Environmental Impact Statement

Uungula Wind Farm

Appendix M: Route Study (Rex J. Andrews, 2020)

May 2020

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REX J ANDREWS
ENGINEERED TRANSPORTATION

ROUTE STUDY:

PROJECT: UUNGULA WIND FARM
EX PORT OF NEWCASTLE.

20/02/2020 REV 07

Rev.	Date	Change	Responsible	Checked
00	15/11/18	Route Assessed	W Andrews	✓
00	12/12/18	Report compiled	W Andrews	✓
00	04/01/19	Report completed	W Andrews	✓
01	06/06/19	Updated route	W Andrews	✓
02	26/06/19	82 Metre blade included	W Andrews	✓
03	25/07/19	Edited	W Andrews	✓
04	11/09/19	Additional route added	W Andrews	✓
05	21/09/19	Edited section 14.0	W Andrews	✓
06	14/02/20	Edited section 3.0 & 4.0	W Andrews	✓
07	20/02/20	Edited section 3.0 & 7.0	W Andrews	✓

Index:

1.0 Introduction

This document describes observations and previous experience on route and explains the Transport of Wind turbine equipment from Newcastle to Uungula wind farm.

This Route survey took place on 15-11-18.

2.0 Evaluation

1	No Cost
2	Some Work
3	Urgent Modification
4	Extreme Amount of Work

(Mark below boxes with an X)

		1	2	3	4
A	Harbour		**X**		
B	Road Modification			**X**	
C	Road Furnishings			**X**	
D	Trees			**X**	
E	Site Entrance			**X**	
F	Bridge Calculations		**X**		
G	Traffic Control		**X**		

3.0 Project data.

Date of latest Route Assessment. 15/11/2018

Survey undertaken by. (Rex J Andrews P/L)

Project name. Uungula Windfarm

Location. Newcastle port (NSW) to Uungula (NSW)

Wind turbine type.

Option 1: 97 off 158 Metre rotor, 141 metre H/H

Option 2: 97 off 162 Metre rotor, 141 metre H/H

Note: Turbines of up to 170 Metre rotors at a 166 metre H/H are starting to be introduced into the market. These will add approximately 3 metres to the length of the blade and will slightly alter the swept path.

The 166 metre H/H will likely make the towers a larger diameter. The route will only allow a maximum of 5.9 metres travel height, so all towers would need to be designed to stay under this height and take into account the added height of the transporter.

4.0 Transport combination examples

Nacelle bodies (15l x 3.9w x 3.5h x 86.2T)
Possible transport configuration. Prime mover with 8x8 platform trailer.
Overall length: 32.0l x 4.5w x 5.5h x 144.5T.

Drivetrains (6.3l x 3.6w x 3.1h x 90.2T)
Possible transport configuration. Prime mover with 8x8 platform trailer.
Overall length: 32.0l x 4.5w x 5.5h x 144.5T.

Hubs (4.0l x 3.5w x 3.8h x 51.5T)
Possible transport configuration. Prime mover with 2x8 4x8 Low Loader.
Overall length: 26.0l x 5.1w x 5.9h x 54.5T.

Blades option 1 (76.0l x 4.5w x 3.3h x 32T)
Possible transport. Prime mover with 2x8 dolly and 4x4 Extending trailer.
Overall length: 85.0l x 4.5w x 5.2h x 68.5T.

Blades option 2 (82.0l x 4.0w x 4.0h x 35T)
Possible transport. Prime mover with 2x4 dolly and 4x4 Extending trailer.
Overall length: 92.0l x 4.5w x 5.5h x 77.5T.

Door section tower (9.5l x 5.0 x 4.6 x 69.5T)
Possible transport configuration. Prime mover with 2x8-4x8 Bookend
Overall length: 35.0l x 5.2w x 5.3h x 93.5T.

Mid Tower D (17.3l x 4.6 x 4.3 x 91T)
Possible transport configuration. Prime mover with 8x8 low platform
Overall length: 35.0l x 4.6w x 5.4h x 144.5T.

Mid Tower C (22.4l x 4.3 x 4.3 x 95T)
Possible transport configuration. Prime mover with 10x8 Platform
Overall length: 39.0l x 4.3w x 5.2h x 164.5T.

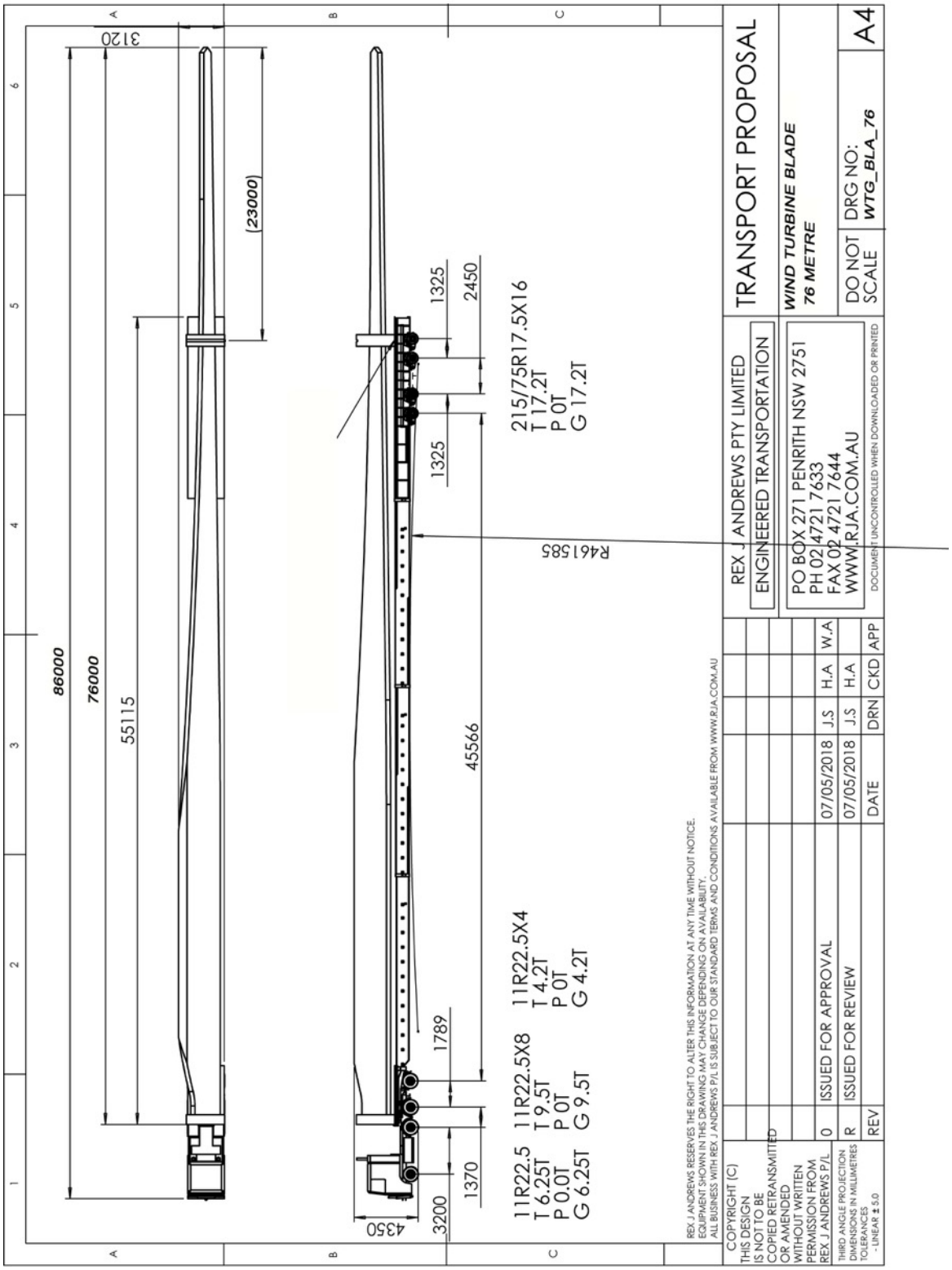
Mid Tower B (29.9 x 4.3 x 4.3 x 93.5T)
Possible transport configuration. Prime mover with extending 10x8 Platform
Overall length: 45.0l x 4.3w x 5.2h x 174.5T.

Mid Tower A (29.9 X 4.3 X 4.3 X 59.2T)
Possible transport configuration. Prime mover with 2x8 Dolly 3x8 Jinker
Overall length: 45.0l x 4.3w x 5.2h x 94.5T.

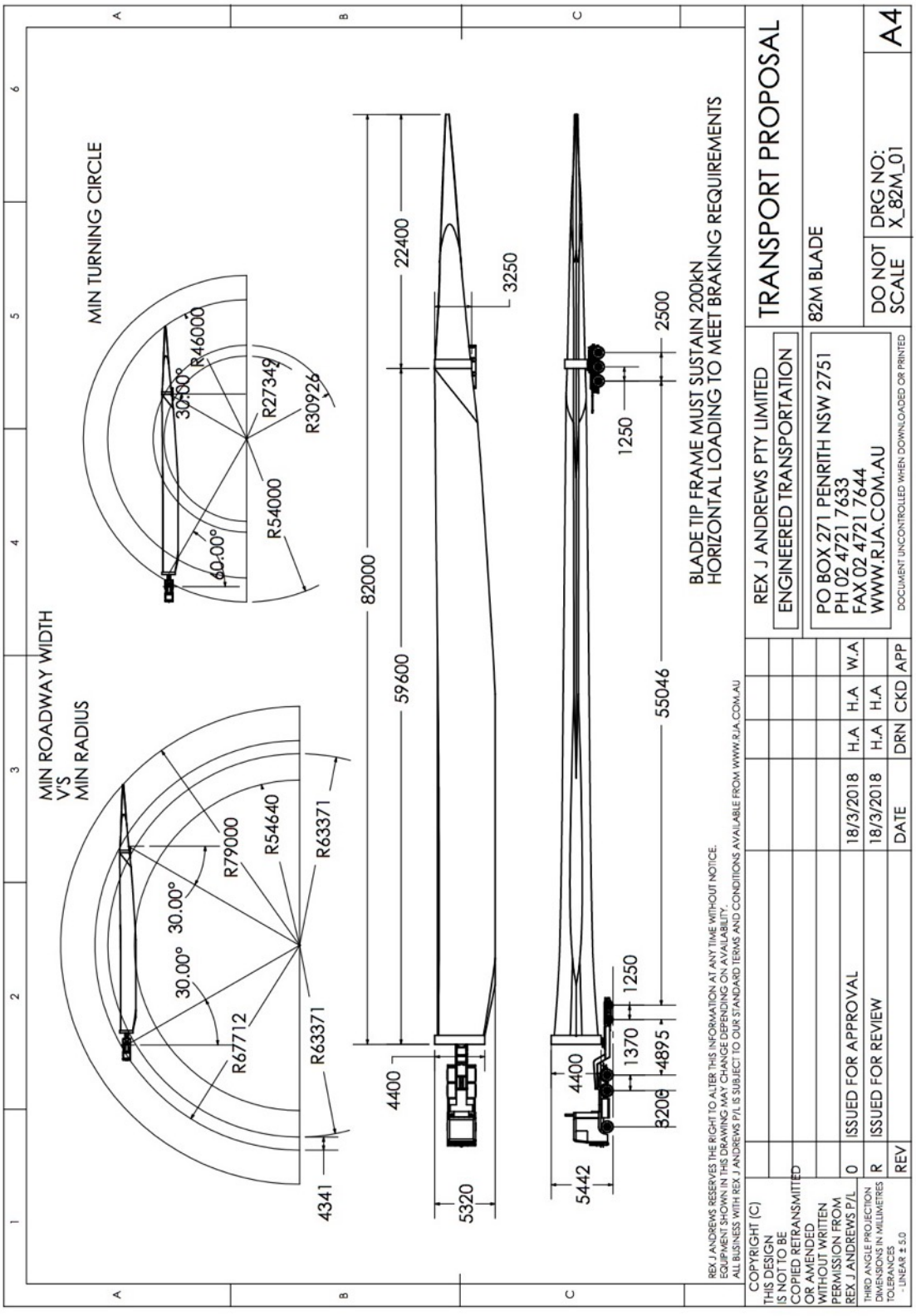
Top Towers (29.7l x 4.3w x 3.5h x 45T)
Possible transport configuration. Prime mover with 2x8 Dolly 2x8 Jinker
Overall length: 45.0l x 4.3w x 5.3h x 84.5T.

5.0 Sample transport drawings.

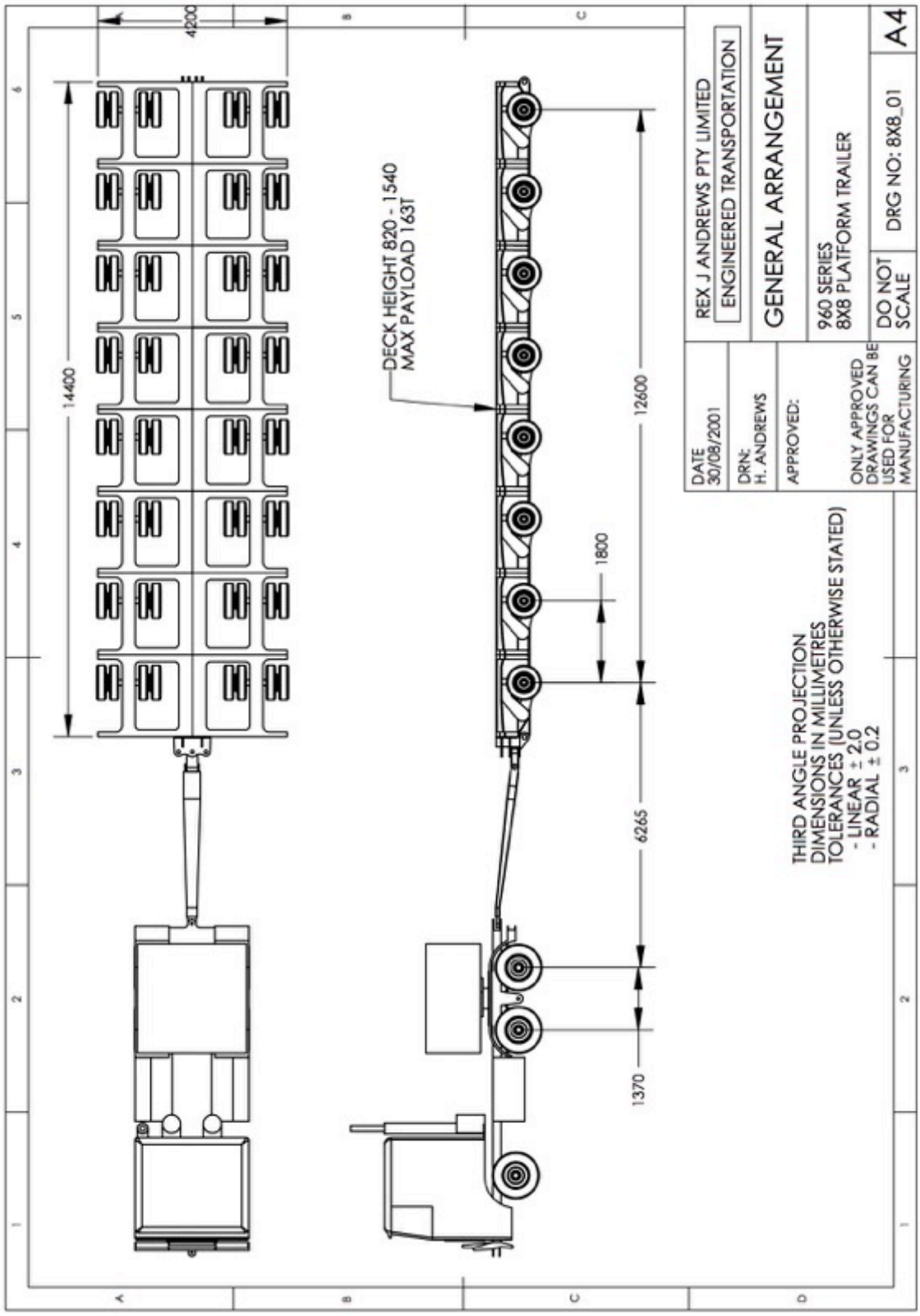
Blade diagram: (Option 1, 76 metre)



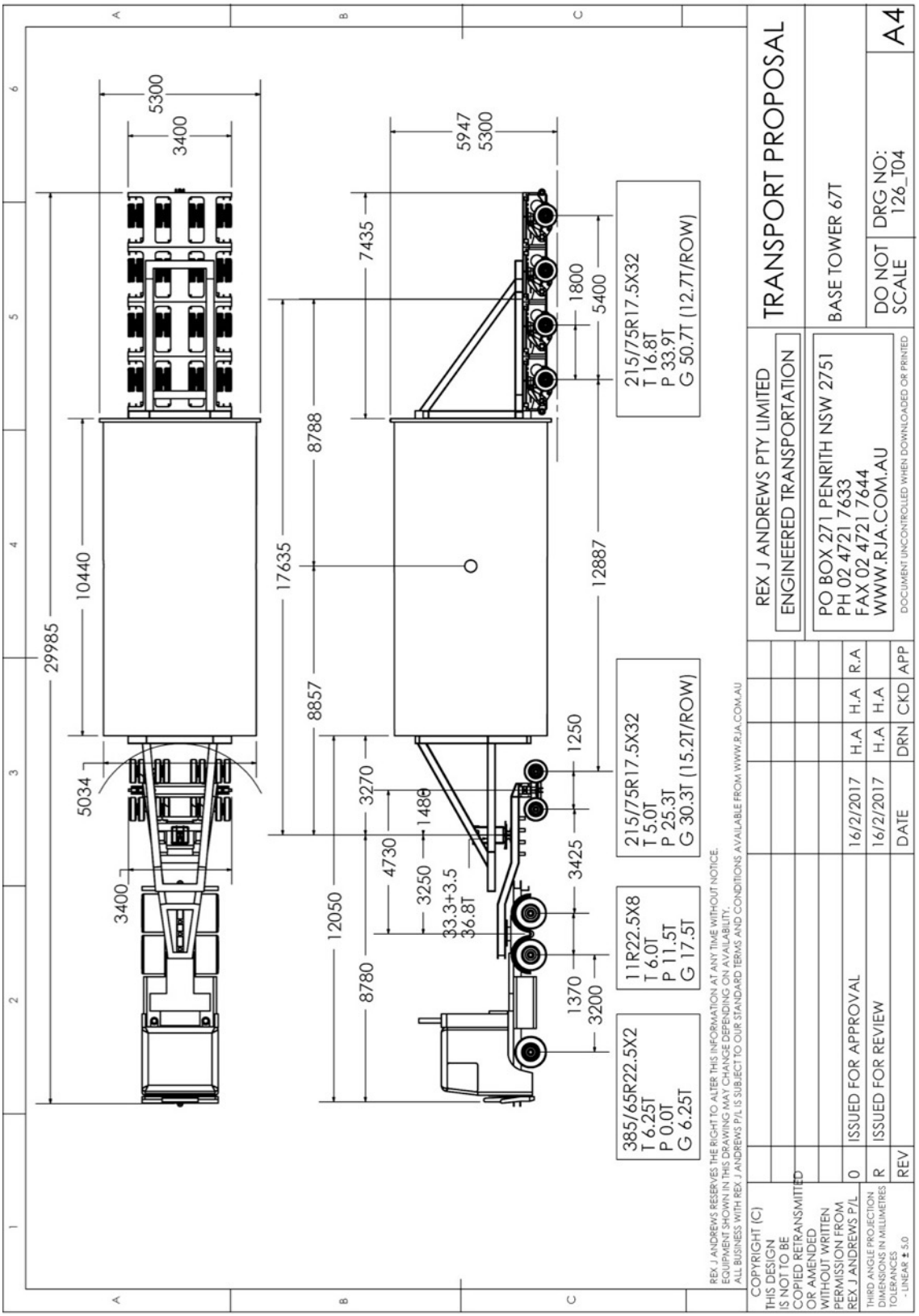
Blade diagram: (Option 2, 82 metre)



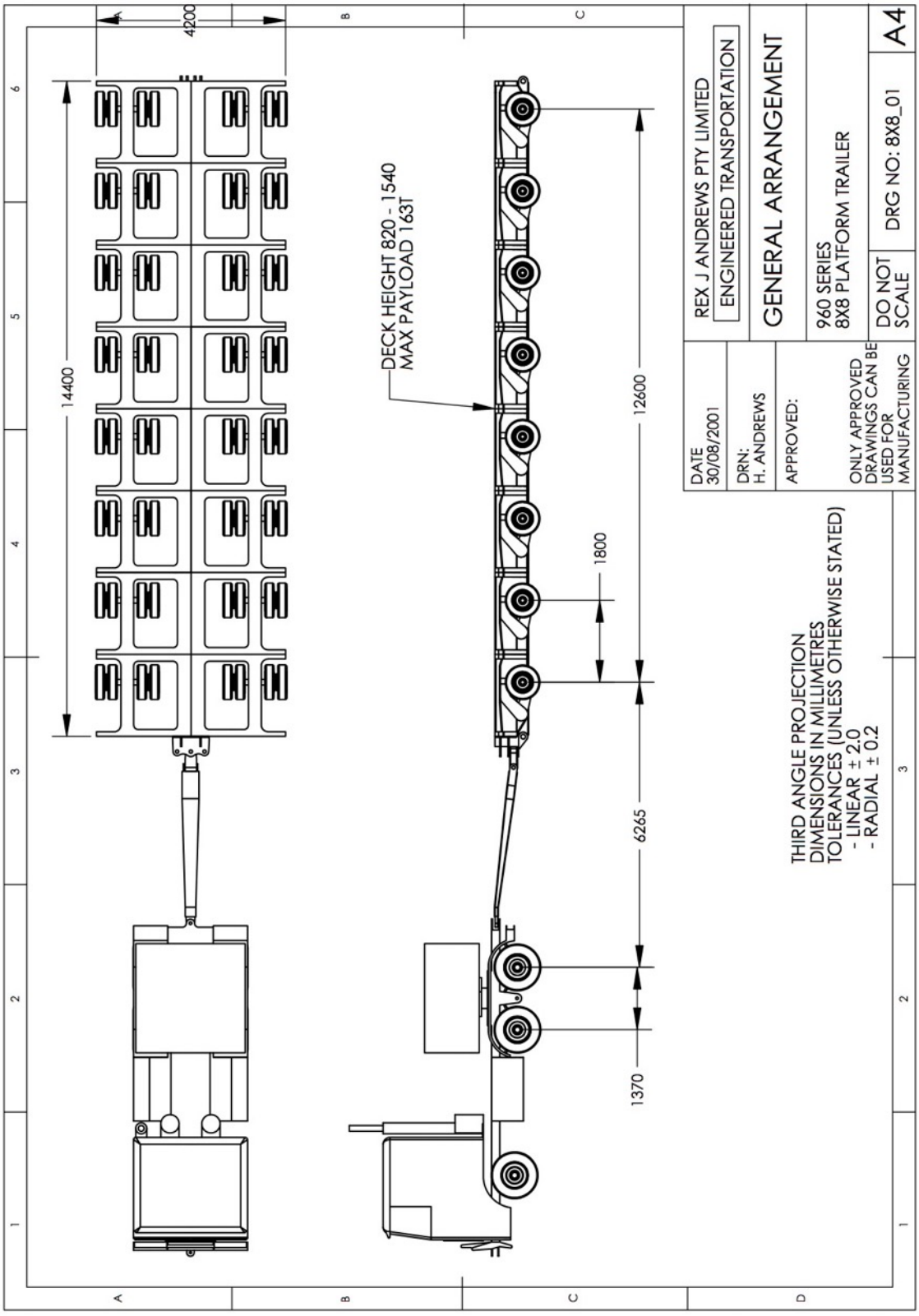
Nacelle/Drive Train trailer:



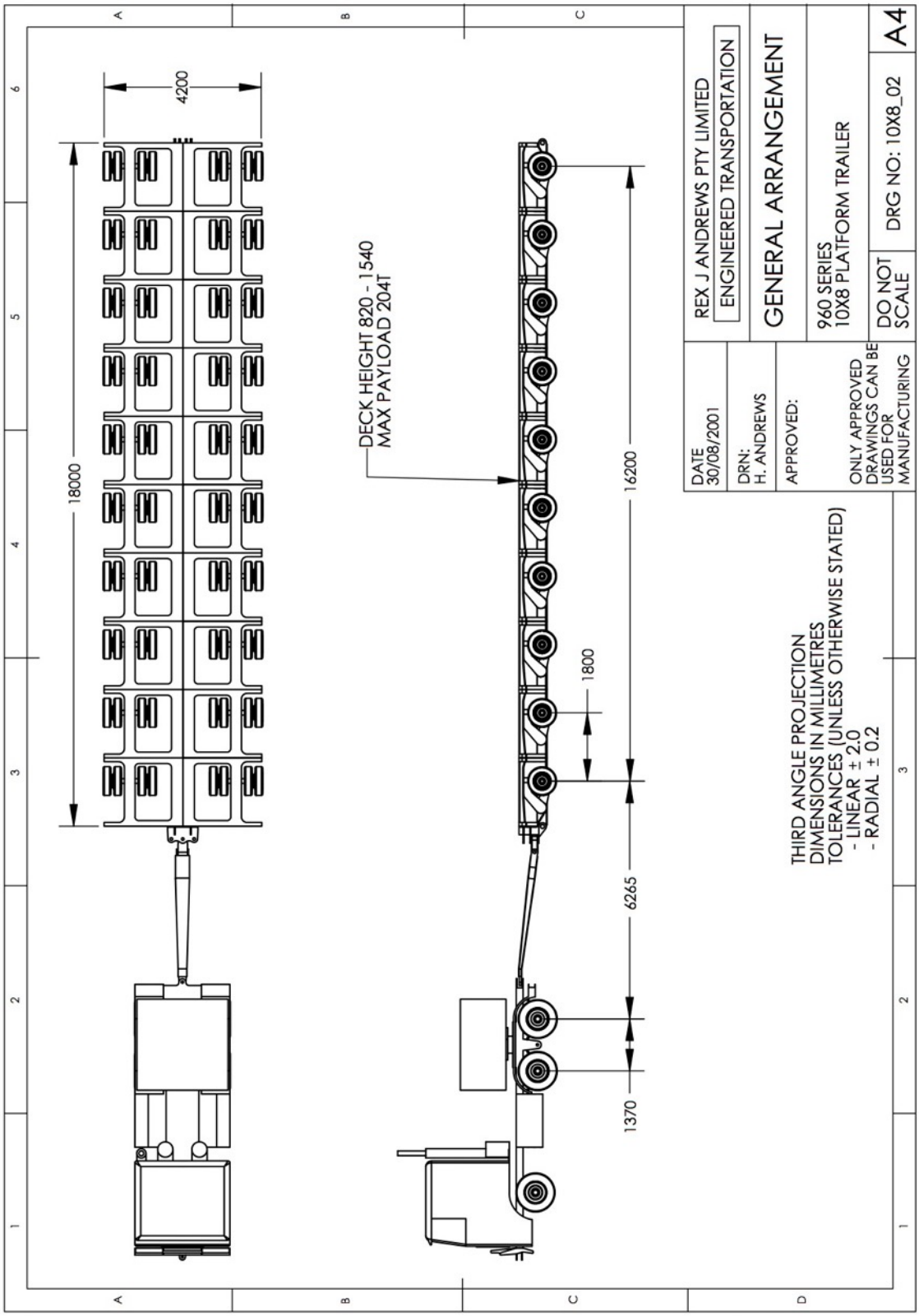
Door section:



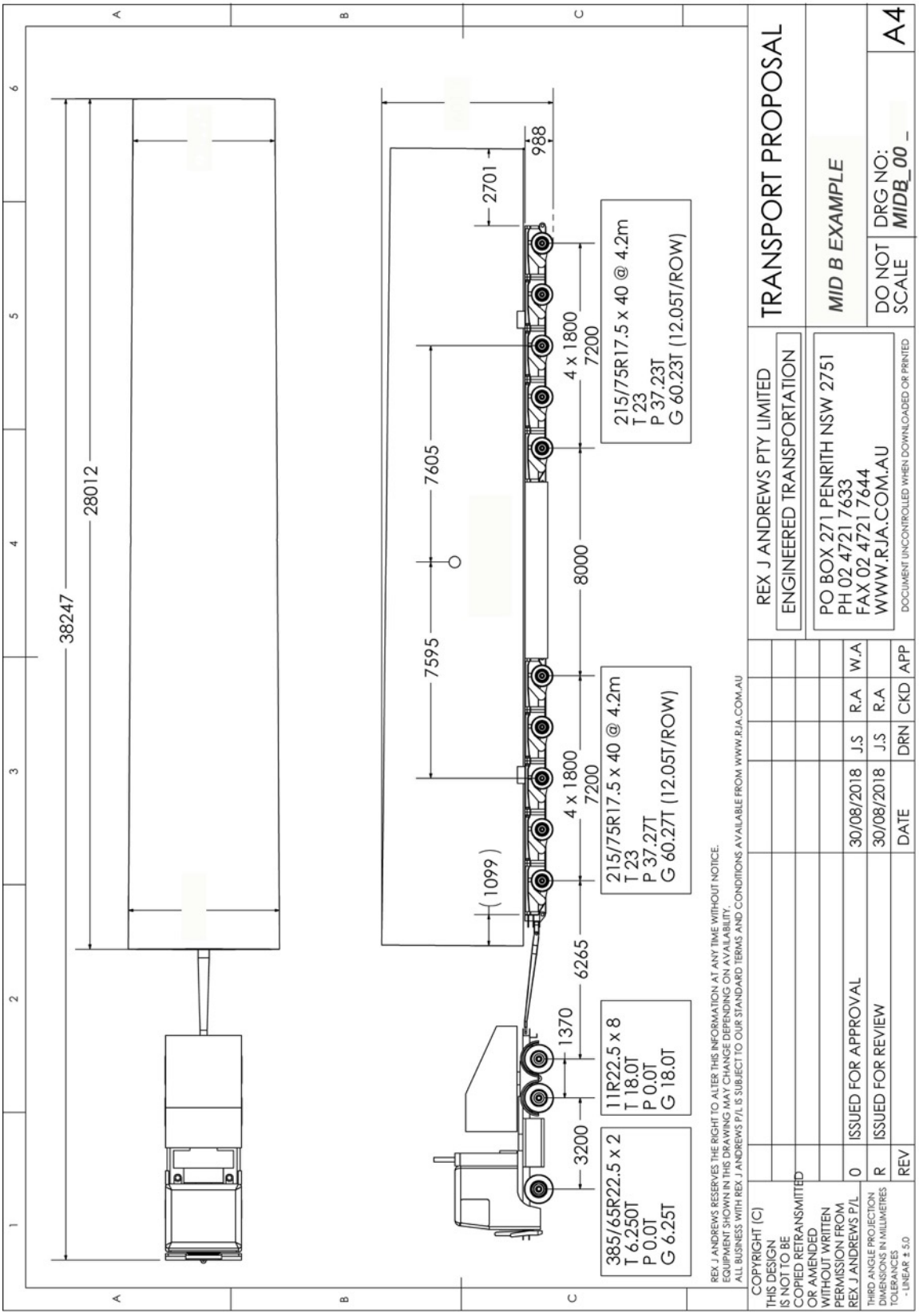
Mid D example:



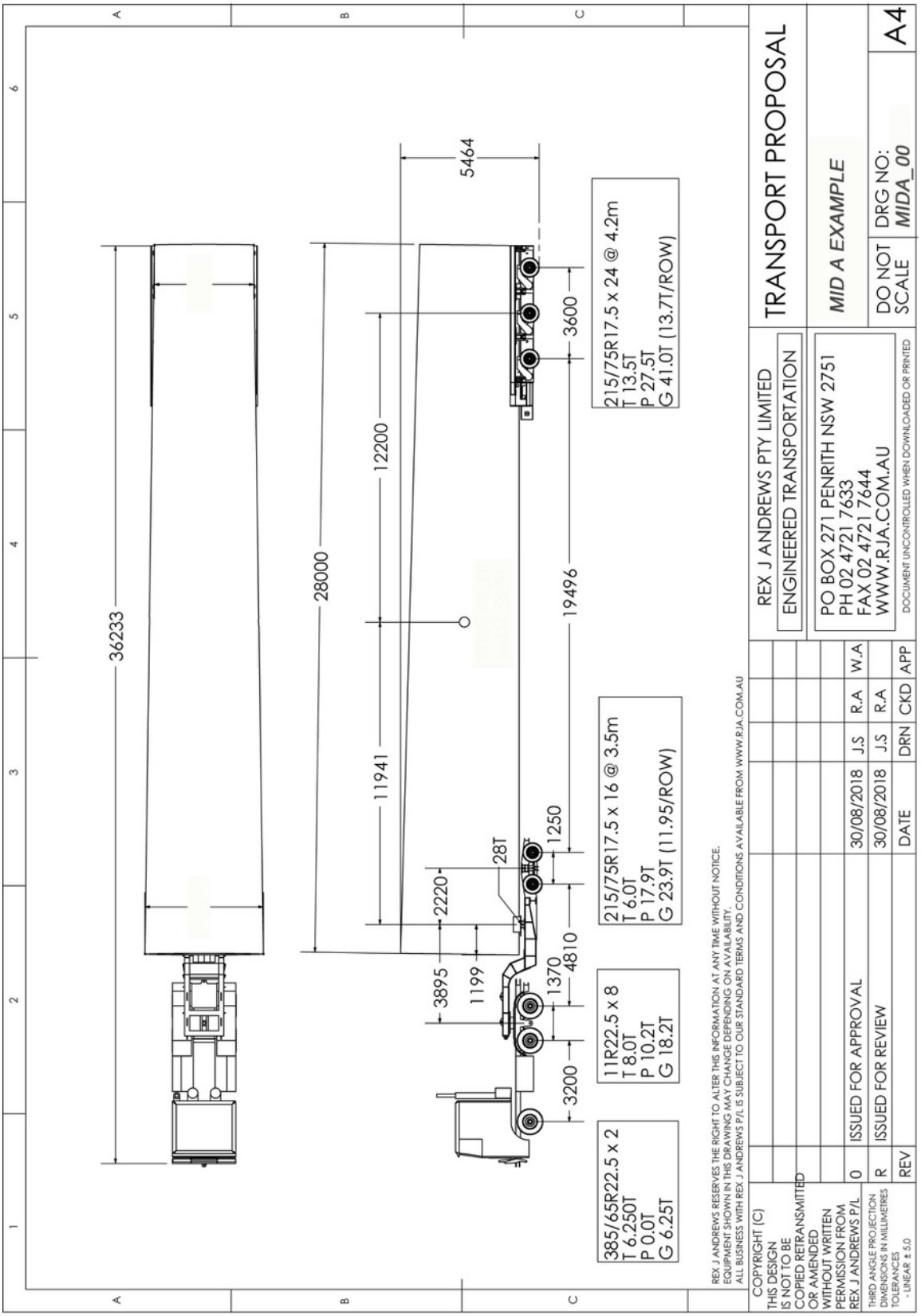
Mid C example:



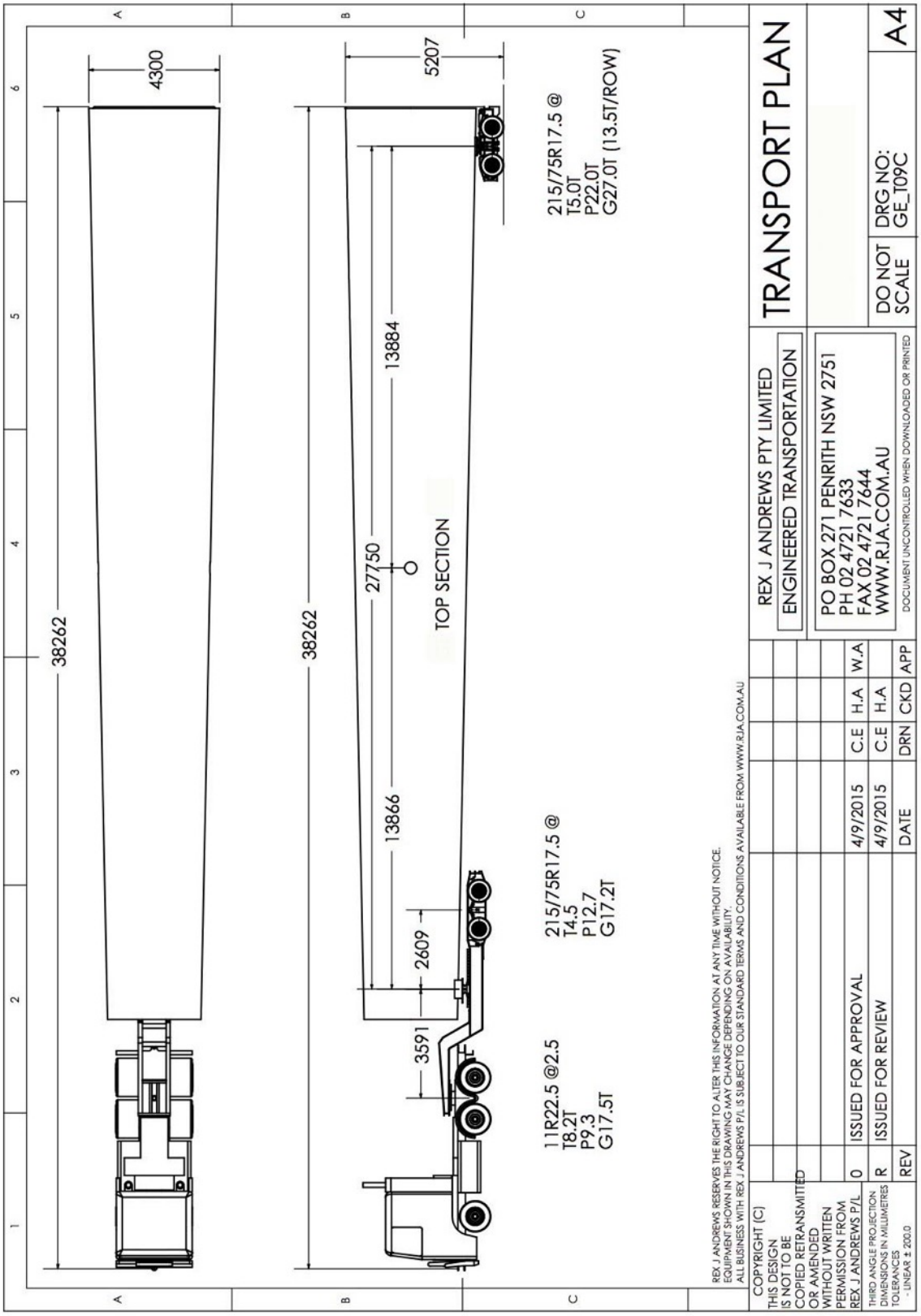
Mid B example:



Mid A example:



Top example:


4300
38262
5207
13884
27750
TOP SECTION
38262
13866
2609
3591
11R22.5 @2.5
T8.2T
P9.3
G17.5T
215/75R17.5 @
T4.5
P12.7
G17.2T
215/75R17.5 @
T5.0T
P22.0T
G27.0T (13.5T/ROW)
TRANSPORT PLAN
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THIRD ANGLE PROJECTION
DIMENSIONS IN MILLIMETRES
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- LINEAR ± 200.0
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4/9/2015
C.E
H.A
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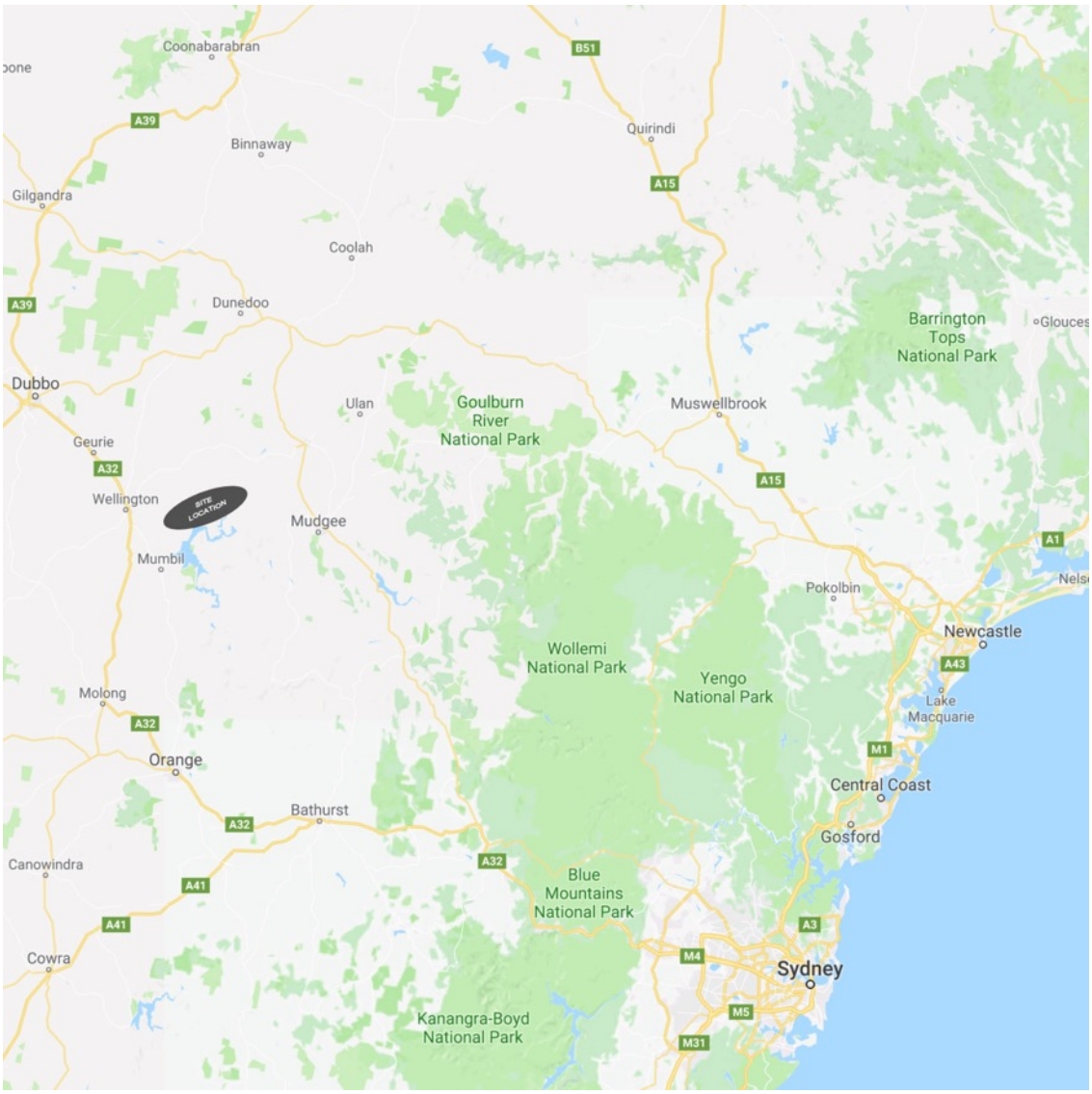
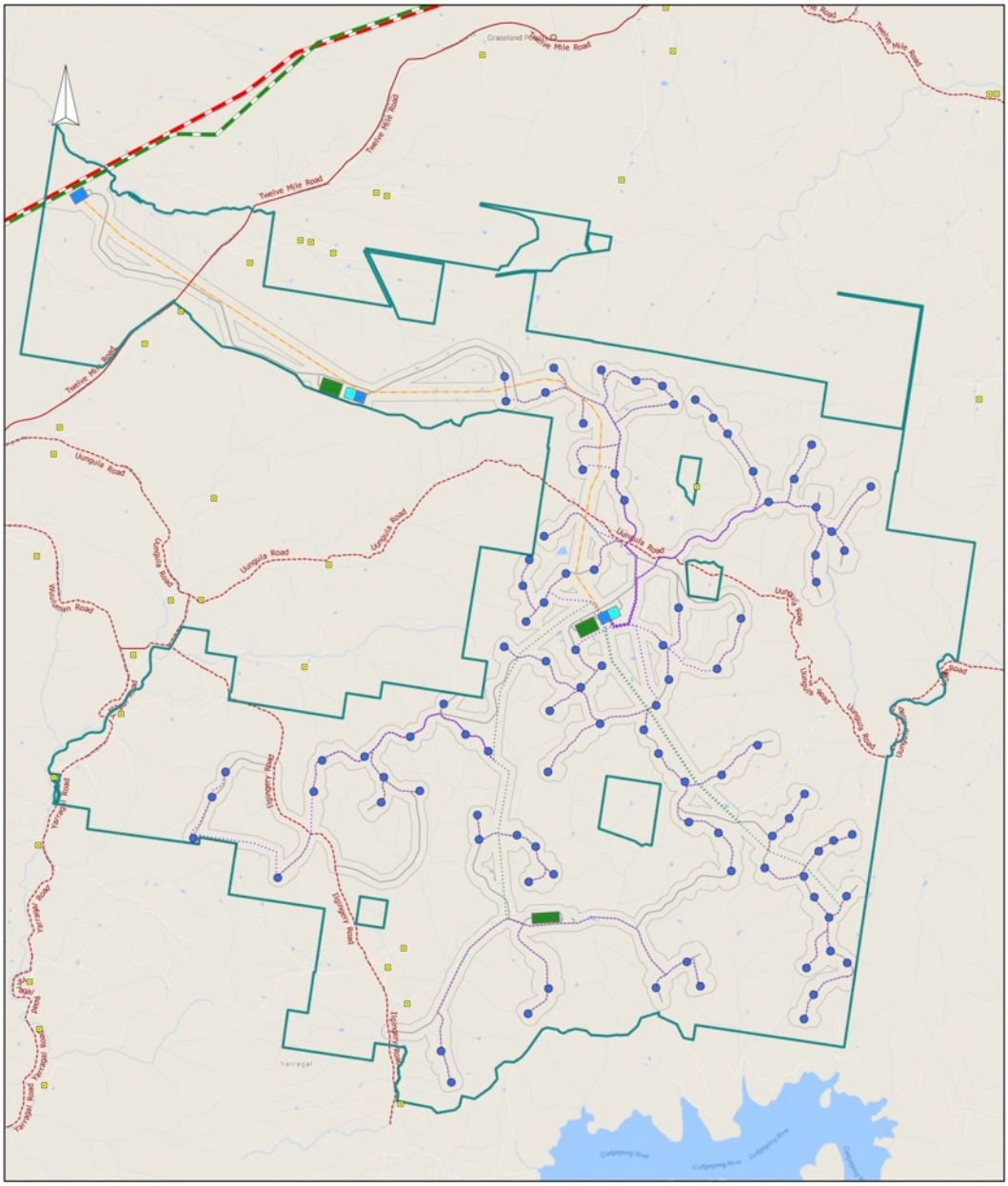
4/9/2015
C.E
H.A

6.0 Site Location.

The Uungula windfarm is located approx. 14 Kilometres East of Wellington in NSW and is 400 Kilometres by road from the Port of Newcastle NSW.



7.0 Site layout.



LEGEND

- Dwellings
- Existing Unsealed Road
- Existing Sealed Road
- Wind Turbine Generator (97)
- Project Site
- Development Corridor
- Wind farm access tracks
- Site Compound
- Substation
- Energy Storage Facility

Existing Powerlines:
- 132kV
- 330kV

Proposed Powerlines:
- Underground (medium to low voltage)
- Overhead (medium to low voltage)
- Overhead (high voltage)

SCALE BAR: 0 — 5 km

COMPANY				
UUNGULA WIND FARM PTY LTD				
TITLE				
Project Layout				
DATE	SCALE	DWG NO	REV	VER
18/02/20	1:64000	UWF-049	A	1
DRAWN BY	CHECKED BY	SHEET	JOB NO	SIZE
J PETERSEN	M FLOWER	1 OF 1	110247	A3

8.0 Port of Import.

The wind turbine equipment will be imported from various countries and will arrive on ships into the Port of Newcastle. The client may alternately source local towers. The ideal berth for these shipments is the Mayfield #4 Berth. This facility has a hardstand storage area of roughly 100,000 s/q meters, adjacent to the berth.

Access from the storage to the Public roads, is via a port operated road onto Selwyn Street. There will need to be a small amount of road modifications within the port.

Image 1: Port overview.

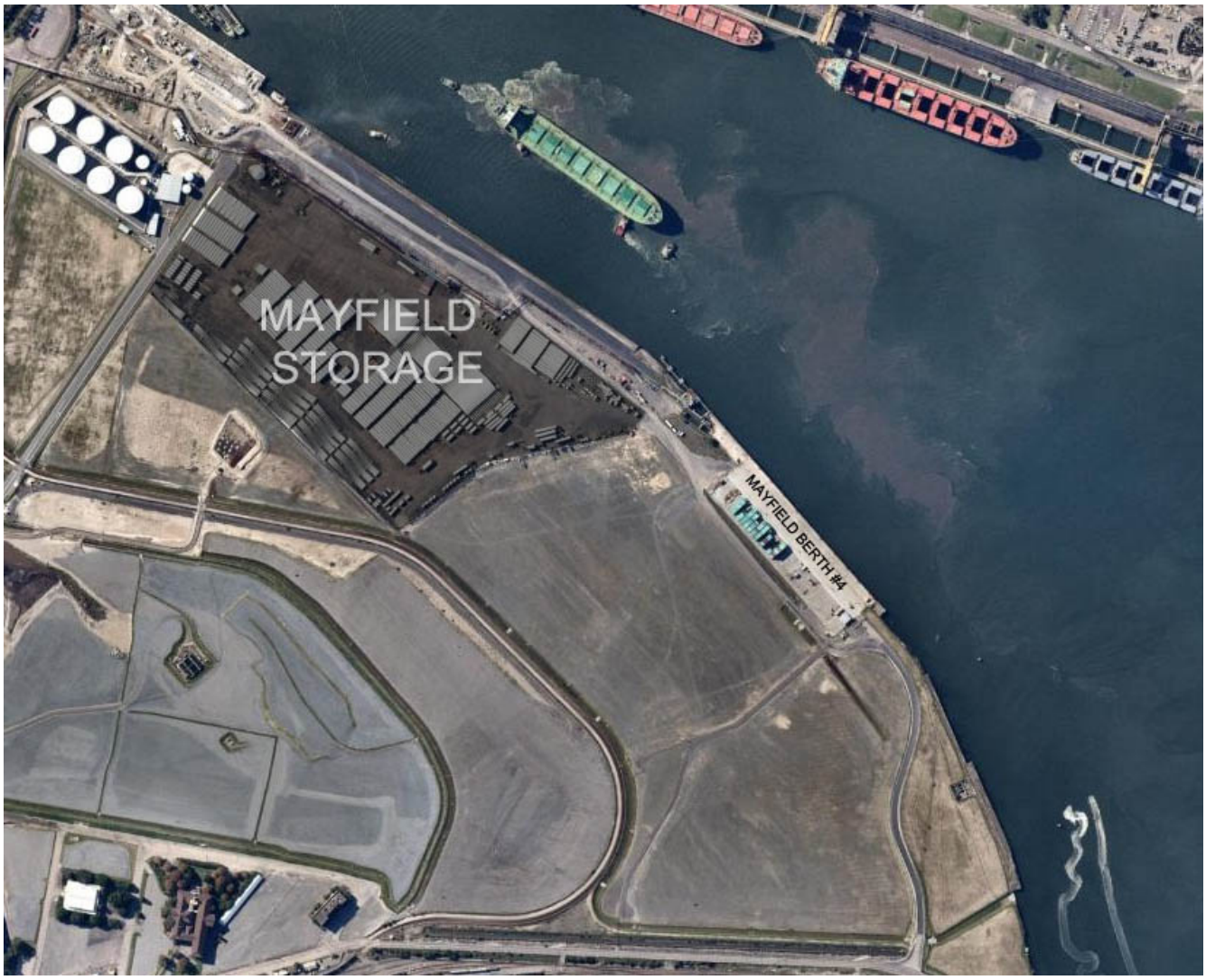


Image 2: Mayfield #4 Berth

Image 3: Mayfield #4 Port storage area.

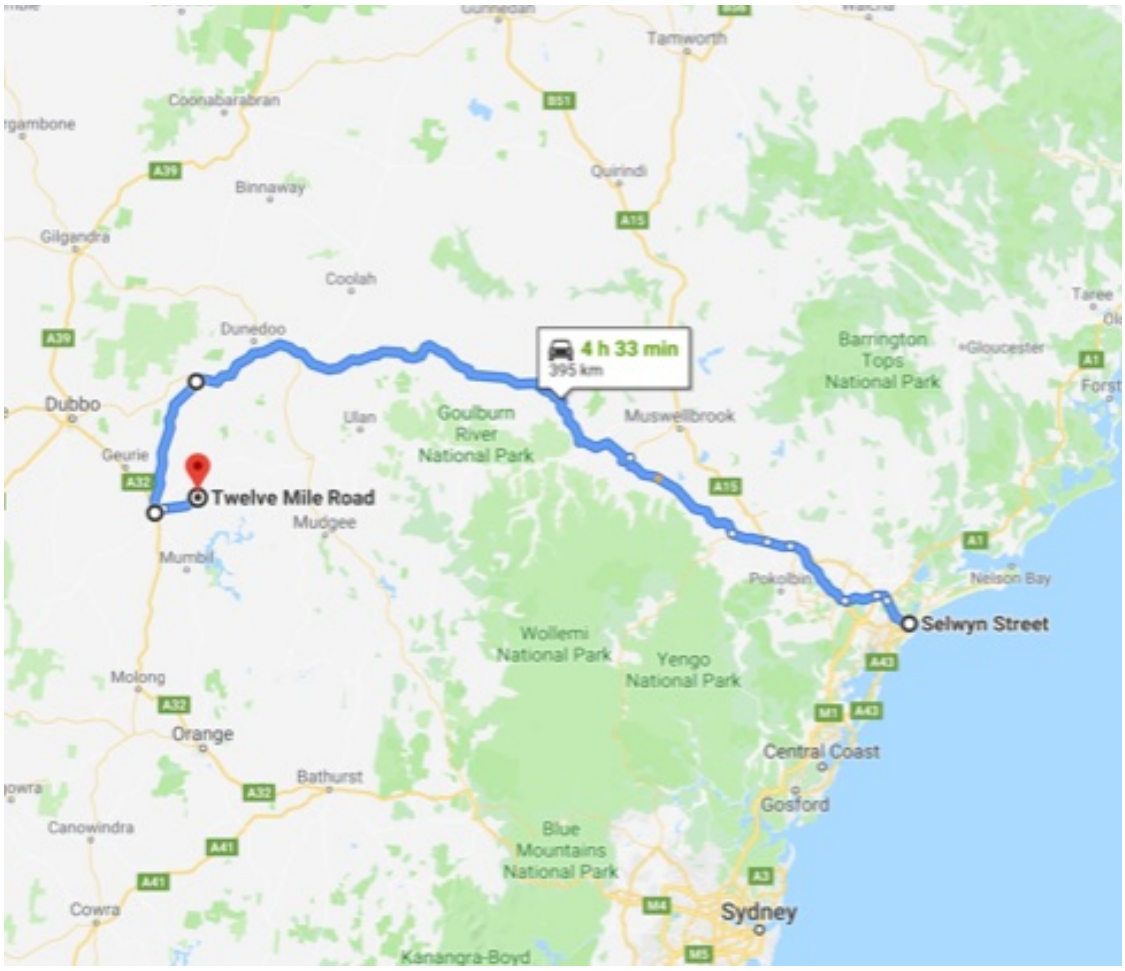
Image 4: Mayfield #4 Port storage area.

9.0 Transport routes: Newcastle Port to Uungula Windfarm

We have based this study on the turbine components, and towers entering Australia via the Port of Newcastle. This project will be accessed via 2 routes. The blade route and the remaining component route. The following surveys will show each route up to the turnoff from Twelve Mile Road into site. All turbines will be accessed from this entrance.

BLADE ROUTE FROM PORT OF NEWCASTLE TO TWELVE MILE ROAD UUNGULA: (395.0 kilometres): After completing this route survey, we believe the following is the most suitable option.

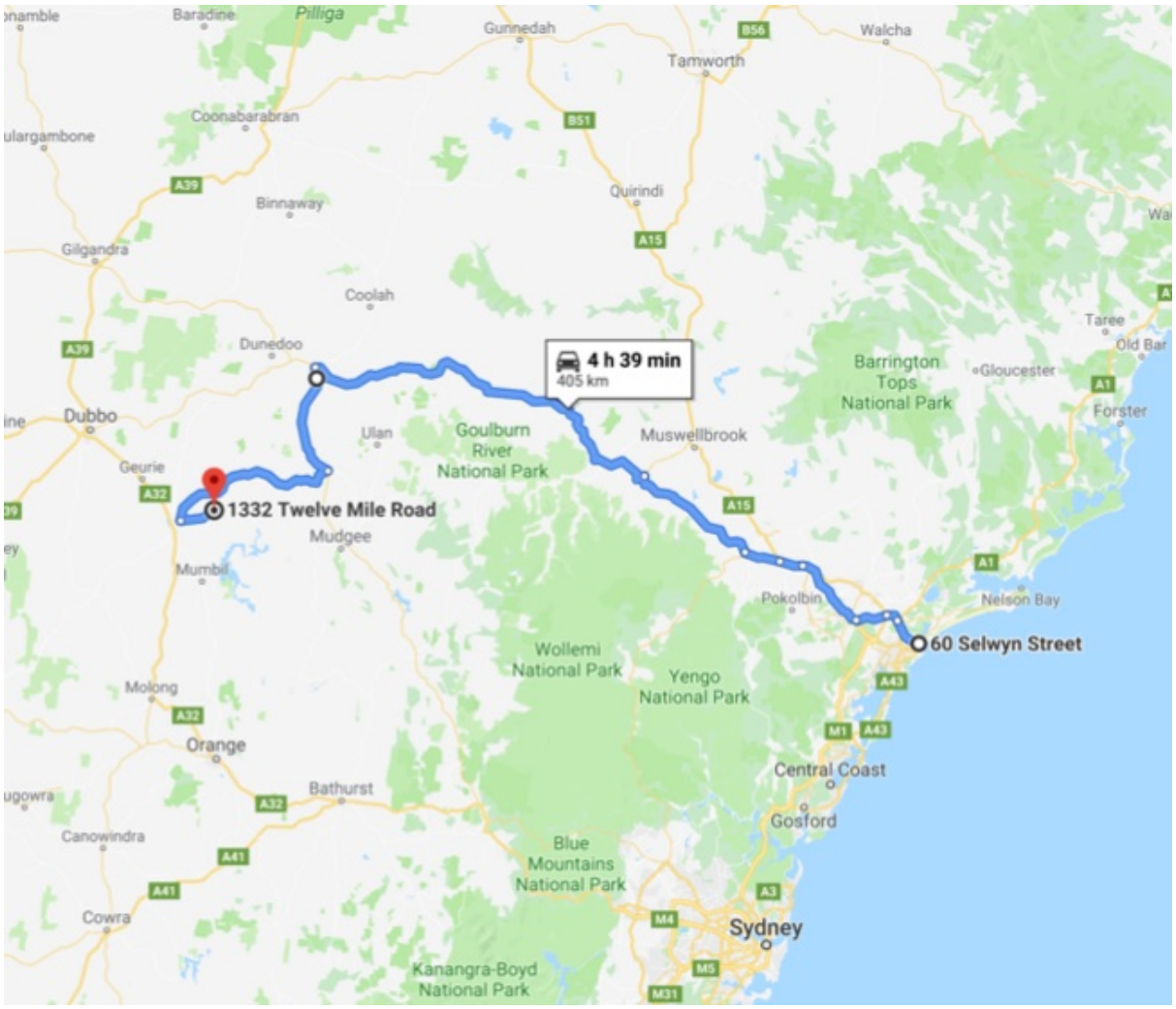
This route took us via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Cobbora Rd, Mitchell Highway, Goolma Road, Twelve Mile Road.



GPS link: https://goo.gl/maps/gwfURhh6hjxUo6Jm6

REMAINING COMPONENTS ROUTE FROM PORT OF NEWCASTLE TO TWELVE MILE ROAD UUNGULA: (405.0 kilometres): After completing this route survey, we believe the following is the most suitable option.

This route took us via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Castlereagh Highway, Goolma Road, Twelve Mile Road.



GPS link: https://goo.gl/maps/ihF6g8xn7coCAhzt8

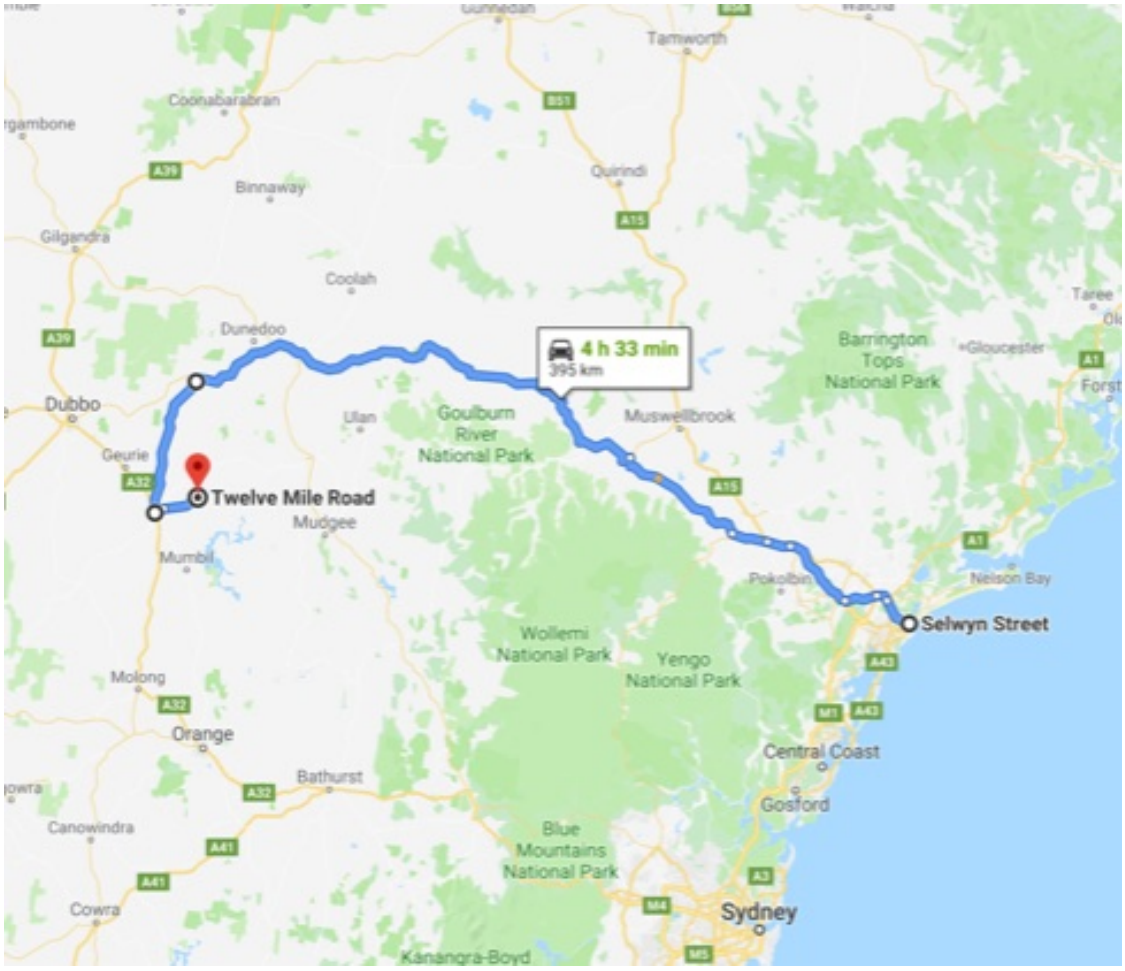
10.0 Route Survey (76 metre blades): Newcastle Port to Uungula

After completing this route survey, we believe the following is the most suitable option.

This route took us via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Cobbora Rd, Mitchell Highway, Goolma Road, Twelve Mile Road.

Distance: **395.0 kilometres**

GPS link: https://goo.gl/maps/gwfURhh6hjxUo6Jm6



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ROUTE STUDY
Newcastle to Uungula windfarm

KEY	
CRITICAL	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
Route index					
0.0	Mayfield	Mayfield #4 berth onto Selwyn Street GPS link: https://goo.gl/maps/afLwPYKuNdm	70.0 metres clearance	Moderate right hand turn	The fence will need to be relocated on the left hand side. Some hardstand will need to be added to the exit of the corner.
0.4	Mayfield	Selwyn Street rail crossing GPS link: https://goo.gl/maps/AmohE54hKSz	9.0 Metres wide	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
1.3	Mayfield	Selwyn Street onto George Street GPS link: https://goo.gl/maps/qXeHvBtCp4D2	70.0 metres clearance	Right hand turn	The sign on the inside of the corner will need to be made removable.
1.4	Mayfield	George Street onto Industrial Drive https://goo.gl/maps/s4ayrsuoAsD2	70.0 metres clearance	Right hand turn	Entering Industrial Drive the loads will cross from the correct side to the incorrect side before travelling over the centre median and returning to the correct side. Some hardstand will need to be placed on the south side of the intersection.
4.9	Mayfield	Industrial Drive under traffic signals GPS link: https://goo.gl/maps/YmqhiS2iR582	5.4 Metres clearance	Travel directly ahead	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right hand lane.
5.5	Mayfield West	Industrial Drive onto Maitland Road GPS link: https://goo.gl/maps/Kn49dhWG2qG2	70.0 metres clearance	Right hand turn	The blades will need to cross to the incorrect side 150 metres prior to the intersection, than return to the correct side 120 metres past the intersection. The concrete median strip will need to be reduced in height, and have a gentle slope. Police and escorts to control traffic flow.
6.4	Sandgate	Maitland Road over rail bridge GPS link: https://goo.gl/maps/W2JWWjhfqv5UMviB7	9.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
13.9	Hexham	New England Highway under gantry GPS link: https://goo.gl/maps/YTMoFe7Aick	5.95 metres high	Travel directly ahead	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
15.1	Tarro	New England Highway over rail bridge GPS link: https://goo.gl/maps/tTnWLwQC2hzSPhAp6	7.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
17.4	Tarro	New England Highway onto John Renshaw Drive GPS link: https://goo.gl/maps/SRDr5JigkBp	100.0 metres clearance	Left hand merge	No problems with this section of road.
18.4	Beresfield	John Renshaw Drive GPS link: https://goo.gl/maps/N19vJih1Fgr	Overhead traffic signals: 5.9m high	Travel directly ahead	No problems with this section of road.
28.7	Buchanan	John Renshaw Drive onto the Hunter Expressway GPS link: https://goo.gl/maps/1STJ1PfQt9E2	65.0 metres clearance	Right hand turn	Cross to the incorrect side than down the off-ramp onto the incorrect side of the expressway. Approx 600 metres along the expressway there is a break in the road, which will allow the blades to cross back to the correct side of the expressway. Traffic control and or police will be required to perform this procedure.
58.9	Branxton	The Hunter Expressway onto The New England Highway GPS link: https://goo.gl/maps/7rauNuxzqjq	12.0 Metres wide	Travel directly ahead	No problems with this section of road.
67.3	Whittingham	The New England Highway onto the Golden Highway GPS link: https://goo.gl/maps/nAnfkYfeUn42	12.0 Metres wide	Left Hand turn	The NSW Government is currently upgrading this intersection. The intersection in its current form has a number of signs that would need to be made removable, but no modifications are required on the existing corner. At this stage the data that is available for the upgrades shows that the section of road that we would need to access does not change considerably. However it is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
67.4	Whittingham	Golden Highway GPS link: https://goo.gl/maps/R86RFuPnmFU2	115.0 x 9.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
68.0	Whittingham	Golden Highway over rail bridge GPS link: https://goo.gl/maps/5NwDQofandvvMKfY9	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.3	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/qTxSbkxPu87L5hx4A	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.

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ROUTE STUDY
Newcastle to Uungula windfarm

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
77.4	Mount Thorley	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/7hQdEmK1EgE2	85.0 metres clearance	Left hand turn	Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable.
77.5	Mount Thorley	Golden Highway GPS link: https://goo.gl/maps/zGvdupDuixx	100.0 x 10.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
80.6	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/ipGU4USXmWZ8GkJs6	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
80.8	Mount Thorley	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/VyA42n1CqZx	85.0 metres clearance	Right hand turn	Blades to cross from the incorrect side and cross back to the correct side approx. 500 metres west of the intersection.
98.0	Warkworth	Golden Highway GPS link: https://goo.gl/maps/Y6V6EXaCwxq	100.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
107.0	Jerrys Plains	Golden Highway through Jerrys Plains village GPS link: https://goo.gl/maps/WgSCRsJ9ZGt	75.0 metres clearance	Left hand than right hand turn	Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added.
126.0	Ogilvy	Golden Highway GPS link: https://goo.gl/maps/58Tj9ojs7CC2	6% gradient	Travel directly ahead	This section of road has a steep mountain range that will require additional pull trucks to assists loads that exceed 80T gross weight. Additionally the NSW Government is currently upgrading this section of road. It is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
131.9	Denman	Golden Highway onto Denman Road GPS link: https://goo.gl/maps/sf4PNnycxB32	65.0 metres clearance	Left hand turn	The blades will travel around the corner from incorrect side onto the incorrect side. The existing corner will require hardstand to be added and signs made removable.
132.8	Denman	Golden Highway over Denman Bridge GPS link: https://goo.gl/maps/UToXyFe3QKu	5.8 Metres height clearance 6.9 Metres width clearance	Travel directly ahead in the centre of the lane	A width of 6.5 metres and a height of 5.6 metres should not be exceeded of this structure. If loads are over these dimensions than they may detour the bridge via Bengalla and Wybong Roads.
137.9	Denman	Golden Highway rail crossing GPS link: https://goo.gl/maps/r7x7Qc685d82	8.0 metres in width	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
150.1	Sandy Hollow	Golden highway GPS link: https://goo.gl/maps/2THBuV165xx	50.0 x 4.0 metres	Parking Bay	Suitable parking for Fatigue breaks.

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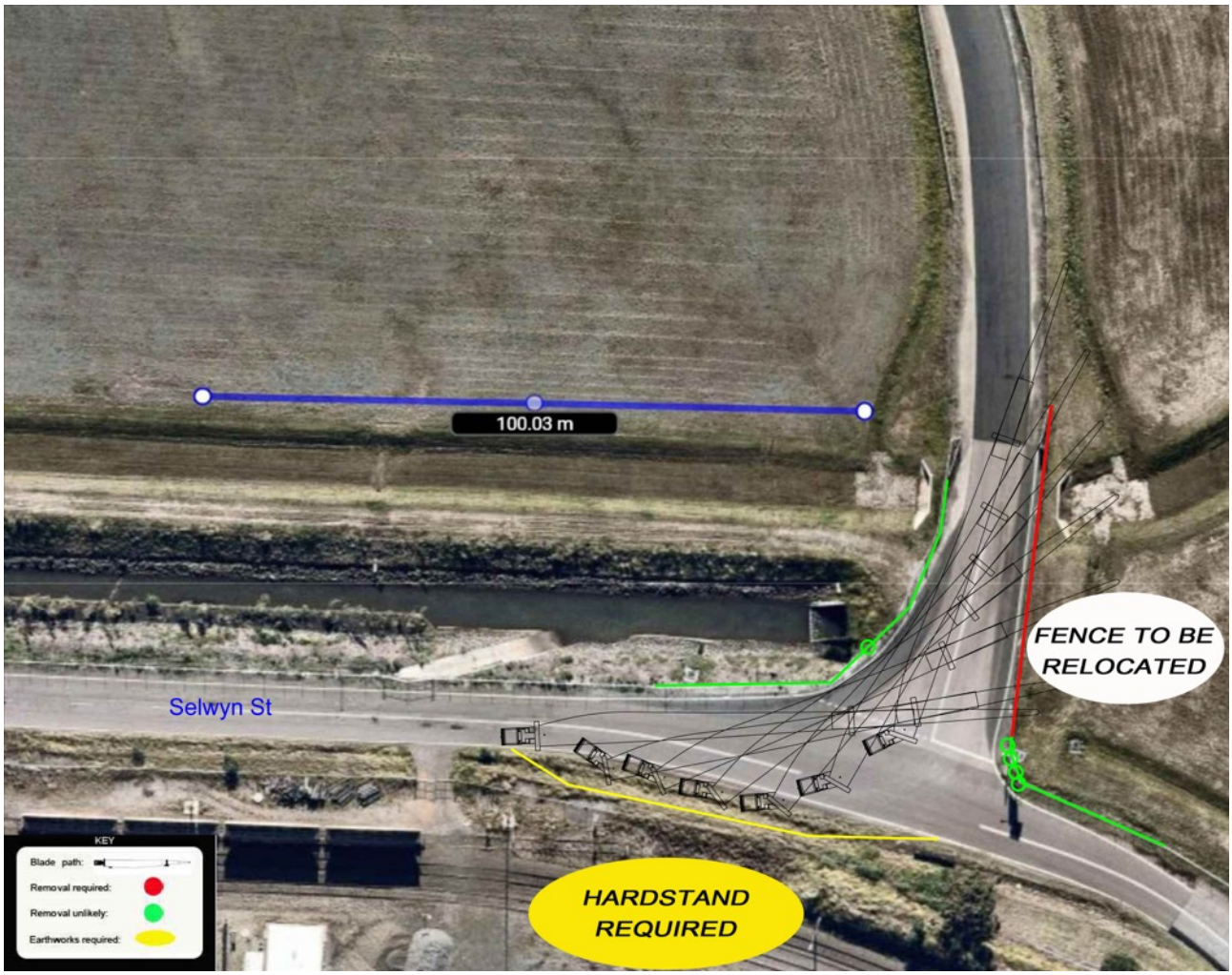
ROUTE STUDY
Newcastle to Uungula windfarm

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
161.2	Gungal	Golden highway GPS link: https://goo.gl/maps/WDoL2LfeCoP2	70.0 x 6.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
184.8	Merriwa	Golden highway GPS link: https://goo.gl/maps/NqrWzTsRmnt	100.0 x 5.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
234.0	Cassilis	Golden highway GPS link: https://goo.gl/maps/vs6YMT6TxCA2	200.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
282.0	Leadville	Golden highway onto the Castlereagh Highway GPS link: https://goo.gl/maps/aJMXknfMmuH2	65.0 metres clearance	Left hand turn	The blades will travel around the corner from incorrect side onto the incorrect side. Some fill is required on the inside and outside of the corner, and some signs made removable.
291.0	Dunedoo	Golden Highway rail crossing GPS link: https://goo.gl/maps/wsyNKfcoAij3SosY9	8.0 metres in width	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
291.1	Dunedoo	Golden Highway intersection with Wargundy Street GPS link: https://goo.gl/maps/WzACUHey3jYadj1K7	75.0 metre clearance	Right hand bend	A no parking area is required on the exit of the corner.
325.4	Elong Elong	Golden Highway onto Cobbora Road GPS link: https://goo.gl/maps/XSoTDVA8TZwNsGo47	60.0 metres clearance	Left hand turn	Hardstand is required on both sides of the road. No drainage works are required. Some side markers will need to be relocated, and 2 signs made removable.
375.7	Wellington	Cobbora Road rail crossing GPS link: https://goo.gl/maps/oPmj2bbBpPTHJYtF6	8.0 metres in width	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
375.8	Wellington	Cobbora Road onto Mitchell Highway GPS link: https://goo.gl/maps/Y9WRnEdpCEsfWPHBA	70.0 metres clearance	Left hand turn	2 Giveaway signs will need to be made removable.
378.3	Wellington	Mitchell Highway onto Goolma Road GPS link: https://goo.gl/maps/nWHNN3pzCvpzp7ag8	78.0 metres clearance	Left hand turn	No works required.
381.5	Wellington	Goolma Road onto Twelve Mile Road GPS link: https://goo.gl/maps/Ajjk5pVCQCn	100.0 metres clearance	Merge right onto incorrect side of the road	The blades will need to travel onto the incorrect side of Twelve Mile Road. Police and pilots to control traffic.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
381.5 to 395.0	Wellington to Uungula	Twelve Mile Road GPS link: https://goo.gl/maps/6cF9vF51JYvr6taA8	65.0 Length 5.0 Pavement width 5.5 Overall width 4.6 Height clearance	Travel directly ahead through winding sections of road with several moderate inclines and declines	Twelve Mile Road is asphalt pavement up until the proposed site entrance. The pavement is in fair condition with a surface width of generally 5.0 metres. Sections of this road will require tree trimming/removal for the swept path of the blade, and also the height of the towers. A survey is recommended on this section of road for vertical clearance and swept path.
395.0	Uungula	Twelve Mile Road into Primary site entrance GPS Location: https://goo.gl/maps/VW6Np4Vhtwo		Right hand turn	Site entrance to be made suitable for the swept path of the largest loads.

0.0 Km's: Mayfield #4 onto Selwyn Street at Mayfield.

Image 1:



PROCEDURE: Right hand turn.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/afLwPYKuNdm

COMMENTS: Some fill will need to be added to the left exit of the corner. Some signs will need to be relocated and or made removable and some fence will need to be relocated.

A spotter will need to keep the driver informed throughout the procedure. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Yes moderate amounts of work are required.

0.4 Km's: Rail crossing over Selwyn Street at Mayfield.

PROCEDURE: Travel directly ahead over the crossing.

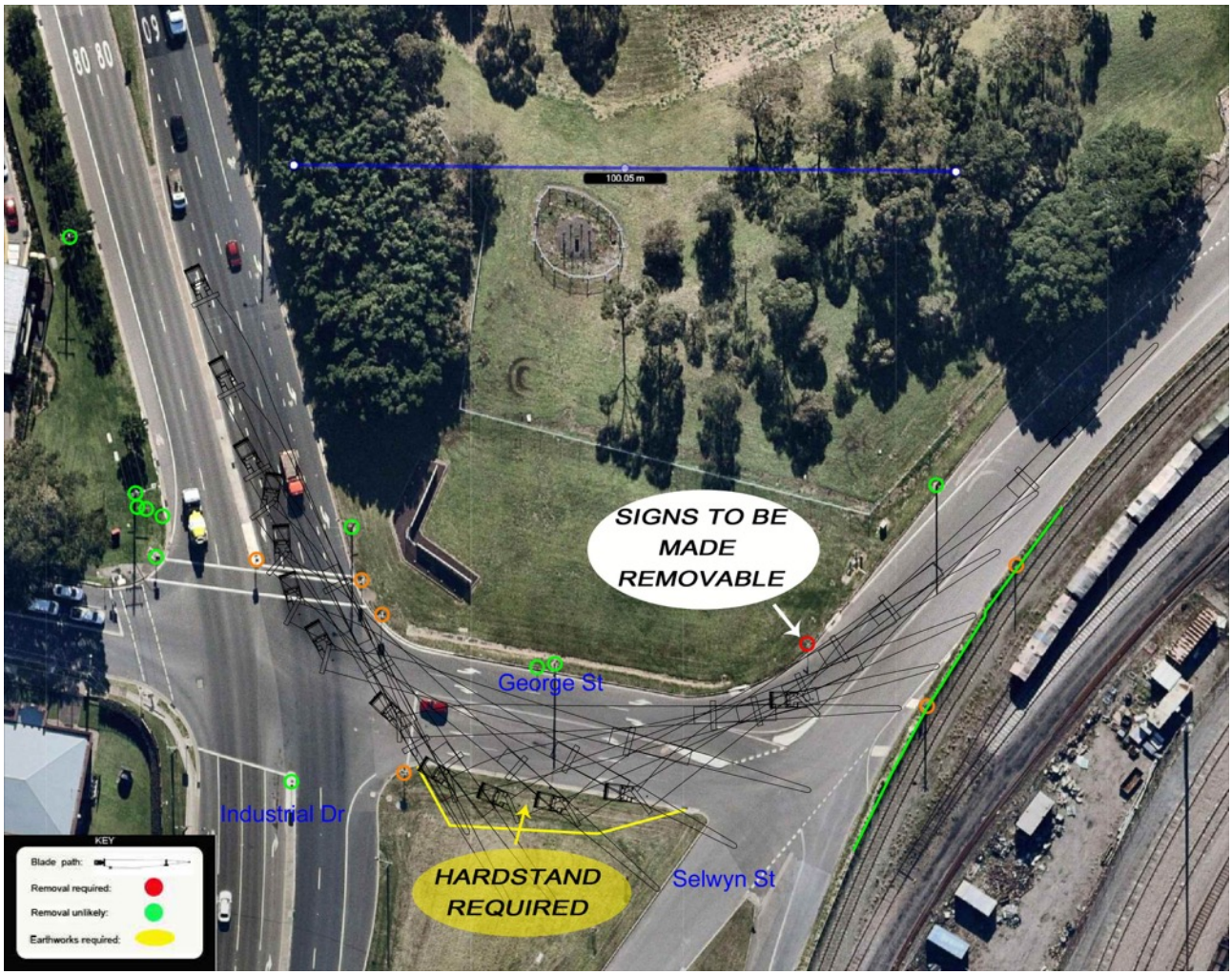
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/864FhMSaF9P2

COMMENTS: Large width clearance and good ground clearance over this crossing.
Police and escorts to control local traffic either side of the crossing. ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

ROAD MODIFICATIONS: No works required.

1.3 Km's: Selwyn Street onto Industrial Drive, via George Street at Mayfield.

Image 1:



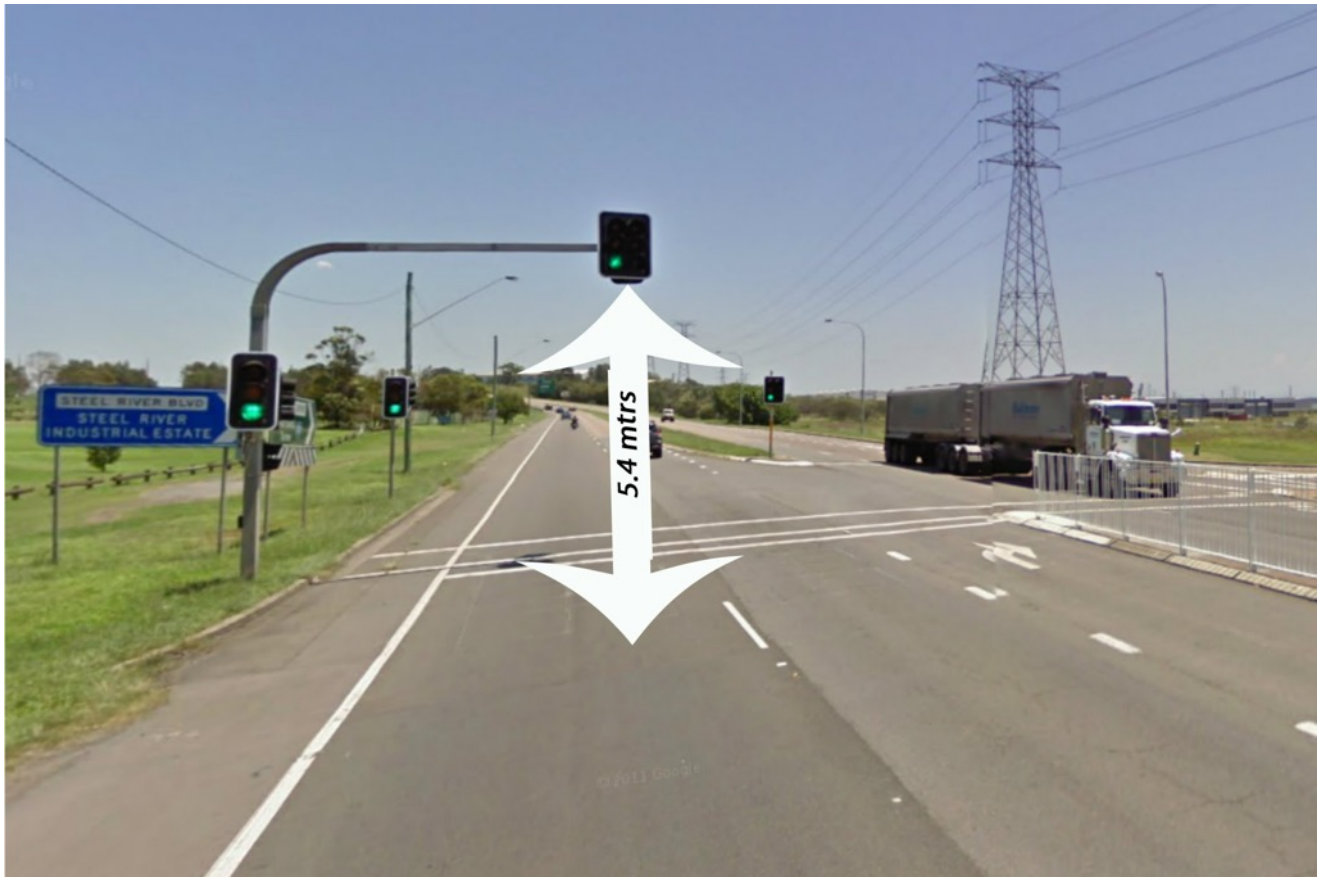
PROCEDURE: Right hand turn from Selwyn Street through George Street and onto Industrial Drive.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/brPRAckLr572

COMMENTS: The first right hand turn through George Street will need a sign made removable. Entering Industrial Drive the loads will cross from the correct side to the incorrect side before travelling over the centre median and returning to the correct side. Some hardstand will need to be placed on the south side of the intersection.

ROAD MODIFICATIONS: Yes, moderate amounts of works are required.

4.9 Km's: Standard overhanging Traffic signals Mayfield to Hunter Expressway.



PROCEDURE: Overhanging signals while travelling through the intersection.

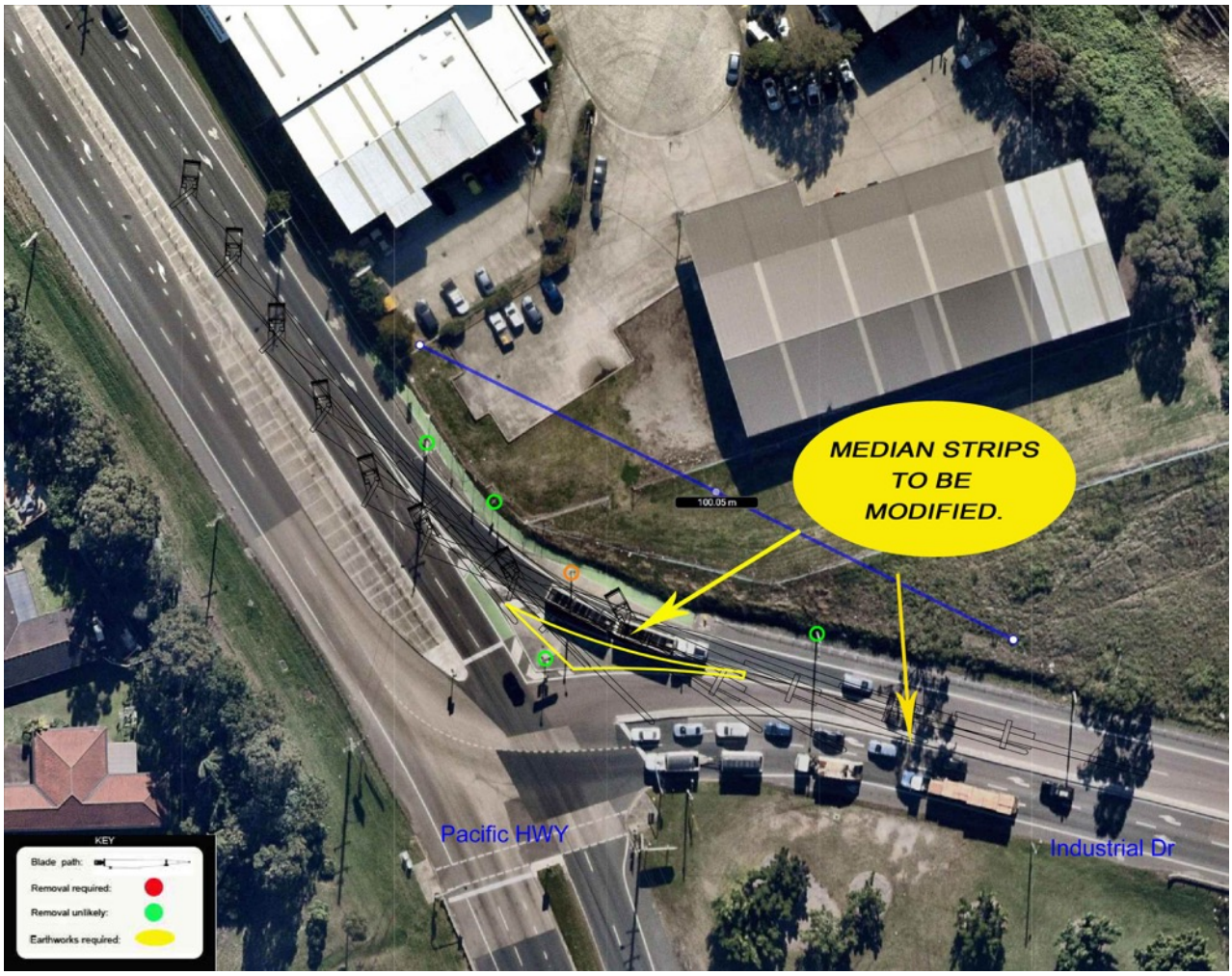
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/5DpD3b7KnT72

COMMENTS: The lowest traffic signal on route has 5.4 metres clearance. This signal is on the corner of Steel River Blvd at Mayfield West. Loads with an overall height of 5.3 or higher, can avoid this signal by travelling in the centre lane. Loads to slow down while doing this manoeuvre. All other signals exceed 5.6 metres high on this section of road.

ROAD MODIFICATIONS: No works are required.

5.5 Km's: Industrial Drive onto Maitland Road at Mayfield West.

Image 1:



PROCEDURE: Right hand turn from Industrial Drive onto Maitland Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Kn49dhWG2qG2

COMMENTS: The loads will need to cross to the incorrect side of the intersection, before crossing back over 200 metres to the north. The centre median strip will need to be modified so the trucks can cross over safely.

Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Yes moderate amounts of works are required.

13.9 Km's: Lowest structure (Bridge or Sign) between Mayfield and the Hunter Expressway.

Image 1:

PROCEDURE: Travel directly ahead in the centre lane.

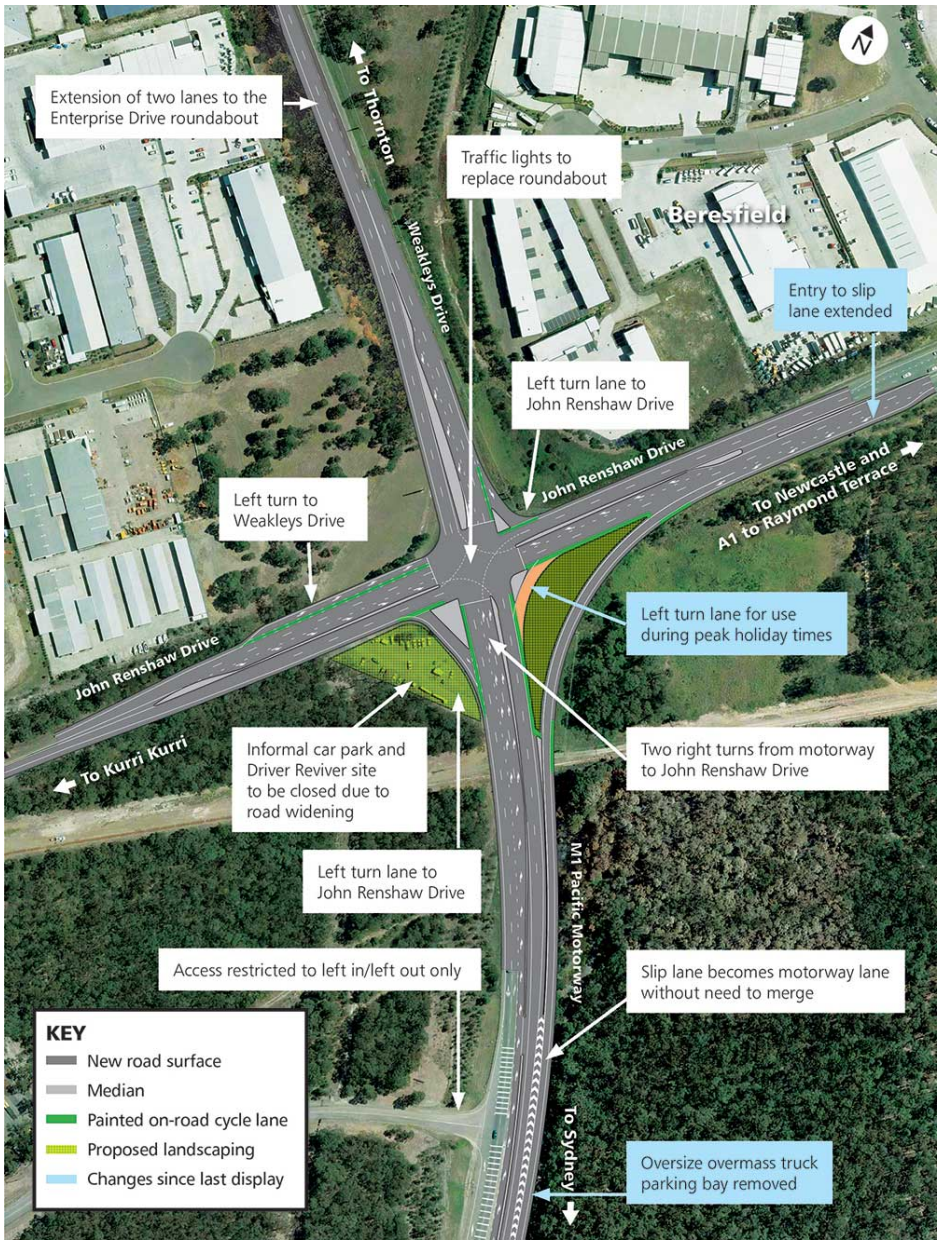
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/YTMoFe7Aick

COMMENTS: This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.8 metres should not be exceeded.

ROAD MODIFICATIONS: No works are required.

18.4 Km's: Intersection of John Renshaw Drive and M1 at Beresfield.

Image 1:



PROCEDURE: Travel directly ahead in the centre lane.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/MYSBciVvcwB2

COMMENTS: The roundabout has been demolished. The new intersection has 2 lanes directly ahead with a width clearance of 9.0 metres. The traffic signals have a clearance of 5.9 metres.

ROAD MODIFICATIONS: No problems with this section of road.

28.7 Km's: John Renshaw Drive onto the Hunter Expressway at Buchanan.

Image 1:

PROCEDURE: Right hand turn onto the incorrect side of the Motorway, before crossing back onto the correct side at the crossover bay.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/cEnuC5th1p52

COMMENTS: Cross to the incorrect side than down the off-ramp onto the incorrect side of the expressway. Approx 600 metres along the expressway there is a break in the road, which will allow the blades to cross back to the correct side of the expressway. Traffic control and or police will be required to perform this procedure.

ROAD MODIFICATIONS: No works required.

67.3 Km's: New England Highway onto Golden Highway at Whittingham.

Image 1:

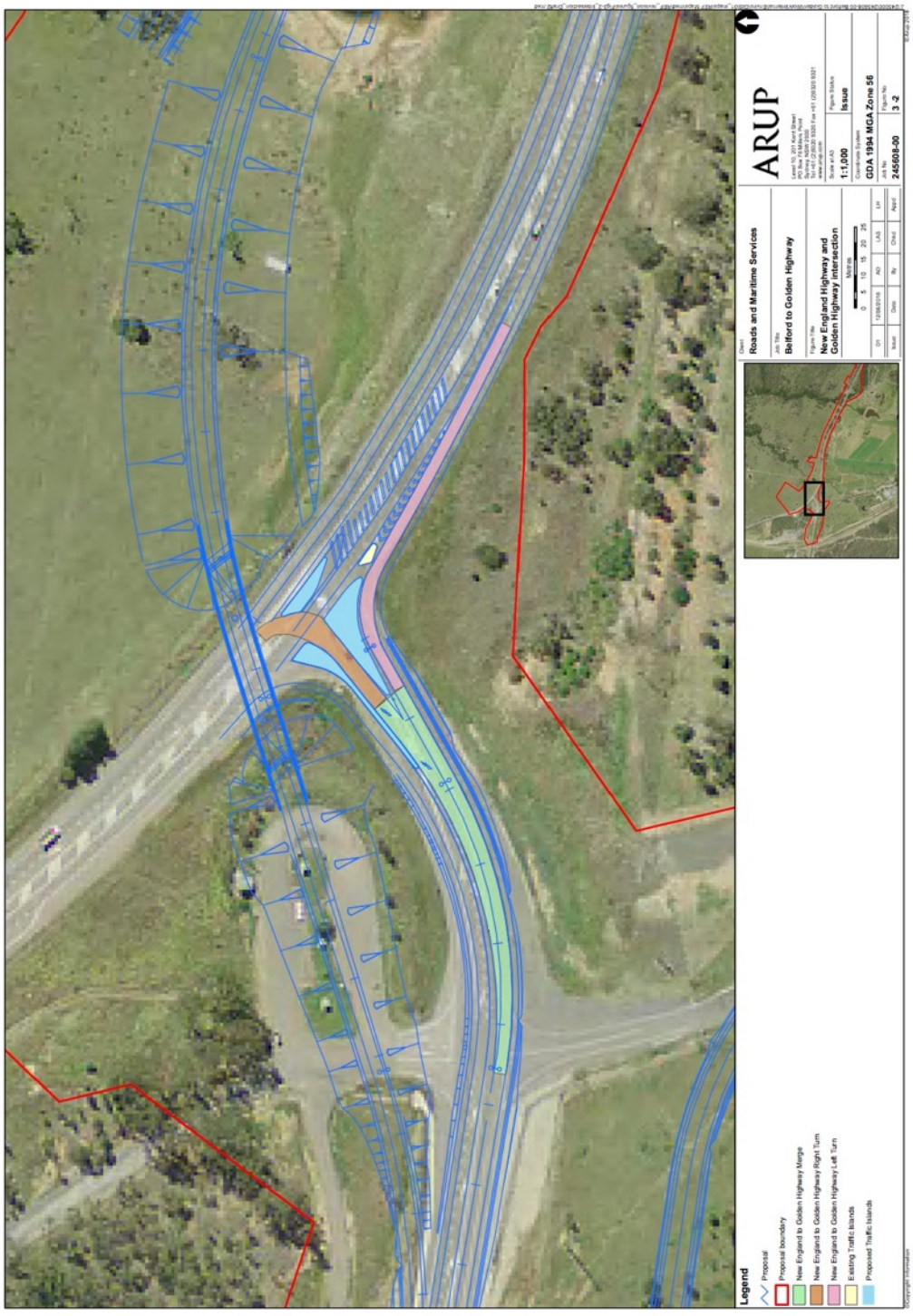


Image 2:

PROCEDURE: Left hand turn from the New England Highway onto the Golden Highway.

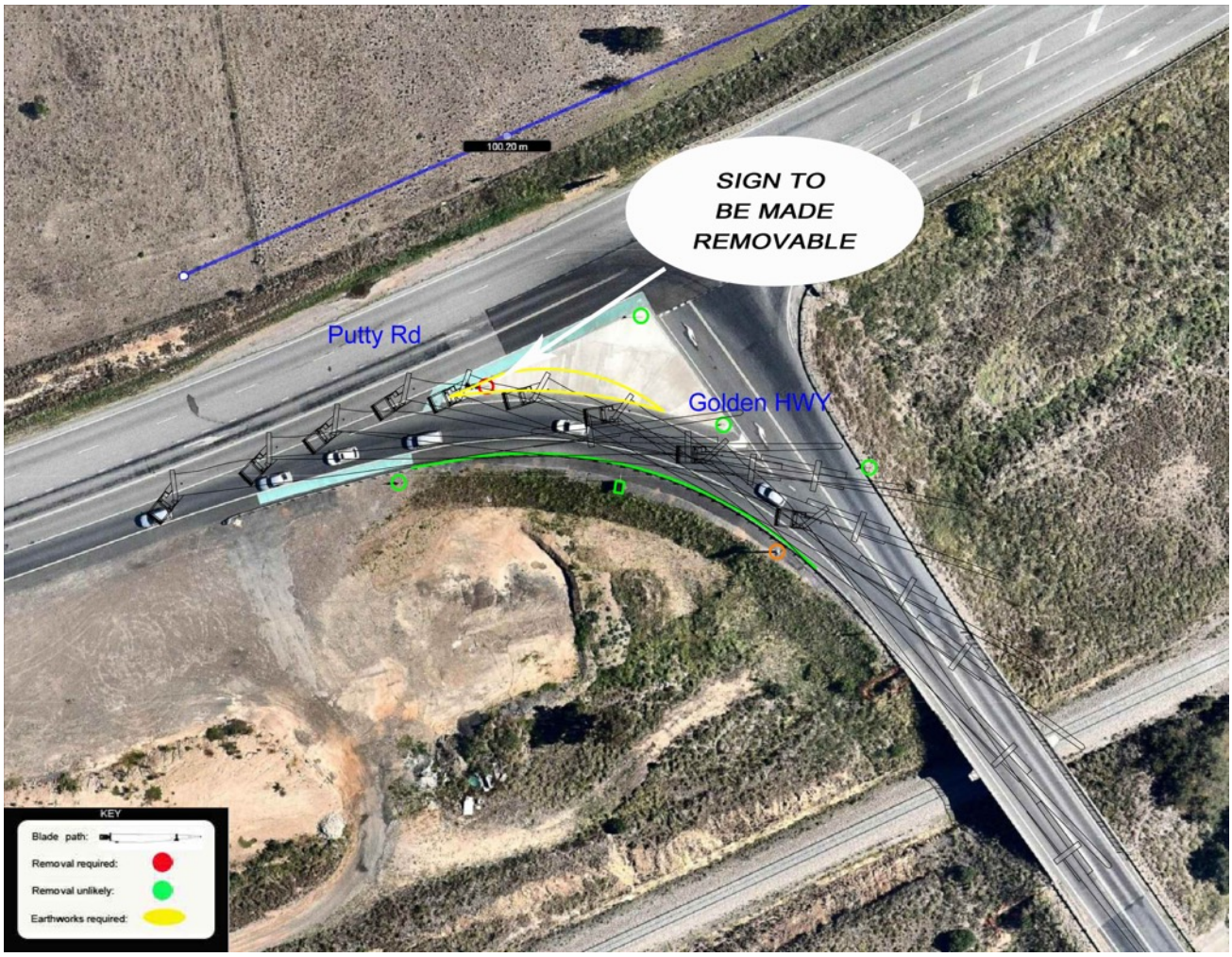
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/GZ3VbkLrKf42

COMMENTS: Loads to turn from the incorrect side to the incorrect side. The signs in the center median will need to be made removable.

ROAD MODIFICATIONS: NOTE: This intersection is currently in line to be upgraded. The details on image 1 shows that the changes should not affect the swept path, however it is recommended that this is monitored.

77.3 Km's: Golden Highway intersection with Putty Road at Whittingham.

Image 1:



PROCEDURE: Left hand turn from the Golden Highway at the intersection of the Putty Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/esuS6TUUwQ92

COMMENTS: Loads to turn from the incorrect side to the incorrect side. The signs in the center median will need to be made removable. Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Small amounts of work are required.

80.8 Km's: Golden Highway intersection with Putty Road at Mount Thorley.

Image 1:

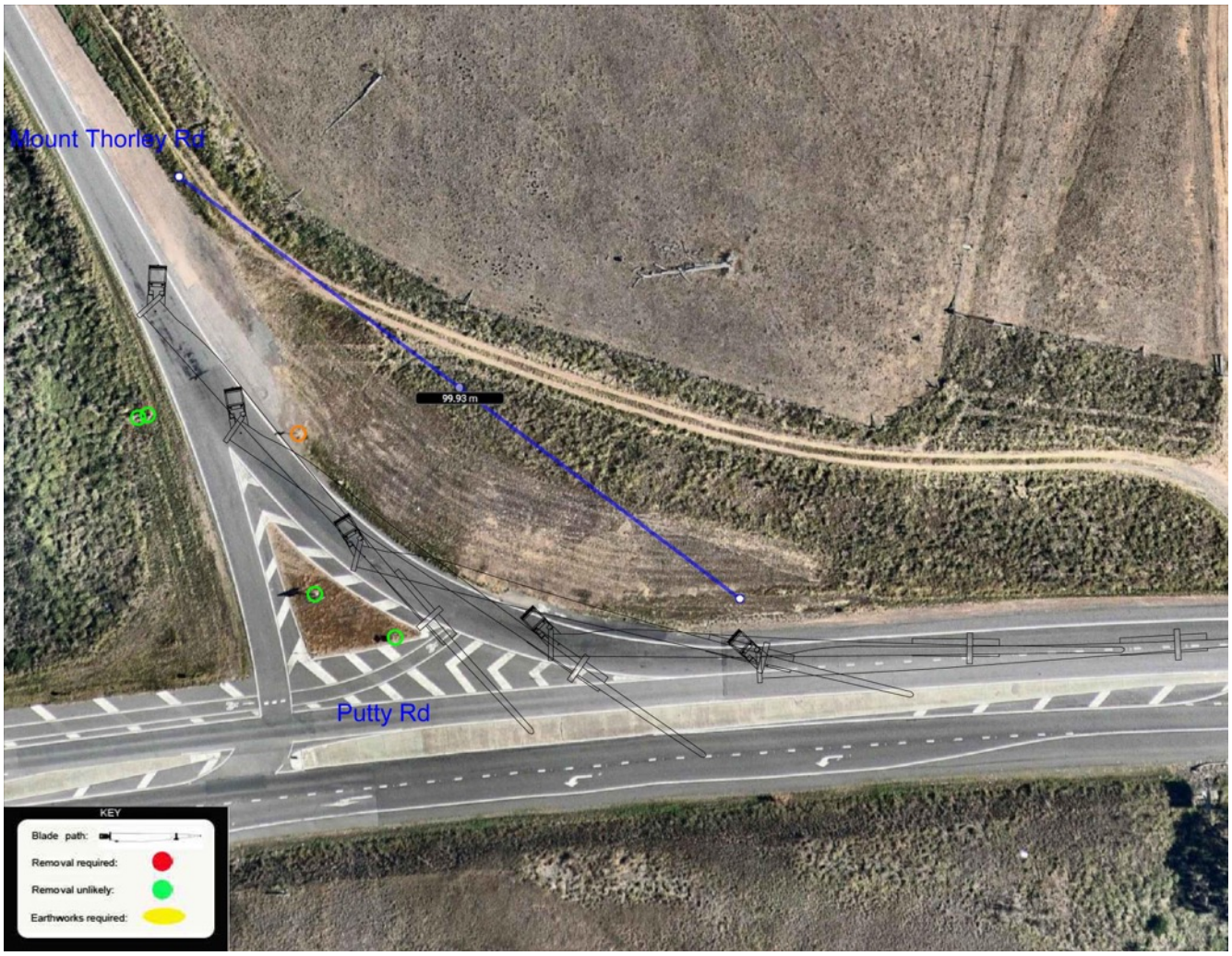
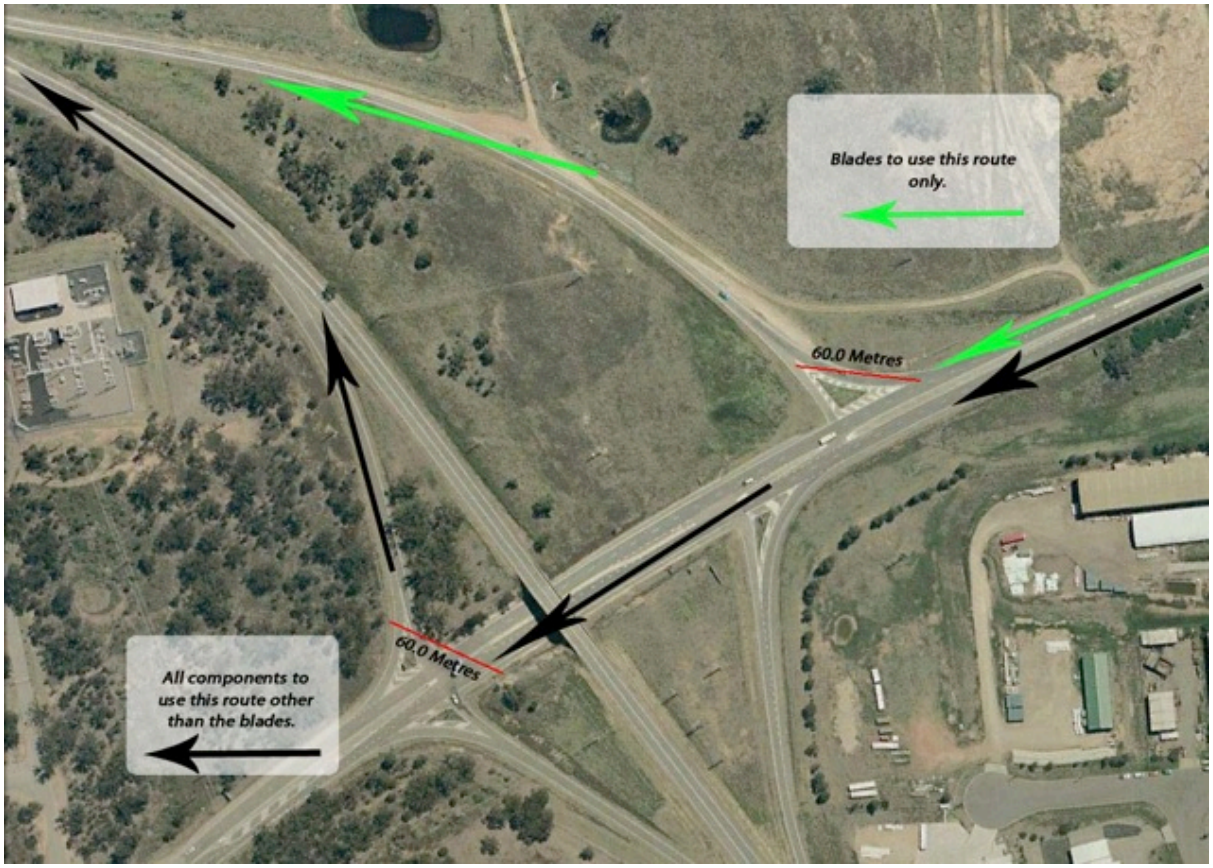


Image 2:



PROCEDURE: Right hand turn from the Putty Road onto the Golden Highway.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Qj4tjSSjN932

COMMENTS: Loads to turn from the incorrect side to the incorrect side. Blades to cross to the incorrect side prior to the intersection, and return to the correct side when the lanes remerge. Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

NOTE: Towers and general loads will travel under the overpass and stay on the correct side of the road. The overpass is 5.6 in the center of the road. Loads that exceed 5.6 high will need to take the blade detour.

ROAD MODIFICATIONS: No works required.

107.0 Km's: Golden Highway through Jerrys Plains.

Image 1:

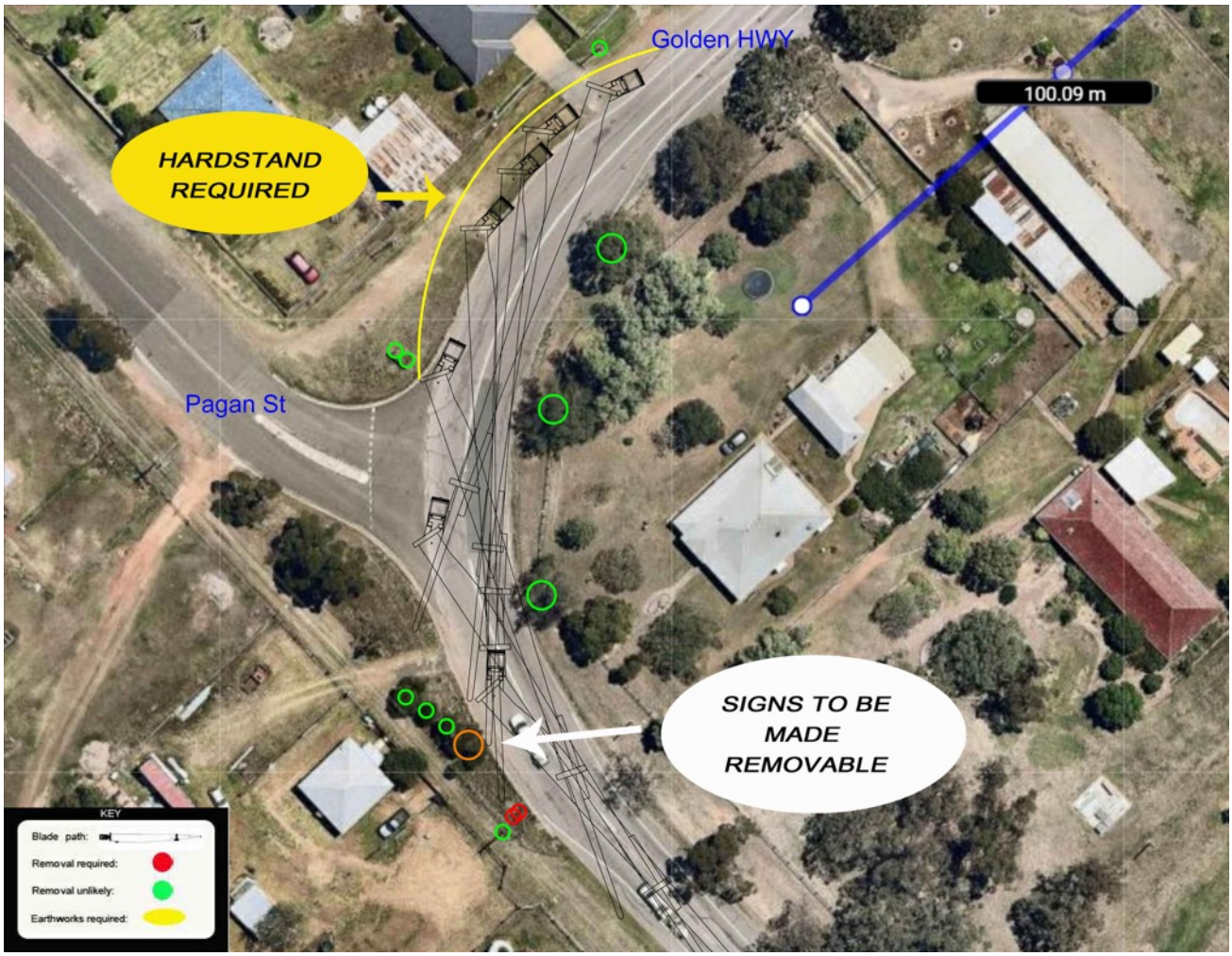


Image 2:

PROCEDURE: Left and right hand turn through the village.

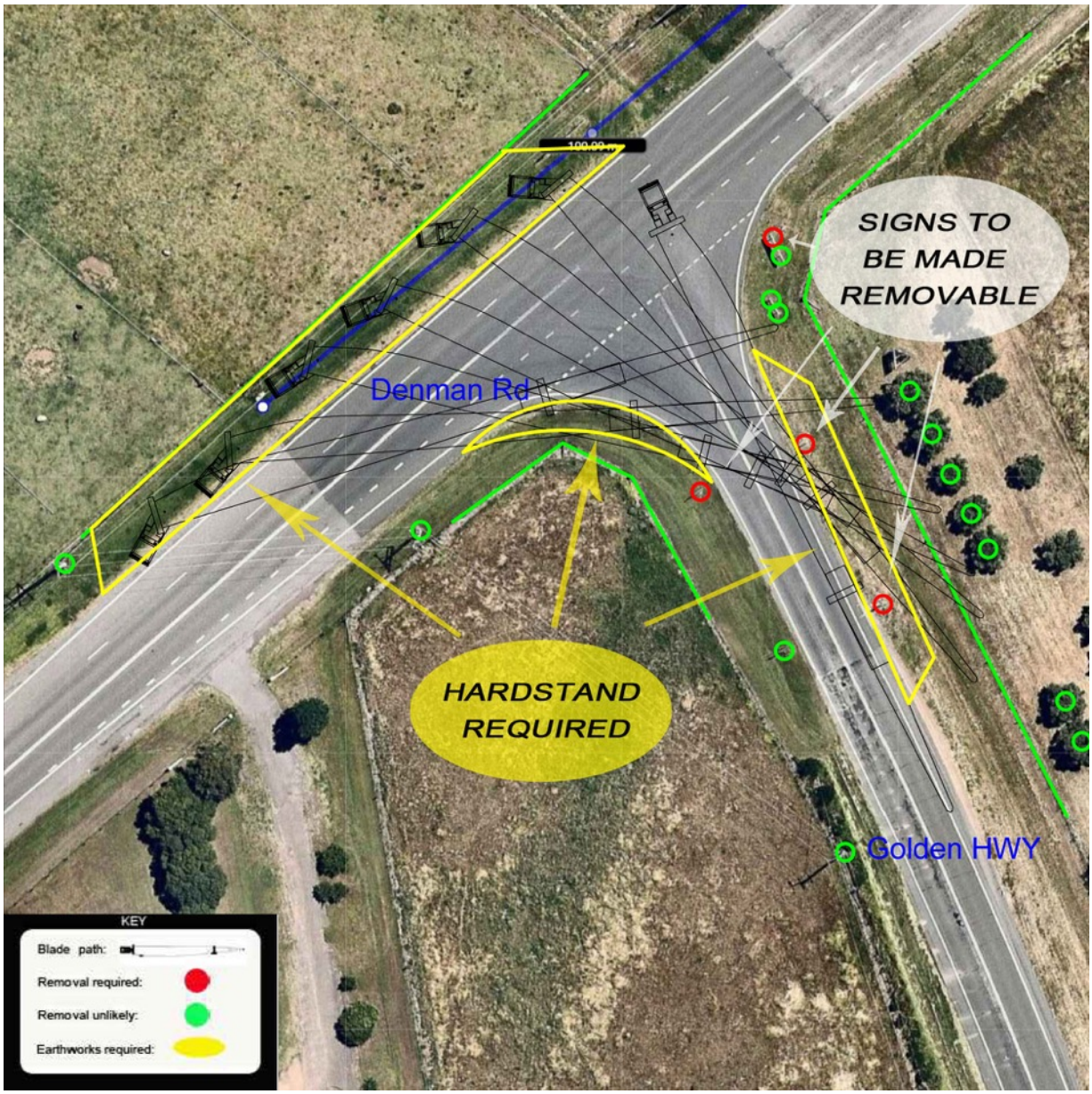
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Ys3yKZ6vQs62

COMMENTS: Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added, additionally some trees will need to be trimmed/removed. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Moderate amounts of work are required.

131.9 Km's: Golden Highway intersection with Denman Road at Denman.

Image 1:



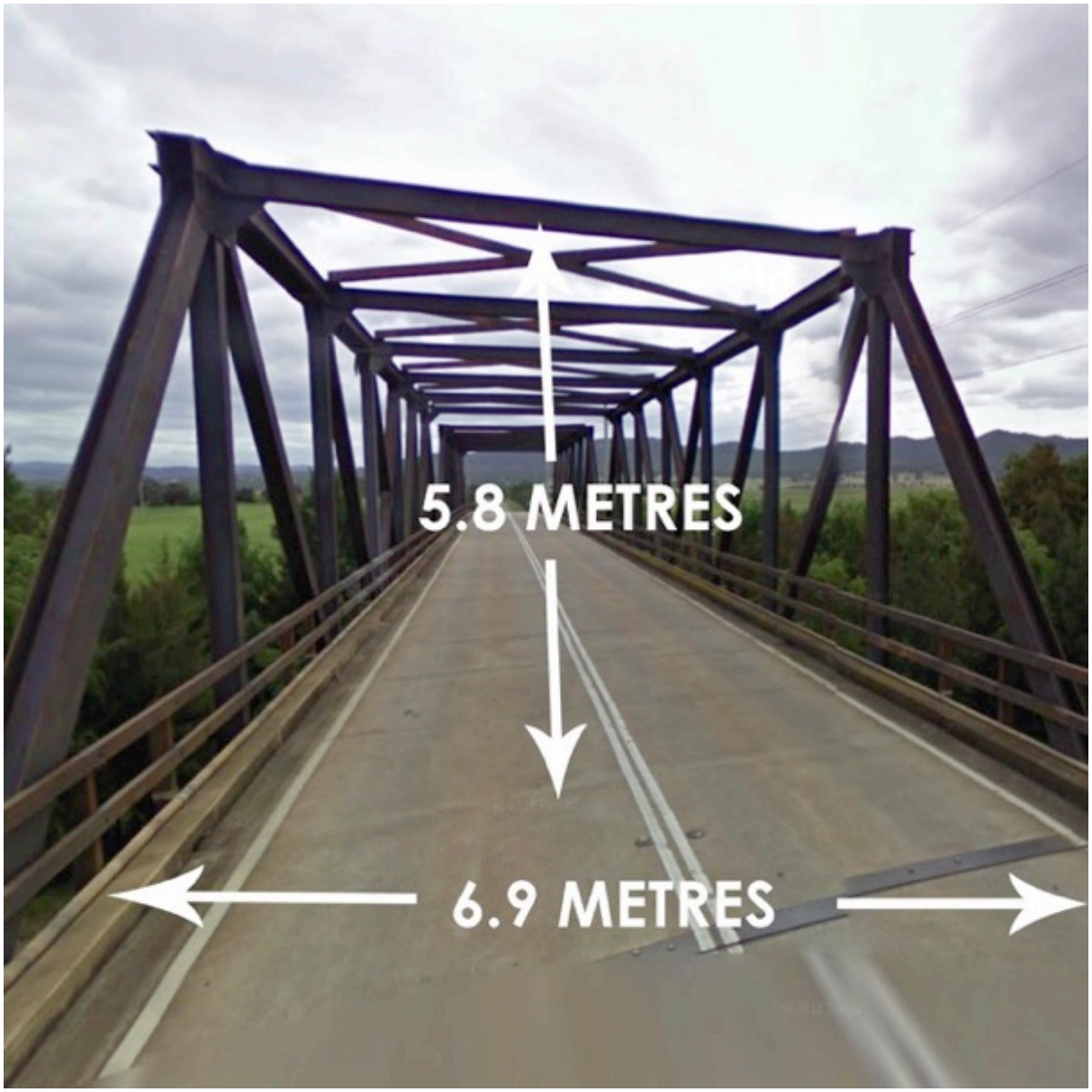
PROCEDURE: Left hand turn from the Golden Highway at the intersection of Denman Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/T4m46bBNuro

COMMENTS: Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added to the inside and outside of the corner. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Moderate amounts of work are required.

132.8 Km's: Denman Bridge.



PROCEDURE: Travel over the bridge.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/UToXyFe3QKu

COMMENTS: A width of 6.5 metres and a height of 5.6 metres should not be exceeded of this structure. If loads are over these dimensions than they may detour the bridge via Bengalla and Wybong Roads.

137.9 Km's: Golden Highway rail crossing at Denman.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/r7x7Qc685d82

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

291.0 Km's: Golden Highway rail crossing at Dunedoo.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/wsyNKfcoAij3SosY9

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

291.1 Km's: Golden Highway intersection with Wargundy Street at Dunedoo.

Image 1:

PROCEDURE: Right hand bend on the Golden Highway at the intersection of Wargundy Street.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/WzACUHey3jYadj1K7

COMMENTS: The blades will travel around the corner from correct side onto the correct side.

ROAD MODIFICATIONS: NA no parking area needs to be put in place on the exit of the corner.

325.4 Km's: Golden Highway onto Cobbora Road at Elong Elong.

Image 1:

PROCEDURE: Left hand turn from the Golden Highway onto Cobbora Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/XSoTDVA8TZwNsGo47

COMMENTS: Blades to turn from the incorrect side to the incorrect side.

ROAD MODIFICATIONS: Hardstand is required on both sides of the road. No drainage works are required. Some side markers will need to be relocated, and 2 signs made removable.

375.7 Km's: Cobbora Road Rail crossing at Wellington.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/oPmj2bbBpPTHJYtF6

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

375.8 Km's: Cobbora Road onto Mitchell Highway at Wellington.

Image 1:

PROCEDURE: Left hand turn from Cobbora Road onto the Mitchell Highway.
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Y9WRnEdpCEsfWPHBA
COMMENTS: Blades to turn from the incorrect side to the incorrect side.
ROAD MODIFICATIONS: 2 signs will need to be made removable.

378.3 Km's: Mitchell Highway onto Goolma Road at Wellington.

Image 1:

PROCEDURE: Left hand turn from the Mitchell Highway onto Goolma Road.
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/nWHNN3pzCvpzp7ag8
COMMENTS: Blades to turn from the incorrect side to the incorrect side.
ROAD MODIFICATIONS: No works required.

395.0 Km's: Twelve Mile Road into Primary site entrance at Uungula.

Image 1: (Looking south from Twelve Mile Road)

PROCEDURE: Right hand turn from Twelve Mile Road into Primary site entrance.
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/VW6Np4Vhtwo
COMMENTS: Site entrances to be made suitable for the swept path of the largest loads.
ROAD MODIFICATIONS: Large amounts of works are required.

11.0 Conclusion: (76 Metre blade)

After studying all options and undertaking a route survey, we believe with some upgrades between Newcastle and Uungula, the listed loads could travel the route from the port to Twelve Mile Road.

PORT:

The port has an excellent Break bulk berth that runs at approx. 60% berth occupancy.

The berth has axle and crane loadings well above what is required for this project.

The storage area is asphalt hardstand with a current area of 100,000 s/q metres available, all level. It is adjacent to the port, and within 300 metres of the berth, all within the Port grounds. No local roads need to be used during the discharge.

Access to the local roads from the port is while require some upgrades, including adding hardstand and relocating fences.

NEWCASTLE:

The intersection of George Street and Industrial Drive at Mayfield looks to be the most difficult corner. It is recommended that the area south of the intersection is filled with hardstand to allow a straighter run into the corner.

HUNTER EXPRESSWAY:

The blades will not make it around the roundabout from John Renshaw Drive onto the Hunter Expressway. The largest blade that could make the turn on the correct side is 65 metres in length. For blades over 65 metres it is likely that traffic control/Police would be required to block the eastbound lanes of the Hunter expressway while the blades travel down the incorrect side before crossing over at the centre crossover point.

NEW ENGLAND HIGHWAY ONTO THE GOLDEN HIGHWAY:

This corner is currently in the design stage of modifications. The existing corner would need only a small amount of works to allow the blades a suitable swept path. It is recommended that the project keep a close eye on any potential changes that may affect the blades swept path around the corner.

THE GOLDEN HIGHWAY:

Several corners would need to have a moderate amount of modifications. Additionally the blades will need to travel onto the incorrect side of the Golden Highway for approx. 400 metres. This will require the police escorts to hold all eastbound traffic on the Golden Highway. Roadwork’s are programmed to take place on this route over the next few years, so it is recommended that the client discuss upcoming road projects with Transport NSW.

DUNEDOO:

A no parking area needs to be placed on a corner.

COBBORA ROAD:

The corner from the Golden Highway onto Cobbora Road will need a moderate amount of works. This will include a small amount of hardstand and relocating side markers and making 2 signs removable.

Once onto Cobbora Road it is asphalt pavement for the entirety, which is generally in good condition. There is a small section that is rough, but passable. There is a pavement width of generally 6.0 metres for the entirety.

The swept path along Cobbora Road is okay in its current form.

The road has 2 floodway's and 2 crests that appear suitable, but a survey is recommended to confirm suitability.

The turn from Cobbora onto the Mitchell Highway only requires 2 signs to be made removable.

WELLINGTON:

The turn from the Mitchell Highway onto Goolma Road is suitable in it's current form.

TWELVE MILE ROAD:

The corner from Goolma Road onto Twelve Mile road will require the blades to travel to the incorrect side of the road, and travel directly ahead onto Twelve Mile Road. Once onto Twelve Mile Road it is asphalt pavement up until the site entrance. The pavement is in fair condition with a surface width of generally 5.0 metres. Sections of this road will require tree trimming and possible removal for the swept path of the blade, and also the height of the towers. A thorough survey is recommended on this section of road for vertical clearance and additional swept path analysis.

ROADWORKS:

Roadworks are likely to be continuous on any route within NSW, as this is common practice. Some roads will just have general maintenance, and resealing, while other sections will have complete realignment. It is recommended that the project discuss any major works well in advance with the authorities.

BRIDGE CROSSINGS:

There are multiple bridges on this route that will need to be assessed. On our current data we believe the loads will have no problems up until the turnoff from Goolma Road onto Twelve Mile Road. All bridges from Twelve Mile Road through to the site entrance would need to be assessed for axle loadings.

OVERHEAD STRUCTURES:

The lowest structure on this route are overhanging traffic signals, the lowest of these is 5.4 metres high, but these signals can be avoided by passing them to the side. The lowest fixed structure is a gantry at Hexham. Loads over 5.2 metres are to pass to the side of the traffic signals. The lowest structure that cannot be detoured is the traffic gantry on the New England Highway at Hexham. A loaded height over 5.9 metres cannot travel on this route.

Denman Bridge is 5.7 metres in height. A loaded height of 5.6 metres should not be exceeded. Loads that exceed 5.6 metres will need to detour this structure.

OVERHEAD WIRES:

This route would need to be assessed to handle a loaded height of up to 5.9 metres. It is likely that there are wires that will need to be raised for loads over 5.2 metres in height.

RAIL ASSETS:

There are a number of rail crossings on route that will require approval from authorities before loads can be approved to cross. These structures locations are listed in the route index.

The wellington crossing may require a protection officer to be onsite for each blade movement.

FLOODWAYS:

There are a couple of floodway's on Cobbora Road and Twelve Mile Road that will need to be checked for vertical curve.

PAVEMENT:

The road up to Twelve Mile Road is of Highway standard and would not require any work. Twelve Mile Road up to the main site entrance also looks suitable, however this road may need to be monitored and serviced for wear.

VEGETATION:

The route up to Twelve Mile Road is okay and does not require works. A thorough survey needs to be done on Twelve Mile Road to see the extent of the works through this section.

VERTICAL CURVE:

A thorough survey needs to be done to see the extent of the works on Cobbora Road and Twelve Mile Road.

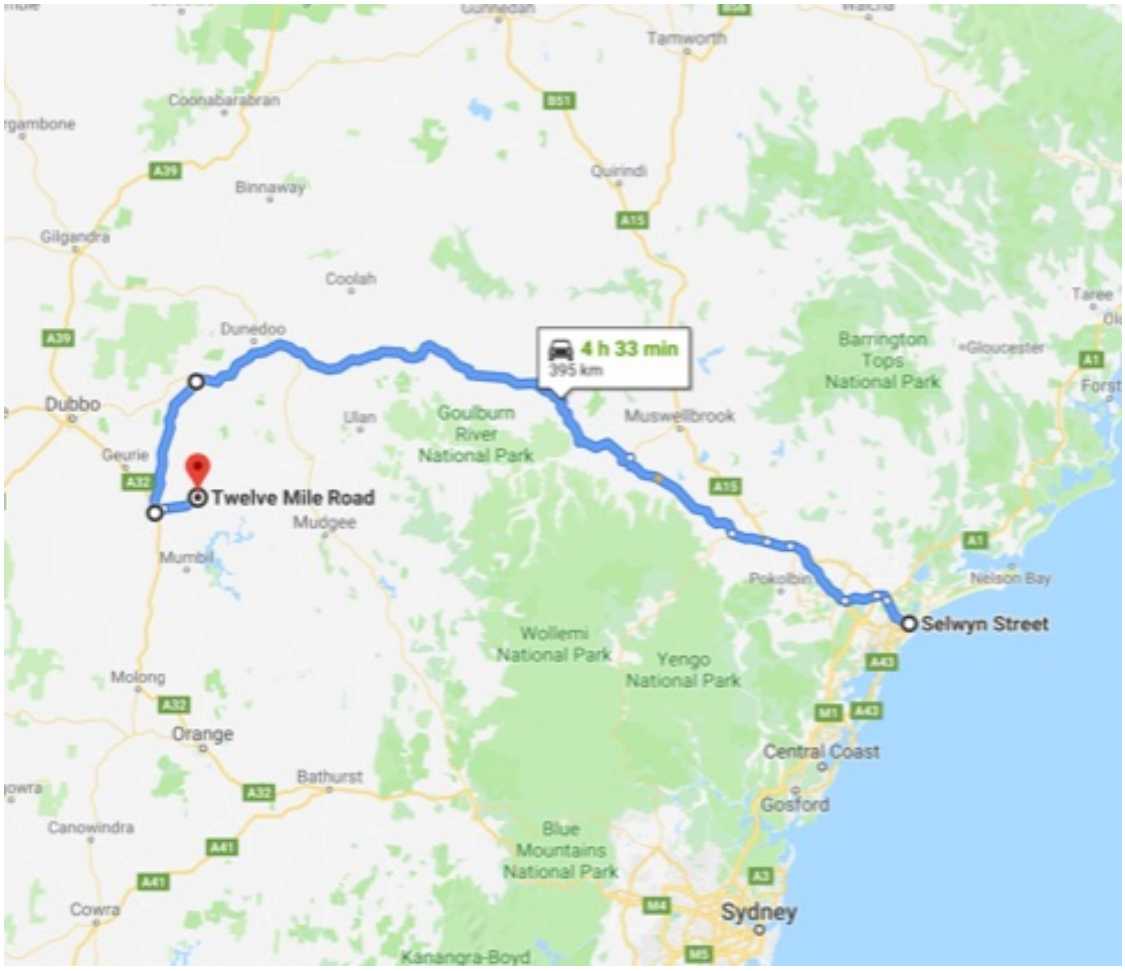
12.0 Route Survey (82 metre blades): Newcastle Port to Uungula Windfarm

After completing this route survey, we believe the following is the most suitable option.

This route took us via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Cobbora Rd, Mitchell Highway, Goolma Road, Twelve Mile Road.

Distance: **395.0 kilometres**

GPS link: https://goo.gl/maps/gwfURhh6hjxUo6Jm6



REX J ANDREWS
ENGINEERED TRANSPORTATION

ROUTE STUDY
Newcastle to Uungula windfarm

KEY	
CRITICAL	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
Route index					
0.0	Mayfield	Mayfield #4 berth onto Selwyn Street GPS link: https://goo.gl/maps/afLwPYKuNdm	70.0 metres clearance	Moderate right hand turn	The fence will need to be relocated on both sides and some hardstand will need to be added to the exit of the corner.
0.4	Mayfield	Selwyn Street rail crossing GPS link: https://goo.gl/maps/AmohE54hKSz	9.0 Metres wide	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
1.3	Mayfield	Selwyn Street onto George Street GPS link: https://goo.gl/maps/qXeHvBtCp4D2	70.0 metres clearance	Right hand turn	The sign on the inside of the corner will need to be made removable, and hardstand added to the inside of the corner.
1.4	Mayfield	George Street onto Industrial Drive https://goo.gl/maps/s4ayrsuoAsD2	70.0 metres clearance	Right hand turn	Entering Industrial Drive the loads will cross from the correct side to the correct side to the correct side. Some hardstand will need to be placed on the south side of the intersection, and a traffic signal will need to be relocated.
4.9	Mayfield	Industrial Drive under traffic signals GPS link: https://goo.gl/maps/YmqhiS2iR582	5.4 Metres clearance	Travel directly ahead	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right hand lane.
5.5	Mayfield West	Industrial Drive onto Maitland Road GPS link: https://goo.gl/maps/Kn49dhWG2qG2	70.0 metres clearance	Right hand turn	The blades will need to cross to the incorrect side 150 metres prior to the intersection, than return to the correct side 120 metres past the intersection. The concrete median strip will need to be reduced in height, and have a gentle slope. Police and escorts to control traffic flow.
6.4	Sandgate	Maitland Road over rail bridge GPS link: https://goo.gl/maps/W2JWWjhfqv5UMviB7	9.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
13.9	Hexham	New England Highway under gantry GPS link: https://goo.gl/maps/YTMoFe7Aick	5.95 metres high	Travel directly ahead	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded.

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ROUTE STUDY
Newcastle to Uungula windfarm

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
15.1	Tarro	New England Highway over rail bridge GPS link: https://goo.gl/maps/tTnWLwQC2hzSPhAp6	7.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
17.4	Tarro	New England Highway onto John Renshaw Drive GPS link: https://goo.gl/maps/SRDr5JigkBp	100.0 metres clearance	Left hand merge	No problems with this section of road.
18.4	Beresfield	John Renshaw Drive GPS link: https://goo.gl/maps/N19vJih1Fgr		Travel directly ahead	The roundabout has been removed. A set of dual lanes now takes traffic directly across the intersection.
28.7	Buchanan	John Renshaw Drive onto the Hunter Expressway GPS link: https://goo.gl/maps/1STJ1PfQt9E2	65.0 metres clearance	Right hand turn	Cross to the incorrect side than down the off-ramp onto the incorrect side of the expressway. Approx 600 metres along the expressway there is a break in the road, which will allow the blades to cross back to the correct side of the expressway. Traffic control and or police will be required to perform this procedure.
58.9	Branxton	The Hunter Expressway onto The New England Highway GPS link: https://goo.gl/maps/7rauNuxzqjq	12.0 Metres wide	Travel directly ahead	No problems with this section of road.
67.3	Whittingham	The New England Highway onto the Golden Highway GPS link: https://goo.gl/maps/nAnfkYfeUn42	12.0 Metres wide	Left Hand turn	The NSW Government is currently upgrading this intersection. The intersection in its current form has a number of signs that would need to be made removable, but no modifications are required on the existing corner. At this stage the data that is available for the upgrades shows that the section of road that we would need to access does not change considerably. However it is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
67.4	Whittingham	Golden Highway GPS link: https://goo.gl/maps/R86RFuPnmFU2	115.0 x 9.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
68.0	Whittingham	Golden Highway over rail bridge GPS link: https://goo.gl/maps/5NwDQofandvvMKfY9	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.3	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/qTxSbkxPu87L5hx4A	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.

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ROUTE STUDY
Newcastle to Uungula windfarm

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
77.4	Whittingham	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/7hQdEmK1EgE2	85.0 metres clearance	Left hand turn	Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable.
77.5	Mount Thorley	Golden Highway GPS link: https://goo.gl/maps/zGvdupDuixx	100.0 x 10.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
80.6	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/ipGU4USXmWZ8GkJs6	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
80.8	Mount Thorley	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/VyA42n1CqZx	85.0 metres clearance	Right hand turn	Blades to cross from the incorrect side and cross back to the correct side approx. 500 metres west of the intersection.
98.0	Warkworth	Golden Highway GPS link: https://goo.gl/maps/Y6V6EXaCwxq	100.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
107.0	Jerrys Plains	Golden Highway through Jerrys Plains village GPS link: https://goo.gl/maps/WgSCRsJ9ZGt	75.0 metres clearance	Left hand than right hand turn	Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added. Additionally some trees will need to be Trimmed/Removed.
126.0	Ogilvy	Golden Highway GPS link: https://goo.gl/maps/58Tj9ojs7CC2	6% gradient	Travel directly ahead	This section of road has a steep mountain range that will require additional pull trucks to assists loads that exceed 80T gross weight. Additionally the NSW Government is currently upgrading this section of road. It is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
131.9	Denman	Golden Highway onto Denman Road GPS link: https://goo.gl/maps/sf4PNnycxB32	65.0 metres clearance	Left hand turn	The blades will travel around the corner from incorrect side onto the incorrect side. The existing corner will require hardstand to be added and signs made removable. Additionally some trees will need to be trimmed/removed inside a property owners boundaries.
132.8	Denman	Golden Highway over Denman Bridge GPS link: https://goo.gl/maps/UToXyFe3QKu	5.8 Metres height clearance 6.9 Metres width clearance	Travel directly ahead in the centre of the lane	A width of 6.5 metres and a height of 5.6 metres should not be exceeded of this structure. If loads are over these dimensions than they may detour the bridge via Bengalla and Wybong Roads.

REX J ANDREWS
ENGINEERED TRANSPORTATION

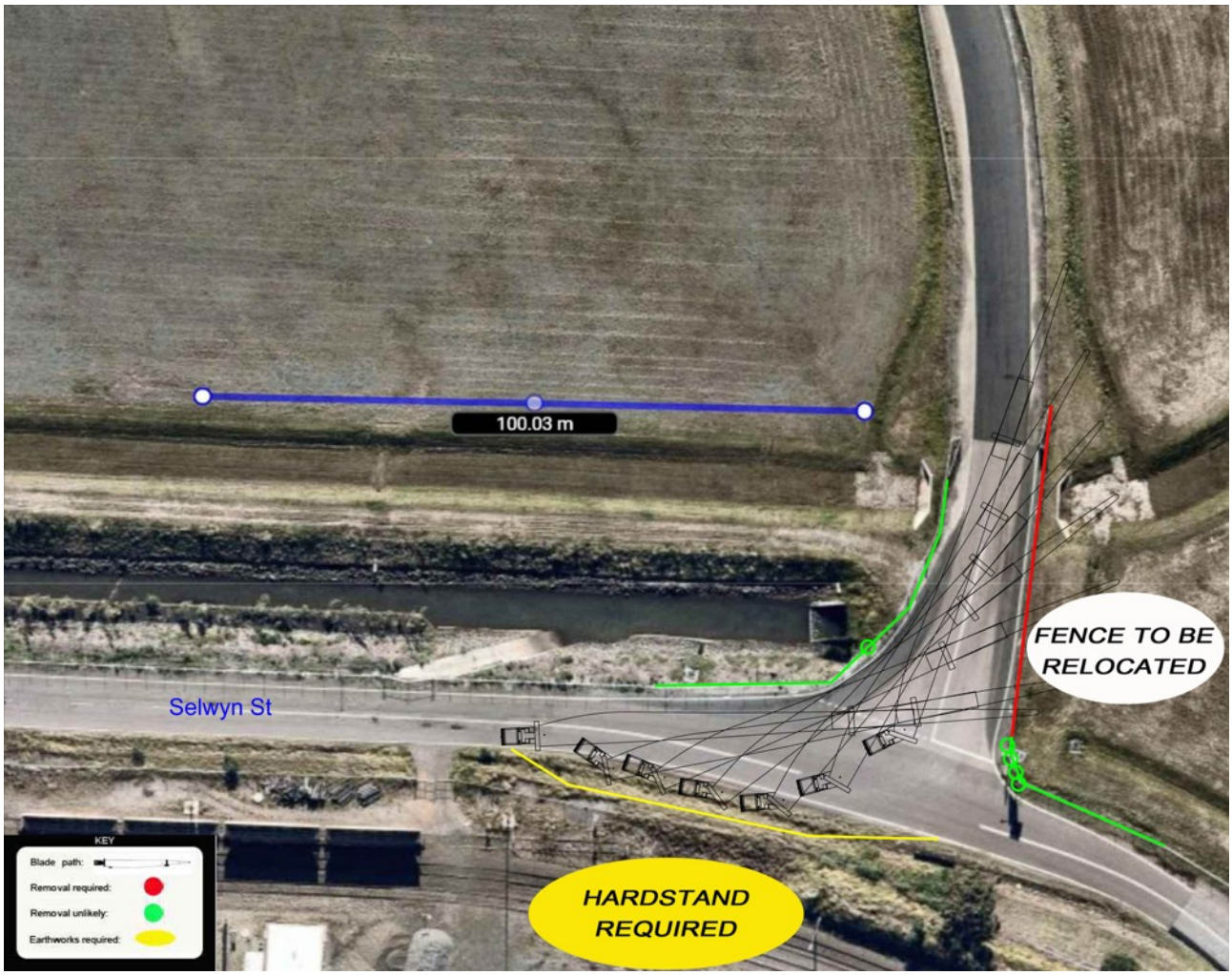
ROUTE STUDY
Newcastle to Uungula windfarm

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
137.9	Denman	Golden Highway rail crossing GPS link: https://goo.gl/maps/r7x7Qc685d82	65.0 metres clearance	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
150.1	Sandy Hollow	Golden highway GPS link: https://goo.gl/maps/2THBuV165xx	50.0 x 4.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
161.2	Gungal	Golden highway GPS link: https://goo.gl/maps/WDoL2LfeCoP2	70.0 x 6.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
184.8	Merriwa	Golden highway GPS link: https://goo.gl/maps/NqrWzTsRmnt	100.0 x 5.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
234.0	Cassilis	Golden highway GPS link: https://goo.gl/maps/vs6YMT6TxCA2	200.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
282.0	Leadville	Golden highway onto the Castlereagh Highway GPS link: https://goo.gl/maps/aJMXknfMmuH2	65.0 metres clearance	Left hand turn	The blades will travel around the corner from incorrect side onto the incorrect side. Some fill is required on the inside and outside of the corner, and some signs made removable.
291.0	Dunedoo	Golden Highway rail crossing GPS link: https://goo.gl/maps/wsyNKfcoAij3SosY9	8.0 metres in width	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
291.1	Dunedoo	Golden Highway intersection with Wargundy Street GPS link: https://goo.gl/maps/WzACUHey3jYadj1K7	75.0 metre clearance	Right hand bend	A no parking area is required on the exit of the corner.
325.4	Elong Elong	Golden Highway onto Cobbora Road GPS link: https://goo.gl/maps/XSoTDVA8TZwNsGo47	60.0 metres clearance	Left hand turn	Hardstand is required on both sides of the road. Drainage works are required on the outside of the corner. Some side markers will need to be relocated, and 2 signs made removable.
375.7	Wellington	Cobbora Road rail crossing GPS link: https://goo.gl/maps/oPmj2bbBpPTHJYtF6	8.0 metres in width	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
375.8	Wellington	Cobbora Road onto Mitchell Highway GPS link: https://goo.gl/maps/Y9WRnEdpCEsfWPHBA	70.0 metres clearance	Left hand turn	1 Giveaway sign will need to be made removable. And hardstand added to the inside of the corner.
378.3	Wellington	Mitchell Highway onto Goolma Road GPS link: https://goo.gl/maps/nWHNN3pzCvpzp7ag8	78.0 metres clearance	Left hand turn	Hardstand will be required on the outside of the corner, and several signs relocated or made removable. Additionally, 2 x light poles will need to be relocated.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
381.5	Wellington	Goolma Road onto Twelve Mile Road GPS link: https://goo.gl/maps/Ajjk5pVCQCn	100.0 metres clearance	Merge right onto incorrect side of the road	The blades will need to travel onto the incorrect side of Twelve Mile Road. Police and pilots to control traffic.
381.5 to 395.0	Wellington to Uungula	Twelve Mile Road GPS link: https://goo.gl/maps/6cF9vF51JYvr6taA8	65.0 Length 5.0 Pavement width 5.5 Overall width 4.6 Height clearance	Travel directly ahead through winding sections of road with several moderate inclines and declines	Twelve Mile Road is asphalt pavement up until the proposed site entrance. The pavement is in fair condition with a surface width of generally 5.0 metres. Sections of this road will require tree trimming/removal for the swept path of the blade, and also the height of the towers. A survey is recommended on this section of road for vertical clearance and swept path.
395.0	Uungula	Twelve Mile Road into Primary site entrance GPS Location: https://goo.gl/maps/VW6Np4Vhtwo		Right hand turn	Site entrance to be made suitable for the swept path of the largest loads.

0.0 Km's: Mayfield #4 onto Selwyn Street at Mayfield.

Image 1:



PROCEDURE: Right hand turn.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/afLwPYKuNdm

COMMENTS: Some fill will need to be added to the left exit of the corner. Some signs will need to be relocated and or made removable and some fence will need to be relocated.

A spotter will need to keep the driver informed throughout the procedure. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Yes moderate amounts of work are required.

0.4 Km's: Rail crossing over Selwyn Street at Mayfield.

PROCEDURE: Travel directly ahead over the crossing.

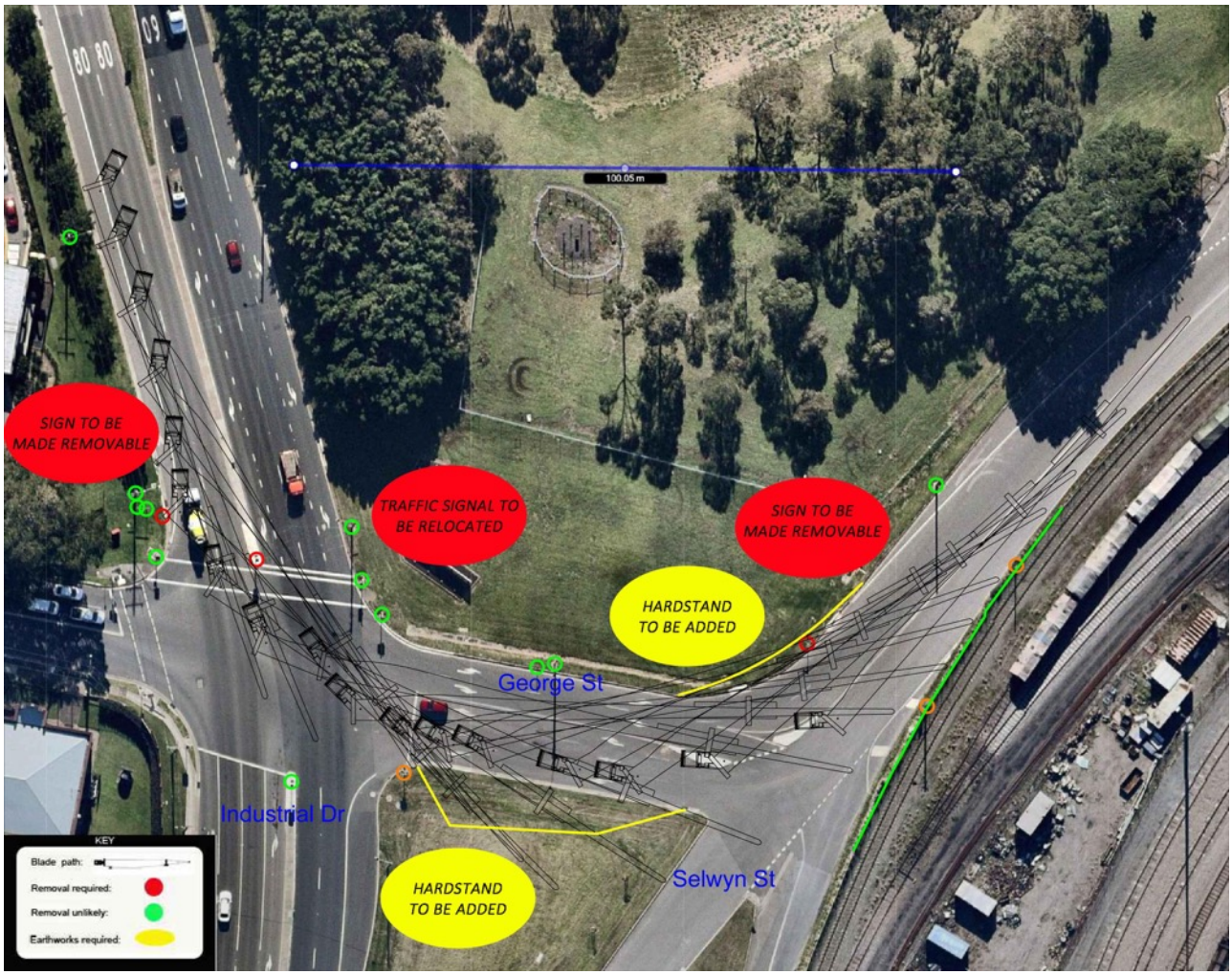
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/864FhMSaF9P2

COMMENTS: Large width clearance and good ground clearance over this crossing.
Police and escorts to control local traffic either side of the crossing. ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

ROAD MODIFICATIONS: No works required.

1.3 Km's: Selwyn Street onto Industrial Drive, via George Street at Mayfield.

Image 1:



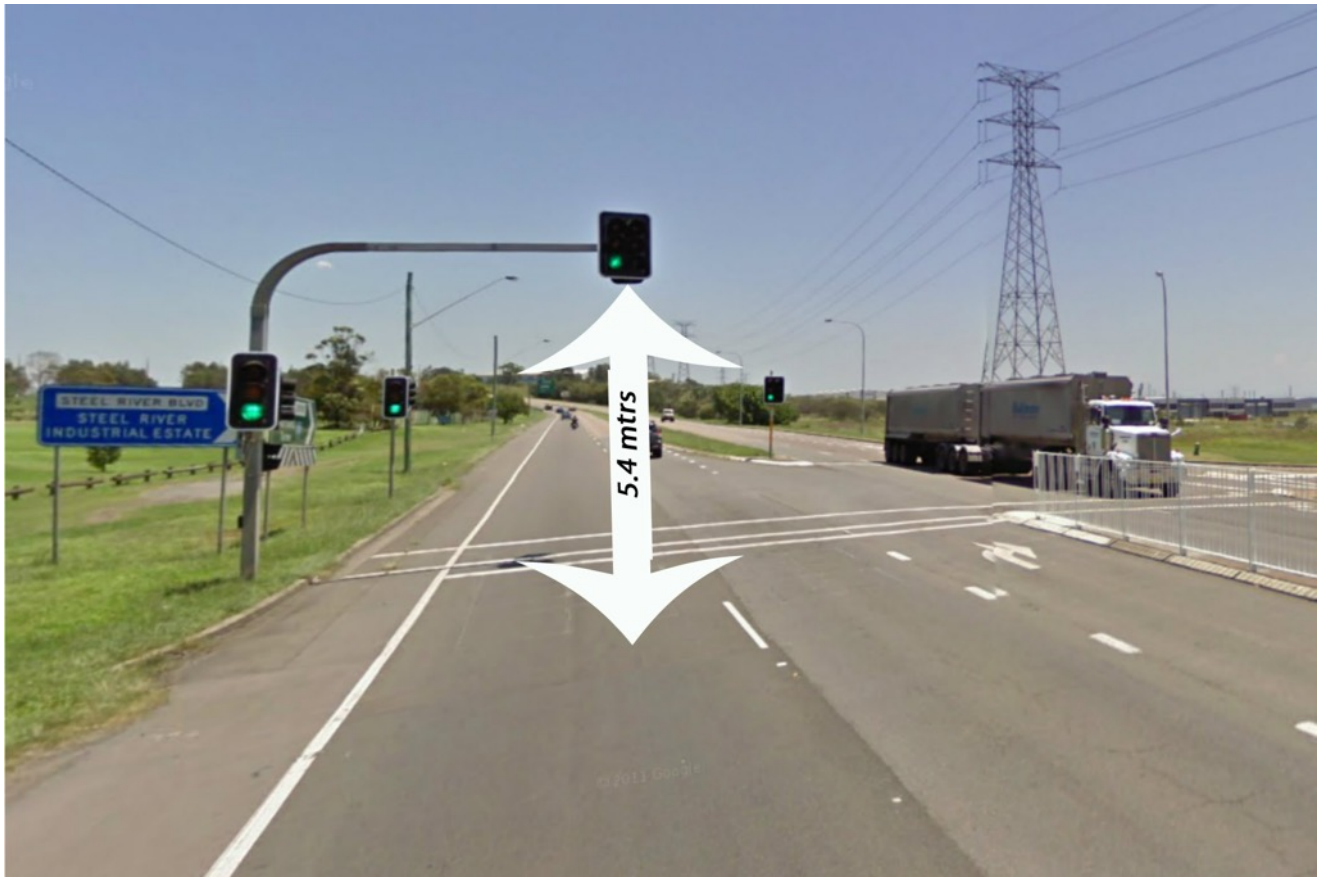
PROCEDURE: Right hand turn from Selwyn Street through George Street and onto Industrial Drive.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/brPRAckLr572

COMMENTS: The first right hand turn through George Street will need a sign made removable. Entering Industrial Drive the loads will cross from the correct side to the correct side. A traffic signal will need to be relocated, and a sign made removable. Some hardstand will need to be placed on the south side of the intersection.

ROAD MODIFICATIONS: Yes, large amounts of works are required.

4.9 Km's: Standard overhanging Traffic signals Mayfield to Hunter Expressway.



PROCEDURE: Overhanging signals while travelling through the intersection.

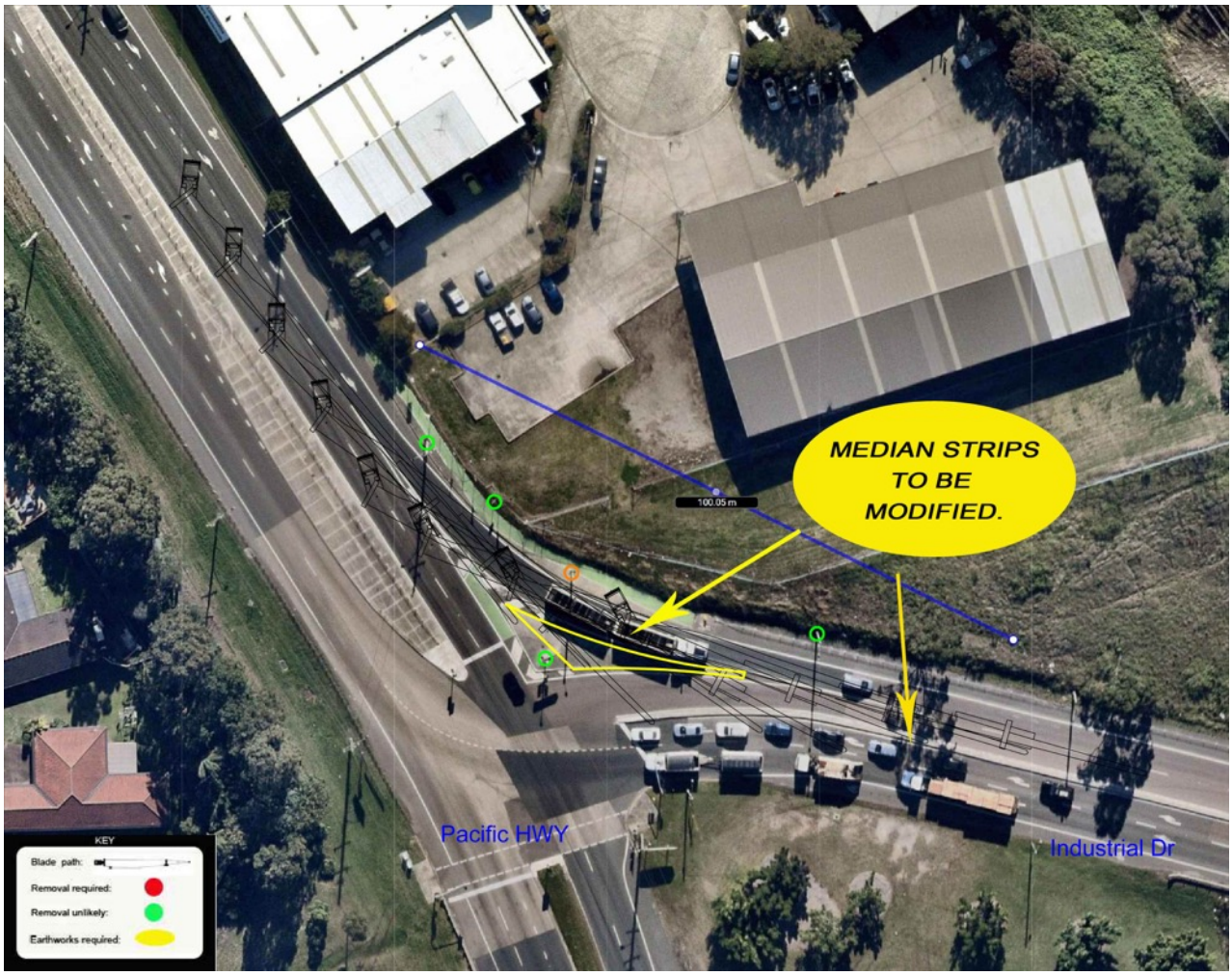
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/5DpD3b7KnT72

COMMENTS: The lowest traffic signal on route has 5.4 metres clearance. This signal is on the corner of Steel River Blvd at Mayfield West. Loads with an overall height of 5.3 or higher, can avoid this signal by travelling in the centre lane. Loads to slow down while doing this manoeuvre. All other signals exceed 5.6 metres high on this section of road.

ROAD MODIFICATIONS: No works are required.

5.5 Km's: Industrial Drive onto Maitland Road at Mayfield West.

Image 1:



PROCEDURE: Right hand turn from Industrial Drive onto Maitland Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Kn49dhWG2qG2

COMMENTS: The loads will need to cross to the incorrect side of the intersection, before crossing back over 200 metres to the north. The centre median strip will need to be modified so the trucks can cross over safely.

Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Yes moderate amounts of works are required.

13.9 Km's: Lowest structure (Bridge or Sign) between Mayfield and the Hunter Expressway.

Image 1:

PROCEDURE: Travel directly ahead in the centre lane.

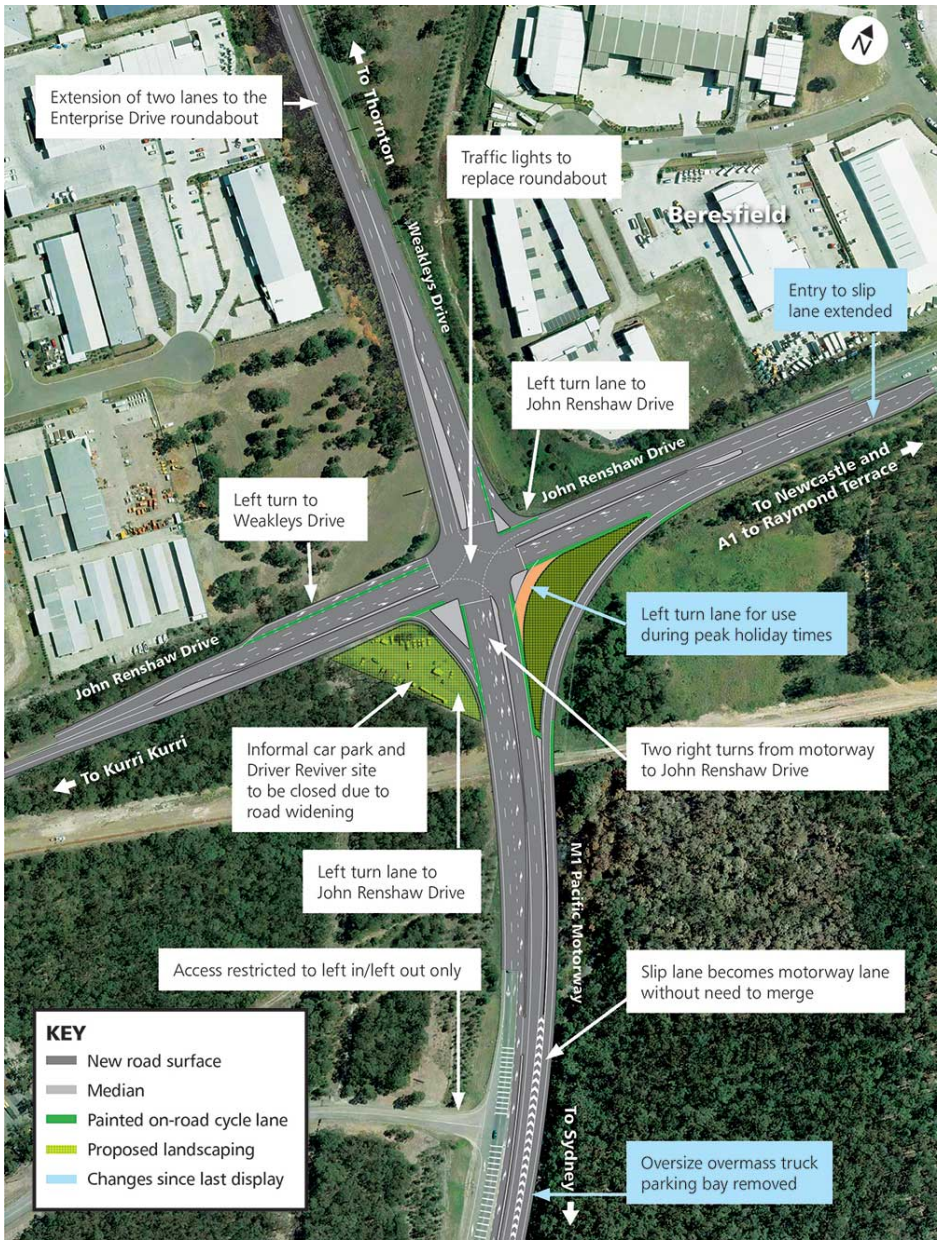
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/YTMoFe7Aick

COMMENTS: This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.8 metres should not be exceeded.

ROAD MODIFICATIONS: No works are required.

18.4 Km's: Intersection of John Renshaw Drive and M1 at Beresfield.

Image 1:



PROCEDURE: Travel directly ahead in the centre lane.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/MYSBciVvcwB2

COMMENTS: The roundabout has been demolished. The new intersection has 2 lanes directly ahead with a width clearance of 9.0 metres. The traffic signals have a clearance of 5.9 metres.

ROAD MODIFICATIONS: No problems with this section of road.

28.7 Km's: John Renshaw Drive onto the Hunter Expressway at Buchanan.

Image 1:

PROCEDURE: Right hand turn onto the incorrect side of the Motorway, before crossing back onto the correct side at the crossover bay.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/cEnuC5th1p52

COMMENTS: Cross to the incorrect side than down the off-ramp onto the incorrect side of the expressway. Approx 600 metres along the expressway there is a break in the road, which will allow the blades to cross back to the correct side of the expressway. Traffic control and or police will be required to perform this procedure.

ROAD MODIFICATIONS: No works required.

67.3 Km's: New England Highway onto Golden Highway at Whittingham.

Image 1:

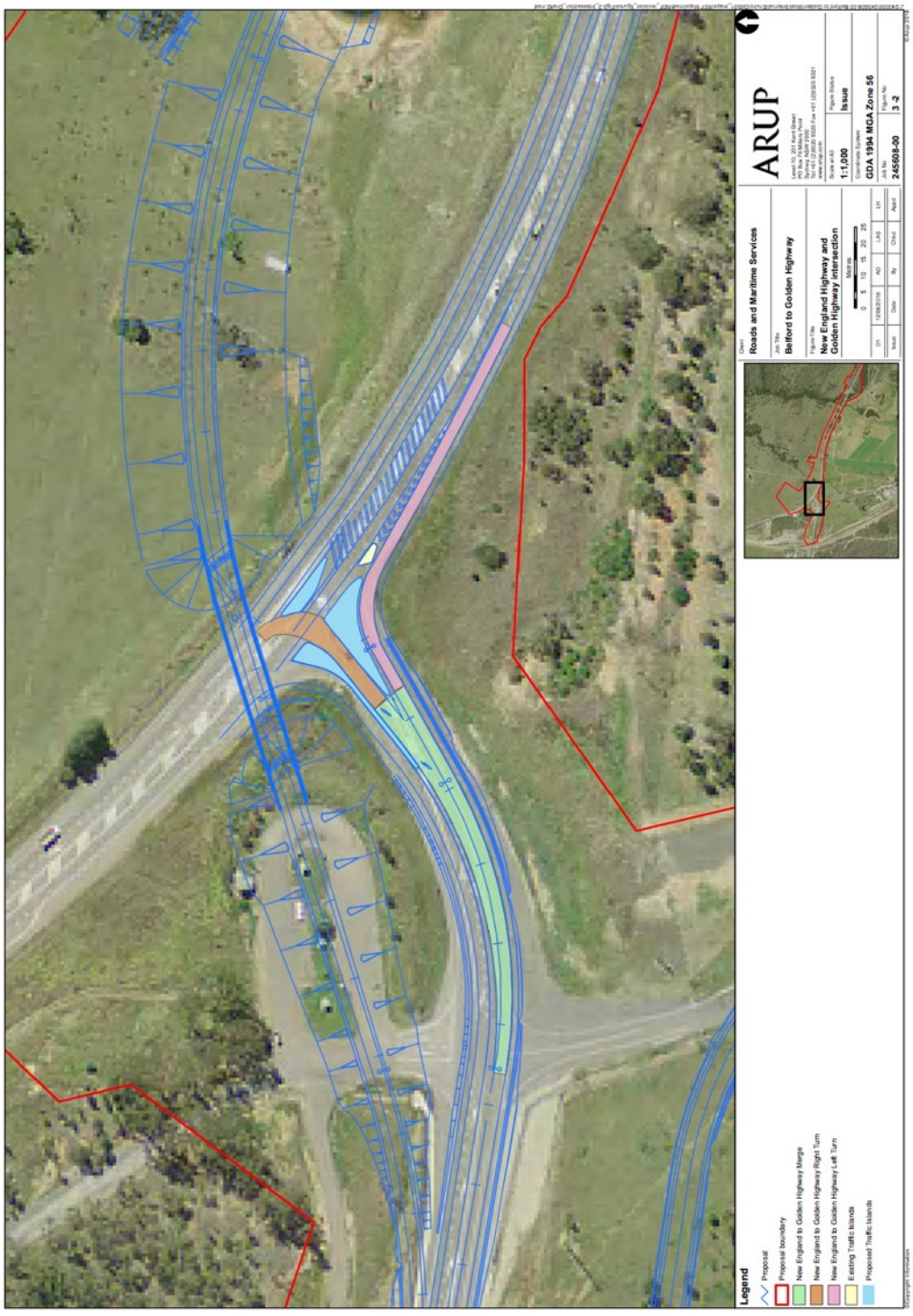
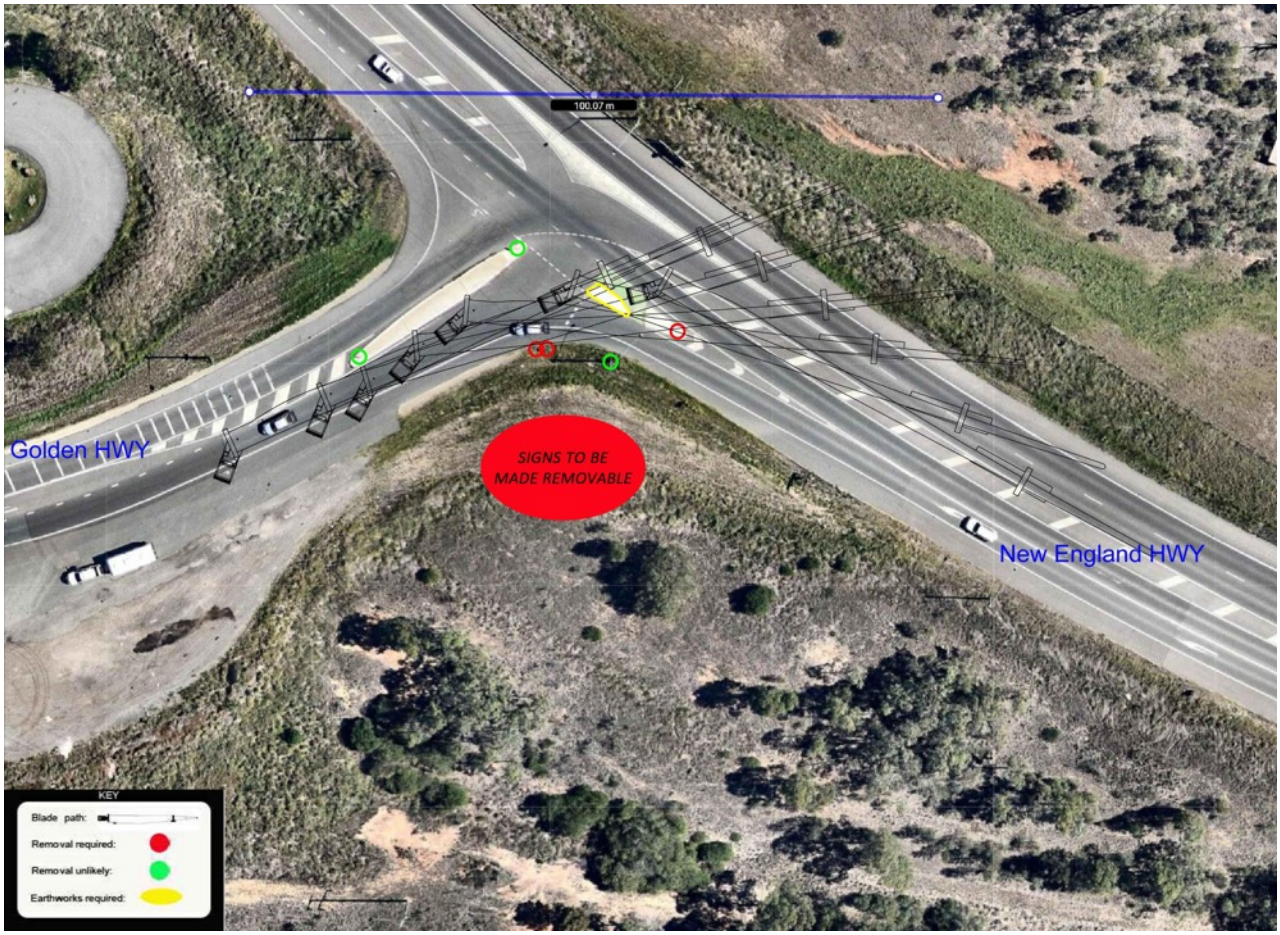


Image 2:



PROCEDURE: Left hand turn from the New England Highway onto the Golden Highway.

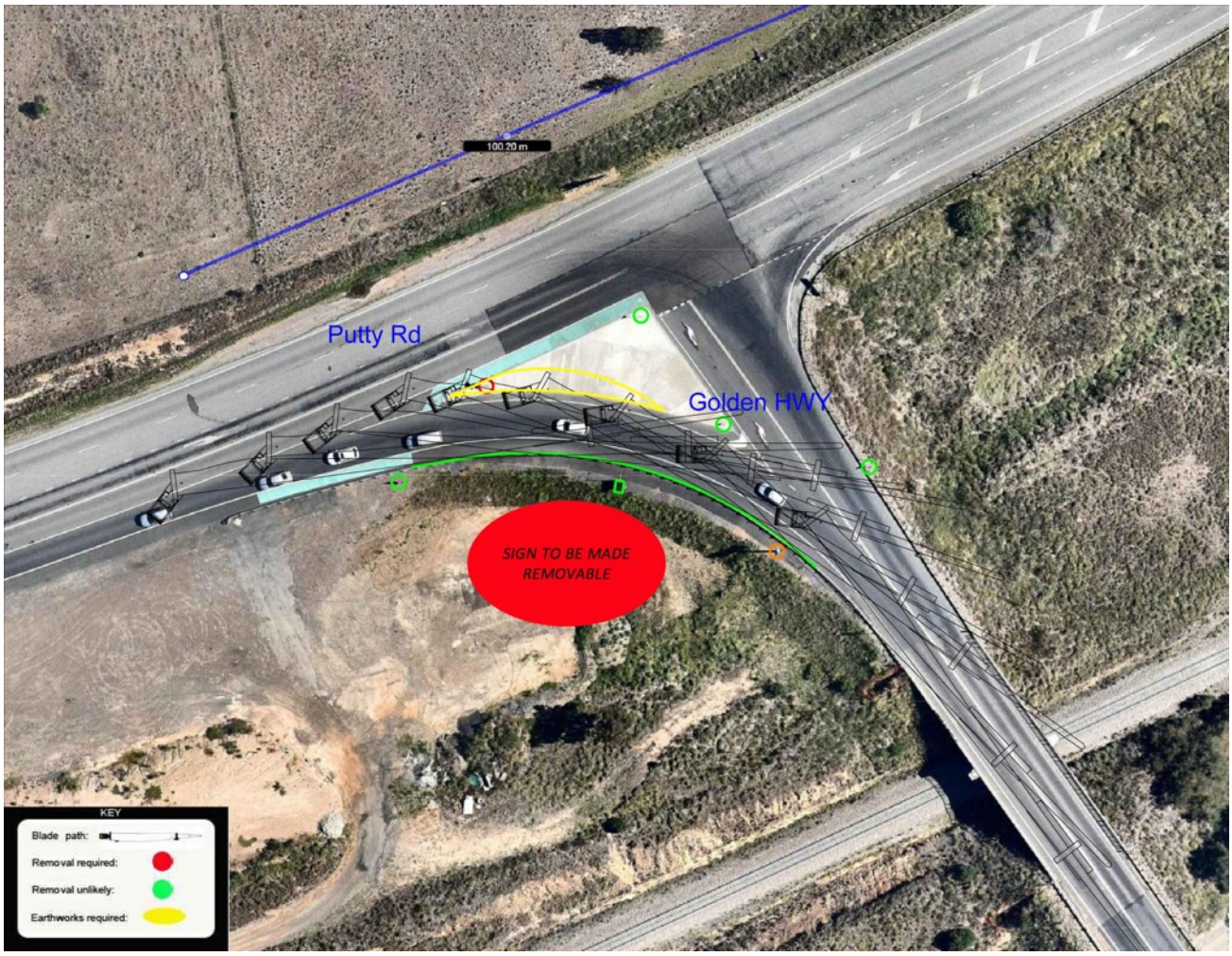
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/GZ3VbkLrKf42

COMMENTS: Loads to turn from the incorrect side to the incorrect side. The signs in the center median will need to be made removable.

ROAD MODIFICATIONS: NOTE: This intersection is currently in line to be upgraded. The details on image 1 shows that the changes should not affect the swept path, however it is recommended that this is monitored.

77.3 Km's: Golden Highway intersection with Putty Road at Whittingham.

Image 1:



PROCEDURE: Left hand turn from the Golden Highway at the intersection of the Putty Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/esuS6TUUwQ92

COMMENTS: Loads to turn from the incorrect side to the incorrect side. The signs in the center median will need to be made removable. Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Small amounts of work are required.

80.8 Km's: Golden Highway intersection with Putty Road at Mount Thorley.

Image 1:

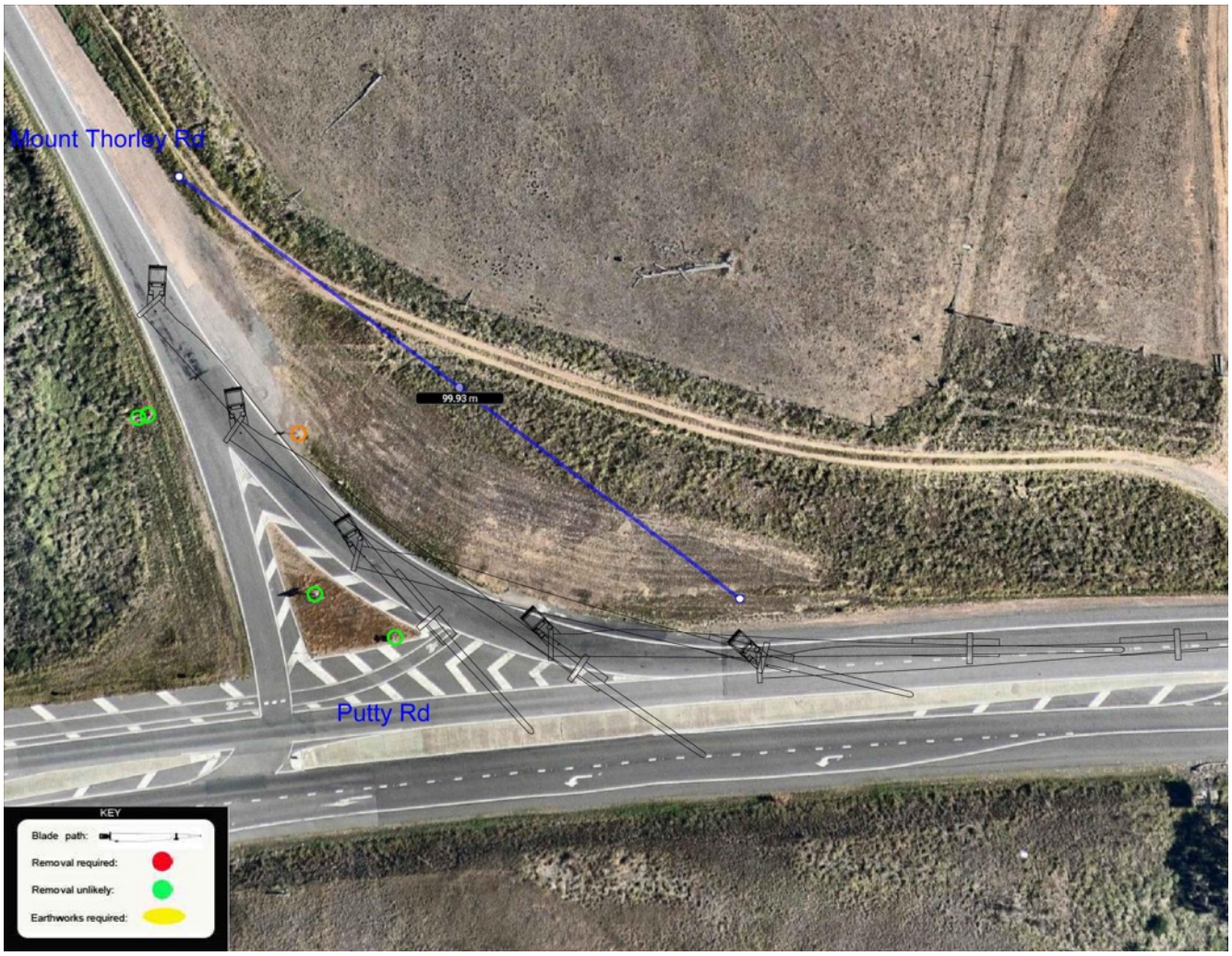
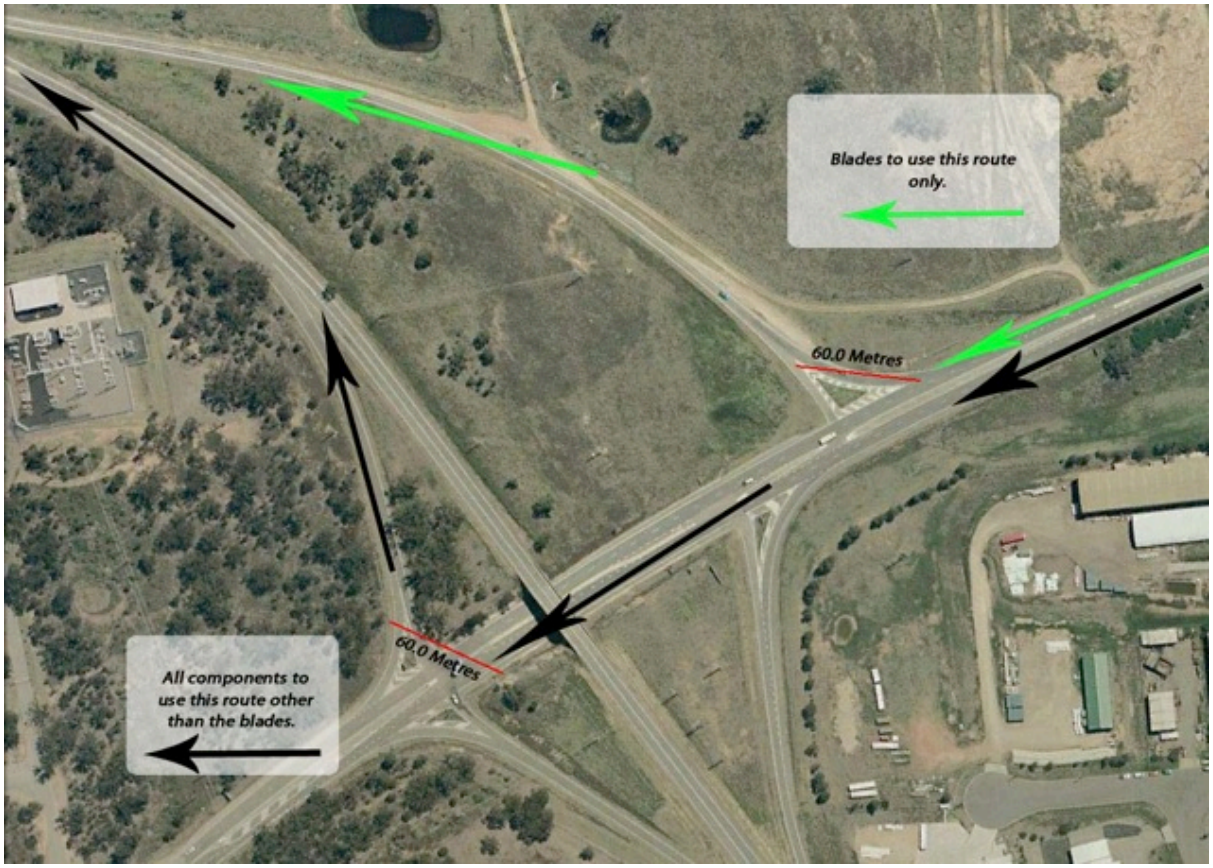


Image 2:



PROCEDURE: Right hand turn from the Putty Road onto the Golden Highway.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Qj4tjSSjN932

COMMENTS: Loads to turn from the incorrect side to the incorrect side. Blades to cross to the incorrect side prior to the intersection, and return to the correct side when the lanes remerge. Spotter to keep the driver informed throughout the procedure.

Police and escorts to control local traffic either side of the intersection.

NOTE: Towers and general loads will travel under the overpass and stay on the correct side of the road. The overpass is 5.6 in the center of the road. Loads that exceed 5.6 high will need to take the blade detour.

ROAD MODIFICATIONS: No works required.

107.0 Km's: Golden Highway through Jerrys Plains.

Image 1:

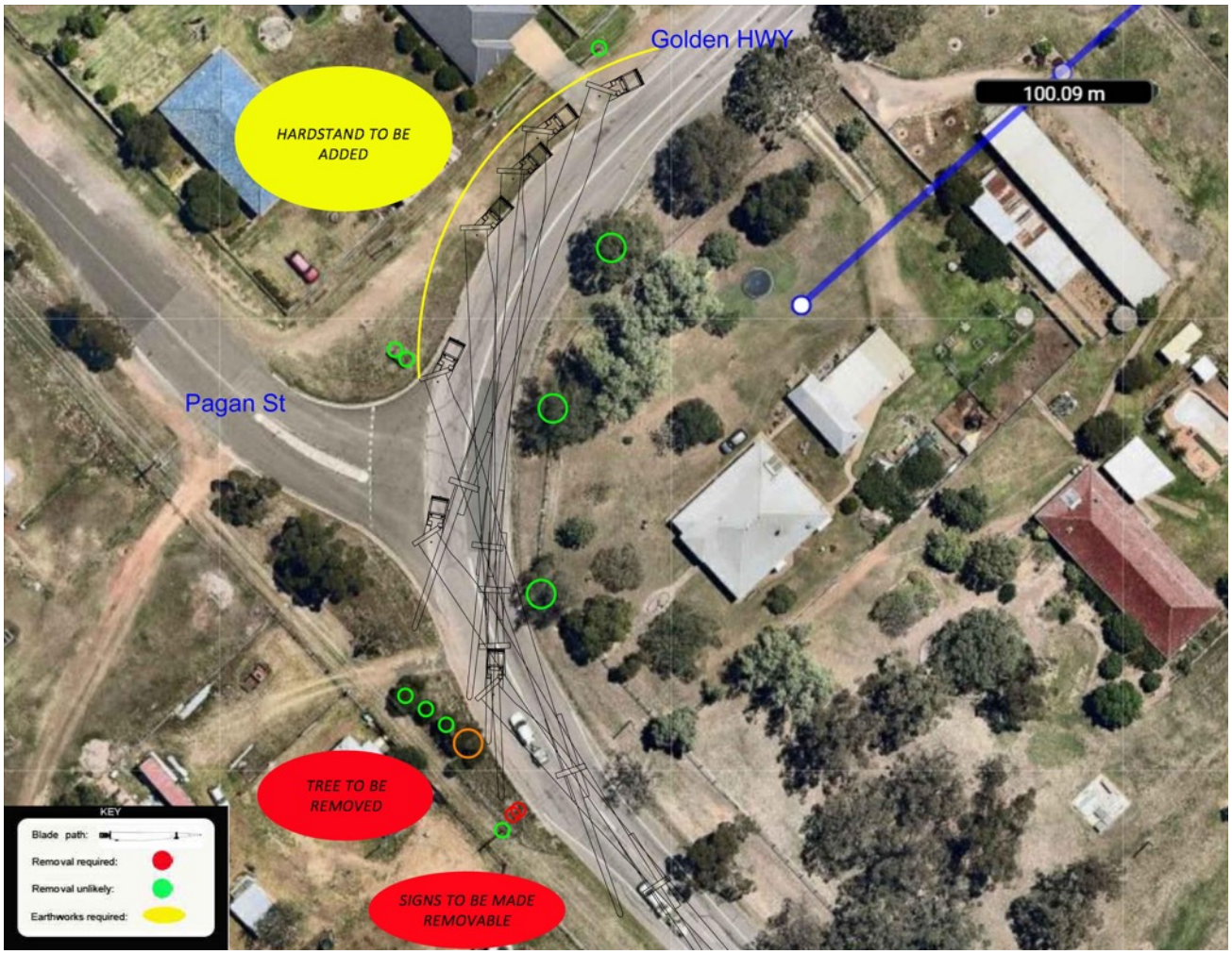


Image 2:

PROCEDURE: Left and right hand turn through the village.

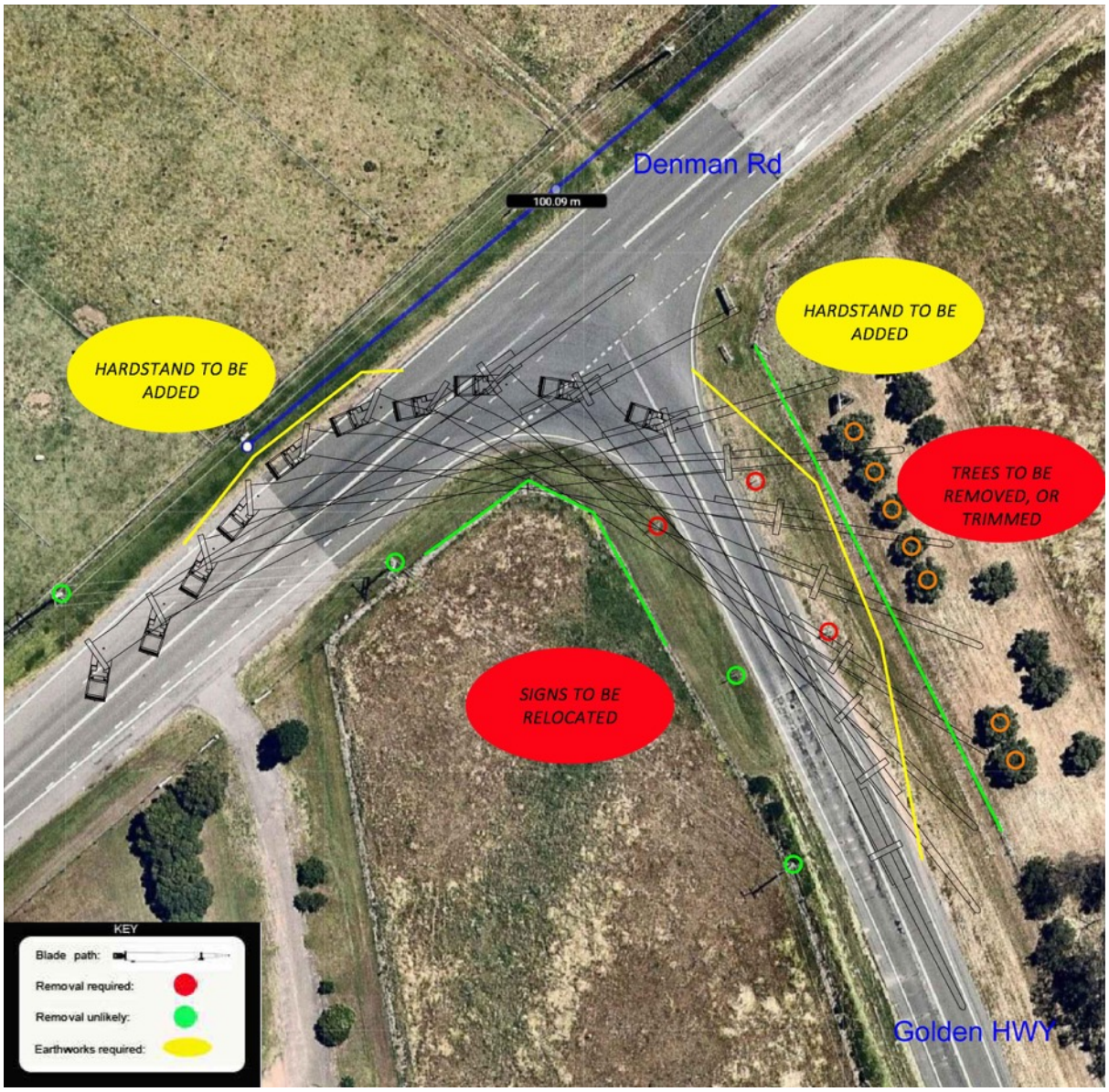
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Ys3yKZ6vQs62

COMMENTS: Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added, additionally some trees will need to be trimmed/removed. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Moderate amounts of work are required.

131.9 Km's: Golden Highway intersection with Denman Road at Denman.

Image 1:



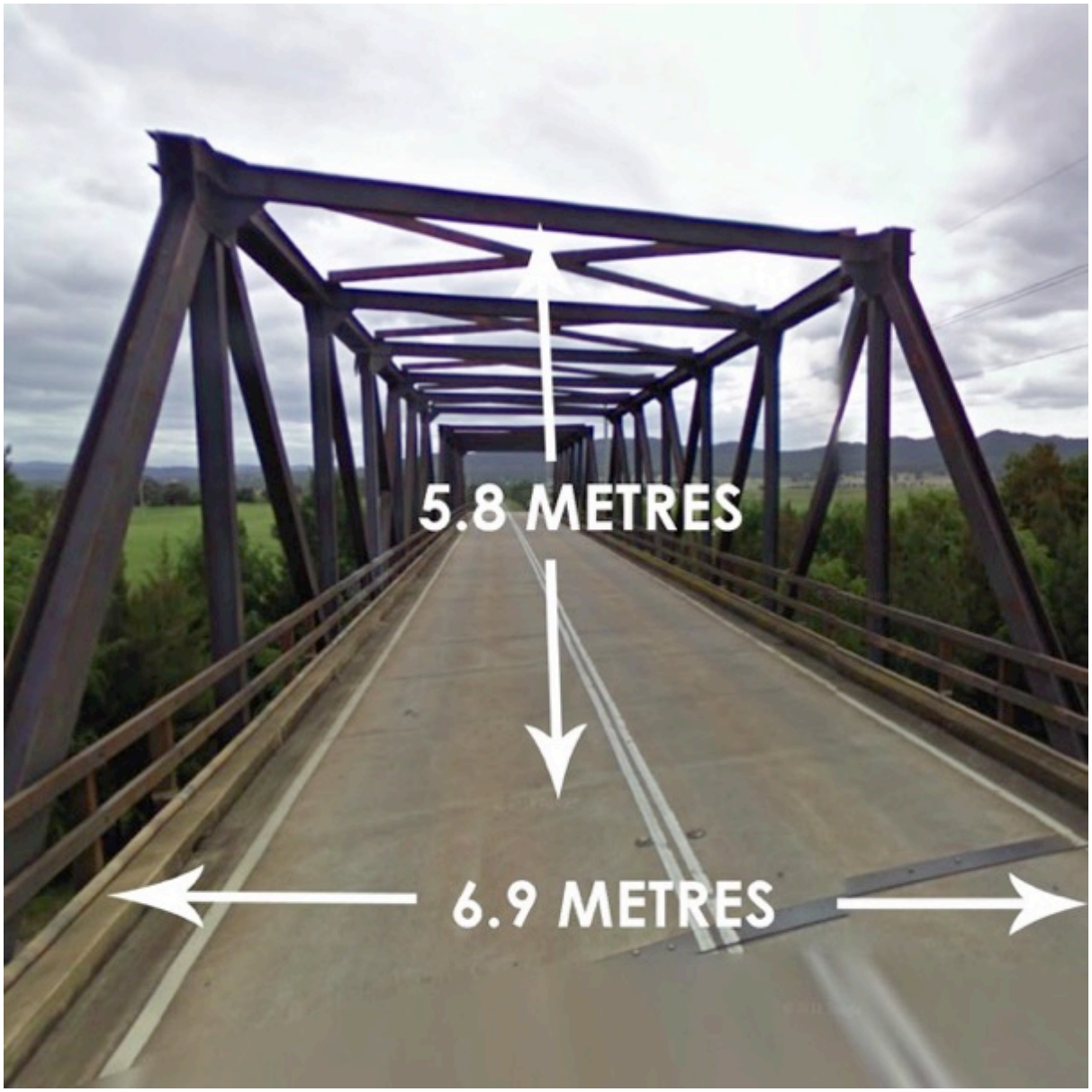
PROCEDURE: Left hand turn from the Golden Highway at the intersection of Denman Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/T4m46bBNuro

COMMENTS: Blades to cross from the incorrect side to the incorrect side. Some signs will need to be made removable and some hardstand added to the inside and outside of the corner. Some trees will also need to be trimmed/removed from a landowners property. Police and escorts to control local traffic either side of the intersection.

ROAD MODIFICATIONS: Large amounts of work are required.

132.8 Km's: Denman Bridge.



PROCEDURE: Travel over the bridge.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/UToXyFe3QKu

COMMENTS: A width of 6.5 metres and a height of 5.6 metres should not be exceeded of this structure. If loads are over these dimensions than they may detour the bridge via Bengalla and Wybong Roads.

137.9 Km's: Denman Rail crossing.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/r7x7Qc685d82

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

291.0 Km's: Golden Highway rail crossing at Dunedoo.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/wsyNKfcoAij3SosY9

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

291.1 Km's: Golden Highway intersection with Wargundy Street at Dunedoo.

Image 1:

PROCEDURE: Right hand bend on the Golden Highway at the intersection of Wargundy Street.

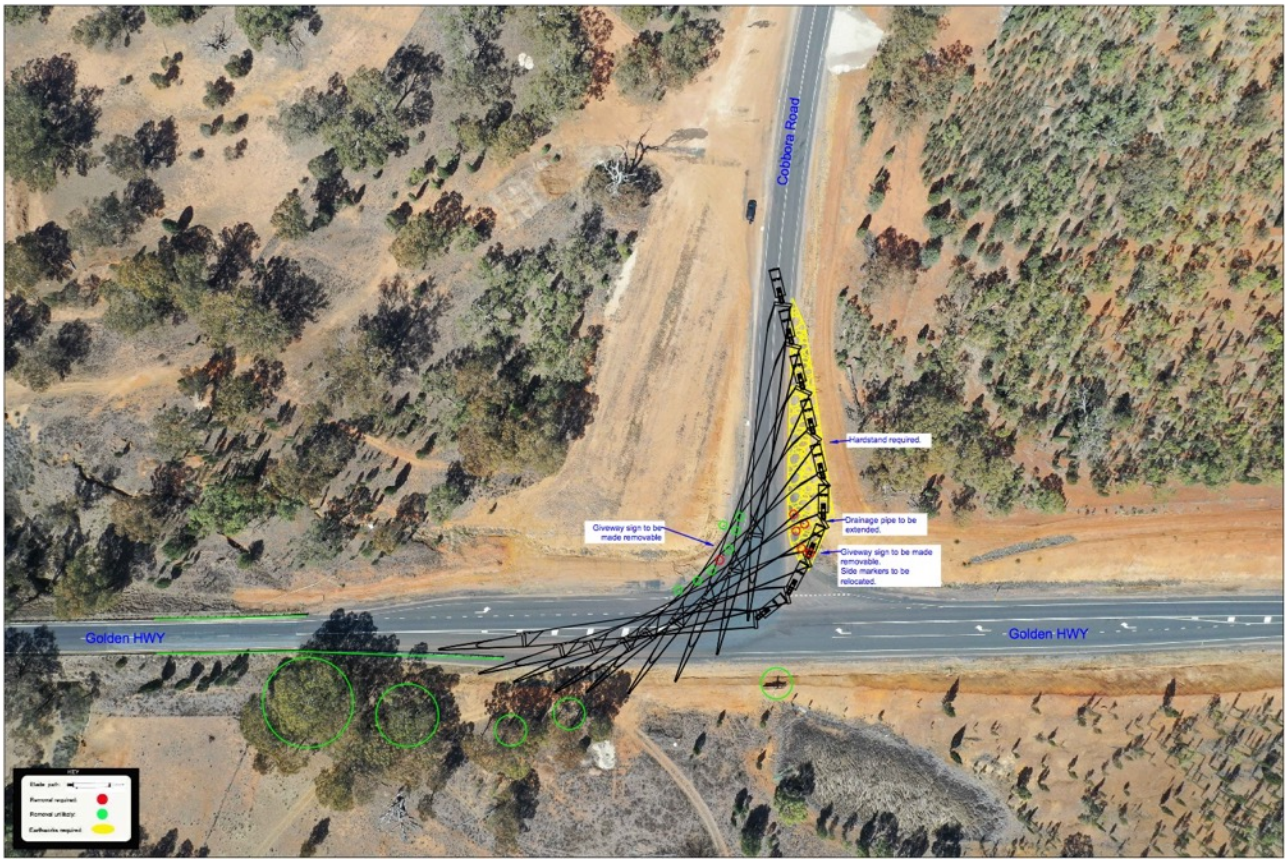
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/WzACUHey3jYadj1K7

COMMENTS: The blades will travel around the corner from correct side onto the correct side.

ROAD MODIFICATIONS: A no parking area will need to be placed on the exit of the corner.

325.4 Km's: Golden Highway onto Cobbora Road at Elong Elong.

Image 1:



PROCEDURE: Left hand turn from the Golden Highway onto Cobbora Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/XSoTDVA8TZwNsGo47

COMMENTS: Blades to turn from the incorrect side to the incorrect side.

ROAD MODIFICATIONS: Hardstand is required on both sides of the road. Drainage works are required on the outside of the corner. Some side markers will need to be relocated, and 2 signs made removable.

375.7 Km's: Cobbora Road Rail crossing at Wellington.

PROCEDURE: Travel over crossing.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/oPmj2bbBpPTHJYtF6

COMMENTS: Large width clearance and good ground clearance over this crossing.

NOTE: ARTC approval will need to be obtained to travel over this crossing. Likely to cross with caution, no escort required.

375.8 Km's: Cobbora Road onto Mitchell Highway at Wellington.

Image 1:

PROCEDURE: Left hand turn from Cobbora Road onto the Mitchell Highway.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/Y9WRnEdpCEsfWPHBA

COMMENTS: Blades to turn from the incorrect side to the incorrect side.

ROAD MODIFICATIONS: Hardstand will be required on the inside of the corner, and a giveaway sign will need to be made removable.

378.3 Km's: Mitchell Highway onto Goolma Road at Wellington.

Image 1:

PROCEDURE: Left hand turn from the Mitchell Highway onto Goolma Road.

GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/nWHNN3pzCvpzp7ag8

COMMENTS: Blades to turn from the incorrect side to the incorrect side.

ROAD MODIFICATIONS: Hardstand will be required on the outside of the corner, and several signs relocated or made removable. Additionally, 2 x light poles will need to be relocated.

395.0 Km's: Twelve Mile Road into Primary site entrance at Uungula.

Image 1: (Looking south from Twelve Mile Road)

PROCEDURE: Right hand turn from Twelve Mile Road into Primary site entrance.
GPS LINK FOR SECTION OF ROAD: https://goo.gl/maps/VW6Np4Vhtwo
COMMENTS: Site entrances to be made suitable for the swept path of the largest loads.
ROAD MODIFICATIONS: Large amounts of works are required.

13.0 Conclusion: (82 Metre blade)

After studying all options and undertaking a route survey, we believe with a large amount of upgrades between Newcastle and Uungula, the listed loads may travel the route from the port to Twelve Mile Road.

PORT:

The port has an excellent Break bulk berth that runs at approx. 60% berth occupancy.

The berth has axle and crane loadings well above what is required for this project.

The storage area is asphalt hardstand with a current area of 100,000 s/q metres available, all level. It is adjacent to the port, and within 300 metres of the berth, all within the Port grounds. No local roads need to be used during the discharge.

Access to the local roads from the port is while require some upgrades, including adding hardstand and relocating fences.

NEWCASTLE:

The intersection of George Street and Industrial Drive at Mayfield looks to be the most difficult corner. It is recommended that the area south of the intersection is filled with hardstand to allow a straighter run into the corner. Additionally a traffic signal would need to be relocated.

The turn from Industrial Drive onto Maitland Road will require the centre median strip to be lowered in height.

HUNTER EXPRESSWAY:

The blades will not make it around the roundabout from John Renshaw Drive onto the Hunter Expressway. The largest blade that could make the turn on the correct side is 65 metres in length. For blades over 65 metres it is likely that traffic control/Police would be required to block the eastbound lanes of the Hunter expressway while the blades travel down the incorrect side before crossing over at the centre crossover point.

NEW ENGLAND HIGHWAY ONTO THE GOLDEN HIGHWAY:

This corner is currently in the design stage of modifications. The existing corner would need a moderate amount of works to allow the blades a suitable swept path. It is recommended that the project keep a close eye on any potential changes that may affect the blades swept path around the corner.

THE GOLDEN HIGHWAY:

Several corners would need to have a moderate to large amount of modifications. Additionally the blades will need to travel onto the incorrect side of the Golden Highway for approx. 400 metres. This will require the police escorts to hold all eastbound traffic on the Golden Highway. Roadwork's are programmed to take place on this route over the next few years, so it is recommended that the client discuss upcoming road projects with Transport NSW.

DUNEDOO:

A no parking area needs to be placed on a corner.

COBBORA ROAD:

The corner from the Golden Highway onto Cobbora Road will need a large amount of works. This will include a moderate amount of hardstand to the outside of the corner and relocating a drainage pipe. Additionally, some works rea required relocating side markers and making 2 signs removable.

Once onto Cobbora Road it is asphalt pavement for the entirety, which is generally in good condition. There is a small section that is rough, but passable. There is a pavement width of generally 6.0 metres for the entirety.

The swept path along Cobbora Road is okay in its current form.

The road has 2 floodway's and 2 crests that appear suitable, but a survey is recommended to confirm suitability.

The turn from Cobbora onto the Mitchell Highway requires some hardstand to the inside of the corner and 1 sign to be made removable.

WELLINGTON:

The turn from the Mitchell Highway onto Goolma Road will require Hardstand to be added on the outside of the corner, and several signs relocated or made removable. Additionally, 2 x light poles will need to be relocated.

TWELVE MILE ROAD:

The corner from Goolma Road onto Twelve Mile road will require the blades to travel to the incorrect side of the road and travel directly ahead onto Twelve Mile Road. Once onto Twelve Mile Road it is asphalt pavement up until the site entrance. The pavement is in fair condition with a surface width of generally 5.0 metres. Sections of this road will require tree trimming and possible removal for the swept path of the blade, and also the height of the towers. A thorough survey is recommended on this section of road for vertical clearance and additional swept path analysis.

ROADWORKS:

Roadworks are likely to be continuous on any route within NSW, as this is common practice. Some roads will just have general maintenance, and resealing, while other sections will have complete realignment. It is recommended that the project discuss any major works well in advance with the authorities.

BRIDGE CROSSINGS:

There are multiple bridges on this route that will need to be assessed. On our current data we believe the loads will have no problems up until the turnoff from Goolma Road onto Twelve Mile Road. All bridges from Twelve Mile Road through to the site entrance would need to be assessed for axle loadings.

OVERHEAD STRUCTURES:

The lowest structure on this route are overhanging traffic signals, the lowest of these is 5.4 metres high, but these signals can be avoided by passing them to the side. The lowest fixed structure is a gantry at Hexham. Loads over 5.2 metres are to pass to the side of the traffic signals. The lowest structure that cannot be detoured is the traffic gantry on the New England Highway at Hexham. A loaded height over 5.9 metres cannot travel on this route.

Denman Bridge is 5.7 metres in height. A loaded height of 5.6 metres should not be exceeded. Loads that exceed 5.6 metres will need to detour this structure.

OVERHEAD WIRES:

This route would need to be assessed to handle a loaded height of up to 5.9 metres. It is likely that there are wires that will need to be raised for loads over 5.2 metres in height.

RAIL ASSETS:

There are a number of rail crossings on route that will require approval from authorities before loads can be approved to cross. These structures locations are listed in the route index.

FLOODWAYS:

There are a couple of floodway’s on Cobbora Road and Twelve Mile Road that will need to be checked for vertical curve.

PAVEMENT:

The road up to Twelve Mile Road is of Highway standard and would not require any work. Twelve Mile Road up to the main site entrance also looks suitable, however this road may need to be monitored and serviced for wear.

VEGETATION:

Several intersections between the port and Twelve Mile Road will require tree removal. These are listed in the index. A thorough survey needs to be done on Twelve Mile Road to see the extent of the works through this section.

VERTICAL CURVE:

A thorough survey needs to be done to see the extent of the works on Cobbora Road and Twelve Mile Road.

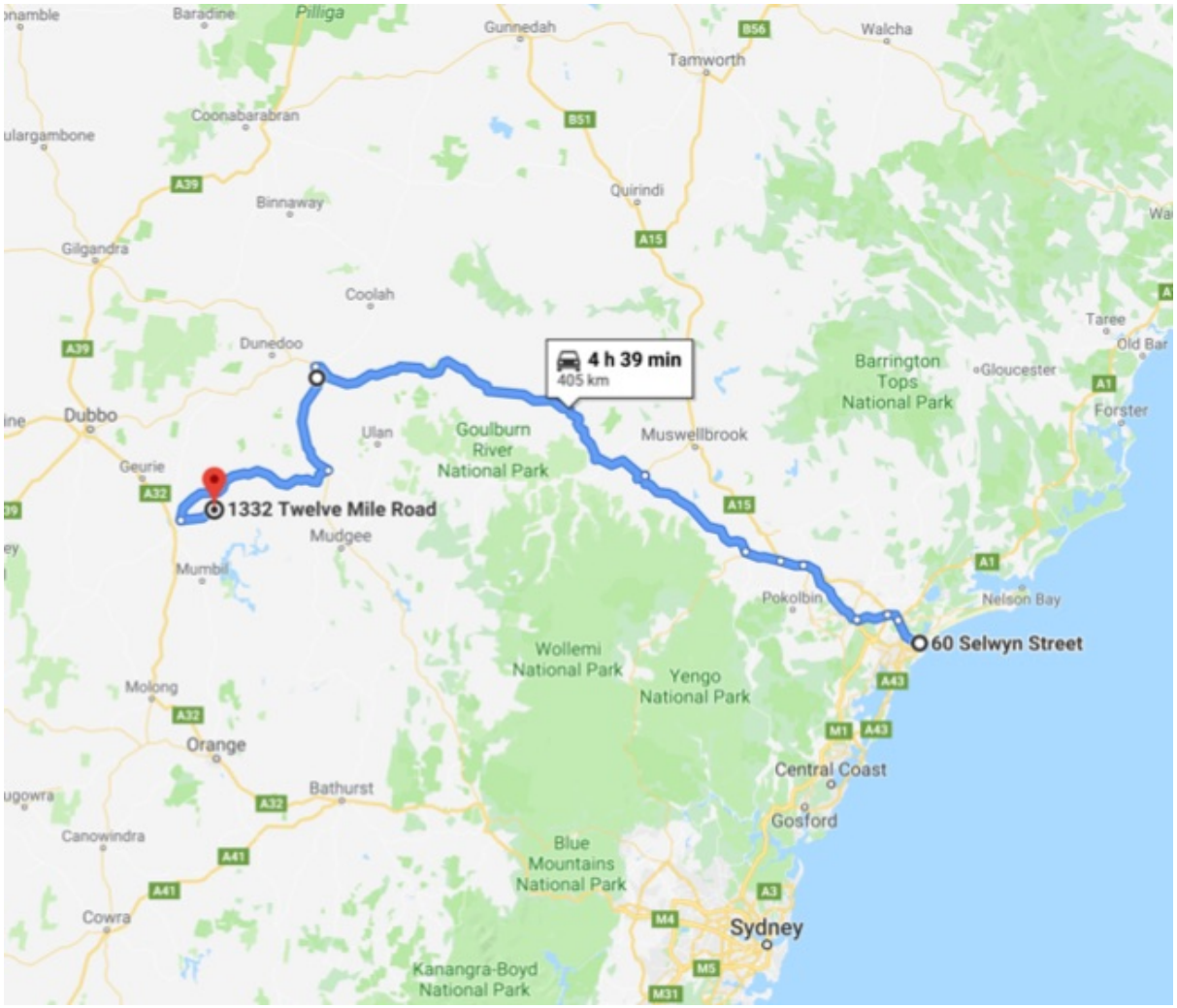
14.0 Route Survey (Remaining components): Newcastle Port to Uungula

After completing this route survey, we believe the following is the most suitable option.

This route took us via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Castlereagh Highway, Goolma Road, Twelve Mile Road.

Distance: **(405.0 kilometres)**

GPS link: https://goo.gl/maps/ihF6g8xn7coCAhzt8



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ROUTE STUDY
Newcastle to Uungula windfarm

KEY	
CRITICAL	
CAUTION	
EMERGENCY PARKING	

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
Route Index					
0.0	Mayfield	Mayfield #4 berth onto Selwyn Street GPS link: https://goo.gl/maps/afLwPYKuNdm	50.0 metres clearance	Moderate right hand turn	No problems with this section of road.
0.4	Mayfield	Selwyn Street rail crossing GPS link: https://goo.gl/maps/AmohE54hKSz	9.0 Metres wide	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
1.3	Mayfield	Selwyn Street onto George Street GPS link: https://goo.gl/maps/gXeHvBtCp4D2	70.0 metres clearance	Right hand turn	No problems with this section of road.
1.4	Mayfield	George Street onto Industrial Drive https://goo.gl/maps/s4ayrsuoAsD2	70.0 metres clearance	Right hand turn	No problems with this section of road.
4.9	Mayfield	Industrial Drive under traffic signals GPS link: https://goo.gl/maps/YmqhiS2iR582	5.4 Metres clearance	Travel directly ahead	The lowest traffic signal on route is at the intersection of Steel River Blvd. Trucks that exceed 5.3 metres will need to travel in the right hand lane.
5.5	Mayfield West	Industrial Drive onto Maitland Road GPS link: https://goo.gl/maps/Kn49dhWG2qG2	70.0 metres clearance	Right hand turn	No problems with this section of road.
6.4	Sandgate	Maitland Road over rail bridge GPS link: https://goo.gl/maps/W2JWWjhfqv5UMviB7	9.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
13.9	Hexham	New England Highway under gantry GPS link: https://goo.gl/maps/YTMoFe7Aick	5.95 metres high	Travel directly ahead	This is the lowest structure on route. There is no bypass around the gantry. A maximum loaded height of 5.9 metres should not be exceeded.
15.1	Tarro	New England Highway over rail bridge GPS link: https://goo.gl/maps/tTnWLwQC2hzSPhAp6	7.0 metres width clearance	Travel directly ahead in the right-hand lane	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
17.4	Tarro	New England Highway onto John Renshaw Drive GPS link: https://goo.gl/maps/SRDr5JigkBp	100.0 metres clearance	Left hand merge	No problems with this section of road.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
18.4	Beresfield	John Renshaw Drive GPS link: https://goo.gl/maps/N19vJih1Fgr	Overhead traffic signals: 5.9m high	Travel directly ahead	No problems with this section of road.
28.7	Buchanan	John Renshaw Drive onto the Hunter Expressway GPS link: https://goo.gl/maps/1STJ1PfQt9E2	65.0 metres clearance	Right hand turn	Continue around the roundabout and take the third exit onto the Hunter Expressway. No problems with this section of road.
58.9	Branxton	The Hunter Expressway onto The New England Highway GPS link: https://goo.gl/maps/7rauNuxzqjq	12.0 Metres wide	Travel directly ahead	No problems with this section of road.
67.3	Whittingham	The New England Highway onto the Golden Highway GPS link: https://goo.gl/maps/nAnfkYfeUn42	12.0 Metres wide	Left Hand turn	No problems with this section of road.
67.4	Whittingham	Golden Highway GPS link: https://goo.gl/maps/R86RFuPnmFU2	115.0 x 9.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
68.0	Whittingham	Golden Highway over rail bridge GPS link: https://goo.gl/maps/5NwDQofandvvMKfY9	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.3	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/qTxSbkxPu87L5hx4A	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
77.4	Mount Thorley	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/7hQdEmK1EgE2	85.0 metres clearance	Left hand turn	No problems with this section of road.
77.5	Mount Thorley	Golden Highway GPS link: https://goo.gl/maps/zGvdupDuixx	100.0 x 10.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
80.6	Mount Thorley	Golden Highway over rail bridge GPS link: https://goo.gl/maps/ipGU4USXmWZ8GkJs6	9.0 metres width clearance	Travel directly ahead in the centre of the road.	Approval from Rail company required to cross this structure. Travel over this structure may have specific conditions.
80.8	Mount Thorley	Golden Highway intersection with the Putty Road GPS link: https://goo.gl/maps/VyA42n1CqZx	45.0 metres clearance	Right hand turn	No problems with this section of road.
98.0	Warkworth	Golden Highway GPS link: https://goo.gl/maps/Y6V6EXaCwxq	100.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.

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KM index	Location	Section of road	Critical Measurement	Procedure	Notes
107.0	Jerrys Plains	Golden Highway through Jerrys Plains village GPS link: https://goo.gl/maps/WgSCRsJ9ZGt	75.0 metres clearance	Left hand than right hand turn	No problems with this section of road.
126.0	Ogilvy	Golden Highway GPS link: https://goo.gl/maps/58Tj9ojs7CC2	6% gradient	Travel directly ahead	This section of road has a steep mountain range that will require additional pull trucks to assists loads that exceed 80T gross weight. Additionally, the NSW Government is currently upgrading this section of road. It is recommended that you monitor the progress of the upgrades, and that any changes are thoroughly looked at.
131.9	Denman	Golden Highway onto Denman Road GPS link: https://goo.gl/maps/sf4PNnycxB32	65.0 metres clearance	Left hand turn	No problems with this section of road.
132.8	Denman	Golden Highway over Denman Bridge GPS link: https://goo.gl/maps/UToXyFe3QKu	5.8 Metres height clearance 6.9 Metres width clearance	Travel directly ahead in the centre of the lane	A width of 6.5 metres and a height of 5.6 metres should not be exceeded of this structure. If loads are over these dimensions than they may detour the bridge via Bengalla and Wybong Roads.
137.9	Denman	Golden Highway rail crossing GPS link: https://goo.gl/maps/r7x7Qc685d82	65.0 metres clearance	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.
150.1	Sandy Hollow	Golden highway GPS link: https://goo.gl/maps/2THBuV165xx	50.0 x 4.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
161.2	Gungal	Golden highway GPS link: https://goo.gl/maps/WDoL2LfeCoP2	70.0 x 6.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
184.8	Merriwa	Golden highway GPS link: https://goo.gl/maps/NqrWzTsRmnt	100.0 x 5.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
234.0	Cassilis	Golden highway GPS link: https://goo.gl/maps/vs6YMT6TxCA2	200.0 x 8.0 metres	Parking Bay	Suitable parking for Fatigue breaks.
282.0	Leadville	Golden highway onto the Castlereagh Highway GPS link: https://goo.gl/maps/aJMXknfMmuH2	65.0 metres clearance	Left hand turn	No problems with this section of road.
292.8	Birriwa	Castlereagh Highway rail crossing GPS link: https://goo.gl/maps/BTrCz8VaeLN2	65.0 metres clearance	Travel directly ahead	Loads to travel over the crossing in the center of the road. Approval required crossing this line, likely cross with caution.

KM index	Location	Section of road	Critical Measurement	Procedure	Notes
324.4	Gulgong	Castlereagh Highway onto Goolma Road GPS link: https://goo.gl/maps/US53QJHQ6R92	65.0 metre clearance	Right hand turn	The longest towers will require the signs removed and replaced in the centre islands.
330.8	Gulgong	Goolma Road intersection of Guntawang Road GPS link: https://goo.gl/maps/r511gpBpRzN2	65.0 metres clearance	Right hand turn	No problems with this section of road.
391.7	Wellington	Goolma Road onto Twelve Mile Road GPS link: https://goo.gl/maps/Ajjk5pVCQCn	50.0 metres clearance	Left hand hairpin turn	The towers will travel around the corner from incorrect side onto the incorrect side. Some fill is required on the inside and outside of both corners, and some signs made removable
391.7 to 405.0	Wellington to Uungula	Twelve Mile Road GPS link: https://goo.gl/maps/6eF9vF51JYvr6taA8	65.0 Length 5.0 Pavement width 5.5 Overall width 4.6 Height clearance	Travel directly ahead through winding sections of road with several moderate inclines and declines	Twelve Mile Road is asphalt pavement up until the proposed site entrance. The pavement is in fair condition with a surface width of generally 5.0 metres. Sections of this road will require tree trimming/removal for the swept path of the blade, and also the height of the towers. A survey is recommended on this section of road for vertical clearance and swept path.
405.0	Uungula	Twelve Mile Road into Primary site entrance GPS Location: https://goo.gl/maps/VW6Np4Vhtwo		Right hand turn	Site entrance to be made suitable for the swept path of the largest loads.

15.0 References:

RMS 2008 Version 2: Operating Conditions: Specific permits for oversize and overmass vehicles and loads
Rex Andrews Engineered Transportation Pty. Ltd.
CWP Renewables
Route Survey LL260REV00.
Google Earth/Maps
Nearmaps
NHVAS Maintenance Management (NHVAS21193)
NHVAS Basic Fatigue Management (NHVAS21193)

Disclaimer: This route study is a guide only; government approvals would be required before these routes could be deemed suitable for transporting the components over the listed routes.

This study was undertaken using data supplied by Rex J Andrews P/L. Equipment and swept paths might vary if using transport methodology other than the data supplied by Rex J Andrews.