TRAFFIC IMPACT ASSESSMENT

YINDJIBARNDI ENERGY PROJECT BARU & MARNDA

Yindjibarndi Energy
A partnership with ACEN



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1 Executive Summary

icubed consulting was commissioned by Yindjibarndi Energy Corporation (YEC) to undertake a Traffic Impact Assessment (TIA) for the proposed Yindjibarndi Energy Project, located approximately 70km south of Karratha. The assessment considers the impacts of constructing and operating up to 84 Wind Turbine Generators, 250 MW of Solar PV, a substation, 14km of overhead transmission lines and an optional Battery Energy Storage System (BESS) on the surrounding road network.

The assessment reviewed existing traffic conditions, proposed access arrangements, construction and operational traffic generation, and the resulting impacts on traffic volumes and pavement loading. During construction, traffic volumes are forecast to increase by up to 37.4% on Manuwarra Red Dog Highway, while Equivalent Standard Axle (ESA) volumes are forecast to increase by up to 108.2%, primarily due to the low existing traffic volumes on the route. Traffic and pavement impacts on the remaining roads are generally modest.

Subject to the implementation of the recommended traffic management and mitigation measures outlined in this report, the surrounding road network is considered capable of accommodating the proposed development traffic. The assessment should be reviewed during the detailed design phase once transport contractors and construction logistics have been finalised.

2 Introduction

2.1 Project Scope

icubed consulting was commissioned by Yindjibarndi Energy Corporation (YEC), a joint venture partnership project between ACEN and the Yindjibarndi Aboriginal Corporation (YAC) to undertake a Traffic Impact Assessment (TIA), for the proposed Yindjibarndi Energy Project located approximately 70km south of Karratha, in the Pilbara region of Western Australia. This assessment covers the traffic impact to the local road network from Port Hedland and Karratha to the proposed Project Site entry intersection off the Manuwarra Red Dog Highway at Millstream. Local access from Manuwarra Red Dog Highway to the Project Site, including interfaces with Rio Tinto, Water Corporation, and the Millstream-Chichester National Park, is not considered. The assessment is based on construction related traffic forecasts generated for:

1. Construction of the wind farm consisting of 84 wind turbine generators (WTGs), 250MW solar farm, BESS, substation and 14km of overhead transmission lines, including associated access tracks, hardstands and operation and maintenance facility. Construction is anticipated to take place over four (4) stages from 2028 to 2033.
2. Operation of the infrastructure listed above.

This report details the results of this assessment, including an evaluation of:

- Existing traffic conditions.
- The proposed access arrangements.
- The proposed development traffic requirements.
- The impact of the proposed development on the surrounding road network.

This report has been produced for submission to Main Roads Western Australia (MRWA) in accordance with Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines (August 2016).

Once the Project reaches the detailed design stage of works and a transportation contractor has been engaged, this report should be re-assessed to either confirm the impact results or provide amended outcomes.

2.2 Limits of Report

The above tasks have been carried out based on information supplied by YEC, together with observations on Site and information from relevant authorities. These are detailed in the report.

While icubed has taken care in the preparation of this report, it neither accepts liability nor responsibility whatsoever in respect of:

- Any use of this report by any third party
- Any third party whose interests may be affected by any decision made regarding the contents of this report.

3 Existing Conditions

3.1 Site Location

The development Site is located approximately 70km south of Karratha, in the Pilbara region of Western Australia. The Project area lies on Yindjibarndi native land within the Shire of Ashburton local government area and adjacent to Millstream Chichester National Park. Figure 1 depicts the location of the development Site.



Figure 1: Yindjibarndi Energy Project: Port to Site
Source: Google Maps, 2026

3.2 Existing Local Road Network and Proposed Transport Routes

The proposed transport route has been indicated as Option 1 by the Transport Route Study (TRS). The TRS is shown in Appendix D – Transport Route Assessment. The Great Northern Highway runs southwest of Port Hedland for approximately 30km through the Town of Port Hedland where it connects with the North West Coastal Highway. The North West Coastal Highway travels east for approximately 159km until Roebourne, a small town 35km from Karratha within the City of Karratha. The North West Coastal Highway is navigated through Roebourne until Karratha. Finally, the route travels south along Manuwarra Red Dog Highway for approximately 55km through the Shire of Ashburton until the Site entrance. The route from Port Hedland to Site is considered the main Port to Site transport route for all oversize and/or overmass (OSOM) wind farm, solar farm, BESS and Substation material/component deliveries, for the purpose of this assessment. All non-oversize and/or overmass (non-OSOM) vehicles are anticipated to travel from Karratha to Site.

Table 1: Existing Local Road Network

Road Name	Relative Location	Intended Use	Existing Conditions (approximated from mapping)
Great Northern Highway	North-East of Site	OSOM	Sealed two-way highway 3.5m lanes, 1.0m shoulder
North West Coastal Highway	North-East of Site	OSOM	Sealed two-way highway 3.5m lanes, 1.0m shoulder
North West Costal Highway (through Roebourne)	North-East of Site	OSOM	Sealed two-way road 3m lanes, 0.5m shoulder. Lanes split via median

Manuwarra Red Dog Highway	North-East connecting to Site	All vehicles	Sealed two-way highway 3.5m lanes, 0.5m shoulder

3.3 Existing Traffic Conditions

The current traffic count data was acquired from the MRWA Traffic map. The Port to Site route has eleven (11) publicly available traffic count data points. Figure 2 illustrates the locations of the data points.

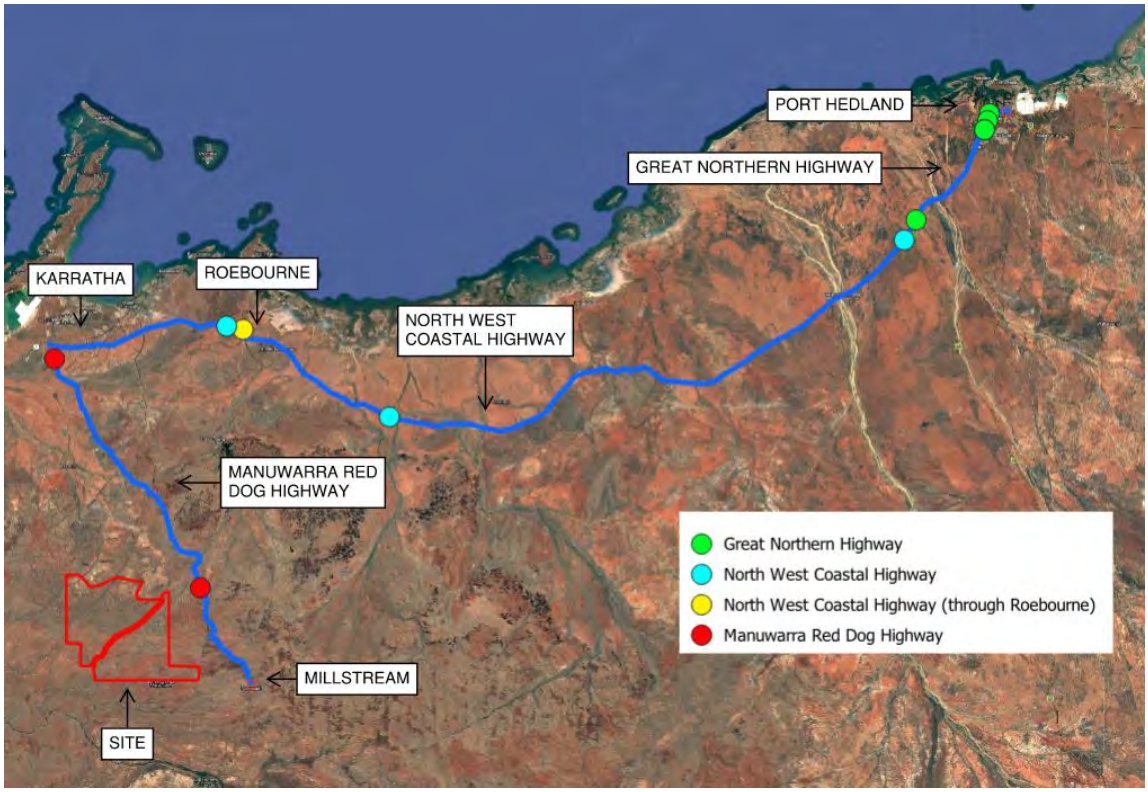


Figure 2: Traffic Count Data Point Locations: Port to Site
Source: Google Maps & Main Roads WA, 2026

Tables 2-5 represent hourly traffic volume peaks from Monday to Sunday at each traffic data count location for each road.

Table 2: Great Northern Highway Hourly Traffic Volume Peaks (Traffic Map, 2026)

Site ID	Latitude	Longitude	Direction	Peak AM		Peak PM		Year
				Time	Vehicles	Time	Vehicles	
51730	-20.366635	118.582253	Eastbound	9:00	131	17:15	175	2023/2024
			Westbound	4:45	226	12:00	108	
51729	-20.37958	118.578977	Northbound	5:15	198	17:15	276	2023/2024
			Southbound	4:45	301	16:45	196	
53574	-20.395795	118.573598	Northbound	11:45	83	17:15	104	2025/2026
			Southbound	4:45	108	12:15	84	
51727	-20.395959	118.573258	Northbound	11:45	110	17:30	141	2023/2024
			Southbound	4:45	138	12:00	111	
50074	-20.56101	118.44276	Northbound	11:30	68	14:30	72	2023/2024
			Southbound	9:30	75	13:30	66	

Table 3: North West Coast Highway Hourly Traffic Volume Peaks (Traffic Map, 2026)

Site ID	Latitude	Longitude	Direction	Peak AM		Peak PM		Year
				Time	Vehicles	Time	Vehicles	
8546	-20.597687	118.420207	Eastbound	9:15	30	12:45	32	2025/2026
			Westbound	10:30	34	12:30	33	
16309	-20.924449	117.427188	Eastbound	9:00	37	13:15	35	2023/2024
			Westbound	10:45	55	15:00	48	

8048	-20.75985	117.11205	Northbound	8:00	106	12:15	99	2024/2025
			Southbound	11:15	108	15:45	122	

Table 4: North West Coastal Highway (Through Roebourne) Hourly Traffic Volume Peaks (Traffic Map, 2026)

Site ID	Latitude	Longitude	Direction	Peak AM		Peak PM		Year
				Time	Vehicles	Time	Vehicles	
16303	-20.765978	117.143902	Northbound	10:45	107	15:15	112	2020/2021
			Southbound	8:00	113	13:45	87	

Table 5: Manuwarra Red Dog Highway Hourly Traffic Volume Peaks (Traffic Map, 2026)

Site ID	Latitude	Longitude	Direction	Peak AM		Peak PM		Year
				Time	Vehicles	Time	Vehicles	
52040	-20.819455	116.779276	Northbound	9:45	20	15:30	33	2025/2026
			Southbound	6:30	34	12:00	16	
54035	-21.235459	117.061493	Northbound	7:45	26	12:00	17	2025/2026
			Southbound	11:45	18	14:30	29	

4 Proposed Development

4.1 Description of Proposed Development

The proposed development will comprise of the elements listed in Table 6. Transportation and construction of these elements will be based on the Project construction timeline outlined in the Section 4.2.

Table 6: Proposed Development Construction Elements

Wind Farm	Solar Farm
• Access tracks • WTG hardstands • Temporary construction benches / laydown areas • WTG footings • Turbines (tower sections, blades, hubs and nacelles) • Underground electrical cables • Culverts	• Access tracks • Solar panels • Inverters • Racking • Underground electrical cables • Culverts
BESS	**Substation**
• Bench • Batteries • Footings • Underground electrical cables • Drainage structures	• Bench • Transformers • Switch room • Substation equipment • Footings • Underground electrical cables • Drainage structures
Overhead Transmission Lines	**Operations and Maintenance Facility**
• Transmission towers • Overhead electrical cables • Footings	• Bench • Carpark • Office building • Warehouse • Footings • Underground services • Drainage structures

4.2 Construction Timeline

The construction timeline is expected to commence in April of 2028. For this assessment, the traffic count data will be adjusted to represent the anticipated Annual Average Daily Traffic (AADT) during construction. The construction of the entire Project is split into 4 stages which have been assumed to be equal. The anticipated construction timeframes for each stage are listed below, which will be used to approximate material and component delivery times:

- Stage 1: April 2028 to September 2030
- Stage 2: June 2029 to August 2031
- Stage 3: August 2030 to September 2032
- Stage 4: September 2031 to September 2033

Although there are overlaps between the construction of these stages, it is reasonable to assume that the peak traffic volume at any point throughout the construction of the entire Project will occur around stages 1, 2 & 3, where the following stage has commenced. This TIA considers the traffic impact during these peaks.

5 Parking and Internal Layout

The Site layout will consist of a series of internal access roads, which will be designed and constructed to safely and efficiently allow for the movement of vehicles to all WTG locations and ancillary infrastructure locations throughout the construction and operation phases of the Project.

There will be sufficient areas assigned for parking during the construction stages of the Project to accommodate the anticipated number of construction and employee vehicles. Up to 350 full-time equivalent staff are expected during peak construction periods. It is expected that the number of workers to be employed during the operational phase will not be more than 10 full time staff, with very few visitors or material / component deliveries.

6 Changes to Surrounding Transport Networks

There are no known developments in the area that would impose any significant changes to the surrounding transport network in the vicinity of the proposed development. It is understood that any developments that occur along the local road network could change constraints along the transport route, which may need to be re-assessed in the Project Transport Route Study (TRS). It is expected that upgrades to the local road network will be required in some locations along the proposed OSOM transport routes to provide the necessary geometry for OSOM vehicles to negotiate roads and intersections to travel to the development Site.

Manuwarra Red Dog Highway is primarily a freight and resource corridor. The largest traffic generators are mining operations, pastoral stations and the towns at either end rather than residential development.

7 Existing Traffic Assessment

7.1 Traffic Volumes

The existing traffic volumes for the 11 Site IDs from Port to Site were sourced from MRWA Traffic Map. This data has been adjusted to better represent potential future traffic conditions using growth rates which were based on the following assumptions:

- The assumed annual growth rate has been calculated on the difference in AADT between the two most recently recorded years
- The growth rate has been applied over 3 years to adjust 2025/2026 data to approximate the "Actual" AADT at the end of 2028
- Traffic count data points without previous years of AADT data will determine an "Actual" AADT with a 2% growth per year.
- Where annual traffic rates decrease, the growth rate is assumed to be 0% (i.e. the "Actual" AADT will be equal to the most recent AADT data.)

Table 7: Summary of Great Northern Highway Traffic Volumes

Site ID	Direction	Latest AADT	Previous AADT	Annual Growth Rate	"Actual" AADT
51730	Eastbound	2204	1761	11.9%	3086
	Westbound	2156	1749	11.0%	2951
51729	Northbound	2389	N/A	2.0%	2535
	Southbound	2340			2483
53574	Northbound	1230	1316	0.0%	1230
	Southbound	1283	1335		1283
51727	Northbound	1649	1509	3.0%	1802
	Southbound	1706	1467	5.2%	1985
50074	Northbound	912	976	0.0%	912
	Southbound	928	978		928

Table 8: Summary of North West Coastal Highway Traffic Volumes

Site ID	Direction	Latest AADT	Previous AADT	Annual Growth Rate	"Actual" AADT
8546	Eastbound	316	318	0.0%	316
	Westbound	326	326		326
16309	Eastbound	375	N/A	2.0%	398
	Westbound	477			506
8048	Northbound	1307	1332	0.0%	1307
	Southbound	1343	1344		1343

Table 9: Summary of North West Coastal Highway (through Roebourne) Traffic Volumes

Site ID	Direction	Latest AADT	Previous AADT	Annual Growth Rate	"Actual" AADT
16303	Northbound	1163	N/A	2.0%	1234
	Southbound	1109			1177

Table 10: Summary of Manuwarra Red Dog Highway Traffic Volumes

Site ID	Direction	Latest AADT	Previous AADT	Annual Growth Rate	"Actual" AADT
52040	Northbound	250	292	0.0%	250
	Southbound	253	291		253
54035	Northbound	176	N/A	2.0%	187
	Southbound	180			191

7.2 Pavement Loading

The existing pavement loading was calculated as equivalent standard axles (ESA) based on the "*Actual*" AADT data calculated in Section 7.1. The available traffic data does not provide the load status of specific vehicle classes, therefore the "Actual" ESA values in Tables 11-14 were based on the following assumptions:

- Heavy vehicle ESA for the existing traffic is 3.2
- Light vehicle ESA for the existing traffic is 0

Table 11: Great Northern Highway Summary of Existing "Actual" Pavement Impact Data

Site ID	Direction	% HV	% LV	HV ESA	LV ESA	"Actual" AADT	"Actual" ESA
51730	Eastbound	37	63	3.2	0	3086	3654
	Westbound	36	64			2951	3400
51729	Northbound	28	72			2535	2271
	Southbound	27	73			2483	2145
53574	Northbound	51	49			1230	2007
	Southbound	52	48			1283	2135
51727	Northbound	56	44			1802	3229
	Southbound	38	62			1985	2414
50074	Northbound	62	38			912	1809
	Southbound	62	38			928	1841

Table 12: North West Coastal Highway Summary of Existing "Actual" Pavement Impact Data

Site ID	Direction	% HV	% LV	HV ESA	LV ESA	"Actual" AADT	"Actual" ESA
8546	Eastbound	40	60	3.2	0	316	404
	Westbound	46	54			326	480
16309	Eastbound	31	69			398	395
	Westbound	36	64			506	583
8048	Northbound	24	76			1307	1004
	Southbound	19	81			1343	817

Table 13: North West Coastal Highway (through Roebourne) Highway Summary of Existing "Actual" Pavement Impact Data

Site ID	Direction	% HV	% LV	HV ESA	LV ESA	"Actual" AADT	"Actual" ESA
16303	Northbound	41	59	3.2	0	1309	1619
	Southbound	46	54			1249	1733

Table 14: Manuwarra Red Dog Highway Summary of Existing "Actual" Pavement Impact Data

Site ID	Direction	% HV	% LV	HV ESA	LV ESA	"Actual" AADT	"Actual" ESA
52040	Northbound	30	70	3.2	0	250	240
	Southbound	34	66			253	275
54035	Northbound	82	18			180	491
	Southbound	71	29			184	434

8 Development Traffic

8.1 Project Phases

The requirements for access to the development Site are expected to vary between the construction and operational phases of the Project:

- Construction of the wind farm consisting of 84 wind turbine generators (WTGs), 250MW solar farm, BESS, substation and 14km of overhead transmission lines.
- Operation and maintenance of the infrastructure listed above.

During the construction phase, vehicles arriving on Site will be a combination of workers in light vehicles, construction materials in heavy vehicles and turbine components and transformers on OSOM vehicles. It is expected that the largest delivery vehicles during the construction phase will be a road trains and the WTG blade trailer vehicle (OSOM).

During the operational phase, there are expected to be occasional visits for inspections, security, maintenance and system monitoring by staff in light vehicles. Heavy vehicles will be required intermittently throughout the operation phase for transportation of materials. OSOM vehicles will only be required in the rare event that a large turbine component, such as a blade, needs replacing.

The decommissioning phase is excluded from this TIA, as the operator may choose to either replace the equipment with newer models or decommission the facilities and other above-ground infrastructure. Both options will produce significantly different traffic volumes and loadings, which cannot be foreseen.

8.2 Trip Generation – Construction Phase

Majority of the traffic impact from the development will occur during the construction phase when a significant number of vehicles will be accessing the Site. The trip generation during the construction phase of the Project was calculated by estimating the construction quantities and delivery requirements, based on the construction timeline. The quantities and delivery requirements were based on information provided by YEC (the Project proponent) and icubed consulting's experience with renewable energy projects.

The Project was simplified into the main elements detailed in Table 6, to estimate the quantities of construction equipment, materials and resources required for each stage. Assuming the type of vehicle used to deliver specific components, the total number of deliveries were calculated. Based on the staging of the Project, an assumed construction timeline was used to forecast the timeline of deliveries to the Site. As discussed in Section 4.2, the construction traffic peaks will occur at the middle of stages 1, 2 and 3, where the following stage has also commenced, thus it is anticipated that the construction of all main elements of the Project may occur at the same time. Table 15 shows the total daily two-way vehicle trips resulting from the transportation of the construction equipment / materials / resources to the development Site. Several other assumptions were made in calculating the total daily two-way vehicle trips:

- Anticipating a total peak workforce of 350 full time equivalent (FTE) workers, with 90% personnel staying at Jinbi Project workers camp (under construction). 10% of workers are expected to commute from accommodation in Karratha.
- Cranes, construction machinery and portable buildings are expected to be delivered to Site at the beginning of the construction phase and removed at the end, instead of being transported to and from the Site every day. These deliveries will occur outside of the peak stages of construction.
- Vehicle types were assumed based on the smallest likely vehicles that may be used to transport the relevant materials to Site. This provides a conservative estimate for number of vehicles required and therefore a conservative estimate for the construction related traffic volumes and pavement impact.

Table 15: Daily Projected Traffic Volumes to Site

Construction Equipment / Materials / Resources	Vehicle Type	Transported From (% of total if applicable)	Total Daily Two-way Vehicle Trips
Workers	LV	Karratha (10%)	35
		Site (90%)	-
Water	HV	Karratha	1
Cranes / Construction Machinery (to remain on Site throughout construction)	OSOM	Port Hedland	1
Portable Buildings (to remain on Site throughout construction)	OSOM		1
Cement	Double Tanker	Karratha	2
Ground Granulated Blast-Furnace Slag	Double Tanker		1
Silica Fume	Double Tanker		1
Crusherdust	Truck and Dog		3
20mm concrete aggregate	Truck and Dog		4
10mm concrete aggregate	Truck and Dog		2
Sand	Truck and Dog		1
Reinforced Concrete Pipe	19m AV (tri-axle)		1
Formwork (to remain on Site throughout construction)	19m AV (tri-axle)		1
Steel Reinforcement	B double		1
Electrical - Cables	B double		1
Electrical - Equipment	B double		1
Electrical - Transmission Towers	OSOM	Port Hedland	1
Electrical - Transformers	OSOM		1
Electrical - Switch Room	OSOM		1
WTG - Blades	OSOM		1
WTG - Nacelles	OSOM		1
WTG - Hubs	OSOM		1
WTG - Tower Sections	OSOM		2
WTG - Steel Embedments	OSOM		1
Solar - Panels	B Triple		1
Solar - Inverters	19m AV (tri-axle)		1
Solar - Tracks and Piles	B double		1
BESS - Battery Modules	19m AV (tri-axle)		1
			70

The peak hour construction traffic volume was calculated using the results above and estimating the trips to and from Site, which occur during the morning and afternoon peaks, based on the following assumptions:

- Where 1 two-way vehicle trip is expected per day, it is assumed that the trip in and trip out occur during the morning and afternoon peaks respectively.

- Workers travelling in light vehicles (cars) are expected to arrive during the morning peak hour and depart during the evening peak hour.
- Concrete materials and water truck arrivals / departures are expected to be evenly distributed throughout the day.
- Transportation of wind turbine and electrical components using OSOM vehicles are assumed to be off peak.

The peak hour construction traffic volume is summarised in Table 16, with more detailed calculations provided in Appendix A – Vehicle Generation Data.

Table 16: Peak Hour Construction Traffic Volume

Phase	Morning Peak (veh/hr)	Afternoon Peak (veh/hr)
Construction	63	63

Based on the assumed number of workers, it is expected that approximately 56% of the vehicles during these peak hours will be light vehicles (cars), throughout the construction period. The remainder of the vehicles are expected to be heavy vehicles or OSOM vehicles including:

- Flatbed trucks
- Water trucks
- Truck and dog quarry trucks
- 19m AV trucks
- B-double trucks
- B-triple trucks
- Triple and Quad Road Trains
- Large mobile cranes (approx. 800 Tonne)
- Small mobile cranes (i.e. 25 Tonne Franna)
- Other equipment delivery trucks and/or heavy equipment mobilising to the Site at the beginning of construction
- Over-dimension Vehicles (Oversize / Over-mass vehicles) for delivery of portable buildings, transmission towers, substation transformers, switch room and wind turbine components (Blades, Tower Sections, Nacelle, Hub)

8.3 Trip Generation – Operational Phase

During the operational phase, it is estimated that up to 10 FTE workers would be employed to conduct routine maintenance on the facility. It is anticipated that the staff will travel from Karratha to the Site during the morning peak and return to Karratha during the afternoon peak, each day.

With the limited number of maintenance workers and very few visitors expected at the Site, traffic generated will be negligible with no more than 12 daily two-way trips, which includes workers as well as an allowance for maintenance and delivery vehicles. The estimated number of trips generated during operation is summarised in Table 17, with more detailed calculations provided in Appendix A – Vehicle Generation Data

Table 17: Peak Hour Operation Traffic Volume

Phase	Morning Peak (veh/hr)	Afternoon Peak (veh/hr)
Operation	12	12

9 Impact Assessment

9.1 Construction Phase Impact Assessment

9.1.1 Traffic Impact Assessment

The traffic impact assessment assumes that traffic relating to the Project construction will travel to Site along the identified traffic routes and return via the same path, hence the northbound and southbound traffic volumes will be the same for each Site ID. The percentage increase was calculated by comparing the "Actual" AADT and the daily projected traffic volumes (Table 15). As shown in Table 21, the traffic impact along the Manuwarra Red Dog Highway will greatly increase, which is largely attributed to the low existing traffic volumes along this section of the highway and the high development related AADT of this area.

Table 18: Great Northern Highway Traffic Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	Development Related AADT	Increase in AADT from "Actual"
51730	Eastbound	2204	2023/2024	11.87%	3086	15	0.5%
	Westbound	2156		11.03%	2951		0.5%
51729	Northbound	2389	2023/2024	2.00%	2535		0.6%
	Southbound	2340			2483		0.6%
53574	Northbound	1230	2025/2026	0.00%	1230		1.2%
	Southbound	1283			1283		1.2%
51727	Northbound	1649	2023/2024	3.00%	1802		0.8%
	Southbound	1706		5.17%	1985		0.8%
50074	Northbound	912	2023/2024	0.00%	912		1.6%
	Southbound	928			928		1.6%

Table 19: North West Coastal Highway Traffic Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	Development Related AADT	Increase in AADT from "Actual"
8546	Eastbound	316	2025/2026	0.00%	316	15	4.7%
	Westbound	326			326		4.6%
16309	Eastbound	375	2023/2024	2.00%	398		3.8%
	Westbound	477			506		3.0%
8048	Northbound	1307	2024/2025	0.00%	1307		1.1%
	Southbound	1343			1343		1.1%

Table 20: North West Coastal Highway (through Roebourne) Traffic Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	Development Related AADT	Increase in AADT from "Actual"
8546	Northbound	1163	2020/2021	2.00%	1234	15	1.2%
	Southbound	1109			1177		1.3%

Table 21: Manuwarra Red Dog Highway Traffic Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	Development Related AADT	Increase in Development AADT from "Actual"
52040	Northbound	250	2025/2026	0.00%	250	70	28.0%
	Southbound	253			253		27.7%
54035	Northbound	176	2025/2026	2.00%	187		37.4%
	Southbound	180			191		36.6%

9.1.2 Pavement Impact Assessment

The pavement impact assessment assumes that traffic relating to the Project construction will travel to Site along the identified traffic routes and return via the same path. Appendix B – Australian Trucking Association Truck Impact Chart shows the factors used to determine the development related traffic ESA values for various loaded and unloaded vehicles. Vehicles travelling to Site were assumed to be 100% loaded and vehicles travelling away from Site were assumed to be 0% loaded. Passenger vehicles were assumed to be 50% loaded to and from Site.

The percentage increase was calculated by comparing the "Actual" traffic ESA and the daily projected traffic ESA, which were calculated using Table 15 and Appendix B – Australian Trucking Association Truck Impact Chart. As shown in Tables 22-25, significant pavement impacts along these roads are largely attributed to the low existing traffic volumes throughout the route, especially through Manuwarra Red Dog Highway.

Table 22: Great Northern Highway Pavement Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	"Actual" Traffic ESA	Development Related ESA	Increase in ESA from "Actual"
51730	Eastbound	2204	2023/2024	11.87%	3086	3654	41	1.1%
	Westbound	2156		11.03%	2951	3400	137	4.0%
51729	Northbound	2389	2023/2024	2.00%	2535	2271	41	1.8%
	Southbound	2340			2483	2145	137	6.4%
53574	Northbound	1230	2025/2026	0.00%	1230	2007	41	2.0%
	Southbound	1283			1283	2135	137	6.4%
51727	Northbound	1649	2023/2024	3.00%	1802	3229	41	1.3%
	Southbound	1706		5.17%	1985	2414	137	5.7%
50074	Northbound	912	2023/2024	0.00%	912	1809	41	2.2%
	Southbound	928			928	1841	137	7.4%

Table 23: North West Coastal Highway Pavement Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	"Actual" Traffic ESA	Development Related ESA	Increase in ESA from "Actual"
8546	Eastbound	316	2025/2026	0.00%	316	404	41	10.1%
	Westbound	326			326	480	137	28.5%
16309	Eastbound	375	2023/2024	2.00%	398	398	41	10.3%
	Westbound	477			506	506	137	23.4%
8048	Northbound	1307	2024/2025	0.00%	1307	1004	41	4.1%
	Southbound	1343			1343	817	137	16.7%

Table 24: North West Coastal Highway (through Roebourne) Pavement Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	"Actual" Traffic ESA	Development Related ESA	Increase in ESA from "Actual"
16303	Northbound	1163	2020/2021	2.00%	1234	1619	41	2.5%
	Southbound	1109			1177	1733	137	7.9%

Table 25: Manuwarra Red Dog Highway Pavement Impact Assessment Results

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	"Actual" Traffic ESA	Development Related ESA	Increase in ESA from "Actual"
52040	Northbound	250	2025/2026	0.00%	250	240	80	33.4%
	Southbound	253			253	275	298	108.2%
54035	Northbound	176	2025/2026	2.00%	187	491	80	16.3%
	Southbound	180			191	434	298	68.6%

9.2 Operational Phase Impact Assessment

During the operational phase, it is estimated that up to 10 FTE workers would be employed to conduct routine maintenance on the facility. It is anticipated that the staff will travel from Karratha to the Site during the morning peak and return to Karratha during the afternoon peak, each day. This route is only accounted for by 2 Site IDs which are located on Manuwarra Red Dog Highway of the total 11.

With the limited number of maintenance workers and very few visitors expected at the Site, traffic generated will be negligible with no more than 12 daily two-way trips, which includes workers as well as an allowance for maintenance and delivery vehicles.

Table 26: Operational Phase Traffic Impact Assessment Results: AADT Increase

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	Development Related AADT	Increase in AADT from **"Actual"**
52040	Northbound	250	2025/2026	0.0%	240	12	5.0%
	Southbound	253			275		4.4%
54035	Northbound	176	2025/2026	2.0%	491		2.4%
	Southbound	180			434		2.8%

Table 27: Operational Phase Traffic Impact Assessment Results: Pavement Loading

Site ID	Direction	Latest AADT	Year	Annual Growth Rate	"Actual" AADT	"Actual" Traffic ESA	Development Related ESA	Increase in ESA from **"Actual"**
52040	Northbound	250	2025/2026	0.0%	240	240	7	3.0%
	Southbound	253			276	275		2.6%
54035	Northbound	176	2025/2026	2.0%	491	491		1.5%
	Southbound	180			434	434		1.6%

10 Transport Impacts

10.1 Transport Routes to Site

The TRS shown in Appendix D – Transport Route Assessment indicates that all construction traffic is expected to originate from Port Hedland or Karratha. These routes consist primarily of highways, which are assumed to have sufficient geometric parameters for OSOM delivery vehicles, however highway intersections at Port Hedland, Roebourne and Karratha may require upgrades to cater for these. Refer to appendix for further detail.

Upgrades will need to comply with *Austroads Guide to Road Design Part 4A – Unsignalised and Signalised Intersections* any relevant MRWA supplements. Swept path analysis will determine any additional upgrade requirements. The potential intersection design upgrades may include, but are not limited to:

- Turn lanes / shoulder widening at the proposed intersection locations
- Pavement widening to cater for blade trailer, transformer and largest tower section vehicle turning paths
- Vegetation clearing for blade trailer swept path
- Signage and line marking to provide appropriate controls and awareness of construction traffic

Presently, the largest proposed load for the duration of the Project is a 90-meter WTG blade, which will likely be the defining constraint that may require road infrastructure upgrades to facilitate access to the Site. Tower section vehicles and transformer delivery vehicles may also govern some of the upgrades required along the proposed transport routes. Where materials are sourced from towns such as Karratha, it is expected that the local roads will provide sufficient access to highways.

10.2 Site Access Points

It is expected that a site entry intersection will be established along the Manuwarra Red Dog Highway at Millstream to allow OSOM vehicles to travel from the public road network to site. This new intersection will need to comply with *Austroads Guide to Road Design Part 4A – Unsignalised and Signalised Intersections* any relevant MRWA supplements. Swept path analysis will determine any additional upgrade requirements.

10.3 Disturbance to Local Communities

The transport routes identified in the Project TRS should minimise interactions with urban environments and reduce the disturbance to local communities. The main impacts to local communities will include:

- Additional construction traffic on the Great Northern Highway, North West Coastal Highway, Roebourne and Manuwarra Red Dog Highway
- Congestion of traffic from slow moving vehicles causing delays
- Turning movements of construction vehicles along the transport routes
- Transportation of OSOM vehicles under escort

The increase in daily traffic on Great Northern Highway, North West Coastal Highway and Manuwarra Red Dog Highway may produce an increase in short-term noise emissions, however the impact should be minimal due to the lack of residents within the vicinity of the highway. OSOM deliveries are expected to occur outside of peak times to minimise traffic disruptions, however, the logistics will need to be confirmed with the transport contractor and MRWA closer to the Project's construction.

11 Mitigation and Control Measures

It is recommended that the following measures be implemented as a condition of approval for this Project:

- Develop and implement a traffic management plan (TMP) with appropriate controls and signage for the roads adjacent to the Project Site entrances. The extent of this is to be determined and completed once a contractor has been engaged.
- Engage a licensed and experienced haulage contractor to obtain all necessary permits and approvals from MRWA and the relevant local authorities and to ensure compliance with the approval conditions.
- Escort vehicles for OSOM vehicles will be provided in accordance with MRWA requirements.
- Provide upgrades to intersections in accordance with the Project TRS as some of these upgrades are likely to reduce impacts at intersections.
- Operate a 24-hour telephone contact during construction to promptly identify and address any issues or concerns.
- Implement appropriate erosion and sediment control measures for earthworks conducted within the Site.
- Implement appropriate dust control measures for earthworks conducted within the Site.
- Conduct pre and post construction visual dilapidation survey and reports, on all roads significantly impacted by construction traffic (or as required by MRWA or council).
- Establish an inspection and maintenance program if required by MRWA or council, should road deterioration occur during construction activities.
- Repair roads where damage has been caused from construction traffic.

It is considered that these measures will be appropriate to mitigate the long- and short-term traffic impacts of this proposed development.

12 Conclusion and Recommendations

This report represents the Traffic Impact Assessment for the proposed Yindjibarndi Energy Project located in the Pilbara region of Western Australia. It is anticipated that construction will commence in 2028 and continue till 2033. While the exact timing for construction may vary, it is anticipated that the entire Project will be completed and operational at the end of 2033.

The identified transport routes and trip generation assessment were used to determine the impacts to each of the local road network in terms of traffic volumes and pavement impact. The traffic impact assessment has considered both the construction and operational phases of the Project.

Table 28 highlights the anticipated increase in traffic and ESA volumes.

Table 28: % Increase in Traffic Volume and ESA Volume

Road	% Increase in Traffic Volume	% Increase in ESA Volume
Great Northern Highway	1.6	7.4
North West Coastal Highway	4.7	28.5
North West Coastal Highway (through Roebourne)	1.3	7.9
Manuwarra Red Dog Highway	37.4	108.2

The high proportional increase for Manuwarra Red Dog Highway can be attributed to low existing road usage. Construction phase controls shall be put in place to minimise the impacts to the local road network as outlined in Section 11 of this report.

This report has been produced for submission to Main Roads Western Australia (MRWA) and local councils, in accordance with Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines (August 2016).

Once the Project reaches the detailed design stage of works and a transportation contractor has been engaged, this report should be re-assessed to either confirm the impact results or provide amended outcomes.

Appendix A – Vehicle Generation Data

Shown Overleaf

24-007 ACEN Pilbara Renewable Energy Hub
TIA - Trip Generation

Phase 1 - Construction - Equipment / Materials / Resources Deliveries (Peak Traffic)

				Morning Peak Hour					Evening Peak Hour				
Description	Vehicle Type	Daily Two-way Vehicle Trips	Proportion of Trips in Each Peak Hour	% In	Trips In	% Out	Trips Out	Total Trips	% In	Trips In	% Out	Trips Out	Total Trips
Workers	LV - Light vehicle	35	100%	100%	35	0%	0	35	0%	0	100%	35	35
Water (consumption / dust)	HV - HRV	1	20%	50%	1	50%	1	2	50%	1	50%	1	2
Cranes / Construction Machinery	(O.D.) over-dimensional	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Portable Buildings	(O.D.) over-dimensional	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Cement	HV - Double Tanker	2	50%	50%	1	50%	1	2	50%	1	50%	1	2
Ground Granulated Blast-Furnace Slag	HV - Double Tanker	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Silica Fume	HV - Double Tanker	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Crusherdust	HV - Truck and Dog	3	20%	50%	1	50%	1	2	50%	1	50%	1	2
20mm Concrete Aggregate	HV - Truck and Dog	4	20%	50%	1	50%	1	2	50%	1	50%	1	2
10mm Concrete Aggregate	HV - Truck and Dog	2	20%	50%	1	50%	1	2	50%	1	50%	1	2
Gravel (quarried)	HV - Truck and Dog	0	20%	50%	0	50%	0	0	50%	0	50%	0	0
Sand	HV - Truck and Dog	1	20%	50%	1	50%	1	2	50%	1	50%	1	2
Reinforced Concrete Pipe	HV - 19m AV (tri-axle)	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Formwork	HV - 19m AV (tri-axle)	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Steel Reinforcement	HV - B Double	1	50%	50%	1	50%	1	2	50%	1	50%	1	2
Electrical - Cables	HV - B Double	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Electrical - Equipment	HV - B Double	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Electrical - Transmission Towers	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
Electrical - Transformers	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
Electrical - Switch Room	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
WTG - Blades	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
WTG - Nacelles	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
WTG - Hubs	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
WTG - Tower Sections	(O.D.) over-dimensional	2	0%	0%	0	0%	0	0	0%	0	0%	0	0
WTG - Steel Embedments	(O.D.) over-dimensional	1	0%	0%	0	0%	0	0	0%	0	0%	0	0
Solar - Panels	HV - B Triple	1	20%	50%	1	50%	1	2	50%	1	50%	1	2
Solar - Inverters	HV - 19m AV (tri-axle)	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
Solar - Tracks and Piles	HV - B Double	1	50%	50%	1	50%	1	2	50%	1	50%	1	2
BESS - Battery Modules	HV - 19m AV (tri-axle)	1	100%	50%	1	0%	0	1	0%	0	50%	1	1
BESS - Inverters	HV - 19m AV (tri-axle)	0	100%	50%	0	0%	0	0	0%	0	50%	0	0
Total		**70**			**54**		**9**	**63**		**9**		**54**	**63**
% Light Vehicles								**56%**					**56%**

Notes:

1. Traffic generation above is for trips along public roads adjacent to the site.
2. 90% of the 350 FTE workers will stay at the site accommodation, and will not need to commute to site along public roads.
3. Major Construction plant and portable buildings will be delivered at the start of the project and remain on site throughout the construction phase.
4. Majority of OSOM deliveries will occur outside of the peak hours under escort.

Phase 2 - Operation

				Morning Peak Hour					Evening Peak Hour				
Description	Vehicle Type	Daily Two-way Vehicle Trips	Proportion of Trips in Each Peak Hour	% In	Trips In	% Out	Trips Out	Total Trips	% In	Trips In	% Out	Trips Out	Total Trips
Workers	Light vehicle	10	100%	100%	10	0%	0	10	0%	0	100%	10	10
Deliveries or Maintenance	HRV	2	100%	50%	1	50%	1	2	50%	1	50%	1	2
Total		**12**			**11**		**1**	**12**		**1**		**11**	**12**
% Light Vehicles								**83%**					**83%**

Notes:

1. Average Labour Force has been Considered

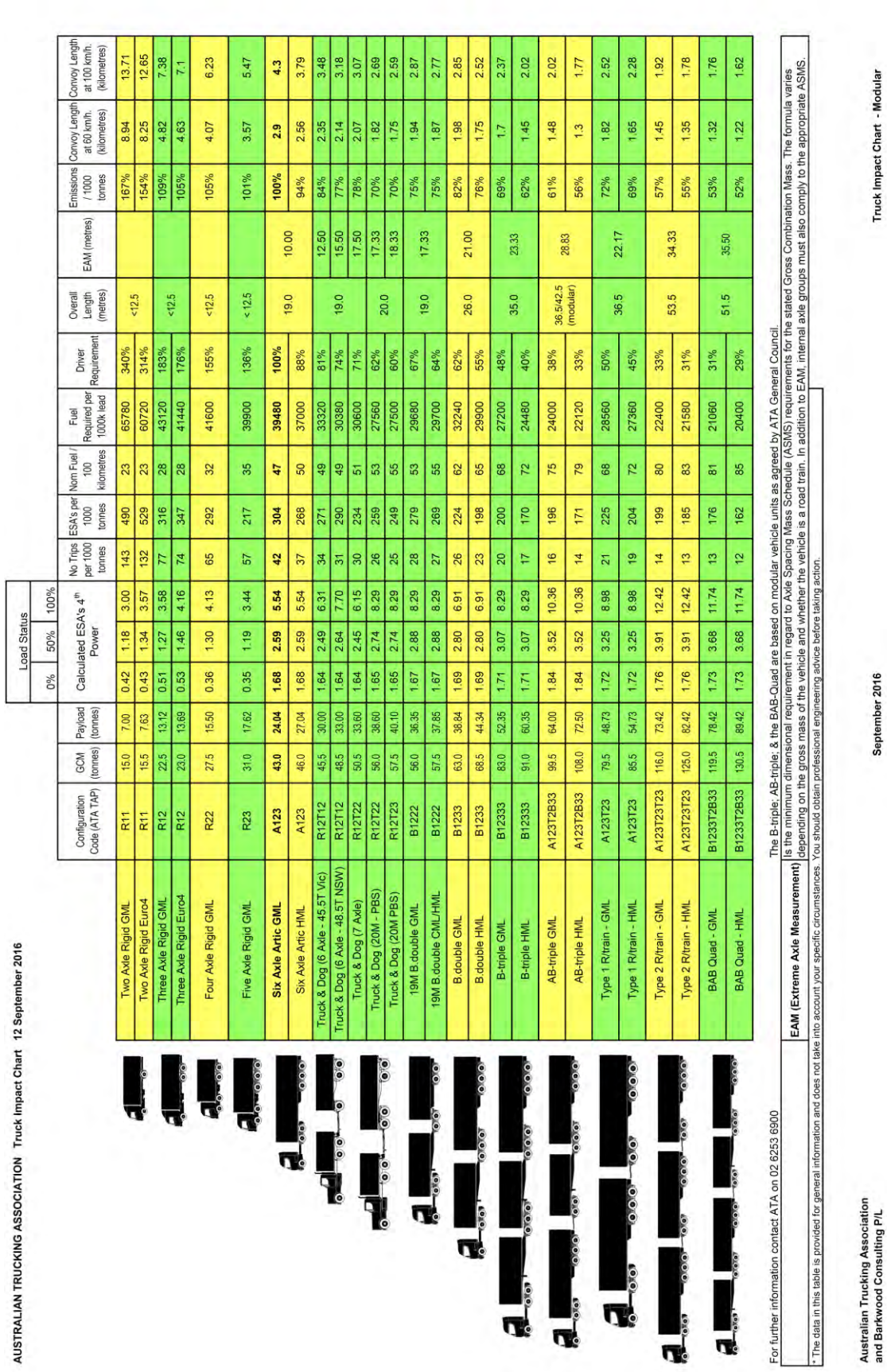
Trip Generation Summary

Phase	Morning Peak	Afternoon Peak
Construction	63	63
Operations	12	12

Appendix B – Australian Trucking Association Truck Impact Chart

Shown overleaf

1. The Truck Impact Chart - Modular



AUSTRALIAN TRUCKING ASSOCIATION Truck Impact Chart 12 September 2016

	Configuration Code (ATA TAP)	GCM (tonnes)	Payload (tonnes)	Load Status: Calculated ESA's 4th Power 0%	50%	100%	No Trips per 1000 tonnes	ESA's per 1000 tonnes	Nom Fuel / 100 kilometres	Fuel Required per 1000k lead	Driver Requirement	Overall Length (metres)	EAM (metres)	Emissions / 1000 tonnes	Convoy Length at 60 km/h. (kilometres)	Convoy Length at 100 km/h. (kilometres)
Two Axle Rigid GML	R11	15.0	7.00	0.42	1.18	3.00	143	490	23	65780	340%	<12.5		167%	8.94	13.71
Two Axle Rigid Euro4	R11	15.5	7.63	0.43	1.34	3.57	132	529	23	60720	314%			154%	8.25	12.65
Three Axle Rigid GML	R12	22.5	13.12	0.51	1.27	3.58	77	316	28	43120	183%	<12.5		109%	4.82	7.38
Three Axle Rigid Euro4	R12	23.0	13.69	0.53	1.46	4.16	74	347	28	41440	176%			105%	4.63	7.1
Four Axle Rigid GML	R22	27.5	15.50	0.36	1.30	4.13	65	292	32	41600	155%	<12.5		105%	4.07	6.23
Five Axle Rigid GML	R23	31.0	17.62	0.35	1.19	3.44	57	217	35	39900	136%	< 12.5		101%	3.57	5.47
Six Axle Artic GML	**A123**	**43.0**	**24.04**	**1.68**	**2.59**	**5.54**	**42**	**304**	**47**	**39480**	**100%**	19.0	10.00	**100%**	**2.9**	**4.3**
Six Axle Artic HML	A123	46.0	27.04	1.68	2.59	5.54	37	268	50	37000	88%			94%	2.56	3.79
Truck & Dog (6 Axle - 45.5T Vic)	R12T12	45.5	30.00	1.64	2.49	6.31	34	271	49	33320	81%	19.0	12.50	84%	2.35	3.48
Truck & Dog (6 Axle - 48.5T NSW)	R12T12	48.5	33.00	1.64	2.64	7.70	31	290	49	30380	74%		15.50	77%	2.14	3.18
Truck & Dog (7 Axle)	R12T22	50.5	33.60	1.64	2.45	6.15	30	234	51	30600	71%		17.50	78%	2.07	3.07
Truck & Dog (20M - PBS)	R12T22	56.0	38.60	1.65	2.74	8.29	26	259	53	27560	62%	20.0	17.33	70%	1.82	2.69
Truck & Dog (20M PBS)	R12T23	57.5	40.10	1.65	2.74	8.29	25	249	55	27500	60%		18.33	70%	1.75	2.59
19M B.double GML	B1222	56.0	36.35	1.67	2.88	8.29	28	279	53	29680	67%	19.0	17.33	75%	1.94	2.87
19M B.double GML/HML	B1222	57.5	37.85	1.67	2.88	8.29	27	269	55	29700	64%			75%	1.87	2.77
B.double GML	B1233	63.0	38.84	1.69	2.80	6.91	26	224	62	32240	62%	26.0	21.00	82%	1.98	2.85
B.double HML	B1233	68.5	44.34	1.69	2.80	6.91	23	198	65	29900	55%			76%	1.75	2.52
B-triple GML	B12333	83.0	52.35	1.71	3.07	8.29	20	200	68	27200	48%	35.0	23.33	69%	1.7	2.37
B-triple HML	B12333	91.0	60.35	1.71	3.07	8.29	17	170	72	24480	40%			62%	1.45	2.02
AB-triple GML	A123T2B33	99.5	64.00	1.84	3.52	10.36	16	196	75	24000	38%	36.5/42.5 (modular)	28.83	61%	1.48	2.02
AB-triple HML	A123T2B33	108.0	72.50	1.84	3.52	10.36	14	171	79	22120	33%			56%	1.3	1.77
Type 1 R/train - GML	A123T23	79.5	48.73	1.72	3.25	8.98	21	225	68	28560	50%	36.5	22.17	72%	1.82	2.52
Type 1 R/train - HML	A123T23	85.5	54.73	1.72	3.25	8.98	19	204	72	27360	45%			69%	1.65	2.28
Type 2 R/train - GML	A123T23T23	116.0	73.42	1.76	3.91	12.42	14	199	80	22400	33%	53.5	34.33	57%	1.45	1.92
Type 2 R/train - HML	A123T23T23	125.0	82.42	1.76	3.91	12.42	13	185	83	21580	31%			55%	1.35	1.78
BAB Quad - GML	B1233T2B33	119.5	78.42	1.73	3.68	11.74	13	176	81	21060	31%	51.5	35.50	53%	1.32	1.76
BAB Quad - HML	B1233T2B33	130.5	89.42	1.73	3.68	11.74	12	162	85	20400	29%			52%	1.22	1.62

The B-triple; AB-triple; & the BAB-Quad are based on modular vehicle units as agreed by ATA General Council.

EAM (Extreme Axle Measurement) Is the minimum dimensional requirement in regard to Axle Spacing Mass Schedule (ASMS) requirements for the stated Gross Combination Mass. The formula varies depending on the gross mass of the vehicle and whether the vehicle is a road train. In addition to EAM, internal axle groups must also comply to the appropriate ASMS.

* The data in this table is provided for general information and does not take into account your specific circumstances. You should obtain professional engineering advice before taking action.

For further information contact ATA on 02 6253 6900

Australian Trucking Association and Barkwood Consulting P/L

September 2016

Truck Impact Chart - Modular

Table 3: Truck Impact Chart

Appendix C – WA Planning Guidelines TIA Checklist

Shown overleaf

Appendix A2:

Checklists for individual development transport impact assessment

Checklist for a transport impact assessment for individual development

- Tick the provided column for items for which information is provided.
- Enter N/A in the provided column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or signalisation of an existing intersection.

ITEM	PROVIDED	COMMENTS/PROPOSALS
Summary		
Introduction/Background		
name of applicant and consultant	Y	YEC
development location and context	Y	Yindjibarndi Energy Project, Pilbara, Western Australia
brief description of development proposal	Y	Wind Farm, Solar Farm, BESS, Substation and Overhead Transmission Lines
key issues	Y	OSOM deliveries, construction traffic
background information	Y	Refer Introduction
Existing situation		
existing site uses (if any)	Y	Cattle grazing land
existing parking and demand (if appropriate)	Y	No existing parking. Parking demand to be met through construction of carparks / hardstands
existing access arrangements	N	Site access to be established
existing site traffic	Y	Peak hourly and daily traffic volumes
surrounding land uses	Y	Cattle grazing land
surrounding road network	Y	Manuwarra Red Dog Highway East of Site.
traffic management on frontage roads	Y	Detailed within section 9.2
traffic flows on surrounding roads (usually AM and PM peak hours)	Y	Detailed within section 2.3
traffic flows at major intersections (usually AM and PM peak hours)	N/A	
operation of surrounding intersections	N/A	
existing pedestrian/cycle networks	N/A	
existing public transport services surrounding the development	N/A	
crash data	N	Dataset removed from Main Roads Open Data Portal as of July 2026

ITEM	PROVIDED	COMMENTS/PROPOSALS
Development proposal		
regional context	Y	Proposed site location provided
proposed land uses	Y	Wind Farm, Solar Farm, BESS, Substation and Overhead Transmission Lines
table of land uses and quantities	Y	Cattle grazing land
access arrangements	Y	Detailed within section 2.2
parking provision	Y	Detailed within section 4
end of trip facilities	N/A	Site camp
any specific issues	Y	Construction traffic volumes & OSOM deliveries
road network	Y	Detailed within section 2.2
intersection layouts and controls	N/A	Detailed within section 7.4 (TBC)
pedestrian/cycle networks and crossing facilities	N/A	
public transport services	N/A	
Integration with surrounding area		
surrounding major attractors/ generators	Y	Millstream–Chichester National Park
committed developments and transport proposals	N/A	
proposed changes to land uses within 1200 metres	N/A	
travel desire lines from development to these attractors/ generators	N/A	
adequacy of existing transport networks	Y	7m wide roads and low existing traffic volumes
deficiencies in existing transport networks	N/A	
remedial measures to address deficiencies	N/A	
Analysis of transport networks		
assessment years	Y	2025 - 2028
time periods	Y	Detailed within Section 3.2
development generated traffic	Y	Detailed within Section 7
distribution of generated traffic	Y	Detailed within Section 7
parking supply and demand	Y	Detailed within Section 4
base and 'with development' traffic flows	Y	Detailed within Section 8
analysis of development accesses	Y	Detailed within Section 7.4
impact on surrounding roads	Y	Detailed within Section 8
impact on intersections	N/A	

ITEM	PROVIDED	COMMENTS/PROPOSALS
Analysis of transport networks (cont.)		
impact on neighbouring areas	Y	Neighbours include Sylvania Homestead Airport, and Coobina Chromite Mine
road safety	Y	Detailed within section 9.4
public transport access	N/A	
pedestrian access/amenity	N/A	
cycle access/amenity	N/A	
analysis of pedestrian/cycle networks	N/A	
safe walk/cycle to school (for residential and school site developments only)	N/A	
traffic management plan (where appropriate)	N	Not provided
Conclusions		

Proponent's name: Bernard Buck.....

Company: icubed consulting..... **Date: 22/07/2026**.....

Transport assessor's name .....

Company ..... **Date** .....

Transport impact assessment revision checklist

Please include this checklist when providing revisions to transport impact assessments (TIAs) to the Department of Planning, to identify changes made.

Name of planning application: .....

Date/revision no. of previous TIA: .....

Date/revision no. of revised TIA: .....

ITEM No.	INFORMATION/CHANGE REQUESTED	COMPLETE ✓	PAGE No.

If information/changes not provided, please attach explanatory notes, using item no. to identify information/change request.

Appendix D – Transport Route Assessment

Shown overleaf

Preliminary Transport Route Assessment

YINDJIBARNDI ENERGY PROJECT Baru + Marnda

Yindjibarndi Energy
A partnership with ACEN



Prepared By	Blake Henry
Released By	Fraser MacMillan
Job Number	24-007
Date	**16/09/2024**
Document Name	24-007 - Yindjibarndi Energy Project - Preliminary Transport Route Assessment
Version	V2.0

Document Revision History

Version	Revision History	Date
1	Issued to client	**27/08/2024**
2	Swept path and OHL assessments added	**16/09/2024**



Fraser MacMillan
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STATEMENT OF LIMITATION

Data and conclusions of this report are the findings and opinions of icubed consulting and are not an expressed or implied representation, warranty or guarantee. This report has been prepared for ACEN. icubed Consulting does not accept liability for any third party's use or reliance on this report.

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1 Introduction

Yindjibarndi Energy Corporation (YEC) is a joint venture partnership project between ACEN and the Yindjibarndi Aboriginal Corporation (YAC). YEC is investigating the feasibility of proposed projects Baru and Marnda which are part of the Yindjibarndi Energy Project (the Project) in the Pilbara region of Western Australia, approximately 70km south of Karratha. The Project is within the early feasibility stages; however, it is anticipated to consist of up to 600MW of wind turbine generators (WTGs), 250MW of Solar PV and the option of Battery Energy Storage Systems (BESS).

The wind farm component of the Yindjibarndi Energy Project may require over 1,100 Over Size Over Mass (OSOM) vehicle movements to deliver WTGs from the designated Port of Entry. Therefore, it is important that the chosen route into the site can accommodate these vehicles safely and allow delivery to site in a timely and efficient manner.

This report considers two potential candidates for the Port of Entry; it is worth noting that at the time of writing each facility is currently under construction or refurbishment:

- Lumsden Point – Port of Port Hedland
- Dampier Cargo Wharf

The WTG components will arrive at the chosen Port of Entry where they will be loaded on to the OSOM transport fleet, leave the Port and travel along public roads to the Project site under escort. Both potential Ports are administered by Pilbara Ports. It is recommended that early consultation is made with Pilbara Ports for their designated component storage facilities. Furthermore, a detailed assessment of the Port exit strategy is recommended.

This report considers the transport route from the chosen Port of Entry to the locality of Millstream, which is approximately 25km south-west of the Yindjibarndi Energy Project. It is expected that a site entry will be established along Roebourne-Wittenoom Rd (Manuwarra Red Dog Hwy) to allow OSOM vehicles to travel from the public road network to site. A Site Access Corridor Selection Study is to be completed as separate scope of works to identify potential opportunities for access from the public roads into the Project site.

It is understood that the WTG supplying contractor is yet to be determined, however the turbines have been assumed to have:

- A capacity of up to 7.2MW,
- A 6.0m tower diameter,
- A 266m height from ground to rotor tip; and
- A rotor blade length of up to approximately 100m.

1.1 Purpose

The purpose of this report is to assess the possible routes available, with careful consideration given to the OSOM transport fleet's general requirements, to therefore establish the most likely option and enable further dialogue with the relevant agencies including Pilbara Ports, Main Roads Western Australia (MRWA) and the relevant Local Authorities who are custodians of the Lower Order Roads.

This report details the results of this assessment, including an evaluation of:

- The existing conditions of the proposed transport route from the Port of Port Hedland (Lumsden Point) and Dampier Cargo Wharf including;
  - Identifying the key intersections and turning movements the vehicles will undertake including a horizontal and vertical desktop route constraints assessment;
  - Identification of any road or intersection upgrades required to enable transportation of vehicles to site;
  - A high-level assessment of potential conditioning and temporary works required (e.g. drainage, widening, removal of signs and light poles);

1.2 Design Vehicle

Of the multiple elements of wind farm infrastructure to be transported, turbine blades present the largest logistical challenge, as they must be transported as a single piece. Tower sections also present a logistical challenge due to the loaded vehicle height conflicting with overhead obstructions.

The longest vehicle expected to deliver components to site during construction of the facility will be a WTG Blade Trailer vehicle as shown indicatively in Figure 1. The WTG used as part of the Project are expected to use WTG blades up to 100m long. Given the large geometry of the required blade trailer vehicle, it has been considered that upgrade works that cater for the blade vehicle will provide for a worst-case scenario for turns.

The tower section transportation vehicles will likely be the tallest, shown indicatively in Figure 2 and will provide a worst-case scenario for the transportation of other components restricted by height constraining overpasses. Other large vehicles that are likely during construction are oversize, over mass vehicles for deliveries of other turbine components, transformers and B-Double vehicles for other material deliveries.



Figure 1: Indicative Dimensions of Oversize Vehicle for WTG Blade Transportation (indicative)
Source: icubed consulting, 2024

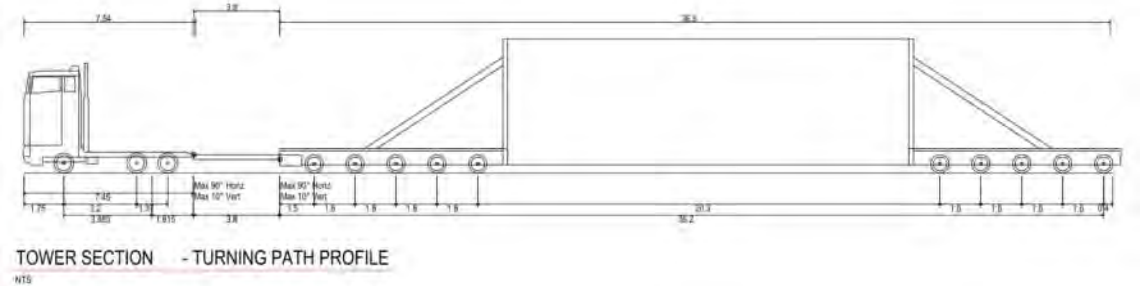


Figure 2: Indicative Dimensions of Oversize Vehicle for WTG Tower Section Transportation
Source: icubed consulting, 2024

2 Oversize Transport Route Options

Two (2) potential access routes from the Port of Entry to the Yindjibarndi Energy Project have been identified as part of this study, herein referred to as Option 1 and Option 2. These routes have been assessed with respect to their ability to cater for the applicable OSOM delivery vehicle requirements:

- **Option 1:** Port of Port Hedland (Lumsden Point) to Millstream
- **Option 2:** Dampier Cargo Wharf to Millstream

Also considered as part of Option 1 are two potential bypasses of the township of Roebourne:

- **Bypass 1:** Bypasses Roebourne via Cooya Pooya
- **Bypass 2:** Bypasses Roebourne via Mount Herbert

A map of the potential routes of travel and bypasses are shown below in Figure 3 with the associated distances and road custodians presented in Table 1.



Figure 3: Assessed Travel Routes from Port to Site
Source: Google Earth, 2024

Table 1: Access Route Summary

Road to site Entry Point	Road Custodian				Total Travel Route Distance
	MRWA	Pilbara Ports	City of Karratha	Shire of Ashburton	
Option 1 (Lumsden Point to site)	329km	3km	-	-	332km
Option 2 (Dampier Cargo Wharf to site)	124km	<1km	2km	-	126km
Bypass 1 (Lumsden Point to site)	233km	3km	52km*	-	288km
Bypass 2 (Lumsden Point to site)	174km	3km	58km	20km	255km

**Includes road privately owned by Rio Tinto*

Main Roads Western Australia (MRWA) oversize and overmass networks are presented below in Figure 4 and Figure 5. The North West Coastal Highway (National Route 1) is a designated oversize and overmass network according to this mapping. However Warlu Road/Manuwarra Red Dog Highway and the other lower order roads are not shown. These roads should be investigated to confirm their suitability for OSOM vehicles.



Figure 4: MRWA Oversize Networks (Road Train)
Source: Main Roads Western Australia, 2024

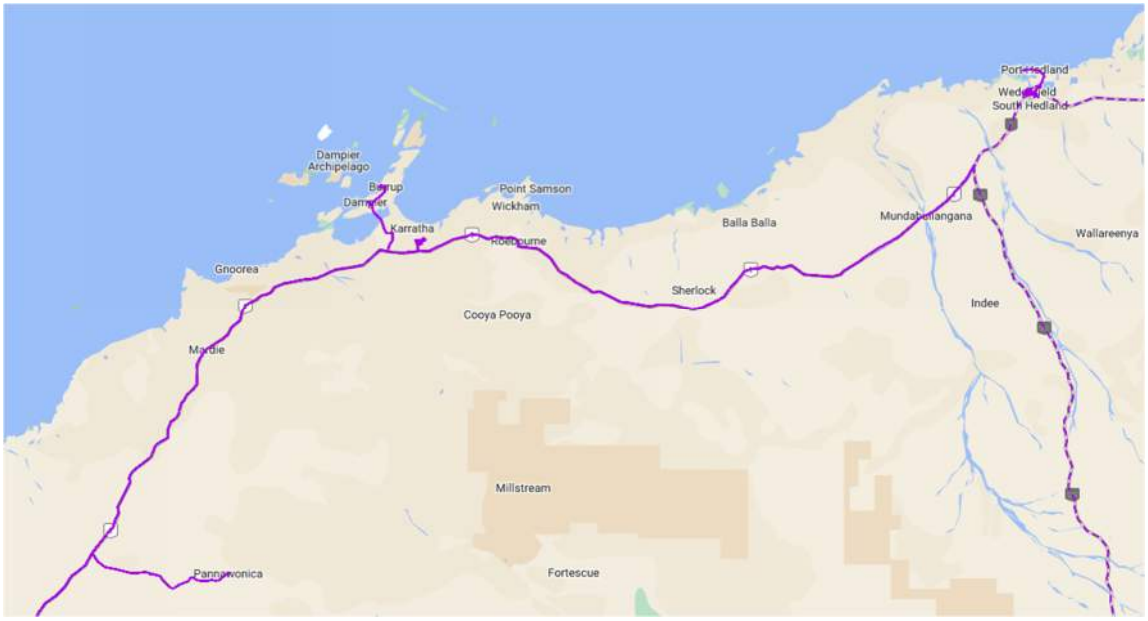


Figure 5: MRWA Overmass Networks (PTR1)
Source: Main Roads Western Australia, 2024

The roads used by the potential routes of travel and bypasses are shown below in Table 2 and Table 3, along with the relevant custodians that oversee these roads.

Table 2: Access Route Road Tracker

Access Route Roads	Road Custodian
Roads used by Option 1 - Port of Port Hedland (Lumsden Point)	
Unnamed Road (Within Port of Port Hedland)	Pilbura Ports
Great Northern Highway	MRWA
Roads used by Option 2 - Dampier Cargo Wharf	
Mof Road	Pilbura Ports/City of Karratha
King Bay Road	City of Karratha
Burrup Road	MRWA
Dampier Highway	MRWA
Madigan Road	MRWA
Roads used by Option 1 and Option 2	
North West Coastal Highway	MRWA
Warlu Road/Manuwarra Red Dog Highway	MRWA
Roebourne-Wittenoom Road/Manuwarra Red Dog Highway	MRWA

Table 3: Roebourne Bypass Road Tracker (Option 1)

Access Route Roads	Road Custodian
Bypass via Cooya Pooya	
Cherratta Road	City of Karratha
Woodbrook Road	City of Karratha
Cooya Pooya Road	City of Karratha
Robe River Rail Access Road	Rio Tinto
Bypass via Mount Herbert	
Roebourne-Wittenoom Road	City of Karratha/Shire of Ashburton

3 Access Route Analysis – Port Hedland (Lumsden Point)

The following section highlights areas of concern along the transport route for Option 1 and the two potential bypasses routes for the blade and tower section vehicles and provides a high-level overview of potential upgrades required.

3.1 Option 1 – Port of Port Hedland (Lumsden Point) to Millstream

Under Option 1, the OSOM components would arrive at the Port of Port Hedland's new facility at Lumsden Point, as shown below in Figure 6. The proposed route then travels along the Great Northern Highway and then the North West Coastal Highway before turning onto Warlu Road/Manuwarra Red Dog Highway near Karratha, with a total travel distance of 332km.



Figure 6: Option 1 - Port to site via Karratha
Source: Google Earth, 2024

3.1.1 Lumsden Point (Port of Port Hedland)

At the time of writing, Pilbara Ports is developing new multi-user facility and logistics hub at Lumsden Point within the Port of Port Hedland. This development has been designated to facilitate the import of renewable energy infrastructure including wind turbines and blades (Pilbara Ports, 2024). According to a publication by Infrastructure Australia, the Lumsden Point development is due to be completed by 2026. The OSOM components would travel for around 3km on a likely port-controlled road that is unnamed at this point, before turning onto the Great Northern Highway at an intersection that is not expected to require extensive upgrades, however temporary measures may be required (e.g. removal of signs and light posts), shown below in Figure 7. The route then travels 30km south-west to an intersection between the Great Northern Highway and North West Coastal Highway.



Figure 7: Access Route through Lumsden Point (Port of Port Hedland)
Source: Google Earth, 2024

3.1.2 Great Northern Highway/North West Coastal Highway Intersection

The intersection between the Great Northern Highway and North West may require temporary measures (e.g. removal of signs and light posts). The OSOM vehicles could alternatively pass onto the oncoming traffic lane depicted below (in yellow) in Figure 8. This would be a more straightforward manoeuvre; however additional traffic management measures may be required. The route then continues 160km south-west along the North West Coastal Highway passing by the town of Whim Creek on the way to Roebourne.



Figure 8: Access Route through Great Northern Highway/North West Coastal Highway Intersection
Source: Google Earth, 2024

3.1.3 Roebourne

There are several locations where the access route passes under several overhead powerlines along the North West Coastal Highway near Roebourne, including once 16km south-east of the town and three locations around 5km west of Roebourne. The intersection between the North West Coastal Highway and Cherratta Road is not expected to be overly challenging from a geometric perspective but may require temporary modifications including the removal of signs and guideposts to accommodate OSOM delivery. If road widening is required, the associated earthworks can be expected to be relatively minor, due to the flat nature of the area. The desktop overview has not identified any major obstructions through the township of Roebourne. Temporary modifications to streetlights, signs and traffic medians may be required. Consultation with the respective council (City of Karratha) may be required to discuss the impacts associated with OSOM vehicles travelling through the town. Two potential bypasses have been identified to avoid the need to travel through Roebourne, discussed in section 3.2 and 3.3. The route then travels 40km west along the North West Coastal Highway to the intersection with Warlu Road/Manuwarra Red Dog Highway south of Karratha.



Figure 9: Access Route through Roebourne
Source: Google Earth, 2024

3.1.4 Karratha

The proposed route passes under a powerline located 15km east of the intersection between North West Coastal Highway and Warlu Road/Manuwarra Red Dog Highway. This intersection, located 10km south-west of Karratha, is not expected to be geometrically challenging, however some temporary modifications may be required including the removal of signs, light poles and guideposts. The placement of sandbags may be required to allow the OSOM vehicles to mount the kerbs and traffic island.

As depicted in Figure 10, the proposed routes for Option 1 and Option 2 are joined at this point, and roads are shared from this intersection onwards. The route then heads south for approximately 90km to Millstream. Warlu Road/Manuwarra Red Dog Highway is not a designated oversize or overmass route as discussed in Section 2. However, a preliminary assessment completed as part of a site visit by icubed found the road to be in overall favourable condition for the delivery of OSOM components. Warlu Road/Manuwarra Red Dog Highway includes several floodways and railway crossings, however these are not expected to impede the delivery of OSOM components.



Figure 10: Access Route through intersection south of Karratha (Option 1 and Option 2)
Source: Google Earth, 2024

3.1.5 Millstream

The proposed route passes under a powerline 38km before reaching Millstream, as well as two railway crossings, shown below in Figure 11 and Figure 12. These are part of the Hamersley & Robe River railway, a private rail network majority-owned by Rio Tinto. From Google Earth satellite imagery and a site visit, the crossings appear to be in good condition to facilitate delivery of OSOM components. However, consultation with Rio Tinto may be required to confirm the suitability of these movements. A site entry to the Yindjibarndi Energy Project is expected to be established from Roeborune-Wittenoom Road (Manuwarra Red Dog Highway) within 10km to the north or south of Millstream.

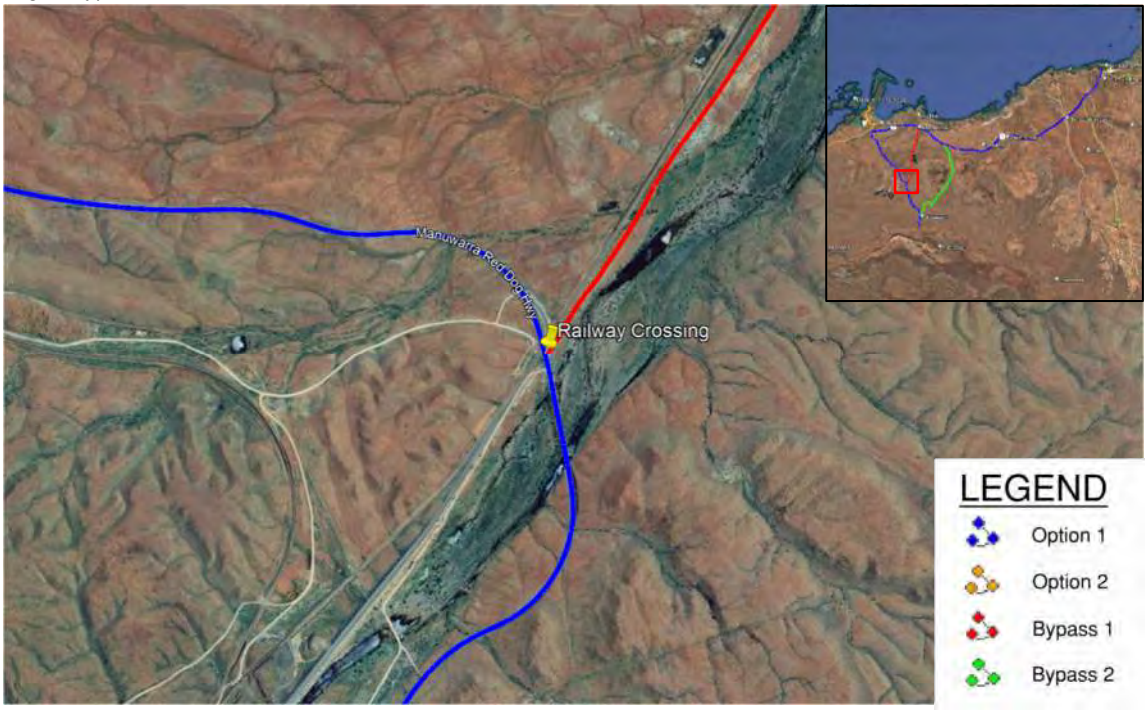


Figure 11: Access Route through Millstream (Railway Crossing 1)
Source: Google Earth, 2024



Figure 12: Access Route through Millstream (Railway Crossing 2)
Source: Google Earth, 2024

3.2 Bypass 1 – Cooya Pooya

This alternative bypass section avoids the need for OSOM vehicles to pass through Roebourne by travelling south through Cooya Pooya to Warlu Road/Manuwarra Red Dog Highway, shown below in Figure 13. The length of the bypass section itself is 52km, with a total travel distance from Lumsden Point to Millstream of 288km, which is 44km less than that of Option 1. Accessing Millstream using this bypass section is not recommended due to potential flood immunity issues, part of the route including a private road requiring a permit and the potential significant upgrades required.

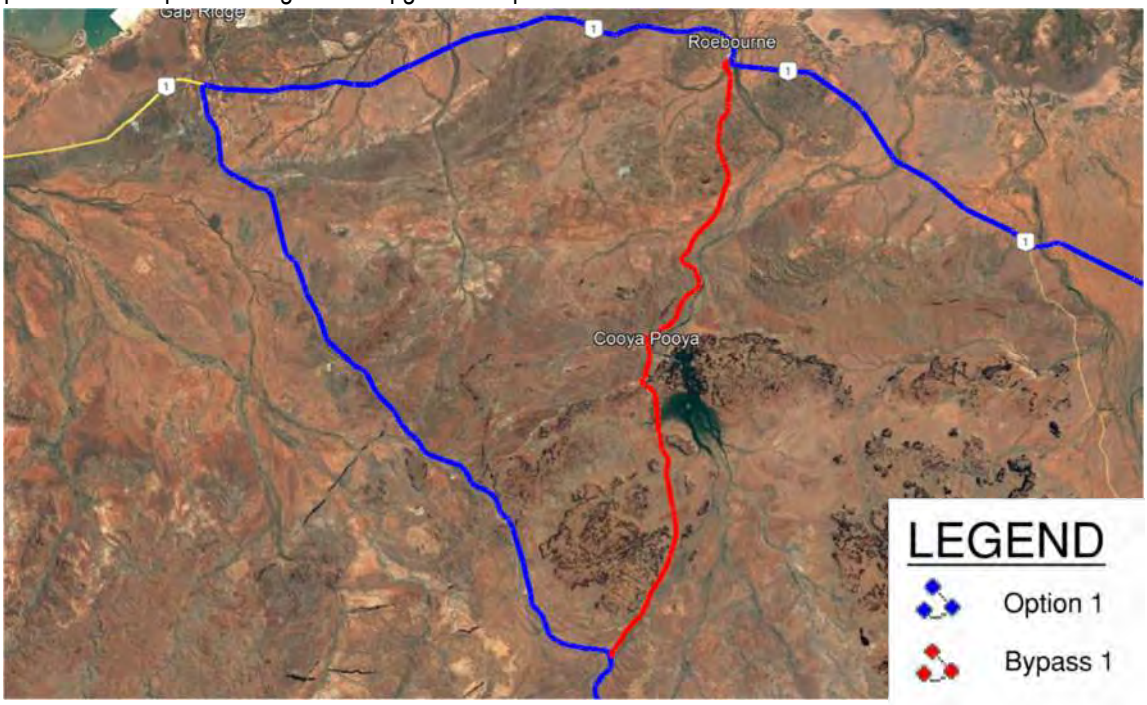


Figure 13: Bypass 1 via Cooya Pooya
Source: Google Earth, 2024

3.2.1 Roebourne (Bypass)

The access route travels to the North West Coastal Highway and Cherratta Road intersection, 1km south of Roebourne, refer to the commentary from Sections 3.1.1 and 3.1.2. The bypass section begins by continuing straight from the North West Coastal Highway onto Cherratta Road, before passing through two intersections depicted below in Figure 14, and then heading south on Woodbrook Road. Both intersections are likely to require significant upgrades to facilitate the delivery of OSOM components. The route then travels south approximately 25km to Cooya Pooya.



Figure 14: Access Route through Roebourne (Bypass)
Source: Google Earth, 2024

3.2.2 Cooya Pooya

The access route continues onto Cooya Pooya Road, and then crosses the Hamersley & Robe River railway twice, as shown below in Figure 15. In some places there are tight horizontal radii that may present a challenge to OSOM delivery vehicles.

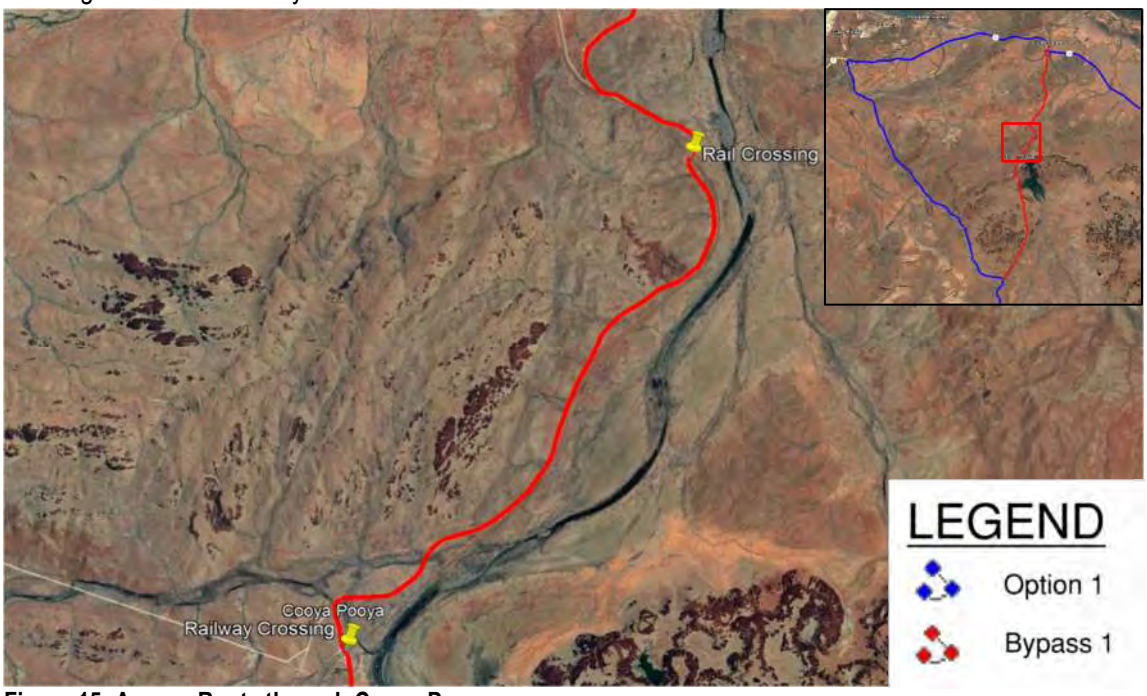


Figure 15: Access Route through Cooya Pooya
Google Earth, 2024

After the southernmost railway crossing, the bypass section continues on to the Robe River Rail Access Road, privately owned by Rio Tinto. Consultation with Rio Tinto would be required to obtain access to this road for delivery of OSOM components. This road is likely to be of lower quality than that of Cooya Pooya Road, which would likely require further upgrades to facilitate OSOM vehicles. Satellite imagery suggests there may be flood immunity and drainage issues associated with the road, as shown below in Figure 16.



Figure 16: Potential Flood Immunity and Drainage Issues with Robe River Rail Access Road
Source: Google Earth, 2024

The access route continues along the privately owned Robe River Rail Access Road for approximately 18km before intersecting Warlu Road/Manuwarra Red Dog Highway. In the absence of Google Street View imagery, it is unclear what upgrades or temporary works may be required for this intersection. The access route then travels 33km south to Millstream, refer to Section 3.1.5.

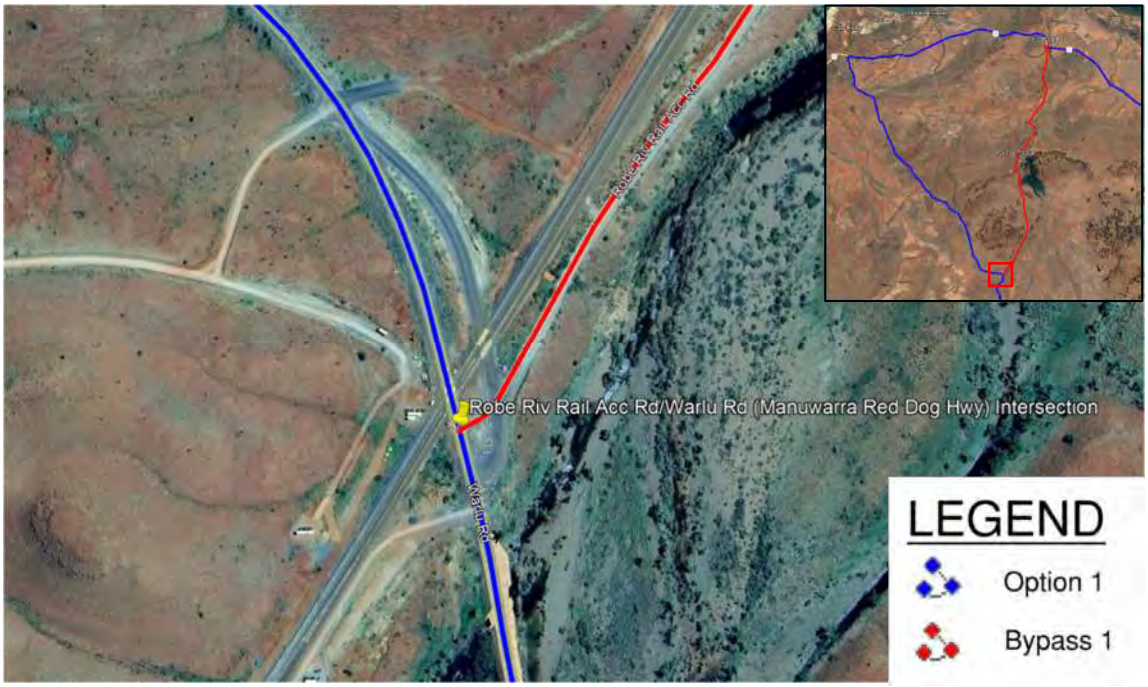


Figure 17: Bypass Section 1 adjoining Warlu Rd/Manuwarra Red Dog Hwy
Source: Google Earth, 2024

3.3 Bypass 2 – Mount Herbert

This alternative bypass section avoids the need for OSOM vehicles to pass through Roebourne by travelling south to Millstream on Roebourne-Wittenoom Road, shown below in Figure 18. The length of the bypass section itself is 79km, with a total travel distance from Lumsden Point to Millstream of 255km, which is 77km less than that of Option 1. Accessing Millstream using this bypass section is not recommended as due to significantly geometric constraints associated with the southern end of the route.

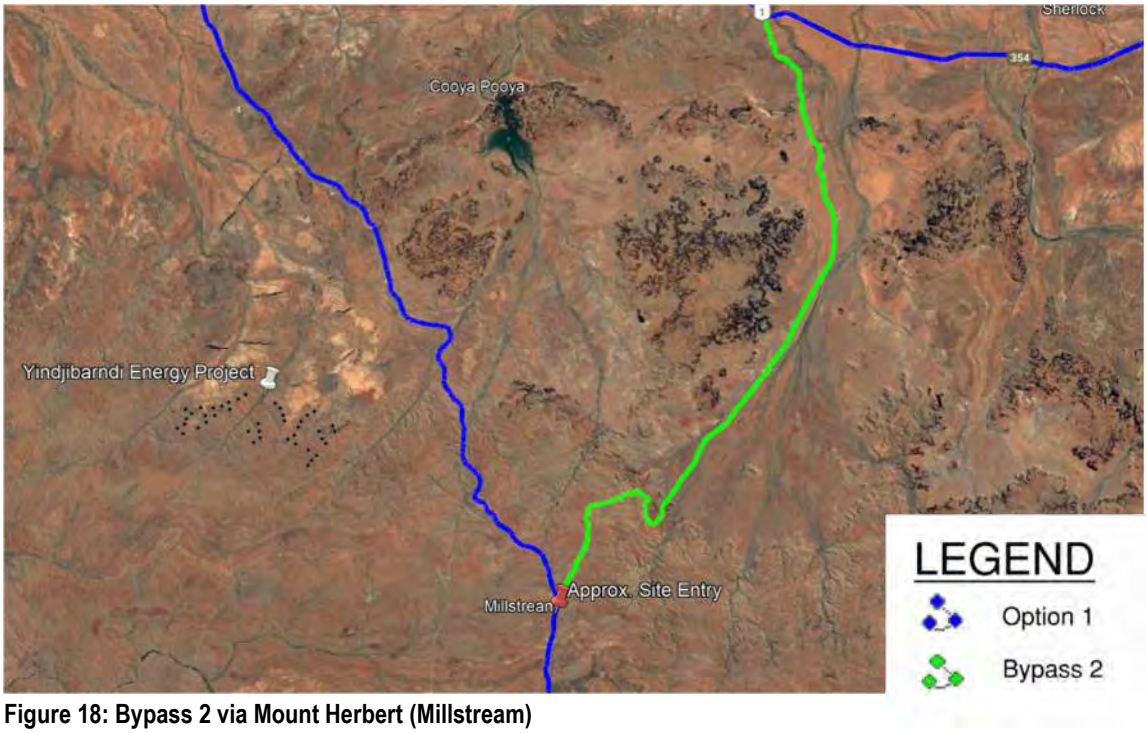


Figure 18: Bypass 2 via Mount Herbert (Millstream)
Source: Google Earth, 2024

3.3.1 Sherlock

The bypass section begins at the North West Coastal Highway and Roeborune-Wittenoom Road intersection near Sherlock (see Figure 19), around 25km south-east of Roebourne, refer to commentary from Sections 3.1.1 and 3.1.2. The intersection may require temporary works such as the removal of signs and guideposts to facilitate OSOM vehicles. The route then travels 55km south to Mount Herbert.



Figure 19: Access Route through Sherlock
Source: Google Earth, 2024

3.3.2 *Mount Herbert (Millstream)*

The bypass section then travels through a section of Roebourne-Wittenoom Road near Mount Herbert, that is shown to be geometrically challenging. Horizontal radii are significantly constrained throughout this section, in some cases found to be around 30m. The section is also vertically challenging, with grades exceeding 9% as shown below in Figure 20. Consequently, this bypass section is unlikely to appropriate for OSOM vehicles without significant upgrades and road realignment.

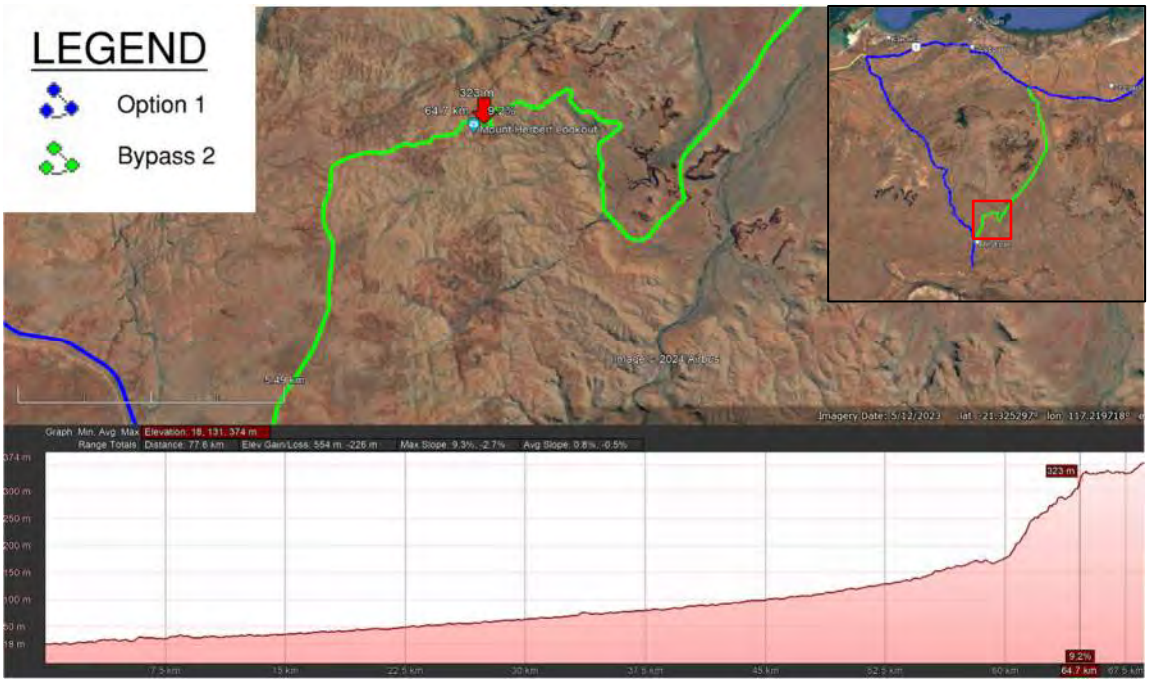


Figure 20: Access Route through Mount Herbert (Millstream)
Source: Google Earth, 2024

4 Access Route Analysis – Dampier Cargo Wharf

4.1 Option 2 – Dampier Cargo Wharf to Millstream

The following section highlights areas of concern along the transport route for Option 2 for the blade and tower section vehicles and provides a high-level overview of potential upgrades required. The OSOM vehicles would depart the newly refurbished Dampier Cargo Wharf before travelling south along the Dampier Highway and then Madigan Road before turning onto the North West Coastal Highway and then onto Warlu Road/Manuwarra Red Dog Highway, with a total travel distance of 126km from the Port of Entry to Millstream, which is 206km less than that of Option 1.

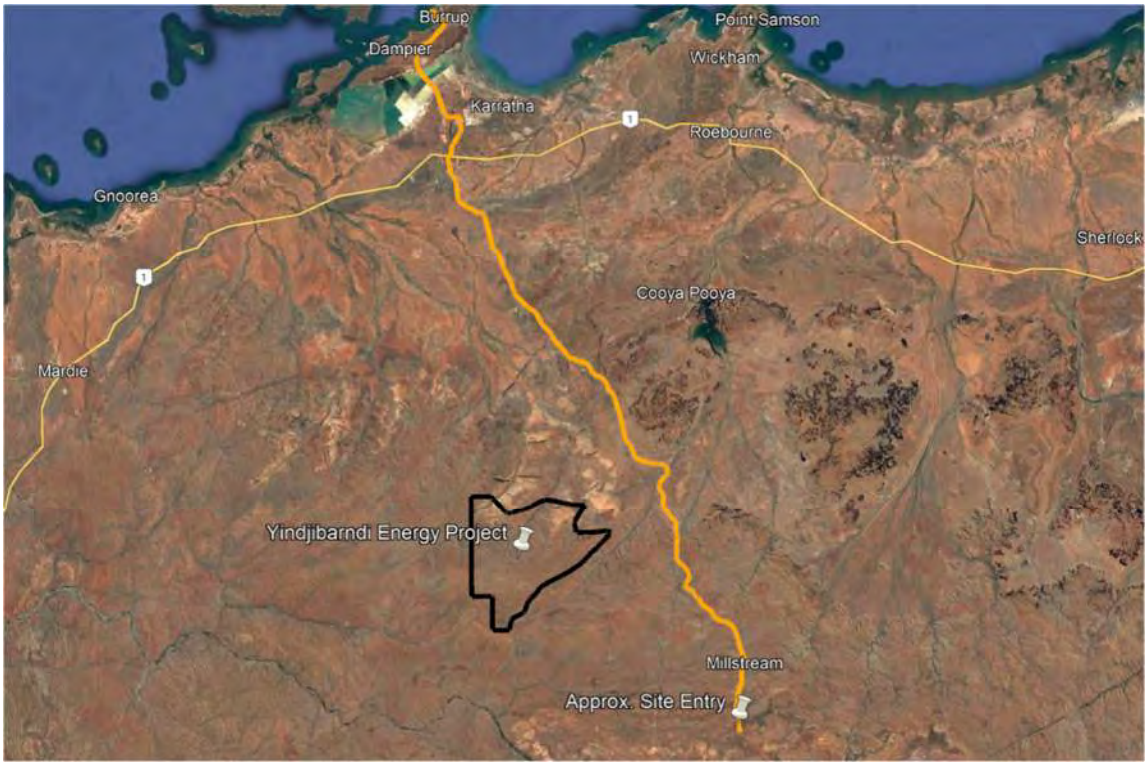


Figure 21: Access Route Option 2 - Dampier Cargo Wharf
Source: Google Earth, 2024

4.1.1 *Dampier Cargo Wharf (Burrup)*

At the time of writing, Pilbara Ports is in the process of refurbishing the Dampier Cargo Wharf into a multi-user facility with expanded capabilities. This involves the construction of the Dampier Bulk Handling Facility and Dampier Link Bridge (Pilbara Ports, 2024). Whether the facility will be appropriate for the delivery of renewable energy infrastructure, and the completion date for construction, are unclear. Consultation with Pilbara ports is recommended to assess whether the Dampier Cargo Wharf could serve as the Port of Entry for WTG components for the Project.

After arriving at the Dampier Cargo Wharf, the OSOM vehicles are to travel along Mof Road; which is a Pilbara Ports controlled road for less than a kilometre before becoming a City of Karratha controlled road. The access route passes through two (2) intersections in Burrup as shown below in Figure 22. The intersection between Mof Road and King Bay Road may be somewhat geometrically challenging and will likely require temporary works (e.g. removal of signs, light posts or additional pavement widening) to facilitate OSOM vehicles. The Burrup Road and King Bay Road intersections appears less geometrically constrained, however some temporary works may also be required. The route then heads along Burrup Road for 7km to an intersection with the Dampier Highway, near the town of Dampier.



Figure 22: Access Route through Burrup
Source: Google Earth, 2024

4.1.2 Dampier Highway and Burrup Road Intersection

The access route travels through an intersection between the Dampier Highway and Burrup Road, approximately 2km east of Dampier, shown below in Figure 23. The intersection is expected to be favourable for the delivery of OSOM components overall, however, may require temporary measures to be implemented, such as the removal of traffic lights and light poles. Following this, the access route travels 11km along the Dampier Highway to an intersection with Madigan Road in Gap Ridge, near the town of Karratha.



Figure 23: Access Route through Dampier Highway and Burrup Road intersection
Source: Google Earth, 2024

4.1.3 Gap Ridge (Karratha)

The access route then travels through an intersection (see Figure 24) between the Dampier Highway and Madigan Road, approximately 5km west of Karratha. This intersection is not expected to be excessively challenging from a geometric perspective. Temporary works such as the removal of signs, light poles and traffic lights may be required to pass through the horizontal turn and as well the placement of sandbags to mount kerbs and existing traffic island.



Figure 24: Access Route through Dampier Highway and Madigan Road intersection
Source: Google Earth, 2024

The route continues South along Madigan Road for 6km passing under two powerlines before reaching an intersection with the North West Coastal Highway. This intersection also may require temporary works by the way of removal of signs and light poles, and placement of sandbags to mount kerbs and traffic islands. At this point, the route adjoins Option 1, travelling approximately 90km south to Millstream, refer to Sections 3.1.4 and 3.1.5.



Figure 25: Access Route through North West Highway and Madigan Road intersection
Source: Google Earth, 2024

5 Identified Obstructions

The expected modifications and further analysis required for the obstructions (e.g. intersection, railway crossing, powerlines) identified in section 3 and section 4 are shown below in Table 4 and Table 5. Further imagery on each identified obstruction is provided in Appendix A. A swept path analysis has been conducted on horizontal turns required as part of Option 1 and Option 2. These are indicative of the modifications required to deliver the OSOM vehicles and are included in Appendix B.

Table 4: Option 1 – Port Hedland (Lumsden Point)

Location No.	Location Description	Authority /Owner	Modification Required	Risk Category	Appendix Reference
1	**Intersection:** Great Northern Hwy / Unnamed Road, Port Hedland	Pilbara Ports, MRWA	• Light poles and signs temporarily removed • Existing traffic median to be made drivable	Medium	Figure 29, SK 01
2	**Intersection:** Great Northern Hwy / N W Coastal Hwy, Mundabullangana	MRWA	• Light poles and signs temporarily removed • Existing traffic median to be made drivable • Pavement widening • Consider alternative route (oncoming lane)	Medium	Figure 30 and Figure 31, SK 02
3	**Powerline:** N W Coastal Hwy, Cooya Pooya	Horizon Power	• Confirm clearance to power line	Low	Figure 46
4	**Intersection:** N W Coastal Hwy / Cherratta Rd, Roebourne	MRWA	• Light poles and signs temporarily removed • Existing traffic median to be made drivable • Pavement widening • Vegetation clearing	Medium	Figure 32, SK 03
5	**Powerline:** N W Coastal Hwy, Roebourne	Horizon Power	• Confirm clearance to power line	Low	Figure 47
6	**Powerline:** N W Coastal Hwy, Cooya Pooya	Horizon Power	• Confirm clearance to power line	Low	Figure 48
7	**Powerline:** N W Coastal Hwy, Cooya Pooya	Horizon Power	• Confirm clearance to power line	Low	Figure 49
8	**Powerline:** N W Coastal Hwy, Cooya Pooya	Horizon Power	• Confirm clearance to power line	Low	Figure 50
9	**Intersection:** N W Coastal Hwy / Warlu Rd (Manuwarra Red Dog Hwy), Karratha	MRWA	• Light poles and signs temporarily removed • Existing traffic median to be made drivable • Pavement widening	Medium	Figure 33, SK 04
10	**Powerline:** N W Coastal Hwy / Warlu Rd (Manuwarra Red Dog Hwy), Cooya Pooya	Rio Tinto	• Confirm clearance to power line	Low	Figure 51

11	**Railway Crossing:** Warlu Rd (Manuwarra Red Dog Hwy), Millstream	MRWA, Rio Tinto	• Consultation with Rio Tinto	Low	Figure 52
12 Bypass 1	**Intersection:** Cherratta Rd / Unnamed Rd, Roebourne	City of Karratha	• Signs temporarily removed • Potential road widening	Medium	Figure 34
13 Bypass 1	**Intersection:** Cherratta Rd / Woodbrook Rd, Roebourne	City of Karratha	• Pavement testing • Potential road widening	Medium	Figure 35
14 Bypass 1	**Powerline:** Woodbrook Rd, Roebourne	Horizon Power	• Confirm clearance to power line	Low	Figure 53
15 Bypass 1	**Several Railway Crossings:** Cooya Pooya Rd, Cooya Pooya	City of Karratha, Rio Tinto	• Pavement testing • Potential road widening • Consultation with Rio Tinto	Medium	Figure 36 and Figure 37
16 Bypass 1	**Flood Immunity:** Robe River Access Rd, Cooya Pooya	Rio Tinto	• Significant geometric and pavement upgrades • Consider alternative routes	High	Figure 27
17 Bypass 1	**Intersection:** Warlu Rd (Manuwarra Red Dog Hwy) / Robe River Access Rd, Millstream	MRWA, Rio Tinto	• Pavement testing • Potential road widening • Consultation with Rio Tinto	Medium	Figure 38
18 Bypass 2	**Intersection:** N W Coastal Hwy / Roebourne-Wittenoom Rd, Sherlock	MRWA, City of Karratha	• Signs temporarily removed • Pavement testing • Potential road widening	Medium	Figure 39
19 Bypass 2	**Geometric Constraint:** Roebourne-Wittenoom Rd, Millstream	Shire of Ashburton	• Significant geometric and pavement upgrades • Road realignment • Consider alternative routes	High	Figure 28
20 Bypass 2	**Intersection:** Warlu Rd (Manuwarra Red Dog Hwy) / Roebourne-Wittenoom Rd, Millstream	MRWA, Shire of Ashburton	• Signs temporarily removed • Pavement testing • Potential road widening	Medium	Figure 40
21	**Railway Crossing:** Roebourne-Wittenoom Rd (Manuwarra Red Dog Hwy), Millstream	MRWA, Rio Tinto	• Consultation with Rio Tinto	Low	Figure 54
22	**Powerline:** Roebourne-Wittenoom Rd (Manuwarra Red Dog Hwy), Millstream	Rio Tinto	• Confirm clearance to power line	Low	Figure 55

Table 5: Option 2 – Dampier Cargo Wharf

Location No.	Location Description	Authority /Owner	Modification Required	Risk Category	Appendix Reference
23	**Intersection:** Mof Rd / King Bay Rd, Burrup	City of Karratha	• Light poles, signs and guard rail temporarily removed • Pavement widening • Vegetation removed	Medium	Figure 41, SK 05
24	**Intersection:** King Bay Rd / Burrup Rd, Burrup	MRWA, City of Karratha	• Light poles, signs and guard rail temporarily removed • Existing traffic median to be made drivable • Pavement widening	Medium	Figure 42, SK 06
25	**Intersection:** Dampier Hwy / Burrup Rd, Burrup	MRWA	• Traffic lights and signs temporarily removed	Medium	Figure 43, SK 07
26	**Intersection:** Dampier Hwy / Madigan Rd, Karratha	MRWA	• Traffic lights, light poles and signs temporarily removed • Existing traffic median to be made drivable	Medium	Figure 44, SK 08
27	**Powerline:** Madigan Rd, Gap Ridge	Horizon Power	• Confirm clearance to power line	Low	Figure 56
28	**Powerline:** Madigan Rd, Gap Ridge	Horizon Power	• Confirm clearance to power line	Low	Figure 57
29	**Intersection:** N W Coastal Hwy / Madigan Rd, Karratha	MRWA	• Light poles and signs temporarily removed • Traffic lights and signs temporarily removed • Pavement widening	Medium	Figure 45, SK 09

A desktop risk assessment of the obstructions along the proposed transport route was undertaken. It is noted that conditions may differ as this risk assessment was conducted using Google Earth images, captured before 2023. Extra obstructions may be present. Some Google Street View imagery is from as early as 2008, and thus may not reflect current conditions.

Several locations where the potential access routes pass underneath overhead powerlines were identified using publicly available mapping from the Western Australia Government, shown below in Figure 26. This was checked against Google Earth Street View imagery which showed some instances where the transmission lines transitioned to underground cables at road crossings. Further site investigations and engagement with the relevant asset owners is recommended, however, it is not expected that public road powerline crossings will inhibit OSOM deliveries.

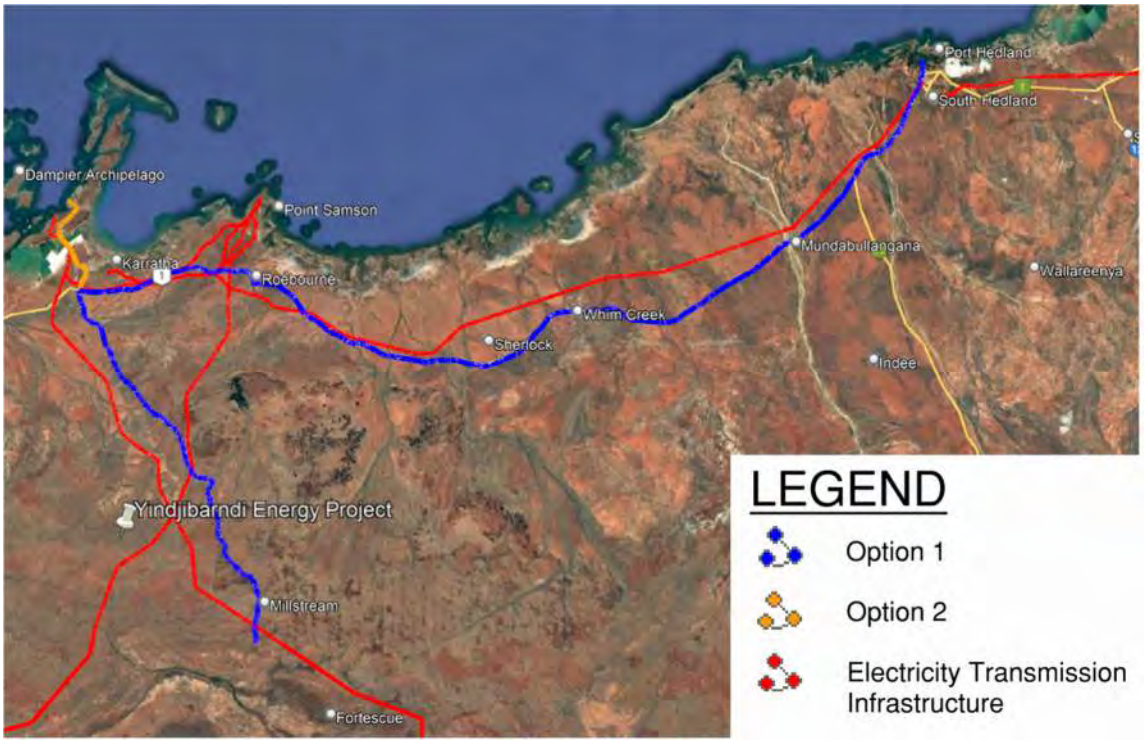


Figure 26: Access Route Options and Electricity Transmission Infrastructure
Source: Google Earth, 2024

icubed have adopted three (3) risk categories that define items, high risk, medium risk and low risk.

- High risk items include bridges/culverts that appear structurally weak, obstacles that clearly impede, and locations where significant upgrades are expected to be required.
- Medium risk items include: All remaining bridges due to unknown weight capacity, horizontal turns and railway crossings that can be expected to require an intersection upgrade / modification, particularly along state-controlled roads.
- Low risk items are any other obstructions near the path of travel that may affect OSOM vehicles but are likely not expected to do so. OSOM clearance for all identified powerlines should be confirmed via a site investigation.
- Culverts on oversize and overmass routes are assumed to be structural adequate, however these and all other roads will need to be confirmed
- Crossing of gas pipelines are not expected to impede OSOM vehicles, including the Pilbara Energy Pipeline operated by APA located on Madigan Road, Karratha.

The total risks identified for each route option and the 2 bypass sections are shown below in Table 6.

Table 6: Risk Categories for Access Route options

Access Route Option	Risk Category		
	High Risk	Medium Risk	Low Risk
Option 1		4	9
Bypass 1	1	7	4
Bypass 2	1	4	3
Option 2		6	6

Each of these risk items are identified further in Appendix A.

6 Conclusions and Recommendations

icubed consulting has been commissioned to provide preliminary civil engineering services to assist with project planning for the Yindjibarndi Energy Project. This report specifically analyses the two potential travel routes for OSOM vehicles – from the Port of Port Hedland and Dampier Cargo Wharf to Millstream, highlighting obstructions along the route. The purpose of this report is to outline a route for OSOM vehicles that will cater for their requirements.

With careful consideration, icubed believes that the Option 1 (Port of Port Hedland) will be the preferred route, based on the ongoing development of the new Pilbara Ports facility at Lumsden Point that is designed to receive renewable power infrastructure, and the limited recorded obstructions from geometric constraints and road conditions. Two potential bypasses of the town of Roebourne were discussed in section 3.2 and 3.3, however these are not recommended due to geometric constraints and private controlled roads.

This report has been conducted using Google Earth Pro and other various software, and thus it is recommended that the route is driven in person to confirm data is up to date. All Google Street View images come from 2008-2022 and as such obstructions may have changed in nature. It is recommended that the route is checked in person to confirm unknown heights of underpasses, street lights and powerlines to ensure they provide sufficient clearance for OSOM vehicles.

It is recommended that investigation into the structural capacities of Bridges and Culverts along the route are checked to ensure that they can withstand the loads that they will be subjected to whilst the OSOM vehicles are travelling over them.

Continuing on, icubed recommends:

- Dialogue with the Pilbara Ports on capacity to manage and store WTGs upon their arrival at port;
- Dialogue with the Main Roads Western Australia (MRWA) on their requirements for transport impact assessment and discussion over the load carrying capacity of existing bridges on the state-controlled road network;
- Dialogue with the City of Karratha on the potential disruption of traffic and the travel of OSOM vehicles through Roebourne;
- Site inspection of overhead powerlines and dialogue with respective asset owners; and
- Confirmation of OSOM requirements, once a WTG model has been chosen.

Appendix A – Risk Assessment of Obstructions

High Risk Obstructions



Figure 27: High Risk – Robe River Access Road (16) - Road Immunity (Flooding) (Bypass 1)



Figure 28: High Risk – Roebourne-Wittenoom Rd (19) - Geometric Constraints (Bypass 2)

Medium Risk Obstructions



Figure 29: Medium Risk – Great Northern Hwy (1) - Horizontal Turn (Option 1)



Figure 30: Medium Risk – Great Northern Hwy and N W Coastal Hwy (2) - Horizontal Turn (Option 1)



Figure 31: Medium Risk – Great Northern Hwy and N W Coastal Hwy (2) - Alternative Access (Oncoming Lane) (Option 1)



Figure 32: Medium Risk – N W Coastal Hwy and Cherrata Road (4) - Horizontal Turn (Option 1)



Figure 33: Medium Risk – N W Coastal Hwy and Warlu Rd (Manuwarra Red Dog Hwy) (9) - Horizontal Turn (Option 1 and 2)



Figure 34: Medium Risk – Cherratta Rd (12) - Horizontal Turn (Bypass 1)



Figure 35: Medium Risk – Cherratta Rd and Woodbrook Rd (13) - Horizontal Turn (Bypass 1)



Figure 36: Medium Risk – Cooya Pooya Rd (15) - Railway Crossing 1 (Bypass 1)



Figure 37: Medium Risk – Cooya Pooya Rd (15) - Railway Crossing 2 (Bypass 1)



Figure 38: Medium Risk – Warlu Rd (Manuwarra Red Dog Hwy) and Robe River Access Rd (17) - Horizontal Turn (Bypass 1)



Figure 39: Medium Risk – N W Coastal Hwy and Roebourne-Wittenoom Rd (18) - Horizontal Turn (Bypass 2)



Figure 40: Medium Risk – Warlu Rd (Manuwarra Red Dog Highway) and Roebourne-Wittenoom Rd (20) - Horizontal Turn (Bypass 2)



Figure 41: Medium Risk – King Bay Rd and Mof Rd (23) - Horizontal Turn (Option 2)



Figure 42: Medium Risk – Burrup Rd and King Bay Rd (24) - Horizontal Turn (Option 2)



Figure 43: Medium Risk – Dampier Hwy and Burrup Rd (25) - Horizontal Turn (Option 2)



Figure 44: Medium Risk – Dampier Hwy and Madigan Rd (26) - Horizontal Turn (Option 2)



Figure 45: Medium Risk – N W Coastal Hwy and Madigan Rd (29) - Horizontal Turn (Option 2)

Low Risk Obstructions



Figure 46: Low Risk – N W Coastal Hwy (3) - Powerline (Option 1)

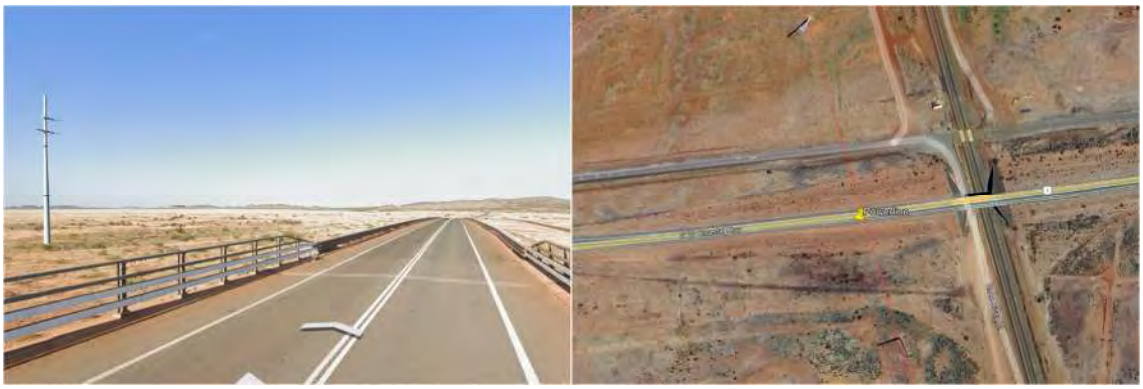


Figure 47: Low Risk – N W Coastal Hwy (5) - Powerline (Option 1)

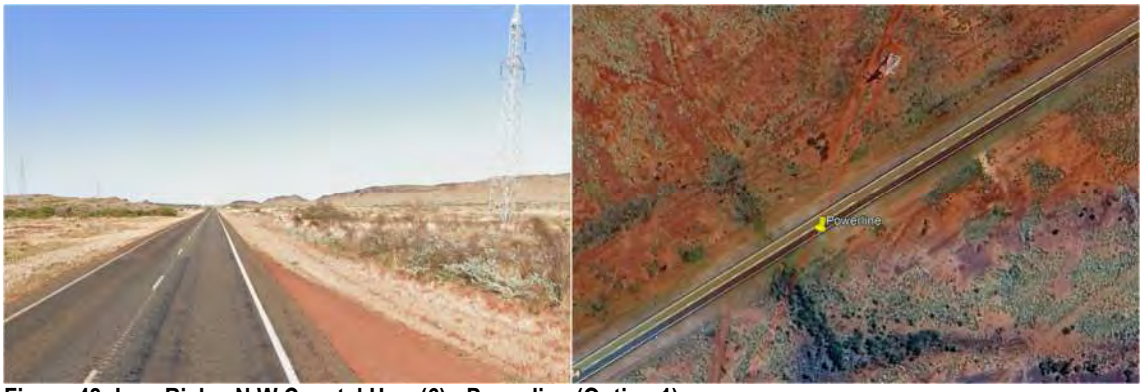


Figure 48: Low Risk – N W Coastal Hwy (6) - Powerline (Option 1)



Figure 49: Low Risk – N W Coastal Hwy (7) - Powerline (Option 1)



Figure 50: Low Risk – N W Coastal Hwy (8) - Powerline (Option 1)



Figure 51: Low Risk – Warlu Rd (Manuwarra Red Dog Hwy) (10) - Powerline (Option 1 and Option 2)



Figure 52: Low Risk – Warlu Rd (Manuwarra Red Dog Hwy) (11) - Railway Crossing (Option 1 and Option 2)



Figure 53: Low Risk – Woodbrook Rd (14) - Powerline (Bypass 1)



Figure 54: Low Risk – Roebourne-Wittenoom Rd (Manuwarra Red Dog Hwy) (21) - Railway Crossing (Option 1 and Option 2)



Figure 55: Low Risk – Roebourne-Wittenoom Rd (Manuwarra Red Dog Hwy) (22) - Powerline (Option 1 and Option 2)

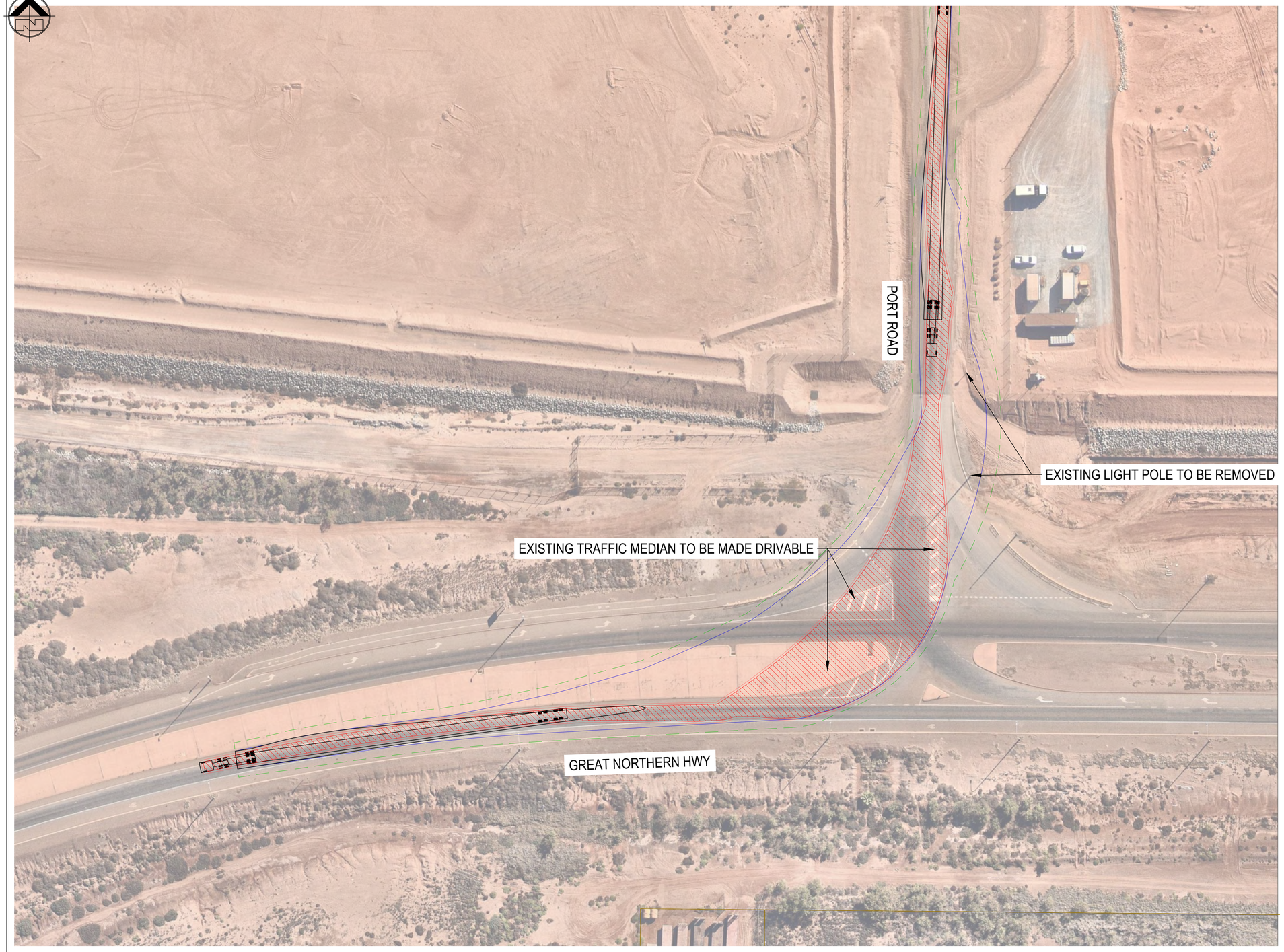


Figure 56: Low Risk – Madigan Rd (27) - Powerline (Option 2)



Figure 57: Low Risk – Madigan Rd (28) - Powerline (Option 2)

Appendix B – Swept Path Sketches



LEGEND

- WHEEL PATH
- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

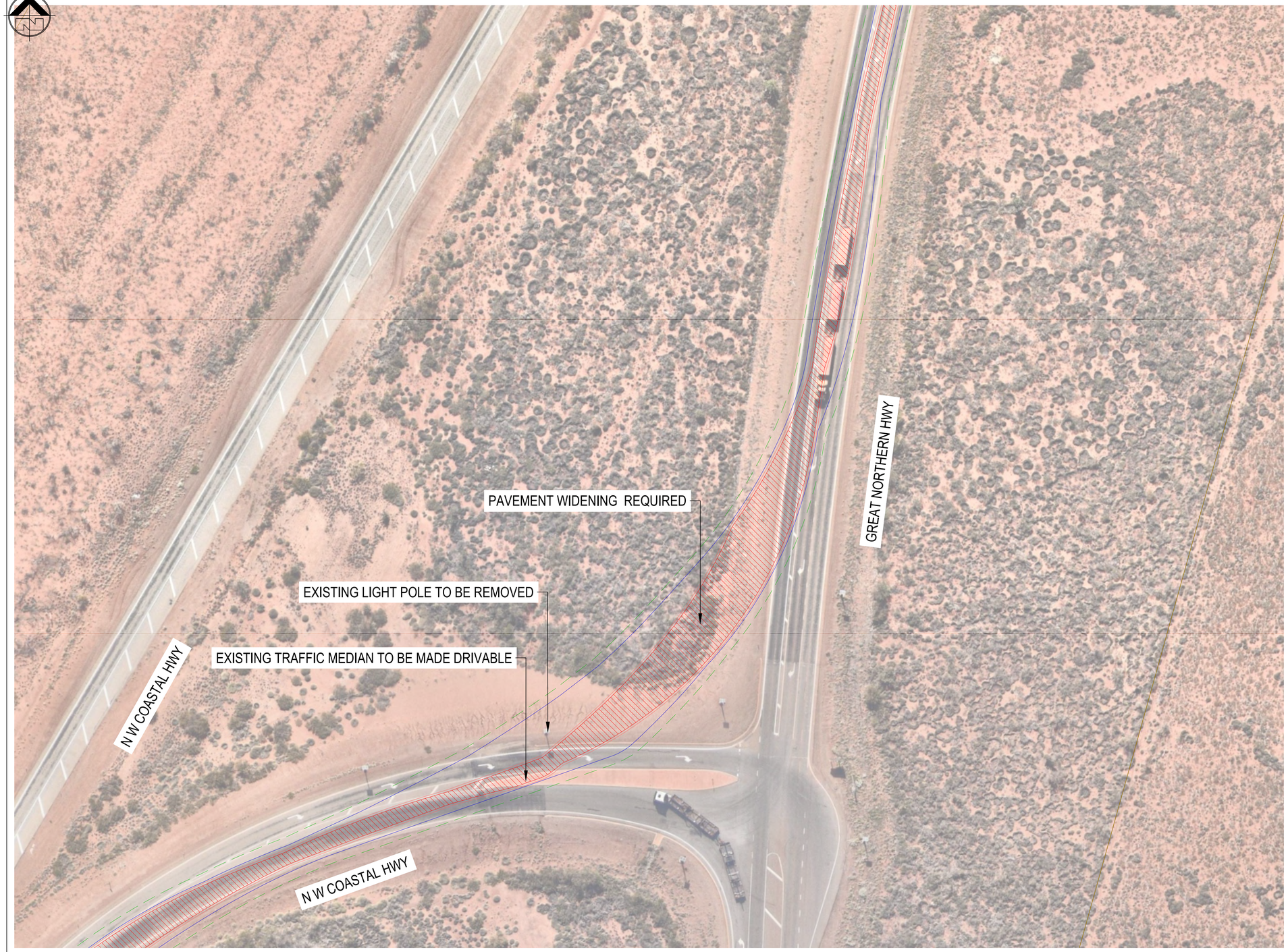
GREAT NORTHERN HWY/ PORT RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 1
SK 01- 10.09.2024- BaP A1



LEGEND

- WHEEL PATH
- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

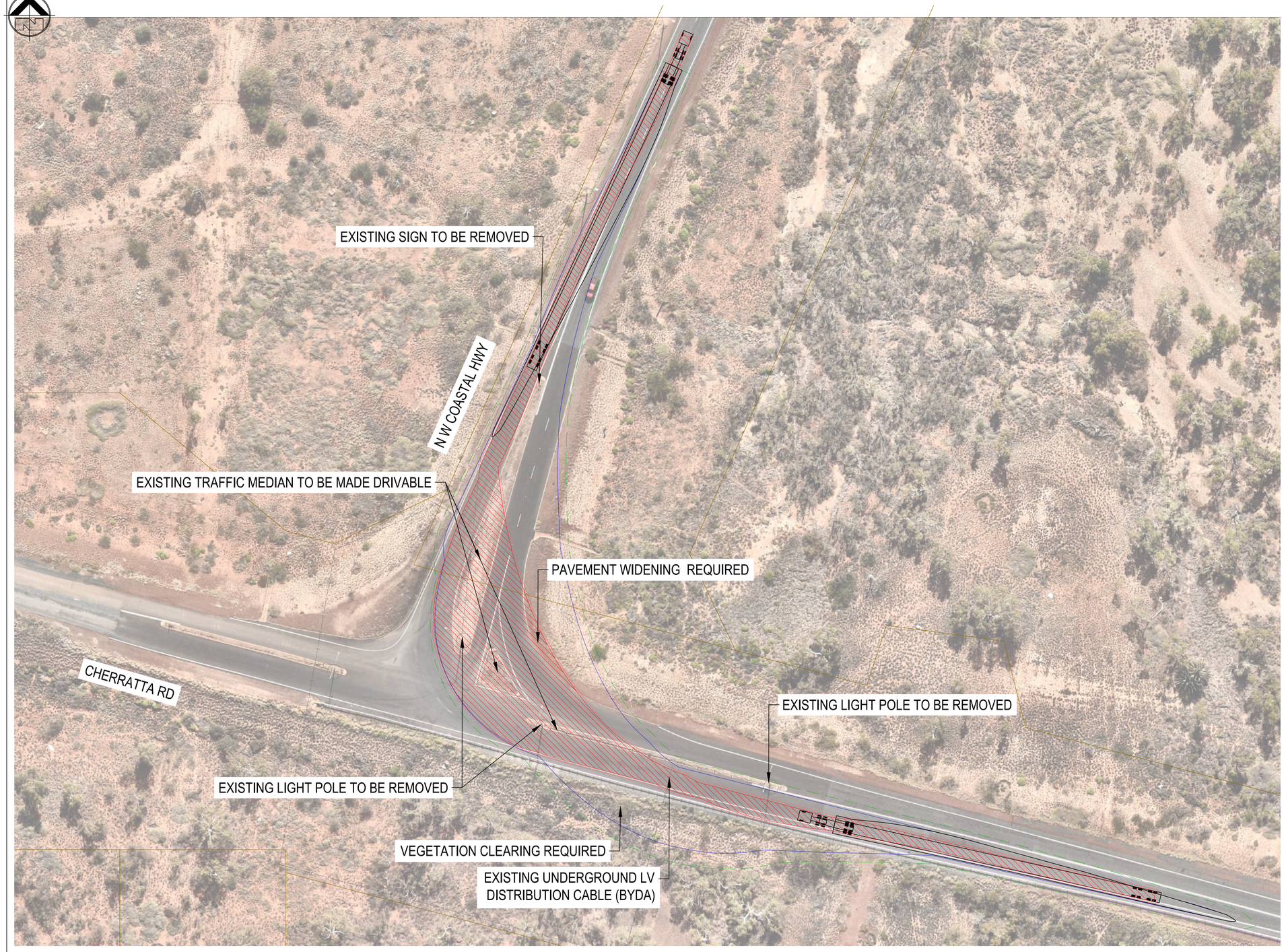
GREAT NORTHERN HWY/ N W COASTAL HWY - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

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innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 2
SK 01- 10.09.2024- BaP A1



LEGEND

- WHEEL PATH
- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

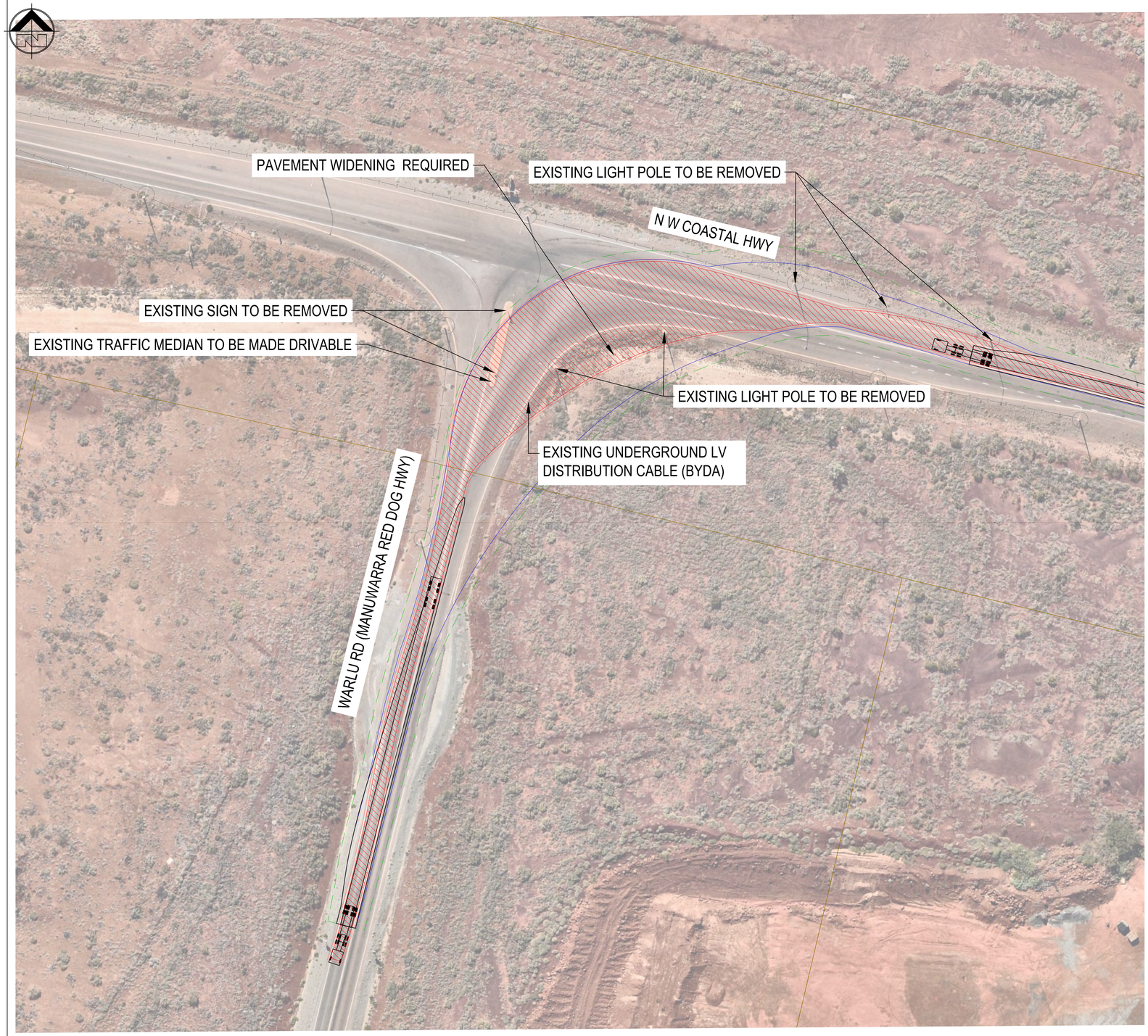
N W COASTAL HWY / CHERRATTA RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

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ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 3
SK 01- 10.09.2024- BaP A1



LEGEND

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- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

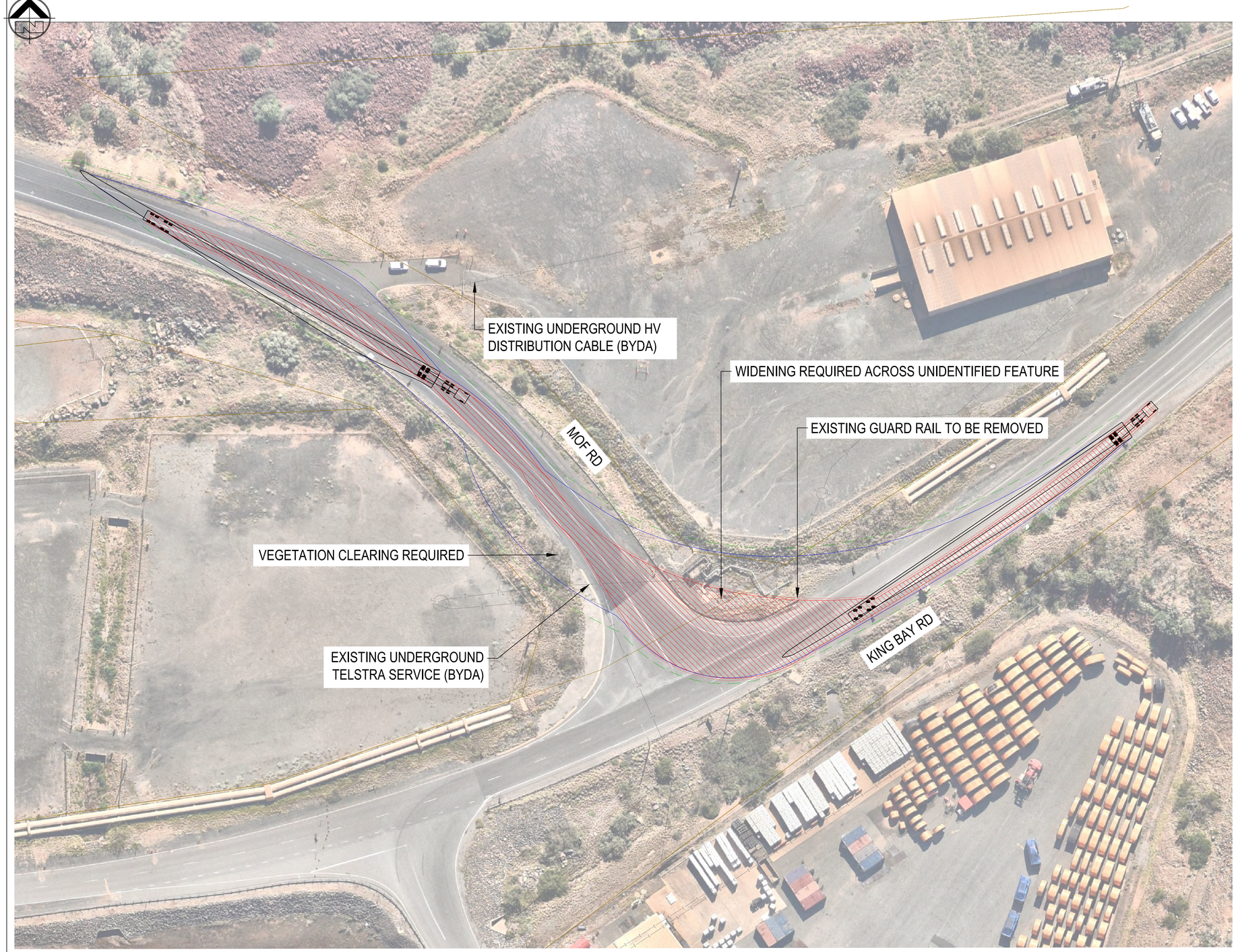
N W COASTAL HWY / WARLU RD (MANUWARRA RED DOG HWY) - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 4
SK 01- 10.09.2024- BaP A1



LEGEND

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- WHEEL PATH 0.5m OFFSET
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- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

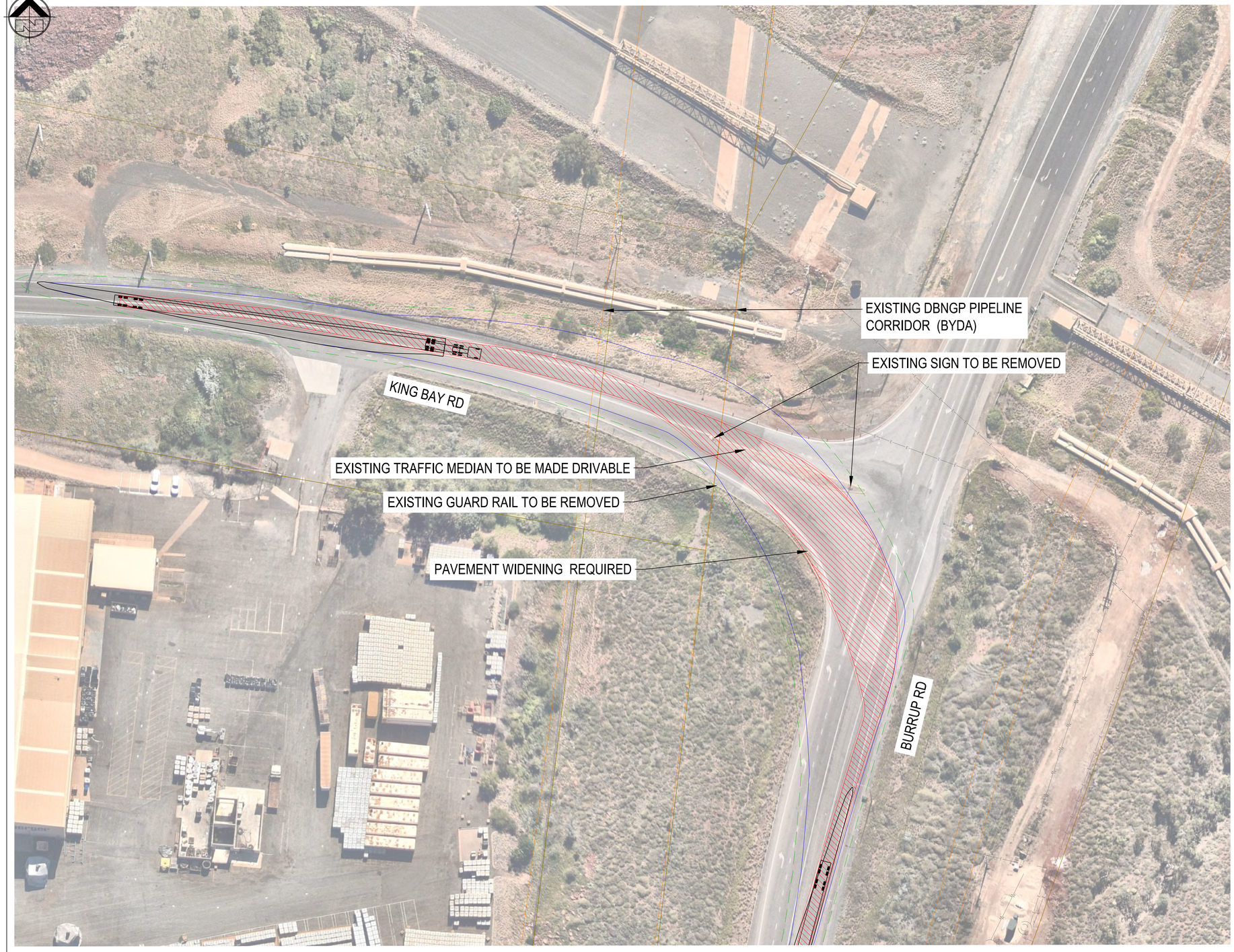
KING BAY RD/ MOF RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

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ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 5
SK 01- 10.09.2024- BaP A1



LEGEND

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- WHEEL PATH 0.5m OFFSET
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- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

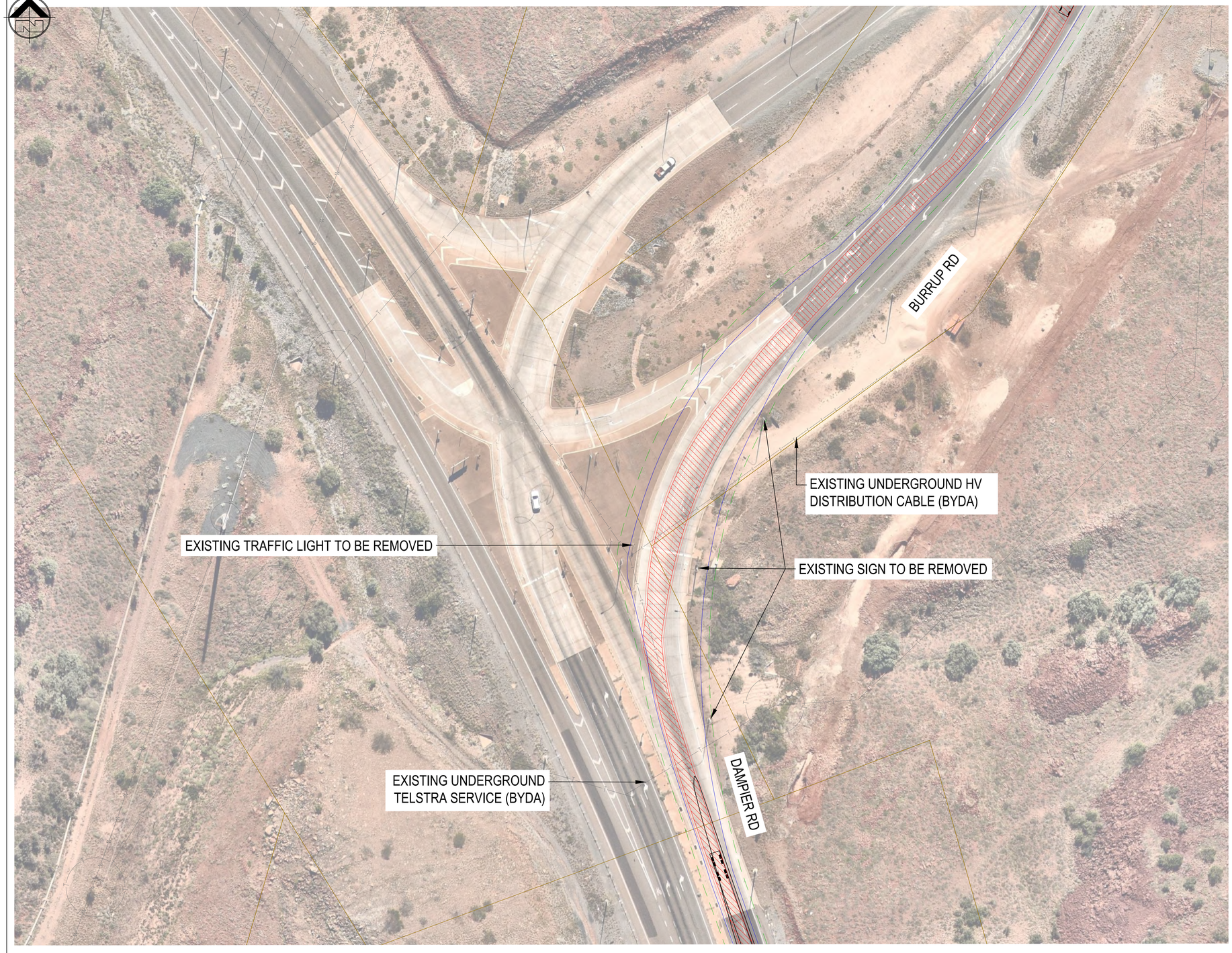
BURRUP RD / KING BAY RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 6
SK 01- 10.09.2024- BaP A1



LEGEND

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- WHEEL PATH 0.5m OFFSET
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- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

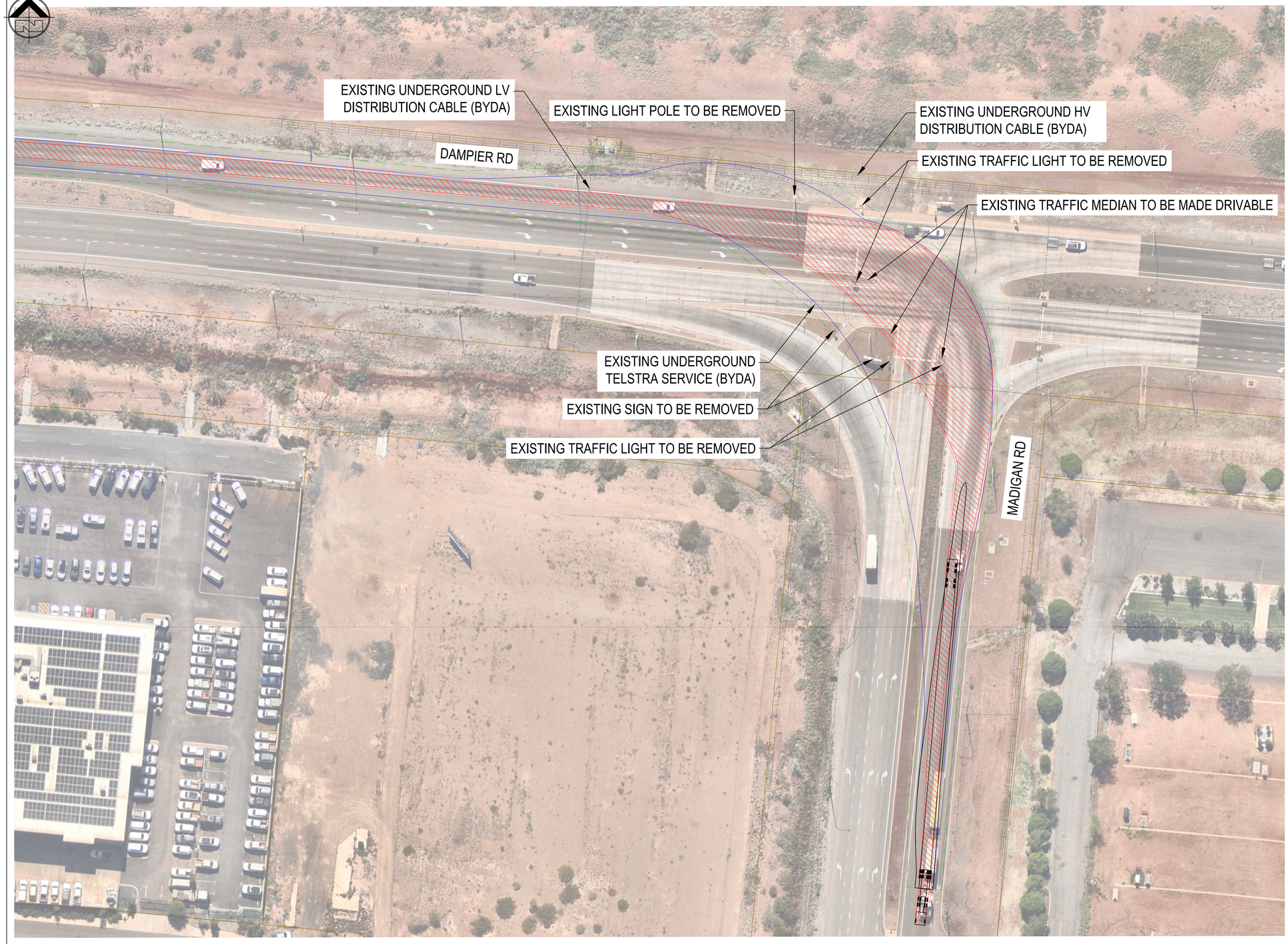
DAMPIER RD/ BURRUP RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

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ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 7
SK 01- 10.09.2024- BaP A1



LEGEND

- WHEEL PATH
- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

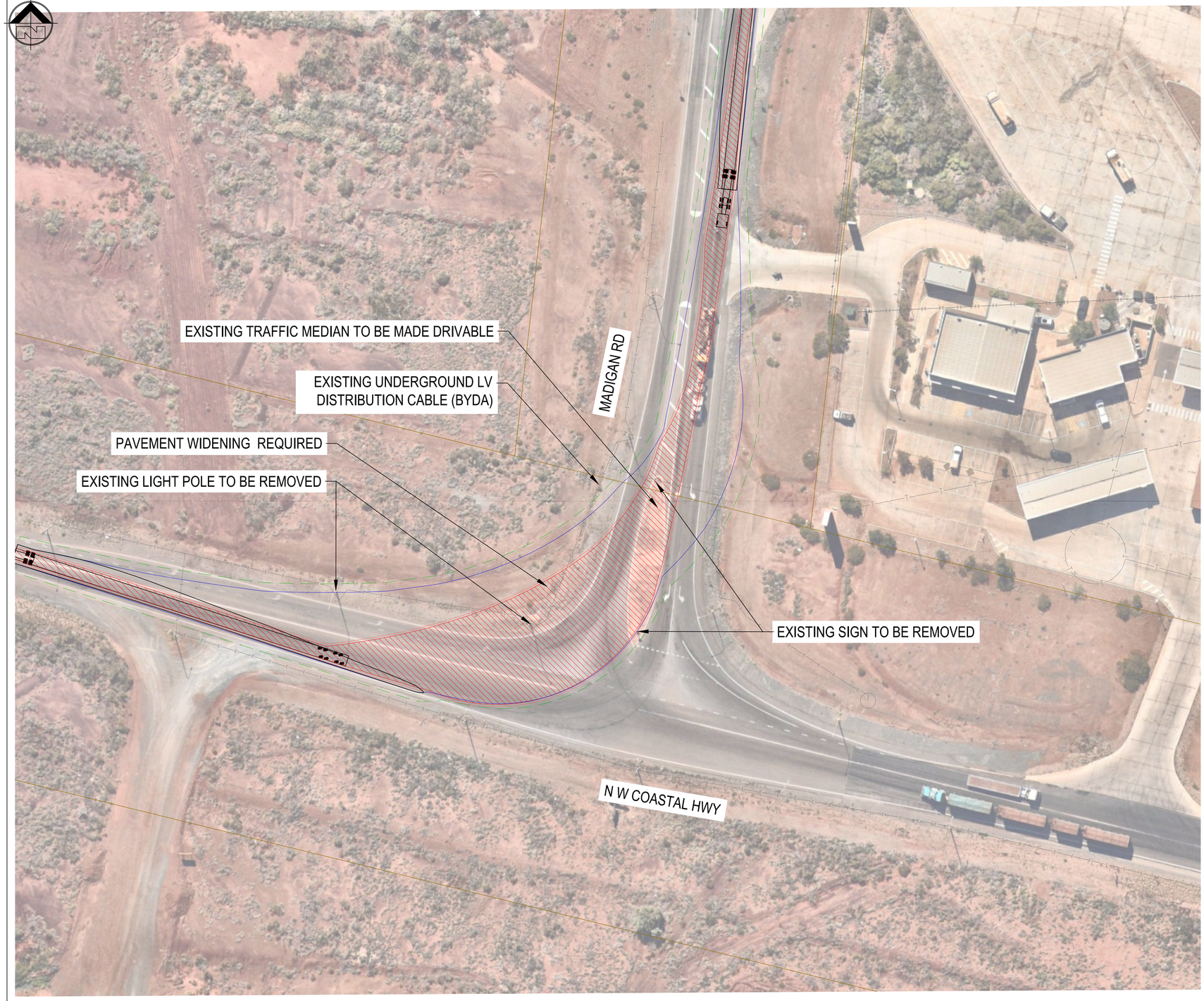
MADIGAN RD / DAMPIER RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 8
SK 01- 10.09.2024- BaP A1



LEGEND

- WHEEL PATH
- WHEEL PATH 0.5m OFFSET
- BLADE OVER SAIL
- BLADE OVER SAIL OFFSET (2m BODY, 5m TIP)

N W COASTAL HWY / MADIGAN RD - 100m BLADE TRAILER TURNING PATH

SCALE 1:500

icubed consulting

innovation ingenuity inspiration

ACEN PILBARA RENEWABLE ENERGY HUB
SWEPTH PATH SKETCH - INT 9
SK 01- 10.09.2024- BaP A1

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