# Wimmera Intermodal Freight Terminal Precinct

Stage 1 Development Plan

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# Definitions

**Enabling Infrastructure** means stormwater swales, retardation basins, and the principal road network.

**Gateway sites** mean the developable land on either side of the two main road entrances, one at the intersection of Freight Terminal Road and the Henty Highway, and the other at the intersection of Road R1a and the Wimmera Highway. Planning permit conditions will require distinctive landscaping and landmark built form to mark the entrance to the precinct at these locations.

**Principal Access** means the intersection of the Henty Highway and Freight Terminal road, and the intersection of the Principal Road Network and the Wimmera Highway.

**Principal Road Network** means the intersection of Freight Terminal Road and the Henty Highway, Freight Terminal Road, the roundabout at the eastern end of Freight Terminal Road (marked as R4 in Figure 5) at the intersection with Molyneaux Road, the second roundabout on Molyneaux road (marked as R3 in Figure 5), the section of Molyneaux Road between roundabouts R3 and R4, the "Loop" Road (marked as R1 in Figure 5), the "Link" Road (marked as R1a in Figure 5), the intersection of the "Loop" and the "Link" road, and the intersection of the "Loop" road with the Wimmera Highway.

**Stage 1** means the following land titles:

- Lot 1 on Plan of Subdivision 802641P
- Lot 1 on Plan of Subdivision 630867S
- Lot 1 on Plan of Subdivision 630872A
- Lot 3 on Title Plan 857523X

**Subsequent Stages** means the following land titles:

- Lot 2 on Plan of Subdivision 802641P
- Lot 1 on Plan of Subdivision 630874V
- Lot 2 on Plan of Subdivision 630874V
- Lot 3 on Plan of Subdivision 630874V
- Lot 4 on Plan of Subdivision 630874V
- Lot 5 on Plan of Subdivision 630874V
- Lot 6 on Plan of Subdivision 630874V

**WIFT** means land contained with Special Use Zone Schedule 3 Dooen Freight Hub in the Horsham Planning Scheme, now known as the Wimmera Intermodal Freight Terminal, located on land adjacent the precinct and the Melbourne Adelaide Rail Line.

**WIFT Precinct** (or "Precinct") means Land contained in Special Use Zone Schedule 9 Wimmera Intermodal Freight Terminal precinct and to be developed generally in accordance with this Development Plan.

# 1. Introduction

The Wimmera Intermodal Freight Terminal Stage 1 Development Plan applies to land shown within Development Plan Overlay Schedule 9 Wimmera Intermodal Freight Terminal Precinct comprising of the following land titles:

- Lot 1 on Plan of Subdivision 802641P
- Lot 1 on Plan of Subdivision 630867S
- Lot 1 on Plan of Subdivision 630872A
- Lot 3 on Title Plan 857523X

The proposed use and development of the land is shown in Figure 1 Wimmera Intermodal Freight Terminal Precinct Stage 1 Development Master Plan, below.

Development of the land is to be generally in accordance with this development plan, which is further described in sections 3, 4, 5, 6, and 7 of this development plan.

# 2. Vision

The Wimmera Intermodal Freight Terminal (WIFT) Precinct will be a major intermodal freight and logistics hub for the Wimmera-Southern Mallee region. The Precinct will facilitate the agglomeration of freight related land uses around key freight handling facilities and ensure the continued efficient and effective transfer of goods into and out of the region.

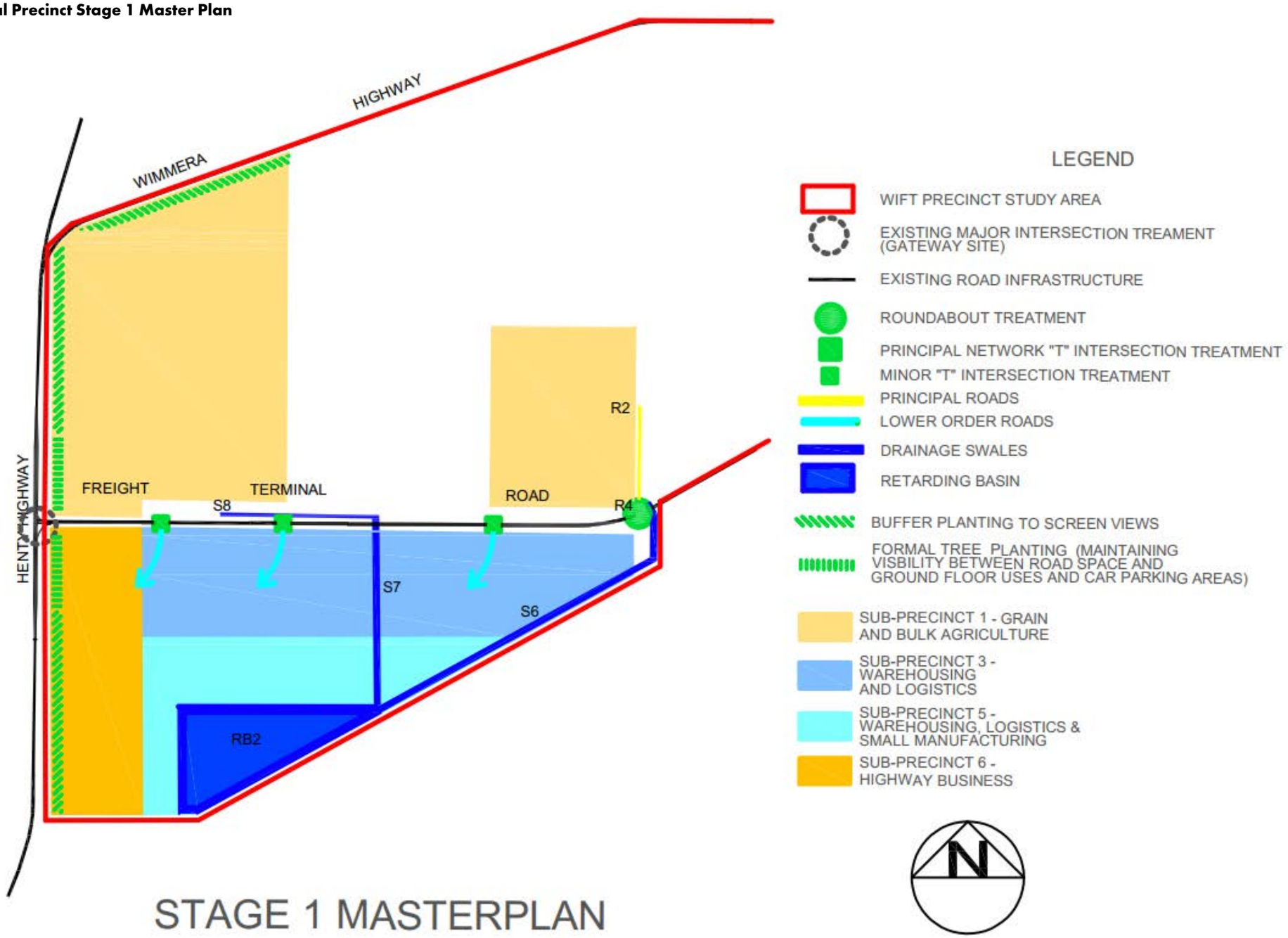
In accordance with the vision:

- The Precinct will comprise industry involved in the storage and transfer of primary produce and raw materials from farm-road- rail, for eventual transport to sea-ports and international markets beyond.
- The Precinct will be supported by a range of complementary activities and businesses, including container park facilities, large volume container packing, bulk loading and warehousing facilities.
- The Precinct will incorporate industry that adds value to primary produce and raw materials through their manufacture, packaging and transportation.
- The Precinct will contribute to the diversification of employment opportunities for the municipality of Horsham and the wider Wimmera-Southern Mallee region by establishing a thriving industrial employment precinct that provides or a range of businesses and jobs.
- The Precinct will incorporate principles of quality design and landscaping, environmentally sustainable development and water sensitive urban design.

# 3. Stage 1 Master Plan

Figure 1 Wimmera Intermodal Freight Terminal Precinct Stage 1 Development Master Plan, below, identifies the following elements of the development of the WIFT Precinct:

**Figure 1:**
**Wimmera Intermodal Freight Terminal Precinct Stage 1 Master Plan**



# 3. Stage 1 Master Plan

### 3.1 Sub-precincts

The location of sub-precincts accord with the corresponding Tables of Use contained within Clause 37.01 Schedule 9 Wimmera Intermodal Freight Terminal Precinct in the Horsham Planning Scheme. This Development Plan should be read in conjunction with that Clause of the Horsham Planning Scheme.

### 3.2 Land Uses

Planning Permit applications for use of land within close proximity with the WIFT Terminal will include documentation that demonstrates the need to use or have access to the Terminal.

Planning Permit applications for land uses will include documentation to demonstrate that they are not incompatible with surrounding land uses permissible under the zone.

Planning permit conditions may include conditions to ensure potential incompatible externalities are contained within the site, so as to prevent environmental problems created by siting incompatible land uses close together.

### 3.3 Gateway Sites

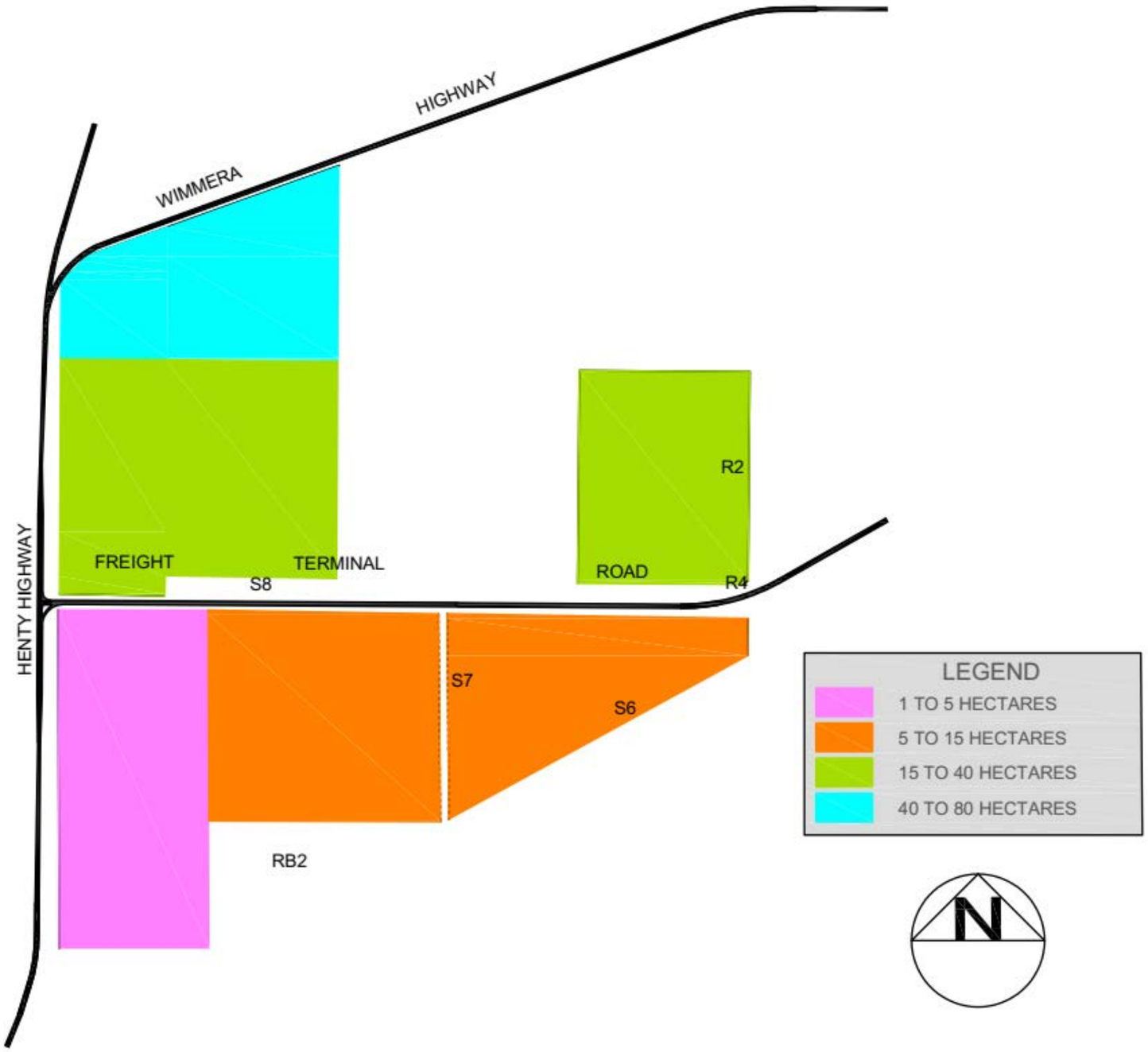
Gateway sites are developable land on either side of the main road entrance at the intersection of Freight Terminal Road and the Henty Highway. This intersection will provide primary access to the WIFT Precinct. When these sites undergo future development, planning permit conditions will require distinctive landscaping and landmark built form to mark the entrance to the precinct.

Entrance to the Precinct will also be marked with signage and distinctive entrance statements that provide a strong sense of arrival to the precinct, community interest, and contributes to the Wimmera-Southern Mallee regions public art offer. These street furnishings will require approval from Council and Regional Roads Victoria.

### 3.4 Subdivision layout

Applications for subdivision will demonstrate subdivision layout showing a range of lot sizes generally in accordance with Figure 2, right:

**Figure 2: Stage 1 Subdivision Layout**



# 3. Stage 1 Master Plan

Subdivision will also provide for:

- The presentation of lots to the Wimmera and Henty Highways ensuring that no lot has direct road access from the Henty or Wimmera Highways.
- An internal loop road to service uses in sub-precinct 6 Highway Business, shown in Figure 1 as a lower order road.
- Primary access to the precinct will be from a gateway site located at the existing intersection of Freight Terminal road and the Henty Highway.
- Typical street cross-sections will accord with Figures 3, 5, 6, and 8 in this Development Plan.
- Smaller lots may be considered if the lot is required by a public authority, utility or telecommunications service provider to create a lot for a utility or telecommunications installation.

A permit for subdivision must contain the following conditions:

- The provision of utilities and services, including electricity, telecommunications, and water supply shall accord with Figure 3, below.
- Standards for localised infrastructure shall accord with the standards required by relevant agencies that apply at the time of making an application under this plan.

### 3.5 Provision of utilities

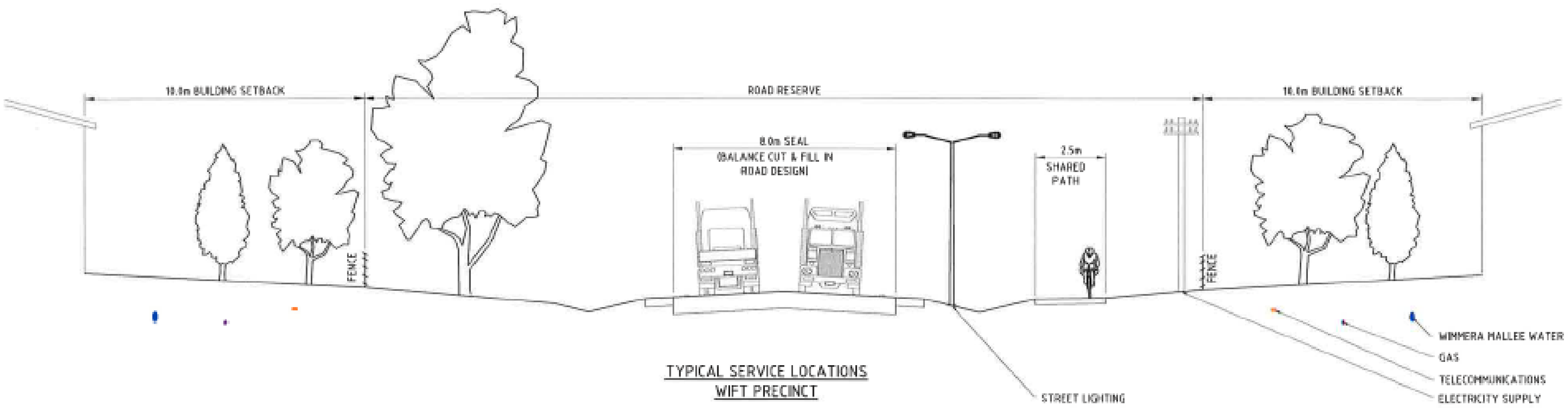
Utilities will be provided in accordance with the following:

- Disposal of onsite wastewater shall be provided in accordance with State Environmental Planning Policy Waters of Victoria.
- The owner of the land must enter into an agreement with:
  – A telecommunications network or service provider for the provision of telecommunication services to each lot in accordance with the provider's requirements and relevant legislation at the time; and
  – A suitably qualified person for the provision of telecommunication facilities to each lot shown on the endorsed plan in accordance with any industry specifications or any standards set by the Australian Communications and Media Authority.
- Before the issue of a Statement of Compliance for any subdivision under the Subdivision Act 1988, the owner of the land must provide written confirmation from:
  – A telecommunications network or service provider that all lots are connected to or are ready for connection to telecommunications services in accordance with the provider's requirements and relevant legislation at the time; and
  – A suitably qualified person that telecommunication facilities have been provided in accordance with any industry specifications or any standards set by the Australian Communications and Media Authority.

### 3.6 Staging

This Development Plan applies to Stage 1 of the WIFT Precinct, as shown in Figure 1, above. A separate Development Plan(s) is required for any subsequent stage or stages in the development of land shown in Development Plan Overlay Schedule 9 Wimmera Intermodal Freight Terminal in the Horsham Planning Scheme.

**Figure 3: Typical Street Cross Section Showing Location of Services**



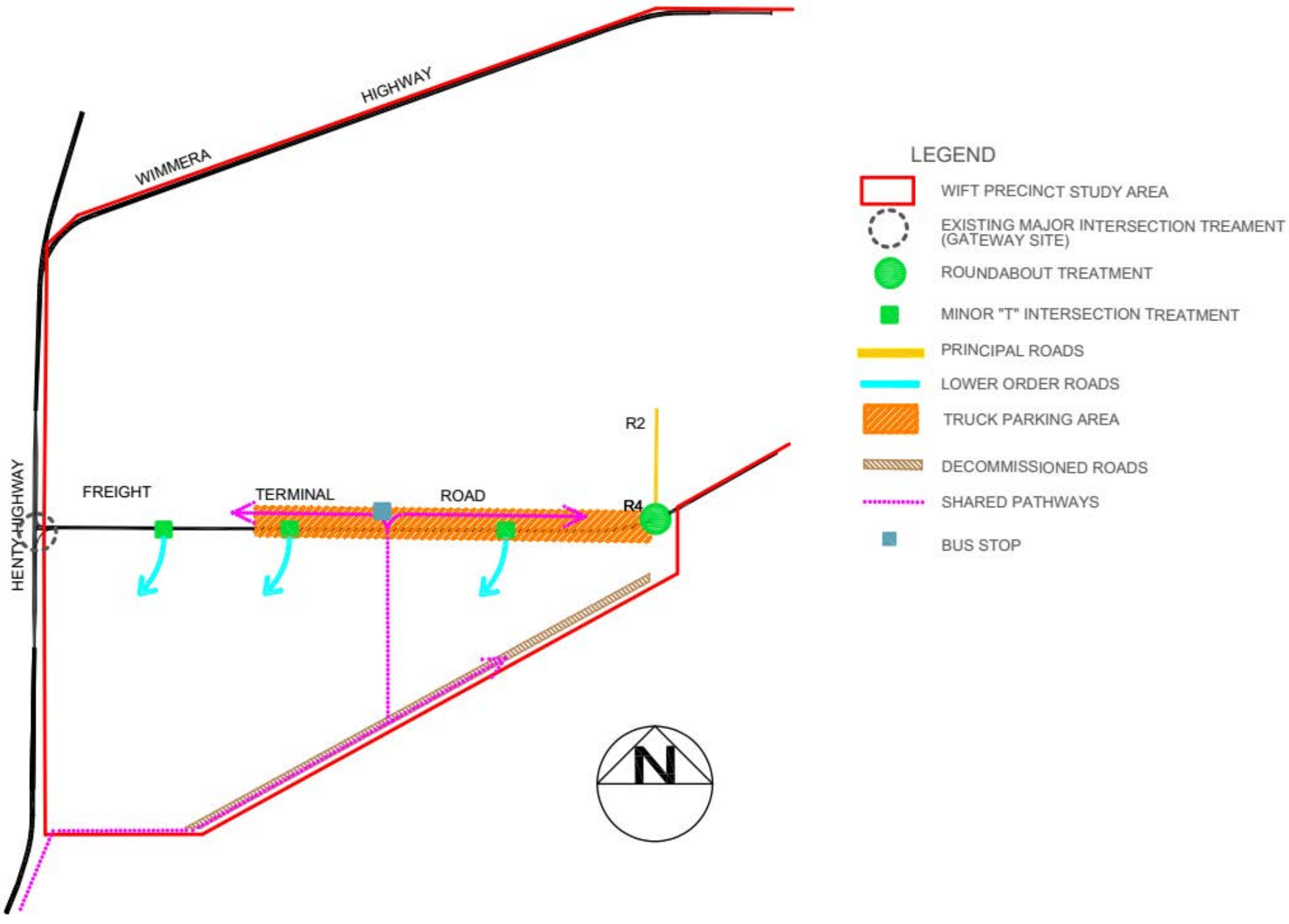
# 4. Stage 1 Transport Management Plan

The development of the WIFT Precinct as a freight and logistics hub for western Victoria will likely result in increased traffic volumes within the precinct, with a likely high number of heavy vehicle trips. The Principal Road Network (enabling infrastructure items) and lower order roads (localised infrastructure) shall be provided in accordance with the requirement of this Stage 1 Development Plan, as given right.

### 4.1: Integrated Transport Plan

The following Figure 4 shows the Integrated Transport Plan for Stage 1 of the WIFT Precinct.

**Figure 4: Stage 1 Integrated Transport Plan**



# 4. Stage 1 Transport Management Plan

**F 4.2 Road Transport Plan**

Figure 4 shows the Principal Road Network annotated in yellow. The Principal Road Network is key enabling infrastructure required for development of the Precinct. The Principle Road Network must include:

- A major intersection treatment at the intersection of Freight Terminal Road and the Henty Highway (existing), the development of Freight Terminal Road as a quality tree-lined boulevard, a new roundabout at the intersection of Freight Terminal Road and Molyneaux Road, an upgraded section of the existing Molyneaux road (shown as Principal Road R2 in Figure 4, above).

Several features of the Principal Road Network are existing, such as the Principal access point at the Intersection of Freight Terminal Road and the Henty Highway, Freight Terminal Road, and the intersection of Freight Terminal Road and Molyneaux Road.

Figure 1, above, shows the intersection of Freight Terminal Road and Molyneaux Road being provided for via a roundabout, see Figure 7 and Appendix 1 for design details. Notwithstanding this, the elements of the Principal Road Network to be provided by the Stage 1 Development Plan will allow for:

a. A-Double vehicle movements at intersections and access ways/driveways;

b. Bus bays at strategic locations as shown in Figure 4 (for future installation);

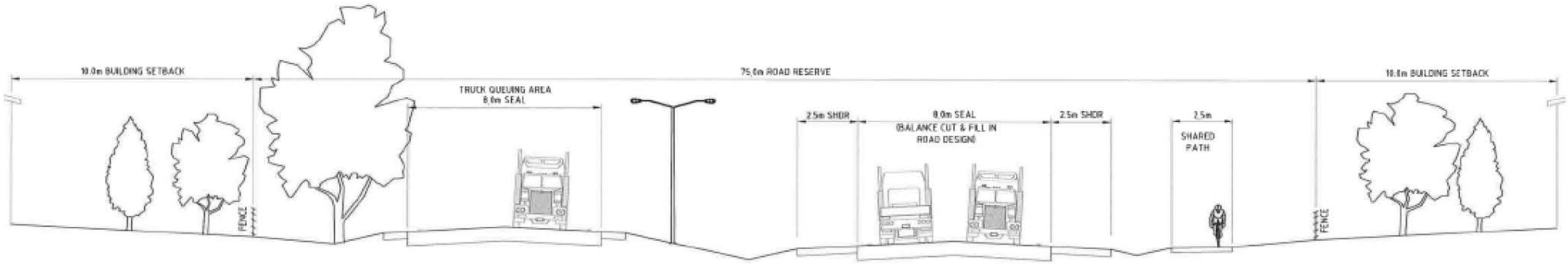
c. Truck parking/queuing area on Freight Terminal Road;

d. Shared footway/bicycle ways, as shown in Figure 4;

e. Localised drainage to complement the Integrated Water Management Plan (see Section 6 of this Development Plan).

The design of the Principal Road Network shall be in accordance with the following cross section diagrams. All road infrastructure items are to be constructed to the satisfaction of Council.

**Figure 5: Freight Terminal Road**




TYPICAL SECTION FREIGHT TERMINAL ROAD
(250m to 1600m EAST OF HENTY HWY)

# 4. Stage 1 Transport Management Plan

**Figure 6: Principal Road Network**

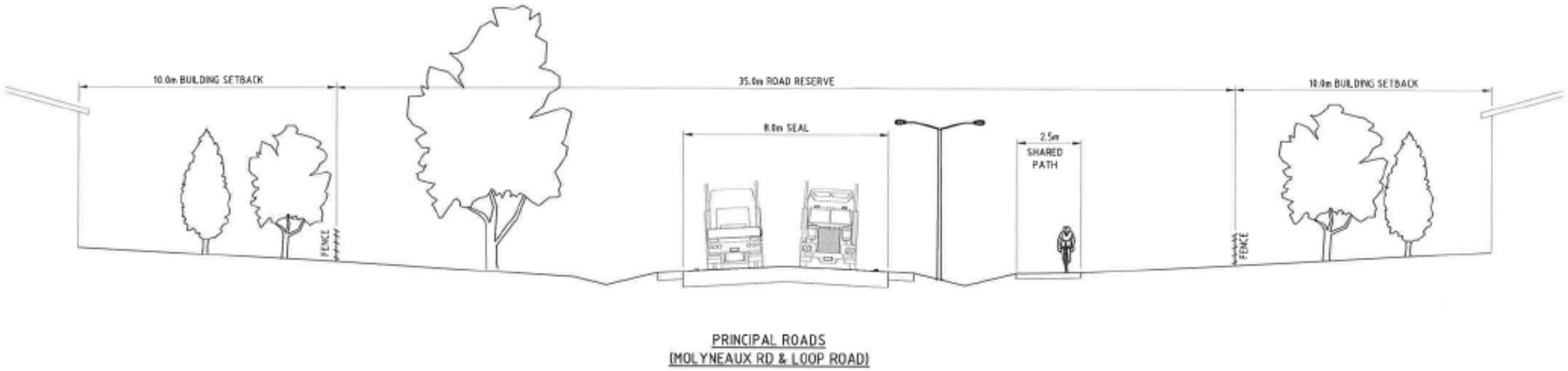
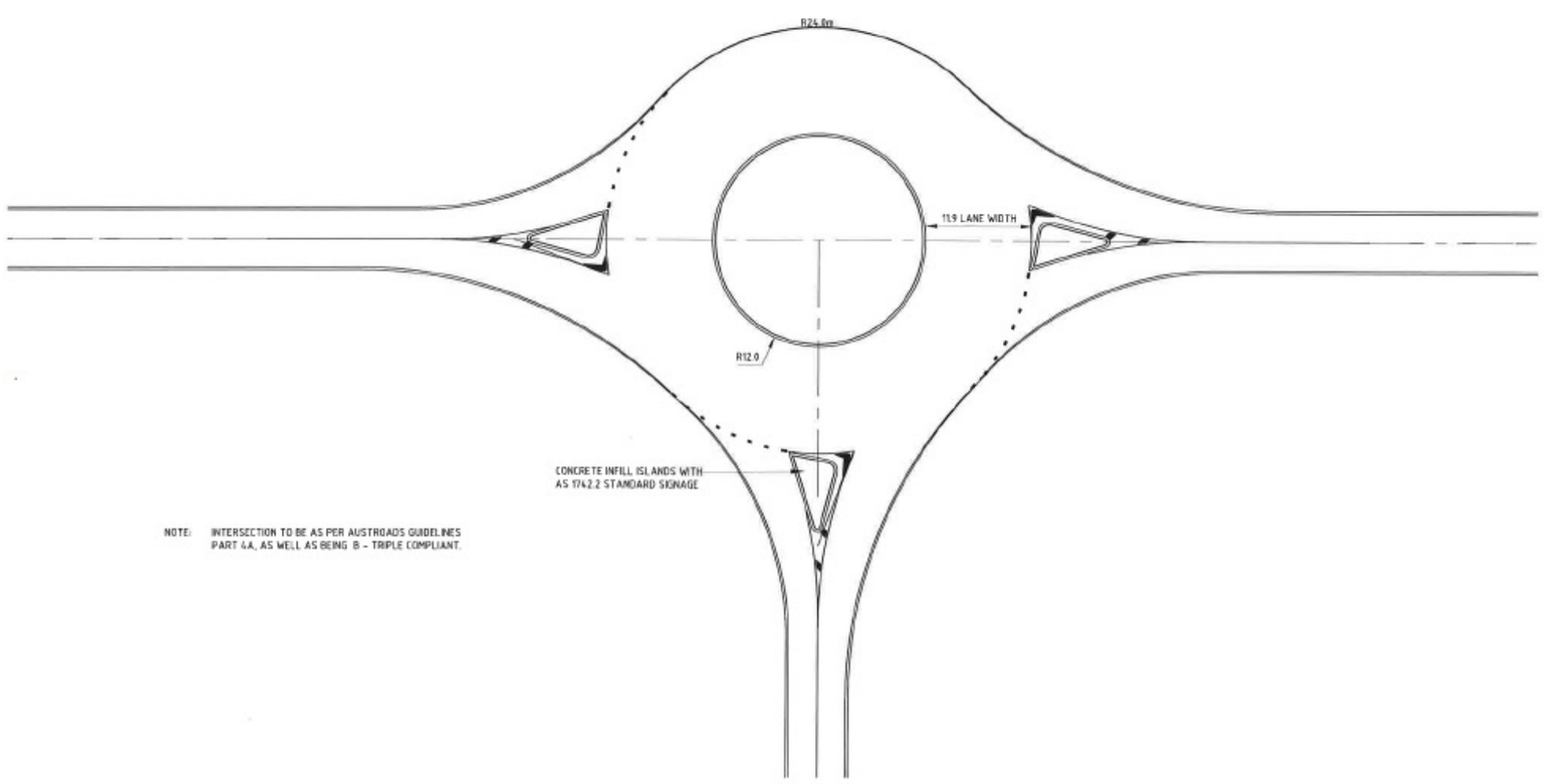



**Figure 7: Roundabout Design**



# 4. Stage 1 Transport Management Plan

**Figure 8: Lower Order Road**

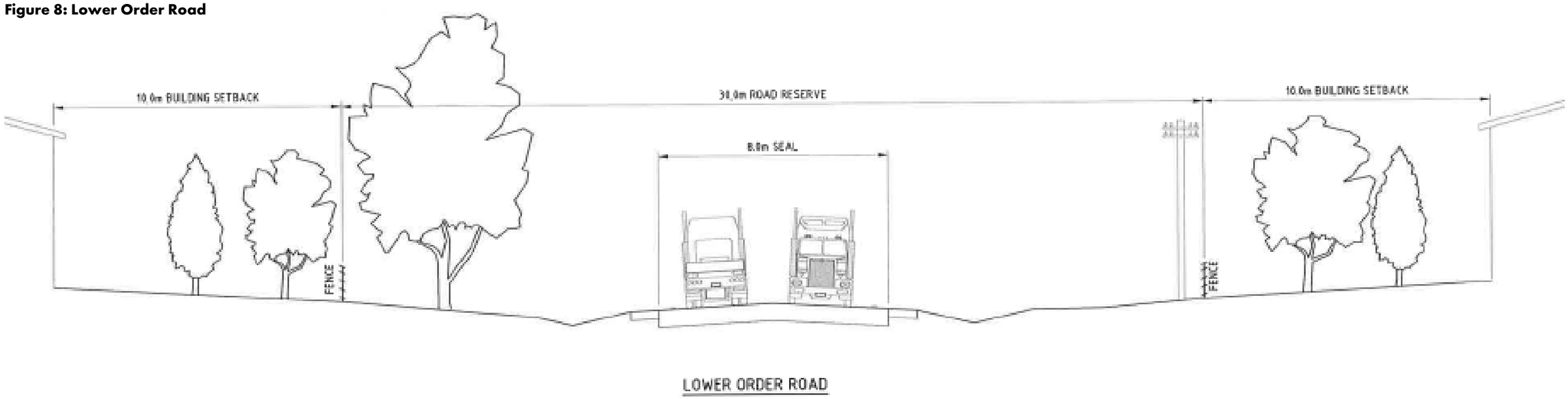
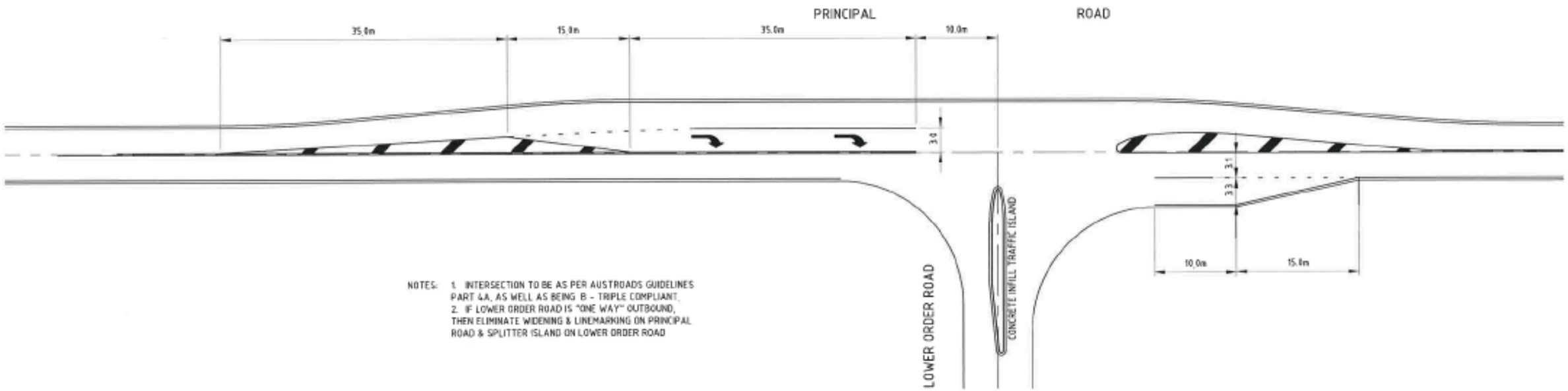



**Figure 9: Lower Order Road Intersection with Principal Road Network**



# 4. Stage 1 Transport Management Plan

### 4.3 Principal Access

Principal access to the WIFT Precinct is located at the intersection of Freight Terminal Road and the Henty Highway via a large priority T-junction intersection, see Figure 4. Distinctive entrance statement landscaping/design treatments are also located at this intersection to identify it as a gateway to the WIFT precinct.

**Figure 10: WIFT Precinct Principal Access Intersection Design**

The Principal Access Intersection includes:

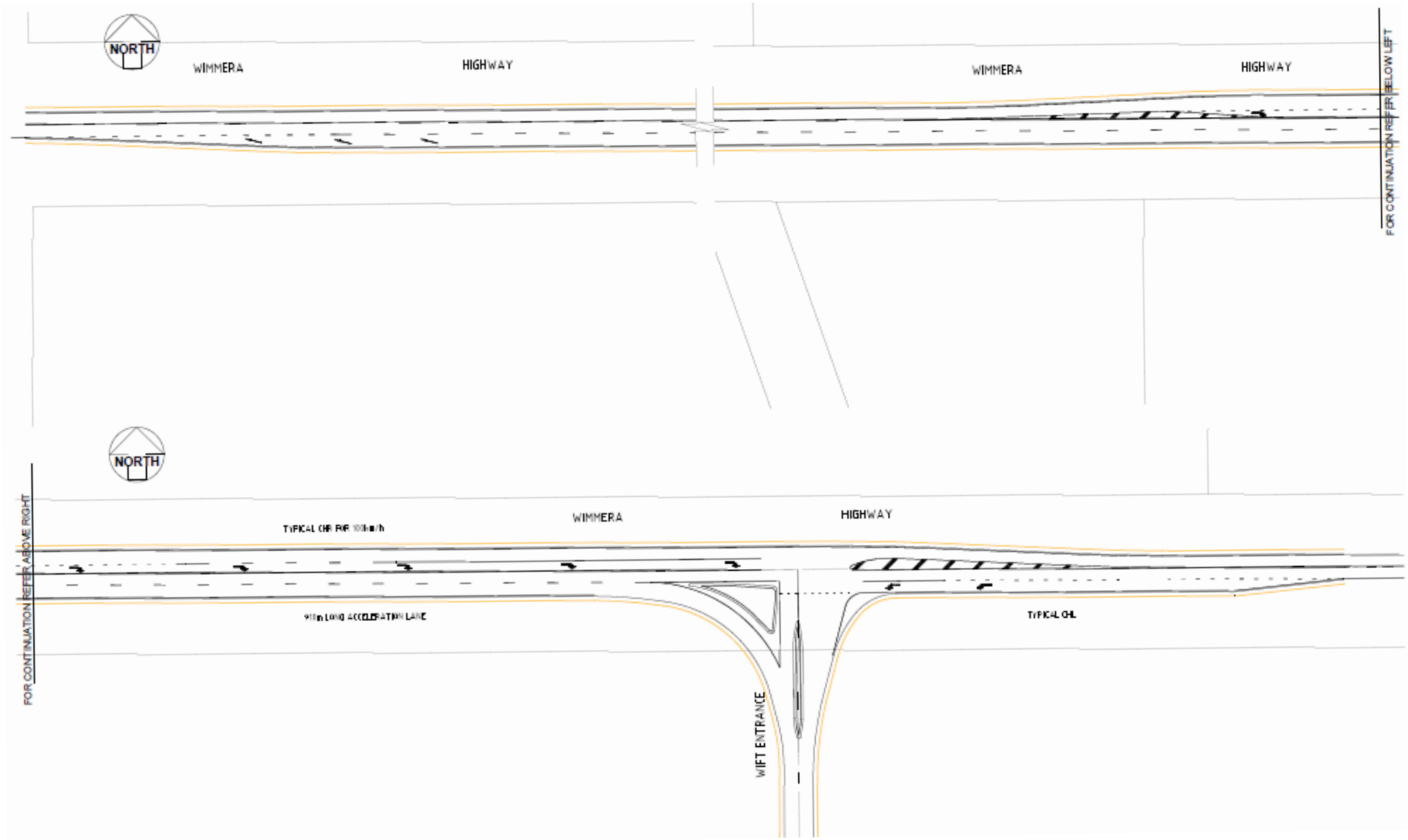
a. Channelised right turn Lane (storage to meet demands of the intersection)

b. Channelised left turn Lane including deceleration lane

c. Acceleration lanes to meet speed zone demands and traffic volume demands

d. Street lighting

e. Capacity for A-Double vehicle movements



# 4. Stage 1 Transport Management Plan

### 4.4 Truck Queuing Area

A Truck parking/queuing area has been identified on Freight Terminal road. This area is to be used by vehicles waiting to access the WIFT. On-street truck parking/queuing areas are not considered warranted elsewhere in the precinct. All parking demand (including trailer exchange) should be satisfied with on-site (off-street) parking within all development lots; avoiding unnecessary interaction between slow moving/parking vehicles and through traffic.

### 4.5 Australian Level Crossing Assessment of the Molyneaux Road Rail Level Crossing

The Molyneaux Road rail crossing does not form part of the Principal Road Network of the precinct, and is located outside of the area covered by Development Plan Overlay Schedule 9. No development is contemplated within the WIFT or the WIFT Precinct that would impact on traffic levels of this crossing, as such, the most recent Australian Level Crossing Assessment Model (ALCAM) report has been included in Appendix B.

It is recognised that if development, either within or outside the WIFT Precinct, is contemplated that would have the effect of changing the traffic conditions of this crossing, a further safety assessment of the crossing will be required.

It is recognised that development external to the precinct may trigger the need for an ALCAM report, which may result in additional road works being required within the WIFT Precinct at the off-site developer's expense. Any works required within the WIFT Precinct triggered by off site development will be provided by the off-site developer.

### 4.6 Road Layout

Freight Terminal Road will be retained as a single carriageway, with potential to provide a truck queuing area on the northern side at a future juncture when the number of truck movements entering the WIFT warrant additional traffic control measures. The design of Freight Terminal Road will provide for a quality, tree-lined boulevard with appropriate safety and relevant utility service requirements, generally in accordance with this Development Plan.

A roundabout is required at the intersection of Freight Terminal Road and Molyneaux Road. Refer to Figure 7, above, for roundabout design. Molyneaux Road is to be upgraded to Principle Road Network Standard for a length on 300m north of the roundabout marked as R4 in Figure 4, above. A turnaround court bowl is to be provided at this point, as an interim measure awaiting preparation of a Development Plan for subsequent stages, as shown in Figure 4, above.

Lower order roads will be provided by subdividers/developers, where required, to provide opportunity for development of lots without frontage to the principal road network. The layout of lower order roads is to provide for future development of the sub-precincts identified in Clause 37.01s9 in the Horsham Planning Scheme.

Intersections of lower order roads with the Principal Road Network shall be at T-Junctions that provide for A-Double vehicle movements at intersections and access ways/driveways.

Pavement design for roads is to take into account the load weight and frequency of use by A-Double vehicles. Private roads accessing the Terminal should consider the appropriateness of higher design standards to accommodate overweight loads. Attention should be paid to pavement load limits within the Terminal, and freight handling limitations at port destinations when considering this action.

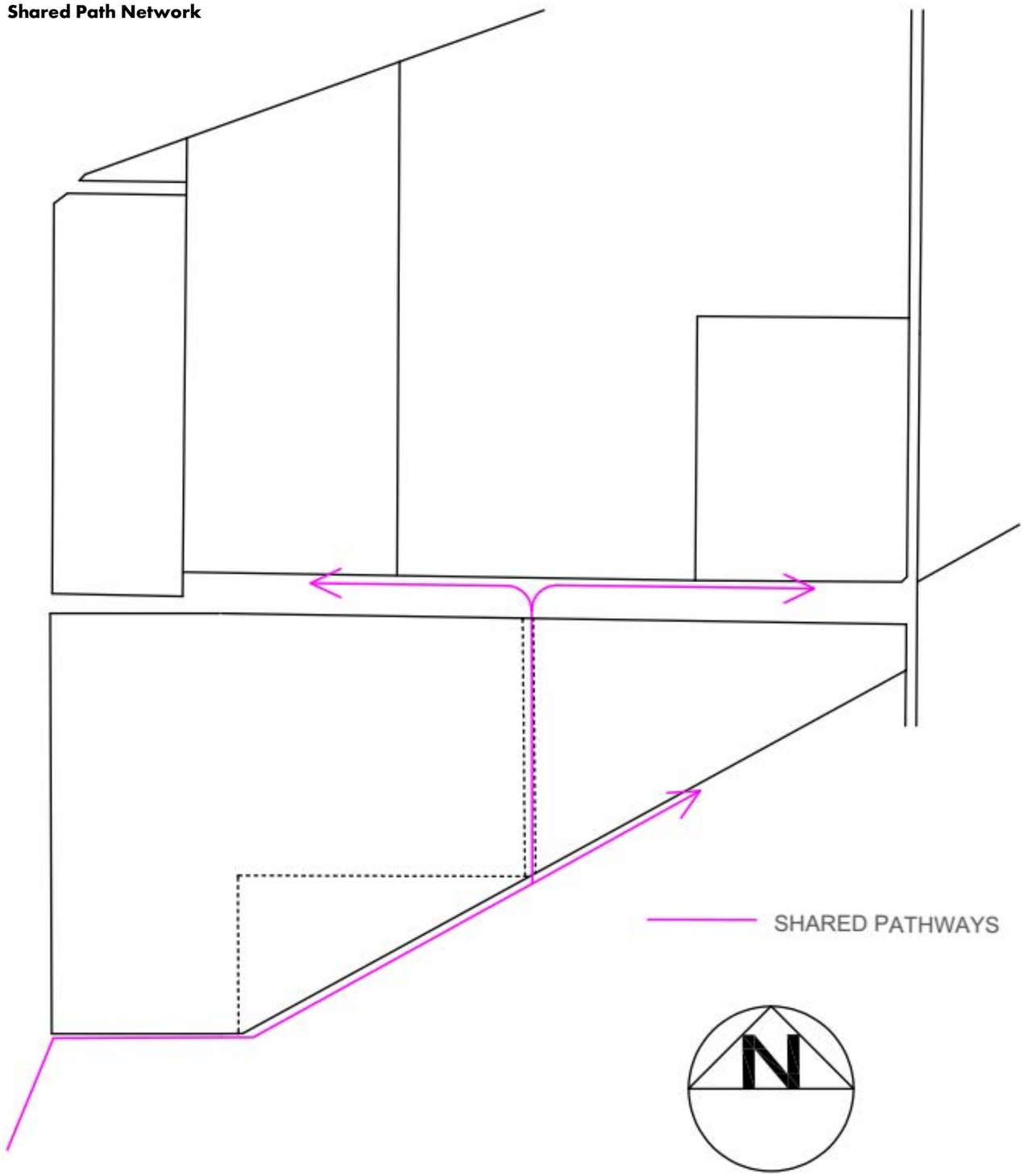
### 4.7 Design of Path Networks

The design of footpaths, bicycle paths, and shared pathway networks, internal to the precinct will be constructed to the satisfaction of Council at a 2.5m width, and located on the Principal Road Network and the storm water drainage network, in accordance with Figure 11 below.

A shared path (minimum 2.5m wide) shall be constructed from the end of the existing service road at the Dooen Recreation Reserve to the south west corner of the WIFT site along the east side of Henty Hwy. This shared path shall include a crossing facility at Longerenong Rd designed and constructed to relevant Austroads standard, and a level crossing for pedestrians and cyclists over the rail line at Dooen, subject to the approval of the Minister for Transport. The shared path shall link to the internal WIFT Precinct shared path network via a link through the drainage reserve to Freight Terminal Road; the location of such link shall be determined in the landscape design of the drainage reserves and drainage linear links (swale alignments). The Shared Path network external to the precinct will generally accord with Figure A1 in Appendix A.

# 4. Stage 1 Transport Management Plan

**Figure 11: Stage 1 Shared Path Network**




### 4.8 Traffic Management Measures

Traffic Management measures and signalisation will be provided using statutory control methodologies.

### 4.9 Parking

All parking demand should be satisfied with on-site parking within all development lots, avoiding unnecessary interaction between slow moving/ reversing cars and heavy vehicle traffic. All traffic should be capable of entering a development site in a forward direction and egressing to the road network in a forward direction. There is to be no on-road car parking. Driveways should be constructed with robust culverts and endwalls to satisfy turning profiles of A-Double vehicles, and meet any swale crossing requirements under the Integrated Water Management Plan (see Section 6). Demand for off-street parking should be a consideration in determining appropriate lot size.

### 4.10 Access for A-Double Vehicles

The principal access point to the precinct will be constructed to A-Double vehicle standards.

Intersections of lower order roads with the Principal Road Network shall be at T-Junctions that provide for A-Double vehicle movements at intersections and access ways/driveways.

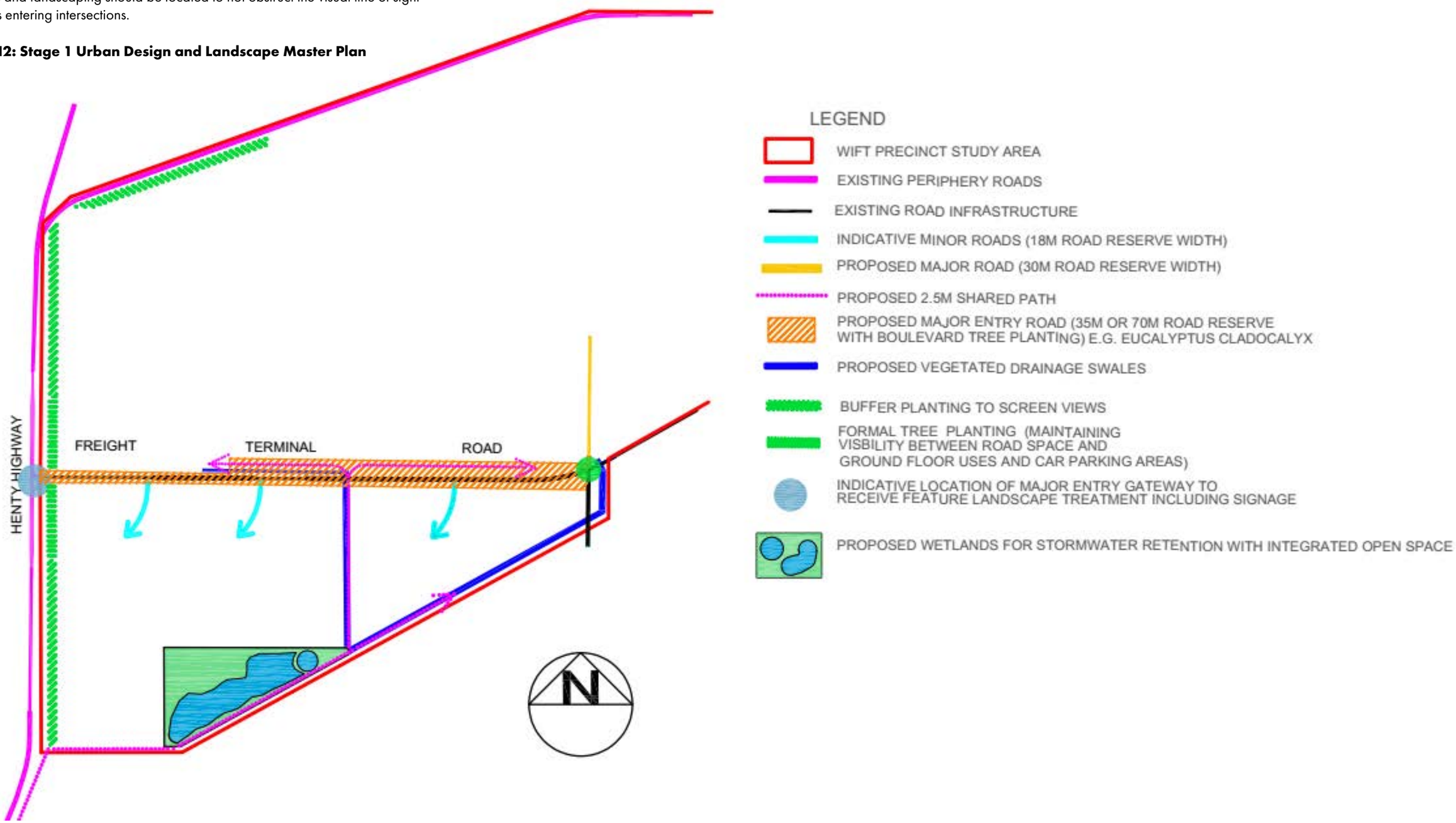
All sites within the precinct, including entry/exit points to/from the WIFT, shall accommodate A-Double vehicles to be capable of entering a site in a forward direction and egressing to the road network in a forward direction.

# 5. Stage 1 Urban Design and Landscape Master Plan

**The Stage 1 Urban Design and Landscape Master Plan** for the overall Wimmera Intermodal Freight Terminal Precinct is shown in Figure 12, below. The Planting Schedule contained in Appendix C provides a species selection for landscaping purposes.

Buildings and landscaping should be located to not obstruct the visual line of sight of drivers entering intersections.

**Figure 12: Stage 1 Urban Design and Landscape Master Plan**



# 5. Stage 1 Urban Design and Landscape Master Plan

### 5.1 Environmentally Sustainable Design Principles

Building pads and slabs of any new development will be constructed to be a minimum of 150mm above natural ground level to contribute towards achieving the 300mm freeboard height required for the precinct, which has been allowed for in the Integrated Water Management Plan. The Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan (Water Technology Pty. Ltd, 2018) attached in Appendix D, has allowed for a freeboard of 150mm from the 1% AEP water level to the top of each swale. This then requires an additional 150mm to be achieved at each building location using gravel pads, a concrete slab etc. resulting in a total freeboard of 300mm for all new buildings.

Development that exceeds 50% site coverage/hard runoff areas is required to provide additional on-site stormwater retention to accommodate runoff generated from site coverage/hard runoff area above the 50% area.

Dominant streetscape elements should be landscaping and buildings, not signs.

Planning Permit applications for buildings and works shall be accompanied by a Construction Management Plan prepared to Council's satisfaction, which demonstrates how environmental impacts of construction are to be managed.

### 5.2 Gateway Sites

Gateway sites are located at the intersection of Freight Terminal road and the Henty Highway. These Gateway sites will include distinctive landscaping, landmark built form, and distinctive signage to mark the entrance to the precinct.

Integration of signage and artwork will provide the opportunity to compliment the regions Silo Art Trail, whilst being distinctly different. This signage/artwork is to incorporate elements that reflect the operation of the terminal and precinct into the streetscape to provide visual interest and contextual relevance to the combined signage/artwork.

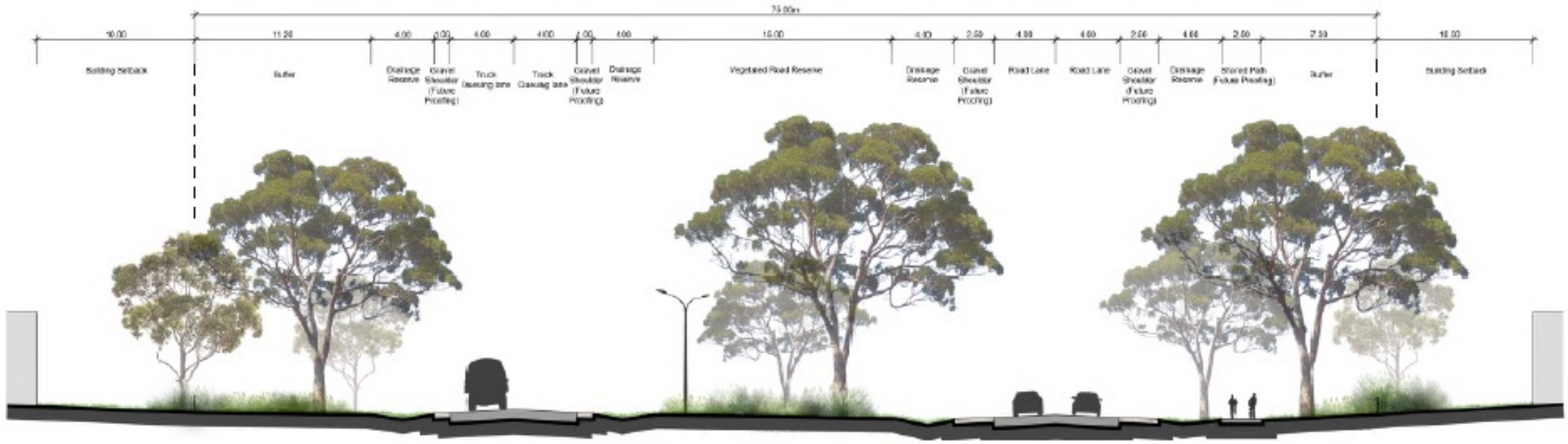
### 5.3 Street Tree Master Plan

Street tree planting for the Principal Road Network will provide a distinctive Boulevard Road environment that accords with Figures 13 and 14, right. Species selection for street trees is provided in Appendix C.

The planting is to provide tree canopies but maintain visibility between the road space and ground floor uses / activities and car parking areas.

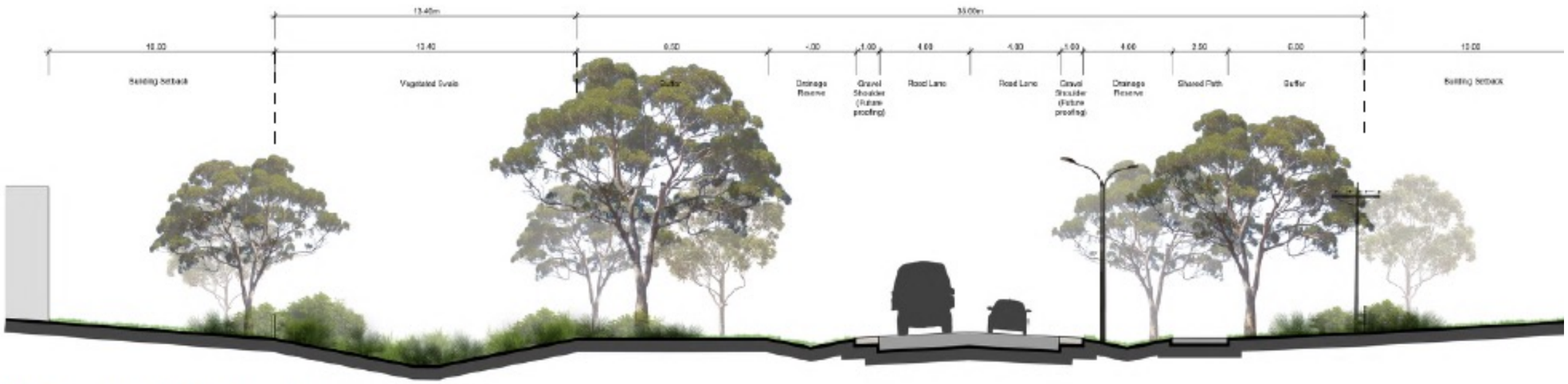
# 5. Stage 1 Urban Design and Landscape Master Plan

**Figure 13: Freight Terminal Road Cross Section with Boulevard Road Tree Plantings**




**1** Freight Terminal Road
250m-1600m East of Henty Highway
75m Road Reserve

**Figure 14: Principal Road Network Cross Section with Boulevard Road Tree Plantings**

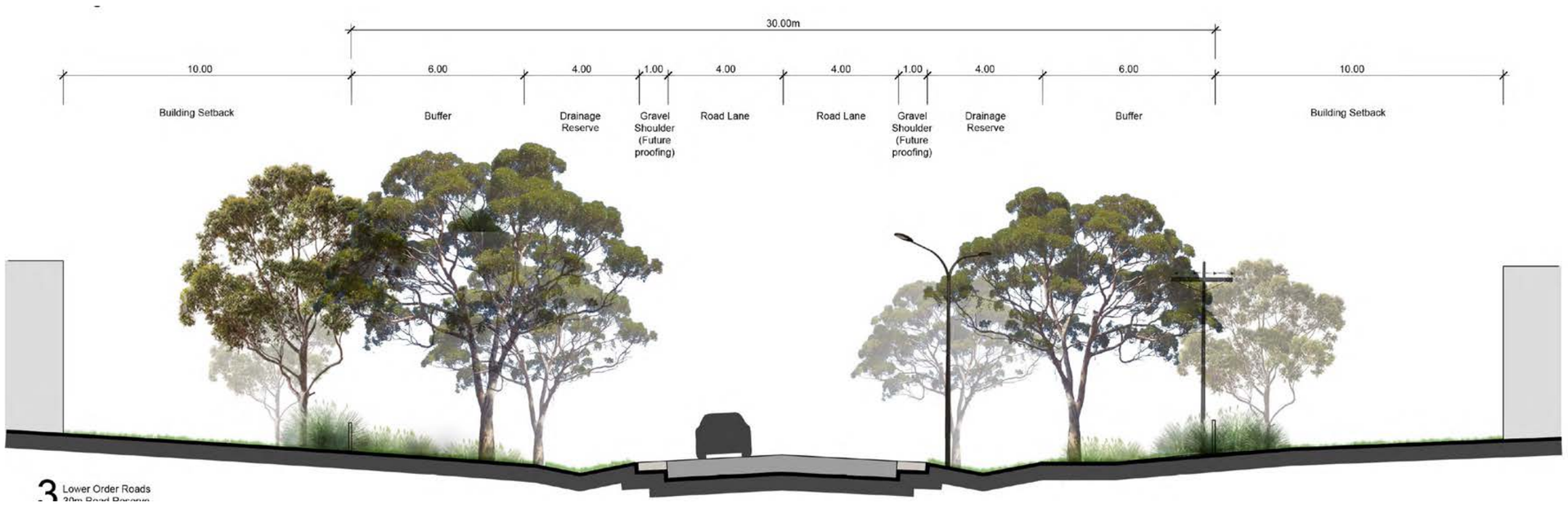



**2** Principal Roads (Molyneux & Loop Road)
13.4m Swale Reserve
35m Road Reserve

# 5. Stage 1 Urban Design and Landscape Master Plan

Lower order roads are also to be landscaped in accordance with Figure 15, below. Landscaping treatment of lower order roads is to assist in creating distinct road hierarchy within the precinct. Species selection for street trees is provided in Appendix C.

**Figure 15: Lower Order Road Cross Section with Tree Plantings**




### 5.4 Landscape Tree Planting

Tree planting within property boundaries will have regard to Figure 12, above. Species selection landscape planting within property boundaries is provided in Appendix C.

Tree planting should be located within property boundaries along the eastern side of Henty Highway, the southern side of Wimmera Highway, the northern side of the railway corridor between Henty Highway and Molyneaux Road, and at the rear of properties abutting the northern side of the railway corridor to the east of the freight terminal. The intention of this tree planting is to provide a landscaped 'screen'. The development of the landscaped screen is a long-term development objective and is predicated on the intensity of land uses along these interfaces.

Landscape tree planting is to provide an obvious transition from the rural environment to the Precinct by the creation of a distinctive planted landscape edge. Precinct boundary landscape planting within property boundaries is to be provided along the Wimmera and Henty Highway to screen views to the precinct from these roads, as shown in Figure 12, above.

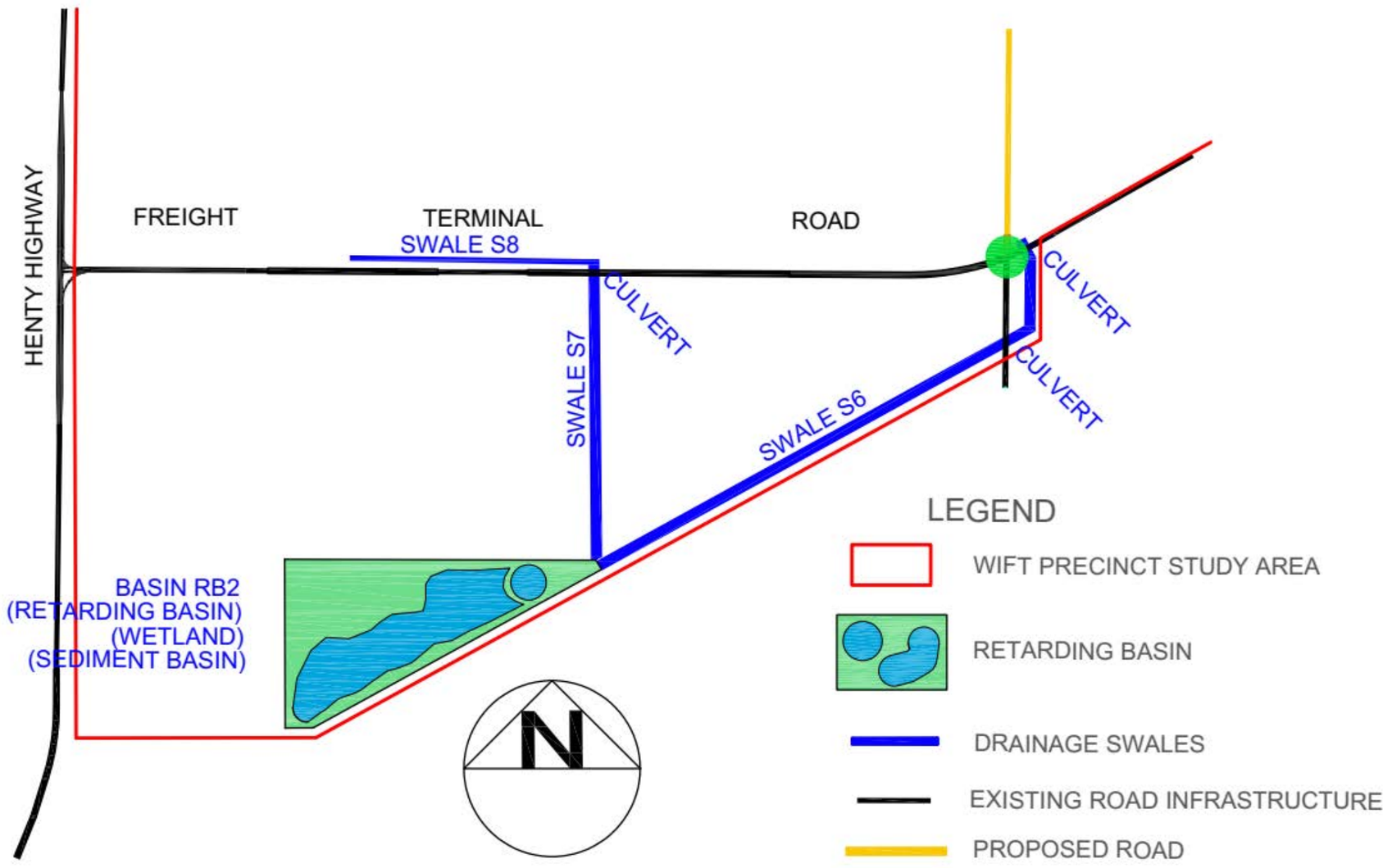
Species selection for landscape planting within property boundaries is provided in Appendix C.

# 6. Stage 1 Integrated Water Management Plan

The Stage 1 Integrated Water Management Plan prepared for the WIFT Precinct has been designed to respond to flooding, stormwater and drainage management. The Integrated Water Management Plan is provide at Figure 16, below. The Integrated Water Management Plan has been prepared to address flooding, stormwater, and drainage management issues.

The Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan has been prepared to provide base design calculations and parameters. A copy of this report is included in Appendix D.

**Figure 16: Stage 1 Storm Water Management Strategy**



# 6. Stage 1 Integrated Water Management Plan

### 6.1 Stormwater Management Strategy

The Stormwater Management Strategy has been prepared to ensure that stormwater management:

- Maintains the existing 1% Annual Exceedance Probability (AEP) peak flow rate is no greater than current flows from the Precinct.
- Maintains water quality to existing conditions.
- Ensures there is sufficient total storage capacity for 79,900 m3 of stormwater in retardation basinRB2 in Figure 16.
- Ensure that stormwater will not overtop the rail corridor.

This figure has been prepared based on modelling of stormwater flows and by having regard to Map 3 of Schedule 9 to Clause 43.04 of the Horsham Planning Scheme. The intent of the design is to separate drainage infrastructure and roads while maintaining efficient flow paths, minimising the number of drains but use a centralised treatment system.

### 6.2 Stormwater Storage

Stormwater storage capacity for Stage 1 has been established, as shown in Figure 18, below. Retardation Basin 2 (RB2), Figure 18, is located in the south-west of the Precinct, and provides for a maximum of 42,200 m3 storm water storage.

The Southern retardation basin is located slightly further east than is shown in Schedule 9 to Clause 43.04 of the Horsham Planning Scheme as detailed design of the stormwater system has highlighted the need to move this retardation basin to ensure outfall drainage.

The total capacity of retardation basins required for the development of the whole precinct has been increased from the figure of 145,800 m3 referred to in Schedule 9 to Clause 43.04 of the Horsham Planning Scheme to 113,900m3, as detailed design of the stormwater network has indicated that additional stormwater storage is required to ensure the 1% Annual Exceedance Probability (AEP) peak flow rate from the precinct in its fully developed form is no greater than current flows from the Precinct.

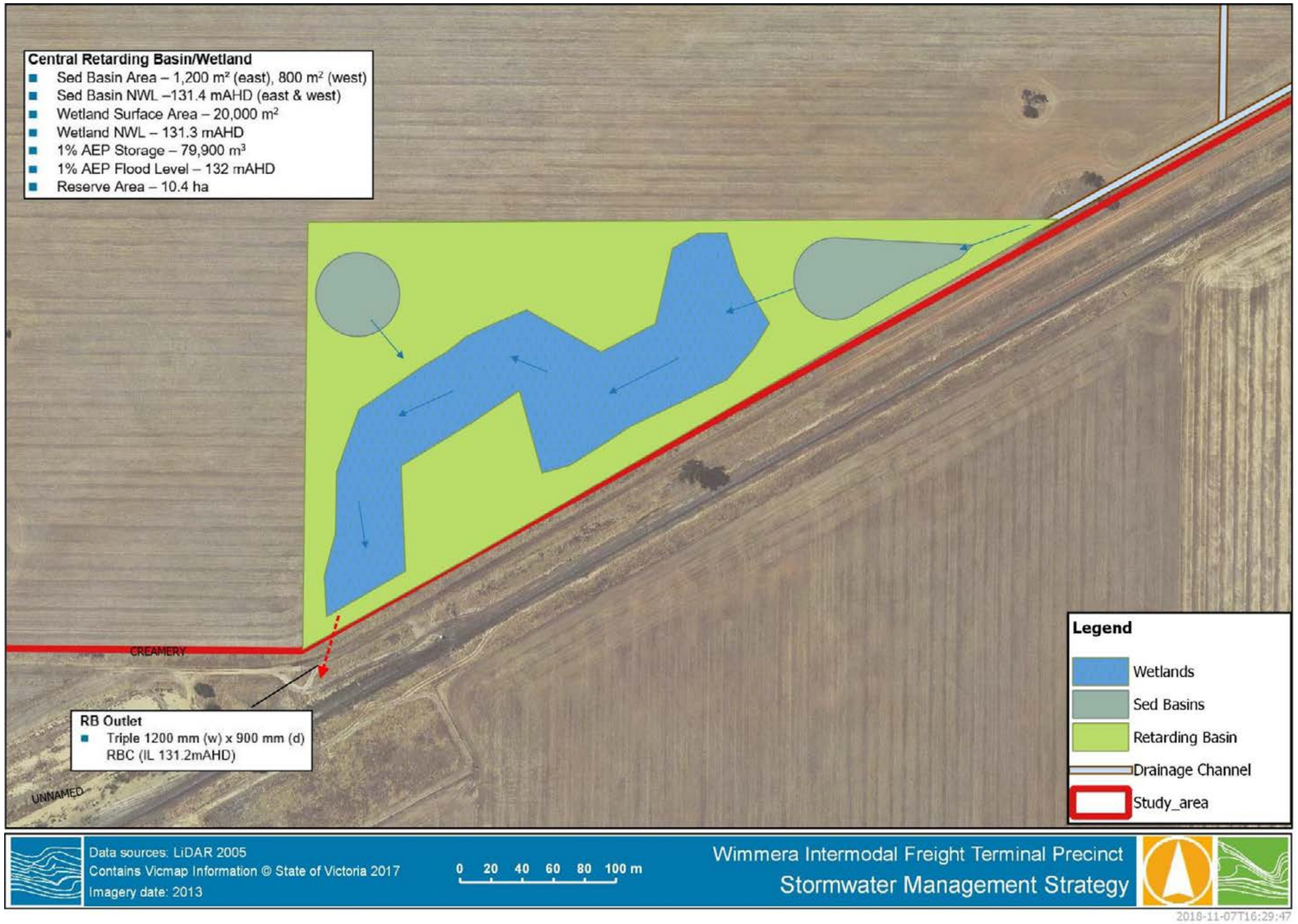
Further information on the stormwater management strategy can be found in Appendix D Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan.

The inclusion of sedimentation basins in RB2 ensures water quality of stormwater discharge from the precinct is maintained.

### 6.3 Freeboard Height

Building pads and slabs of any new development will be constructed to be a minimum of 150mm above natural ground level to contribute towards achieving the 300mm freeboard height required for the precinct, which has been allowed for in the Integrated Water Management Plan. The Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan (Water Technology Pty. Ltd, 2018) attached in Appendix D, has allowed for a freeboard of 150mm from the 1% AEP water level to the top of each swale. This then requires an additional 150mm to be achieved at each building location using gravel pads, a concrete slab etc. resulting in a total freeboard of 300mm for all new buildings.

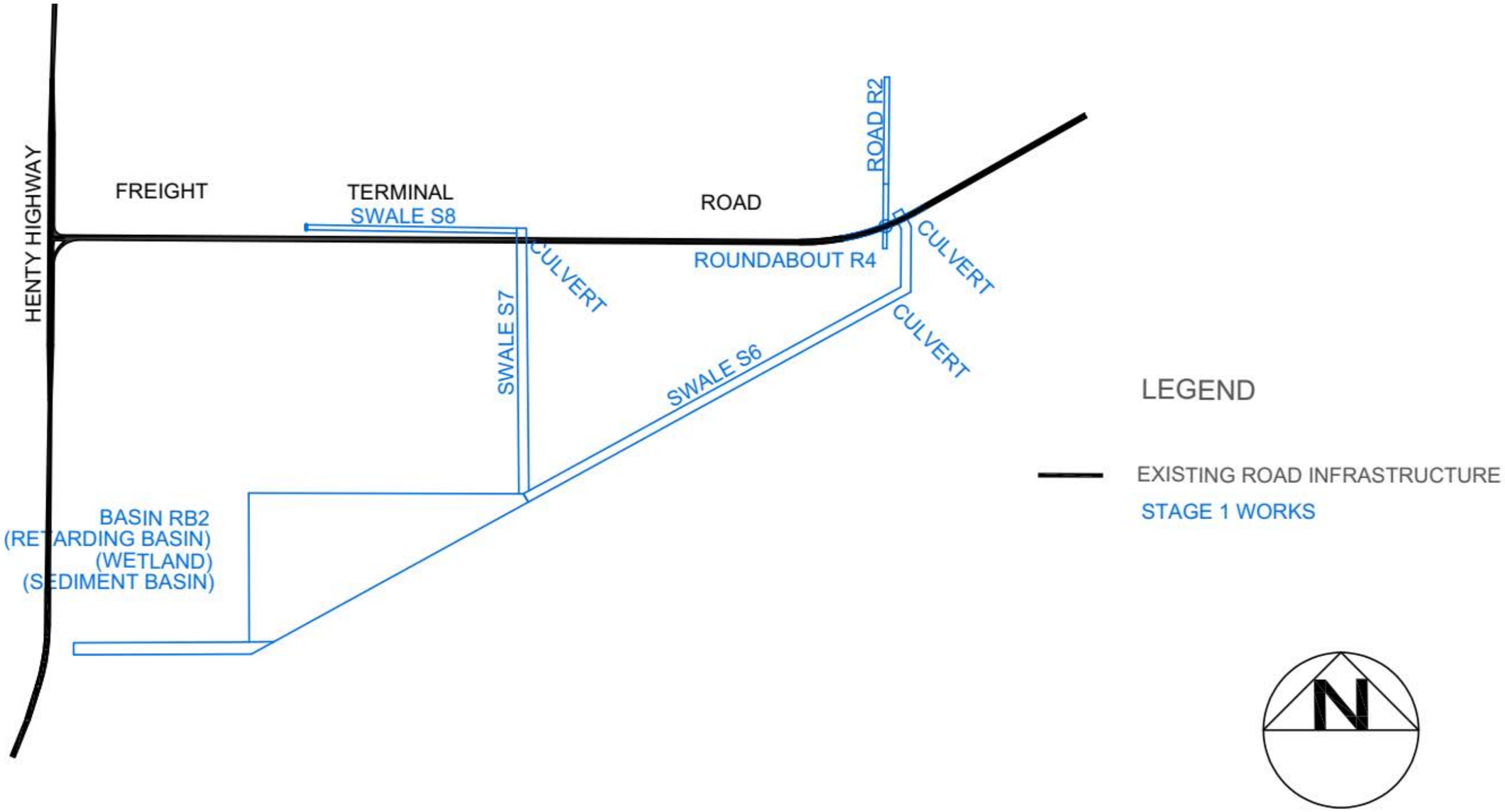
**Figure 17: Retardation Basin 2**



# 7. Stage 1 Infrastructure Plan

The Infrastructure Plan is provided at Figure 18, below. The Infrastructure Plan has been prepared to address the staging and timing of the provision of enabling infrastructure. Other infrastructure items that may be reasonably requested by the Responsible Authority are identified in sections 7.5, with section 7.6 identifying the responsible agency.

**Figure 18: Stage 1 Infrastructure Plan**



# 7. Stage 1 Infrastructure Plan

### 7.1 Provision, staging and timing of stormwater drainage works.

Provision of the stormwater drainage infrastructure will occur generally in accordance with this Development Plan.

Stage 1 works include:

- Construction of retardation basin RB2;
- Construction of drainage swales S6 and S7, including culverts, as shown in Figure 18, above; and
- Construction of landscaping works within RB2 and drainage swales S6 and S7, see section 7.3, below, for further information.

Construction of RB2 includes sedimentation basins, constructed wetlands, and landscaping. Construction of RB2 can be phased, with initial capacity providing 50% of the required final capacity as part of the initial Stage 1 Infrastructure. The remaining RB2 works are triggered by the development of greater than 75% of the available Stage 1 land.

The timing of supply of storm water drainage infrastructure will be:

- Prior to the commencement of any new use of the Subject land other than farming activities which are current as at the date of preparation of this Development Plan, whether or not a planning permit is required;
- Immediately prior to the issue of a Building Permit;
- Prior to the issue of a Statement of Compliance in respect of any Plan of Subdivision affecting the Subject Land; or
- Immediately prior to the issue of a new planning permit for Works-

Whichever occurs first unless an alternative time is agreed to in writing by Council.

### 7.2 Provision, Staging and Timing of Roadworks

Provision of the roadworks will occur in accordance with this Development Plan.

Stage 1 works include:

- Construction of Molyneaux Rd north of the intersection with Freight Terminal Road to service the property at 151 Freight Terminal Road, shown as R2 in Figure 4; and
- Construction of roundabout R4 and transitions, as shown in Figure 4.

Lower order roads are not included in this section, as their provision, staging and timing will be determined via conditions on any relevant planning permit for subdivision.

The timing of supply of roadworks considered by this section of the Development Plan will be:

- Prior to the commencement of any new use of the Subject land other than farming activities which are current as at the date of preparation of this Development Plan, whether or not a planning permit is required;
- Immediately prior to the issue of a Building Permit;
- Prior to the issue of a Statement of Compliance in respect of any Plan of Subdivision affecting the Subject Land; or
- Immediately prior to the issue of a new planning permit for Works-

Whichever occurs first unless an alternative time is agreed to in writing by Council.

### 7.3 Provision, Staging and Timing of Landscaping Works

Provision of landscaping works will occur in accordance with this Development Plan.

Landscaping works associated with stormwater swales and retardation basins shall occur concurrently with the construction of the relevant infrastructure item.

Landscaping works will also be provided on private land. Landscaping works on private land will be provided in accordance with Figure 12 Urban Design and Landscape Master Plan. Landscaping works on private land shall be supplied and maintained in compliance with permit conditions for either use, development, or subdivision

Stage 1 works include:

- Construction of the landscaping component of retardation basin RB2;
- Construction of the landscaping component of drainage swales S6 and S7;
- Construction of the landscaping component for Molyneaux Rd north of the intersection with Freight Terminal Road to service the property at 151 Freight Terminal Road,; and
- Construction of the landscaping component of roundabout R4.

The timing of supply of landscaping works considered by this section of the Development Plan will be:

- Prior to the commencement of any new use of the Subject Land other than farming activities which are current as at the date of preparation of this Development Plan, whether or not a planning permit is required;
- Immediately prior to the issue of a Building Permit;
- Prior to the issue of a Statement of Compliance in respect of any Plan of Subdivision affecting the Subject Land; or
- Immediately prior to the issue of a new planning permit for Works-

Whichever occurs first unless an alternative time is agreed to in writing by Council.

Planning permits for use, development, or subdivision of land will include conditions for the provision of landscaping works on private land in accordance with Figure 12 Urban Design and Landscape Master Plan.

### 7.4 Section 173 Agreements for Infrastructure Provision

Owners and developers of land in the WIFT Precinct will enter into a Section 173 Agreement with Council to be registered on title detailing the obligations for compliance for the supply of infrastructure and landscaping outlined in this Development Plan.

### 7.5 Other Infrastructure Requested by the Responsible Authority

Other infrastructure items associated with the subdivision of land may be required to be supplied to the satisfaction of Council, or any relevant referral authority, as required in accordance with Clause 65.02 of the Horsham Planning Scheme (Approval of an Application to Subdivide Land).

### 7.6 Agency Responsible for Provision Infrastructure

Other agencies to be consulted with respect to the provision of, or interaction with, infrastructure include:

- GWMWater for water supply
- Environment Protection Agency for on-site wastewater disposal
- Powercor for electricity
- VicRoads for connectivity to the Henty Highway and Wimmera Highway
- VicTrack and Australian Rail Track Corporation for rail related matters
- Australian Energy Market Operator for gas supply
- A telecommunications network or service provider for the provision of telecommunication services.

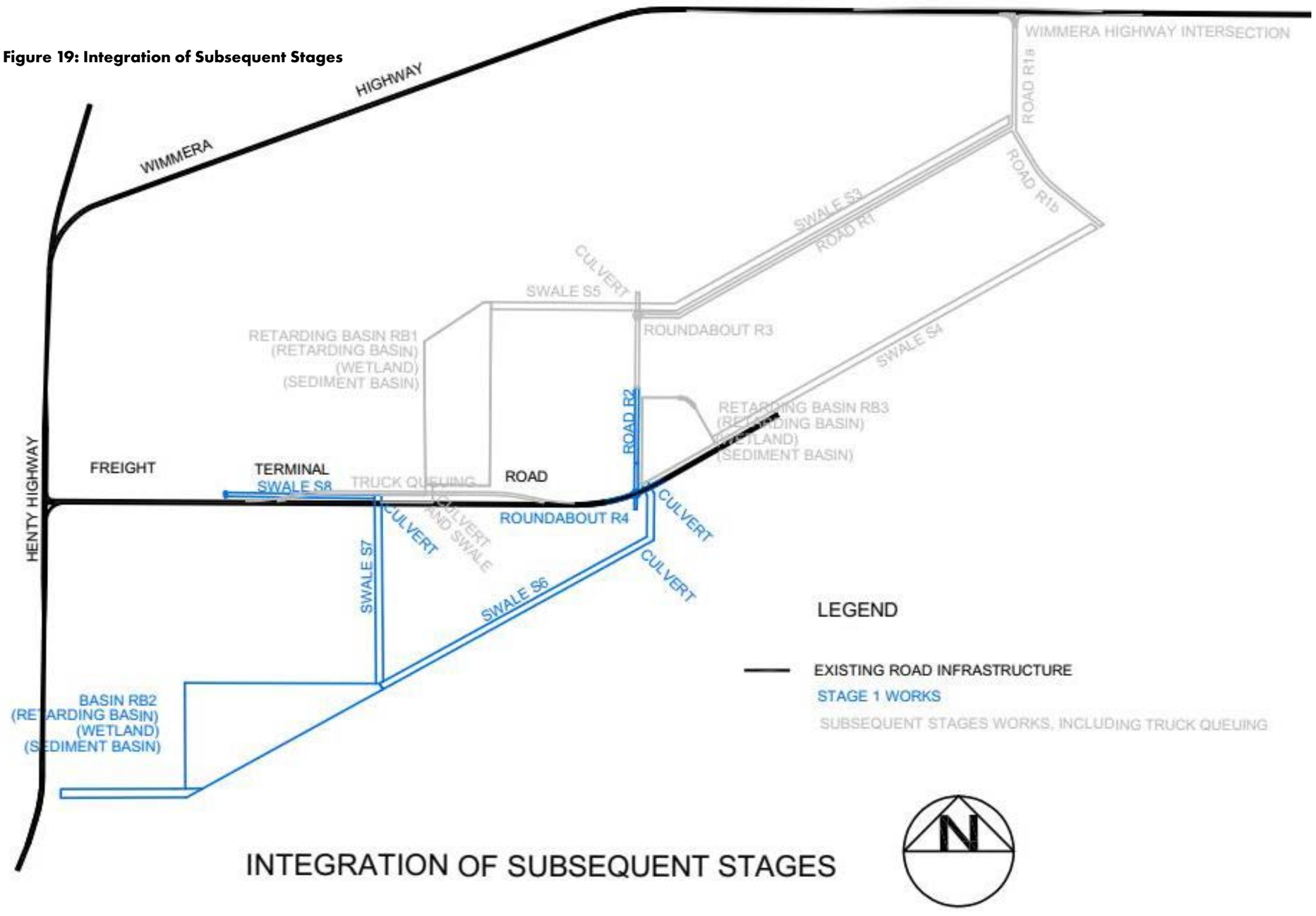
# 8. Integration of Development Plans for Subsequent Stages

A Development Plan is required for any subsequent stage or stages of development for the WIFT Precinct. A Development Plan prepared for subsequent stages of the WIFT Precinct will address the requirements of Development Plan Overlay Schedule 9 Wimmera Intermodal Freight Terminal. Standards for all elements of the future Development Plans will accord with standards outlined in the Wimmera Intermodal Freight Terminal Precinct Stage 1 Development Plan.

## 8.1 Master Plan Integration

Figure 19, below, shows development matters requiring integration with the Wimmera Intermodal Freight Terminal Precinct Stage 1 Development Plan.

**Figure 19: Integration of Subsequent Stages**



# 8. Integration of Development Plans for Subsequent Stages

### 8.2 Transport Integration

Transport development matters to be addressed by subsequent Development Plans include the following:

- Establish a Gateway site at the intersection of the Principal road network and the Wimmera Highway.
- The Principal Road network to be developed as a quality tree-lined boulevard.
- Establish a new roundabout at the northern end of the upgraded section of Molyneaux Road (shown as R3 in Figure 19 above).
- Establish a new road running generally west to east from Roundabout R3 (shown as R1 in Figure 19 above).
- Establish a new road running generally northwards to connect Road R1 to the Wimmera Highway (shown as R1a in Figure 19 above)
- Establish a new principal road network intersection with the Wimmera Highway.
- Establish a shared path network that augments the shared path network established by the Wimmera Intermodal Freight Terminal Stage 1 Development Plan.

The exact location of the road intersection with Wimmera Hwy shall ultimately be determined by:

- Land subdivision/demand for specific lot sizes along Wimmera Hwy boundary;
- Road Safety Audit and Risk Assessment of potential highway intersection location;
- Suitable length of acceleration/deceleration lanes associated with highway intersection design; and
- Consultation with Regional roads Victoria.

The exact location of remaining elements of the Principal Road Network will be determined by the future subdivision to create reserves for the stormwater drainage network and future development lots. Elements of the Principal Road Network to be provided by Development Plans for subsequent stages will allow for:

a. A-Double vehicle movements at intersections and access ways/driveways;

b. Bus bays at strategic locations;

c. Truck parking/queuing area on Freight Terminal Road;

d. Shared footway/bicycle ways;

e. Localised drainage to complement the Integrated Water Management Plan (see Section 6 of this Development Plan).

Principal Access Intersection includes:

a. Channelised right turn Lane (storage to meet demands of the intersection)

b. Channelised left turn Lane including deceleration lane

c. Acceleration lanes to meet speed zone demands and traffic volume demands

d. Street lighting

e. Capacity for A-Double vehicle movements

The design of footpaths, bicycle paths, and shared pathway networks, internal to the precinct will be constructed to the satisfaction of Council at a 2.5m width, and located on the Principal Road Network and the storm water drainage network.

### 8.3 Urban Design Integration

Gateway sites will include distinctive landscaping, landmark built form, and distinctive signage to mark the entrance to the precinct.

Street tree planting for the Principal Road Network will provide a distinctive Boulevard Road environment that accords with the Wimmera Intermodal Freight Terminal Stage 1 Development Plan. The planting is to provide tree canopies but maintain visibility between the road space and ground floor uses / activities and car parking areas.

Landscape tree planting is to provide an obvious transition from the rural environment to the Precinct by the creation of a distinctive planted landscape edge. Precinct boundary landscape planting within property boundaries is to be provided along the Wimmera and Henty Highway to screen views to the precinct from these roads.

### 8.4 Water Management Integration

The design of stormwater management in subsequent stages will need to ensure connectivity with the stormwater drainage infrastructure constructed in Stage 1. The stormwater management in subsequent stages will:

- Maintain the existing 1% Annual Exceedance Probability (AEP) peak flow rate at no greater than current flows from the Precinct.
- Maintain water quality to existing conditions.
- Ensure there is sufficient total retardation basin storage capacity of 113,900 m3 for the whole area precinct at the completion of works.
- Ensure that stormwater will not overtop the rail corridor.

In respect to infrastructure for subsequent stages identified in Figure 19, above, Stormwater Retardation Basins shown as RB1 and RB3 in Figure 19 will provide for:

- RB1
  - Sedimentation Basin Area 3,800sqm
  - Sedimentation Basin Normal Water Level 133.1AHD
  - Wetland Surface Area 38,000sqm
  - Wetland Normal Water Level 133mAHD
  - 1% Annual Exceedance Probability Storage 66,400 cubic metres
  - 1% Annual Exceedance Probability Flood Level 134mAHD
  - Reserve Area 8.6ha

- RB3
  - Sedimentation Basin Area 2,000sqm
  - Sedimentation Basin Normal Water Level 133AHD
  - Wetland Surface Area 20,000sqm
  - Wetland Normal Water Level 132.9mAHD
  - 1% Annual Exceedance Probability Storage 23,700 cubic metres
  - 1% Annual Exceedance Probability Flood Level 133.9mAHD
  - Reserve Area 3.4ha

It should be noted that the total 113,900 m3 of stormwater retardation capacity is higher than shown in Development Plan Overlay Schedule 9 Wimmera Intermodal Freight Terminal Precinct as detailed design of the stormwater network has indicated that additional stormwater storage is required to ensure the 1% Annual Exceedance Probability (AEP) peak flow rate from the precinct in its fully developed form is no greater than current flows from the Precinct.

### 8.5 Infrastructure Integration

Infrastructure standards for subsequent Development Plans will accord with the Wimmera Intermodal Freight Terminal Precinct Stage 1 Development Plan.

# Appendix A Larger Scale Figures


Figure 1: Wimmera Intermodal Freight Terminal Precinct Development Master Plan

Figure 2: Subdivision Layout

Figure 3: Typical Street Cross section Showing Location of Services

Figure 4: Integrated Transport Plan

Figure 5: Freight Terminal Road

Figure 6: Principal Road Network

Figure 7: Roundabout Design

Figure 8: Lower Order Road

Figure 9: Lower order Road Intersection with Principal road network

Figure 10: WIFT Precinct Principal Access Intersection design

Figure 11: Shared Path Network

Figure 12: Urban Design and Landscape Master Plan

Figure 13: Freight Terminal Road Cross Section with Boulevard Road Tree Planting

Figure 14: Principal Road network Cross Section with Boulevard Road Tree Planting

Figure 15: Lower order Road Cross Section with Tree Plantings

Figure 16: Storm Water Management Strategy

Figure 17: Retardation Basin 2

Figure 18: Infrastructure Plan

Figure 19: Integration of Subsequent Stages


**Figure A1: Shared Path external to WIFT Precinct**

# Appendix B Australian Level Crossing Assessment Model (ALCAM) Report

**Assessment Summary**
**Level Crossing Overview Report - Road**

***Search Criteria***

Jurisdiction: VIC
Keywords: molyneaux
Rail Status: Active
Road/Path Statuses: Open



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| | | | |
|---|---|---|---|
| **CROSSING NAME** | Molyneaux Rd | | |
| ALCAM No | 1856 | Suburb | Dooen |
| Jurisdiction | VIC | Associated Ped | No |
| Traffic Type | ROAD | Survey Date | 23/05/2017 |
| | | Surveyed By | LCSMS |
| Line Section | PYRENEES LOOP - SERVICETON | Rail KM | 317.227 |
| Primary Control | Stop Signs | | |
| Risk Score | 0.00149 | Yrs Between Fatalities | 670.70490 |
| Raw Infrastructure Factor | 245 | Infrastructure Factor | 0.04957 |
| Exposure Factor | 0.0062 | Consequence Factor | 0.2829 |
| Rail Traffic | 8.73 | Road Traffic | 20 |
| Rail Infrastructure Manager | ARTC * | | |
| Road Infrastructure Manager | Horsham Rural City Council * Horsham Rural City Council | | |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | Medium High | Likelihood Band All: | Medium Low |
| Risk Band Jurisdiction: | Medium High | Likelihood Band Jurisdiction: | Medium |

**Stop**

| | | | |
|---|---|---|---|
| Risk Band All: | High | Likelihood Band All: | Medium |
| Risk Band Jurisdiction: | High | Likelihood Band Jurisdiction: | Medium High |

Top Rated Characteristics: S3 - visibility to train (vehicle stopped at crossing)
High train speed
Longest train length (typical)
Conformance with AS 1742.7 and NZTA Part 9

Notes

Safety Flags



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# Appendix B Australian Level Crossing Assessment Model (ALCAM) Report

High Speed Train - 115kph
Sighting S3 Rating (5)
Road Condition - Average
Sun Clare Sighting Train - Rating (5)

Summary Incident Data



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# Appendix B Australian Level Crossing Assessment Model (ALCAM) Report

***Search Criteria***

Jurisdiction: VIC

Keywords: molyneaux

Rail Status: Active

Road/Path Statuses: Open



**1856 Molyneaux Rd** **317.227 PYRENEES LOOP - SERVICETON**

Dooen Existing Road

| *Characteristics* | *Condition* | *Points* | *Score* | *% of total* |
|---|---|---|---|---|
| CONTROL DETAILS | | | | |
| 11. Effectiveness of equipment inspection and maintenance | Good | 0 | 0 | 0% |
| 12. Longest approach warning time | <20 secs | 0 | 0 | 0% |
| ROAD GEOMETRY | | | | |
| 21. Proximity to intersection/control point | >200m | 0 | 0 | 0% |
| 22. Proximity to siding/shunting yard | 50 to <100m | 3 | 23 | 9% |
| 23. Proximity to station | >200m | 0 | 0 | 0% |
| 24. Possibility of short stacking | Low | 0 | 0 | 0% |
| 25. Number of lanes (number of lines of traffic) | 1 lane(s) | 0 | 0 | 0% |
| 26. Vulnerability to road user fatigue | Low | 0 | 0 | 0% |
| ROAD TRAFFIC CONTROL | | | | |
| 31. Presence of adjacent distractions | Low | 0 | 0 | 0% |
| 32. Condition of traffic control at crossing | Good | 0 | 0 | 0% |
| 33. Visibility of traffic control at crossing | Good | 0 | 0 | 0% |
| 34. Distance from advance warning to crossing | Good | 0 | 0 | 0% |
| 35. Conformance with AS 1742.7 and NZTA Part 9 | Partly | 3 | 25 | 10% |
| 36. Likelihood of vandalism to controls | Low | 0 | 0 | 0% |
| ROAD VEHICLES | | | | |
| 41. Heavy vehicle proportion | 5 to <11% | 3 | 11 | 4% |
| 42. Level of service (vehicle congestion) | Lvl A Free Flow | 0 | 0 | 0% |
| 43. Queueing from adjacent intersections | None | 0 | 0 | 0% |
| 44. Road traffic speed (approach speed 85%ile) | <=60 kph | 0 | 0 | 0% |
| RAIL VEHICLES | | | | |
| 51. Seasonal/Infrequent train patterns | Regular trains | 0 | 0 | 0% |
| 52. Slowest train speed at crossing (typical) | >=80 kph | 0 | 0 | 0% |
| 53. Longest train length (typical) | >1000m | 5 | 30 | 12% |
| 54. High train speed | >100 to 120 kph | 4 | 46 | 19% |
| CROSSING GEOMETRY | | | | |
| 61. Number of operational rail tracks | 1 tracks | 0 | 0 | 0% |
| 62. Road surface on approach/departure (not Xing panel) | Average | 3 | 5 | 2% |
| 63. Is the crossing on a hump, dip or rough surface? | No | 0 | 0 | 0% |
| VISIBILITY | | | | |
| 71. SSD - advance visibility of crossing from road | >100% | 0 | 0 | 0% |
| 72. S2 - approach visibility to train (vehicle approaching crossing) | <50% | 5 | 0 | 0% |
| 73. S3 - visibility to train (vehicle stopped at crossing) | <50% | 5 | 97 | 40% |
| 74. Possible sun glare sighting crossing on road approach | No sunglare | 0 | 0 | 0% |
| 75. Possible sun glare sighting train | Known sunglare issue | 5 | 8 | 3% |
| 76. Temporary visual impediments - sighting of crossing | No | 0 | 0 | 0% |
| 77. Temporary visual impediments - sighting of train | No | 0 | 0 | 0% |
| | | | **245** | |

Surveyed: 23/05/2017 12:00:00 AM Rating Last Updated: 10/12/2017 Rating Model: ALCAM Rd 2b.1.1.1

# Appendix B Australian Level Crossing Assessment Model (ALCAM) Report

***Controls***

| | |
|---|---|
| Controls at Crossing | Stop Signs |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-1, W7-7, NZ WX1 OR NZ WX3) |
| Train Related | Whistle board / location board for train |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |

*Crossing Volume (AADT)* Road: 20 Rail: 8.73

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **245** | | |
| Infrastructure Factor: | **0.84957** | | |
| Exposure Factor: | **0.0062** | | |
| Likelihood Factor: | **0.00527** | Years Between Collisions: | **190** |
| Consequence Factor: | **0.2829** | | |
| Risk Score: | **0.00149** | Years Between Fatalities: | **671** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium High** | Likelihood Band All: | **Medium Low** |
| Risk Band Jurisdiction: | **Medium High** | Likelihood Band Jurisdiction: | **Medium** |

**Within Stop Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **Medium** |
| Risk Band Jurisdiction: | **High** | Likelihood Band Jurisdiction: | **Medium High** |

***Flags:***

High Speed Train
Sighting S3
Road Condition
Sun Glare Sighting Train

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***Mechanisms***

| | |
|---|---|
| **UNABLE TO AVOID** | |
| Unable to stop in time | 15 |
| Stuck on tracks | 0 |
| Stopped on tracks | 1 |
| **UNAWARE** | |
| Distracted | 1 |
| Could not see control | 1 |
| Could not see train from road approach (S2) | 0 |
| Could not see train from at crossing (S3) | 136 |
| Assumes train will stop | 17 |
| Does not expect second train | 0 |
| Finds crossing protection is ambiguous | 10 |
| Is fatigued | 0 |
| Mislead by Controls | 3 |
| **UNWILLING TO RECOGNISE** | |
| Queued on tracks | 0 |
| Overhangs on tracks | 0 |
| Racing train or misjudged train speed | 56 |
| Driving through passive warning without looking | 5 |
| Driving through flashing lights | 0 |
| Driving around boom gates | 0 |
| | **245** |

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# Appendix C Landscape Planting Schedule

## EXTERNAL BOUNDARIES

### Trees

*Allocasuarina littoralis*
Black Sheoak
(H)10-15m x (W)5-7m

*Allocasuarina luehmannii*
Bull Sheoak
(H)10-15m x (W)4-8m

*Acacia baileyana*
Cootamundra Wattle
(H)6m x (W)6m

*Acacia pendula*
Silver Myall
(H)6m x (W)4m

*Acacia pycnantha*
Golden Wattle
(H)6m x (W)3m

*Callitris gracilis*
Slender Cypress Pine
(H)5-10m x (W)5-10m

*Callitris preissii*
Slender Cypress Pine
(H)10-20m x (W)5-8m

*Eucalyptus largiflorens*
Black Box
(H)15-20m x (W)15m

*Eucalyptus leucoxylon*
Yellow Gum
(H)10-25m x (W)5-7m

*Eucalyptus microcarpa*
Grey Box
(H)20m x (W) 20m

*Melaleuca armillaris*
Bracelet Honey-myrtle
(H)5-10m x (W)7m

*Corymbia citriodora*
Lemon Scented Gum
(H)20-35m x (W)12-18m

*Eucalyptus sideroxylon*
Red Ironbark
(H)10-30m x (W)6-10m

### Shrubs and Sub-shrubs

*Acacia howittii*
Sticky Wattle
(H)5m x (W)5m

*Dodonaea viscosa* ssp. *spatulata*
Broadleaf Hop-bush
(H)4m x (W)3m

*Callistemon viminalis*
Weeping Bottlebrush
(H)8m x (W)6m

*Callistemon citrinus* 'Kings Park Special'
Kings Park Bottlebrush
(H)4m x (W)2m

*Grevillea* 'Poorinda Queen'
Poorinda Queen Grevillea
(H)3m x (W)3m

*Grevillea rosmarinifolia* ssp. *rosmarinifolia*
Rosemary Grevillea
(H)2m x (W)2.2m

*Melaleuca decussata*
Totem-poles
(H)3m x (W)3m

# Appendix C Landscape Planting Schedule

## INTERNAL ROADS + PRIVATE ALLOTMENTS

### Evergreen Trees

*Allocasuarina littoralis*
Black Sheoak
(H)10-15m x (W)5-7m

*Allocasuarina luehmannii*
Bull Sheoak
(H)10-15m x (W)4-8m

*Callitris gracilis*
Slender Cypress Pine
(H)5-10m x (W)5-10m

*Callitris preissii*
Slender Cypress Pine
(H)10-20m x (W)5-8m

*Eucalyptus largiflorens*
Black Box
(H)15-20m x (W)15m

*Eucalyptus microcarpa*
Grey Box
(H)20m x (W) 20m

*Eucalyptus leucoxylon*
Yellow Gum
(H)10-25m x (W)5-7m

*Eucalyptus cladocalyx*
Sugar Gum
(H)15-35m x (W)7-10m

*Eucalyptus sideroxylon*
Red Ironbark
(H)10-30m x (W)6-10m

*Eucalyptus melliodora*
Yellow Box
(H)15-30m x (W)15m

### Deciduous Trees

*Fraxinus pennsylvanica* 'Cimmaron TM'
Cimmaron Ash
(H)13m x (W)8m

*Pyrus calleryana* 'Valzam Valiant'
Ornamental Pear
(H)9m x (W)5m

*Populus x canadensis* 'Manawatu Gold'
Poplar
(H)14m x (W)9m

# Appendix C Landscape Planting Schedule

## INTERNAL ROADS + PRIVATE ALLOTMENTS

### Shrubs + Grasses

*Acacia acinacea*
Gold Dust Wattle
(H)1.5-2m x (W)2-4m

*Acacia fimbriata* 'Crimson Blush'
Crimson Blush Acacia
(H)1.5m x (W)1.5m

*Acacia sclerophylla var. sclerophylla*
Hard-leaf Wattle
(H)3m x (W)4m

*Atriplex nummularia*
Old Man Saltbush
(H)3m x (W)2-4m

*Banksia marginata* 'Minimarg'
Silver Banksia Minimarg
(H)0.5-1.3m x (W)1-1.2m

*Banksia spinulosa* 'Cherry Candles'
Cherry Candles Banksia
(H)0.5m x (W)0.8m

*Banksia ornata*
Desert Banksia
(H)1-2.5m x (W)0.5-2.5m

*Bulbine bulbosa*
Bulbine Lily
(H)0.6m x (W)0.3m

*Calytrix tetragona*
Fringe Myrtle
(H)1.5m x (W)1.5m

*Carpobrotus modestus*
Inland Pigface
(H)0.1m x (W)1.3m

*Chrysocephalum apiculatum*
Common Everlasting
(H)0.2m x (W)1m

*Chrysocephalum semipapposum*
Clustered Everlasting
(H)0.1m x (W)1.3m

*Correa alba*
White Correa
(H)1.5m x (W)1.5m

*Correa backhouseana*
Backhouse's Correa
(H)1-2m x (W)2-3m

*Danthonia ssp.*
Wallaby Grass
(H)0.4m x (W)0.4m

*Dianella caerulea* 'Little Jess'
Little Jess Dianella
(H)0.4m x (W)0.4m

*Dodonea viscosa*
Purple Hop Bush
(H)3m x (W)2m

*Eremophila desertii*
Emu-bush
(H)2m x (W)2m

*Eryngium ovinum*
Blue Devil
(H)0.6m x (W)0.6m

*Ficinia nodosa*
Knobby Club-rush
(H)1.5m x (W)2.2m

*Grevillea aquifolium*
Holly-leaved Grevillea
(H)1-1.5m x (W)1.5-2m

*Grevillea* 'Poorinda Queen'
Rosemary Grevillea
(H)3m x (W)3m

*Grevillea rosmarinifolia* ssp. *rosmarinifolia*
Rosemary Grevillea
(H)2m x (W)2.2m

*Lomandra longifolia* 'Tanika'
Tanika Lomandra
(H)0.60m x (W)0.65m

*Lasiopetalum behrii*
Pink Velvet-bush
(H)1.5m x (W)2.5m

*Melaleuca wilsonii*
Wilson's Honey-myrtle
(H)3m x (W)4m

*Myoporum parvifolium*
Creeping Boobialla
(H)0.75m x (W)3m

*Ozothamnus obcordatus*
Grey Everlasting
(H)1-3m x (W)1-3m

*Pelargonium rodneyanum*
Magenta Stork's-bill
(H)0.45m x (W)0.5m

*Pimelea glauca*
Smooth Riceflower
(H)1m x (W)1m

*Rhagodia spinescens*
Hedge Saltbush
(H)1m x (W)2m

*Teucrium racemosum*
Grey Germander
(H)0.4m x (W)3m

# Appendix C Landscape Planting Schedule

## SWALES

### Trees and Shrubs

*Acacia fimbriata* 'Crimson Blush'
Crimson Blush Acacia
(H)1.5m x (W)1.5m

*Acacia howittii*
Sticky Wattle
(H)5m x (W)5m

*Callistemon viminalis*
Weeping Bottlebrush
(H)8m x (W)6m

*Callistemon citrinus* 'Kings Park Special'
Kings Park Bottlebrush
(H)4m x (W)2m

*Callistemon subulatus*
Dwarf Bottlebrush
(H)3m x (W)3m

*Grevillea* 'Poorinda Queen'
Rosemary Grevillea
(H)3m x (W)3m

*Grevillea rosmarinifolia* ssp. *rosmarinifolia*
Rosemary Grevillea
(H)2m x (W)2.2m

*Syzygium australe*
Brush Cherry
(H)12m x (W)8m

*Banksia robur*
Swamp Banksia
(H)3m x (W)3m

*Melaleuca squarrosa*
Scented Paperbark
(H)3m x (W)3m

*Melaleuca decussata*
Totem-poles
(H)3m x (W)3m

*Goodenia ovata*
Hop Goodenia
(H)2m x (W)2m

### Grasses

*Acacia cognata* 'Bronze Cascade'
Bronze Cascade Acacia
(H)0.7-1m x (W)0.7-1m

*Acacia cognata* 'Curvaceous'
Curvaceous Acacia
(H)0.6-1m x (W)1m

*Acacia cognata* 'Limelight'
Limelight Acacia
(H)0.7-1.2m x (W)1.2m

*Carex appressa*
Tall Sedge
(H)0.9m x (W)0.75m

*Dianella caerulea* 'Little Jess'
Little Jess Dianella
(H)0.4m x (W)0.4m

*Dianella caerulea* 'Lucia'
Lucia Dianella
(H)0.3-0.4m x (W)0.5m

*Ficinia nodosa*
Knobby Club-rush
(H)1.5m x (W)2.2m

*Lomandra fluviatilis* 'Shara'
Shara Lomandra
(H)0.4m x (W)0.5m

*Lomandra longifolia*
Spiny-headed Matt-rush
(H)0.75m x (W)0.75m

*Lomandra longifolia* 'Tanika'
Tanika Lomandra
(H)0.60m x (W)0.65m

*Pennisetum alopecuroides* 'Nafray'
Nafray Pennisetum
(H)0.6m x (W)0.6m

*Phormium tenax*
New Zealand Flax
(H)2m x (W)1.5m

*Poa labillardierei*
Common Tussock Grass
(H)1.2m x (W)0.8m

# Flood Modelling

## Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan

Horsham Rural City Council

March 2019

### Document Status

| Version | Doc type | Reviewed by | Approved by | Date issued |
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| V01 | Draft | Luke Cunningham | Luke Cunningham | 17/04/2018 |
| V02 | Final | Luke Cunningham | Luke Cunningham | 14/09/2018 |
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| V04 | Final | Ben Hughes | Ben Hughes | 07/11/2018 |
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### Project Details

| | |
|---|---|
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| **Client** | Horsham Rural City Council |
| **Client Project Manager** | Ian Mitchell |
| **Water Technology Project Manager** | Ben Hughes |
| **Water Technology Project Director** | Luke Cunningham |
| **Authors** | Ben Hughes/Luke Cunningham/Hui Min Lee |
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# Appendix D Wimmera Intermodal Freight Terminal Precinct Surface Water Management Plan

26 March 2019

Ian Mitchell
Engineer
Horsham Rural City Council
PO Box 511
HORSHAM VICTORIA 3402

Dear Ian

Wimmera Intermodal Freight Terminal Precinct

Please see the attached report outlining the Storm Water Management Plan of Wimmera Intermodal Freight Terminal Precinct, Horsham.

The report outlines the methodology undertaken to produce the storm water management plan. It also outlines proposed drainage infrastructure sizes and estimated costs. Horsham Rural City Council may have more recent or specific costs for excavation/fill disposal. We are happy to incorporate these in a revision post your review of this report.

This report includes changes to the stormwater treatment system on previous reports. The intent of the changes was to allow each prospective developer to treat their own stormwater as a distributed treatment system rather than rely on an individual whole of development system at the development outlet. It also revises the alignment of Swale 8, which now flows into Swale 7 rather than the retarding basin at the development outlet.

The report also contains revised sizing of RB02, and Swales 6, 7 and 8 in accordance with the preliminary functional design of these structures. For further detail around the functional design of these components please see the functional design report.

Throughout the report there is reference to two designs for RB02, Interim and Ultimate designs. The Interim Design minimises the cost of RB02 by partial construction of the wetland and retarding basin, the outlet structure and type of vegetation to spray seeding (rather than complete wetland planting). Costs at the rear of the report are also separated into two components, the Interim and Ultimate designs. The Interim Design costing covers the estimated cost for constructing RB02 (Interim Design) and Swales 6, 7 and 8 and their associated culvert infrastructure under Molyneux Road and Freight Terminal Road. It is important to note the Ultimate Design costs are detailed as a whole cost and does not include the cost of revegetating swales, additional earthworks and reconstructing the RB02 outlet.

For discussion of the previous stormwater management designs please see the previous reports.

If you have any queries, please don't hesitate to contact me.

Yours sincerely

**Ben Hughes**
Principal Engineer
ben.hughes@watertech.com.au
**WATER TECHNOLOGY PTY LTD**





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# 1 OVERVIEW AND PROJECT BACKGROUND

## 1.1 Project Background

Horsham Rural City Council is looking to develop a Stormwater Management Plan (SWMP) for the proposed Wimmera Intermodal Freight Terminal (WIFT) located at the junction of Henty Highway and Wimmera Highway, as shown in Figure 1-1. Viterra have already developed part of the western end of the site with a grain cereal facility, this area has an existing stormwater detention and treatment system, however issues have arisen with limited ability to transfer flow to the south, resulting in the northern internal Freight Terminal Road table drain permanently holding water. This has impacted on the road subsurface and the longevity of the road.

The SWMP is intended to provide a guide for drainage arrangements and sizing, which then provides cost estimates and allows for an approximate developer contribution to be determined.

This report outlines the base design calculations and parameters used to size and cost the drainage infrastructure requirements of the WIFT precinct.


Figure 1-1 Proposed WIFT Precinct location and existing development (Source: Google Earth)

## 1.2 Reporting Structure

The report is broken up into three sections discussing the hydrological analysis, water quality analysis and concept design parameters. Specifically, this report addresses:

- Hydrological modelling and confirmation of storage configuration (size and location) (Section 3.2.2);
- Water Sensitive Urban Design (WSUD) options analysis and sizing of water quality works including integrated water treatment options (Section 3.3.2); and
- Concept design considerations and costing of the proposed works (Section 0).

# 2 STUDY AREA

The WIFT Precinct is in a rural agricultural area, north east of Horsham and Dooen Swamp Bushland Reserve, where the area naturally drains to.

The WIFT Precinct is intended to be primarily industrial agricultural development, with typical sites used for grain/hay storage and transport. The development is proposed to be approximately 430 Ha, no set internal layout has been determined. Development of the lot layout and sale of lots are expected to occur over a 15-20 year timeframe, allowing for flexibility within the development to cater for the range of prospective lot owners. This will also allow for flexibility in staging the development depending on the requirements of prospective owners.

A preliminary road layout and drainage plan produced during the WIFT Structure Plan[1] is shown in Figure 2-1. This report supersedes this work.

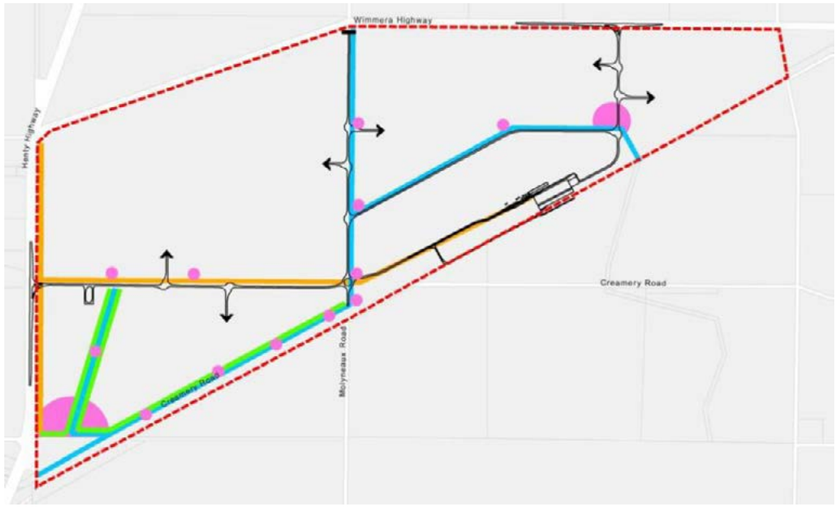


**Figure 2-1 Preliminary WIFT Lot Layout**

[1] AECOM (2012), WIFT Precinct Structure Plan, Commissioned by Horsham Rural City Council



# 3 MODELLING

## 3.1 Overview

This Section details the method used to model WIFT Precinct. Modelling is separated into two main components; hydrology and hydraulics.

Hydrological modelling was completed in the runoff routing program RORB. RORB was used to determine existing and developed flows across and exiting the WIFT Precinct and size retardation infrastructure. The hydraulic calculations were made using a spreadsheet model based on a series of Manning's Equations.

## 3.2 Hydrology

### 3.2.1 RORB model construction and parameters

The RORB model was comprised of several key data inputs, these included:

- Sub catchment and reach delineation;
- Fraction impervious;
- Rainfall depth information;
- Rainfall losses;
- Rainfall temporal pattern;
- Rainfall spatial pattern;
- kc – RORB's calibration parameter, the chosen kc value is discussed during the model results as sensitivity testing was required to determine the most appropriate value.
- m – RORB's degree of catchment non-linearity.

Each of these inputs are discussed in the following sections.

#### 3.2.1.1 Catchment/reach delineation

The WIFT Precinct internal and external catchment areas were delineated based on LiDAR data captured in 2005. The LiDAR data was processed in the ESRI terrain modelling software ArcHydro, delineating the internal and external catchment contributions into 25 sub-catchments with associated drainage reaches. The delineated catchments and reaches are shown in Figure 3-1 along with the base LiDAR dataset. It was found there were no external catchment areas, this was confirmed by a site visit undertaken by Water Technology (Ben Hughes) and Horsham Rural City Council.

The natural direction of drainage is south with three culvert locations along the southern site boundary, which is also a railway line.

The objective of the delineation was to ensure an even distribution of similar sized catchments with enough subareas to ensure the contributions along internal drainage lines are well represented.

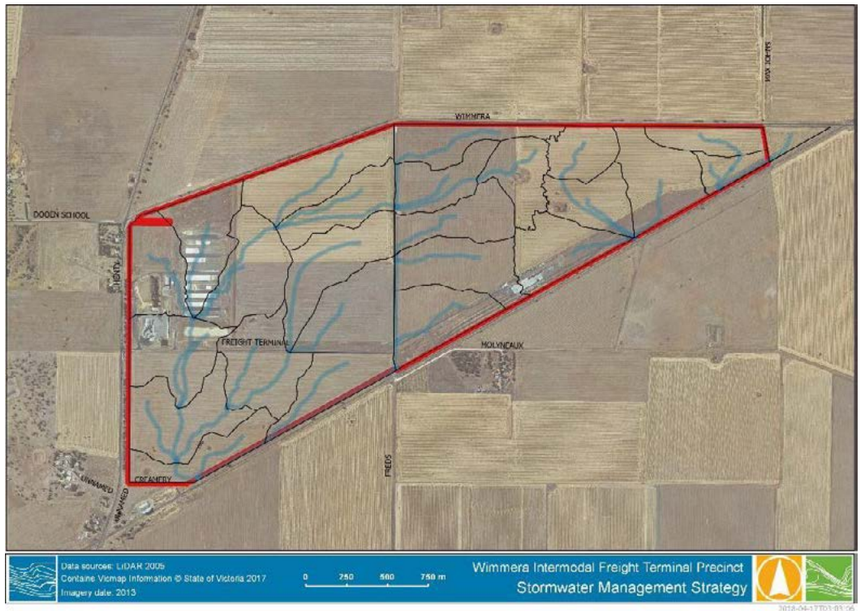


Figure 3-1 Wimmera Intermodal Freight Terminal delineated catchment

#### 3.2.1.2 Fraction Impervious

The estimated percentage of impervious surface within each sub catchment is represented by a Fraction Impervious (FI). The varying fraction impervious of the Wimmera Intermodal Freight Terminal catchment was determined using 2010 aerial imagery separating the catchment into three main land uses; open space (including farming), roadway and industrial. The adopted values for each are provided in Table 3-1, a map of the designated land uses is shown in Figure 3-2.

Table 3-1 Adopted FI values for the WIFT RORB Model

| Land use | Adopted FI |
|---|---|
| Open space including farming | 0.1 |
| Sealed Road | 0.8 |
| Existing Industrial Development | 0.9 |
| Planned Industrial Development | 0.6 |
| Rail Corridor | 0.7 |



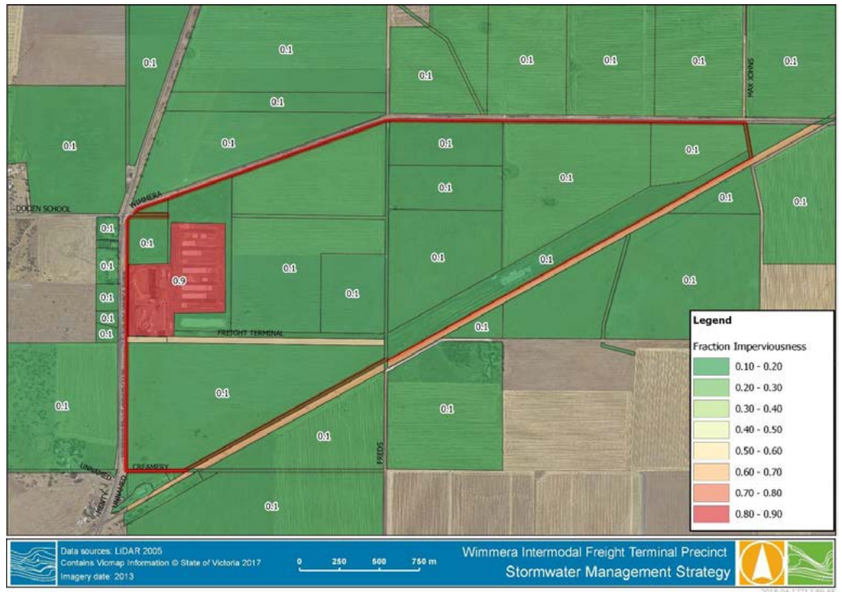


Figure 3-2 Catchment land use determining FI

#### 3.2.1.3 Rainfall depths

Rainfall depths for the Wimmera Intermodal Freight Terminal catchment were determined using Australian Rainfall and Runoff (2016) recommendations. Areal Reduction Factors and temporal patterns were sourced from the ARR Data Hub[2] and the intensity-frequency-duration rainfall depths were sourced from Bureau of Meteorology (BoM) Online IFD Tool[3], based on the coordinates of the catchment centroid.

#### 3.2.1.4 Losses

Losses for the Wimmera Intermodal Freight Terminal RORB model were determined using ARR2016 Book 5, Chapter 3 methods; this included mapped regional estimates and equation based estimates.

Wimmera Intermodal Freight Terminal is located in Region 03 for loss prediction equations, as outlined in ARR2016, Book 5, Chapter 3 (Figure 5.3.16), and shown in Figure 3-3.

[2] Australian Rainfall and Runoff (2016), http://data.arr-software.org/
[3] Bureau of Meteorology online IFD tool, http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-37.571&longitude=143.814&sdmin=true&sdhr=true&sdday=true&user_label=

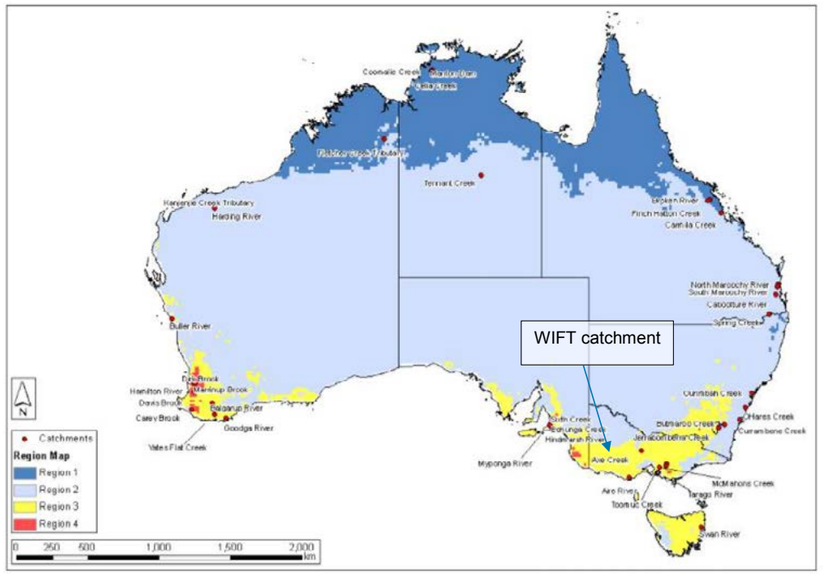


Figure 3-3 Regions adopted for Loss Prediction Equations

$IL_s$ (Storm Initial Loss) and CL (Continuing Loss) equations are outlined below.

$$IL_s = -1.57 * s0_{wrt} + 0.14 * DES_{RAIN_{24HR}} + 18.8$$

$$CL = 0.03 * DES_{RAIN_{24HR}} + 0.06 * SOmax + 5.1$$

Where:

$IL_s$ is the storm Initial Loss (mm)

CL is the Continuing Loss (mm/h)

s0_wtr is the soil moisture in the surface store in winter season (mm)

DES_RAIN_24HR is the design Rain Intensity (I24,50) (mm)

$SO_{max}$ is the maximum storage of the surface soil layer (mm)

Based on median input values these equations determined an $IL_s$ value of 44 mm and a CL of 1.3 mm/hr.

#### 3.2.1.5 RORB kc

kc is a RORB model routing parameter that dictates attenuation along the model reaches. In gauged catchments the kc value is one of the major parameters used to calibrate the RORB model, varying peak flow and timing. In ungauged catchments (such as Wimmera Intermodal Freight Terminal) there are several ways





to estimate the kc value, these include empirical equation-based estimates of kc and the adoption of a kc value based on nearby calibrated RORB models.

For this project the kc value was determined by matching the modelled 1% AEP Monte Carlo (Monte Carlo analysis is discussed further in Section 3.2.2.1.1) peak outflows to Rational Method (Adams Method), Modified Rational Method (VicRoads) and the Hydrological Recipes – Urban and Rural Estimates.

The analysis determined a kc of 4.75.

### 3.2.2 Design Modelling

#### 3.2.2.1 Overview

As recommended in ARR2016, Monte Carlo analysis was used to determine design peak flows at the catchment outlet. RORB was then run using the Ensemble Modelling approach, and temporal pattern with the closest matching peak flow was chosen for each event AEP. A flow chart showing the modelling process is shown in Figure 3-4.

This process resulted in a single temporal pattern chosen for each design run, significantly reducing the number of runs required.

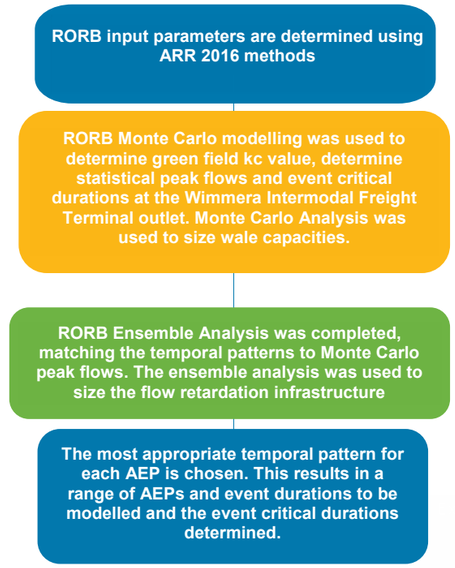


Figure 3-4 Design Modelling Process Diagram

#### 3.2.2.1.1 MONTE CARLO ANALYSIS

The RORB Monte Carlo Analysis was undertaken adopting the recommended losses from ARR2016 (rural catchment mean IL = 44 mm with probability distribution from ARR2016, CL 1.3 mm/hr) and kc value of 4.75. During a Monte Carlo analysis the RORB model is run many times, sampling for an extensive range of temporal patterns and rainfall initial loss, in combination with the other set model parameters of rainfall intensities, spatial pattern, continuing loss, aerial reduction factors, kc and m. The model then takes the hydrographs from all model runs and produces a statistical design peak flow at the RORB output location.

Seven output locations were placed in the RORB model throughout the WIFT catchment in strategic locations that corresponded to anticipated swale and storage locations. The Monte Carlo analysis showed the existing conditions 1% AEP critical duration across all locations was either 6 or 12 hours. The catchment outlet had a 1% AEP critical duration of 12 hours with peak flow of 7.5 $m^3/s$.

The seven hydrograph output point locations are shown in Figure 3-5.

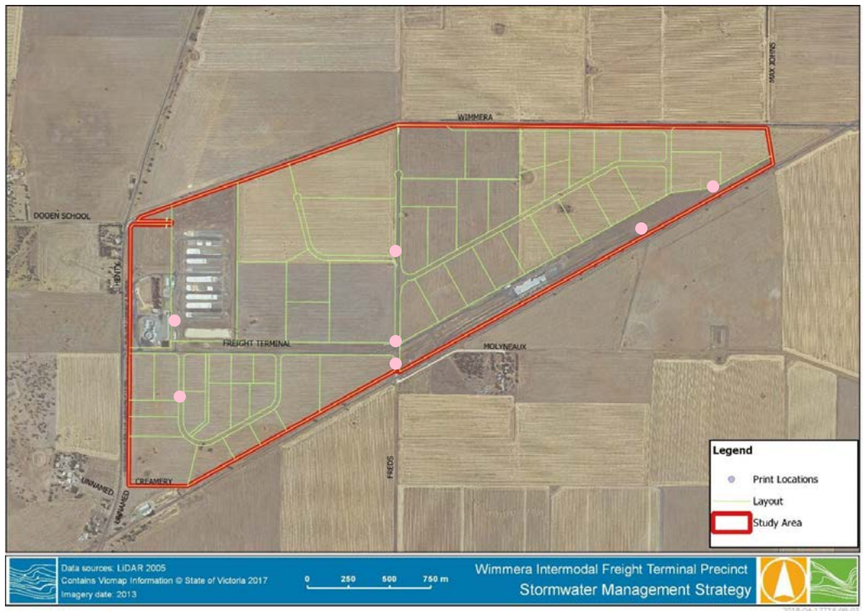


Figure 3-5 WIFT Precinct hydrograph print points

#### 3.2.2.1.2 ENSEMBLE ANALYSIS

The RORB model was run as an Ensemble Analysis following the ARR2016 procedure. Using the determined kc value and recommended ARR2016 losses, the RORB Ensemble Analysis was run for all 10 ARR2016 recommended temporal patterns for each event duration. For this case, six design events were modelled, resulting in 60 design event temporal patterns for each of the six durations, 360 model simulations. The peak flows determined in the Monte Carlo analysis were used to find a temporal pattern from the Ensemble Analysis producing a hydrograph with a similar peak flow. This comparison of peak flows between the Monte Carlo and



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Ensemble Analysis was completed at the catchment outlet. As outlined in Section 3.2.2.1.1 the outlet peak flow was 4.9 $m^3/s$.

### 3.2.2.2 Existing conditions modelling

The RORB model was used to produce existing conditions flows within the WIFT Precinct, the existing conditions RORB model is shown below in Figure 3-6. The railway line culverts were incorporated into the RORB model with flows that exceeded the culvert capacities flowing along the railway line linking into the drainage and flowing to the south west.

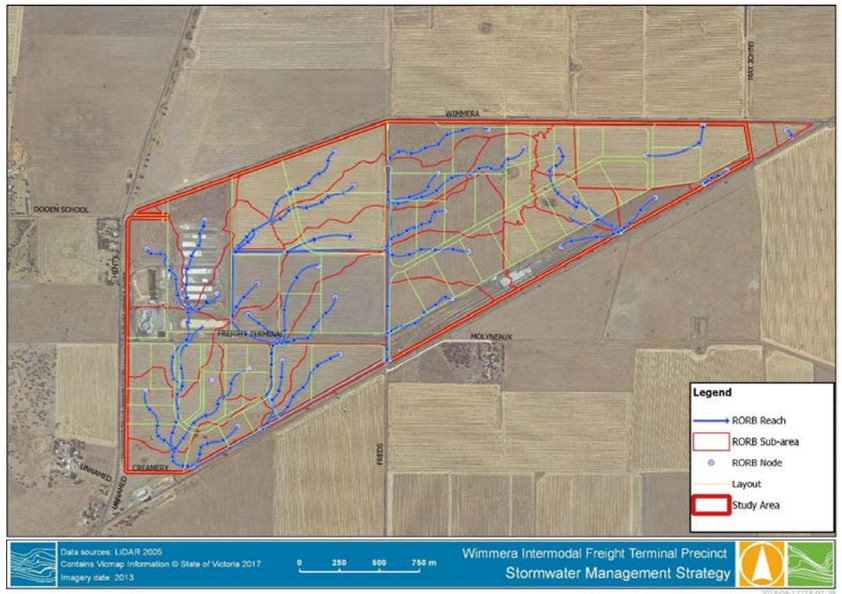


Figure 3-6 Existing Conditions RORB model

### 3.2.2.3 Developed conditions modelling

#### 3.2.2.3.1 OVERVIEW

Over the course of this project there were several drainage design iterations. The intent of the design was to separate drainage infrastructure and roads while maintaining efficient flow paths, minimising the number of drains while having treatment system distributed across the three major catchment areas. Developed conditions modelling has assumed approximately 40Ha of developable land at the eastern end of the development will not contribute flow to the broader development drainage infrastructure. This area is intended to be developed by a mineral sands mine with high reuse demand. Any development of this area will have to treat their own runoff to the standards set out by the Environmental Protection Agency Victoria and the Horsham Rural City Council Infrastructure Design Guidelines. This area essentially forms its own natural

catchment and if the development was not to progress flow could continue through the railway culverts to the south unchanged.

The RORB model FI and loss values were changed to represent the change to catchment conditions due to the development. The FI across the developed catchments was increased to 0.6, this value was determined by Horsham Rural City Council and if a development intends to exceed this proportion of impervious service individual lot level stormwater retardation must be constructed. It is important to note that a typical industrial area FI would be around 0.9 but given the large lot size a generally lower value is expected.

The initial loss value in RORB was lowered to 20mm, this is consistent with recommendations from ARR2016. The model kc value was also modified with the revised reach layout using the same kc to average reach distance (Dav) used in the existing conditions. This resulted in a revised kc of 7.1.

The intent of the drainage design was to allow each respective major catchment its own water treatment infrastructure. This enables each portion of the development to be carried out independently, along with any infrastructure costs. The principals of the infrastructure requirements remain the same across each catchment and all developers must abide by the stormwater management requirements setout in the Horsham Rural City Council Infrastructure Design Manual. This report outlines concept sizes for all drainage infrastructure within all development areas for complete development of the Wimmera Intermodal Freight Terminal. The details of potential infrastructure sizing for staged development within each treatment catchment is outlines in Section 3.3.2.

#### 3.2.2.3.2 RESULTS AND STORMWATER RETARDATION

The increase in impervious area caused an increase in peak discharge and volume from the WIFT Precinct to reduce the increase in peak flows back to a level similar to existing levels three retardation basins were installed, these are shown in Figure 3-7. The size of the basins and outlet pipes were modelled iteratively until optimum sizes were reached.

The existing and developed peak flows up and downstream of the stormwater treatment infrastructure are shown in Table 3-2, with the size of the basins and their outlets shown in Table 3-3.

**Table 3-2 Existing and developed peak flows at the stormwater treatment infrastructure**

| Flow scenario/location | Peak flow ($m^3/s$) |
|---|---|
| Existing conditions at the catchment outlet | 4.9 |
| Developed conditions at catchment outlet (no mitigation) | 10.4 |
| Developed conditions DS of RB1 | 1.7 |
| Developed conditions DS of RB2 | 4.9 |
| Developed conditions DS of RB3 | 2.4 |

**Table 3-3 Stormwater treatment infrastructure sizing**

| Retarding basin/outlet | Size/Elevation |
|---|---|
| RB01 | 68.6 ML |
| RB01 pipe outlet (at 133.0 m AHD) | 2 x 675 mm |
| RB01 spillway | 134.04 m AHD |
| RB02 | 42.2 ML |







| Retarding basin/outlet | Size/Elevation |
|---|---|
| RB02 pipe outlet (at 131.2 m AHD) | 5 x 1200 mm and 1 x 450mm |
| RB02 spillway | 132.0 m AHD |
| RB03 | 3.1 ML |
| RB03 pipe outlet (at 133.0 m AHD) | 3 x 675 mm |
| RB03 spillway | 134 m AHD |

## 3.3 Hydraulics

### 3.3.1 Drainage Design

#### 3.3.1.1 Swales

As mentioned in Section 3.1, sizing of the required drainage infrastructure was completed using the Manning's Equation. Manning's Equation is shown below and uses wetted perimeter, area, slope and Manning's coefficient for roughness to determine peak flow.

$$Q = VA = \frac{1.00}{n} AR^{2/3}\sqrt{S}$$

Where,

$$Q = Peak\ flow\ \left(\frac{m^3}{s}\right), V = Velocity\ \left(\frac{m^2}{s}\right), n = Manning's\ coefficent\ of\ roughness$$

$$A = Area\ (m^2), R = Wetted\ Perimeter\ (m)\ and\ S = Slope\ \left(\frac{m}{m}\right)$$

Manning's Equation was used to size the drainage infrastructure for the locations determined by Horsham Rural City Council.

The location of the drains are outlined in Figure 3-7, with corresponding maximum discharges, sizes, lengths and grades outlined in Table 3-4.

The increase in fraction impervious has decreased the event critical duration to 0.5 hours in the upper areas and 2 hours in lower potions of the drainage system.

A freeboard of 0.15 m from the 1% AEP water level to the top of each swale has been allowed, this assumes an additional 0.15 m will be achieved at each building location due to gravel pads, a concrete slab etc. resulting in a total freeboard of 0.3 m.

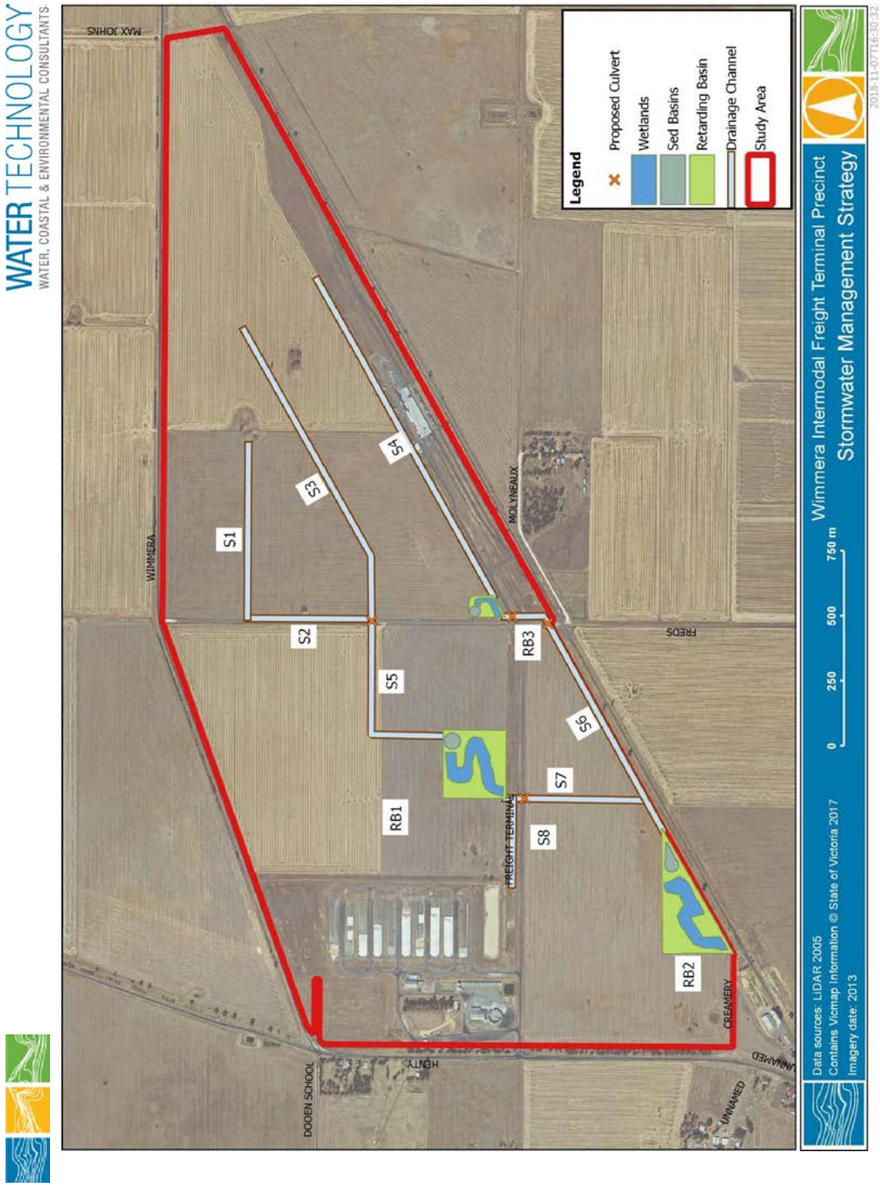


**Figure 3-7 Developed conditions drainage layout and sizing**







Table 3-4 Stormwater drainage infrastructure details

| Swale | Length (m) | Critical Duration (hrs) | Peak Flow ($m^3/s$) | Grade (%) | Depth (m) | Bottom width (m) | Inundated Top Width (m) | Top width including freeboard (m) |
|---|---|---|---|---|---|---|---|---|
| S1 | 670 | 0.5 | 1.7 | 0.2 | 0.7 | 1 | 8 | 9.50 |
| S2 | 500 | 0.5 | 1.7 | 0.2 | 0.7 | 1 | 8 | 9.50 |
| S3 | 1,250 | 2 | 6.9 | 0.23 | 1.2 | 1 | 12 | 13.4 |
| S4 | 1,600 | 2 | 1.9 | 0.2 | 0.75 | 1 | 8 | 9.40 |
| S5 | 670 | 2 | 3.1 | 0.2 | 0.8 | 2 | 10 | 9.05 |
| S6 | 900 | 6 | 3.25 | 0.3 | 0.8 | 1 | 9.5 | 11.0 |
| S7 | 530 | 48 | 4.6 | 0.2 | 1 | 1 | 11 | 12.5 |
| S8 | 510 | 48 | 2.3 | 0.1 | 1 | 0 | 9.2 | 10.6 |

Swale 8 will take flow from Freight Terminal Road and any overflows from the Viterra evaporation basin and council maintained retarding basin. Modelling has shown at the current operational level the dam could handle a short duration 1% AEP event without overtopping but successive events could cause overtopping and allowance for is necessary to cater for successive events or long wet periods. There is currently a 300mm RCP linking the Viterra storage to the Council retarding basin, it is recommended this be maintained in place and a rocked spillway also be created on the western end of the Viterra storage to allow for controlled overflow in the case it is required.

The location of Swale 7 is flexible, the only design requirement is to ensure the downstream end can link to the sedimentation basin in RB2 before it discharges into the wetland. This will enable some flexibility in the subdivision plan for Council and the exact location can be determined during the detailed design phase.

#### 3.3.1.2 Culverts

There are four culvert crossing locations; two on Molyneux Road (water flowing into S5 and along S6), one at the Freight Terminal Entry (out of RB3) and two on Freight Terminal Road (flowing into S6 and S7).

The culverts sizes required at these locations was determined using Hy8[4], modelling assumed peak water levels were able to reach the culvert obvert in a 1% AEP event. The flow at each culvert and the minimum flow area required is shown in Table 3-5. The number/size/type of culverts used is flexible as long as the minimum flow area and minimum cover requirements for each culvert are met. The minimum cover required will vary dependent on the culvert type and approval of Horsham Rural City Council. However, a minimum cover of 600mm should be allowed for pipe culverts. The costing included in Section 4 assumed nominal pipe diameters without consideration for the road pavement height purely for cost estimation purposes.

**Table 3-5 Stormwater culvert sizes**

| Culvert Location | 1% AEP peak flow ($m^3/s$) | Culvert size | US invert (m AHD) | DS Invert (m AHD) | Headwater elevation (m AHD) |
|---|---|---|---|---|---|
| Molyneux Road - water flowing into S5 | 3.1 | Flow area of 1.8 $m^2$ | | | |
| Freight Terminal Entry - water flowing out of RB3 | 2.4 | 4 x 0.75 m | 132.9 | 132.8 | 133.73 |
| Molyneux Road - water flowing in S6 | 2.4 | 4 x 0.75 m | 132.8 | 132.7 | 133.63 |
| Freight Terminal Road - flowing into S7 | 4.6 | 6 x 0.90 m | 132.7 | 132.6 | 133.77 |
| Ultimate Outlet for RB02 | 4.9 | 5 x 1.2 m<br>1 x 0.45 m | 131.2 | 131.15 | 132.0 |
| Interim Outlet for RB02 | 0.3 | 4 x 0.45 m | 131.2 | 131.15 | 132.0 |

### 3.3.2 Wetland Concept Design

A concept design for three sedimentation basin and wetland locations were completed. The sedimentation basin and wetlands were sized using the eWater water quality model MUSIC. MUSIC predicts the performance of stormwater quality management systems using defined urban or rural catchment characteristics.

The wetland was sized using the RORB model outputs, using the same parameters discussed throughout Section 3.2.2. Flows were scaled down to a three-month flow for input into the wetland/sedimentation basin design.

[4] US Federal Highway Administration



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Concept sedimentation basin wetland location and relative sizing at RB01, RB02 and RB03 are shown in Figure 3-8, Figure 3-9 and Figure 3-10 respectively, including Normal Water Levels (NWL), Top of Extended Detention (TED) level, batters, footprint and basic arrangements. Note that the locations of sedimentation basin and wetlands are indicative only. They could be moved if the new proposed location captures the runoff inline with the current proposed location. The required volumes and areas; however, are fixed.

It should be noted the Interim Design of RB02 has an excavation of similar size to the ultimate design, but contains a swale with disconnected pools enabling drainage.

5559-01R01V06a_Horsham_Freight_Terminal.docx

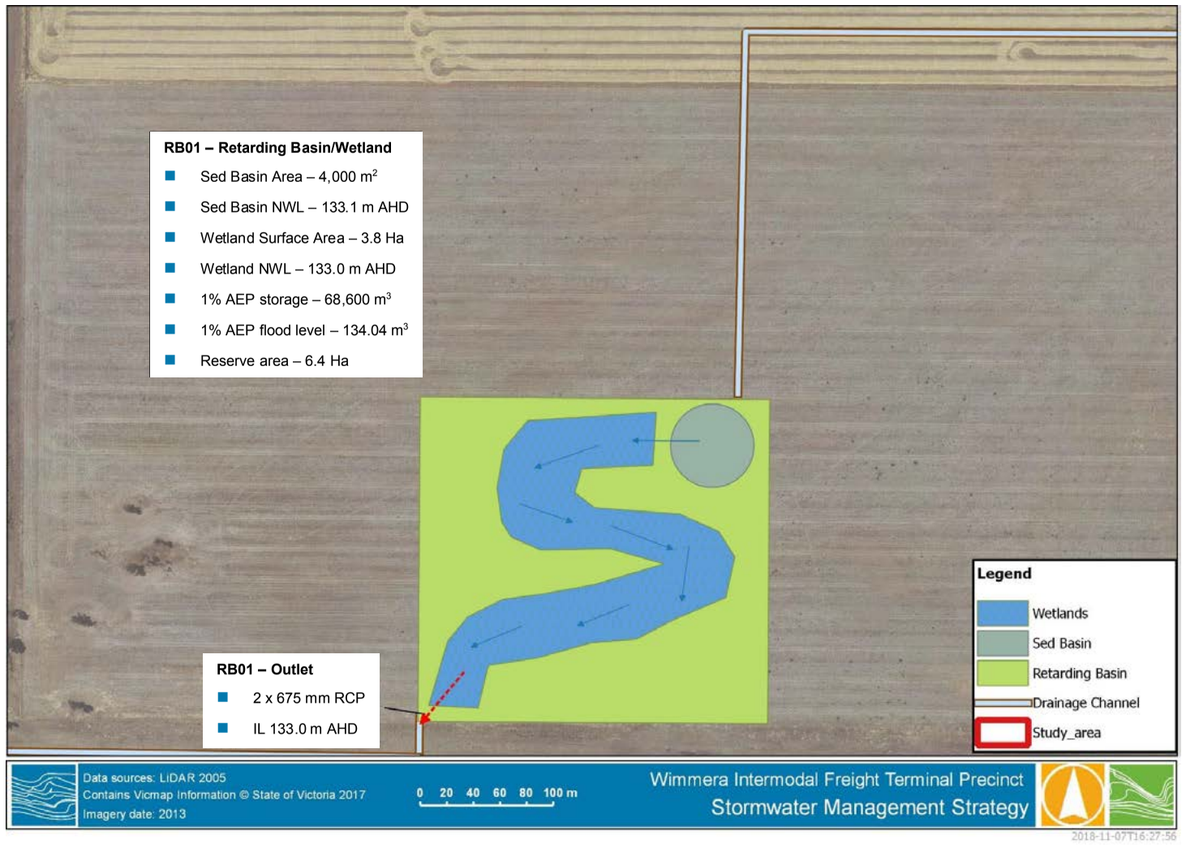


Figure 3-8 RB01 Sedimentation basin and wetland sizing





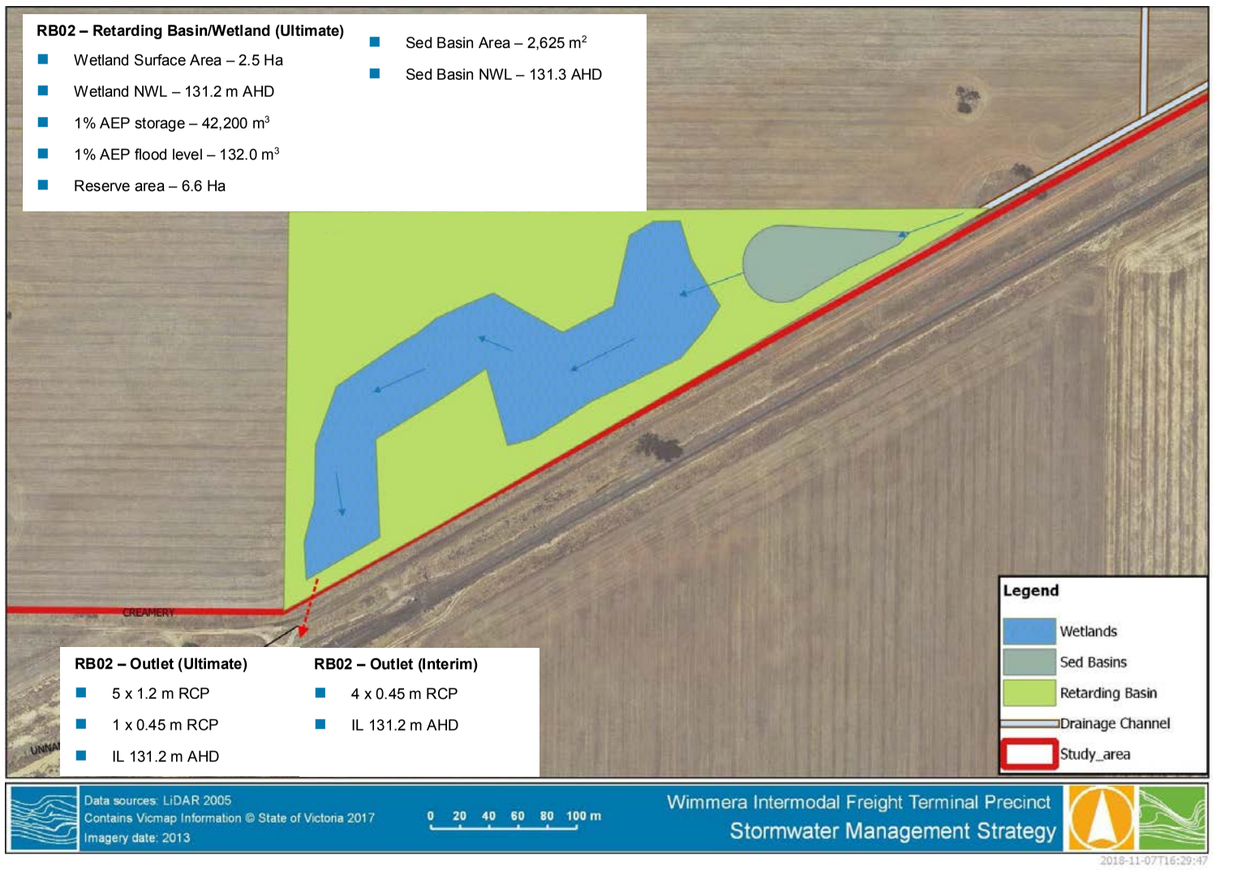


Figure 3-9 RB02 Sedimentation basin and wetland sizing

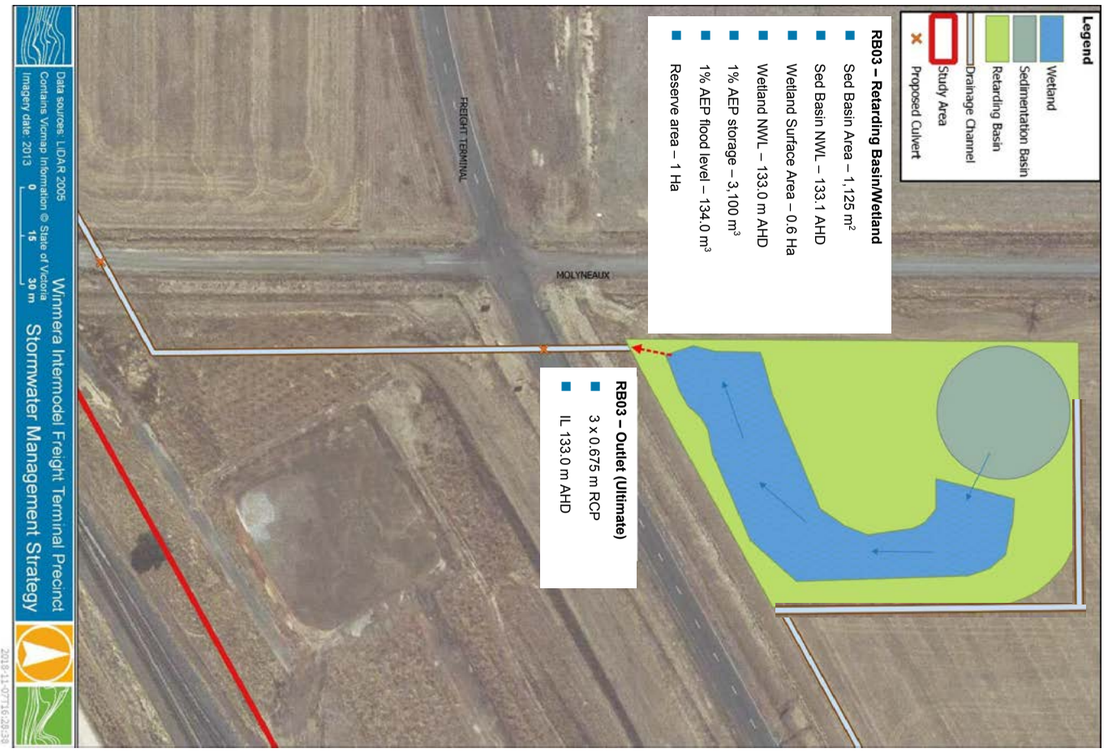


Figure 3-10 RB03 Sedimentation basin and wetland sizing







Given type of development and its location lots are not expected to sell rapidly, and staged construction of sedimentation and wetland infrastructure may be an option to avoid a high up-front cost or to limit the risk that not all lots will sell within a desired period.

Each of the three proposed basins has its own district catchment area, the relationship between catchment area and the area/volume of the treatment infrastructure is approximately linear. If staged development of a basin's catchment area was to occur a similar percentage of the basin's construction would be required, e.g. if 50% of the catchment upstream of RB1 was to be developed, 50% of the sedimentation/wetland area/volume would also be required. This is outlined in Table 3-6.

Table 3-6 Example treatment infrastructure required for staged catchment development

| % of catchment development | Sed. Basin Area ($m^2$) | | | Wetland Surface Area ($m^2$) | | | 1%AEP Storage ($m^3$) | | | Reserve Area (Ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RB1 | RB2 | RB3 | RB1 | RB2 | RB3 | RB1 | RB2 | RB3 | RB1 | RB2 | RB3 |
| 25 | 1,000 | 656 | 2,815 | 9,500 | 6,250 | 1,500 | 17,150 | 10,550 | 775 | 1.6 | 1.65 | 0.25 |
| 50 | 2,000 | 1,312 | 562 | 19,000 | 12,500 | 3,000 | 34,300 | 21,100 | 1,550 | 3.2 | 3.3 | 0.5 |
| 75 | 3,000 | 1,969 | 843 | 28,500 | 18,750 | 4,500 | 51,450 | 31,650 | 2,325 | 4.8 | 4.95 | 0.75 |
| 100 | 4,000 | 2,625 | 1,125 | 38,000 | 25,000 | 6,000 | 68,600 | 42,200 | 3,100 | 6.4 | 6.6 | 1 |

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# 4 DESIGN CONSIDERATIONS AND COSTING

The cost associated with construction of the required drainage infrastructure was determined based on Melbourne Water Drainage Scheme standard costing rates for greenfield developments. If Horsham Rural City Council have more specific rates, we are happy to include them.

The costing made the following assumptions

- The cost of excavation - $14/m$^3$
- Cost of topsoiling - $3/m$^2$
- Swales are grassed in the Interim Design, cost of grassing is $2/m$^2$
- Swales are vegetated in the Intimate Design, cost of vegetation is $14/m$^2$ (6 plants per m$^2$)
- The developer will be able to use/store/dispose of 50% of retardation basin/wetland spoil, in the case of RB02 and RB03 (if it is to be disposed of the cost would be $18/m$^3$). It is understood the spoil from RB02 will be disposed of by Council entirely.

The drainage costs associated with the WIFT Precinct are separated into three stormwater treatment areas, the infrastructure upstream and including each RB01, RB02 and RB03, and Interim and Ultimate designs.

Costs are also separated “Hydraulic” and “Water Treatment Infrastructure” components. The costing includes estimated additional construction costs as a percentage of the development’s construction e.g. Site Establishment and Preparation, Engineering Fees, Administration, Contingences. The stated percentages are standard industry figures; however, they are likely to be conservative in this case.

An overview of the Ultimate costing is shown in Table 4-1 with a more detailed breakdown of the construction cost shown in Table 4-3.

An overview of the Interim costing is shown in Table 4-2 with a more detailed breakdown of the construction cost shown in Table 4-4.

The total cost of the development drainage and treatment infrastructure including contingencies for each stormwater treatment area was determined as follows:

- RB01 - $4,530,772
- RB02 - $2,708,480
- RB03 – $945,931
- Swales – $2,775,566
- Culverts - $321,389
- Total - $11,282,137

Using a total developable area of 330 Ha (excluding 40 Ha for the mineral sands mine development and existing on-site development) the cost per hectare is $34,200. This is relatively cost effective compared to other recent industrial developments. For example, Water Technology recently worked on three sites in the Shepparton area all with an industrial development cost greater than $120,000/Ha, these were smaller areas at between 14-25 Ha per development area.



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Table 4-1 Ultimate - Costs Summary

| Works Description | Culverts | Swales | RB01 | | | RB02 | | | RB03 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Retarding Basins | Wetlands | Sediment Basins | Retarding Basins | Wetlands | Sediment Basins | Retarding Basins | Wetlands | Sediment Basins |
| Estimated Basic Construction Cost (A) | $194,491 | $1,962,505 | $1,637,840 | $1,100,413 | $148,625 | $729,223 | $928,461 | $108,833 | $60,748 | $520,300 | $65,423 |
| Provisions | $36,953.24 | $0.00 | $327,568 | $0 | $29,725 | $145,845 | $0 | $21,767 | $12,150 | $0 | $13,085 |
| 'A' x Site Establishment, Preparation & Reinstatement Costs @ 6% | $11,669 | $117,750 | $98,270 | $66,025 | $8,918 | $43,753 | $55,708 | $6,530 | $3,645 | $31,218 | $3,925 |
| 'A' x Site Environmental & Traffic Management Plans @ 2.5% | $4,862 | $49,063 | $40,946 | $27,510 | $3,716 | $18,231 | $23,212 | $2,721 | $1,519 | $13,007 | $1,636 |
| Sub-total 'B' | $247,976 | $2,129,318 | $2,104,624 | $1,193,949 | $190,983 | $937,051 | $1,007,380 | $139,850 | $78,061 | $564,525 | $84,068 |
| 'B' x Engineering Fee @ 15% | $37,196 | $319,398 | $315,694 | $179,092 | $28,647 | $140,558 | $151,107 | $20,977 | $11,709 | $84,679 | $12,610 |
| Sub-total 'C' | $285,172 | $2,448,715 | $2,420,318 | $1,373,041 | $219,631 | $1,077,609 | $1,158,487 | $160,827 | $89,770 | $649,204 | $96,678 |
| 'C' x Administration Fee @ 9% | $25,665 | $220,384 | $217,829 | $123,574 | $19,767 | $96,985 | $104,264 | $14,474 | $8,079 | $58,428 | $8,701 |
| Sub-total 'D' | $310,838 | $2,669,100 | $2,638,147 | $1,496,615 | $239,397 | $1,174,593 | $1,262,751 | $175,302 | $97,849 | $707,632 | $105,379 |
| 'B' x Contingencies @ 5% | $10,551 | $106,466 | $88,853 | $59,697 | $8,063 | $39,560 | $50,369 | $5,904 | $3,296 | $28,226 | $3,549 |
| Sum | $321,389 | $2,775,566 | $4,530,772 | | | $2,708,480 | | | $945,931 | | |
| Total Cost | | | | | | | | | | | $11,282,137 |

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Table 4-2 Interim - Costs Summary

| Works Description | Culverts | Swales | RB02 Retarding Basins |
|---|---|---|---|
| Estimated Basic Construction Cost (A) | $147,504 | $390,637 | $748,702 |
| Provisions | $28,026 | $0 | $149,740 |
| | | | |
| 'A' x Site Establishment, Preparation & Reinstatement Costs @ 6% | $8,850 | $23,438 | $44,922 |
| 'A' x Site Environmental & Traffic Management Plans @ 2.5% | $3,688 | $9,766 | $18,718 |
| Sub-total 'B' | $188,068 | $423,841 | $962,082 |
| 'B' x Engineering Fee @ 15% | $28,210 | $63,576 | $144,312 |
| Sub-total 'C' | $216,278 | $487,417 | $1,106,394 |
| 'C' x Administration Fee @ 9% | $19,465 | $43,868 | $99,575 |
| Sub-total 'D' | $235,743 | $531,285 | $1,205,970 |
| 'B' x Contingencies @ 5% | $8,002 | $21,192 | $40,617 |
| **Sum** | $243,745 | $552,477 | $1,246,587 |
| **Total Cost** | | **$2,042,809** | |



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Table 4-3 Ultimate - Detailed construction cost breakdown

| Item of Works | No/volume/area | | Item cost/rate | | Total Cost | Subtotal Costs |
|---|---|---|---|---|---|---|
| **RB01** | | | | | | **$ 1,637,840.00** |
| Outlet Culverts | 1 | | $ 7,040.00 | | $ 7,040.00 | |
| Inlet / Outlet Structures | 1 | | $ 10,000.00 | | $ 10,000.00 | |
| Construct Spillway | 1 | | $ 10,000.00 | | $ 10,000.00 | |
| Earthworks | | | | | | |
| Excavation | 68,600 | $m^3$ | 14 | $/m^3$ | $ 960,400.00 | |
| Disposal of surplus soil (0%) | 34,300 | $m^3$ | 18 | $/m^3$ | $ 617,400.00 | |
| Grassing | 22,000 | $m^2$ | 1.5 | $/m^2$ | $ 33,000.00 | |
| **RB02** | | | | | | **$ 729,222.50** |
| Outlet Culverts | 1 | | $ 55,860.00 | | $ 55,860.00 | |
| Inlet / Outlet Structures | 1 | | $ 10,000.00 | | $ 10,000.00 | |
| Construct Spillway | 1 | | $ 15,000.00 | | $ 15,000.00 | |
| Earthworks | | | | | | |
| Excavation | 42,200 | $m^3$ | 14 | $/m^3$ | $ 590,800.00 | |
| Disposal of surplus soil (0%) | 0 | $m^3$ | 18 | $/m^3$ | $ - | |
| Grassing | 38,375 | $m^2$ | 1.5 | $/m^2$ | $ 57,562.50 | |
| **RB03** | | | | | | **$ 60,747.50** |
| Outlet Culverts | 1 | | $ 10,560.00 | | $ 10,560.00 | |
| Inlet / Outlet Structures | 1 | | $10,000 | | $ 10,000.00 | |
| Construct Spillway | 1 | | $10,000 | | $ 10,000.00 | |
| Earthworks | | | | | | |
| Excavation | 1,125 | $m^3$ | 14 | $/m^3$ | $ 15,750.00 | |
| Disposal of surplus soil (50%) | 563 | $m^3$ | 18 | $/m^3$ | $ 10,125.00 | |
| Grassing | 2,875 | $m^2$ | 1.5 | $/m^2$ | $ 4,312.50 | |
| **RB01 WETLAND** | | | Cost Formula | | | **$ 1,100,413** |
| | 3.80 | ha | =640,147 x Area$^{0.4058}$ | | $ 1,100,413 | |
| **RB02 WETLAND** | | | Cost Formula | | | **$ 928,461** |
| | 2.50 | ha | =640,147 x Area$^{0.4058}$ | | $ 928,461 | |
| **RB03 WETLAND** | | | Cost Formula | | | **$ 520,300** |
| | 0.60 | ha | =640,147 x Area$^{0.4058}$ | | $ 520,300 | |
| **RB01 SEDIMENT BASIN** | | | | | | **$ 148,625** |
| Total Excavation Volume | 6,000 | $m^3$ | 14 | $/m^3$ | $ 84,000 | |
| Topsoiling | 4,800 | $m^2$ | 3.1 | $/m^2$ | $ 14,880 | |
| Grassing | 4,000 | $m^2$ | 1.5 | $/m^2$ | $ 6,000 | |
| Vegetation (littoral zone) | 800 | $m^2$ | 13.6 | $/m^2$ | $ 10,880 | |
| Riprap at Inlet | | | allow | | $ 5,400 | |
| Outlet Structure | | | allow | | $ 5,015 | |
| First clean out | | | allow | | $ 22,450 | |
| **RB02 SEDIMENT BASIN** | | | | | | **$ 108,833** |
| Total Excavation Volume | 3,938 | $m^3$ | 14.00 | $/m^3$ | $ 55,125 | |
| Topsoiling | 3,150 | $m^2$ | 3.10 | $/m^2$ | $ 9,765 | |
| Grassing | 2,625 | $m^2$ | 1.50 | $/m^2$ | $ 3,938 | |
| Vegetation (littoral zone) | 525 | $m^2$ | 13.60 | $/m^2$ | $ 7,140 | |
| Riprap at Inlet | | | allow | | $ 5,400 | |
| Outlet Structure | | | allow | | $ 5,015 | |
| First clean out | | | allow | | $ 22,450 | |

| RB03 SEDIMENT BASIN | | | | | | $ | 65,423 |
|---|---|---|---|---|---|---|---|
| Total Excavation Volume | 1,688 | $m^3$ | 14.00 | $/m^3$ | | $ | 23,625 |
| Topsoiling | 1,350 | $m^2$ | 3.10 | $/m^2$ | | $ | 4,185 |
| Grassing | 1,125 | $m^2$ | 1.50 | $/m^2$ | | $ | 1,688 |
| Vegetation (littoral zone) | 225 | $m^2$ | 13.60 | $/m^2$ | | $ | 3,060 |
| Riprap at Inlet | | | allow | | | $ | 5,400 |
| Outlet Structure | | | allow | | | $ | 5,015 |
| First clean out | | | allow | | | $ | 22,450 |

| DRAINAGE SWALES | | | | | | | $ | 1,962,505 |
|---|---|---|---|---|---|---|---|---|
| ID | Length | | Cross Sectional Area | | Excavation/Topsoil/Grassin | Total Cost | | |
| S1 | 670 | m | 6.0 | m | 14/3/2 | | $ | 165,122 |
| S2 | 500 | m | 6.0 | m | 14/3/2 | | $ | 123,225 |
| S3 | 1250 | m | 8.4 | m | 14/3/2 | | $ | 432,998 |
| S4 | 1600 | m | 6.0 | m | 14/3/2 | | $ | 390,570 |
| S5 | 670 | m | 9.9 | m | 14/3/2 | | $ | 219,462 |
| S6 | 900 | m | Variable | m | 14/3/2 | | $ | 291,685 |
| S7 | 530 | m | Variable | m | 14/3/2 | | $ | 191,652 |
| S8 | 510 | m | Variable | m | 14/3/2 | | $ | 147,792 |

| Culverts | | | | | $194,491 |
|---|---|---|---|---|---|
| ID | Length | Pipe size (mm) | No of barrel | Total Cost | |
| Molyneux Road - water flowing in | 15.0 | 900 | 3 | $46,987 | |
| Freight Terminal Road - water flo | 15.0 | 750 | 4 | $34,644 | |
| Molyneux Road - water flowing in | 20.0 | 750 | 4 | $44,684 | |
| Freight Terminal Road - flowing i | 20.0 | 1,200 | 6 | $68,176 | |

| TOTAL BASIC COST FOR ALL WORKS | $ | 7,456,860 |
|---|---|---|

Table 4-4 Interim - Detailed construction cost breakdown

| Item of Works | No/volume/area | | Item cost/rate | | Total Cost | Subtotal Costs |
|---|---|---|---|---|---|---|
| RB02 | | | | | | $ 748,702.00 |
| Outlet Culverts | 1 | | $ 7,960.00 | | $ 7,960.00 | |
| Inlet / Outlet Structures | 1 | | $ 10,000.00 | | $ 10,000.00 | |
| Construct Spillway | 1 | | $ 15,000.00 | | $ 15,000.00 | |
| Earthworks | | | | | | |
| Excavation | 44,053 | $m^3$ | 14 | $/m^3$ | $ 616,742.00 | |
| Disposal of surplus soil (0%) | 0 | $m^3$ | 18 | $/m^3$ | $ - | |
| Grassing | 66,000 | $m^2$ | 1.5 | $/m^2$ | $ 99,000.00 | |

| DRAINAGE SWALES | | | | | | | $ | 390,637 |
|---|---|---|---|---|---|---|---|---|
| ID | Length | | Cross Sectional Area | | Excavation/Topsoil/Grassin | Total Cost | | |
| S6 | 900 | m | Variable | m | 14/3/2 | | $ | 177,745 |
| S7 | 530 | m | Variable | m | 14/3/2 | | $ | 114,060 |
| S8 | 510 | m | Variable | m | 14/3/2 | | $ | 98,832 |

| Culverts | | | | | $147,504 |
|---|---|---|---|---|---|
| ID | Length | Pipe size (mm) | No of barrel | Total Cost | |
| Freight Terminal Road - water flo | 15.0 | 750 | 4 | $34,644 | |
| Molyneux Road - water flowing in | 20.0 | 750 | 4 | $44,684 | |
| Freight Terminal Road - flowing i | 20.0 | 1,200 | 6 | $68,176 | |

| TOTAL BASIC COST FOR ALL WORKS | $ | 1,286,843 |
|---|---|---|





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