

## GEELONG BLUE CIRCLE SITE ROLLING STOCK FACILITY



## NEW SITE FINAL REPORT

22 SEPTEMBER 2009

PREPARED BY

**coffey**  **rail**

SPECIALISTS CONNECTING  
COMMUNITIES

Coffey Rail Pty Ltd  
ABN 54 125 584 401  
Level 2/60 Collins Street,  
Melbourne, Victoria 3000  
Phone: (+61) 3 9650 1444  
Fax: (+61) 3 9650 7622  
Email: rail@coffey.com  
www.coffey.com

## **GEELONG BLUE CIRCLE SITE ROLLING STOCK FACILITY – NEW SITE FINAL REPORT**

Department of Transport  
Victoria

21684  
22 September 2009



Department of  
Transport

# CONTENTS

Prepared by

Deleted - Confidential

Allan Hoy  
Principal, Operations

Coffey Rail  
Level 2, 60 Collins Street Melbourne VIC 3000 Australia  
T (+61) 3 9650 1444 F (+61) 3 9650 7622

Prepared by

Deleted - Confidential

Peter Kwán  
Senior Project Manager

Checked by

Deleted - Confidential

Howard Ellis  
Principal, Project Management

Revision	Description of changes	Prepared	Checked	Date
-	Draft Report	AJH and PK	HE	16 April 2009
1	Final Report	AJH and PK	HE	22 September 2009

# CONTENTS

<b>1. OVERVIEW AND DEPOT LOCATION</b>	<b>1</b>
1.1. Proposed Layout of New Site	1
1.2. Site Specifics	2
<b>2. GENERAL REQUIREMENTS</b>	<b>2</b>
<b>3. FUNCTIONAL REQUIREMENTS</b>	<b>2</b>
<b>4. FACILITY SPECIFICATION</b>	<b>3</b>
4.1. Workshop	3
4.2. Servicing Arrangements	4
4.3. Train Stabling Facility	4
4.4. Signalling Arrangements	4
4.5. Road Vehicle Access	4
4.6. General Facilities	4
<b>5. DEPOT OPERATIONS PHILOSOPHY</b>	<b>5</b>
5.1. Depot Train Working	5
5.2. Signalling and Control	5
<b>6. ROAD VEHICLE MOVEMENTS INTO AND WITHIN THE FACILITY</b>	<b>6</b>
<b>7. PEDESTRIAN MOVEMENTS WITHIN THE DEPOT</b>	<b>6</b>
<b>8. MATTERS FOR CONSIDERATION</b>	<b>6</b>
8.1. Safety and Security Arrangements	6
8.2. Safety Aspects	7
8.3. Security Measures	7
8.4. Train Crew Amenities	7
8.5. Rain Water Harvesting	7
<b>9. STAGED CONSTRUCTION OF THE FACILITY</b>	<b>8</b>
9.1. Stage 1	8

# **CONTENTS**

<b>9.2. Stage 2</b>	<b>8</b>
<b>9.3. Stage 3</b>	<b>9</b>
<b>9.4. Overall and Future Expansion Requirements</b>	<b>9</b>
<b>10. ON-GOING ISSUES TO BE RESOLVED</b>	<b>9</b>
<b>10.1. Barwon Water</b>	<b>9</b>
<b>10.2. OH&amp;S - Dust Study</b>	<b>10</b>
<b>10.3. BCSC Restoration Of The Site</b>	<b>10</b>
<b>11. TRACK AND CIVIL DRAWINGS</b>	<b>10</b>
<b>12. SIGNALLING DRAWINGS</b>	<b>11</b>
<b>13. COST ESTIMATE</b>	<b>11</b>
<b>14. DUST STUDY REPORT</b>	<b>11</b>
<b>15. BARWON WATER</b>	<b>11</b>

# CONCEPT DESIGN AND STAGING PROGRAM FOR NEW REGIONAL ROLLING STOCK FACILITY AT GEELONG

## 1. OVERVIEW AND DEPOT LOCATION

This Final Concept Design Report follows on from the Preliminary Analysis of the previously intended site for the new Regional Rolling Stock Train Maintenance and Stabling facility being located on land owned by Blue Circle Southern Cement (BCSC) on the north side of the Geelong-Warrnambool railway between the Anglesea Road PCR at 86.384km and the Waurm Ponds cement works PCR at approximately 87.800km. This site was subsequently rejected because of realignment of the Anglesea Road flyover and difficulties obtaining road access to the facility, which then led the Department of Transport (DOT) to investigate a new site.

The new site for the proposed Rolling Stock Maintenance Depot has now been identified as being on the same land owned by BCSC, but approximately 2 kilometres west of the previous site and similarly located on the north side of the Geelong – Warrnambool rail line. Rail access to the proposed depot will be provided by a turnout from the main line at 88.288kms. The site is more-or-less adjacent to the BCSC freight siding located on the south side of the main line; it is bordered by Reservoir Road and Draytons Road and constrained at the western corner by land owned by Barwon Water that is unavailable to the DOT.

The DOT engaged Coffey Rail (previously Asia Pacific Rail – APR) to prepare an assessment of the new BCSC site, together with a concept layout for the required maintenance and stabling facility. The layout is required to initially provide for train stabling of ten 8-car trains, a by-pass track and three servicing tracks. The layout is required to allow for expansion capability to include a Maintenance Workshop, one internal cleaning track and stabling for an additional ten 8-car trains, with a future proofing-concept for a further ten 8-car trains.

It is proposed that the new depot be constructed and operated in conjunction with the intended acquisition of a new fleet of high capacity (HC) DMU's, primarily for Geelong line operation. The new DMU's will operate as permanently coupled 4-car consists, with two consists coupled to form 8-car trains during peak periods.

The assessment is required to build on the work previously completed by APR and is to be based on the previous DOT Scope of Work and draft report provided by APR. The concept design required is to allow for construction of the depot facility over three stages with appropriate drawings.

### 1.1. Proposed Layout of New Site

The longitudinal layout adopted for the previous site has not been able to be replicated on the new site because of restrictions on land availability, particularly relevant to the land in the western corner of the site owned by Barwon Water. Accordingly, a "U" shaped track layout has been developed that minimises land use and ensures that all Functional Requirements of the brief are achieved.

The layout adopted is operationally efficient and has some advantages over a longitudinal layout, such as:

- Better utilisation of available land;
- Improved security and monitoring of the facility;
- Consolidation of functional activities within the compound; and

- Reduction in walking times for train crew and maintenance personnel.

## 1.2. Site Specifics

The identified new site is currently being mined by BCSC. Agreement between the DOT and BCSC will be required with respect to the expected condition of the site prior to DOT assuming occupancy.

The land identified as being required for the facility has an area of 268.303m<sup>2</sup> which is delineated on Drawing SK-21684-R-004 – Appendix 1. The area includes provision for future proofing with respect to train stabling and a freight siding requested by BCSC, as well as bund walls as required. The area requiring compaction is also clearly defined.

**Stage 1** of the project will be designed to provide just the essentials for servicing (tracks 1 to 4 - external washing, fuelling, toilet extraction, etc.) and train stabling for ten 8-car trains. No Maintenance Workshop will be provided at this stage, but provision will be made for same. The proposed track for internal heavy cleaning (track 5) will not be provided at this stage; however track leads at each end, and signalling arrangements will be provided for. Facilities will be established for on-train staff, i.e. drivers and conductors; however it is yet to be determined where these staff will ultimately be located for sign on/off and supervisory purposes.

**Stage 2** of the project will be designed more-or-less as the ultimate facility with, as far as practicable, seamless transition from Stage 1. It is expected that construction of Stage 2 could commence soon after completion of Stage 1. The expanded facility will include a Maintenance Workshop which will meet requirements to around 2050. At this stage, staff facilities and amenities (maintenance and on-train) will likely be provided within the Workshop to include sign-on and supervisor areas, canteen, stand-by rooms, toilets, showers, lockers, etc. Car parking will be provided for approximately 120 staff. The Internal Heavy Cleaning Track (track 5) will be provided as part of this stage, together with a head shunt leading from the Workshop to the stabling sidings.

**Stage 3** will include provision of additional train stabling for ten 8-car trains, together with extension of the head-shunt and double track access/egress between the train servicing area and the stabling sidings.

Future Proof: A further provision for a possible ten 8-car is included in order to define the proposed land acquisition requirements.

## 2. GENERAL REQUIREMENTS

The facility layout and depot buildings ultimately will be designed and built in compliance with applicable local building codes to suit environmental conditions. Building services will adhere to Australian standards and requirements.

The conceptual layout of the stabling facility has been developed using as a reference the VRIOGS Metropolitan Electric Train Stabling Design Guidelines (as advised by DOT), together with the functional requirements provided in the project brief and detailed below.

## 3. FUNCTIONAL REQUIREMENTS

The overall functional requirements of the proposed facility will be broadly as set out in the original brief. However, following a previous review with V/Line, the layout is required, as far as practicable, to

physically separate the areas in which trains will be moved by other qualified personnel. Therefore, the desired concept is to have trains arrive directly into servicing tracks where qualified personnel would progress trains through external wash, fuelling, toilet servicing, etc. The same personnel would then place fully serviced trains into their designated stabling sidings. Day to day internal cleaning (removal of litter and spot clean) would be undertaken in the stabling sidings.

Drivers would take outgoing trains into running from the stabling sidings or servicing tracks, as may be required.

The objective is to minimise the movement of trains within the depot area for servicing, cleaning and maintenance purposes.

The proposed Stage 2 Maintenance Workshop and general facility will be designed to undertake the following functions on a 24/7 basis:

- All HC DMU maintenance (other than heavy repairs), including unit exchange of all modular components;
- On-site inventory of appropriate components and consumable items;
- All routine servicing, including external and internal cleaning, fuelling, toilet extraction, etc;
- Secure stabling of all rolling stock on the site;
- Provision of maintenance workforce amenities, including car parking;
- Provision of facilities for on-train staff (drivers and conductors), including car parking;
- Road and foot crossings to be avoided as much as possible.

The maintenance function will be facilitated by train operations that are planned to allow for:

- Trains to proceed to and from stabling without passing through the service and train washing track – via a bypass track;
- Ease of access to the Workshop for trains returning from the main line to the depot, for reasons of failures or maintenance; and
- Trains shunting to and from the workshop and stabling facilities to proceed without undue interference with line operation.

## **4. FACILITY SPECIFICATION**

### **4.1. Workshop**

- The Maintenance Workshop is to comprise three undercover tracks, each of 4-car length, with full width overhead carnage; the tracks will be established as under:
  - Track 1 will have an in-floor 4-car jacking system;
  - Track 2 will be elevated above a full-width pit with fork lift access; and
  - Track 3 will be flat with track laid flush to the floor surface.
- The Maintenance annex will include a small component clean repair room and adequate area for component and consumable items inventory with fork lift access.

## 4.2. Servicing Arrangements

- Servicing facilities for two 8-car trains, desirably in series layout, to process incoming trains prior to entering stabling, with concurrent servicing of 4-cars;
- A train wash track with automatic external washing facility with direct access from the main line;
- A separate 8-car length track and covered platform set up with appropriate equipment for heavy periodic internal cleaning; and
- A bypass track providing through passage for trains entering or departing the facility.

## 4.3. Train Stabling Facility

- Stage 1 stabling sidings to accommodate ten 8-car trains or equivalent, which has been laid out to comply with VRIOGS and permit vehicular access between each pair of tracks;
- Site and track layout provision for stabling sidings expansion in later stages for up to a further ten 8-car trains; and
- Optional stabling layouts for sidings accommodating individual 8-car trains or alternatively, up to two x 8-car consists.
- Future proofing to allow for additional ten, 8-car trains.

## 4.4. Signalling Arrangements

- Remote controlled signalling for access between the Warrnambool main line and the site but not for internal movements within the site;
- Automatic signalling will be extended from Marshall Station to the new depot site. Trains will access the depot via a turnout and signal from the main line at 88.288kms working in conjunction with route indicators applicable to the respective 5 arrival tracks. Similarly, automatic signalling will be provided on all 5 tracks for trains departing the depot;
- Train movements leading to and from the facility will be remotely controlled by Control in communication with facility supervisors; and
- Train movements within the facility will be controlled locally.

## 4.5. Road Vehicle Access

- Site road access adequate for B-double access to maintenance and fuelling facilities and for approximate 3-tonne capacity vehicles between pairs of stabling tracks;
- Car parking to accommodate requirements for 30 staff; and
- Consideration given to asphaltting all road vehicle access to reduce dust.

## 4.6. General Facilities

- Maintenance and servicing workforce amenities for up to 30 staff,
- Separate, or alternatively co-located, on-train staff facilities and amenities, including sign-on and supervisor area, meal room, toilets, showers, lockers, etc. for train drivers and conductors for up to 80 staff, including car parking for up to 50 staff on duty concurrently;
- Full site lighting and security to current standards;

- Appropriate site environmental provision, including screening and/or bunding; and
- Roof design to maximise rain water harvesting.

## **5. DEPOT OPERATIONS PHILOSOPHY**

### **5.1. Depot Train Working**

Depending on the train status with respect to washing and / or servicing requirements, the arriving train/s will be directed by Control into a designated arrival track as confirmed by coordination with the Maintenance Supervisor and liaison with train drivers.

Designated arrival tracks will be:

- Track 1 - Bypass Track, providing through access to / from stabling;
- Track 2 - Train Servicing Track for fuelling and toilet extraction – 8-cars;
- Track 3 - Train Servicing Track for fuelling and toilet extraction – 8-cars;
- Track 4 - Automatic Train Wash Track – 8-cars;
- Track 5 (provided in Stage 2) - Train Internal Heavy Cleaning Track with platform – 8-cars.

A safety barrier will separate the bypass track from the servicing tracks.

Train drivers will be released from trains as they arrive in the arrival / servicing tracks; authorised maintenance personnel will assume control and move trains through servicing and the train wash and eventually to stabling.

Train drivers in charge of trains arriving via the by-pass track and being directed immediately to stabling will be released after securing and closing the train down.

The facility layout provides for a high degree of flexibility of train movements; however the objective will be to minimise train movements within the facility. Servicing (fuelling and toilet extraction) will be the priority function and, in the main, will be completed as trains come out of service and before proceeding to stabling. External washing of trains will be next priority. This is a scheduled function and, when practicable, will also be done as trains come out of service and before proceeding to stabling.

The internal heavy cleaning is also a scheduled function (part of stage 2) but these trains will be afforded lower priority for placement. Placement of trains in the appropriate track (track No. 5) would preferably occur as a train comes out of service, but is more likely to necessitate a train being transferred from the stabling sidings. In the interim between stage 1 and stage 2, this cleaning function will be done at another location.

### **5.2. Signalling and Control**

The existing automatic signalling on the Warrnambool main line (ATC) currently operates only as far as the Dn end of Marshall Station. The ATC will be extended from Marshall to the depot site and provide safe access between the main line and the facility. The Up end access to the existing BCSC freight siding will also be upgraded to ATC signalling because it is located within the proposed ATC extended area. This will facilitate the operation of BCSC trains.

ATC signalling will be provided to facilitate smooth and safe access and egress to / from the Warrnambool main line and the leads to tracks 1, 2, 3, 4 and 5 within the depot. At this time, it is

intended that hand operated points will be provided for all other train movements within the depot facility.

Track circuits will be located, as required, on each arrival track (tracks 1, 2, 3, 4 and 5) to provide Control with indication of track occupation.

All train movements in either direction between the main line and depot facility will be planned and coordinated by the Train Controller at Control and the Maintenance Supervisor. Train movements within the depot will be planned and co-ordinated between the Maintenance Supervisor, Operations Supervisor and Drivers, as appropriate. Local control of signalling will be provided at the site.

Trains ready to depart the depot will proceed on instructions provided by train radio and applicable hand signals from the stabling tracks or other location up to and as far as, the departure signal applicable to tracks 1, 2, 3, 4 and 5 and the main line.

Coffey Rail recommends that the new site layout should be fully signalled and remotely controlled from Control (with local control possible) to safely control all train movements within the facility, except for an area to be defined immediately in front of the Workshop This would be in line with the approach adopted for the majority of modern depots being constructed internationally. A fully signalled depot will enhance efficiency and provide safer movement of trains within the depot area.

## **6. ROAD VEHICLE MOVEMENTS INTO AND WITHIN THE FACILITY**

Two access roads are provided to the site to facilitate access / egress of fuel supplies. However, normal vehicles will access the site via the Reservoir Road access, which is intended to be manned by security personnel. All entries and exits, including staff and all deliveries by service vehicles, should normally be routed through this entrance gate.

The road layout is designed to minimise the need to cross tracks, however all PCRs into and within the site will be provided Active Protection. Adequate parking space for cars and two wheeled vehicles is provided for both staff and visitors.

Appropriate access is provided for emergency vehicles to the workshop and main parts of the depot.

Visitors and administrative personnel should be directed to the administrative area and the dedicated car park after checking, identification and registration at the access gate.

## **7. PEDESTRIAN MOVEMENTS WITHIN THE DEPOT**

At a later stage of design, adequate access and pedestrian footpaths should be provided to minimise the amount of walking required, and to provide safe personnel movements.

## **8. MATTERS FOR CONSIDERATION**

### **8.1. Safety and Security Arrangements**

Safety and security should be given the highest reasonable level of attention to protect maintenance and operating staff as well as equipment and installations from any possible hazards throughout the depot. A Risk Assessment should be developed later to identify and mitigate realized hazards.

## **8.2. Safety Aspects**

The future design of the facility should clearly identify areas where there is potential danger to personnel from moving trains and these should be fenced off, or guardrails and warning signs erected as necessary in accordance with applicable safety standards.

Adequate, safe personnel access routes should be provided to enable safe and efficient movement within the Depot for normal operations and for emergency evacuation. Such access routes will include routes between stabled trains, routes adjacent to tracks and cross-track walkways and rail/road crossing protection.

A Fire Alarm System should be installed, and Fire fighting and Emergency equipment provided at appropriate locations throughout the depot.

## **8.3. Security Measures**

The entire depot compound is completely fenced. Road access to the depot should be by a single entrance only. All entries and exits, including pedestrians and deliveries by service vehicles, should proceed through this entrance gate, controlled by well trained security guards, or remotely controlled by intercom, CCTV and electric release.

Flood lighting should be considered within the compound for the following areas:

- Perimeter fencing;
- Stabling sidings;
- Servicing tracks;
- Outdoor storage areas;
- Road and rail apron areas at workshop entrances;
- Level crossings; and
- Security checkpoints

CCTV should be installed at selected points within the facility and Workshop to facilitate security of both personnel and property.

## **8.4. Train Crew Amenities**

Initially, train crew facilities will be separated from those for maintenance personnel; however when the Workshop is constructed as part of Stage 2, consideration should be given to consolidating all staff amenities within the Workshop facility. This includes offices and sign on areas for operations personnel, locker and standby areas, as well as canteen facilities.

## **8.5. Rain Water Harvesting**

The brief provided for this Concept Design Report requires the Workshop roof to be designed in such a way to maximise rain water harvesting. This is an important matter which should not be overlooked at a future stage of detailed design. Rain water harvesting could provide an important resource for use within the depot facility, particularly for train washing, train servicing and toilet flushing.

The large area at the centre of the facility site could be utilised to form a holding dam where the harvested water would be stored.

## 9. STAGED CONSTRUCTION OF THE FACILITY

The three staged construction plan adopted for the longitudinal layout proposed for the previous site will, in the main, be acceptable for the new site and the 'U' shaped layout now being proposed.

Refer to Drawing: SK-21684-R-0004 for Overall Plan, including future expansion requirements.

### 9.1. Stage 1

Stage 1 of the project is intended to cater for anticipated requirements to 2020 with the overall design and layout compatible with expansion that may be required to cover anticipated needs for the economic life of the rolling stock, i.e. to around 2050.

Specifically, Stage 1 will include:

- a. Four arrival tracks will be provided within the facility as defined below:
  - Track 1 – By-pass track leading directly to stabling;
  - Track 2 – Servicing track to accommodate 8-car trains (fuelling and toilet extraction);
  - Track 3 – Servicing track to accommodate 8-car trains (fuelling and toilet extraction);
  - Track 4 – External train wash track; and
  - Provision only for turnout and signalling leading to proposed track 5.
- b. Train stabling tracks for ten 8-car trains;
- c. Fuel storage facility;
- d. Staff facilities for train crew personnel;
- e. Car parking and access roads; and
- f. Security fencing and monitoring equipment.

Automatic signalling on the Warrnambool main line will be extended from Marshall Station to the Depot facility at 88.288kms, and include access to the Blue Circle Cement siding located on the Dn side of the Warrnambool main line at 87.863kms. The main line turnout providing access to the facility and the turnouts leading to tracks 1, 2, and 3, 4 and 5 will be motorised and train operations in and out of the facility will be remotely controlled from Control, with local control also provided from the facility.

Refer to Drawing: SK-21684-R-0001 for details.

### 9.2. Stage 2

Stage 2 of the project will more-or-less be complete construction of the ultimate facility with provision of the Maintenance Workshop, including staff facilities and amenities, sign-on and supervisor areas, canteen, stand-by rooms, toilets, showers, lockers, etc. Car parking will be provided for approximately 120 staff. The Internal Heavy Cleaning Track (track 5) will be provided as part of this stage.

Specifically, Stage 2 will include:

- a. Maintenance Workshop with staff facilities including canteen;
- b. Internal heavy cleaning track (track 5) with platform and cleaning facilities; and

- c. 8-car head shunt from the Workshop to the loop track

Refer to Drawing: SK-21684-R-0002 for details.

### **9.3. Stage 3**

Stage 3 relates only to the planned expansion of the facility to accommodate additional train stabling.

Specifically, Stage 3 will include:

- a. Expansion of the train stabling facility to accommodate an additional ten 8-car DMUs; and
- b. Extend the Stage 2 Head Shunt to provide two tracks on the loop, which will allow simultaneous operation of trains arriving and departing the stabling area.

Refer to Drawing: SK-21684-R-0003 for details.

### **9.4. Overall and Future Expansion Requirements**

The total area of the required site is 268,303m<sup>2</sup>. This area includes provision for future proofing with respect to train stabling and a freight siding requested by BCSC, as well as bund walls as required. The area requiring compaction is also clearly defined.

Refer to Drawing: SK-21684-R-0004 for details.

## **10. ON-GOING ISSUES TO BE RESOLVED**

### **10.1. Barwon Water**

The following information has been provided by Barwon Water:

1. Design plan of the 1200mm Bellarine Transfer Main.
2. Design plan amended 'as constructed' plan of the 1400mm Petavel – Montpellier Transfer Main.
3. Design plan amended to 'as constructed' for the 1000mm Grovedale Feeder Main (x2).

BW advised that all mains are mild steel cement lined (internal) pipes with sintakote external coating – the thickness of steel was not known.

BW has not previously assessed a request of rail crossing large strategic water mains. They advised that a reduction in cover would not be permitted and a structural assessment of the pipes ability to withstand the loading caused by the rail loading would be required. This assessment should be submitted with detailed design plans of the rail for BW assessment.

BW pointed out that mains of this size are not normally sleeved. Alternative protection proposals over the mains that demonstrate the ability to transfer loads away from the mains would be reasonably assessed. Access to the mains in the event of failure shall also be taken into consideration.

BW further advised that the depth of all mains should be confirmed at the proposed rail crossing location. BW will need to be on site as a witness during depthing.

A 1200mm cover from finish surface level (FSL) to the top of pipe will be required. It should be noted that FSL is at ground level, not at top of rail.

BW confirmed that there is a planned future water main (1350mm or 1650mm diameter) in this location. BW would prefer to construct this main prior to the proposed rail works and suggested that details and timing could be discussed at a later date.

Refer Appendix 5 for relevant drawings provided by Barwon Water.

## **10.2. OH&S - Dust Study**

The Dust Study Report - Refer Appendix 4, relates only to the initial rolling stock facility site. There is approximately two kilometres between that site and the current facility site, hence the content of the report is largely irrelevant. It is noted, however, that the new site is removed from the high concentration dust plume area identified in the Dust Study Report.

At a later stage of design development, it would be prudent to undertake a Dust Study relevant to the current site.

## **10.3. BCSC Restoration Of The Site**

Mining has been occurring at the site since 1960. The area of the proposed stabling siding is currently being extracted. It is expected that extraction in the proposed rail siding area will be completed by the end of 2011 and filling could be completed by the end of 2015 based on current quarry planning.

It is understood that BCSC will restore the site to a finish level suitable for the construction of the maintenance facility. Based on the existing rail level on the main line and the required cover to cross the Barwon Water pipe lines, it is recommended that the site be restored to the profile as detailed in Drawing No. 21684-R-0006 – Proposed Contours. This proposed finish level allows for a 300mm cover above the proposed formation level to protect the site against erosion until construction of the siding proceeds.

In the previously extracted area, overburden has been placed as part of rehabilitation work. The overburden material is transported by scrapers to the rehabilitation area. The scrapers have a loaded weight of 85t and an empty weight of 40t. The method of placement is for the scrapers to deposit approximately 250mm to 400mm deep layer of overburden down a fill slope of 1V:3H, with the following loads deposited over the wheel marks of the previous load, allowing the scraper to wheel roll between each previous load as a method of compaction. Areas previously rehabilitated appear to have achieved a relative density of 95% standard compaction with a moisture content of between 12% and 23%.

This level of compaction is generally sufficient for railway subgrade formation work. It is suggested that at the time of surface preparation for construction, the formation surface be proof rolled using roller compactors to ensure that underlying layers are properly compacted and any soft spot is identified and removed before the placement of the sub-ballast layer.

## **11. TRACK AND CIVIL DRAWINGS**

See Appendix 1 for Track and Civil drawings, which include:

- SK-21684-R-0001 – Stage 1;
- SK-21684-R-0002 – Stage 2;
- SK-21684-R-0003 - Stage 3;
- SK-21684-R-0004 – Overall and Future Expansion Plan;

- SK-21684-R-0005 – Typical Cross Sections; and
- SK-21684-R-0006 – Proposed Contours.

See Appendix 5 for Barwon Water drawings, which include:

- Photograph d022166 – drawing 13316
- Photograph d027965 – drawing 14089

## **12. SIGNALLING DRAWINGS**

See Appendix 2 for Signalling Drawings, which include:

- 21684-G-0001 – Stage 1; and
- 21684-G-0002 – Stage 3.

## **13. COST ESTIMATE**

See Appendix 3 for Cost Estimate.

Within the geographical limits of the project, the cost estimates cover all rail infrastructure related work including track, civil, structural, signalling and communications, including staging of the works.

Estimates are based on 2009 cost rates with 15% contractor's on costs and 12% contractor's overhead margin built in. A general concept cost contingency of 30% together with a risk provision of 50% have been included.

Land acquisition, decontamination and environmental work have been excluded.

## **14. DUST STUDY REPORT**

See Appendix 4 for Dust Study Briefing Note and related interpretation documents.

## **15. BARWON WATER**

See Appendix 5 for Barwon Water drawings, which include:

- Photograph d027965 – drawing 14089 – Grovedale Feeder Main
- Photograph d022166 – drawing 13316 – Pettavel to Montpellier Main – Stage 2