Anketell SIA Transport

LANDCORP

Transport and Traffic Planning Report

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Anketell SIA Transport

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Contents

Summary of Findings

Jacobs have reviewed the proposed transport network for the Anketell Port and Strategic Industrial Area (SIA) as shown in the plan over the page. The first stages of the SIA - Heavy Industrial Area 1 (HIA1) and General Industrial Area (GIA) are anticipated to be developed by 2030.

VISUM was used to assess the future planned transport movements associated with the port and the SIA for a series of future year scenarios.

The model included the Western Corridor but excluded the proposed Central Infrastructure Corridor in order to test the capacity of the Western Corridor to cater for the predicted future traffic volumes.

The results of the analysis show that the Western Corridor Port Access Road and its intersection with North West Coastal Highway (NWCH) are predicted to operate within capacity after full development (2060). The right turn onto NWCH from the Western Corridor is predicted to operate at a level of service C (which is acceptable) whilst the other movements are predicted to operate at level of service A or B.

This indicates that a link road from the proposed Central Infrastructure Corridor to NWCH is not required in terms of capacity. Therefore the proposed transport network caters for the access needs of each of the SIA sites (including secondary access in case of emergency) based on the current assumptions, regards timing of development.

It is not known at this time if the MCC mine development will proceed. It has been assumed in this analysis that it will not be proceeding. In this case, the proposed Central Infrastructure Corridor could be used for access to HIA1.

Transport movement networks have been developed for four potential scenarios as shown in **Appendix A**:

- Year 2030 assuming no MCC mine development
- Year 2060 assuming no MCC mine development
- Year 2030 with the MCC mine development including proposed Central Infrastructure Corridor
- Year 2060 with the MCC mine development including proposed Central Infrastructure Corridor

It is proposed that access in 2030 is via the Western Corridor Port Access Road, again assuming that a rail crossing of up to 2 rail lines is viable. A section of the proposed Central Infrastructure Corridor is proposed to be constructed to provide access between HIA1 and the Port – the proposed Central Infrastructure Corridor Link Road. This link road could be located within the SIA boundary area to form a central spine road, rather than follow the currently planned proposed Central Infrastructure Corridor alignment.

It is recommended that a secondary route to the site for emergency access/egress is provided by constructing a section of road (could be gravel as a first stage) between the proposed Central Infrastructure Corridor Link Road and NWCH via the existing southern section of Cleaverville Road.

By 2060, the proposed Central Infrastructure Corridor may be constructed in full between the Port and NWCH - either linking into the existing southern section of Cleaverville Road (which would be upgraded) or following the planned alignment which shows the proposed Central Infrastructure Corridor joining NWCH west of Cleaverville Road. The proposed Central Infrastructure Corridor Link Road could now form the primary access to the SIA with secondary access via the Western Corridor Port Access Road. A level crossing from the Western Port Access Road linking into HIA1 may be viable for up to 2 rail lines or it may be that a grade separated crossing is provided from the outset.

It is recommended that stop signs be provided on the SIA railway crossing with the Western Corridor Port Access Road if only one rail line is constructed as a first stage. If a second rail line is constructed or the AADT traffic volumes are such that the conflict weighting factor exceeds 15,000, whichever is earliest, then the crossing will require flashing lights.

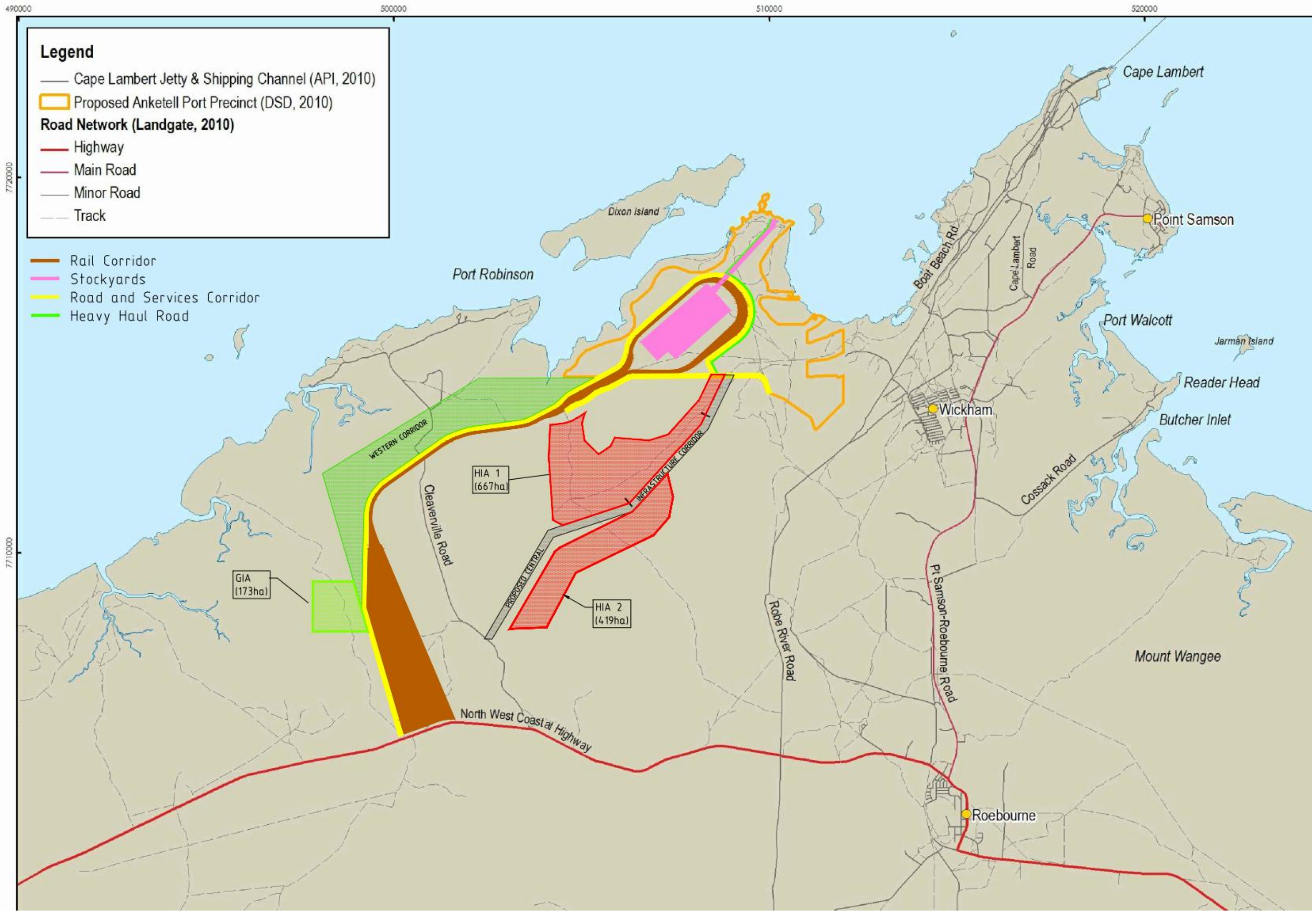
If the second rail line is provided at the same time as the third and/or fourth, or when the rail lines increase from two lines, a grade separated crossing is likely to be required if access is warranted via the Western Corridor Port Access Road. Alternatively, access could be provided solely from the proposed Central Infrastructure Corridor Link Road and so the rail crossing would be closed. It might be possible to retain the ability for vehicles to cross the rail lines in the event of an emergency via a barrier or gate.

At the northern end of the SIA at the interface with the Port, the Pilbara Ports Authority's (PPA) plan is to bring a road linking the causeway to the SIA. This would be constructed to accommodate high wide loads (HWL) but would be used by general traffic and, when required for HWL, appropriate traffic management measures would be put in place for the duration of the trip. However, as more information becomes available on the expected Port usage and operations and SIA potential proponents and their needs, and identifies that there will be regular HWL movements, then the need for a dedicated HWL road should be reassessed. Jacobs recommends that sufficient land be retained for potential future road infrastructure. Jacobs considers same approach should be adopted with regards to the need for a Heavy Haul Road.

Main Roads WA have advised that the rail crossing on NWCH requires grade separation regardless of the number of rail lines that will be constructed.

It is proposed that Cleaverville Road remains open until the road within the Western Corridor Port Access Road is operational. Access would be maintained during construction with consultation with the City of Karratha as to how this will be managed. Following construction, access to the beach would be via the existing section of Cleaverville Road to the north of the new Western Corridor Port Access Road.

The Eastern Corridor was excluded from the assessment. It is not anticipated that there will be sufficient demand, if any, that necessitates a route between Wickham and the Port and SIA. The Pannawonica rail line to Cape Lambert is a constraint that would need to be addressed if such a demand was to eventuate.



490000
500000
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Legend
Cape Lambert Jetty & Shipping Channel (API, 2010)
Proposed Anketell Port Precinct (DSD, 2010)
Road Network (Landgate, 2010)
Highway
Main Road
Minor Road
Track
Rail Corridor
Stockyards
Road and Services Corridor
Heavy Haul Road
Cape Lambert
Point Samson
Dixon Island
Port Robinson
Boat Beach Rd
Cape Lambert Road
Port Walcott
Jarman Island
Reader Head
Wickham
Butcher Inlet
Cossack Road
WESTERN CORRIDOR
HIA 1 (667ha)
INFRASTRUCTURE CORRIDOR
PROPOSED CENTRAL
Cleaverville Road
GIA (173ha)
HIA 2 (419ha)
Robe River Road
Pt Samson-Roebourne Road
Mount Wangee
North West Coastal Highway
Roebourne

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to provide transport planning and traffic engineering advice for the Anketell Strategic Industrial Area (SIA) in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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1. Introduction

The Anketell Port and Strategic Industrial Area (SIA) project was initiated by Government in February 2010. The project consists of four major components, a multi-user port, multi-user infrastructure corridors, heavy industry areas (HIA) and a general industry area (GIA). The port is intended mainly for the export of iron ore from Pilbara mines, with an ultimate throughput of 350 mtpa.

The Department of State Development (DSD) is the lead agency for the project, responsible for coordinating the land acquisition, land use planning, infrastructure provision, tenure and other approval processes to create the port and SIA at Anketell.

The Pilbara Ports Authority (PPA) has responsibility for the planning, design and operation of the proposed Anketell Port. LandCorp is responsible for managing the planning and development of the Anketell SIA.

Together with DSD and PPA, LandCorp initially commissioned Preston Consulting to prepare a Design Plan for the port and SIA which identified two heavy industry areas (HIA 1 and HIA 2, HIA 1 is intended to be developed first and HIA 2 in the future as demand requires) and two general industry areas (GIA 1 and GIA 2); to be freeholded to LandCorp to enable the provision of heavy and general industrial land. Since the Preston Report which was prepared in 2011, the planning for the SIA has resulted in GIA1 being incorporated into HIA1 to maximise priority land for its highest and best use. GIA2 is now the only GIA and is hence now referred to as the GIA.

In addition to the port waters and port lands, a Western Corridor has been identified which will support all necessary rail lines accessing the port from proponent mine sites as well as other access roads and service corridors.

Jacobs was engaged by LandCorp to provide engineering consultancy services on transport planning and traffic management. The study areas for Jacobs' consultancy include the following:

- Port Precinct – approx. 3239 ha
- Western Corridor – approx. 1817 ha
- Proposed Central Infrastructure Corridor – approx.438 ha
- HIA 1 – approx. 667 ha
- HIA 2 – approx. 422 ha
- GIA – approx. 173 ha

1.1 Background Data

Prior to establishing a transport model to assess the network requirements of the development, a due diligence exercise was undertaken of three reference documents:

- Anketell Port Master Plan[1] (*herein referenced as the Port Master Plan*)
- GHD Industrial Ecology Strategy[2] (*herein referenced as the GHD report*)
- Design Plan Report, Preston Consulting[3] – (*herein referenced as the Preston Report*)

Information about the proposed future Cape Lambert Iron Ore mine development by MCC adjacent to the study area has been sourced from the above documents.

A meeting was held with a representative of Rio Tinto Expansion Projects regards the Rio Tinto Cape Lambert Port operations.

[1] Anketell Port Master Plan, Department of State Development, May 2014
[2] Anketell Strategic Industrial Area Ecology Strategy Final, GHD, 5 July 2013
[3] Anketell Port and Strategic Industrial Area Design Plan Report by Preston Consulting, 2011

Population and further information was sourced on growth projections for the area for regional towns including Point Sampson, Wickham, Roebourne and Karratha.

Information was sourced from Main Roads WA and City of Karratha on existing traffic volumes in the area.

The above information is documented under separate cover in a due diligence report. Extracts are included in this report with the source referenced.

Meetings were held with LandCorp and representatives of the Pilbara Port Authority (face to face) and Main Roads WA (phone call with Dave Pearson of the Pilbara office) and City of Karratha (phone call with David Pentz).

1.2 Purpose of this Report

The purpose of this report is to document the findings of the transport assessment, namely to advise of the infrastructure requirements and the recommended timing of provision of infrastructure to meet the forecast future needs of the planned port development at Anketell and adjacent Strategic Industrial Area.

The remainder of this report is presented in the following sections:

Section 2 Existing situation

Section 3 Future proposed development

Section 4 Traffic generation

Section 5 Traffic analysis

Section 6 Design considerations

2. Existing Situation

2.1 Site Location

The proposed development site of the Strategic Industrial Area is located in the north of WA between Karratha and Wickham which are shown in **Figure 2.1**. Karratha is approximately 25km west of the site. To the east, the site is 7km from Wickham, 10km from Cape Lambert and 13km from Roebourne.

Wickham, Point Sampson, Cossack and Whim Creek have all been identified as potential key residential growth and expansion areas as these are located close to Anketell.

Currently the land is vacant with no active uses. There is boat ramp at Cleaverville which is a popular beach site with the local community. Access is via Cleaverville Road which runs north-south through the site.

2.2 Adjacent Development

Rio Tinto Iron Ore's Cape Lambert operations are located east of the SIA site. The bulk of works extends to just past the Wickham townsite.

The site works associated with the Expansion Project Cape Lambert Port B Phase 1 were completed in September 2013. Port B Phase 2 is in commissioning and will provide an additional 70mtpa, so 123mtpa in total when it is completed around mid-2015.

The accommodation camp for construction workers housed 2400 at its peak; the numbers are now declining. Other points to note are that the emergency services are located in Wickham and on the mine site and that an old ballast quarry is on Rio Tinto tenure, however, this is used very occasionally.

There are no plans for any further expansion of the Cape Lambert Port B operations.

2.3 Existing Road Network

The existing road network in the vicinity of the site is shown in **Figure 2.2.**

North West Coastal Highway (NWCH) is located to the south of the SIA site providing, linking to Geraldton in the south and Port Hedland to the north. It is an undivided road with two lanes (one in each direction) and a speed limit of 110 km/hr.

2013 traffic volume information for NWCH was sourced from Main Roads and indicates a volume of between 2000- 3500vpd in the vicinity of the Western Access with a heavy vehicle percentage of between 15%-25%.

Cleaverville Read runs through the site area north of NWCH to a boat ramp at the coast at Cleaverville (west of the planned Anketell Port site). This road provides access for existing recreational users, particularly in summer periods.

Figure 2.1 Local area map

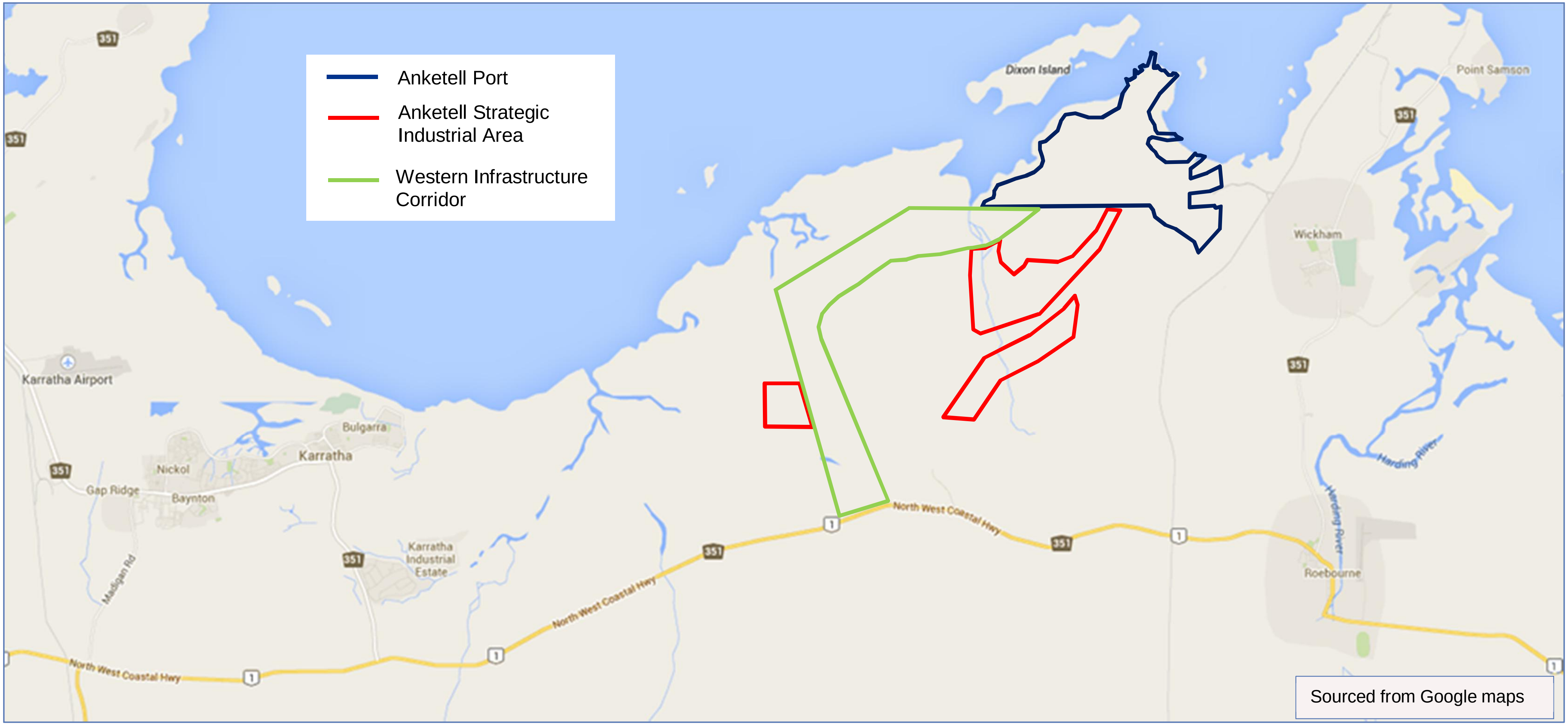
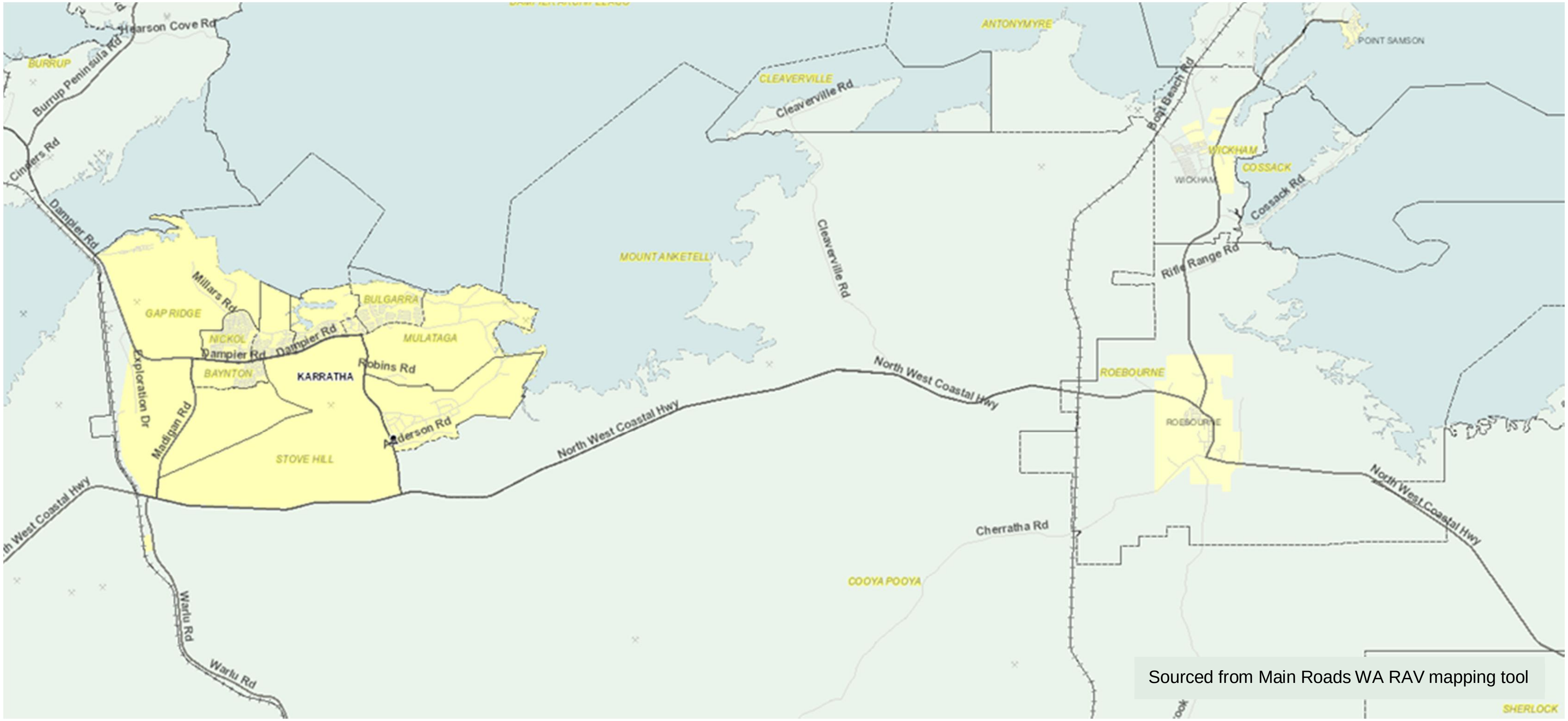


Figure 2.2 Existing road network



Sourced from Main Roads WA RAV mapping tool

As NWCH is a network 10 road (Main Roads WA RAV Mapping Tool), the following vehicles, as well as all smaller vehicles, are allowed to access it:

- Prime Mover, Semi Trailer Towing 2 x 6 Axle Dog Trailers
- B-Double Towing 2 or 3 Axle Converter Dolly Connected to 2 Semi Trailers
- Prime Mover, Semi Trailer Towing B Triple
- B-Double Towing 2 Dog Trailers
- Double Road Train Towing B-Double Trailers
- Prime Mover, Semi Trailer Towing A 6 Axle Dog Trailer and Converter Dolly

Vehicle Description & Configuration	Axle Spacing Table	Length (M)	Mass (T) Maximum Permitted Mass	Height(M)	Notes	Axle Groups	Network Number
(A) Prime Mover, Semi Trailer Towing 2 x 6 Axle Dog Trailers	A	> 36.5 <= 53.5	127.5	<=4.6	(4)	7	Network 10
(B) B-Double Towing 2 Or 3 Axle Converter Dolly Connected to 2 Semi Trailers	A	> 36.5 <= 53.5	127.5	<=4.6	(4)	7	Network 10
(C) Prime Mover, Semi Trailer Towing B Triple	A	> 36.5 <= 53.5	127.5	<=4.6	(4)	7	Network 10
(D) B-Double Towing 2 Dog Trailers	A	> 36.5 <= 53.5	147.5	<=4.6	(4)	8	Network 10
(E) Double Road Train Towing B-Double Trailers	A	> 36.5 <= 53.5	147.5	<=4.6	(4)	8	Network 10
(F) Prime Mover, Semi Trailer Towing A 6 Axle Dog Trailer and Converter Dolly	A	> 36.5 <= 53.5	87.5 +d	<=4.6	(4)	6	Network 10

2.4 Existing Rail Network

Rio Tinto Iron Ore operates the Pannawonica railway line which runs from their Mesa J mine to Cape Lambert. The rail line crosses NWCH via a bridge to the east of the SIA site. Mesa J is part of the Robe River complex and ships iron ore via Cape Lambert port.

3. Future Proposed Development

3.1 Anketell Port

The proposed development at the port (*Anketell Port Master Plan, Pilbara Ports Authority, May 2014*) includes:

- A multi-user, multi-commodity deep water port at Anketell capable of exporting at least 350 mtpa of iron ore. Ultimately the port is planned to handle between 250 mtpa and 400 mtpa. The proposed port will be primarily used for iron ore export, with provision for bulk commodity export, general cargo trade and fuel imports. An initial 40 mtpa of iron ore is planned to be exported. Sufficient and efficient access to the port facilities has been highlighted as critical.
- An onshore port precinct and an infrastructure corridor between the port precinct and the North West Coastal Highway to accommodate utilities and transport infrastructure, including roads and rail lines.
- The associated Anketell Strategic Industrial Area (SIA) consisting of heavy and general industrial land, which will be sufficient to cater for industrial use that may arise in the future. This is discussed in more detail in Section 3.2.

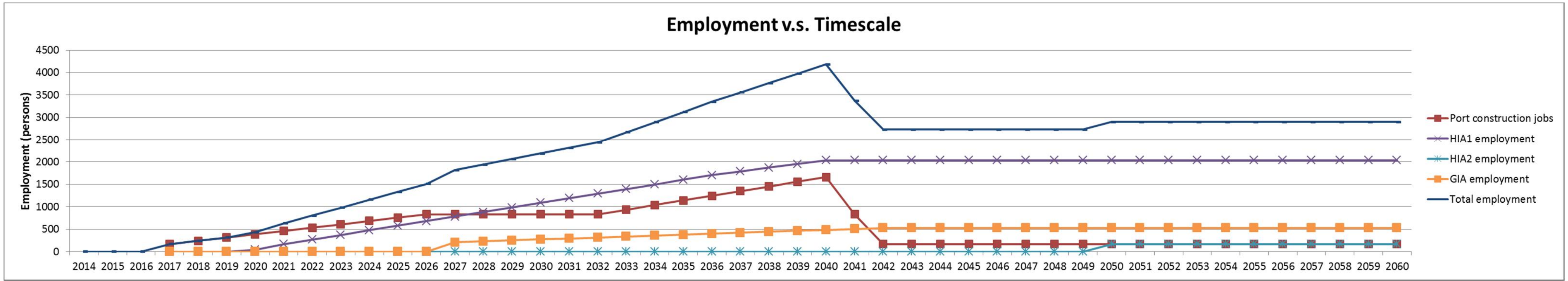
Initially, the land will only be used for construction purposes. Once the port has been constructed to a suitable level it will become operational. Once the port is operating, the industrial areas will need to be constructed in order to support the operation of the port. The construction will cease once the port and industrial areas are fully operational.

Temporary accommodation to house an estimated construction workforce of 2275 – 4000 persons will be required. These are based on the Workshop Report – Anketell Workforce Accommodation Site Options and Anketell Workforce Accommodation Outcomes Note, 22 February 2012.

With the port, SIA and other developments in the region, the Karratha population growth is anticipated to grow from 19000 to 39000 by 2030. The Roebourne population growth is anticipated to grow from 2700 to 4500 by 2030.

The graph in **Figure 3.1** shows how employment is expected to grow over the construction years and then steadily decline once all areas become operational. If MCC mine development is not going ahead there would be a reduction in overall employee numbers from 2050 onwards.

Figure 3.1 : Graph of expected employment vs timescale for the Port and SIA



3.2 Strategic Industrial Area (SIA)

The general industrial area of this site will be used to allow industry to support development of the port, heavy industrial areas, transport operations and proposed future iron ore mine development by MCC.

The SIA is planned to accommodate 1089 ha for heavy industrial land (industries such as downstream resource processing) and 173 ha of general industrial land that is provided next to major transport routes to enable lighter industry support of the development of the port, operation of heavy industrial area, transport operations and the proposed MCC mining operation.

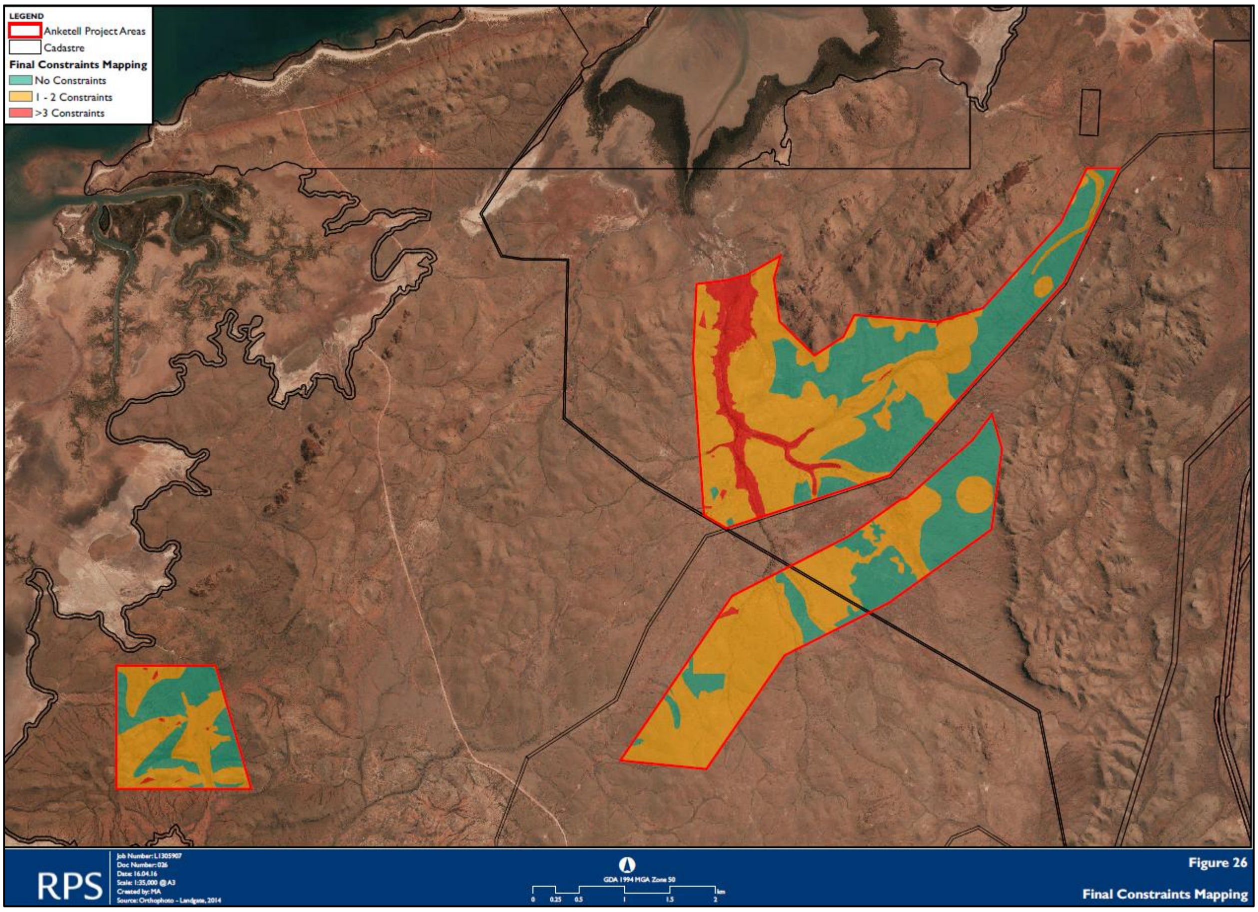
At the time of writing of the Preston Report, there were four areas included in the SIA:

- Heavy Industrial Area 1 (HIA1), with an area of 586 ha, which could be developed immediately following the required land acquisition and approvals;
- Heavy Industrial Area 2 (HIA2), with an area of 422 ha, which would be developed following suitable completion of MCC mining operations;
- General Industrial Area 1 (GIA1), with an area of 81 ha, located close to the port and MCC mining operations; and
- General Industrial Area (GIA2), with an area of 173 ha, located closer to Karratha and the potential location of the rail marshalling yards.

Since the Preston Report which was prepared in 2011, the planning for the SIA has resulted in GIA1 being incorporated into HIA1 to maximise priority land for its highest and best use. Therefore the area of HIA1 has increased to 667 ha. GIA2 is now referred to simply as the GIA (refer to **Figure 3.3**).

District Water Management Strategy (DWMS) report prepared by RPS in March 2016 highlighted some water related constraints and Aboriginal heritage sites within the SIA and a final constraints map was developed as shown in **Figure 3.2**.

Figure 3.2 : Final Constraints Map (RPS, 2016)



The constraints identified in the above figure may have impacts to the size of total development areas within the SIA. For the purpose of this traffic assessment report, the following assumptions and methodology have been developed to suggest a reasonable development area in each of the three development lots within the SIA.

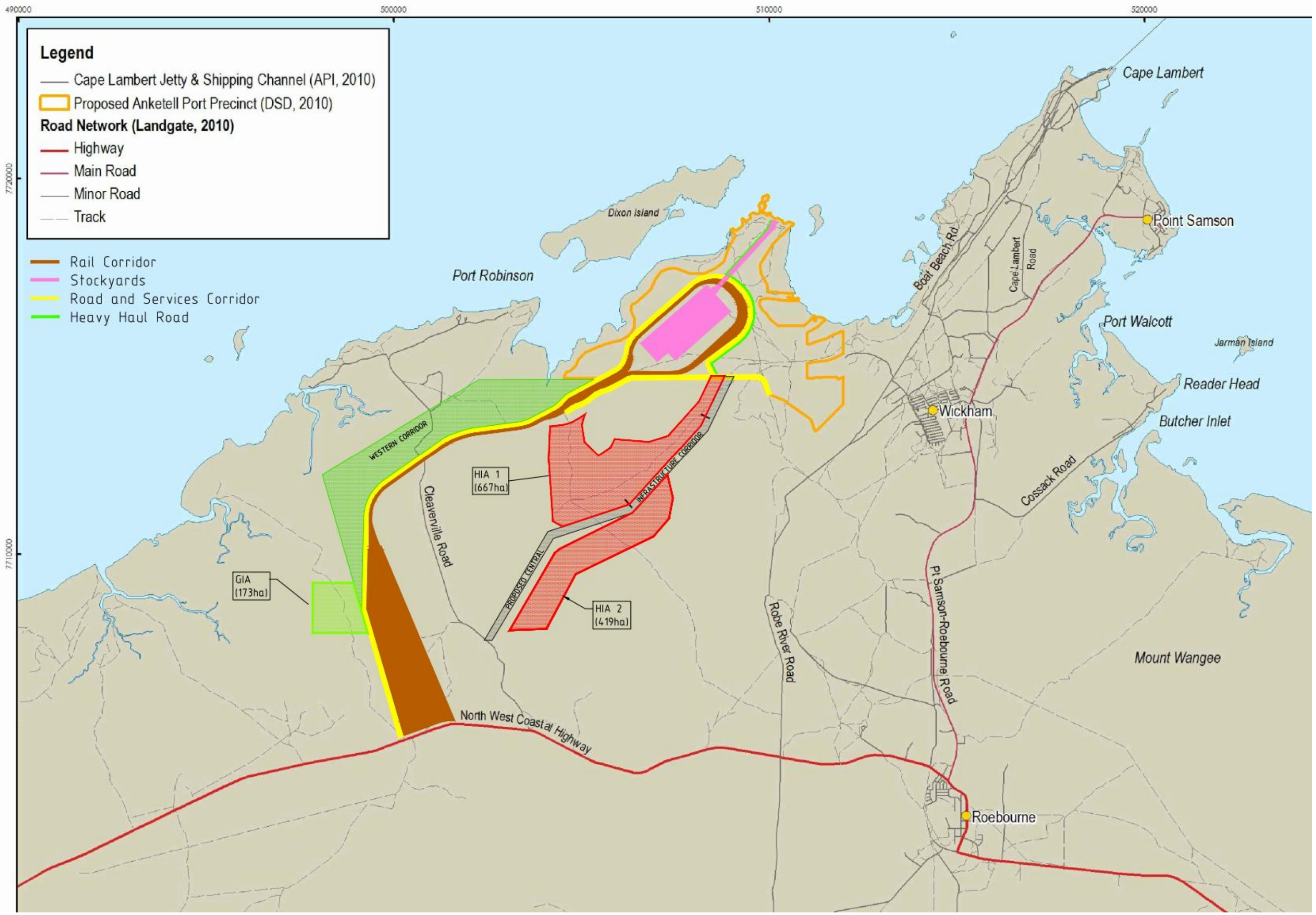
- Areas around high constraints (>3 constraints) were calculated as percentage to the total area of each of the three strategic areas, i.e. 58% of HIA1, 19% of HIA2 and 0% of GIA.
- GHD's report suggested approx. 30% of the total area of the SIA will be required for corridors for infrastructure, drainage and other uses, leaving about 70% as developable land.
- Since the constrained areas may attract relatively high costs for developments Jacobs has assumed they will not be considered as developable area.
- Excluding the constraints area identified above, 70% of the remaining has been assumed as developable land (except 90% for HIA 1 as some of the constrained area may potentially be used for other infrastructure).
- Based on the above assumption, the net development area has been calculated as:
  - HIA 1: 667*(1-58%)*0.9 = 252ha, approx. 38% of total HIA1 area;
  - HIA 2: 422*(1-19%)*0.7 = 239ha, approx. 57% of total HIA2 area;
  - GIA: 173*0.7=121ha, no change, approx. 70% of total GIA area;
- The traffic generation for the SIA was therefore based on the revised development area from the table below.

Lot	Total Area	70% developable area	RPS Constraints (based on RPS report and constraints map Fig 26)	Revised development area for traffic study (Ha)	% of total area
HIA 1	667	0.9	58%	252.1	38%
HIA 2	422	0.7	19%	239.2	57%
GIA	173	0.7	0%	121.1	70%

The potential industry and industrial types as documented in the GHD Report are outlined below.

Lot	Potential Industry (GHD)	Potential Industrial type
HIA 1	Downstream processing of iron ore	Iron ore pelletising plant
		Direct reduction/alternative smelting iron plant
		Medium scale iron ore processing plant
	Downstream processing of other ore	Magnesium production plant
		Titanium production plant
		Medium scale resource processing plant
	Utilities and resource recovery	Gas fired power station (250MW)
		Water-to-energy and material recovery facility
		Biofuels production plant
		Industry feedwater facility
HIA 2	Downstream processing of gas and petrochemicals	Methanol plant
		Ethane extraction
		Ethane cracker
		Medium scale gas processing plant
		Ammonia/urea plant
GIA	General industry	General industries
		Logistic industry
		Stockpiling and lay-down areas
		Fuel storage facilities
		Supply based and construction support industries

Figure 3.3 : Outline of port and SIA development area



3.3 High Level Infrastructure Requirements

From the GHD report, the following is a description of the preliminary infrastructure corridor network that addresses the main transport, services and utilities requirements for the overall SIA based on the demands identified for each precinct:

- The primary mode of transport to the iron ore processing precincts in HIA1 and HIA2 will be by rail, supported by road and conveyor;
- The primary mode of transport for the port-dependant and material intensive industries will be by road, potentially supported by conveyor and pipelines;
- The primary mode of transport to the " other ores " processing precincts will be by road, possibly supported by rail and conveyor;
- The primary mode of transport to the gas and petrochemicals processing precincts will be pipelines supported by road;
- The primary mode of transport for the utilities and resource recovery precinct will be pipelines supported by road;
- The primary mode of transport for the general industrial areas will be by road; and
- The primary internal mode of transport for the SIA will be by road and pipelines, with potential support by conveyor.

For all precincts, the primary mode of transport will be supported by other modes where practical and feasible, including rail and conveyor.

3.4 Future Transport Infrastructure

In consultation with Main Roads WA and the City of Karratha, the following were highlighted for consideration in the development of the site and the associated transport infrastructure:

- NWCH between Karratha and Wickham, need and timing around dualling this road and consideration of the conflicts between road trains and other road users;
- Cleaverville Road – this road has significant use during holiday periods – how is access maintained during construction and the interactions after construction;
- Consideration of a coastal road joining on from Dampier Highway; and
- Connections to the east, the eastern corridor.

This report has not considered the provision of a coastal road joining on from the Dampier Highway at this stage. Further information will be sought from Main Roads WA as to the inclusion of this road infrastructure in current or future budgets.

The current plans for the site show a Western Corridor and a proposed Central Infrastructure Corridor. The following descriptions of the infrastructure corridors are as presented in the reports reviewed during the due diligence.

The assessment of the future road network undertaken by Jacobs is discussed in Sections 4 to 6 of this report.

3.4.1 Western Corridor

The Western Corridor is located on the western edge of the site and is planned to accommodate a road and up to four rail lines.

The road will intersect the existing Cleaverville Road which currently provides access from NWCH to the Cleaverville beach site.

The rail lines are to provide access to and from the port from the mine sites. The corridor is to also cater for services such as water, gas and power.

3.4.2 Proposed Central Infrastructure Corridor

A central spine road will be required within the SIA area, rather than follow the proposed Central Infrastructure Corridor alignment. The purpose of this road is to provide a link between the adjacent strategic industrial areas as well as provide access to the port.

Access to the proposed Central Infrastructure Corridor from HIA1 as currently shown requires the crossing of the gas pipeline. If the proposed Central Infrastructure Corridor is reconfigured, this could be avoided.

Conveyors may also be provided as a means of transporting material from the SIA to the port. It is unlikely that a rail line from the SIA to the port would be viable however this is subject to further investigation when more information is available with regards to potential proponents of the SIA.

However if the MCC mine development goes ahead, the proposed Central Infrastructure Corridor is likely to be constructed by the MCC.

There is sufficient room to provide a 30 to 40m rail reserve within the proposed Central Infrastructure Corridor. However, the GHD Ecology report does state that rail is not usually viable for short haul distance. It is understood that the Port is proposing to cater for iron ore processing activities within the Port development area. The PPA is open to further discussions with regards to the provision of rail and/ or conveyor between the SIA and Port; the details of the interface would require to be worked out in more detail once more information regards specific needs is available. It is recommended that a potential route is nominated and sufficient land be retained that can be made available for potential future use.

A services corridor with conveyors and pipelines linking the SIA with the port is expected to be provided within the proposed Central Infrastructure Corridor area as shown on the plans. However, there may be topography/ heritage or other constraints that might impact on the corridor area. It is recommended that the area available for the services corridor requires to be investigated in more detail.

3.4.3 Eastern Corridor

Plans included in earlier documents reference a potential Eastern Corridor. This would be difficult to achieve as it would require crossing the existing Pannawonica rail line to Cape Lambert.

3.4.4 Primary Corridors

Earlier plans show several primary corridors shown within HIA1 and HIA2 sites that provide links to the proposed Central Infrastructure Corridor. The road corridors within the SIA will be dependent on the concept plan options.

In general terms, it is proposed that there will be a single point of access from the proposed Central Infrastructure Corridor into each SIA site (HIA1 and ultimately HIA2) and a single point of access from the Western Corridor Port Access Road into the GIA. The access into each individual lot area will be via the internal road network.

As stated above, if the MCC mine development does not proceed, there is scope to locate the road servicing HIA1 within the SIA areas to form a central spine road which could provide direct access to individual sites. A more detailed assessment of access will require to be undertaken once more information is known regards the potential proponents of the SIA and their transport needs.

4. Traffic Demand

The assumptions made in respect to timing of development and staging of infrastructure are outlined in **Appendix B**.

4.1 Trip Generation

4.1.1 SIA Industrial Area

Given the remote location and planned nature of the activities, it is not considered appropriate to base the trip rates on the available trip rate data for industrial sites in urban locations; as such the generation of trips was based on a trip rate per employee. Employees were categorised into different functions based upon proposed different land uses from the Anketell Strategic Industrial Area - Industrial Ecology Strategy (GHD, 2013). Different traffic generating rates were then applied to each different category; these are shown in **Appendix C**.

Table 4.1 shows the likely trip generation for each of the three SIA precincts (sourced from the GHD Ecology Report and assumptions described in Section 3.2). The total estimate of future vehicle trips is 6760 per day, with an estimated 1084 vehicle trips in the PM peak hour.

4.1.2 Port Construction and Operations

For the purposes of the traffic projections, it has been assumed that port construction would be likely to be starting early 2017 and finishing late 2019 with around 170 personnel, ramping up and stabilising to 830 by 2026 until 2033 when increased expansion is assumed to a maximum of 1660 employees by 2040 to the completion of the full port. A workforce of 170 is assumed to remain with respect to operations of the port beyond that point.

It has been assumed that operation for HIA1 would commence in 2020 and 2021 each with about 50 employees. The GIA would commence in 2027 with approximately 200 employees. It is likely that the development of HIA 2 maybe deferred to a later stage if the demand requires.

It has been assumed that the majority of these workers would be shuttled to site by bus; as such an average vehicle trip rate of 0.3 per employee has been assumed. The peak traffic generation expected to be associated with the Port is 500 vehicles per day in 2040.

4.1.3 Timing of Development

The following has been assumed regarding the timing for the various elements of development:

- The port will be developed in stages over 30 years. This will generate traffic over the development until a peak is reached when the port becomes fully operational.
- The initial port construction will take approximately 3 years, starting early 2017 and finishing late 2019. It is likely there will be two port construction periods (assuming MCC does not commence operation). If MCC does go ahead, three port construction periods are likely.
- The industrial traffic will build up as the support to the port increases, reaching a peak when the port is fully operational.
- GIA – commences in 2027.
- HIA1 – commences operation in 2020, takes 20 years to reach full development.
- HIA2 – if MCC commences operation under the 30 year lease, it is likely be in 2050.

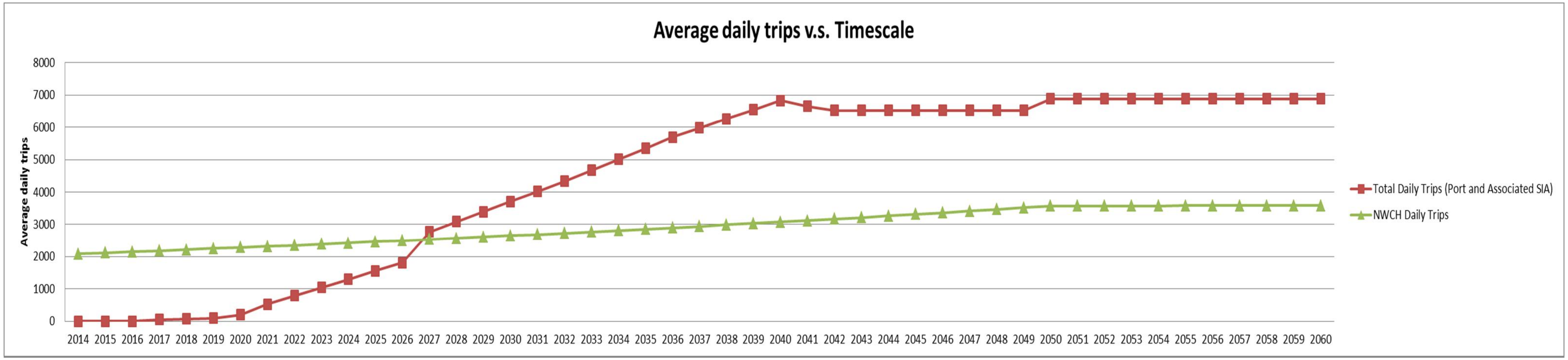
Figure 4.1 shows the average daily trips as the area is constructed, then becomes operational.

The future estimated vehicle trips were revised in April 2016 due to the original GIA1 general industrial area being incorporated into HIA1. As the trip generation for heavy industrial areas is typically lower than that for general industrial areas, the overall number of trips generated is anticipated to be lower than that estimated in previous versions of this traffic report. Hence, the traffic modelling was not revised since the lower trip numbers would indicate that the previous modelling results would be conservative and overestimate the traffic impact. It is expected that the traffic operations of the proposed intersections on North West Coast Highway/Western access would operate at similar or better levels of service and degree of saturation for this land use scenario.

Figure 4.1 : Trip Generation of SIA

Lot	Land Area (ha)	Net developable Area (ha)	Potential Industry GHD	Potential Industrial type	GLA Area (ha) after merge HIA1 and GIA1	Revised Employment no.	Weekday Daily Traffic Rate (Trips/employee) ITE	Trip Generation Rate (Trips/PM Peak/employee) ITE	Trips/day	Trips/PM peak
HIA 1	667	252.1	Downstream processing of iron ore	Iron ore pelletising plant	43	232	2.13	0.36	494	83
		38%		Direct reduction/alternative smelting iron plant	49	232	2.13	0.36	494	83
				Medium scale iron ore processing plant	29	116	2.13	0.36	247	42
			Downstream processing of other ore	Magnesium production plant	17	232	2.13	0.36	494	83
				Titanium production plant	17	174	2.13	0.36	370	63
				Medium scale resource processing plant	29	116	2.13	0.36	247	42
			Utilities and resource recovery	Gas fired power station (250MW)	29	43	2.13	0.36	93	16
				Water-to-energy and meterial recovery facility	6	14	2.13	0.36	31	5
				Biofuels production plant	9	29	2.13	0.36	62	10
				Industry feedwater facility	23	9	2.13	0.36	19	3
						1197	2.13	0.36	2549	431
HIA 2	422	239.2	Downstream processing of gas and petrochemicals	Methanol plant	43	106	2.13	0.36	226	38
		57%	`	Ehane extraction	21	159	2.13	0.36	340	57
				Ethane cracker	53	266	2.13	0.36	566	96
				Medium scale gas processing plant	48	213	2.13	0.36	453	77
				Ammonia/urea plant	74	266	2.13	0.36	566	96
						1010	2.13	0.36	2151	364
GIA	173	121	General industry	General industries	69	345	3.02	0.42	1042	145
		70%		Logistic industry	24	160	3.34	0.46	534	74
				Stockpiling and lay-down areas	10	40	3.34	0.46	134	18
				Fuel storage facilities	9	30	3.89	0.59	117	18
				Supply based and construction support industries	9	60	3.89	0.59	233	35
						635	3.50	0.50	2060	290
Total	1262	46%			612	2842			6760	1084

Figure 4.2 : Projected Average daily trips vs timescale



5. Traffic Analysis

5.1 Findings

The transport model assessed the future planned transport movements associated with the port and the SIA for a series of future year scenarios.

It should be noted that as the trip generation for heavy industrial areas is typically lower than that for general industrial areas, the overall number of trips generated is anticipated to be lower than that estimated in previous versions of this traffic report. Hence, the traffic modelling was not revised since the lower trip numbers would indicate that the previous modelling results would be conservative and overestimate the traffic impact.

The previous model included the Western Corridor but excluded the proposed Central Infrastructure Corridor in order to test the capacity of the Western Corridor only to cater for the predicted future traffic volumes.

The results of the analysis show that the Western Corridor and its intersection with NWCH are predicted to operate within capacity after full development (2060). The right turn onto North West Coastal Highway from the Western Corridor is predicted to operate at a level of service C (which is acceptable) whilst the other movements are predicted to operate at level of service A or B.

This indicates that a link road from the proposed Central Infrastructure Corridor to NWCH is not required in terms of capacity. Therefore the proposed transport network caters for the access needs of each of the SIA sites (including secondary access in case of emergency) based on the current assumptions regards timing of development.

It is not known at this time if the MCC mine development will proceed. If it does, it is understood that the proposed Central Infrastructure Corridor will be constructed to service their access requirements. Whilst it is proposed that access to the SIA is from the Western Corridor Port Access Road via a level rail crossing across the proposed rail lines, the proposed Central Infrastructure Corridor will provide an alternative access in and out of the area for use in an emergency.

The rail crossing, however, could be difficult and costly to achieve as the land area where the crossing is required is heavily inundated with tributaries. The timing of the construction of the rail lines is not yet known. For the purposes of this study, it was assumed that by 2030 no more than two rail lines would have been built.

Transport movement networks have been developed for four potential scenarios as shown in **Appendix A**:

- Year 2030 assuming no MCC mine development
- Year 2060 assuming no MCC mine development
- Year 2030 with the MCC mine development including proposed Central Infrastructure Corridor
- Year 2060 with the MCC mine development including proposed Central Infrastructure Corridor

Assuming that the MCC mine development has not proceeded, it is proposed that access in 2030 is via the Western Corridor Port Access Road, again assuming that a rail crossing of up to 2 rail lines is viable. A section of the proposed Central Infrastructure Corridor is proposed to be constructed to provide access between HIA1 and the port – the Central Infrastructure Corridor Link Road. This link road could be located within the SIA boundary area to form a central spine road, rather than follow the currently proposed Central Infrastructure Corridor alignment.

It is recommended that a secondary route to the site for emergency access/egress is provided by constructing a section of road (could be gravel as a first stage) between the proposed Central Infrastructure Corridor Link Road and NWCH via the existing southern section of Cleaverville Road.

By 2060, it is proposed that the proposed Central Infrastructure Corridor be constructed in full between the Port and NWCH - either linking into the existing southern section of Cleaverville Road (which would be upgraded) or following the planned alignment which shows the proposed Central Infrastructure Corridor joining NWCH west of Cleaverville Road. The proposed Central Infrastructure Corridor Link Road could now form the primary access to the SIA with secondary access via the Western Corridor Port Access Road. A level crossing from the Western Corridor Port Access Road into HIA1 may be viable for up to 2 rail lines or it may be that a grade separated crossing is provided from the outset.

It is recommended that stop signs be provided on the SIA railway crossing with the Western Corridor Port Access Road if only one rail line is constructed as a first stage. If a second rail line is constructed or the AADT traffic volumes are such that the conflict weighting factor exceeds 15,000, whichever is earliest, then the crossing will require flashing lights.

If the second rail line is provided at the same time as the third and/ or fourth, or when the rail lines increase from two lines, a grade separated crossing is likely to be required if access is warranted via the Western Corridor Port Access Road. Alternatively, access could be provided solely from the proposed Central Infrastructure Corridor Link Road and so the rail crossing would be closed. It might be possible to retain the ability for vehicles to cross the rail lines in the event of an emergency via a barrier or gate.

At the northern end of the SIA at the interface with the Port, the Pilbara Ports Authority's (PPA) plan is to bring a road linking the causeway to the SIA. This would be constructed to accommodate high wide loads (HWL) but would be used by general traffic and, when required for HWL, appropriate traffic management measures would be put in place for the duration of the trip. However, as more information becomes available on the expected Port usage and operations and SIA potential proponents and their needs, and identifies that there will be regular HWL movements, then the need for a dedicated HWL road should be reassessed. Jacobs recommends that sufficient land be retained for potential future road infrastructure. Jacobs considers same approach should be adopted with regards to the need for a Heavy Haul Road.

The Eastern Corridor was excluded from the assessment. It is not anticipated that there will be sufficient demand, if any, that necessitates a route between Wickham and the Port and SIA. The Pannawonica rail line to Cape Lambert is a constraint that would need to be addressed if such a demand was to eventuate.

We propose that Cleaverville Road remains open until the road within the Western Corridor is operational. Access would be maintained during construction with consultation with the City of Karratha as to how this will be managed. Following construction, access to the beach would be via the existing section of Cleaverville Road to the north of the new Western Corridor.

No assessment of the capacity of the primary corridors and intersections has been undertaken as part of this transport assessment at this stage. However, it is recommended that roundabouts are not provided at intersections due to the movement requirements of larger vehicles.

This will need to be undertaken once more detailed information is available regarding the potential land uses and estimated timing of development within the various industrial areas.

The remainder of this section outlines the modelling process and data and assumptions used.

5.2 Traffic Modelling and Analysis

A traffic modelling exercise was undertaken previously using the VISUM transport modelling software for the years 2021, 2026, 2031, 2036, 2041 and 2060. As part of this, demand matrices for each of those years were generated based upon the information described in Section 4. These matrices are presented in **Appendix D**. Traffic Link Projections are shown in **Figure 5.1** to **Figure 5.6**. With respect to the North West Coast Highway, the impact of the SIA and port developments is expected to reach a maximum of around 340vph in one direction. It should be noted that the capacity of one lane of traffic in relatively uninterrupted situations is around 1800vph (Guide to Traffic Management, Austroads 2008), so from a traffic capacity perspective, no dualling of North West Coastal Highway is required.

As part of this modelling, intersection analysis of the critical movements for the North West Coastal Highway / Western Corridor has been calculated using the Intersection Capacity Analysis approach (Transportation Research Board, 2010). **Table 5.1** shows the intersection capacity parameter assumptions that have been used in the model compared to those provided in Road Design Guide Part 4A (Austroads, 2008). Higher values for the right turns in and out have been assumed in the model to reflect the expected higher percentage of vehicles with poor acceleration profiles – this has been undertaken to reflect the expectation of a larger proportion of heavy vehicles associated with the Port.

Table 5.1 Intersection Capacity Analysis Parameters

Movement	Parameter Type	Austroads (2008)	Value Used in modelling
Left Turn In	Critical Gap	5	6
	Follow-up Headway	2	3
Left Turn Out	Critical Gap	5	6
	Follow-up Headway	2	3
Right Turn Out	Critical Gap	5	7
	Follow-up Headway	3	5
Right Turn In	Critical Gap	4	6
	Follow-up Headway	2	4

The modelling reports a number of outputs that provide an indication of the intersection capacity. These are described as follows:

- Degree of saturation (DOS) - The degree of saturation is defined as the ratio of demand flow to capacity. It should be noted that although theoretical capacity is reached when the degree of saturation is 1.0, a practical operational capacity occurs between 0.85 and 0.90.
- Level of service (LOS) - There are six levels, designated A to F, with level of service A (LOS A) representing the best operating condition (at or close to free flow), and level of service F (LOS F) the worst (forced flow).
- 95% back of queue (vehicles) – This indicates the 95 percentile length of queuing vehicles on each of the intersection approaches. The 95 percentile queue length is the value below which 95% of all queues lengths during the peak hour will fall or 5 % of all queue lengths exceed.

A summary of the performance of the critical movements in contained within **Table 5.2**. This shows that under each of the years, the traffic performance is expected to work acceptably from a capacity perspective, with a no worse than a Level of Service C expected. This analysis indicates that only the Western Corridor is required for access onto the North West Coastal Highway from a capacity perspective.

Figure 5.1 : Traffic Distribution for 2021

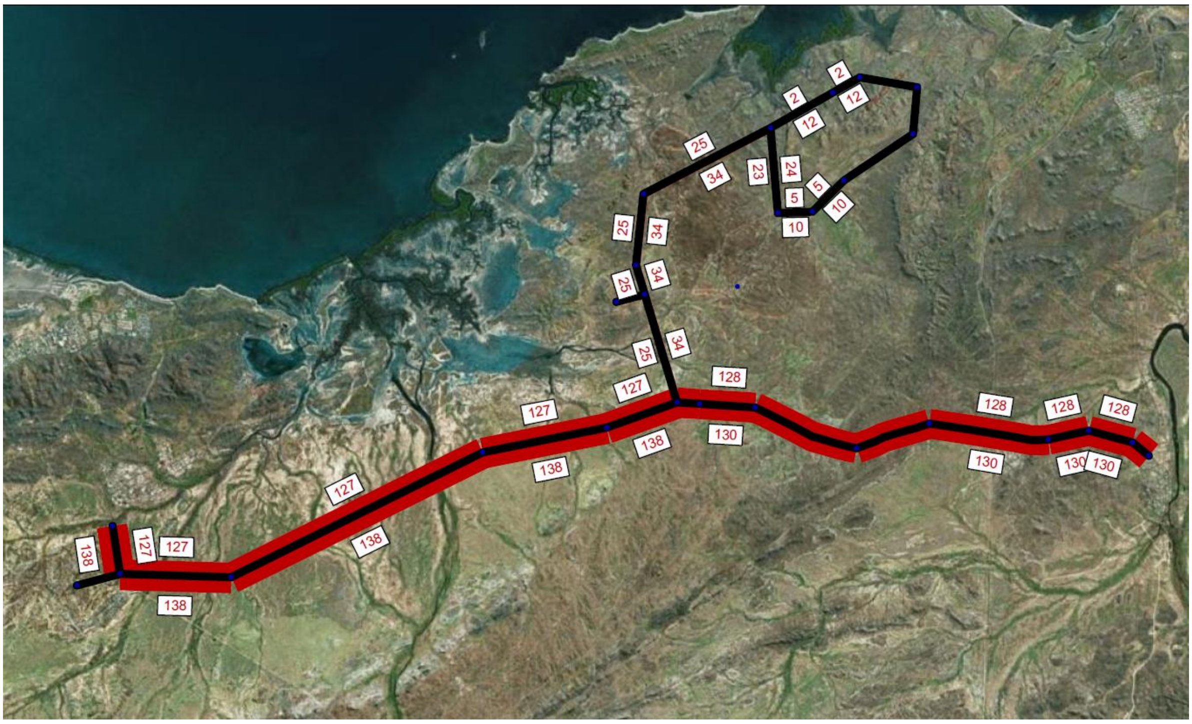


Figure 5.2 : Traffic Distributions for 2026

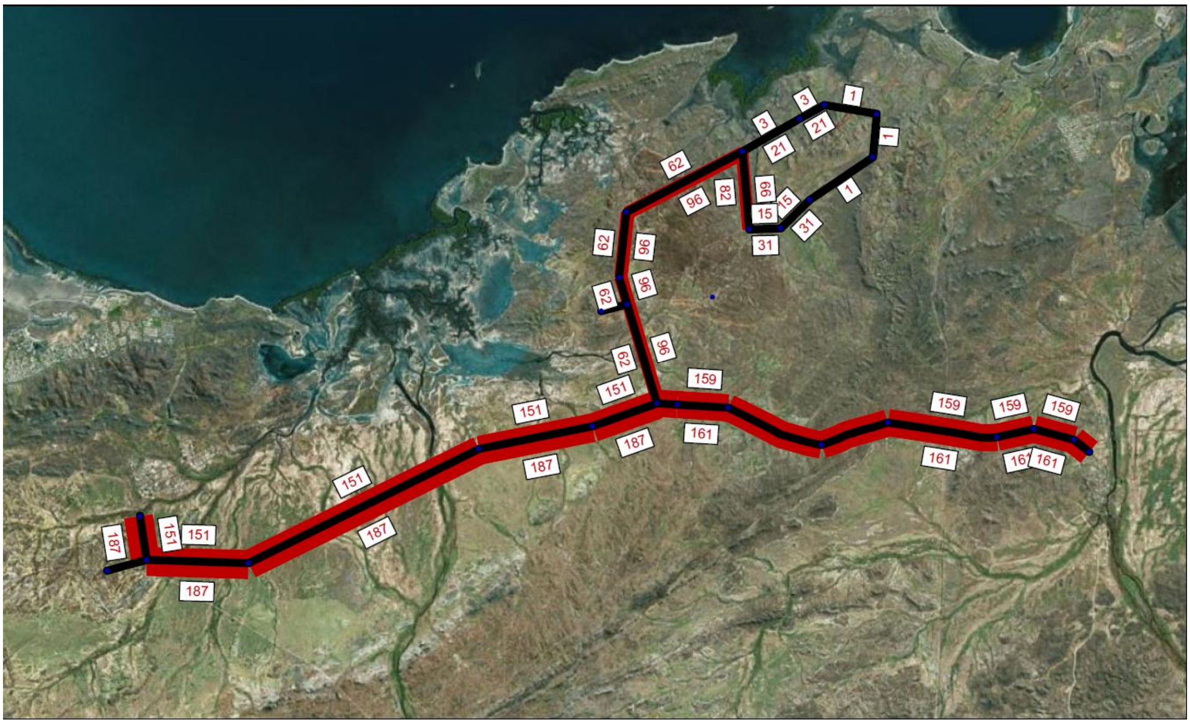


Figure 5.3 : Traffic Distributions for 2031

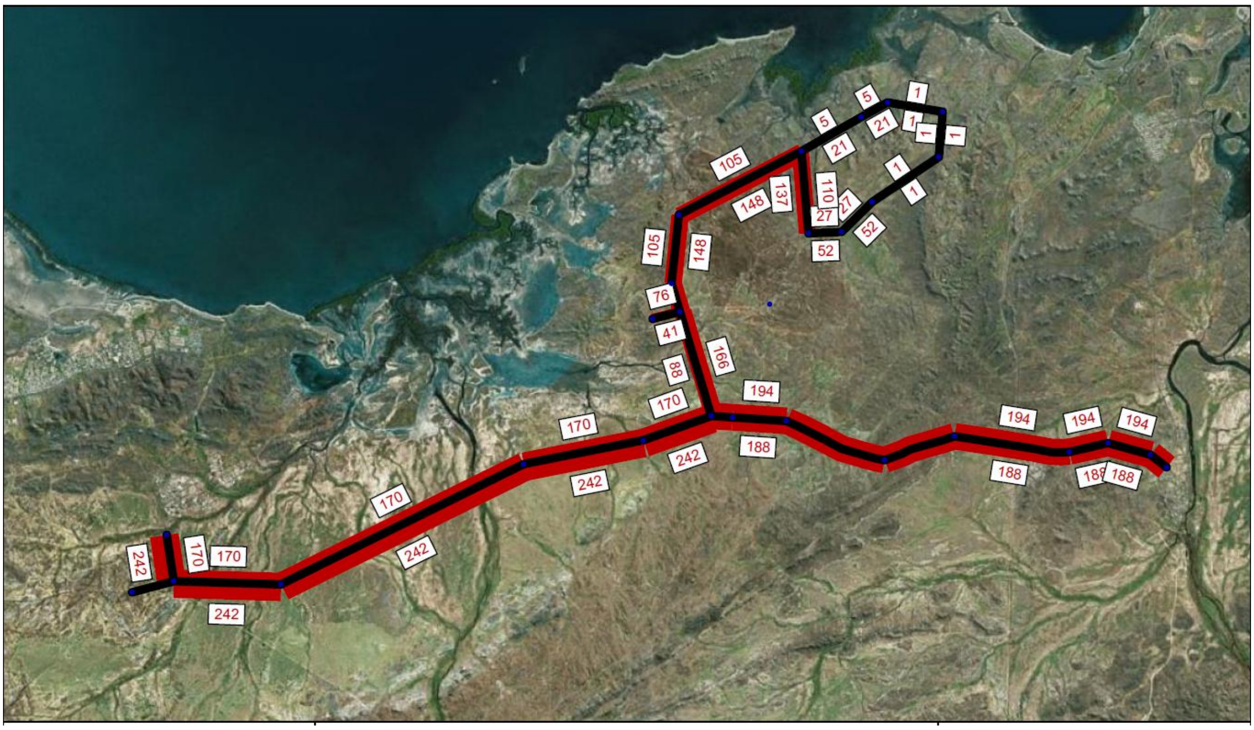


Figure 5.4 : Traffic Distributions for 2036

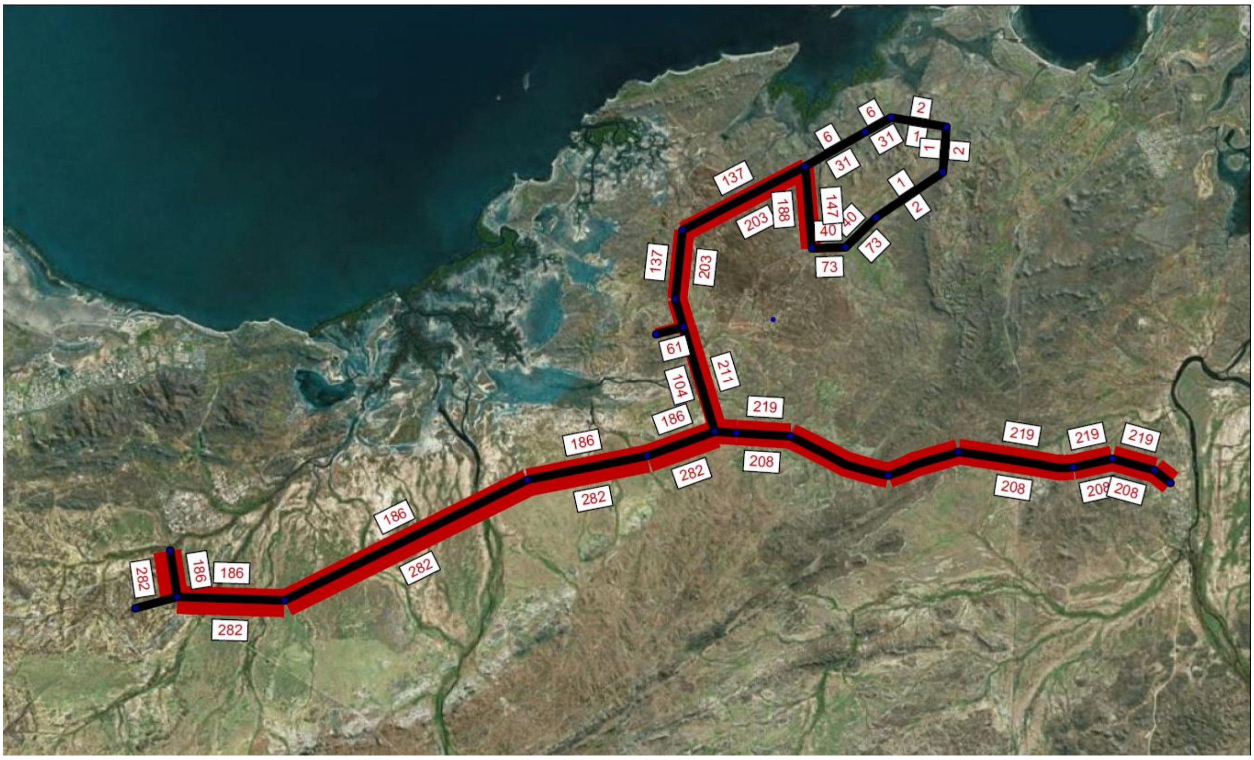


Figure 5.5 : Traffic Distributions for 2041

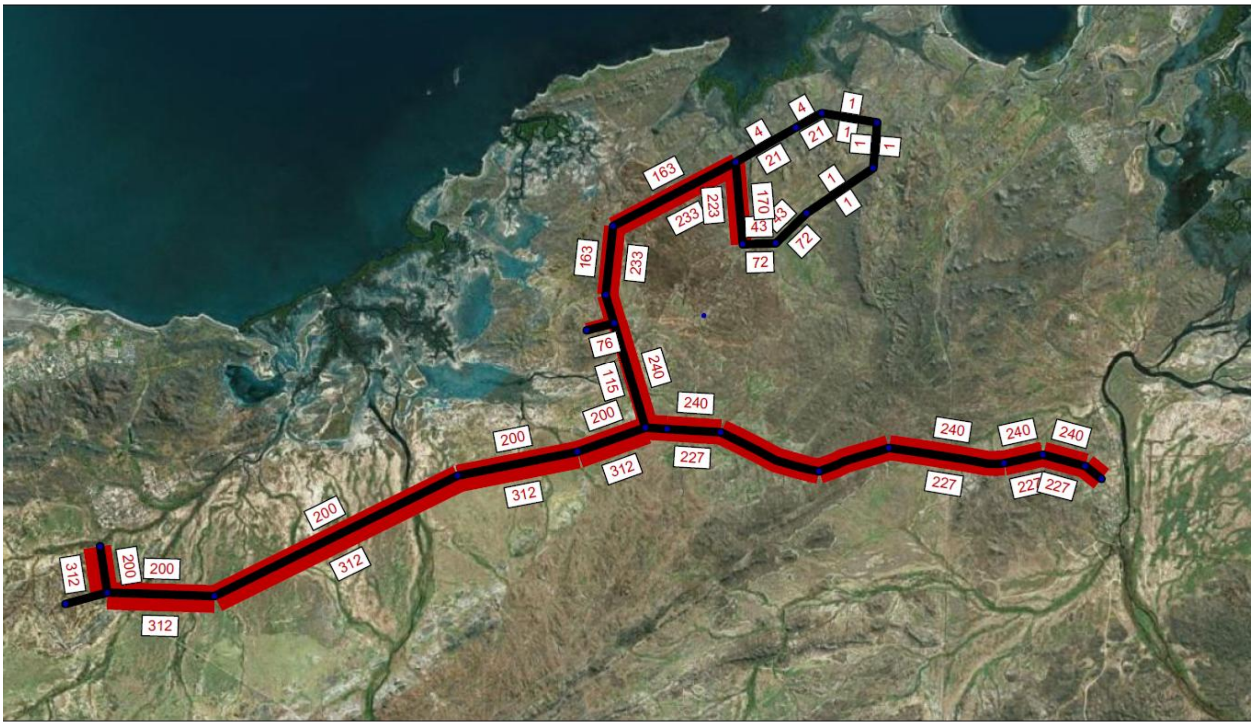


Figure 5.6 : Traffic Distributions for 2060 (without MCC)

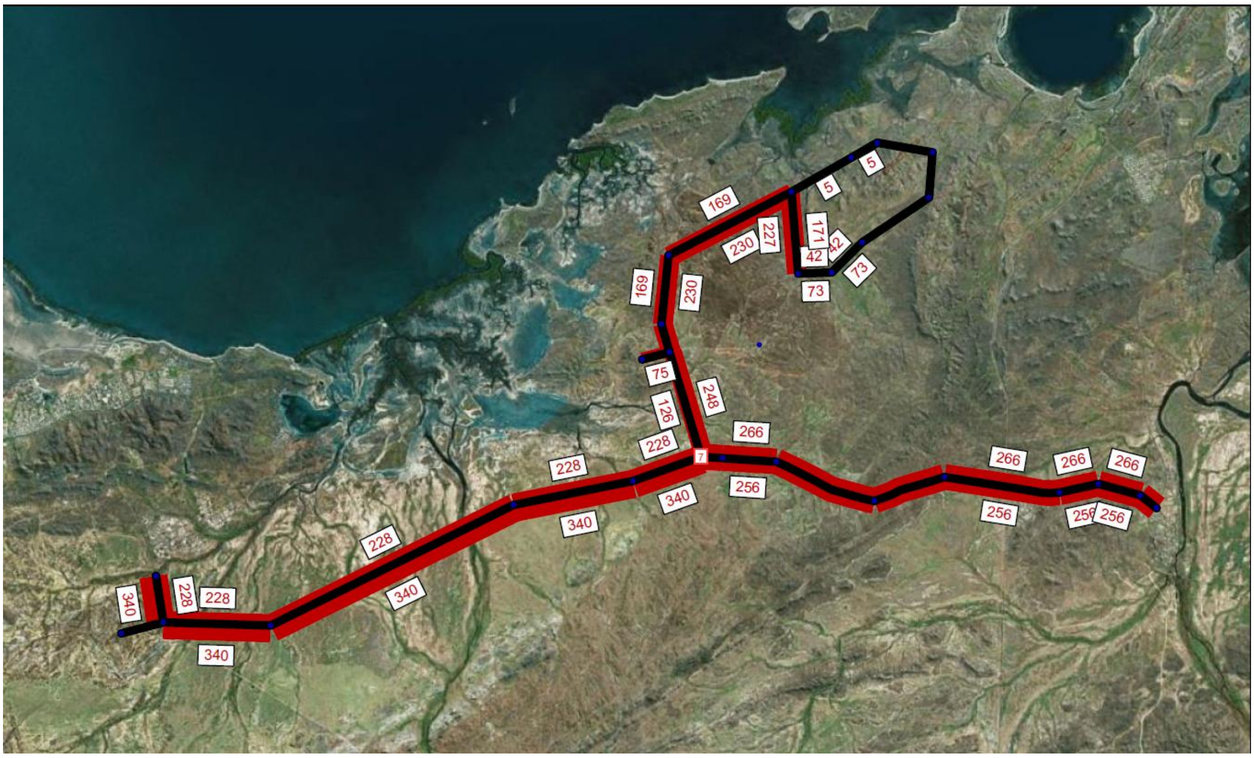


Table 5.2 : PM Peak Hour intersection capacity analysis for North West Coast Highway / Western Access 2021 – 2060

	Western Access		**North West Coastal Highway**
	Left Turn Out	Right Turn Out	Right Turn In
2021			
Degree of Saturation (v/c)	0.013	0.030	0.010
Level of Service	A	B	A
95% Maximum Queue Length (m)	0.387	0.937	0.288
2026			
Degree of Saturation (v/c)	0.037	0.094	0.025
Level of Service	A	B	A
95% Maximum Queue Length (m)	1.137	3.114	0.768
2031			
Degree of Saturation (v/c)	0.064	0.177	0.037
Level of Service	A	B	A
95% Maximum Queue Length (m)	2.057	6.425	1.163
2036			
Degree of Saturation (v/c)	0.082	0.240	0.045
Level of Service	A	B	A
95% Maximum Queue Length (m)	2.662	9.467	1.413
2041			
Degree of Saturation (v/c)	0.094	0.290	0.051
Level of Service	A	B	A
95% Maximum Queue Length (m)	3.106	12.195	1.622
2060 (Without MCC)			
Degree of Saturation (v/c)	0.100	0.325	0.057
Level of Service	A	C	A
95% Maximum Queue Length (m)	3.335	14.378	1.811

6. Design Considerations

A number of road design aspects are highlighted here based upon the assumption of that the design speed limit on access roads are 80km/hr for vehicles, and the speed limit for trains at crossing points are 50km/hr.

- The proposed intersection layout is in accordance with 201431-0002 (T-Intersection Example Treatment for 53.5m Triple Road Train) as this is suitable to vehicles using the corridor.

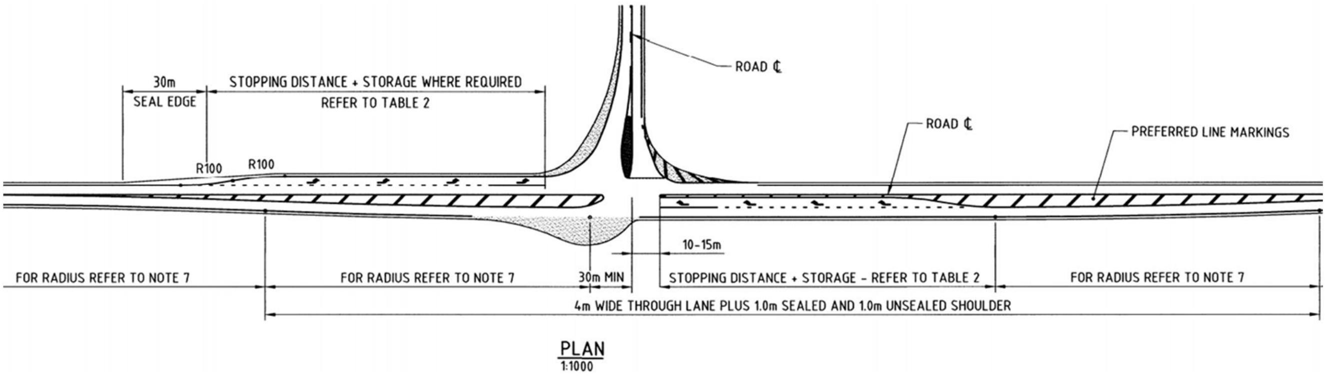


Table 6.1 : Design criteria of turning pocket

Design HV GCM (t)	Design Speed Approaching (km/h)	Wet Correction Factor	Reaction Time Component (m)	Stopping Distance (m)
100	80	1.31	44.4	163
130				171
150				176
175				183
194				188
Recommended length of turning pockets L=				**200**

6.1 Cross Sections

Cross sections have been developed for a number of key locations within and around the port development. In developing these, consideration has been given to the type of vehicles and their likely manoeuvres, as well as the information provided by Main Roads Western Australia. In particular, the immediate access approach to NWCH recommends 6m wide lanes, narrowing further along to standard 3.5m lanes.

The recommended cross-sections for the NWCH approaching the intersection with the Western Corridor from the east and west are shown in **Figures 6.1** and **6.2** respectively. The same cross section is recommended for the intersection of the proposed Central Infrastructure Corridor with NWCH.

The recommended cross-sections for the Western Corridor Port Access Road at the intersection and mid-block are shown in **Figure 6.3** and **6.4**. These are also recommended for the proposed Central Infrastructure Corridor Link Road.

These are preliminary only, and should be considered further at concept design.

Figure 6.1 Recommended cross-section for NWCH eastbound

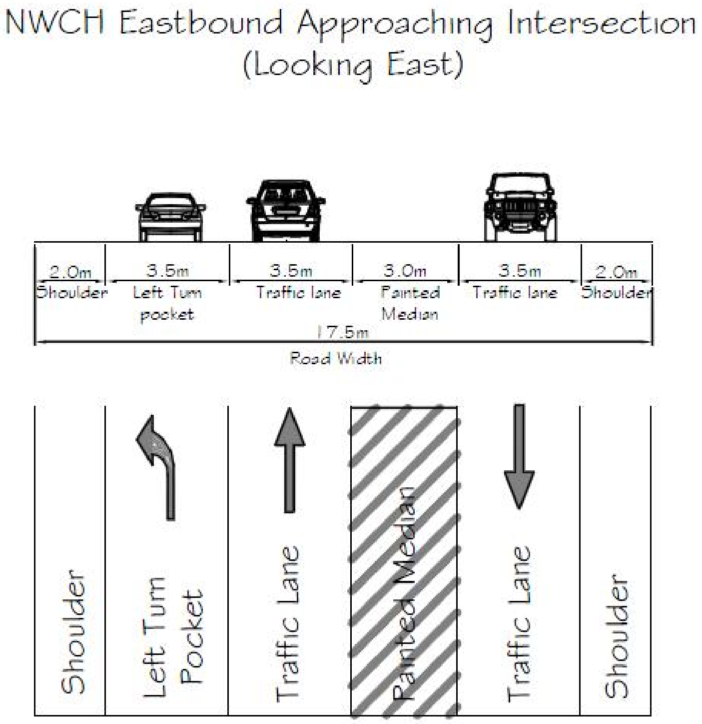


Figure 6.2 Recommended cross-section for NWCH westbound

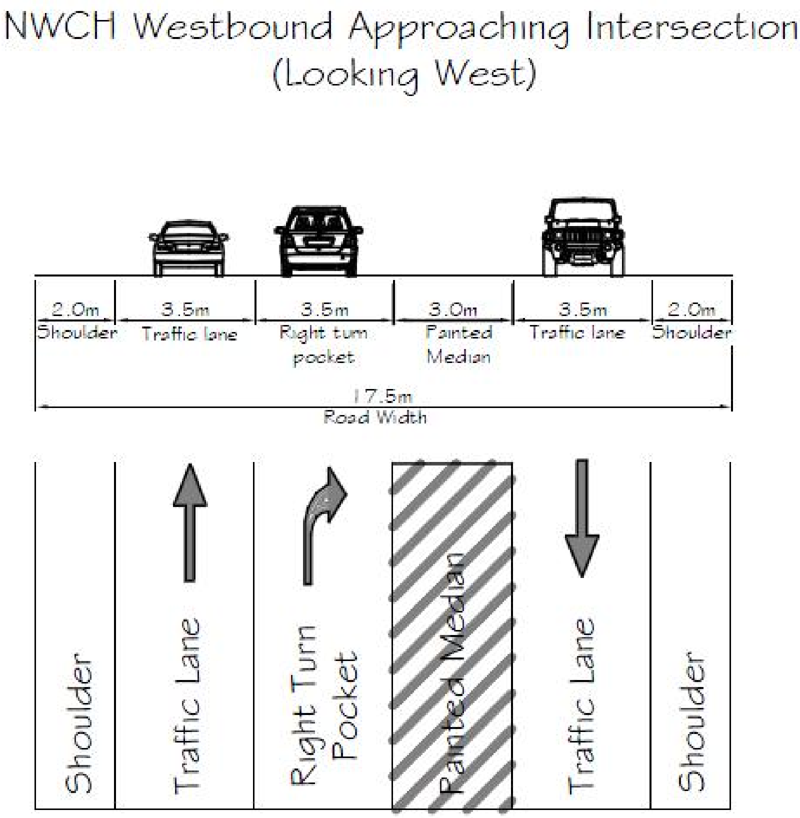


Figure 6.3 Recommended cross-section for Western Corridor Port Access road at the intersection

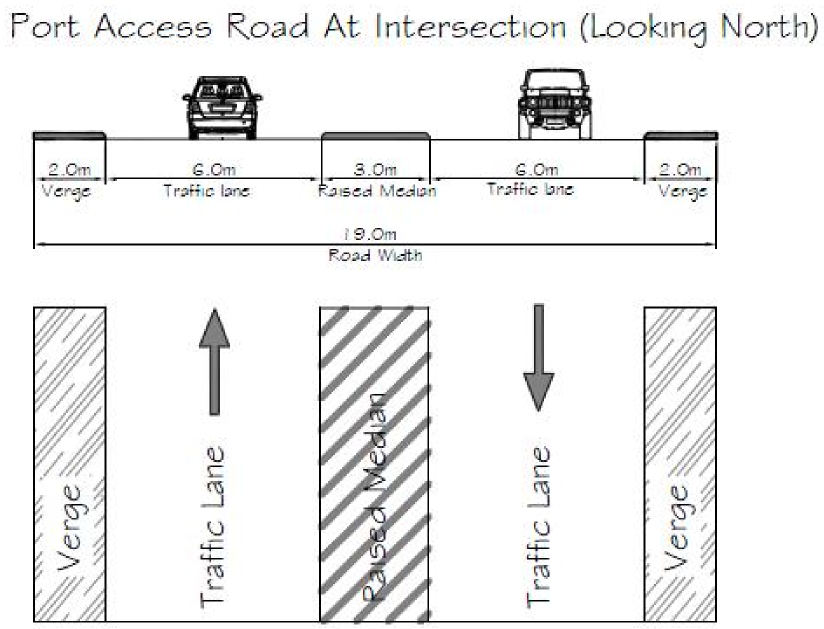
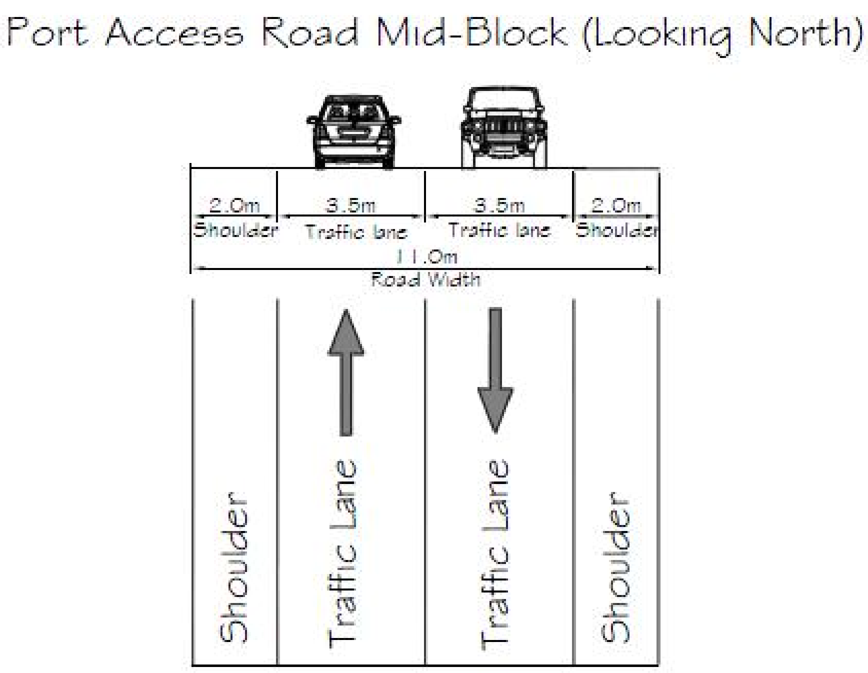


Figure 6.4 Recommended cross-section for mid-block Western Corridor Port Access road at the intersection



6.2 Railway Crossing Protection

An assessment has been undertaken of the need for railway crossing protection for both the Western Corridor and NWCH. **Appendix E** shows the flow charts used to determine if give way or stop signs are required.

The assessment has been based on AS 1742.7 Part 7, 1993 - Manual of Uniform Traffic Control Devices for Railway Crossings and Railway Crossing Protection in Western Australia: Policy and Guidelines.

Advice from PPA is that it is anticipated that only one rail line (out of the four rail reserves indicated for the ultimate development) will be operational by 2036. It has been assumed that one rail line will generate two trains per day.

The following design parameters are noted:

- The installation of give way signs or stop signs are NOT applicable where multiple tracks are used.
- The requirement for flashing lights is based on a calculation to determine weighted conflict (C_{wf}). When C_{wf} is greater than 15,000, then flashing lights are needed.

$$C_{wf} = \frac{V_t}{60} \bullet N_t \bullet \frac{V_v}{60} \bullet AADT$$

- The requirement for boom barriers is based on a calculation to determine weighted conflict (C_{wb}). When C_{wb} is greater than 700,000, then boom barriers are needed.

$$C_{wb} = \frac{V_t \bullet N_t \bullet V_v \bullet AADT}{3600}$$

- Advance flashing warning signs are to be used on a road that is a designated heavy vehicle route.

6.2.1 Western Corridor Port Access Road Rail Crossing into HIA1

In summary, the following rail crossing protection is required for the Western Corridor Port Access Road into HIA1.

Year	Stop Signs	Flashing Lights	Boom Barriers	Advance Flashing Warning Signs
2021	Yes	No	No	Yes
2026	No	Yes	No	Yes
2031	No	Yes	No	Yes
2036	No	Yes	No	Yes
2041	No	Yes	No	Yes

If only one rail line is constructed, then a stop sign is recommended for the rail crossing of the Western Corridor.

The calculations in **Table 6.1** show that by 2026, C_{wf} has reached more than 15,000 and therefore flashing lights are required even if only one rail line is operating. **Table 6.2** shows that a boom barrier is not deemed to be required.

Should an additional rail line be introduced prior to 2026, then flashing lights will be required given that a stop sign is not permitted for multiple rail lines.

Our recommendation is that when more than two rail lines are constructed, then consideration is given to either providing a grade separation or building the proposed Central Infrastructure Corridor and closing the access via the Western Corridor that crosses the rail lines.

Table 6.1 : Flashing Light Requirement Calculation Summary

Flashing light requirement	2021	2026
V_t	50	50
N_t	14	14
V_v	80	80
$AADT$	550	1690
C_{wf}	8556	**26289**

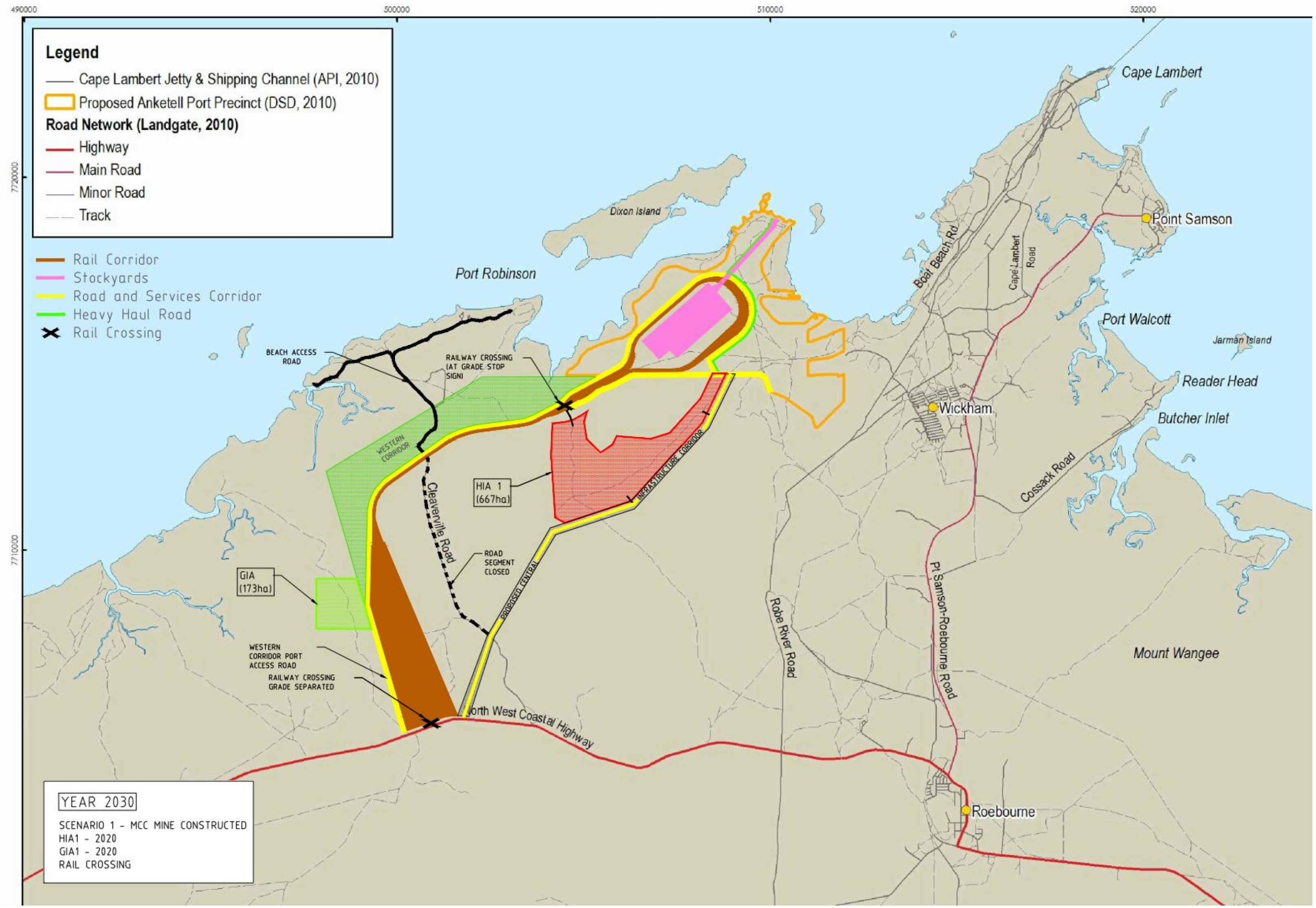
Table 6.2 : Boom Barrier Requirement Calculation Summary

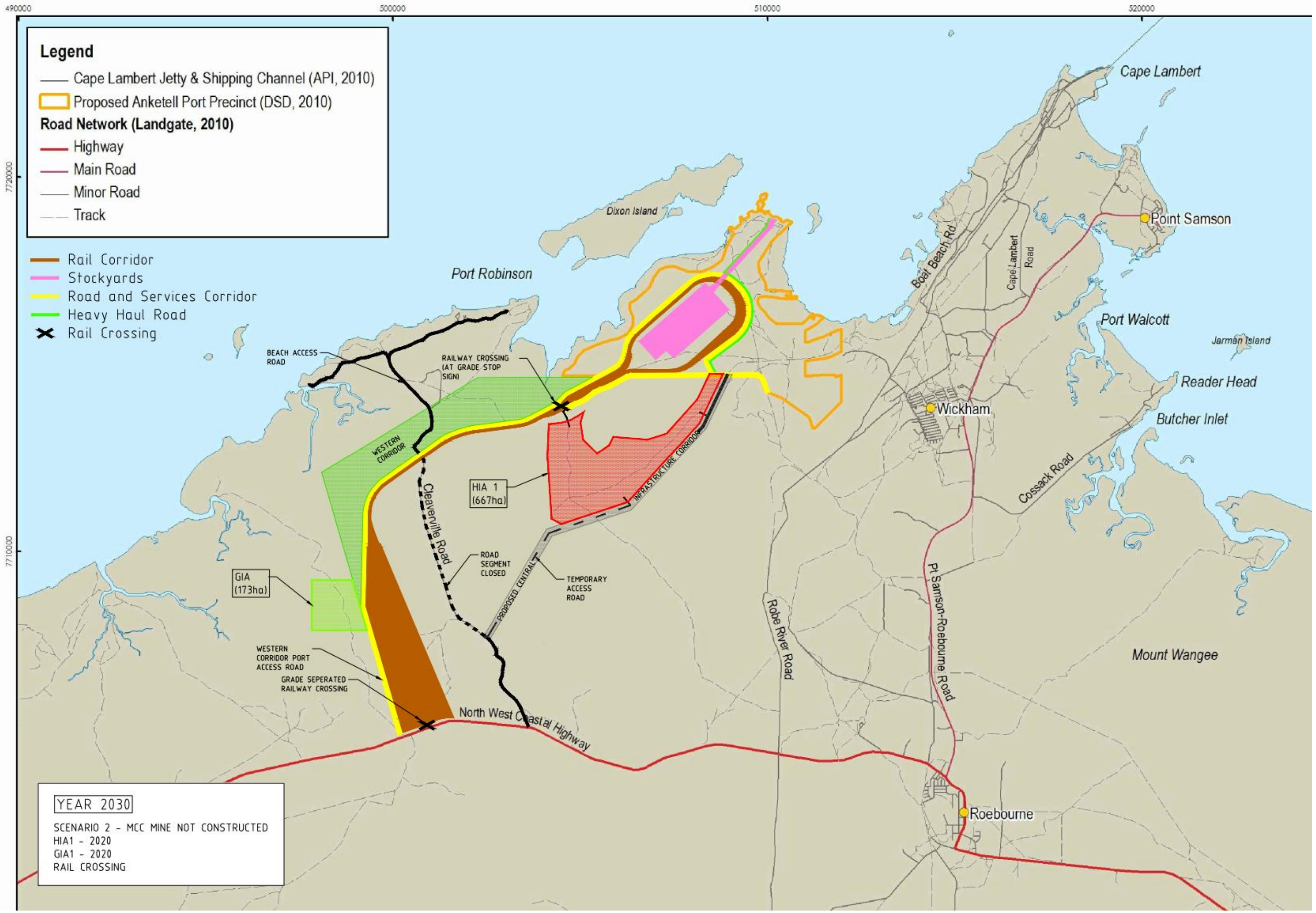
Boom barrier requirement	**2021**	**2026**	**2031**	**2036**	**2041**
V_t	50	50	50	50	50
N_t	14	14	14	14	14
V_v	80	80	80	80	80
$AADT$	550	1690	2890	3920	4610
C_{wb}	8556	26289	44956	60978	71711

6.2.2 North West Coastal Highway Rail Crossing

Main Roads WA advised that a grade separated crossing is required on NWCH for the crossing of any rail line. It is understood that the proponents requiring the rail lines will fund the provision of the crossing. However, it is unknown whether this grade separated crossing will be constructed in one stage to cater for the planned 4 rail lines or in stages as each rail line is required.

Appendix A. Transport Movement Plans for Scenarios


490000
500000
510000
520000
7720000
7710000
Legend
Cape Lambert Jetty & Shipping Channel (API, 2010)
Proposed Anketell Port Precinct (DSD, 2010)
Road Network (Landgate, 2010)
Highway
Main Road
Minor Road
Track
Rail Corridor
Stockyards
Road and Services Corridor
Heavy Haul Road
Rail Crossing
Cape Lambert
Dixon Island
Port Robinson
Point Samson
Port Walcott
Jarman Island
Reader Head
Wickham
Butcher Inlet
Boat Beach Rd
Cape Lambert Road
Cossack Road
BEACH ACCESS ROAD
RAILWAY CROSSING (AT GRADE STOP SIGN)
WESTERN CORRIDOR
HIA 1 (667ha)
INFRASTRUCTURE CORRIDOR
Cleaverville Road
ROAD SEGMENT CLOSED
PROPOSED CENTRAL
GIA (173ha)
WESTERN CORRIDOR PORT ACCESS ROAD
RAILWAY CROSSING GRADE SEPARATED
North West Coastal Highway
Robe River Road
Pt Samson-Roebourne Road
Mount Wangee
Roebourne
YEAR 2030
SCENARIO 1 - MCC MINE CONSTRUCTED
HIA1 - 2020
GIA1 - 2020
RAIL CROSSING



Legend
Cape Lambert Jetty & Shipping Channel (API, 2010)
Proposed Anketell Port Precinct (DSD, 2010)
Road Network (Landgate, 2010)
Highway
Main Road
Minor Road
Track
Rail Corridor
Stockyards
Road and Services Corridor
Heavy Haul Road
Rail Crossing
Cape Lambert
Point Samson
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Cape Lambert Road
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RAILWAY CROSSING (AT GRADE STOP SIGN)
WESTERN CORRIDOR
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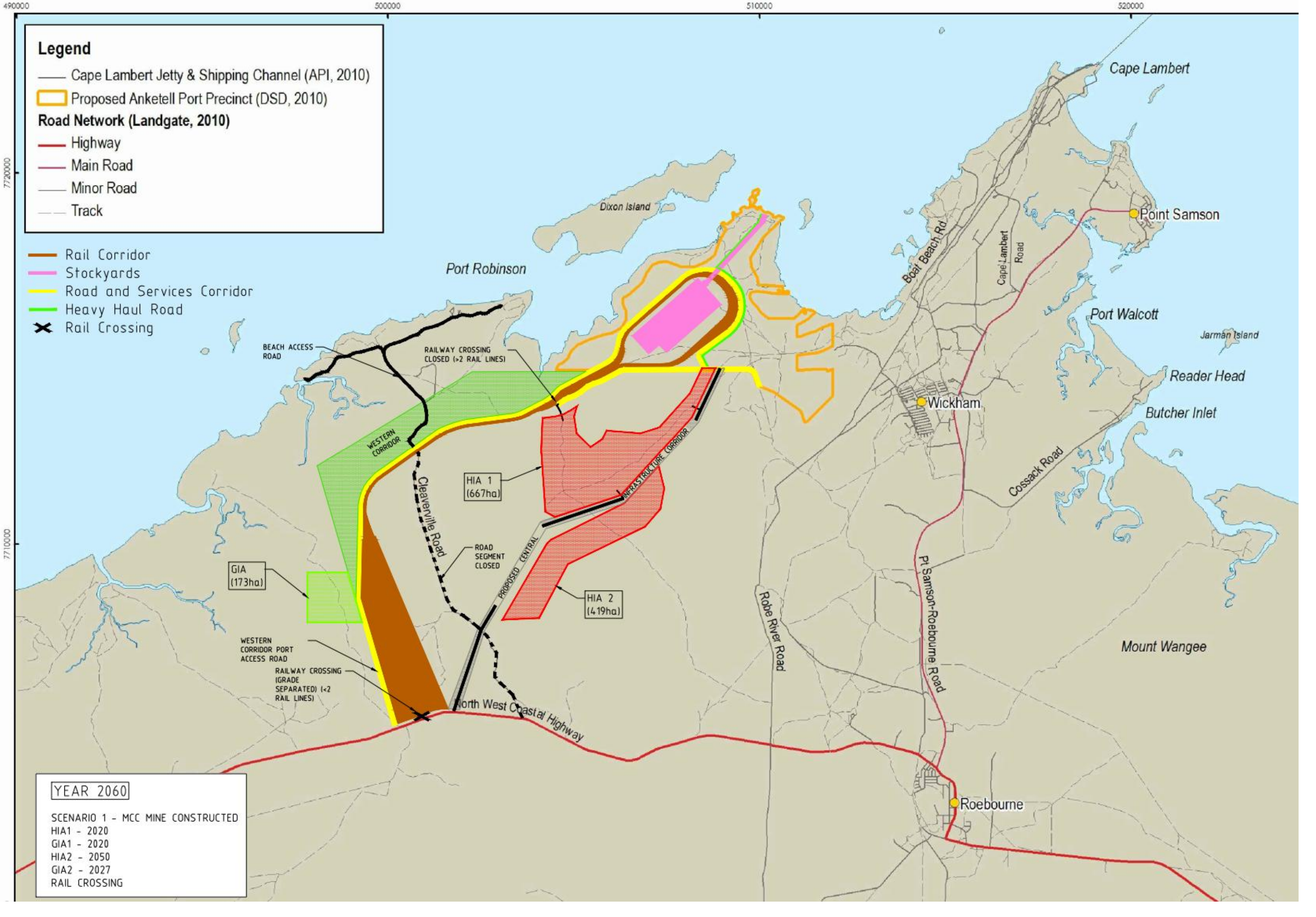
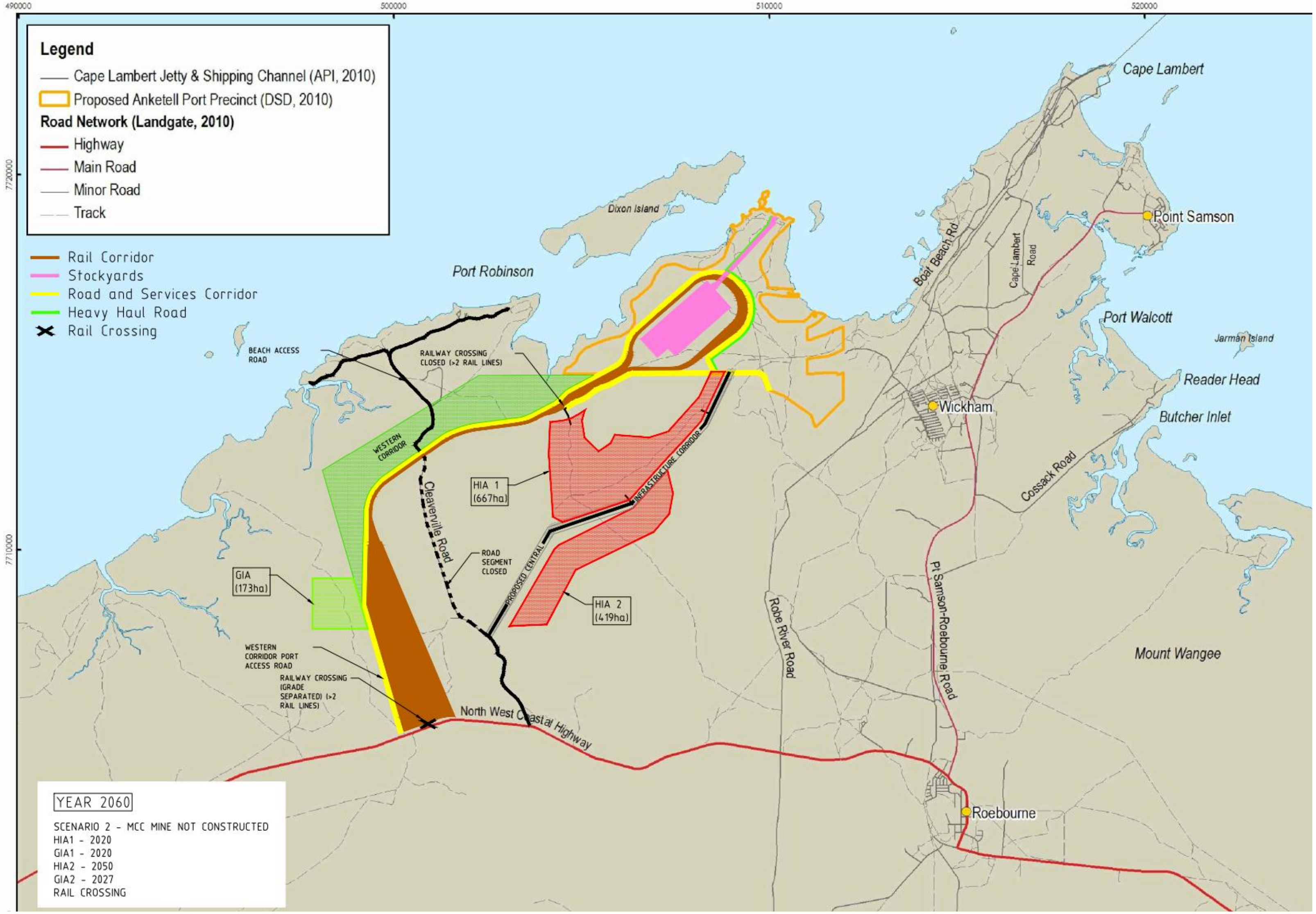
Cleaverville Road
ROAD SEGMENT CLOSED
PROPOSED CENTRAL
TEMPORARY ACCESS ROAD
GIA (173ha)
Robe River Road
Pt Samson-Roebourne Road
Mount Wangee
WESTERN CORRIDOR PORT ACCESS ROAD
GRADE SEPERATED RAILWAY CROSSING
North West Coastal Highway
Roebourne
YEAR 2030
SCENARIO 2 - MCC MINE NOT CONSTRUCTED
HIA1 - 2020
GIA1 - 2020
RAIL CROSSING



Legend
Cape Lambert Jetty & Shipping Channel (API, 2010)
Proposed Anketell Port Precinct (DSD, 2010)
Road Network (Landgate, 2010)
Highway
Main Road
Minor Road
Track
Rail Corridor
Stockyards
Road and Services Corridor
Heavy Haul Road
Rail Crossing
Cape Lambert
Point Samson
Dixon Island
Port Robinson
Port Walcott
Jarman Island
Reader Head
Wickham
Butcher Inlet
Cossack Road
Boat Beach Rd
Cape Lambert Road
BEACH ACCESS ROAD
RAILWAY CROSSING CLOSED (>2 RAIL LINES)
WESTERN CORRIDOR
HIA 1 (667ha)
INFRASTRUCTURE CORRIDOR
Cleaverville Road
ROAD SEGMENT CLOSED
PROPOSED CENTRAL
GIA (173ha)
HIA 2 (419ha)
Robe River Road
Pt Samson-Roebourne Road
Mount Wangee
WESTERN CORRIDOR PORT ACCESS ROAD
RAILWAY CROSSING (GRADE SEPARATED) (<2 RAIL LINES)
North West Coastal Highway
Roebourne
YEAR 2060
SCENARIO 1 - MCC MINE CONSTRUCTED
HIA1 - 2020
GIA1 - 2020
HIA2 - 2050
GIA2 - 2027
RAIL CROSSING
490000
500000
510000
520000
7720000
7710000



490000
500000
510000
520000
7720000
7710000
Legend
Cape Lambert Jetty & Shipping Channel (API, 2010)
Proposed Anketell Port Precinct (DSD, 2010)
Road Network (Landgate, 2010)
Highway
Main Road
Minor Road
Track
Rail Corridor
Stockyards
Road and Services Corridor
Heavy Haul Road
Rail Crossing
Cape Lambert
Point Samson
Dixon Island
Port Robinson
Port Walcott
Jarman Island
Reader Head
Wickham
Butcher Inlet
Cossack Road
Boat Beach Rd
Cape Lambert Road
BEACH ACCESS ROAD
RAILWAY CROSSING CLOSED (>2 RAIL LINES)
WESTERN CORRIDOR
HIA 1 (667ha)
INFRASTRUCTURE CORRIDOR
Cleaverville Road
ROAD SEGMENT CLOSED
PROPOSED CENTRAL
GIA (173ha)
HIA 2 (419ha)
Robe River Road
Pt Samson-Roebourne Road
Mount Wangee
WESTERN CORRIDOR PORT ACCESS ROAD
RAILWAY CROSSING (GRADE SEPARATED) (>2 RAIL LINES)
North West Coastal Highway
Roebourne
YEAR 2060
SCENARIO 2 - MCC MINE NOT CONSTRUCTED
HIA1 - 2020
GIA1 - 2020
HIA2 - 2050
GIA2 - 2027
RAIL CROSSING

Appendix B. Assumptions

Note that the modelling was not redone in the April 2016 version of this report when the original GIA1 was incorporated into HIA1.

The original assumptions are:

Modelling

- Plan to indicate when infrastructure elements require to be provided (i.e. trigger points).

Timelines

- Early 2016 – consortium commence port construction (3 year build). This date has shifted to early 2017.
- Late 2018 – operational. This date has shifted to late 2019.
- Likely 3 port construction periods.
- HIA1 (including GIA1) – commences operation in 2020, takes 20 years to reach full development.
- GIA 2 – commences in 2027. This is now known as GIA and is envisaged to commence operation with the HIA1 development in 2020.
- HIA2 – commences operation in 2050 (as the MCC mine has a 30 year lease).

Land area assumptions

- Assume development is 70% of land area – a worst case.
- Sensitivity test – assume 60% - this could be more realistic use of land area given land constraints.

Access

- HIA/GIA – accessed from Western Corridor Port Access Road which intersects with NWCH and extends to Port. Main Roads WA advised that the rail crossing of NWCH requires grade separation.
- Rail line crossing to industrial area will be required as the rail lines run east of the western corridor. Need to identify when rail traffic vs road traffic triggers grade separation for rail crossing from Western Corridor Port Access Road into HIA1.
- MCC mine will construct a road within the proposed Central Infrastructure Corridor which can be used to access the SIA following the mine closure. Future traffic volumes on NWCH have been factored up to represent future development in the area which would include the MCC mine.
- If MCC mine does not proceed, access can be provided to HIA2 via a road along the proposed Central Infrastructure Corridor and potentially following the current alignment of Cleaverville Road.

Accommodation camps

- Two potential camp locations are located east of the NWCH intersection and two are located west of NWCH – the traffic generation from the camps has been assumed to be 50% to the west and 50% to the east.

Appendix C. Additional Information

Trip rates used from ITE:

ITE						
Description/ITE Code	Units	Weekday Daily Traffic Rate	PM Peak Period Rate	% PM In	% PM Out
General Light Industrial/110	KSF	6.97	0.97	12%	88%
	100m^2	6.48	0.90	12%	88%
	Employees	3.02	0.42	21%	79%
Industrial Park/130	KSF	6.96	0.86	21%	79%
	100m^2	6.47	0.80	21%	79%
	Employees	3.34	0.46	20%	80%
Manufacturing/140	KSF	3.82	0.74	36%	64%
	100m^2	3.55	0.69	36%	64%
	Employees	2.13	0.36	44%	56%
Warehousing/150	KSF	3.56	0.32	25%	75%
	100m^2	3.31	0.30	25%	75%
	Employees	3.89	0.59	35%	65%

Note:

KSF = 1000 square feet

1000 square feet = $92.9m^2$

GHD Ecology Report	
Assumed Daily Trips	4.0-4.5 trips per ha of GLA

Appendix D. Demand Matrices (Previous Modelling)

Locations: (6 and 7 are assumed combined for now)

1	HIA1
2	HIA2
3	GIA1
4	GIA2
5	Port
6	NWCH
7	Karratha
8	NWCH

2021				Quantitative								
				Destination								Total
			Total	12	0	3	0	1	75	0	41	132
		Total	Location	1	2	3	4	5	6	7	8	
	Origin	15	1	0	0	0	0	0	9	0	5	15
		0	2	0	0	0	0	0	0	0	0	0
		9	3	1	0	0	0	0	6	0	3	9
		0	4	0	0	0	0	0	0	0	0	0
		12	5	1	0	0	0	0	7	0	4	12
		41	6	8	0	2	0	1	0	0	116	128
		0	7	0	0	0	0	0	0	0	0	0
		75	8	10	0	3	0	1	116	0	0	129
	Total	153		20	0	6	0	2	138	0	128	

2026				Quantitative								
				Destination								Total
			Total	51	0	10	0	2	81	0	44	189
		Total	Location	1	2	3	4	5	6	7	8	
	Origin	65	1	0	0	5	0	1	38	0	21	65
		0	2	0	0	0	0	0	0	0	0	0
		31	3	9	0	0	0	0	14	0	8	31
		0	4	0	0	0	0	0	0	0	0	0
		22	5	6	0	1	0	0	10	0	5	22
		44	6	21	0	4	0	1	0	0	125	151
		0	7	0	0	0	0	0	0	0	0	0
		81	8	29	0	6	0	1	125	0	0	161
	Total	243		64	0	16	0	4	187	0	158	

2031			Quantitative								
			Destination								Total
		Total	90	0	17	27	2	88	0	47	271
	Total	Location	1	2	3	4	5	6	7	8	
Origin	115	1	0	0	11	17	2	55	0	30	115
	0	2	0	0	0	0	0	0	0	0	0
	52	3	19	0	0	5	1	18	0	10	52
	76	4	28	0	5	0	1	27	0	15	76
	22	5	8	0	1	2	0	7	0	4	22
	47	6	23	0	4	7	1	0	0	135	170
	0	7	0	0	0	0	0	0	0	0	0
	88	8	35	0	7	10	1	135	0	0	188
Total	400		112	0	29	42	4	242	0	193	

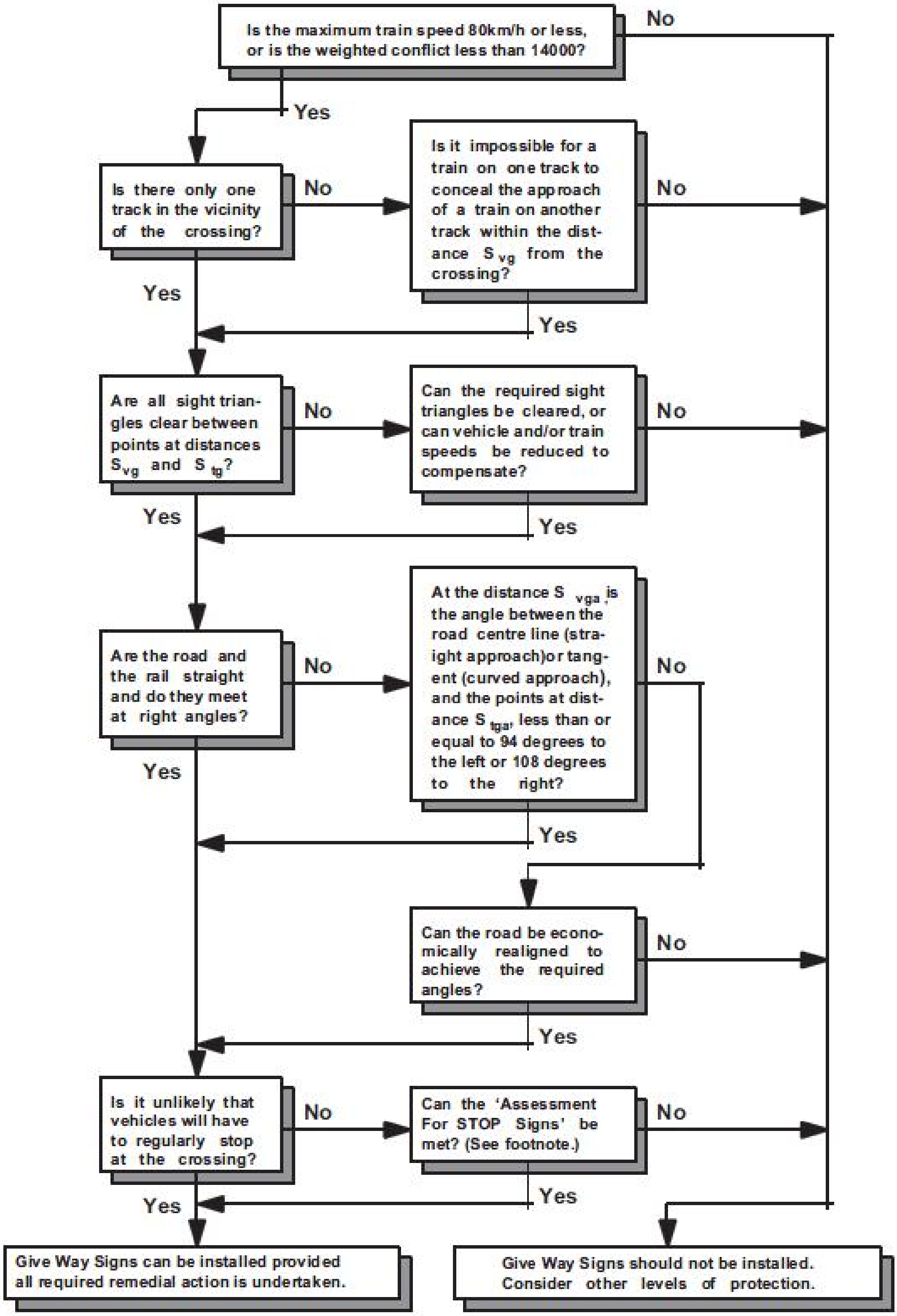
2036			Quantitative								
			Destination								Total
		Total	129	0	25	36	4	94	0	51	339
	Total	Location	1	2	3	4	5	6	7	8	
Origin	165	1	0	0	19	28	3	74	0	40	165
	0	2	0	0	0	0	0	0	0	0	0
	74	3	30	0	0	9	1	22	0	12	74
	103	4	44	0	8	0	1	32	0	17	103
	34	5	13	0	2	4	0	9	0	5	34
	51	6	27	0	5	8	1	0	0	145	185
	0	7	0	0	0	0	0	0	0	0	0
	94	8	42	0	8	12	1	145	0	0	208
Total	520		157	0	43	60	7	283	0	219	

2041			Quantitative								
			Destination								Total
		Total	161	0	25	46	2	102	0	55	390
	Total	Location	1	2	3	4	5	6	7	8	
Origin	204	1	0	0	22	41	2	91	0	49	204
	0	2	0	0	0	0	0	0	0	0	0
	74	3	32	0	0	9	1	20	0	11	74
	131	4	61	0	9	0	1	39	0	21	131
	22	5	9	0	1	3	0	6	0	3	22
	55	6	30	0	5	9	0	0	0	156	201
	0	7	0	0	0	0	0	0	0	0	0
	102	8	49	0	7	14	1	156	0	0	227
Total	588		182	0	45	76	5	312	0	240	

2060		Quantitative											
					Destination								Total
				Total	161	16	25	48	0	116	0	63	428
			Total	Location	1	2	3	4	5	6	7	8	
		Origin	204	1	0	12	19	37	0	89	0	48	204.5
			20	2	8	0	1	2	0	6	0	3	19.8
			74	3	29	3	0	9	0	21	0	11	73.7
			136	4	58	6	9	0	0	42	0	22	136.4
			4	5	2	0	0	1	0	1	0	1	4.5
			63	6	32	3	5	10	0	0	0	179	229.3
			0	7	0	0	0	0	0	0	0	0	0.0
			116	8	51	5	8	15	0	179	0	0	258.6
		Total	618		180	29	42	73	1	338	0	265	

Appendix E. Flow Charts

E.1 Give Way Signs



E.2 Stop Signs