 Years*
Years with Firm	*6 Years*

SUMMARY OF EXPERIENCE

Adrian Johnson is a Professional Technologist registered with ECSA (201570274). He joined JG Afrika (Pty)Ltd. in January 2017. Adrian holds a BSc (Hons) (Applied Sciences: Transportation Planning) degree from the University of Pretoria, a BTech degree in Civil Engineering from the Cape Peninsula University of Technology and completed a Masters' degree in Transport Studies at the University of Cape Town in 2020. He has more than 18 years of experience in a wide range of engineering projects.

He has technical and professional skills in traffic impact studies, transport impact assessments, public transport planning, non-motorised transport planning & design, data analysis of public transport systems, access management plans, quality control, project planning and implementation, geometric design, site supervision, transport assessments for renewable energy projects, speed limit reviews and road safety audits.

PROFESSIONAL REGISTRATIONS & INSTITUTE MEMBERSHIPS

PrTechEng - Engineering Council of South Africa, Registration No 201570274
SAICE - South African Institute of Civil Engineering. No 201700129
SARF WR - South African Road Federation Western Region Administrator and Committee Member

EDUCATION

2004 - National Diploma (Civil) – Peninsula Technikon
2006 - BTech (Civil) – Cape Peninsula University of Technology
2011 - BSc (Hon) (Applied Sciences: Transportation Planning) – University of Pretoria
2020 – Master of Transport Studies – University of Cape Town

SPECIFIC EXPERIENCE

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

September 2022 – Date
Position – Associate and Manager: Traffic and Transportation
Traffic Engineering Support Services Provision of Professional Services: Transport Engineering, Planning and Management to the City of Cape Town, Western Cape. Client: City of Cape Town

Adam Tas Corridor Transport Studies for the Adam Tas Corridor in Stellenbosch, Western Cape. Client" Stellenbosch Municipality

Limpopo Road Asset Management System Undertake network level road safety assessments and analysis of accident statistics of the Limpopo road network (5 000km). – Client: Roads Agency Limpopo SOC Ltd

Aberdeen WEFs Transport study for the proposed Windfarms, Western Cape Client: Private

Hydra B Solar Cluster Transport study for multiple solar facilities in the Northern Cape. Client: Private

Britstown WEFs Transport study for the proposed Windfarms, Northern Cape Client: Private

JG Afrika (Pty) Ltd (Previously Jeffares & Green (Pty) Ltd)

2017 – June 2022
Position – Senior Technologist (Traffic and Transportation Engineering)
Various Transport Impact Statements (TIA) and Traffic Impact Statements (TIS) for private clients including:

- Weltevreden Clinic TIS for Edifice Consulting Engineers
- Oakhurst Primary TIS for BVZ Plan
- Sinai Academy TIS for Bettesworth Scott Planners
- Rustlamere TIA for Bettesworth Scott Planners
- Joostenbergvlakte Farms 732 and 728 TIA for Asla
- Garden Emporium TIA for Rory Cameron Smith Architects
- Strandfontein Sandmine TIS for Chand Environmental Consultants
- Proposed development of Erf 538 Grassy Park TIA for First Plan
- Riebeek West: Proposed Function/Wedding Venue TIS for Elco Property Developers

Kampies Housing Development Proposed upgrade of the informal settlement on Cape Farm 616 Philipi and Erf 63 Spring Field, providing 275 units. Client: Ian Rout & Associates

Highlands Housing Project Traffic calming plans for three proposed sites in Mitchells Plain, Cape Town – Client: City of Cape Town

Richards Bay Gas to Power Facility Transport study for the proposed renewable energy facility in Richards Bay, KwaZulu Natal – Client: Private Client

Solid Waste Management Sector Plan – Collections Work Brief Information Analyst assisting with the assessments and detailed analysis of the collections and drop-off facilities operating model of the City of Cape Town – Client: City of Cape Town

Nooiensfontein Housing Project Transport Study for the Nooiensfontein Housing Development in Bluedowns (2500 units) – Client: Ian Rout & Associates

Bardale Housing Development Transport Impact Assessment and Signal timing plan, Western Cape – Client: Integrated Housing Development

Enkanini Housing Transport Impact Assessment for the development of the Enkanini Informal Settlement, Kayamandi - Client: Stellenbosch Municipality

Sutherland and Rietrug Access Road Transport study for the upgrading and widening of the access road to the proposed Sutherland Windfarm, Northern Cape Client: Nala Environmental Consulting

Pienaarspoort Windfarm Transport study for the proposed Pienaarspoort Windfarm, Western Cape Client: Savannah Environmental (Pty) Ltd

Speed Limit Review Main Road 546, Main Road 552 and Divisional Road 2220, Lutzville, Western Cape – Client: Western Cape Government

Gromis and Komis Wind Energy Facility Transport study for the proposed Windfarm, Northern Cape. Client: CSIR

Geelkop Solar Facility Transport study for the proposed Geelkop Solar PV Facility near Upington, Northern Cape – Client: AEP (Pty) Ltd

Khunab Solar Facility Transport study for the proposed Khunab Solar PV Facility near Upington, Northern Cape – Client: AEP (Pty) Ltd

Bloemsmond Solar Facility Transport study for the proposed Bloemsmond Solar PV Facility near Upington, Northern Cape – Client: AEP (Pty) Ltd

NMT Study for the Upgrading of DR1285, Elgin – Client: Western Cape Government

Traffic Study for the Kudusberg and Rondekop Wind Energy Facilities, Northern Cape. Client: G7

Speed Limit Review Main Road 540, Elandsbay, Western Cape – Client: Western Cape Government

Road Safety Audit for N1 Section 16 Winburg to Ventersburg – Client: Aurecon on behalf of SANRAL

Road Safety Audit for the for the N4 at Bapong, Client: Bakwena

Road Safety Audit for N2 Wild Coast Toll Road Projects, Eastern Cape & Natal, Client: Aurecon/Knight Piesold on behalf of SANRAL

Kuruman Wind Energy Facility Transport study for the proposed Kuruman Windfarm, Northern Cape. Client: CSIR

Coega West Windfarm Transportation and Traffic Management Plan for the proposed Coega Windfarm in Coega, Port Elizabeth – Client: Electrawinds Coega

Parking Audit of the Groenvallei area in Bellville – Client: City of Cape Town

Road Safety Appraisals for the Mpumalanga Province – Client: Mpumalanga Provincial Government

Transportation and Traffic Management Plan for the proposed Coega West Wind Energy Facility in Port Elizabeth – Client: Electrawinds Coega (Pty) Ltd

Road Safety Appraisals for North Region of Cape Town – Client: Aurecon on behalf of City of Cape Town

Speed Limit Reviews for North Region of Cape Town – Client: Aurecon on behalf of City of Cape Town

Road Safety Audit for the Upgrade of N1 Section 4 Monument River – Client: Aurecon on behalf of SANRAL

Road Safety Audit for the Upgrade of N2 Section 8 Knysna to Wittedrift – Client: SMEC on behalf of SANRAL

Road Safety Audit for the Upgrade of N1 Section 16 Zandkraal to Winburg South – Client: SMEC on behalf of SANRAL

Traffic and Road Safety Studies for the Improvement of N7 Section 2 and Section 3 (Rooidraai and Piekenierskloofpass) – Client: SANRAL

Traffic Engineer for the Upgrade of a 150km Section of the National Route N2 from Kangela to Pongola in KwaZulu-Natal, Client: SANRAL

GIBB (Pty) Ltd

2014 – 2016
Position – Technologist / Project Leader (Traffic and Transportation Engineering)
Operational Support to the MyCiTi Integrated Rapid Transit System - Tasks included analysis of AFC data, generating monthly operations reports, analysis of passenger surveys, journey time runs, travel time surveys, compilation of a MyCiTi Festive Season Report and compilation of reports for the Century City and V&A Waterfront stakeholders. Client: Transport for Cape Town.

Technical Support to the MyCiTi Business Planning Department - A detailed route-by-route analysis, during peak and off-peak conditions to generate daily demand profiles, with a focus on identifying inefficiencies.
Additional tasks included:

- An assessment of profitability of routes based on patronage, revenue and operating costs;
- Analysis of AFC data;
- Comparison between the manual survey results and the Transportation Reporting System (TRS) data;
- Analysis of the Free Token Card Promotion;
- Route and bus optimisation;
- Station and feeder stop utilization and
- Assessment of Parking Tariffs for Managed Parking Bays within the City of Cape Town.

Client: Transport for Cape Town.

AFC Data Analysis - Data Analysis of AFC Data of the City of Tshwane's A Re Yeng Bus Service.
Client: Development Bank of Southern Africa.

Ghana Transport Statues Quo Study - Transport Status Quo Study for the Greater Accra Regional Spatial Development Framework. Client: Government of Ghana: Ministry of Lands & Natural Resources.

Botswana TIA – Transport Impact Assessment for the Mogoditshane- Kanye Road project in Botswana. Client: Republic of Botswana's Ministry of Transport and Communications: Roads Department.

Botswana Access Management Plan Transport Impact Assessment for the Mogoditshane- Kanye Road project in Botswana. Client: Republic of Botswana's Ministry of Transport and Communications: Roads Department.

MyCiTi System Planning - Rationalisation of the GABS bus routes within the City of Cape Town. Client: Transport for Cape Town.

Road Safety Master Plan - Compilation of a Road Safety Master Plan for Stellenbosch Municipality. Client: Stellenbosch Municipality.

Constantia TIS - Transport Impact Statement and Parking Motivation for the proposed redevelopment of Erf 2134, Constantia. Client: High Constantia Properties.

Top Yard TIA - Transport Impact Assessment for the Government Garage Precinct Plan (Top Yard). Client: PricewaterhouseCoopers (PWC).

Boschendal TIA - Transport Impact Assessment for the development of Boschendal Village. Client: Boschendal (Pty)Ltd.

Vergenoegd TIA - Transport Impact Assessment for the development of Portion 19 of Farm 653, Vergenoegd. Client: Headland Planners.

Tygerberg Hospital Traffic Status Quo Study - Traffic Status Quo Study for the Development Framework for the Tygerberg Hospital Site in Bellville. Client: City Think Space.

Eerste River TIA - Transport Impact Assessment for Erf 5541, Eerste River. Client: Headland Planners

BVi Consulting Engineers

2013– 2014
Position – Technologist (Transportation Engineering)

Waaihoek Wind Energy Facility TIA - Transport Impact Assessment for the proposed construction of a Wind Energy Facility on Waaihoek Farm near Utrecht Town in Kwazulu-Natal. Client: Mainstream Renewable Power.

Sere Wind Farm - Supervision of bellmouth widening and other modifications along routes between the Saldanha Port and the Sere Wind Farm near Koekenaap. Client: Siemens.

Slip lane Design for Windhoek Service Station - Geometric design of a slip lane to the existing Windhoek Fuel Centre, Windhoek, Namibia. Client: Multi Consult.

Lafarge Industries

2011– 2013
Position – Quality Controller

Responsible for the quality control at four ReadyMix concrete plants and the Tygerberg Quarry.

- Design of new concrete mixes and optimisation of existing mix designs.
- Assist client with technical matters and problem solving.
- Compile technical reports.
- Motivate, train and develop staff to ensure growth and succession.

- Arrange and monitor staff schedules.
- Conduct Quality training for field technicians, reps and batchers.
- Statistical analysis of concrete results and monitoring product performance.

Aurecon Mozambique

2010– 2011
Position – Roadworks Engineer (Site Supervision)

Mozambique site supervision - Roadworks Engineer responsible for inspection of works and monitoring workmanship for the Construction of a 135km road from Montepuez to Ruaca in Northern Mozambique. Client: Administracao Nacional De Estradas (Mozambican Roads Authority)

Aurecon South Africa

2004– 2010
Position – Technician/Technologist (Traffic and Transportation Engineering)

Kewtown site supervision - Resident Engineer for the Community Residential Units Programme Pilot Project in Kewtown. Client: City of Cape Town.

N2 road design - Vertical and horizontal alignment of the N2 from Coega to Colchester. Client: SANRAL.

Western Cape Provincial Weighbridges - Resident Engineer on various projects involving the upgrading and expansion of the 9 Provincial Weighbridges in the Western Cape. Client: Provincial Administration: Western Cape.

Traffic and Transport tasks - Various traffic counts, traffic data analysis and transport impact statements. Client: Various.

CONTINUED PROFESSIONAL DEVELOPMENT

Courses

2007 - SAICE Flood estimation and Storm Water Drainage for Roads Course
2008 - Certificate in Project Management
2009 - SAICE Practical Geometric Design Course
2011 - C&CI Concrete Technology
2013 - Post graduate Courses – Financial Management and Asset Management
AutoCAD Civil 3D Training
2014 - Leadership Training -Project Risk Training and Anti- Corruption and Integrity Management
Post graduate Courses – Strategic Operations Management and Project Management
2015 - Leadership Training – Report Writing
2016 - Leadership Training - Quality Management and Time Management
2017 - Road Safety Auditor Course (SARF)
2018 - Road Safety in Engineering Seminar (SARF)
2020 Understanding and the Investigation of Road Traffic Accidents
2021 Intersection Optimisation course (SARF)

PERSONAL DETAILS

Nationality – South African
Date of Birth – 1984-05-31
Domicile – Cape Town, South Africa

Languages
English – Very Good
Afrikaans – Good

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	**Addressed in the Specialist Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Yes. See attached CV
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Yes. See attached declaration
c) an indication of the scope of, and the purpose for which, the report was prepared;	Yes. See section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	n/a
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Yes. See Chapters 4.2
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	n/a
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Yes. See section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Yes. Chapters 2 and 4
g) an identification of any areas to be avoided, including buffers;	n/a
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	n/a
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Yes. Section 1.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Yes. Chapters 4
k) any mitigation measures for inclusion in the EMPr;	Yes. Chapter 4.2.5
l) any conditions for inclusion in the environmental authorisation;	n/a
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Yes. Chapter 4
n) a reasoned opinion- i. as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Yes. Chapter 4, 6
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n/a

Appendix C - Specialist Statement of Independence

I, Adrian Johnson, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist: ______________________________

Name of Company: JG Afrika (Pty) Ltd

Date: 18-04-2023