WOOD & GRIEVE ENGINEERS

Infrastructure Servicing Report for the proposed Cockburn Coast Development

for

LandCorp
Attention: Sergio Famiano

May 2011

Revision No. 4

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Introduction

Wood & Grieve Engineers were commissioned by LandCorp to provide information on the existing infrastructure and required servicing infrastructure for the Cockburn Coast project. Currently a process of more detailed planning is being carried out by Hassell's consultant team and this will occur over the next twelve months or so.

This report has been prepared to provide information on the servicing infrastructure in the area and its implications for the development and detailed planning.

This report is designed to inform the Project Team and Manager regarding the current state and knowledge of the existing infrastructure and the likely upgrading of servicing infrastructure required for the project to proceed to a first stage and beyond. Other reports will comment on the transportation infrastructure and specific Cockburn Road and Cockburn Drive issues, timing and costings.

The report provides information of rough infrastructure upgrade costings where an estimate can be made and also details likely staging/timing of infrastructure upgrade requirements.

The report provides information on existing servicing infrastructure in the area. Overlaying the likely development scenario accommodating an additional 10,000 people within the development area, we have looked at likely upgrades required to accommodate this development.

We also make comment on the detailed planning implications for infrastructure upgrades.

1 Existing Infrastructure

1.1 General

The development area is defined by the current approved DSP as shown in Figure 1. The DSP provides targets for development (among others) of:

- 10,000 new residents
- 4,850 dwellings
- Minimum 20% affordable housing
- Minimum 33% low rise apartments
- Minimum 31% med-to-high rise apartments (ie ≥ 6 storeys).

It is also the intention of the development to reduce water consumption and greenhouse gas production by 30%-40% of current 'standard' developments.

Existing servicing infrastructure within the area will be discussed within this section on a service by service basis.

1.2 Sewerage

The development area currently has a number of lots which are served by a reticulated gravity sewer system. The current Water Corporation Sewer Strategy for the area is shown in Appendix 1. Water Corporation base sheets showing existing sewer infrastructure in the area are included in Appendix 2.

The existing system consists of the following:

- Gravity sewer lines serving all existing lots in the area. Typically pipe sizes are 225mm ∅.
- Sewer pumping station – pipework gravitates to this pump station which exists near the corner of Rollinson Road and Bennett Avenue.

  The pumping station is a major installation and accepts flows from other stations in the Fremantle area. It pumps flows ultimately to the Woodman Point Wastewater Treatment Plant.
- Sewer pressure main – the pump station pumps flows in a 525mm RC pressure main to the wastewater treatment plant. The route is shown on the Water Corporation base plans, but follows major roads as much as possible and Cockburn Road to the south of the development area.
- Emergency Ocean Outfall – the pumping station would be designed to retain sewer flows on site for a certain time (typically 3 hours) in case of station failure. Further to this, in an emergency it is required to discharge flows safely. As such a gravity ocean outfall main of 610mm ∅ cast iron pipe exists as shown on the drawings. This discharge line would only operate in an emergency situation.

All sewerage infrastructure is owned and operated by the Water Corporation. All serviced lots in the area would be rated and pay an annual charge. Industrial uses may have specific agreements in place with the Water Corporation.

1.3 Water Supply

As in the case of sewer infrastructure, all lots within the development area are served with reticulated potable water supply delivered by a piped system which exists within existing road reserves. The extent of this system is shown on water supply plans attached at Appendix 3.

All existing lots are served in accordance with minimum Water Corporation criteria regarding quality and pressure.

Water supply is served from the Hamilton Hill high level tank and supply area. All water supply assets are owned and operated by the Water Corporation of WA. Lots within the area would be rated by the Water Corporation.

1.4 Roadworks

Existing lots within this development area are fronted by a sealed and kerbed roads system. The main through road is Cockburn Road which carries traffic into and out of the area. Cockburn Road is the main freight route for existing commercial business in the area.

All major services at one point or another exist within the Cockburn Road road reserve.

The integrated Transport Network report and further traffic studies being undertaken by others informs the project more fully on roads and transportation issues and plans.

1.5 Drainage

Lots within the Cockburn Coast area deal with their on site drainage typically by direct infiltration. The natural poorly graded sands offer the ideal medium to enable this to occur.

Roadworks within the development area are served with normal pipe and pits to collect drainage. Run off is conveyed to infiltration areas within the area.

Typically these are old fashioned 'sump' areas which include fairly deep disposal sites, steeply sided and link mesh fencing. These disposal/drainage areas are maintained by the City of Cockburn.

1.6 Power Supply

The location of existing power supply HV infrastructure is shown within the Western Power Report at Appendix 4. There are three 22kV feeders within the vicinity of the development:

- AMT512 Lefroy Road (Yellow)
- AMT507 346 Orsino Boulevard 1 (Pink)
  both of these are fed from the Amherst Zone Substation.
- SF505 Cockburn Road North (Blue)
  which is fed from the South Fremantle Substation.

The majority of the development area is within the Amherst Zone Substation catchment area.

1.7 Telecommunications

The existing area is extensively served by the Telstra Network. A plan showing existing infrastructure is included in Appendix 5.

All existing lots have access to a land line service as well as mobile phone coverage.

1.8 Gas

WA Gas Networks own and operate an existing gas reticulation network in the area. They currently have supply mains in the existing road reserves and supply existing premises and properties. A high pressure gas main is located within Cockburn Road which is the main gas infrastructure asset in the area.

An existing services gas plan is attached in Appendix 6.

2 Service Infrastructure to Support Development

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2.1 General

This section of the report looks at what servicing infrastructure will be required to support the proposed development.

We have looked at servicing infrastructure only. Transportation issues are the subject of other reports being prepared by transportation specialists.

In order to ascertain the level of infrastructure required, we have based the scale of development on the approved DSP. As such, the development will be primarily of a medium to high density residential nature. It is proposed to have a full development of approximately 5,000 new dwellings accommodating over 10,000 people. The development will also include employment opportunities, commercial areas and activity areas.

Based on these raw figures, we have assessed the level of infrastructure required and how this can be achieved.

2.2 Sewerage

Water Corporation has recently reviewed their detailed strategy for sewer planning over the area. The major sewer infrastructure in the area is the Bennett Avenue wastewater pumping station and rising main. It is proposed to do an initial upgrade to the Bennett Avenue WWPS to increase the pumping rate to 260l/s. This is provisionally planned to occur in the 2012/13 financial year. Further pump rate upgrades are not expected to be needed until after 2030.

The existing pressure main from the Bennett Avenue pumping station heads to the south and east to discharge into the Spearwood main sewer. The existing Dn500 pressure main is provisionally indicated for replacement with a DN700 (or possibly duplication) around 2040 which would coincide with the Bennett Avenue pumping station being upgraded.

The rising main route would need to be within road reserves and a majority of the route would need to be accommodated within Cockburn Road.

As part of the development of the area normal extension of the existing gravity system would occur such that all lots within Cockburn Coast area would be provided with a gravity sewer catchment.

The existing sewer pumping station will remain and be upgraded as required. Due to the size of the pump station, a buffer area of 50m from the wet well has been allowed for odour/noise control requirements. Typically this buffer area would be Water Corporation land, road reserve and/or POS area. Currently LandCorp, stakeholders and Water Corporation are in discussions regarding the actual buffer to be achieved. Recent Water Corporation modeling indicates that peak pump rate may ultimately be more than the 350 l/sec which would indicate a greater buffer.

The future possibility of having to duplicate the rising main will require reviewing Cockburn Road verges to ensure enough spare capacity is in place. In particular, the revised Cockburn Road may require sufficient width to accommodate such a significant pressure main.

An emergency outfall main DN600 exists from the sewer pumping station. This outfall will be required to remain, or at least be diverted. As such planning should attempt to locate future road reserves and/or other public land uses over the main in order to minimise relocations and hence cost. Any change to the emergency outfall would be at the cost of the development.

2.3 Water Supply

Water supply planning for the Cockburn Coast development indicates the following:

- Ultimate development will place a significant demand on the Hamilton Hill Gravity Scheme.
- In order to service the total development, the DN600 water distribution main in Forrest Road will be required to be extended at least up to Cockburn Road. This would be a DN600 water main.
- A possible route along Rockingham Road, Bellion Drive through to Cockburn Road is likely to be used, but obviously subject to detailed design and planning.
- The Forrest Road DN600 extension would be required when the capacity of the Lefroy Road DN600 is exceeded due to excessive head loss and is unable to meet required customer demands.
- To service developments along and either side of Cockburn Road heading south, a DN400 main is required south of Rollinson Road. This may be able to reduce to DN300 after about 1km depending on the demands and detailed subdivisional planning.

In order to more clearly ascertain likely timing of water supply infrastructure upgrades, the Water Corporation intend to undertake field pressure testing on the Lefroy Road DN600 main over the summer of 2010/11. The Corporation is also undertaking a review of the Hamilton Hill gravity and high level scheme,

It is worth noting that the Water Corporation modeling is based on historical water supply useage. The express brief for this development is to a medium to high density zoning as well as being very water efficient. As such, we believe this will feed into the development using significantly less water than the Water Corporation modeling indicates.

All current and future potable water supply mains will exist in road reserves. Therefore, the only specific planning implications are for road reserves to be wide enough to accommodate all services. In particular, Cockburn Road will need to be checked that it can accommodate all current and proposed infrastructure.

Costs for the installation of water supply headworks items would be levied in accordance with Water Corporation policy. Costs may need to be prefunded depending on development strategy.

2.4 Roadworks

Major roadworks infrastructure consists of two main elements for the Cockburn coast area, namely:

- Cockburn Coast Drive; This main road may be constructed outside of the 10 year horizon and would likely be decided by State Government and/or Main Roads WA as to the need and timing. It is shown to the immediate east of the Cockburn Coast development area.
- Cockburn Road; This road is the current north-south artery through the development area. It will remain as an important transportation link. It is likely that Cockburn Road will be upgraded as part of the development process. The exact form of the upgrading works will depend on the final configuration of the integrated transportation plan, existing road user requirements and City of Cockburn requirements. Upgrading of Cockburn Road may also include the relocation of existing services within the existing and/or future reserve boundaries. Currently many services exist within the Cockburn Road verges.

We envisage that the transportation studies will inform what roadworks and road widths are required. From a services point-of-view the main issue will be in the design of Cockburn Road. In addition to providing transportation solutions such as bus lanes or light rail, the road reserve will be required to accommodate servicing infrastructure. The aim of Cockburn Road's design should be to ensure a minimum of existing services are disturbed or require relocation. Due to the nature of services along Cockburn Road, any servicing relocations would be relatively costly to implement.

2.5 Drainage

Currently all rain that falls within the Cockburn Coast development area is infiltrated on site. Upon development we would require the same situation to occur. As such, all new lots would be required to infiltrate their rainfall runoff on site up to a certain return period (probably 1 in 5 years).

Flows greater than this and all roadworks would be pipe and pit drained. These flows would be directed to infiltration areas. Our expectation is that the existing drainage sumps would be phased out and aesthetically pleasing infiltration areas incorporated within POS areas and highly landscaped areas would take their place.

Landscaping and engineering design of the new infiltration areas will be critical in that it can turn existing ugly infiltration areas into POS assets.

2.6 Power

Western Power have carried out a feasibility study looking at how the development may be served with a power supply from now until ultimate development from a distribution point of view.

Geographically SF505 is an ideal feeder to supply the initial stages of development, However, this feeder has high fault ratings and is not recommended due to it's poor reliability. It is noted that the South Fremantle sub-station may be relocated in future and it is planned not to have any distribution feeders from this sub-station. As a result, SF505 may not exist in the future.

AMT507 L346 Orsino Boulevard runs through Cockburn Coast south along Cockburn Road and is currently lightly loaded. It may be utilised to supply the initial stages. However, AMT507 was initially installed to primarily supply Port Coogee. When Port Coogee requirements increase over time, this feeder may not have enough capacity to cater for any significant Cockburn Coast load.

AMT512 Lefroy Road feeder is considered one of the critical feeders due to it's limited capacity and various reliability issues. Western Power currently has a project planned to install a new feeder in order to transfer some load from the AMT512 feeder. The project is likely to be implemented after July 2011.

In summary:

- Planning study indicates that the existing feeders within the vicinity are likely to not be able to supply the total load.
- AMT507 may be able to supply the initial stages of development, but this is dependent on the load take up timing of the Port Coogee development.

Ultimately a new feeder is likely to be required to be installed from the Amherst sub-station to the development area. It is also likely that major reinforcement will be required for both transmission and distribution assets to increase capacity.

The order of magnitude cost of installing a new feeder is approximately $1.4 million.

Further discussion with Western Power following their feasibility study indicates a sub-station may be required within the Cockburn Coast area. A sub-station typically requires a land area of 1 hectare and hence has land planning implications. Western Power is addressing this possible requirement in conjunction with the Terminal Substation relocation.

Installation of a new feeder is proposed to occur by direct horizontal drilling within existing road reserves. Hence, future road reserves need to take into account the installation of HV infrastructure.

Existing power supply infrastructure in Cockburn road indicates that underground power cables adjacent to Cockburn Road are within private property. As such, the planning of the revised Cockburn Road reserve needs to accommodate these cables so that expensive relocations do not occur.

2.7 Telecommunications

Telstra landline telecoms system in the areas exists to a reasonable level.

The newly announced National Broadband Network (NBN) would be involved in the provision of telecommunications for the development area. Current policy is that for developments greater than 100 dwellings the NBN will provide optic fibre to each dwelling. The developer will be required to provide pipe and pit for each stage of development in accordance with NBN specifications.

This infrastructure would ensure a very high level of connectivity for the development.

3 Planning Implications

3.1 General

In order to finalise more detailed planning of the individual sub-areas within the approved DSP, a knowledge of infrastructure requirements is important. Some future infrastructure requirements will result in land planning issues. As we are currently in detailed planning for the sub-areas of the approved DSP, it is relevant that implications of infrastructure provision be made at this stage so they can be incorporated in the final planning.

Following, we discuss planning implications for the infrastructure provision for each service.

3.2 Sewerage

The existing sewer pumping station will remain and be upgraded as required. Due to the size of the pump station, a buffer area of 50m from the wet well has been allowed for odour/noise control requirements. Typically this buffer area would be Water Corporation land, road reserve and/or POS area. Currently LandCorp, stakeholders and Water Corporation are in discussions regarding the actual buffer to be achieved. Recent Water Corporation modelling indicates that peak pump rate may ultimately be more than the 350 l/sec which would indicate a greater buffer.

The future possibility of having to duplicate a DN600 rising main will require reviewing Cockburn Road verges to ensure enough spare capacity is in place. In particular, the revised Cockburn Road may require sufficient width to accommodate such a significant pressure main.

An emergency outfall main DN600 exists from the sewer pumping station. This outfall will be required to remain, or at least be diverted. As such, planning should attempt to locate future road reserves and/or other public land uses over the main in order to minimise relocations and hence cost. Any change to the emergency outfall would be at the cost of the development.

3.3 Water Supply

All current and future potable water supply mains will exist in road reserves. Therefore, the only specific planning implications are for road reserves to be wide enough to accommodate all services. In particular, Cockburn Road will need to be checked that it can accommodate all current and proposed infrastructure.

Costs for the installation of water supply headworks items would be levied in accordance with Water Corporation policy. Costs may need to be prefunded depending on development strategy.

3.4 Roadworks

We envisage that the transportation studies will inform what roadworks and road widths are required. From a services point-of-view the main issue will be in the design of Cockburn Road. In addition to providing transportation solutions such as bus lanes or light rail, the road reserve will be required to accommodate servicing infrastructure. The aim of Cockburn Road's design should be to ensure a minimum of existing services are disturbed or require relocation. Due to the nature of services along Cockburn Road, any servicing relocations would be relatively costly to implement.

3.5 Drainage

We envisage drainage infrastructure will be implemented by having designated infiltration areas of a required sizing within POS areas. This will then enable existing 'sumps' to be filled and made into useage development land.

Landscaping and engineering design of the new infiltration areas will be critical in that it can turn existing ugly infiltration areas into POS assets.

3.6 Power Supply

Further discussion with Western Power following their feasibility study indicates a sub-station may be required within the Cockburn Coast area. A sub-station typically requires a land area of 1 hectare and hence has land planning implications. Western Power is addressing this possible requirement in conjunction with the Terminal Substation relocation.

Installation of a new feeder is proposed to occur by direct horizontal drilling within existing road reserves. Hence, future road reserves need to take into account the installation of HV infrastructure.

Existing power supply infrastructure in Cockburn Road indicates that underground power cables adjacent to Cockburn Road are within private property. As such, the planning of the revised Cockburn Road reserve needs to accommodate these cables so that expensive relocations do not occur.

3.7 Telecommunications

There may be minor land areas required as part of the NBN infrastructure. However, these will need to be ascertained when design has been carried out. It is unlikely to have any major planning implications.

4 Infrastructure Staging

The current Cockburn Coast area is well served with existing servicing infrastructure. The District Structure Plan indicates that the area will provide around 5,000 new dwelling and host a population of over 10,000 people, plus have commercial, retail and activity areas. Infrastructure to cater for this increase in population will need to be upgraded and extended as previously discussed.

The upgrade of this infrastructure will not be needed immediately or at the one time. It is envisaged that the infrastructure upgrades will be timed to match when population forecasts dictate as such or in accordance with properly programmed development stages.

In order to give an indication of likely infrastructure timing, we have detailed below likely timing scenarios. These timings are on the assumption that the majority of Cockburn Coast development occurs within a 15 year time horizon.

0 – 5 Years Infrastructure

- Bennett Avenue wastewater pump station upgrade by Water Corporation.
- Water supply infrastructure to augment supply to the area. Connection of main along Rockingham Road to
- Forrest Road. Main constructed along northern portion of Cockburn Road.
- Upgrade of HV Western Power feeder to support power to the area.
- Construction of an upgraded section of Cockburn Road northern. This may include relocation and rationalisation of services within the road reserve.
- Drainage infrastructure rationalisation and extension to grade out ‘sumps’ and connect into aesthetic POS areas for the northern development section.
- WA Gas Networks upgrade to supply infrastructure to serve the area.

5 – 10 Years Infrastructure

- Construction of an upgraded central section of Cockburn Road. This may include relocation and rationalisation of services within the road reserve.
- Possible relocation of the Terminal Substation by Western Power and construction of a Zone Substation.
- Drainage infrastructure rationalisation and extension to grade out ‘sump’ and connect into aesthetic POS areas for the central development section along Cockburn Road.

10 – 15 Years Infrastructure

- Construction of an upgraded central section of Cockburn Road. This may include relocation and rationalisation of services within the road reserve.
- Possible relocation of the Terminal Substation by Western Power and construction of a Zone Substation.
- Drainage infrastructure rationalisation and extension to grade out ‘sump’ and connect into aesthetic POS areas for the southern section along Cockburn Road.

+15 Years Infrastructure

- Bennett Avenue WWPS ultimate upgrade to ~380 l/s.
- Bennett Avenue WWPS rising main replacement and upgrade size of duplication.

5 Cost Sharing

As has been discussed in this report, to support a development of this size and scale a number of infrastructure elements need to be updated, extended or constructed. In addition to the services infrastructure, other elements of 'soft' infrastructure need to be provided to support the development as a whole such as foreshore reserves, POS and landscaping works.

It is reasonable to expect that developers who provide and pay for infrastructure which is of benefit to other developers or the whole development should be reimbursed under a fair, equitable and transparent arrangement.

LandCorp being the largest landholder and having land in the likely first stage of development may well be in the position of up front funding of elements of the infrastructure.

Below we have detailed and discuss possible elements of servicing and soft infrastructure which may be included in a cost sharing scheme.

5.1 Cockburn Road Upgrade

The exact scope of works is unknown at this stage as the final upgraded design will be informed by the final transportation planning and traffic studies. However, cost sharing could include for the following elements:

- Land cost of widening
- Construction cost of upgrade/widening the road
- Cost of service relocations as a result of the roadworks
- Drainage cost for the roadworks
- Cost of intersection and traffic management works.

5.2 Sewer Infrastructure Upgrades

The Bennett Avenue wastewater pumping station is a permanent Water Corporation sewer asset. As such, under their current policy the Water Corporation are ultimately responsible for the cost of upgrading and rising main works. However, if development requires upgrading of the PS prior to Water Corporation planning then the developer would need to negotiate a 'pre-funding' agreement with the Water Corporation. The agreement would entail a repayment of the cost of the works by Water Corporation over an agreed timescale.

The cost to the developer and hence the cost contribution would be the cost of funds outstanding until repayment.

5.3 Water Supply

Supply mains need to be upgraded into the area as demand dictates. It is likely that a portion of these works will be 'Headworks' size and hence ultimately funded by the Water Corporation. However, as with sewer infrastructure this upgrade may need to be 'pre-funded' by the developer. As such, the shared cost will be the cost of the funds until repayment by the Water Corporation.

5.4 Drainage Works

Current drainage sumps will need to be graded out and the drainage function shifted to landscaped POS areas. Possible shared costs include:

- Drainage reconstruction costs

5.5 Power Supply

A number of components may be included in the power supply upgrading works. They fall broadly into two main categories:

Distribution

- Upgrading of existing HV feeders to the site.
- Cost or portion of cost of new Zone Substation.
- Land component cost to house the Zone Substation.

Transmission

- Relocation of the existing Terminal Substation.
- Cost of new Terminal Substation.
- Cost of land component of new Terminal Substation.
- Cost of undergrounding of HV transmission aerial mains.

The latter category of works is the subject of a separate working group and will likely be analyses as a stand alone business case.

5.6 POS

To support the overall development various areas of land will need to be set aside for POS. In addition, a foreshore reserve will need to be given-up. Costs associated with these elements may include:

- Land component of POS.
- Landscaping, paths and improvement costs for POS.
- Preparation of a foreshore management plan.
- Improvement and landscaping costs for the foreshore area.

5.7 Other

This project may also include the introduction of major public transportation systems and infrastructure. We would not expect that these elements would be included in the development cost sharing scheme. These items include:

- Installation of a Bus Rapid Transit (BRT) scheme or a light rail project.
- Construction of Cockburn Drive.

The details of a cost sharing scheme will need to be put in place prior to major infrastructure development. LandCorp have embarked on a process of working through the issues and seeing which responsible body may be put in place to administer any scheme.

Appendix 1

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Water Corporation Current Sewer Strategy


FREMANTLE
SD026
CATCHMENT '191 - 026'
SEWER DESIGN FLOW - 0.6 L/s
CATCHMENT '161 - 026'
SEWER DESIGN FLOW - 1.9 L/s
CATCHMENT '137 - 026'
SEWER DESIGN FLOW - 5.8 L/s
CATCHMENT '138 - 026'
SEWER DESIGN FLOW - 3.2 L/s
CATCHMENT '139 - 066'
SEWER DESIGN FLOW - 0.4 L/s
SPEARWOOD P.S 13 -
DURFORD ST
PUMP STN. '13 066'
REDUCTION '08210 - 066'
SEWER DESIGN FLOW - 25.8 L/s
EXISTING PUMP RATE - 36.3 L/s
LONG TERM PUMP RATE - 46.0 L/s
CATCHMENT 'V9419 - 026'
SEWER DESIGN FLOW - 4.1 L/s
CATCHMENT 'W7715 - 066'
SEWER DESIGN FLOW - 3.3 L/s
CATCHMENT 'V8236 - 066'
SEWER DESIGN FLOW - 1.7 L/s
CATCHMENT 'W7669
SEWER DESIGN FLOW
CATCHMENT 'V8297 - 066'
SEWER DESIGN FLOW - 2.2 L/s
CATCHMENT 'Y9729 - 066'
SEWER DESIGN FLOW - 3.3 L/s
CATCHMENT '150 - 026'
SEWER DESIGN FLOW - 2.6 L/s
FREMANTLE MAIN P.S.2 -
BENNETT AVE
PUMP STN. '22 - 026'
REDUCTION 'Q8541 - 066'
SEWER DESIGN FLOW - 142.3 L/s
EXISTING PUMP RATE - 155.0 L/s
LONG TERM PUMP RATE - 286.8 L/s
CATCHMENT 'W2041 - 026'
SEWER DESIGN FLOW - 4.3 L/s
CATCHMENT 'Y9691 - 066'
SEWER DESIGN FLOW - 3.5 L/s
CATCHMENT 'Y9807 - 066'
SEWER DESIGN FLOW - 2.
Min. fill required
to 2.25m AHD
CATCHMENT '73095 - 026'
SEWER DESIGN FLOW - 33.2 L/s
SPEARWOOD P.S 16
GEENISTER RD
PUMP STN. '16 - 066'
REDUCTION 'S0204 - 066'
SEWER DESIGN FLOW - 11.6 L/s
EXISTING PUMP RATE - 29.8 L/s
LONG TERM PUMP RATE - 15.4 L/s
CATCHMENT '136 - 026'
SEWER DESIGN FLOW - 4.8 L/s
CATCHMENT 'Y9778 - 066'
SEWER DESIGN FLOW - 2.4 L/s
CATCHMENT '194 - 026'
SEWER DESIGN FLOW - 4.2 L/s
CATCHMENT '172 - 026'
SEWER DESIGN FLOW - 2.0 L/s
Min. fill required
to 2.5m AHD
CATCHMENT '177 - 026'
SEWER DESIGN FLOW
CATCHMENT '132 - 026'
SEWER DESIGN FLOW - 4.7 L/s
CATCHMENT '89 - 066'
SEWER DESIGN FLOW - 2.2 L/s
CATCHMENT '300 - 066'
SEWER DESIGN FLOW - 2.0 L/s
Min. fill required
to 2.2m AHD
SPEARWOOD P.S J -
HAMILTON RD
PUMP STN. 'J - 066'
REDUCTION 'S0063 - 066'
SEWER DESIGN FLOW - 15.7 L/s
LONG TERM PUMP RATE - 20.9 L/s
FREMANTLE P.S. A -
COCKBURN RD
PUMP STN. 'A - 026'
REDUCTION 'V9418 - 026'
SEWER DESIGN FLOW - 22.8 L/s
LONG TERM PUMP RATE - 30.4 L/s
CATCHMENT '306 - 066'
SEWER DESIGN FLOW - 3.8 L/s
CATCHMENT '307 - 066'
SEWER DESIGN FLOW - 2.3 L/s
CATCHMENT '305 - 066'
SEWER DESIGN FLOW - 4.
CATCHMENT 'W1504 - 06
SEWER DESIGN FLOW
Owen
Anchorage
CATCHMENT '101 - 066'
SEWER DESIGN FLOW - 1.6 L/s
PUMP STN. '290 - 066'
COOGEE BEACH CARAVAN PARK
REDUCTION 'X3868 - 066'
SPEARWOOD P.S 8 -
PARAKEET WAY
PUMP STN. '8 066'
REDUCTION 'S0225 - 066'
SEWER DESIGN FLOW - 10.0 L/s
EXISTING PUMP RATE - 19.4 L/s
LONG TERM PUMP RATE - 19.4 L/s
CATCHMENT 'V6185 - 066'
SEWER DESIGN FLOW - 3.9 L/s
CATCHMENT '92 - 066'
SEWER DESIGN FLOW
PUMP STN. 'K - 06
REDUCTION
SEWER DESIGN FLOW
LONG TERM PUMP RA

Appendix 2

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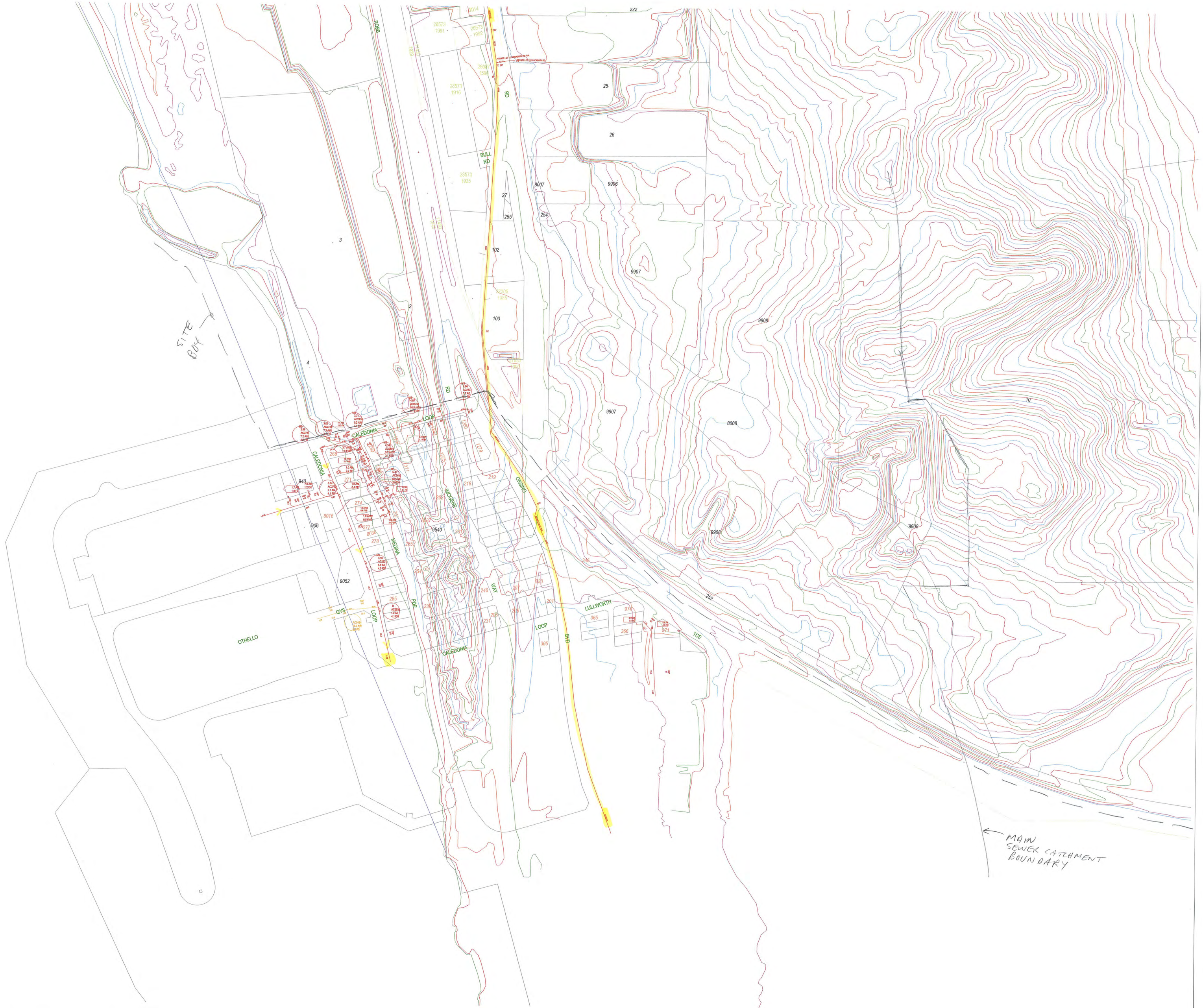
Existing Water Corporation Sewer Infrastructure

Scale 1:2000 @ A1

Sheet 1/3

SERVICE 2/3

SCALE 1:2000 @ A1



SEWER 3/3
SCALE 1:2000 @ A1

Appendix 3

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Water Supply Existing ‘As-Constructed’ Plans

WATER 1/3

SCALE 1:2000 @ A1

SHEET 2/3
SCALE 1:2000 @ A1

WATER 3/3
SCALE 1:2000 @A1

Appendix 4

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Western Power Feasibility Study for Cockburn Coast Area

20146 - PER - C

Feasibility Study

Project Name:	Cockburn Coast
Customer Ref:	20146 – PER – U
Number of lots:	4850 Lots
Project Number:	MF010044

1. INTRODUCTION

Landcorp has requested a Feasibility Study in South Fremantle. The project name is Cockburn Coast. The following information was provided for us to conduct this study:

Number of lots	4860
Number of stages	20
Number of lots per stage	243
Construction to begin	July 2011
Rate of development	one stage per year

Based on the customer request of 9kVA per lot, the total load required therefore is approximately 43.74 MVA. Please refer to **Appendix 1** for details.

2. EXISTING INFRASTRUCTURE

The location of Cockburn Coast and existing infrastructure of HV distribution network supplying the surrounding area are as shown in Figure 1 and Figure 2. There are three 22 kV feeders within the vicinity of the development, *AMT512 Lefroy Rd (yellow)*, *AMT507 346 Orsino Bvd 1 (pink)* which are from Amherst zone Substation, and *SF505 Cockburn Rd North (blue)* which is from South Fremantle substation.

The majority of this development is within the Amherst zone substation's catchment area.

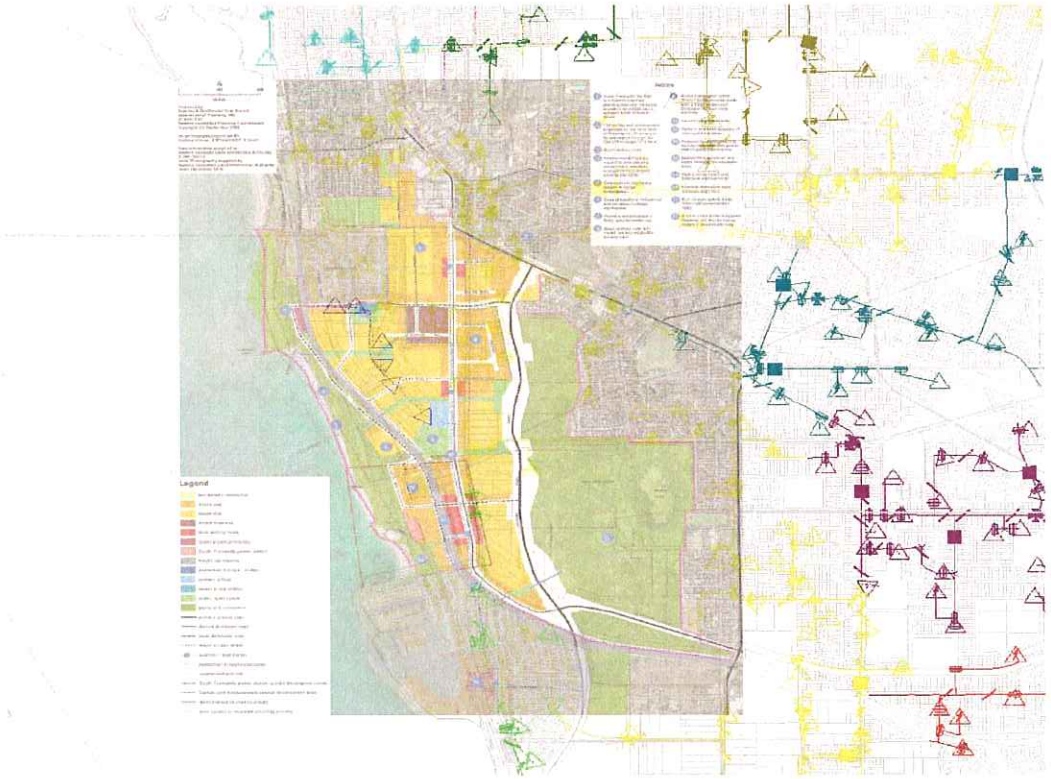


Figure 1: Location of Cockburn Coast

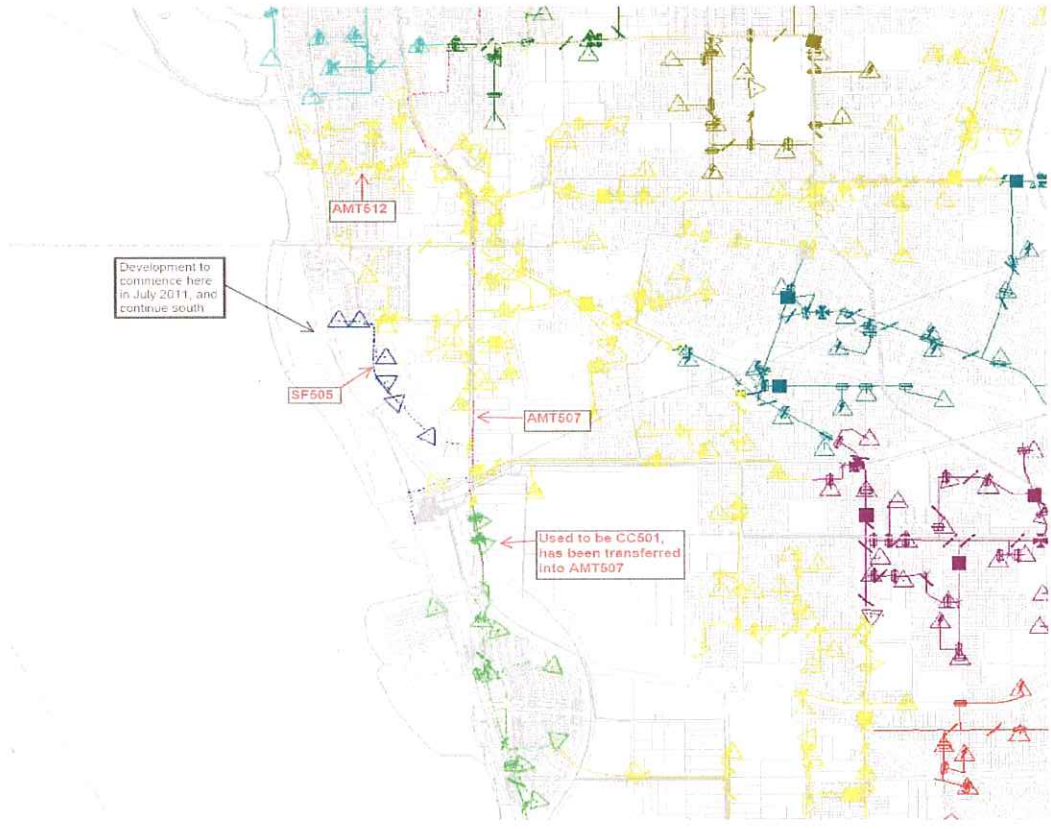


Figure 2: Existing Infrastructure – Distribution

3. STUDY DETAILS

The initial analysis revealed that the existing network infrastructure does not have capacity to supply the new load requested as a whole (43.65MVA) due to the large size of the development.

As shown on **Appendix 1**, the initial stages are to commence around 'area 3' of the structure plan and will continue south. Please see **Appendix 2** for structure plan. Geographically, SF505 is an ideal feeder to supply the initial stages. However, this feeder has high fault ratings and not recommended due to its poor reliability. South Fremantle substation maybe relocated in the future and it is planned not to have any distribution feeders from this substation. As a result, SF 505 may not exist in the future.

AMT507 L346 Orsino Bvd 1 runs through Cockburn Coast south along Cockburn Rd, and it is currently lightly loaded. It may be utilised to supply the initial stages. However, AMT507 was installed to primarily supply Port Coogee and if the load on Port Coogee increases in the near future, this feeder may not have enough capacity to cater for this load take up at Cockburn Coast, particularly at 'area 3'.

AMT512 Lefroy Rd feeder is considered as one of the critical feeders due to limited capacity and the various reliability issues with it. There is a project planned to install a new feeder to transfer some of the loads from AMT 512 feeder but it may be implemented beyond July 2011.

In summary, planning study reveals that the existing feeders within the vicinity of this development are not able to supply the total load request. AMT 507 maybe possible to supply the initial stages but it is highly dependent on the load take up timing at Port Coogee development.

4. REINFORCEMENT REQUIREMENTS

Based on the study details above, the estimated scope of works required is listed below:

- New feeders from Amherst substation
- Major reinforcement required for both Transmission and distribution assets to increase the capacity

The timing of the above reinforcements is highly dependent on the rate of this development and future load growth in the area surrounding.

5. CONCLUSION/ GENERAL ASSESSMENT

Based on the study, the existing HV distribution network infrastructure surrounding the areas of the development may not be able to support this new load. A new feeder is highly recommended to connect the initial loads for this development. The timing of this is best to be evaluated when the formal application for load connection has been received. It may be possible to connect the initial load of approximately 2 MVA on to AMT 507 while it is lightly load at the moment. However, this is not a guaranteed approval as the large amount of load is expected on AMT 507. Due to the large load take up area, major reinforcements for both Transmission and Distribution assets are necessary to cater for this development.

The details in this feasibility enquiry report are only indicative. Further in-depth study and analysis will be required to determine the exact requirement of the reinforcement works once a formal application to Western Power has been lodged. It would be appreciated that at the time of the initial application, a staging plan with expected takeoff dates be provided to Western Power.

Western Power can neither reserve capacity nor guarantee supply to this development without a formal request being lodged. In order to provide a firm connection proposal and cost, a formal application to Western Power will have to be made, in accordance with our connection policies.

6. LAND DEVELOPMENT COMMENTS

Unless the Port Coogee development utilises the spare capacity on the AMT 507 feeder, the current network should be able to supply the first stage of this development.

The following stages will need to be supplied from a new HV feeder from Amherst Zone substation. The approximate cost of direct drilling a 400mm HV cable over 3 kilometres is **$1.4 million (unbinding).**

This new feeder should be able to supply the development for the next 4 to 5 stages, depending on uptake from other projects in the area.

The above estimation is based on but not limited to the aforementioned assumptions and design variables. Normal Subdivision Policy applies.

Appendix 1

westernpower

Electricity Networks Corporation ABN 18 540 492 861

Part A - Application type

☐ Feasibility Enquiry ☑ Feasibility Study

Applicant details - for tax invoice

Title (e.g. Mr, Mrs)	Mr
Surname	Hazelden
Given name(s)	Glenn
Company or busines name	Landcorp C/o Wood and Grieve Engineers
ABN	
Postal address	Level 3, 3 Plain Street
Suburb or town	East Perth
Post code	6004
Email (optional)	
Mobile (optional)	
Telephone	(08) 6222 7000
Fax (optional)	( )
Western Power reference number (if applicable)	

Part B - Land use

Residential ☐	Commercial/Industrial ☐ Special Rural ☐
Other (please describe)	
Number of lots	4850
Number of stages	
Number of lots per stage	
Approximate commencement date for each stage	Stage 1 to commence in July 2011, subsequent stages (243 lots per annum) each year after that. Staging to commence around 'area 3' of the structure plan and will continue south, the last area of development to be 'area 1' (south Fremantle tip site).
Comments	This project is on the WAPC planning website and includes the relocation of the Western Power South Fremantle switchyard.

Part C - Project details

Please attached Stage Plan with this document.

Project name	Cockburn Coast
Your project reference number	20146-PER-U

Part D - Site address/location plan

Please attach a location plan or concept plan with this document.

Site address	Cockburn Coast
Suburb or town	Cockburn — Post code
Nearest cross street	Cockburn Coast Drive
Map number	
Grid reference	From street directory

Part E - Proposed loading

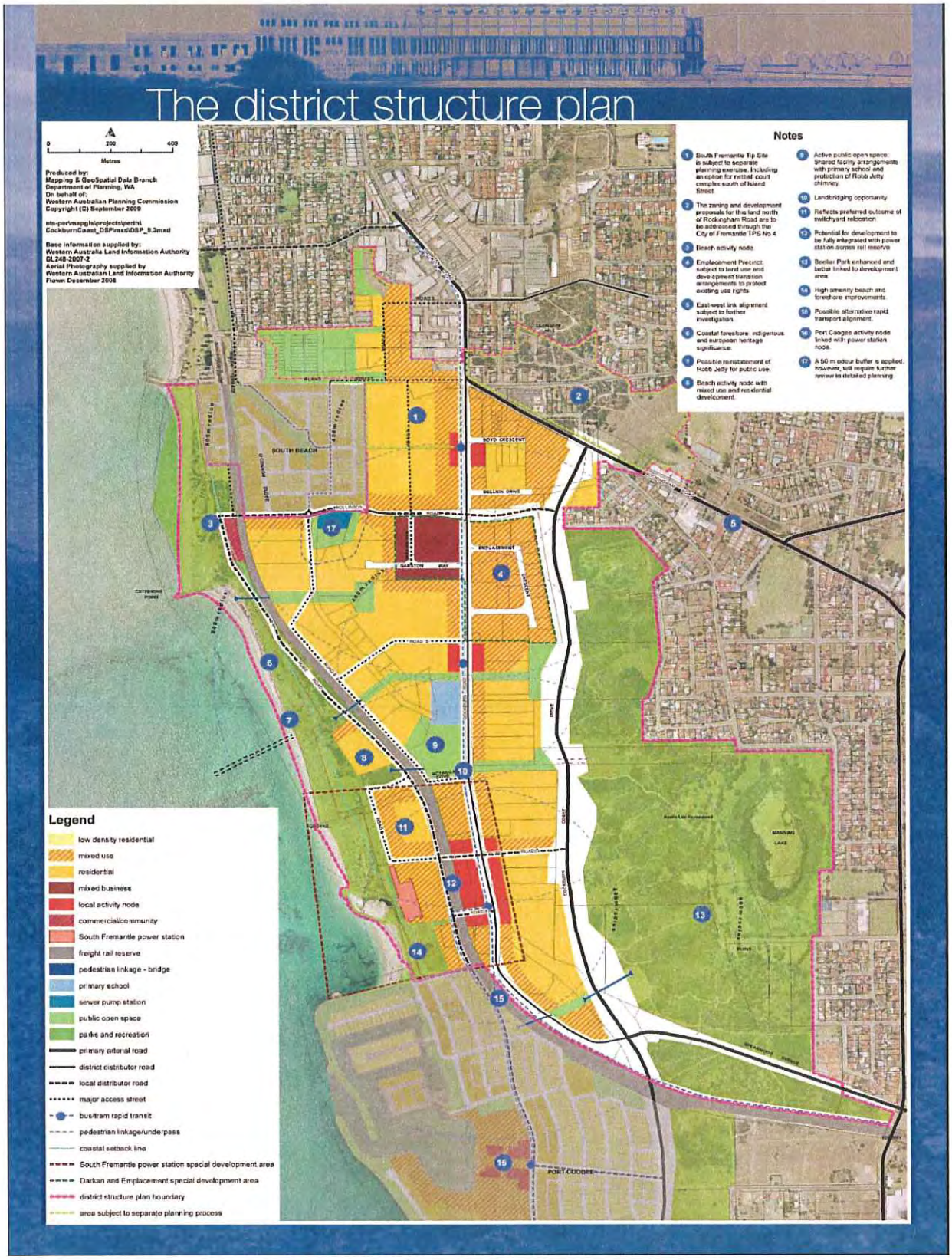
ADMD per lot	9kVA
Comments	

Part F - Approval

On signing this form as the duly authorised representative, the signatory accepts liability for payment of $315.00 (inc GST) for a Feasibility Enquiry or $775.00 (inc GST) for a Feasibility Study. Please refer to 'Terms & Conditions'.

Name	Glenn Hazelden		
Mobile (optional)		Telephone	(08) 6222 7000
Signature	G. Hazelden	Date	20 / 4 / 2010

Appendix 2


The district structure plan
Notes
1 South Fremantle Tip Site is subject to separate planning exercise, including an option for netball court complex south of Island Street
2 The zoning and development proposals for this land north of Rockingham Road are to be addressed through the City of Fremantle TPS No.4
3 Beach activity node
4 Emplacement Precinct subject to land use and development transition arrangements to protect existing use rights
5 East-west link alignment subject to further investigation.
6 Coastal foreshore: indigenous and european heritage significance
7 Possible reinstatement of Robb Jetty for public use.
8 Beach activity node with mixed use and residential development.
9 Active public open space: Shared facility arrangements with primary school and protection of Robb Jetty chimney.
10 Landbridging opportunity
11 Reflects preferred outcome of switchyard relocation
12 Potential for development to be fully integrated with power station across rail reserve
13 Beeliar Park enhanced and better linked to development area
14 High amenity beach and foreshore improvements.
15 Possible alternative rapid transport alignment.
16 Port Coogee activity node linked with power station node.
17 A 50 m odour buffer is applied, however, will require further review in detailed planning
Legend
low density residential
mixed use
residential
mixed business
local activity node
commercial/community
South Fremantle power station
freight rail reserve
pedestrian linkage - bridge
primary school
sewer pump station
public open space
parks and recreation
primary arterial road
district distributor road
local distributor road
major access street
bus/tram rapid transit
pedestrian linkage/underpass
coastal setback line
South Fremantle power station special development area
Darkan and Emplacement special development area
district structure plan boundary
area subject to separate planning process
SOUTH BEACH
PORT COOGEE

Your Ref: 20146-PER-U
Our Ref: MF010044
Enquiries: Customer Contact Centre
Telephone 13 10 87
Fax: 9225 2073

Western Power
Connections Manager
Locked Bag 2520
PERTH, WA 6001
Electricity Networks Corporation
ABN 18 540 492 861

25 June 2010

Wood & Grieve Engineers
Unit 3, 3 Plain Street
EAST PERTH WA 6004

Attention: Mr Glenn Hazelden

Dear Sir/Madam,

COCKBURN COAST
WESTERN POWER REF: MF010044, WAPC No: N/A

In response to your request for a Feasibility Study, 21 April 2010, I am pleased to provide you with the attached report.

Our Tax Invoice will be sent to you in due course. The amount due includes the standard fee of $775.00.

The following is an estimated cost of the high voltage distribution works to provide electricity distribution capacity to your proposed development. This estimate is based on a desktop review of your requirements and the existing electrical network.

FEASIBILITY ESTIMATE

The estimated cost of the reinforcement works to your proposed development is $1,394,627.00, including GST.

Please note the following important information about this estimated cost:

- It is an indicative figure only, to assist you to plan and make decisions about your project.
- The final quoted cost may be higher or lower than this estimate. In some cases, final quotes are significantly higher than estimates, because of ground conditions and other impediments identified during the site visit and / or fluctuations in the cost of materials and labour etc.
- This estimated cost is non-binding.

DISCLAIMER

- This information is based on information available today.
- Western Power cannot reserve any capacity to accommodate the proposed development unless a quotation is offered and accepted.

- Western Power accepts no responsibility for any consequences resulting from decisions made on the basis of information provided in this response.

ANY QUESTIONS?

If you have any questions, please telephone our Customer Contact Centre on 13 10 87 during business hours.

Yours faithfully,

Customer Services Officer
for
Connections Manager
Customer Assist

enc: Terms and Conditions

Electricity Networks Corporation
ABN 18 540 492 861

FEASIBILITY STUDY TERMS AND CONDITIONS

1. **Terms and Conditions**
These terms and conditions shall form part of the contract unless specifically excluded in writing by an authorised representative of Western Power.

2. **Consequential Loss**
Damages shall be limited to damages for direct and foreseeable loss attributable to breach or default under this Agreement. The rights of either party to damages for indirect or consequential loss are hereby excluded. Neither party shall be liable to the other for any loss of profit suffered by a party to this Agreement or any other person.

3. **Modification**
A purported modification, variation or amendment of this Agreement including the scope of works or any waiver of any rights of any party or any approval or consent shall have no effect unless in writing and signed by the party to be charged, and may attract a subsequent fee.

4. **Application of Acts and By-Law**
Nothing contained in these Terms and Conditions shall in any way limit the operation or effect of the Electricity Corporation Act 1994, Energy Corporations (Powers) Act 1994, Energy Corporations (Transitional and Consequential Provisions) Act 1994, or any Regulations, By-Laws or Orders made pursuant thereto.

5. **Ownership of Works**
The whole of the electricity extension that forms the works carried out in accordance with the proposal is the property of Western Power and Western Power has the right to connect additional customers to any part of the extension.

6. **Indicative Estimate**
This indicative estimate of the cost of electrical distribution [and transmission] works is ONLY AN INDICATIVE ESTIMATE.

7. **Assumptions**
Western Power has calculated the indicative estimate on the basis of a "desktop study" only which includes information readily available at the time and certain assumptions regarding the project and costs. The information and assumptions may turn out to be incorrect or incomplete.

8. **Fluctuations**
Construction costs, including materials and labour, are subject to fluctuation and may change significantly over time. The final quoted cost may be higher or lower. In some cases final quoted costs are SIGNIFICANTLY HIGHER than indicative estimates.

9. **Liability**
Western Power has calculated the indicative estimate in good faith however Western Power, to the extent permitted by law, accepts no liability for any errors or omissions or for any discrepancy between the indicative estimate and the final quoted cost, if any.

Appendix 5

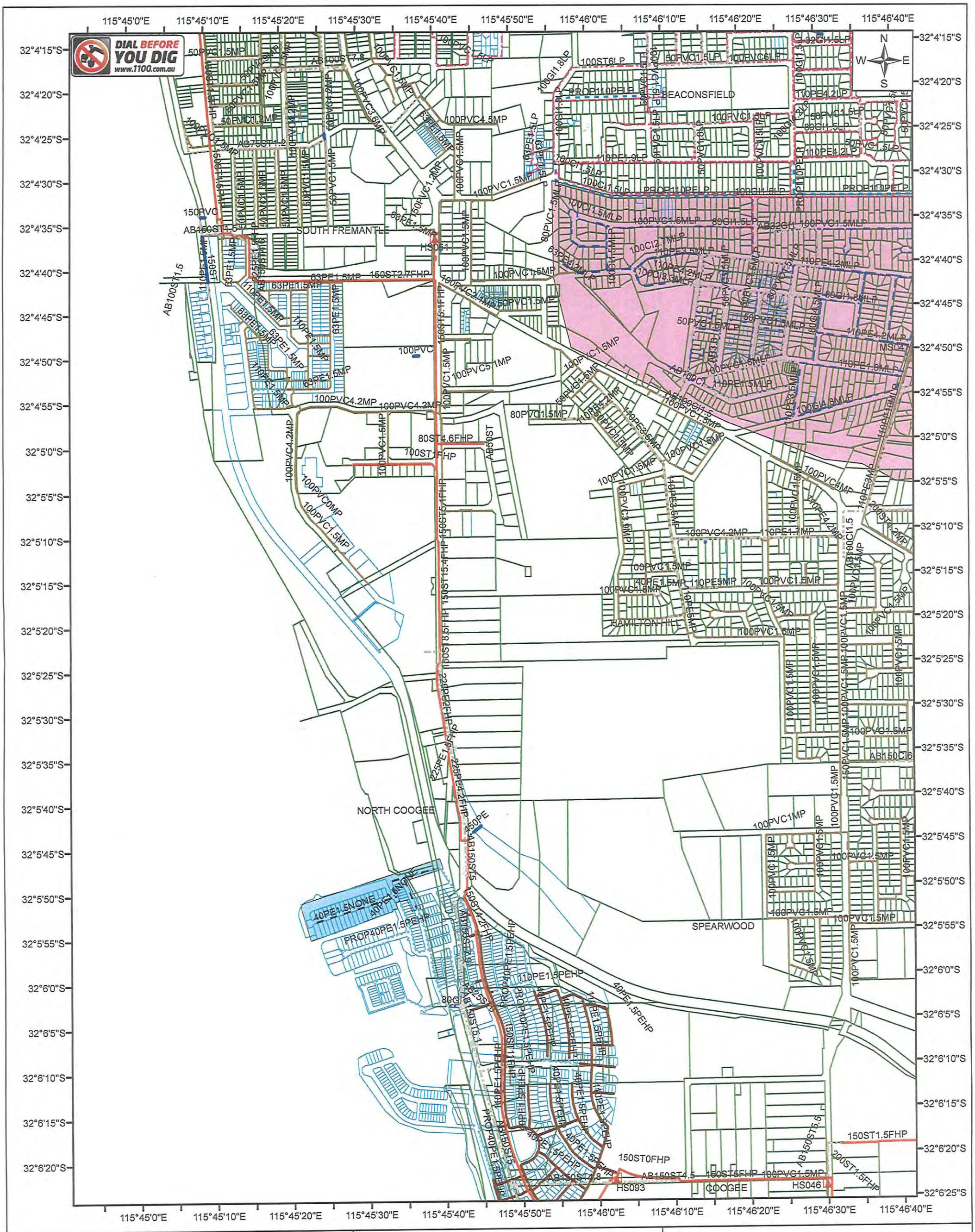
WOOD & GRIEVE ENGINEERS

Telstra Existing Network

Appendix 6

WOOD & GRIEVE ENGINEERS

WA Gas Networks - Existing Services



Cockburn Coast Development

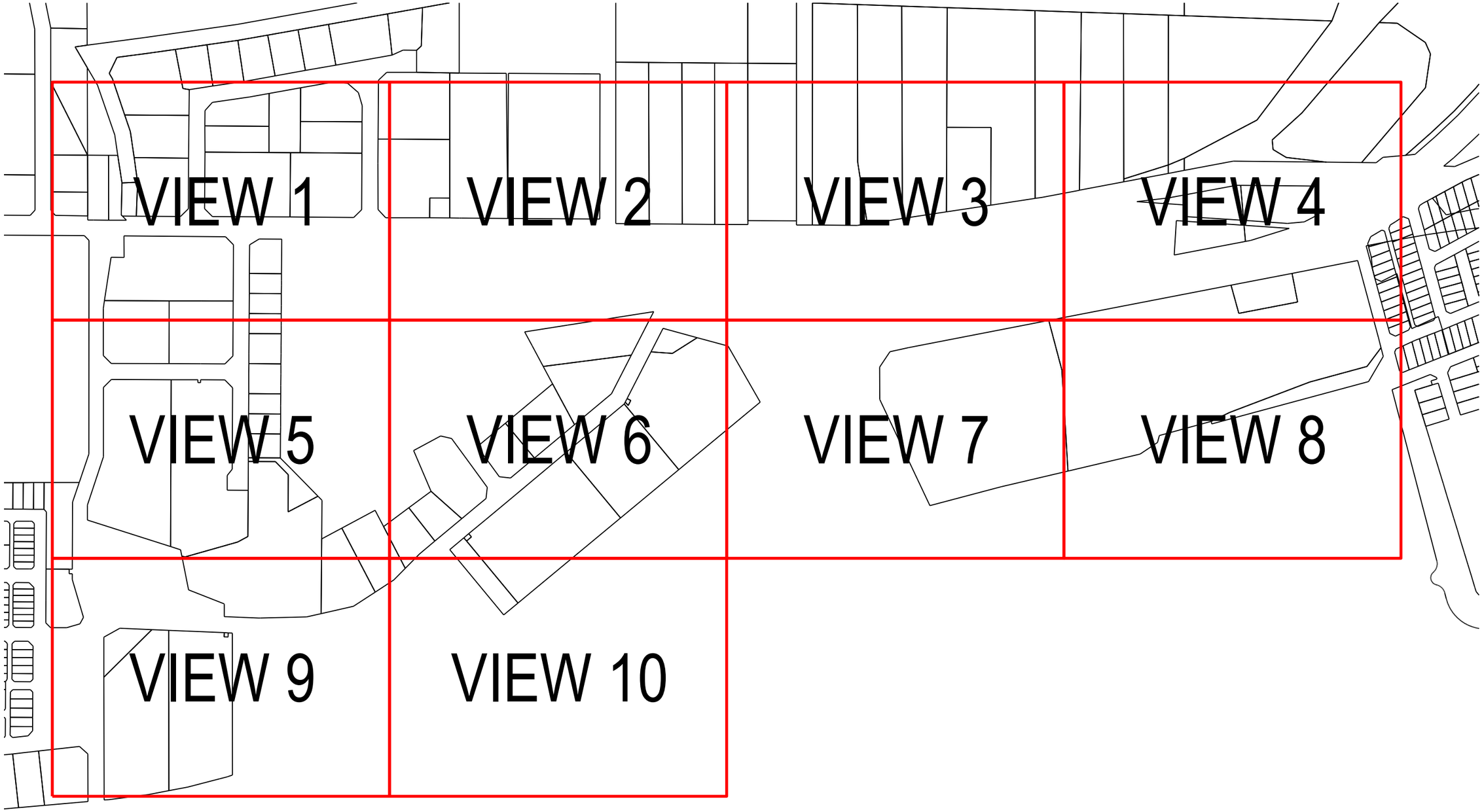
WAGAS NETWORKS

Date: 19/08/2010	Scale: 1:11,576	Plot Size A3
Draftsperson: Ideacon	Datum: GDA94	

Appendix 7

WOOD & GRIEVE ENGINEERS

Existing Combined Services View



LEGEND

UNDERGROUND POWER
OVER HEAD POWER
WATER MAIN
GRAVITY SEWER
PRESSURE MAIN

LANDCORP COCKBURN COAST
SERVICING REPORT OVERALL

20146-PER-C

WOOD & GRIEVE ENGINEERS
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Web www.wge.com.au
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BUSSELTON

EMPLACEMENT

CR

EMPLACEMENT

RD

WAY

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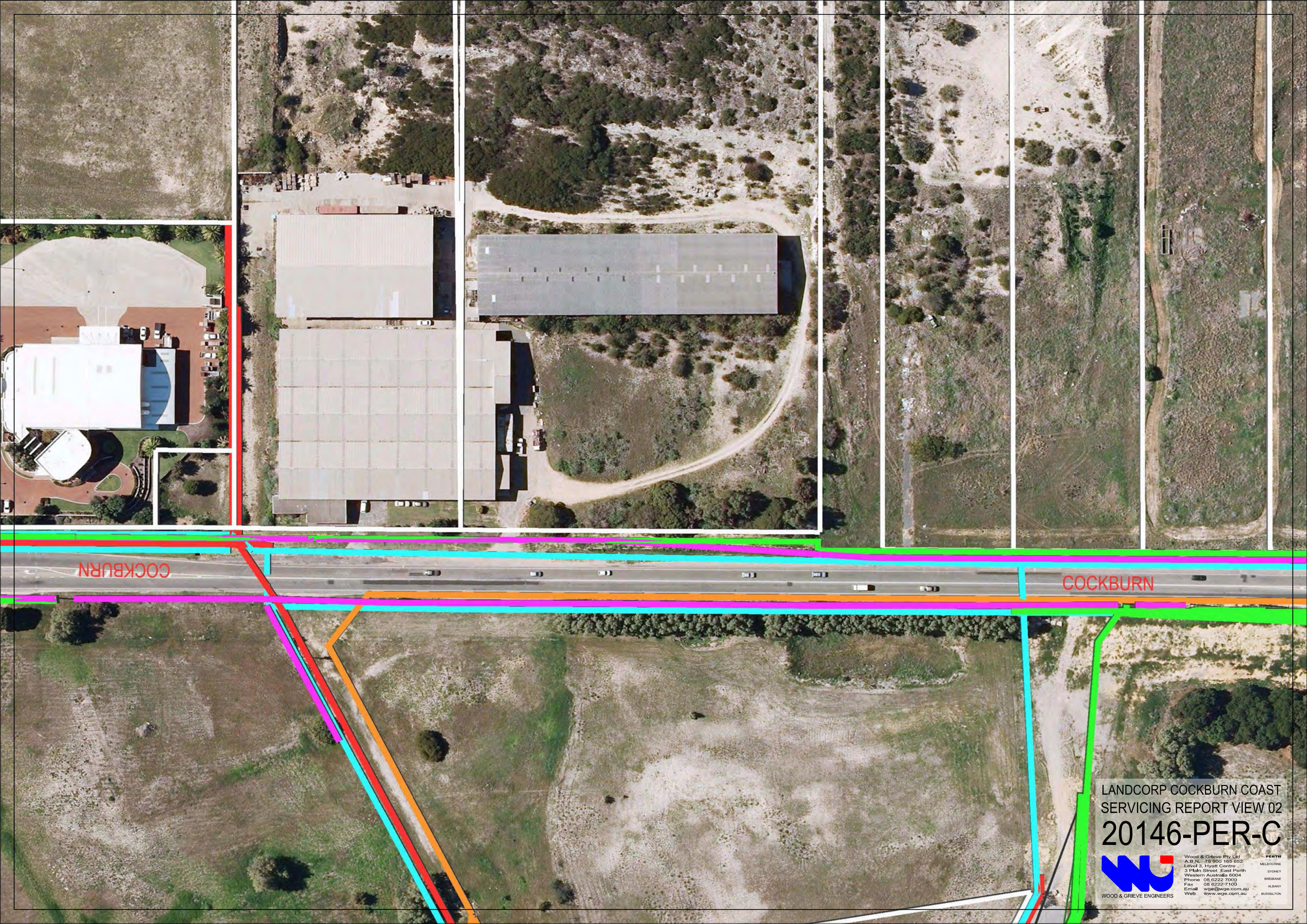

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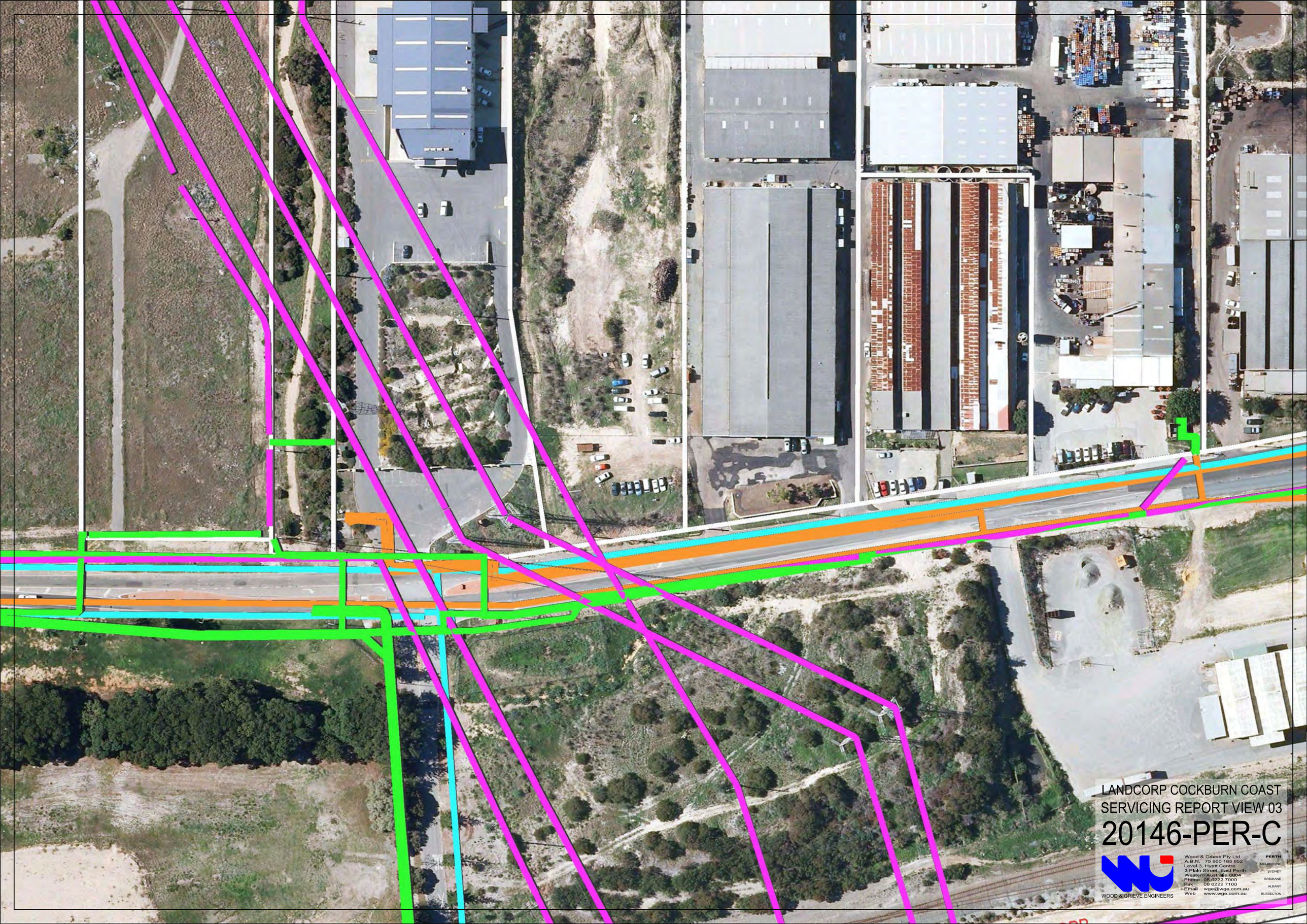

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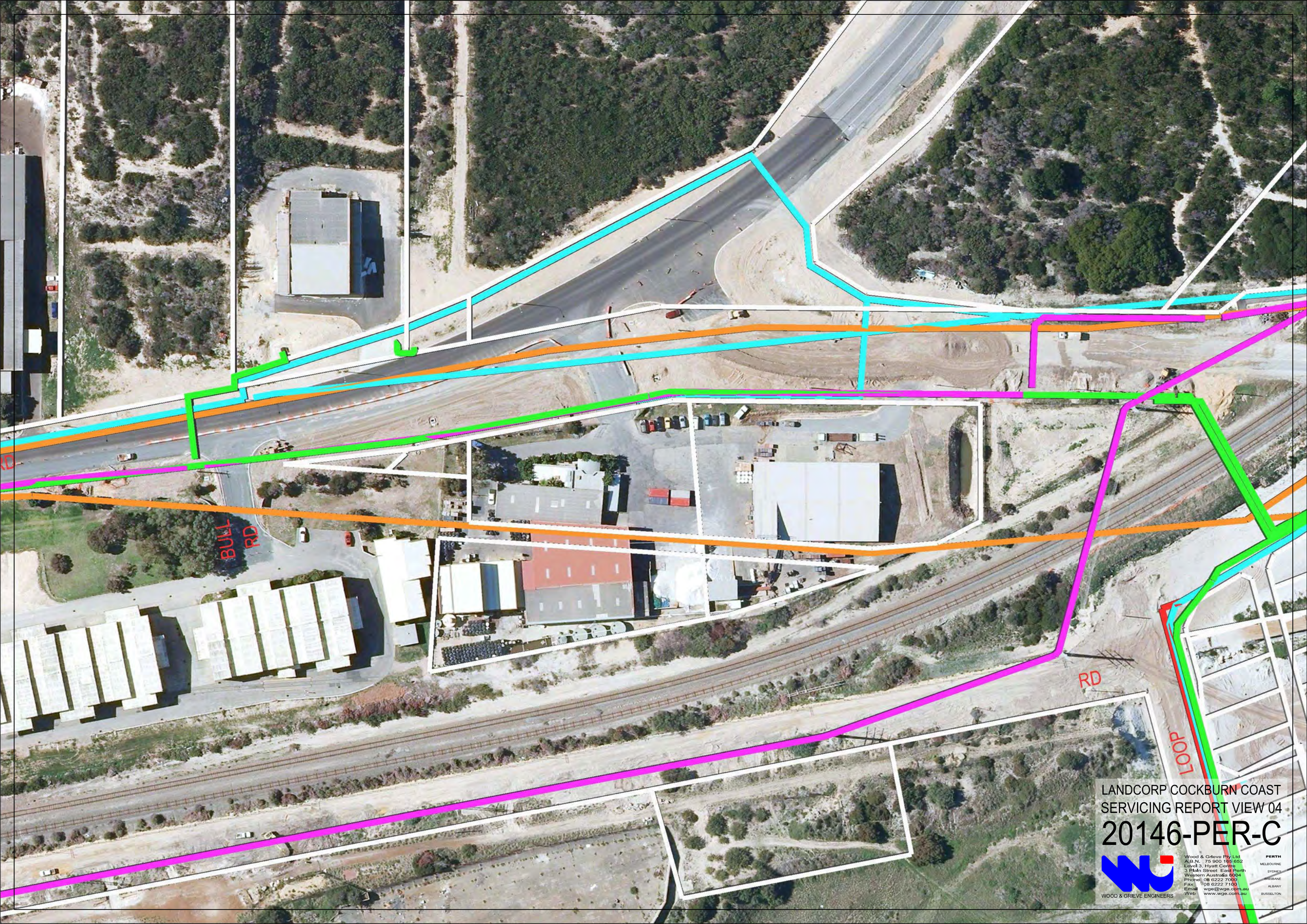

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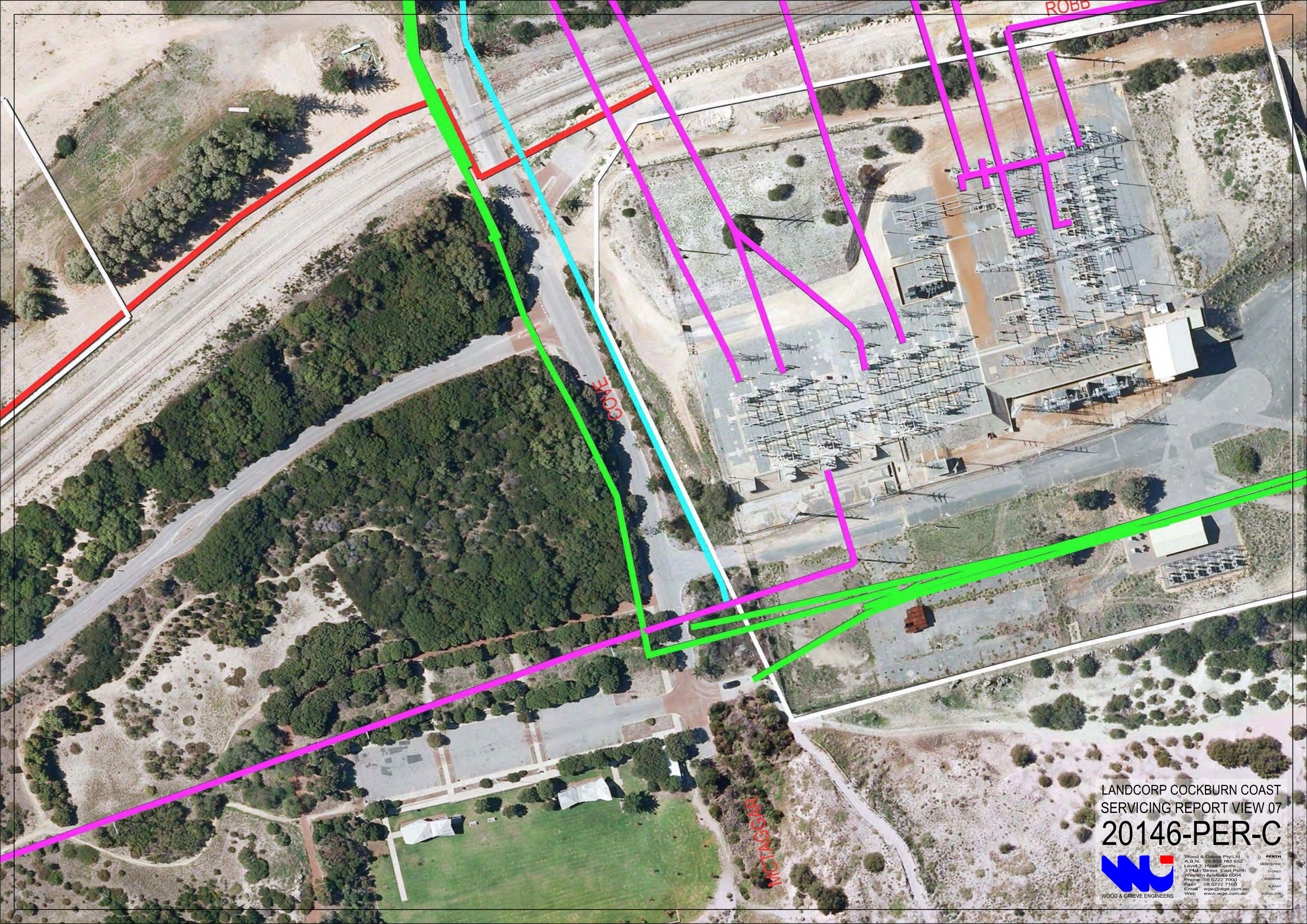

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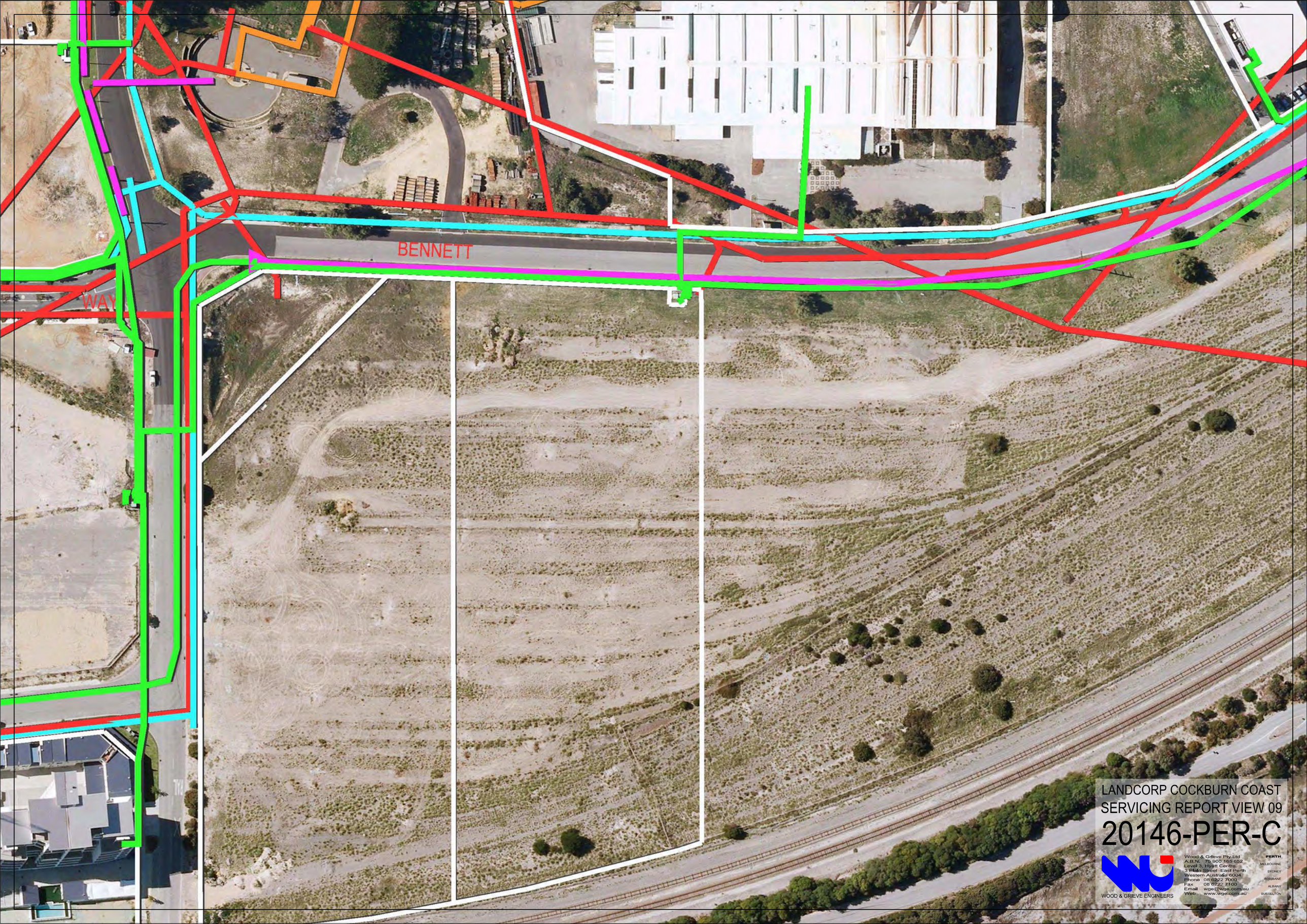

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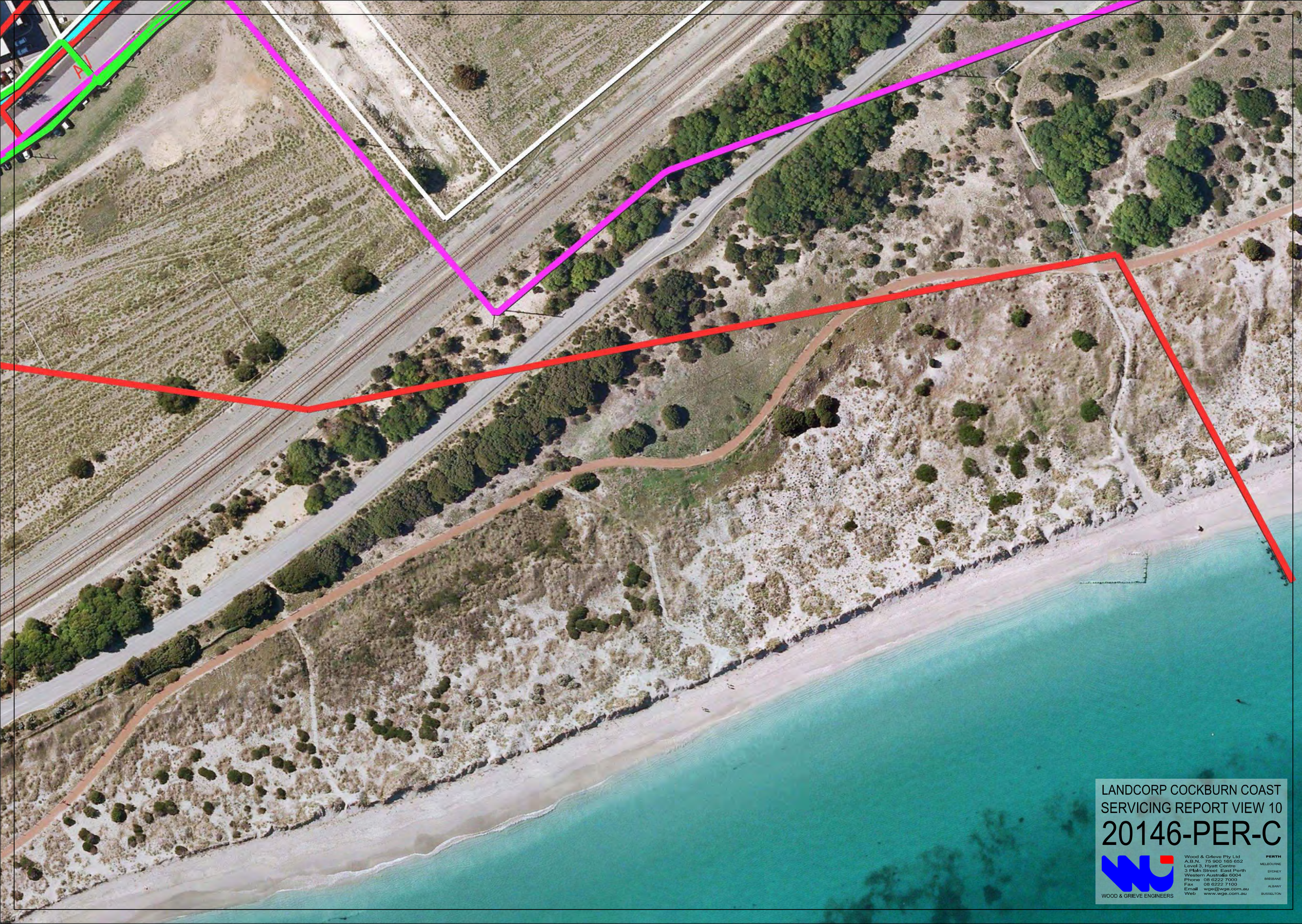

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Appendix 8

WOOD & GRIEVE ENGINEERS

Infrastructure Staging Plans

WATER SUPPLY SYSTEM UPGRADE

WA GAS NETWORK SERVICE UPGRADE (WORKS WITHIN COCKBURN ROAD)

UPGRADE OF WESTERN POWER HV FEEDER TO AUGMENT SUPPLY TO THE DEVELOPMENT

DRAINAGE SUMP REMOVAL AND INTEGRATION OF INFILTRATION AREAS INTO NEW POS.

FUTURE STAGE OF COCKBURN ROAD UPGRADE. NATURE OF WORKS DEPENDS ON FINAL TRANSPORT PLAN AND MAY INCLUDE ELEMENTS SUCH AS WIDENING, LANE DUPLICATION AND PARALLEL SERVICES RELOCATION.

POS AREA TO BE UTILIZED FOR DRAINAGE INFILTRATION BY INCORPORATION INTO LANDSCAPED FEATURE

BENNETT AVE WASTEWATER PUMPING STATION UPGRADE.

DRAINAGE SUMP REMOVAL AND INTEGRATION OF INFILTRATION AREAS INTO NEW POS.

NOTE

INFRASTRUCTURE STAGING DOES NOT INCLUDE OR SHOW ANY SPECIFIC WORKS WHICH MAY BE REQUIRED FOR THE INTEGRATED TRANSPORTATION PLAN SUCH AS, LANE DUPLICATION OR LIGHT RAIL.

INFRASTRUCTURE STAGING
0 - 5 YEARS

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INFRASTRUCTURE STAGING
20146-PER-C

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INFRASTRUCTURE STAGING
5 – 10 YEARS

LANDCORP COCKBURN COAST
INFRASTRUCTURE STAGING
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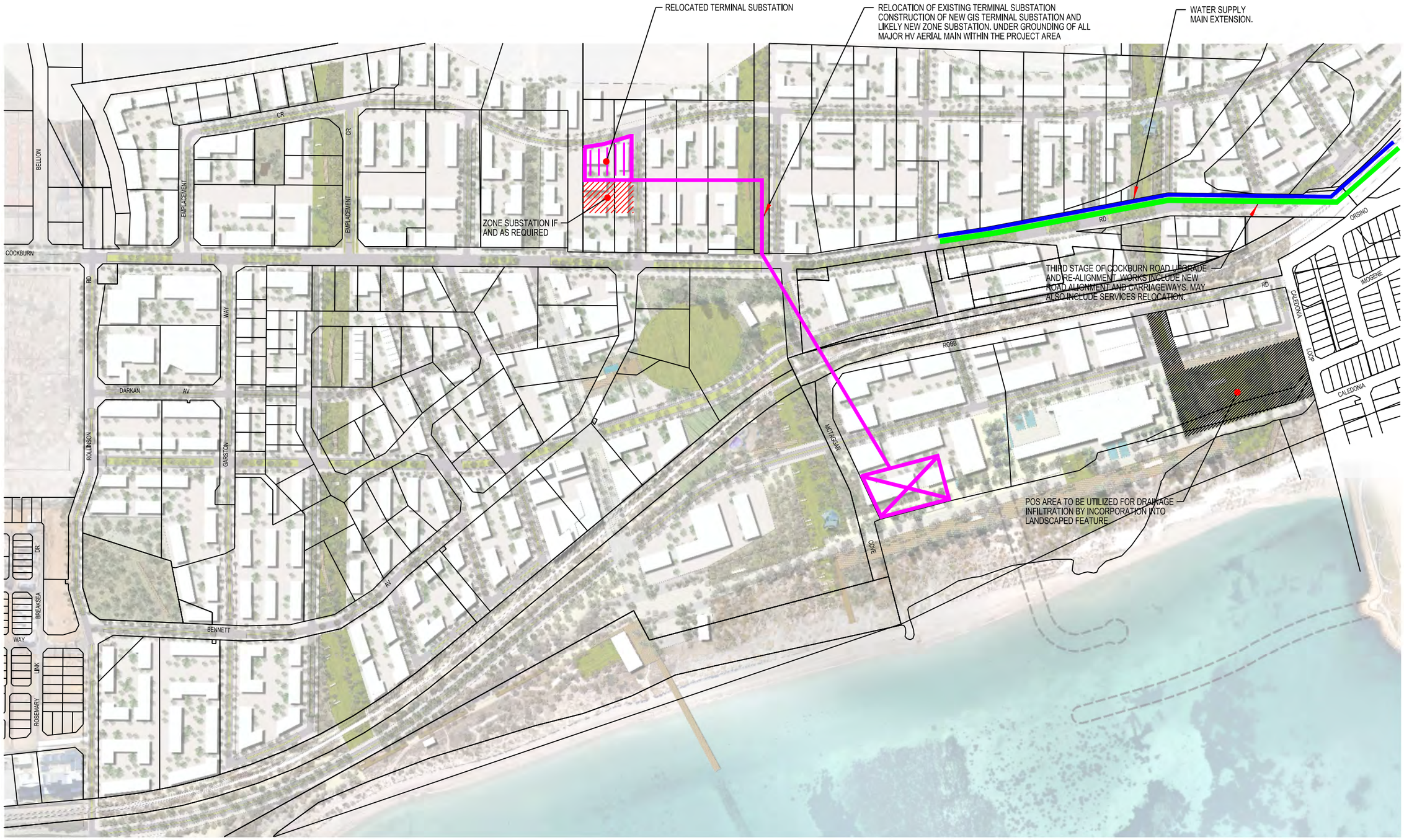

INFRASTRUCTURE STAGING
10 - 15 YEARS

LANDCORP COCKBURN COAST
INFRASTRUCTURE STAGING
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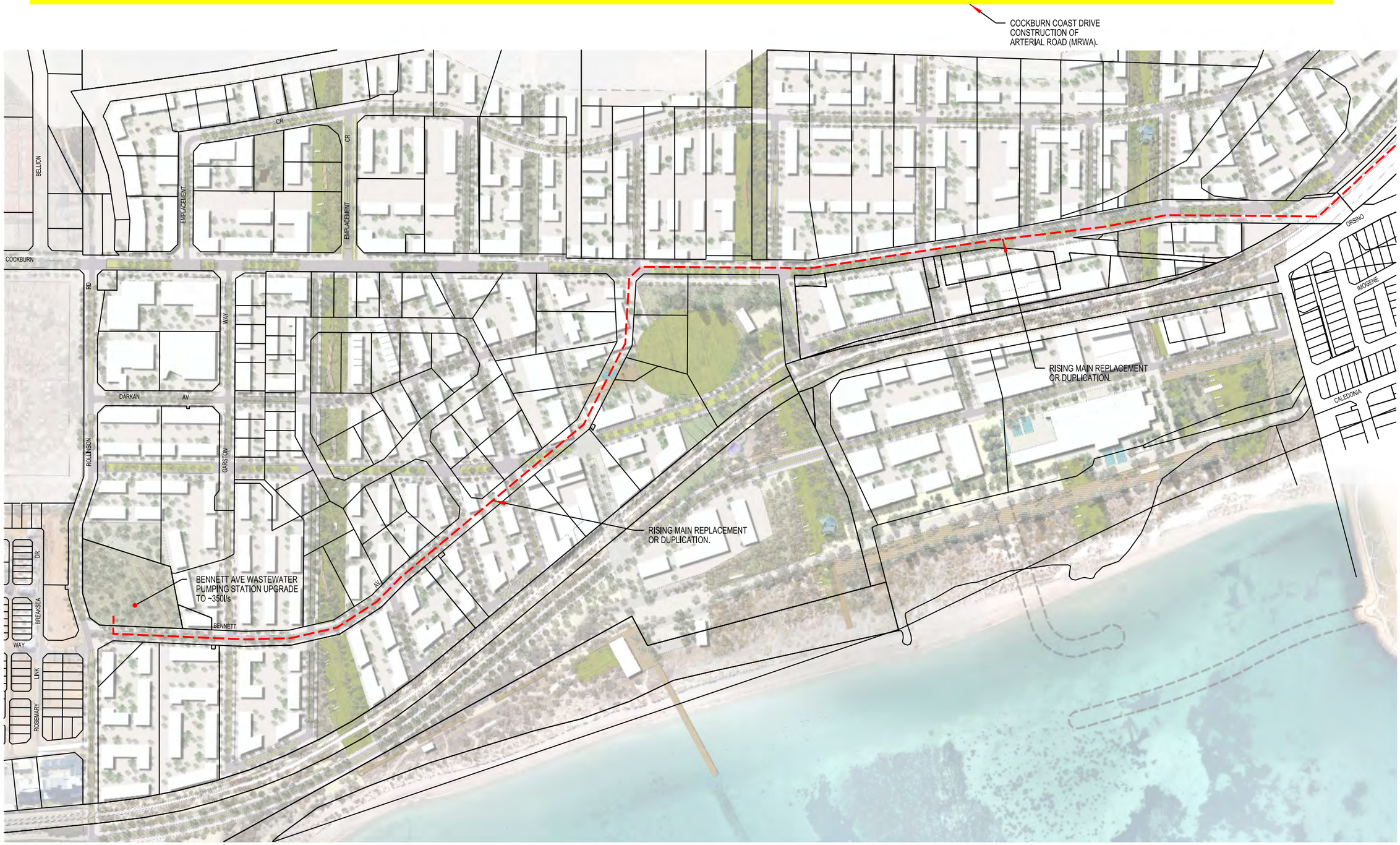

INFRASTRUCTURE STAGING 15+ YEARS

LANDCORP COCKBURN COAST
INFRASTRUCTURE STAGING
20146-PER-C

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