



Integrated Management System

# Planning Approval Consistency Assessment Form

SM ES-FT-414

Sydney Metro Integrated Management System (IMS)

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The Planning Approval Consistency Assessment Form should be completed in accordance with the Sydney Metro Planning Approval Consistency Assessment Procedure (SM ES-PW-314) and Sydney Metro Environmental Planning and Approval Manual (SM ES-ST-216)

## 1.0 Existing Approved Project

### Planning approval reference details (Application/Document No. (including modifications)):

Sydney Metro City and Southwest Chatswood to Sydenham Conditions of Approval (SSI 15\_7400) as modified.

Modification 1 – Relocation of Victoria Cross northern services building. Additional station entry and relocation of Artarmon Substation (SSI Mod 1).

Modification 2 – Central Walk – Sydney Metro City and Southwest – Chatswood to Sydenham (SSI Mod 2).

Modification 3 – Martin Place Metro Station – Sydney Metro City and Southwest – Chatswood to Sydenham (SSI Mod 3).

Modification 4 – Sydenham Station and Metro Facility South – Chatswood to Sydenham (SSI Mod 4).

Modification 5 - Blues Point Acoustic Shed (SSI Mod 5).

Modification 6 – Administrative Changes- Modification to Sydney Metro City & Southwest - Chatswood to Sydenham (SSI Mod 6)

### Date of determination:

SSI 15\_7400 – 9 January 2017.

SSI Mod 1 – 18 October 2017.

SSI Mod 2 – 21 December 2017.

SSI Mod 3 – 22 March 2017.

SSI Mod 4 – 13 December 2017.

SSI Mod 5 – 2 November 2018

SSI Mod 6 – 21 February 2019

### Type of planning approval:

Division 5.2 (cf Part 5.1) - Critical State Significant Infrastructure

### Description of existing approved project you are assessing for consistency:

SSI 15\_7400: The Chatswood to Sydenham component of Sydney Metro City and Southwest comprises a new metro rail line, approximately 16 kilometres long, between Chatswood and Sydenham. New metro stations would be provided at Crow's Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street and Waterloo, as well as new underground metro platforms provided at Central Station.

The Central Station Main (CSM) works are a major element of the Sydney Metro City and Southwest project, which includes the construction of a new metro station underneath Central Station's existing heavy-rail platforms 13, 14 and 15.

SSI Mod 2: Work to the existing Central Station and Central Walk, which includes a new eastern entrance and concourse running below the suburban rail platforms (existing platforms 16 to 23).

#### Combined Services Route (CSR) for high voltage electrical (HV) and communications (Comms.) services

Condition A1 of the Secretary's Conditions of Approval (CoA) for CSSI 7400 states that "*The CSSI must be constructed generally in accordance with the description of the CSSI in the EIS*". Chapter 7 of the Environmental Impact Statement (EIS) details how the existing services routes at Central Station are contained within the underground services and pedestrian tunnels beneath the existing platforms. In order to provide uninterrupted access for the construction of the metro platforms, it is proposed to relocate these services into a combined service ring around the perimeter of the station. The services ring is likely to include power cables, communications cables, signalling cables and fire services.

Central Station has a complex arrangement of services running throughout the station, including a dedicated services tunnel, as well as tunnels for use by pedestrians. These services would be severed by both the Approved CSM Project as well as the Approved Modification (Central Walk), should these services not be relocated. To negate potential impacts to these essential services, section 6.6.1 of the Central Walk Modification Report (Mod 2) has proposed the construction of a Combined Services Route (CSR) which will be placed around Central Station and through Sydney Yard. This CSR will provide:

- A reticulation pathway for east concourse services
- A route for Sydney Trains high voltage (HV) power low voltage (LV) power, communications and hydraulic services serving the east concourse, the wider station and rail operations for Sydney Trains network
- A route for any metro services that need to be extended to the wider Central Station precinct from the metro station.

The proposed CSR will be placed around Central Station, utilising existing service infrastructure where this is available and providing new installations as required to complete the CSR as shown in Figure 7-3 of Mod 2. The CSR will run:

- Through the services building at the southern end of the metro platforms
- On a gantry placed over and to the south of the intercity platforms, across to Platforms 4 & 5
- Through a trench from the south of Platform 4 & 5 and through Platform 4 & 5 to above the baggage tunnel
- Through a vertical bore through Platform 4 & 5 to the baggage tunnel below.

Given the size of the CSR, it will be delivered by Laing O'Rourke (LOR) in two phases – Phase A which was approved on 3<sup>rd</sup> July 2019, and Phase B. This Consistency Assessment has been developed for the second phase of construction of the CSR – Phase B. Phase B is broadly illustrated in Appendix A and will be delivered through the Darling Harbour Goods Line, Mortuary Sidings, Mortuary Tunnel, Sydney Yard, Water Main Tunnel, and Sydney Network Base

#### Relevant background information (including EA, REF, Submissions Report, Director General's Report, MCoA):

- The Sydney Metro City and Southwest – Development Consent – Determination, dated 9th January 2017
- The Sydney Metro City and Southwest - Environmental Impact Statement, dated 3rd May 2016



- The Sydney Metro City and Southwest Chatswood to Sydenham Submissions and Preferred Infrastructure Report (PIR), dated October 2016
- Modification 2 – Central Walk – Sydney Metro City and Southwest – Chatswood to Sydenham (SSI Mod) – 21 December 2017
- Chatswood to Sydenham – Central Walk Modification – Submissions Report – 4 April 2017
- Chatswood to Sydenham – Central Walk Modification – Determination, dated 21 December 2017

The proposed works identified in this assessment would be undertaken in accordance with the mitigation measures identified in the EIS, PIR and the Infrastructure Approval, as modified.

## 2.0 Description of proposed development/activity/works

### 2.1 Describe ancillary activities, duration of work, working hours, machinery, staffing levels, impacts on utilities/authorities, wastes generated or hazardous substances/dangerous goods used.

The CSR Phase B works will incorporate construction of a combination of various route types, mainly Underground conduits, Galvanised Steel Troughing (GST), and use of existing service routes. To ensure the proposed activities are understood, the activities have been specified by work location as detailed in the map provided in Appendix A, which also highlights the Archaeological Methodology to employ. Given the repetitive nature of the works across Central Station, key construction methodologies are detailed in 2.1 and are only briefly cited within each work area in section 2.2 to avoid duplicating information.

- Duration of works/working hours: Works will occur predominantly during standard construction hours approved for the Project, however may occur OOH and during rail possessions. Works are anticipated to start with potholing and service investigation in September, with construction of the CSR Route Phase B occurring from November 2019 through to June 2020, and commissioning and defect works progressing through to December 2020.
- Machinery: Machinery are listed in part 2.2 under each section of works.
- Staffing levels: staff numbers will vary from day to day and depending on the extent of work. It will be alike to those used during CSR Phase A construction, already approved under a separate Consistency Assessment.
- Impacts on utilities/authorities: Utilities will be intercepted throughout construction of Phase B - CSR Route, however impacts have been logically considered and will be negated through the use of a detailed engineering work schedule. Relevant utility authorities have been consulted, and will continue to be consulted and informed throughout the completion of Phase B of the CSR Route.
- Waste generated: The most common waste stream for the proposed works include excavated material (spoil – general GSW, DGB, and other engineering fill materials). Further waste streams include, slurry (as a result of saw cutting), concrete washout (from pours) and litter. These have been considered and addressed as part of the construction methodology and ECM in Appendix B.
- Hazardous substances/dangerous goods used: None used. A surface inspection for any HazMat will be conducted prior to all works, with any discovered HazMat being recorded, removed and disposed of at an appropriately licenced facility.

### 2.1 Construction Methodologies used throughout Phase B CSR (A reference point for Section 2.2)

- GST Construction – GST posts must be excavated using a vac truck and excavator with auger attachment. Posts are placed in holes and concrete encased. Metal troughing is then installed along posts using hand lifts and power tools. Cables to be pulled through GST using mechanical equipment.
- Ground Level Troughing (GLT) – excavation of a shallow trench approximately 500mm wide x 300mm deep. Install precast concrete u-shape troughing, followed by backfilling and installation of lids. Service cables are then pulled through.
- Underground service route (Conduit Install) – excavate a trench to design depth and width. Installation of PVC conduits, followed by backfilling with suitable material (bulk earth fill, concrete, stabilised sand, clean sand etc – site dependent). Pull cables through.
- Installation of Pre-cast pits: excavate a hole to required pit size (as per design). Lift and place pre-cast pit into excavation, connect conduits/GST/GLT to pit followed by backfilling with appropriate material and then install pit lid.
- Installation of Mortuary Service Tunnel Entry riser - Installation of sheet piles around the excavation area. Excavate to required depth (5m). Construct in-situ concrete riser walls (formwork and false work). Placement of in-situ concrete, followed by backfilling and removal of sheet piles.
- Underlevel Crossing (ULX) – excavate a trench to design depth and width. Installation of PVC conduits, followed by backfilling with suitable material for track formation (i.e concrete, stabilised sand, clean sand etc – site dependent). Re-instate sleepers and all necessary elements to maintain track integrity.

### Archaeological Methodology– in accordance with the CSR Archaeological Method Statement (CSR AMS) – Appendix A and E.

- **Archaeological Testing** of excavation works for the installation of HV and Communications and construction of pad mount to the south of the Lee Street substation and in the Sydney Yards
- **Archaeological Monitoring** of trenching for HV and Communications south of Mortuary Station, at Lee St substation, adjacent to the Devonshire Street tunnel entrance and within the driveway of the Railway Institute.
- Monitoring or testing works would revert to **Sydney Metro Unexpected Heritage Finds Procedure** at the discretion of the Excavation Director where it was found that significant archaeological remains were not likely to be impacted.

### General pre-construction works – for Phase B CSR:

- Prior to any construction activities for Phase B CSR, service investigation works comprising of surface scanning, and non-destructive excavation will be completed to determine the location of all known services within the CSR alignment as well as to locate unknown services or archaeological items. A surface inspection for any HazMat will be conducted, with any discovered HazMat being recorded, removed and disposed of at an appropriately licenced facility.

**2.2 – Work Areas for Phase B CSR - refer to Appendix A for relative locations.**

**(1) UT-313103 – Lee Street Substation area, and Darling Harbour Goods line:**

**Scope of Works**

**Part A:**

**ENSURE: Archaeological Monitoring as per CSR AMS**

- GST to transition from the southern end of platform 1 into separate Communication and High Voltage Precast Concrete Pits.
- Installation of Communication and HV precast concrete pits
- Construction of underground conduit route along the northern end of Lee Street Substation boundary
- Installation of GST along the eastern side of Lee Street Substation.
- Installation of four separate metal support frames to allow the re-direction of CSR from Lee St substation, down into the Darling Harbour Goods Line without impacting the wall. Cables to be placed and secured onto installed frames.
- Installation of GST along the eastern side of the Darling Harbour Goods line

**Part B: Padmount substation at Lee Street**

**ENSURE: Archaeological Testing prior to excavation works per CSR AMS**

- To the south of Lee St substation, a service route is to be installed to carry HV cables and a padmount substation is to be built.
- The HV service route consists of two 150mm diameter conduits in a 1.3m deep by 0.5m wide trench.
- The conduits will be encased in stabilised sand and the trench backfilled with compacted fill.
- The padmount substation is installed on a 4.5 x 5.9m concrete slab, 150mm thick. A
- HV cable feeds the padmount and a LV comes from it to feed SYAB. Appendix C depicts the location of the padmount installation, which requires the removal of some ground cover as well as three trees (*Celtis Sinensis* and *Eriobotrya japonica*) which are Identified in the Arborist Report – Appendix D.

**Plant and equipment:**

- Excavators 6t-16t with Buckets and Hammer attachments, Crane and flatbed Trucks, Rigid Tipper Trucks, Crew Truck, Vacuum Excavator, Temporary Fencing, Hand and power tools, Mobile Crane up to 35t, Concrete Agitators, Concrete Line Pump, Cable pulling winches, Cable Drums, Cable Rollers.

**(2) UT-313104 – Mortuary Service Tunnel:**

**Scope of Works –**

- Installation of a steel cable support system within the existing Mortuary Service Tunnel to support additional service cables.

- Cable pulling and installation will occur within the existing services tunnel
- Construction of GST to transition from Mortuary Service Tunnel Access Riser into new Precast Pits. GST to be constructed within the existing embankment
- Installation of 2x Precast concrete pits,
- Construction of GLT for approximately 20m.

**Plant and Equipment**

- Cable pulling winches, Cable Drums, Cable Rollers, power tools, hand tools

**(3) UT-313105 – PA Sidings / Chalmers Substation Area:**

ENSURE: Archaeological Monitoring as per CSR AMS

**Scope of Works -**

- Installation of new cables within the existing comms and HV CSR

**Plant and Equipment**

- Hand and power tools, Cable pulling winches, Cable Drums, Cable Rollers.

**(4) UT-313106 – Railway Institute Driveway**

ENSURE: Archaeological Monitoring as per CSR AMS

- Trenching around the Railway Institute Building and Prince Alfred Station for the installation and connection of HV pits.
- HV connection to Prince Alfred Substation at basement level.
- Installation of pre cast concrete HV Pit and 2x Comms Pits.
- Construction of Underground service route (Conduit install) and cable pulling.
- Connection to the Water Tunnel access point – excavation to expose existing connection riser. Demolish opening into existing rise, install conduits and backfill.
- Cable pulling of services within existing CSR
- Excavators 6t-16t with Buckets and Hammer attachments, Crane and flatbed Trucks, Rigid Tipper Trucks, Crew Truck, Vacuum Excavator, Temporary Fencing, Hand and power tools, Mobile Crane up to 35t, Concrete Agitators, Concrete Line Pump, Cable pulling winches, Cable Drums, Cable Rollers.

**(5) UT-313107 – Platform 23 works**

**Part A (Above ground) – Eastern Boundary Wall**

**ENSURE: Archaeological Monitoring as per CSR AMS**

**Scope of Works -**

- Cable pulling of services through GST that is existing, as well as through a new GST that will be placed along the brick wall to support new HV cables. As indicated in the HIA, the wall mounted GST will transition to being post mounted towards the southern end of Platform 23, where the works are based. GST would be 40m in length on post, and 80m on the wall.
- Cables will be connected into existing service routes

**Plant and Equipment**

- Crane and Flatbed truck, Crew truck, Vacuum Excavator, Hand and power tools

**Part B (Concourse level – ceiling of ESR / Olympic Tunnel):**

**Scope of Works-**

- Installation of cable trays running through the length of ESR concourse ceiling as well as the walls and ceiling of the Olympic tunnel.
- Will involve installing new cable trays, as well as using existing risers.

**Plant and Equipment:**

- Hand tools, EWP, core drill.

**(6) UT-313109 – Mortuary Sidings**

**ENSURE: Archaeological Monitoring and Unexpected Finds Protocol as per CSR AMS**

**Scope of Works –**

- Mortuary Service Tunnel Entry riser - Installation of sheet piles around the excavation area. Excavate to required depth (5m). Construct in-situ concrete riser walls (formwork and false work). Placement of in-situ concrete, followed by backfill and removal of sheet piles.
- Construction of new GST route
- Construction of ULX
- Connections of newly constructed services into existing service pits
- Construction of underground service routes
- Installation of precast concrete pits

- Construction of Padmount Transformer foundation and transformer installation – Excavate an area of 6mx5mx400mm(deep) for padmount foundation works. Form-Reo-Pour (FRP) foundation base. Strip and backfill. Install a pre-assembled padmount transformer using a mobile crane. Pull cables and commission.

**Plant and Equipment –**

- Excavators 6t-20t (with Buckets, Auger, and Hammer attachments, and sheet pile vibration attachment), Crane and flatbed Trucks, Rigid Tipper Trucks, Crew Truck, Vacuum Excavator, Temporary Fencing, Hand and power tools, Mobile Crane up to 35t, Concrete Agitators, Concrete Boom Pump.

**(7) UT-313110 – Sydney Yard (Southern End)**

ENSURE: Archaeological Testing prior to excavation works, and Monitoring for other works per CSR AMS

**Scope of Works –**

- Mortuary Service Tunnel Entry riser - Installation of sheet piles around the excavation area. Excavate to required depth (5m). Construct in-situ concrete riser walls (formwork and false work). Placement of in-situ concrete, followed by backfilling and removal of sheet piles.
- Construction of new GST route
- Connection of new services into existing service pits
- Construction of underground service routes
- Installation of precast concrete pits

**Plant and Equipment –**

- Excavators 6t-20t (with Buckets, Auger, and Hammer attachments, and sheet pile vibration attachment), Crane and flatbed Trucks, Rigid Tipper Trucks, Crew Truck, Vacuum Excavator, Temporary Fencing, Hand and power tools, Mobile Crane up to 35t, Concrete Agitators, Concrete Boom Pump, Cable pulling winches, Cable Drums, Cable Rollers.

**(8) UT-313111 – Sydney Yard (Northern End)**

ENSURE: Archaeological Testing prior to excavation works, and Monitoring for other works per CSR AMS

**Scope of Works –**

- Construction of new GST route
- Connection of new services into existing service pits
- Construction of underground service routes
- Installation of precast concrete pits



**Plant and Equipment –**

- Excavators 6t-20t (with Buckets, Auger, and Hammer attachments), Crane and flatbed Trucks, Rigid Tipper Trucks, Crew Truck, Vacuum Excavator, Temporary Fencing, Hand and power tools, Mobile Crane up to 35t, Concrete Agitators, Concrete Boom Pump, Cable pulling winches, Cable Drums, Cable Rollers.

**(9) UT-313112 – Water Tunnel**

**Scope of Works –**

- Installation of cable support system within existing Service Water Tunnel
- Cable pulling and installation

**Plant and Equipment**

- Cable pulling winches, Cable Drums, Cable Rollers, power tools, hand tools

**3.0 Timeframe**

**When will the proposed change take place? For how long?**

The proposed activities include service investigations, construction and commissioning of the CSR as well as defect rectifications. These works are anticipated to occur for a period of 12 months starting from October 2019. While construction is anticipated to be completed by June 2020, cable pulling and defect rectifications may continue through the second half of 2020 and will mark the completion of the CSR Phase B works.

The majority of works will be occurring during standard working hours for the project as follows:

- 07:00 – 18:00 Monday to Friday
- 08:00 – 13:00 Saturdays.
- No works Sundays or public holidays.

Some works will need to be conducted Out of Hours (OOH), and will therefore follow the Sydney Metro OOH Protocol and CSM EPL 21148. Similarly, some works for Phase B will only be possible during Possession weekends and during Service Isolations – however exact dates cannot be confirmed.

## 4.0 Site description

**Provide a description of the site on which the proposed works are to be carried out, including, Lot and Deposited Plan details, where available. Map to be included here or as an appendix. Detail of land owner.**

Central Station is located to the south of the Sydney Central Business District (CBD) and is the busiest station in the Sydney transport network. The station is located within the City of Sydney Local Government Area (LGA), is zoned as SP2 – Special Purpose (Infrastructure) and is owned by Sydney Trains. The Phase B stage of the CSR works will occur throughout the Central Station precinct which is located on Lot/Section/Plan no: 118//DP1078271.

## 5.0 Site Environmental Characteristics

**Describe the environment (i.e., vegetation, nearby waterways, land use, surrounding land use), identify likely presence of protected flora/fauna and sensitive area.**

Phase B of the CSR works will occur inside and around Central Station, which is located to the south of Sydney's Central Business District (CBD). Central Station is a large interchange hub and is serviced by a large network of rail services, light rail, coaches, taxis and bus networks. The site has been heavily modified across more than a Century of development and redevelopment and is now representative of an inner city urban environment with almost none of the original natural landscape remaining. There are no waterways and no remaining natural vegetation located within the vicinity of the site.

The Sydney Local Environment Plan (LEP) 2012 defines the land use zoning within Central Station and it's surrounds as a mix of the following zones:

- SP2 Infrastructure
- B8 Metropolitan Centre
- RE1 Public Recreation
- B4 Mixed Use
- R1 General Residential.

The majority of the Central Station footprint is contained within land zoned SP2 Infrastructure. The aims of this zone are to provide for infrastructure and related uses and to prevent development that is not compatible with, or that may detract from, the provision of infrastructure. The surrounding localities include Haymarket, Chinatown, Central Park and Surry Hills. Central Station is also located in close proximity to educational facilities including the University of Technology Sydney, the University of Notre Dame, Australia and Sydney Institute of Technology.

## 6.0 Justification for the proposed works

**Address the need for the proposed works, whether there are alternatives to the proposed works (and why these are not appropriate), and the consequences with not proceeding with the proposed work.**

The existing services routes at Central Station are contained within the underground services and pedestrian tunnels beneath the existing platforms.

To avoid damage to the existing services and to provide uninterrupted access to these services during the construction and operation of the Central Station Metro, the services must be relocated into a combined service route (CSR) around Central Station. Although the CSR was identified as a concept in the EIS and Mod 2, the detailed design process has since identified an optimised route from an operational and maintenance perspective. The constructability is consistent with what was identified in Mod 2.

Should the combined services route not be redirected around the perimeter of Central Station, essential services would not only be damaged, but the construction of the Central Station Metro Project would not be possible as a whole. An alternative to the proposed Phase B works is not possible.

## 7.0 Environmental Benefit

**Identify whether there are environmental benefits associated with the proposed works. If so, provide details:**

There is no net environmental benefit associated with the construction of the CSR.

## 8.0 Control Measures

**Will a project and site specific EMP be prepared? Are appropriate control measures already identified in an existing EMP?**

A Construction Method Statement has been prepared, incorporating control measures identified in the CSM works CEMP and CSR HIA (Appendix F) and CSR AMS (Appendix E).

An Environment Control Map has also been developed to communicate to the team, key strategies to negate environmental harm (Appendix B).

## 9.0 Climate Change Impacts

**Is the site likely to be adversely affected by the impacts of climate change? If yes, what adaptation/mitigation measures will be incorporated into the design?**

No. The proposed works are unlikely to be affected by the impacts of climate change.

## 10.0 Impact Assessment – Construction

Attach supporting evidence in the Appendices if required. Make reference to the relevant Appendix if used.

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Flora and fauna	Three trees will require removal for the installation of a padmount substation at the end of Lee Street. The trees were identified as non-native species, had no habitat features and provided little to no ecological benefit.	<ul style="list-style-type: none"> <li>Soil will be stabilised as soon as works are completed (via plantings for example).</li> <li>Removed trees will be recorded and replaced in accordance with CoA E6.</li> </ul>	Y	Y	—
Water	The impacts of these works will be similar to those described in the Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required.</li> </ul>	Y	Y	—
Air quality	The impacts of these works will be similar to those described in the Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Noise and vibration	The nature of the noise and vibration impacts associated with the CSR works will be similar to those described in SSI Mod 2 which notes that the “airborne noise during construction is expected to exceed noise management levels at all sites – and at some sites by possibly more than 20dB(A). During the night-time, airborne noise levels are expected to generally comply with the criteria, with potential for some moderate exceedances at some locations.”	<ul style="list-style-type: none"> <li>No additional mitigation is required.</li> </ul>	Y	Y	—

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	<p>Sheet piling will be required at two locations for the safe installation of Cable Pit installation; south of Mortuary Station, and also near the SYAB. Sheet piling near SYAB poses no vibration risk to built heritage given its distance from any heritage items. Similarly, sheet piling near Mortuary Station will occur more 20m from the Stations Platform, which sits outside the British Standard for Cosmetic Damage. The extent of sheet piling is small, and therefore poses little to no risk to the structure of Mortuary Station and its elements.</p> <p>The construction methodology has allowed for a reduction in vibration impacts by increasing saw cutting to reduce the amount of rock breaking required.</p>				
Indigenous heritage	The impacts of these works will be similar to those described in the Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Non-indigenous heritage	The impacts of these works will be similar to those described in the Approved Project. The recommendations of the Heritage Impact Assessment by OCP have been incorporated into the methodology for Phase B of the CSR Route, as well as the suggested Archaeological Methodology in the CSR AMS.	There are multiple mitigation strategies proposed that must be adopted throughout the construction of Phase B CSR Route, irrespective of the location. These are detailed in the CSR HIA attached (Appendix F). Similarly, the required	Y	Y	—



(Uncontrolled when printed)

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	<p><b>Key impacts by activities are as follows:</b></p> <p><i>Trenching near the Western Boundary (P1):</i> The trench, for Comms. services, will be located adjacent to and not directly impact on the remnant boundary fence, which would remain physically intact and accessible.</p> <p><i>Darling Harbour Goods Line and Lee street substation:</i> Installation of GST on posts in the ground will ensure installation of new services does not impact the wall faces. The posts installed to transition HV services from Platform 1 to GST near Lee Street substation will not exceed the height of the existing substation, which would otherwise have a negative visual impact into/from the site.</p> <p><i>Mortuary Station/mortuary tunnel and Route to SYAB:</i> Installation and location of posts within the western end of the yard will be alike to the present overhead wiring and therefore will not impact visual amenity. Re-using existing tunnel minimises the degree of trenching for the CSR.</p> <p><i>Sydney yard and the SYAB:</i></p>	<p>Archaeological Methodology varies with the work zone, and can be identified in Appendix A, or in the CSR AMS (Appendix E). Key heritage protection measures include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• new fixings must be installed in a neat and consistent manner i.e. in a straight line, is a consistent length, placed at regular height and intervals, and must use non-ferrous fixings.</li> <li>• Given that existing tunnels and service routes are being used, existing connections, penetrations and conduits/passageways must be used to connect new services in the first instance.</li> <li>• Where existing service passageways/cavities are not available or adequate for newly installed services; ensure that the new penetration is of the minimum size required to facilitate the new installation.</li> </ul>			

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	<p>Works within Sydney yard would require Archaeological Testing and monitoring in accordance with the Figure 26 &amp; 27 of the CSR AMS due to higher Archaeological Potential.</p> <p>In contrast, no visual/heritage impacts will result from installing new services on the new SYAB as they would align with the industrial rail character of the area.</p> <p><i>Water main tunnel:</i> Re-use of this existing tunnel to place new services significantly minimises the need for trenching/cutting. Any penetrations must be sealed.</p> <p><i>Trenching near the former Railway Institute:</i> Trenching near the Railway institute would not have a direct impact on the building. When connecting services to the brick basement of the building, there is some potential to impact the brick wall.</p> <p><i>Transitioning from Water Main Tunnel to Devonshire Street tunnel:</i> CSR will transition from the Water Main Tunnel to GST – of which will not generate an “undue level of heritage impact” given that existing risers will be used in this transition.</p>	<ul style="list-style-type: none"> <li>Where no direct impact to heritage fabric is foreseeable, measures must be taken to limit vibration intensive plant use adjacent to heritage items. For example, using different plant, employing saw cutting for new openings, and limiting the use of hammering.</li> <li>Penetrations on platform 1 should be coordinated at platform level to minimise the extent of trenching i.e. vertical transition point should be coordinated with line of trenching required.</li> <li>Protective sheeting should be laid down to protect any items of heritage value that are adjacent to the work front.</li> <li>All saw cuts should be set in from the final edges to ensure that the repair of the joints align edges on completion is neat.</li> </ul>			

(Uncontrolled when printed)

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	<p><i>Risers to Ghost Tunnels and Install of Comms:</i> A vertical penetration extending into the ghost platforms will occur. There is minor heritage impacts to the original tunnel fabric. However, “There would be no impact to the tunnel alignments, which is a particular aspect of significance.”</p> <p><i>ESR Concourse Ceiling:</i> Running cable trays for comms within the existing ceiling space, from an existing riser, is anticipated to have “no long term heritage impacts to significant fabric”.</p> <p><i>Olympic Tunnel:</i> The works will involve installing cable trays behind the wall linings, and passing through services via an existing riser. As the works will impact the existing applied finishes within the tunnel, this fabric itself is not significant and removal of or intervention to it will not give rise to adverse heritage impacts.</p> <p><i>Eastern Boundary Wall:</i> New HV services would be supported by brackets fixed onto the boundary wall. Further, HV services will need to be extended via GST above Sydney Trains Services on the eastern boundary of site. This has potential to impact on the existing brick</p>				

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	boundary wall due to the install of new bracket fixings.				
Community and stakeholder	The impacts of these works will be similar to those described in Approved Project.  The duration of impacts, including noise and vibration would be limited to short term non-continuous intervals throughout the works.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-
Traffic	The impacts of these works will be similar to those described in the Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-
Waste	The impacts of these works will be similar to those described in Approved Project.  Waste streams have been identified and management procedures addressed in the ECM for these works (See Appendix B).	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-
Social	The impacts of these works will be similar to those described in Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-
Economic	The impacts of these works will be similar to those described in Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-
Visual	The impacts of these works will be similar to those described in Approved Project.  The Heritage Impact Assessment has considered the visual impacts of the proposed works and has indicated that there	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	-

(Uncontrolled when printed)

Aspect	Nature and extent of impacts (negative and positive) during construction (if control measures implemented) of the proposed/activity, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
	is little to no visual impact given the design of the works.				
Urban design	The impacts of these works will be similar to those described in Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Geotechnical	No geotechnical investigations are proposed.	<ul style="list-style-type: none"> <li>N/A</li> </ul>	Y	Y	—
Land use	The impacts of these works will be similar to those described in Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Climate Change	There would be no climate change related impacts.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Risk	Environmental risks would be minimal as assessed in this table.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Other	The impacts of these works will be similar to those described in Approved Project.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—
Management and mitigation measures	No additional management and mitigation required for construction of this change.	<ul style="list-style-type: none"> <li>No additional mitigation is required</li> </ul>	Y	Y	—

## 11.0 Impact Assessment – Operation

Attach supporting evidence in the Appendix if required. Make reference to the relevant Appendix if used.

Aspect	Nature and extent of impacts (negative and positive) during operation (if control measures implemented) of the proposed activity/works, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Flora and fauna	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Water	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Air quality	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Noise vibration	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Indigenous heritage	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Non-indigenous heritage	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Community and stakeholder	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Traffic	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Waste	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Social	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-
Economic	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	-



(Uncontrolled when printed)

Aspect	Nature and extent of impacts (negative and positive) during operation (if control measures implemented) of the proposed activity/works, relative to the Approved Project	Proposed Control Measures in addition to project COA and REMMs	Minimal Impact Y/N	Endorsed	
				Y/N	Comments
Visual	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Urban design	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Geotechnical	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Land use	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Climate Change	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Risk	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Other	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—
Management and mitigation measures	No change to the operational impacts described in the Approved Project.	• Not applicable	Y	Y	—

## 12.0 Consistency with the Approved Project

<p>Based on a review and understanding of the existing Approved Project and the proposed modifications, is there is a transformation of the Project?</p>	<p>No. The proposed works would not transform the project. The Approved Project would continue to provide a new metro line between Chatswood and Sydenham. The proposed works anticipated the need for a CSR to be constructed at Central Station as is documented in the Central Walk Modification Report (Mod 2).</p>
<p>Is the project as modified consistent with the objectives and functions of the Approved Project as a whole?</p>	<p>Yes. The proposed works will assist the Approved Project to achieve its objectives and functions.</p>
<p>Is the project as modified consistent with the objectives and functions of elements of the Approved Project?</p>	<p>Yes. The proposed works are consistent with the objectives and functions of the construction element of the Approved Project.</p>
<p>Are there any new environmental impacts as a result of the proposed works/modifications?</p>	<p>No. The heritage, noise and vibration impacts associated with the construction of the CSR are considered to be consistent with those of the Approved Project.</p>
<p>Is the project as modified consistent with the conditions of approval?</p>	<p>Yes. The proposed CSR at Central Station is consistent with the conditions of approval for the Approved Project and no changes are required.</p>
<p>Are the impacts of the proposed activity/works known and understood?</p>	<p>Yes. The impacts of constructing the CSR at Central Station are known and understood.</p>
<p>Are the impacts of the proposed activity/works able to be managed so as not to have an adverse impact?</p>	<p>Yes. The impacts would be managed to avoid adverse impacts. The relevant conditions of approval, the revised environmental management measures, those identified in the CSMW CEMP and the control measures identified in this assessment would be implemented during the construction of the CSR to ensure there are no adverse impacts on the surrounding environment.</p>

## 13.0 Other Environmental Approvals

Identify all other approvals required for the project:

OOHW Permits.


Tree Report to be provided to DPIE for information prior to vegetation clearing, incorporating Arborist Report (Appendix D)

CSR AMS (Appendix E)

CSR HIA (Appendix F)

### Author certification

To be completed by person preparing checklist.


<p>I certify that to the best of my knowledge this Consistency Checklist:</p> <ul style="list-style-type: none"> <li>Examines and takes into account the fullest extent possible all matters affecting or likely to affect the environment as a result of activities associated with the Proposed Revision; and</li> <li>Examines the consistency of the Proposed Revision with the Approved Project; is accurate in all material respects and does not omit any material information.</li> </ul>			
Name:	Hussain Nilar	Signature:	
Title:	Environmental Advisor	Date:	26 <sup>th</sup> October 2019
Company:	Laing O'Rourke		

### Environmental Representative Review

(Additional step for City & Southwest projects only – if this is a CA against a Northwest Project or REF delete this table)

<p>As an approved ER for the Sydney Metro City &amp; Southwest project, I have reviewed the information provided in this assessment. I am satisfied that mitigation measures are adequate to minimise the impact of the proposed work.</p>			
Name:	Michael Woolley	Signature:	
Title:	Env. Representative	Date:	19 November 2019

This section is for Sydney Metro only.

<p>Application supported and submitted by</p>			
Name:	Yvette Buchli	Date:	14/11/19
Title:	Environmental Planning Manager	Comments:	
Signature:			

Based on the above assessment, are the impacts and scope of the proposed activity/modification consistent with the existing Approved Project?

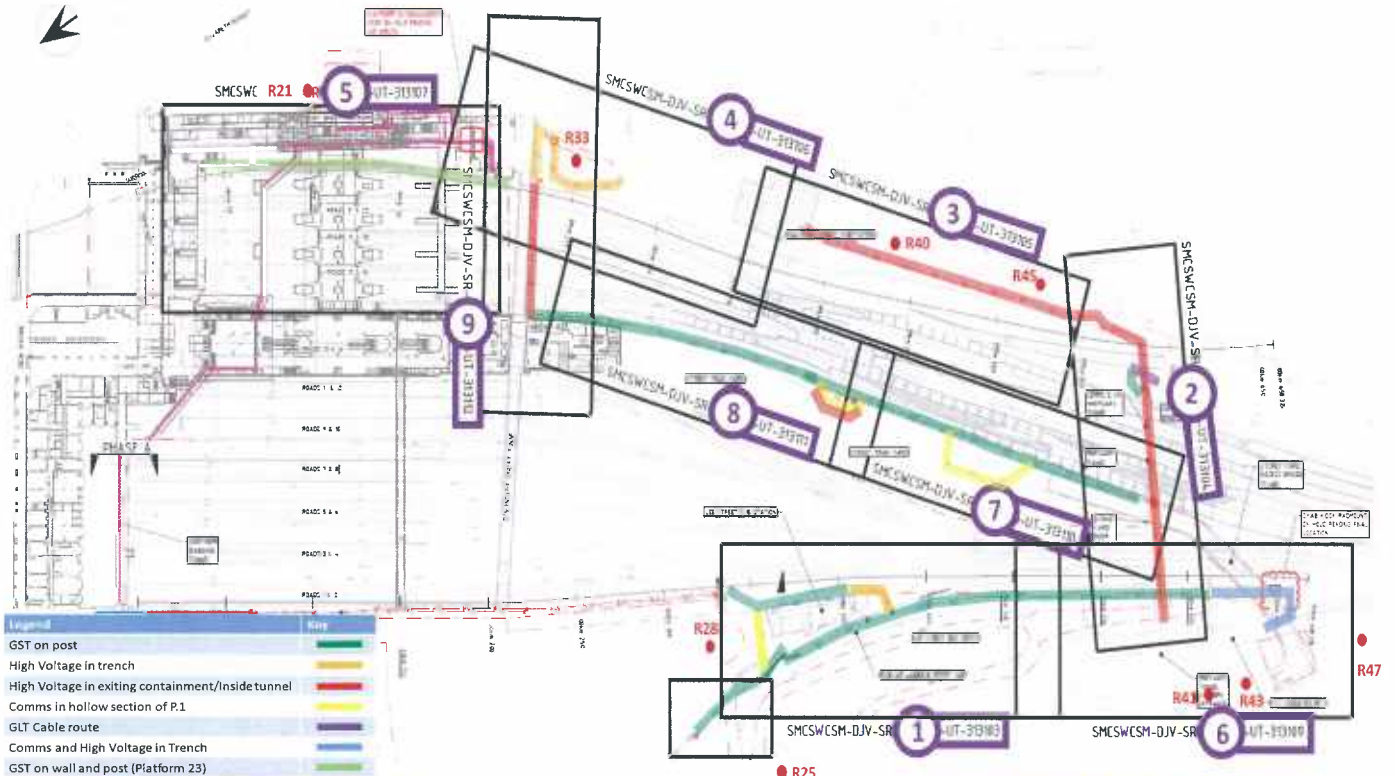
- Yes  The proposed activity/works are consistent and no further assessment is required.
- No  The proposed works/activity is not consistent with the Approved Project. A modification or a new activity approval/ consent is required. Advise Project Manager of appropriate alternative planning approvals pathway to be undertaken.



Endorsed by			
Name:	FIL CERONE	Date:	5/12/19
Title:	<del>Principal Manager</del> Northwest/City & Southwest, Sustainability, Environment Planning	Comments:	-
Signature:			



# Appendix A Layout of Phase B CSR and the associated Archaeological Methodology (Adapted from CSR AMS)





# Appendix B ECM Phase B CSR Route

**LAING O'ROURKE**

Revision A  
ER Endorsement:  
Name: \_\_\_\_\_ Signature  
Date: \_\_\_\_\_



## Central Station Main Works - Environmental Control Plan Phase B – Combined Services Route

### Proposed Work Activity

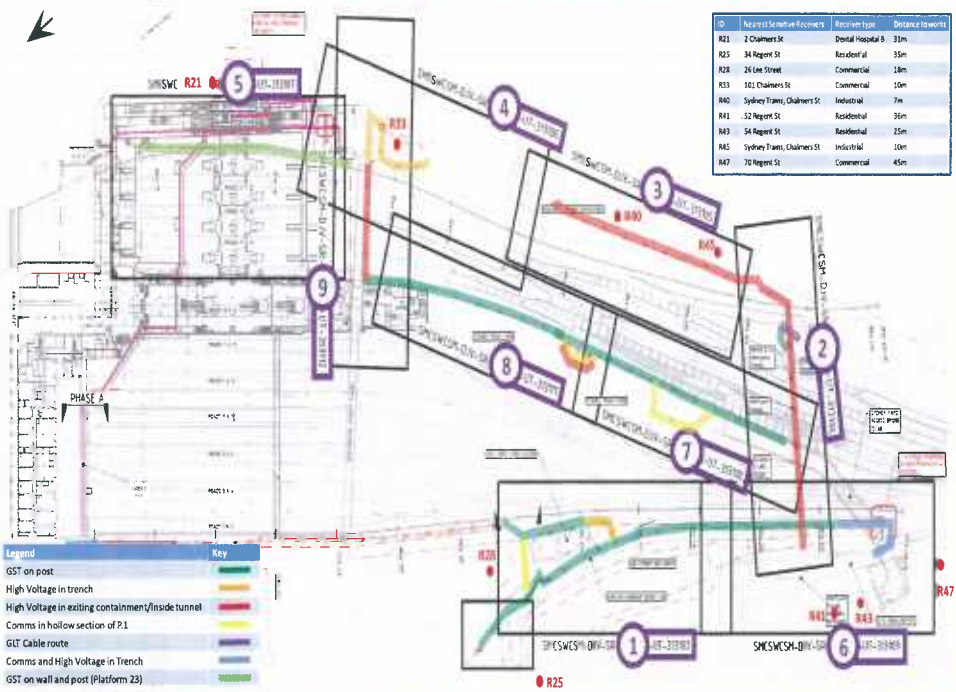
The CSR for Central Station will provide for Communications services and High Voltage electrical services that will service the whole site, both existing and the new infrastructure installations that are being introduced as part of the Central Station Main Works. It will extend as a circular route around the site, utilising existing service infrastructure where this is available and providing new installations as required to complete the system.

- Standard Construction Hours:**
  - Storage of materials may only occur between:
    - 7am – 6pm Mon – Fri
    - 8am – 1pm Saturday.

### Archaeological and Heritage Management

The proposed work area is within the Central Station s.170 and SHR Curtilage and will occur over land that has low to high potential to uncover Archaeological artefacts.

- Key protection measures:**
- Verify work location with Figures 26 and 27 of the CSR AMS to determine the Archaeological Methodology to be implemented before or during the proposed works.
  - Provide protection to any items of heritage value adjacent to construction activities which have potential to be impacted.
  - When installing ceiling and wall mounts in heritage structures** ensure fixings are installed in a neat and consistent manner and are stainless steel to minimise rusting and therefore damage to masonry fabric.
  - Ensure penetrations in all heritage structures for service install is the bare minimum in size.
  - Where possible, newly installed services should use existing support frameworks to minimise further damage to heritage fabric.
  - Ensure the least destructive and vibration intensive methodology is used. Ensure the smallest excavation/cavity is completed to facilitate construction of the CSR at all times.
  - Should heritage/archaeological items be uncovered:**
    - Stop works immediately. Leave the item in place and isolate from other activities.
    - Notify the Environmental Team who will engage Sydney Metro.
    - The heritage consultant will be contacted to determine the items significance.
    - The heritage consultant will indicate whether works may proceed.



ID	Nearest Sensitive Receiver	Receiver type	Distance to works
R21	2 Chalmers St	Dental Hospital B	33m
R23	34 Regent St	Residential	35m
R28	26 Lee Street	Commercial	18m
R33	101 Chalmers St	Commercial	10m
R40	Sydney Tram, Chalmers St	Industrial	7m
R41	52 Regent St	Residential	36m
R43	54 Regent St	Residential	25m
R45	Sydney Tram, Chalmers St	Industrial	10m
R47	70 Regent St	Commercial	45m

**Legend**

Key
GST on post
High Voltage in trench
High Voltage in existing containment/inside tunnel
Comms in hollow section of P1
GLT Cable route
Comms and High Voltage in Trench
GST on wall and post (Platform 23)

### Noise and Vibration

- Proposed activities should occur within standard construction hours.
- Works outside standard hours will require an OOHW Approval
- For all high impact activities, ensure that respite is offered. A maximum 3 hour blocks of work, must be separated by a minimum 1 hour break.
- The least noisy, and vibration intensive work methodology should always be considered in the first instance.
- Ensure that the noisiest activities are scheduled to occur at times which cause less disturbance to sensitive receivers.
- Use quieter equipment where possible.
- Install noise blankets between the work front and the nearest sensitive receiver prior to any noise intrusive works occurring.

### Erosion Sediment Control Measures

- The disturbed soil profile must be stabilised at the close of each shift.
- When working in **live drains** – ensure drains are protected prior to any works beginning and cleaned once works are completed. Typical controls would include filling drain outlets with sand bags and or ply board to contain potential slurry run off/unauthorised discharge.
- When working **near live drains** – protect drains using ply board, and or sand bag bunds prior to commencing works in order to prevent drains receiving any material (soil) or liquid slurry as a result of construction activities. Soil must be stabilised at the close of each shift. ERSed controls must remain in place until the soil is stabilised.
- No stockpiling of material on site. Remove all unwanted material to Sydney Yard.
- Where material (stab sand/DGB is imported to site, it should not be placed directly onto platforms/heritage structures. Place Plastic sheeting to protect any heritage fabric.

### Minor Environmental Concerns

- Dust:**
- Ensure that water is used to suppress dust during any dust generating activities including saw cutting, hammering, or material loading/unloading.
- Hazardous/Contaminated Material**
- If contaminated/hazardous material is uncovered – stop works, contact the Environmental Team and begin the projects Unexpected Finds Protocol.
- Biodiversity**
- Vegetation to be cleared in (1) as per Arborist Report (App D – CSR Phase B C.A).
- Waste**
- Any spoil generated throughout trenching must be brought back to Sydney Storage Yard and handled according to the LORAC Waste Management Plan.
  - Concrete must be washed into a washout bin or a bunded containment – i.e an earth bund lined with plastic.
  - All slurry generated by saw cutting/construction activities must be contained using a wet vac, or sand bag bund as standard.

### Traffic and Access Management

- Construction vehicles must be operated so as to not cause queuing on public roads adjacent to the works area.
- Construction vehicles must not park or stand in the Bus Depot. **No parking in Mortuary Station yard.**
- Access to the Darling Harbour Goods Line by foot must be via the Bus Depot and not Mortuary Station.
- Access must be in accordance with approved CTMP's.

Environmental Manager – Chris McCallum	0409 264 164
Construction Director – James Peane	0459 222 379
Independent Environmental Representative – Michael Woolley	0409 492 137
TNSW Construction Response Line	1800 775 465
TNSW Info Line	1800 884 490
EM Environmental Line / Pollution Incident Response Line	131 555
Emergency	000 or 112

## Appendix C Location of Padmount Substation installation



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## Appendix D Arborist report – EcoLogical Australia



# Central Station Main Works Sydney – Arboricultural Impact Assessment

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**Laing O'Rourke**

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**DOCUMENT TRACKING**

<b>Project Name</b>	Central Station Main Works Sydney - Arboricultural Impact Assessment
<b>Project Number</b>	19SUT-13331
<b>Project Manager</b>	Beth Medway
<b>Prepared by</b>	Deanne Hickey, David Bidwell, Kirsten McLaren
<b>Reviewed by</b>	Beth Medway
<b>Approved by</b>	Beth Medway
<b>Status</b>	<b>Final</b>
<b>Version Number</b>	<b>3</b>
<b>Last saved on</b>	<b>25 September 2019</b>

This report should be cited as 'Eco Logical Australia 2019. *Central Station Main Works Sydney - Arboricultural Impact Assessment*. Prepared for Laing O'Rourke.'

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## Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

# 1. Background

## 1.1 Proposed activity

Eco Logical Australia (ELA) was engaged by Laing O'Rourke to conduct an Arboricultural Impact Assessment for three trees within the Central Station Main Works area as part of the Sydney Metro Project. To the south of Lee St substation, a service route is to be installed to carry High Voltage (HV) cables and a pad mount substation is to be built. The HV service route consists of two 150 mm diameter conduits in a 1.3 m deep by 0.5 m wide trench. The conduits will be encased in stabilised sand and the trench above backfilled with compacted fill. The pad mount substation is installed on a 4.5 x 5.9 m concrete slab, 150 mm thick. A HV cable feeds the pad mount and a LV comes from it to feed the Sydney Yard Access Bridge.

## 1.2 The study area

The three subject trees are located at the southern end of the substation, just east of the Regent Street bus depot, as mapped in Appendix A.

## 1.3 Purpose of report

The purpose of this report is to:

- identify the trees within the site that are likely to be affected by the proposed works
- assess the current overall health and condition of the subject trees
- evaluate the retention value of the subject trees
- determine the likely impact to the trees.

## 2. Method

### 2.1 Definition of a tree

A tree is defined under the *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites* as a long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks.

### 2.2 Visual tree assessment

The subject trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture.

A total of three subject trees were inspected on 29<sup>th</sup> August 2019 by AQF Level 5 Consulting Arborist, David Bidwell.

The following limitations apply to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing.
- No aerial inspections or root mapping was undertaken.
- Tree heights, canopy spread and diameter at breast height (DBH) was estimated, unless otherwise stated.
- Tree identification was based on broad taxonomical features present and visible from ground level at the time of inspection.
- The location of the trees was determined with reference to a survey provided by the client.

### 2.3 Retention value

The retention value/importance of a tree or group of trees is determined using a combination of environmental, cultural, physical and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affected by the proposed works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard AS4970 - Protection of trees on development sites.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturists (IACA) *Significance of a Tree, Assessment Rating System (STARS®)*. Further details and assessment criteria are in **Appendix B**.

## 2.4 Protection zones

### 2.4.1 Tree protection zone (TPZ)

The TPZ is the combination of crown and root area (as defined by AS 4970-2009) that requires restriction of access during the construction process. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.

### 2.4.2 Structural root zone (SRZ)

The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. It is critical for the support and stability of trees. Severance of roots within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree.

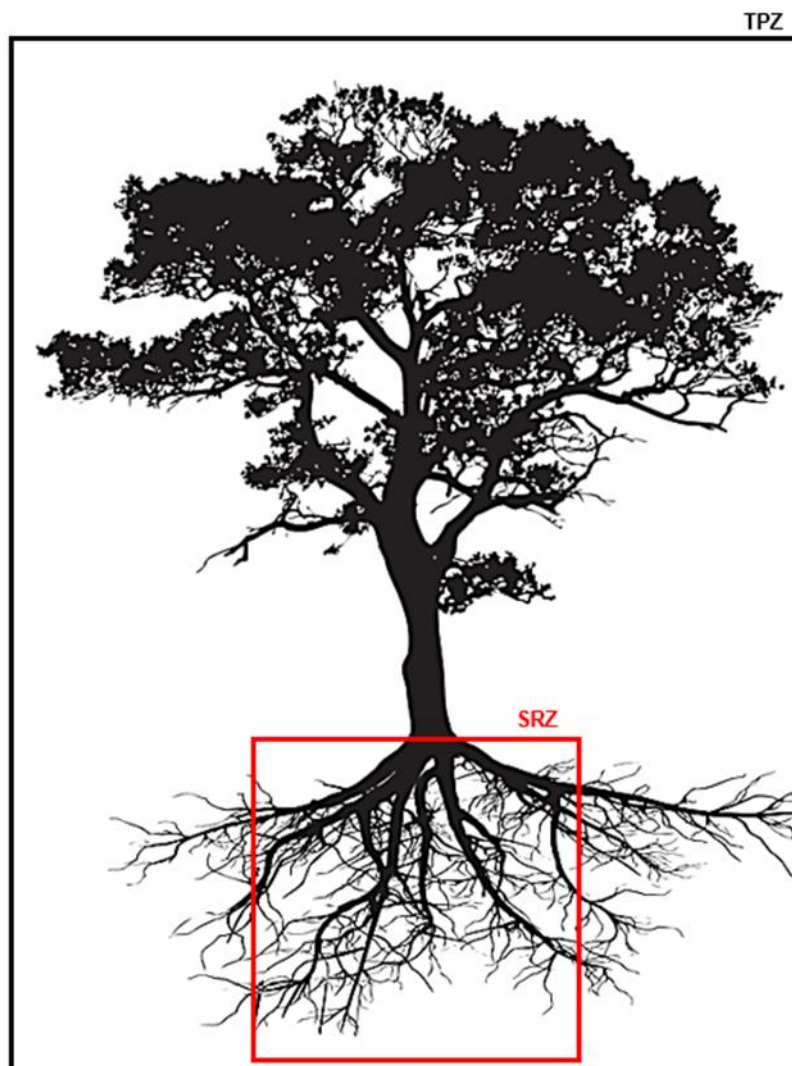


Figure 1: Indicative TPZ and SRZ

## 2.5 Potential impacts

Trees may be impacted by cutting or damaging roots or branches. Potential impacts are as follows:

- **High impact:** The SRZ may be impacted if the proposed encroachment is greater than 20 % of the TPZ. Trees may not remain viable if they are subject to high impact.
- **Medium impact:** If the proposed encroachment is greater than 10% of the TPZ and outside of the SRZ, the project arborist may require detailed root investigation to demonstrate that the tree(s) would remain viable.
- **Low impact:** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required.
- **No impact:** No likely or foreseeable encroachment within the TPZ.

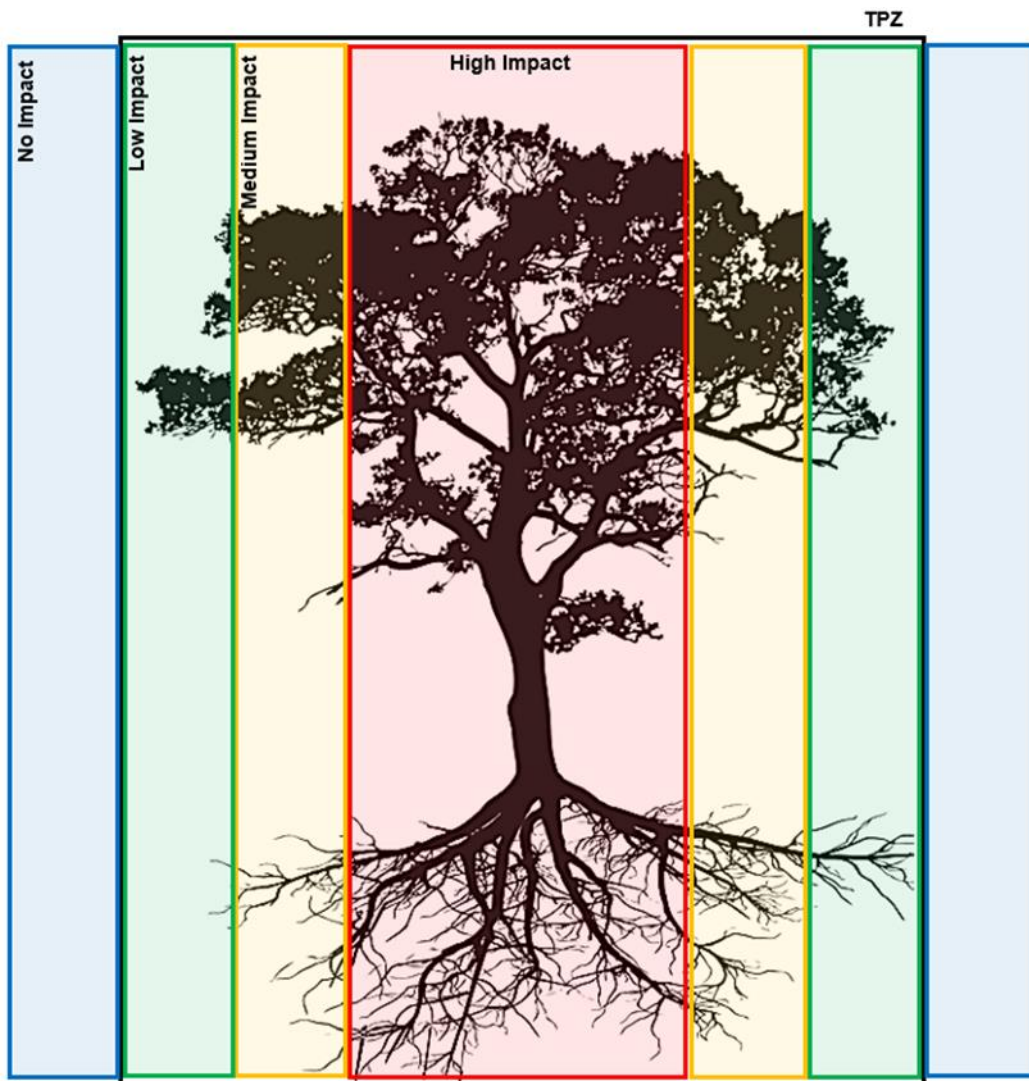


Figure 2: Indicative zones of impact

### 3. Results and discussion

The arboricultural assessment has two components. The first component assesses tree impacts resulting from the construction of a trench, whilst the second component assesses tree impacts based on the proposed development of new structures within the Central Station Main Works area. The trench assessment was based on an impact area of 0.5 m either side of the proposed trench centreline. Results of the arboricultural assessment for tree impacts resulting from trench works and construction of structures are tabulated in **Table 1** and mapped in **Appendix A**, and summarised as follows:

- Results of proposed trench assessment:
  - **Medium Impact (<20%):** 1 low retention value tree will be subject to an intermediate encroachment (<20%) within the TPZ. This tree is not considered important for retention, nor requires special works or design modification to be implemented for its retention.
  - **No impact (0%):** 2 trees with low retention value will not be impacted by the proposed trenching. Under the current proposal, these trees can be successfully retained.
- Results of proposed structures assessment:
  - **High Impact (>20%):** 3 trees with low retention value will be subject to a major encroachment (>20%) within the TPZ. Under the current proposal, none of these trees can be sustainably retained without modification of the proposal.



**Table 1: Results of arboricultural assessment**

Tree	Botanical name	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts - trench	Impacts - structure
1	<i>Celtis sinensis</i>	9	15	Fair	Fair	Medium (15-40 years)	530	6.4	2.5	Medium Impact: <20%	High Impact: >20%
2	<i>Celtis sinensis</i>	9	10	Fair	Fair	Medium (15-40 years)	440	5.3	2.3	None: 0%	High Impact: >20%
3	<i>Eriobotrya japonica</i>	3	4	Fair	Fair	Short (5-15 years)	150	2.0	1.5	None: 0%	High Impact: >20%

## 4. Tree protection plan

### 4.1 Tree removal

- *Celtis sinensis* is a weed and recognised as an 'exempt species' under the Sydney Development Control Plan 2012.
- All tree work must be in accordance with *Australian Standard AS 4373-2007, Pruning of Amenity Trees* and the *NSW WorkCover Code of Practice for the Amenity Tree Industry (1998)*.
- Permission must be granted from the relevant consent authority prior to removing or pruning of any of the subject trees.

### 4.2 Tree protection measures

The following tree protection measures should be applied if the consent authority requires the trees to be retained:

- Tree protection fencing must be established around the perimeter of the TPZ. If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with *AS 4970-2009 - Protection of trees on development sites*. Existing fencing and site hoarding may be used as tree protection fencing.
- If temporary access for machinery is required within the TPZ, ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.
- Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist and must comply with *AS 4970-2009 - Protection of trees on development sites*.

Further information and guidelines on tree protection are in **Appendix C**.

### 4.3 Replacement planting

Any loss of trees should be offset with replacement planting in accordance with the relevant offset policy and in consultation with Transport for New South Wales.

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### 5.1 General references

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- Standards Australia 2009. *Australian Standard: Protection of trees on development sites, AS 4970 (2009)*. Standards Australia, Sydney.

## Appendix A Maps

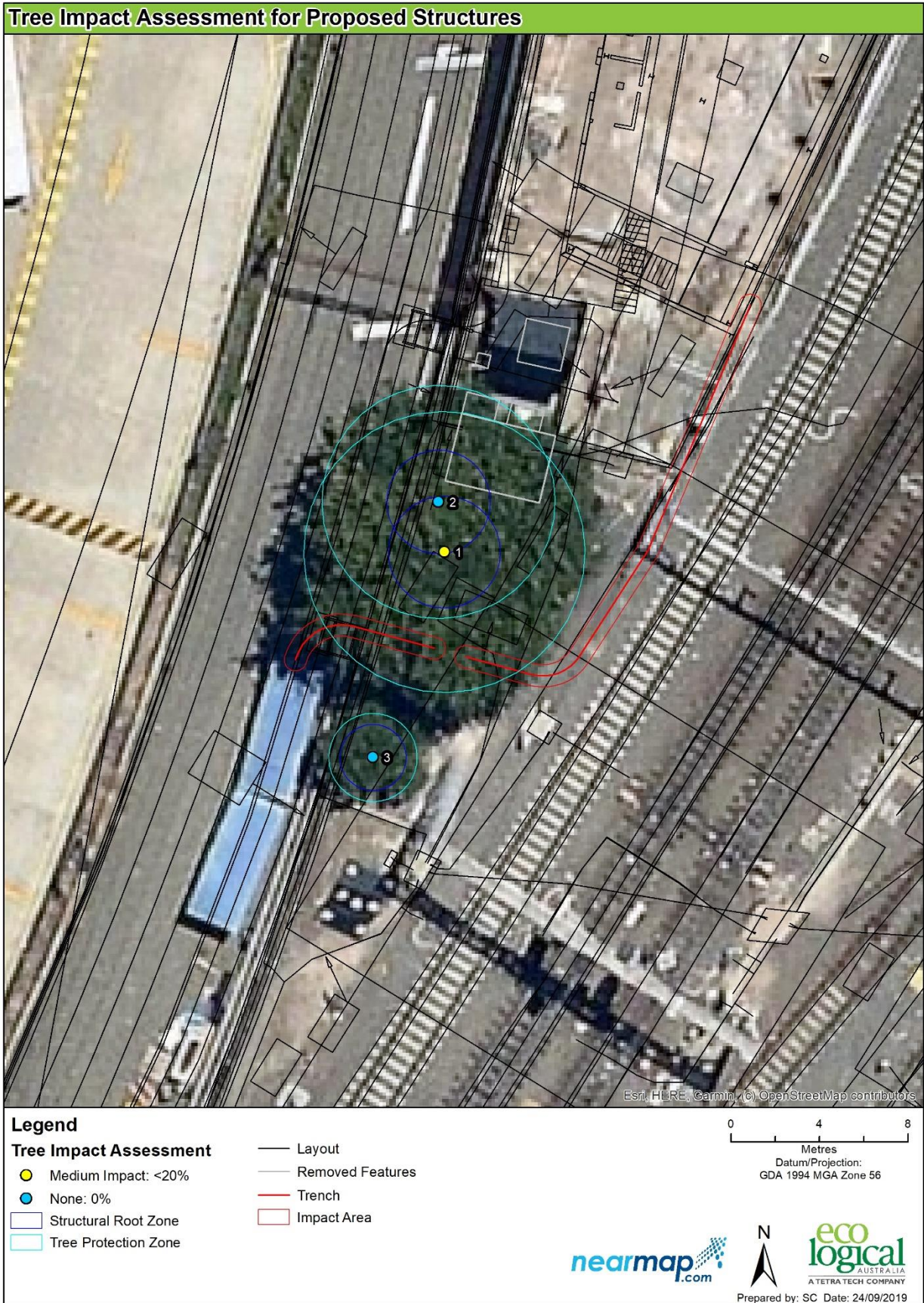


Figure 3: Tree impact assessment for trench works



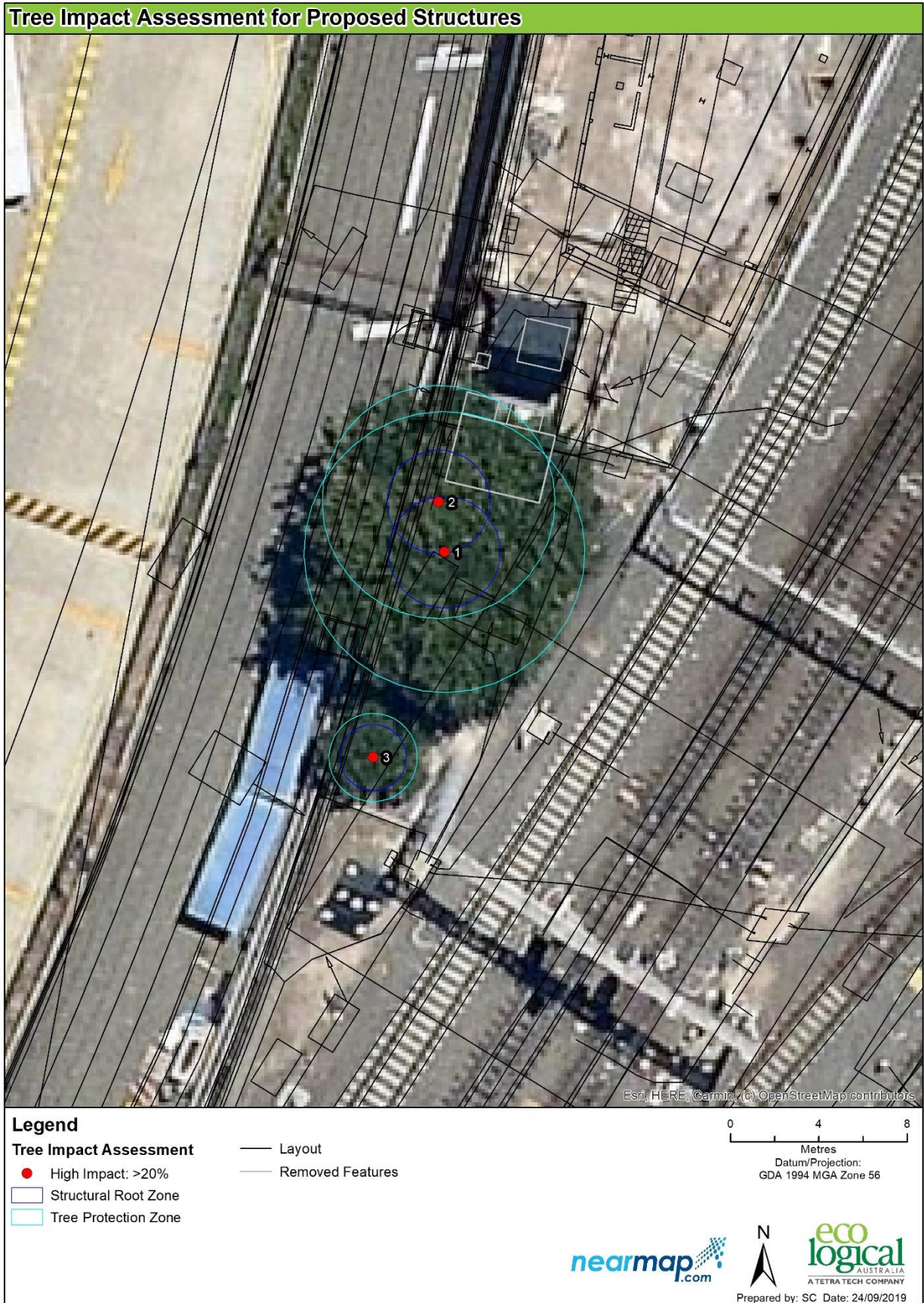


Figure 3: Tree impact assessment for proposed structures

## Appendix B Tree retention assessment method

### B1 Tree Significance Assessment Criteria - STARS®

Low	Medium	High
The tree is in fair-poor condition and good or low vigour.	The tree is in fair to good condition	The tree is in good condition and good vigour
The tree has form atypical of the species	The tree has form typical or atypical of the species	The tree has a form typical for the species
The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings	The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area	The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.
The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area	The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street	The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on Council's significant tree register
The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen	The tree provides a fair contribution to the visual character and amenity of the local area	The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.
The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions	The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ	The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.
The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms		The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.
The tree has a wound or defect that has the potential to become structurally unsound.		
The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.		
The tree is a declared noxious weed by legislation		



## B2 Matrix assessment

		Tree significance			
		High	Medium	Low	
Useful Life Expectancy	Long >40 years				
	Medium 15-40 years				
	Short <1-15 years				
	Dead				

### Legend:

	<b>Priority for retention (High):</b> Tree considered important so should be retained and protected. Design modification or re-location of structure should be considered to accommodate the setbacks as prescribed by the <i>Australian Standard AS4970 Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	<b>Consider for retention (Medium):</b> Tree considered less important, however, retention should remain priority. Removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	<b>Consider for removal (Low):</b> Tree not considered important for retention, nor requiring special works or design modification to be implemented for their retention.
	<b>Consider for removal (Low):</b> Tree not considered important for retention, nor requiring special works or design modification to be implemented for their retention.

## Appendix C Tree protection guidelines

The following tree protection guidelines must be implemented during the construction period if no tree-specific recommendations are detailed.

### C1 Tree protection fencing

The TPZ is a restricted area delineated by protective fencing or the use of an existing structure (such as a wall or fence).

Trees that are to be retained must have protective fencing erected around the TPZ (or as specified in the body of the report) to protect and isolate it from the construction works. Fencing must comply with the Australian Standard, AS 4687-2007, Temporary fencing and hoardings.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with AS 4970-2009, Protection of Trees on Development Sites.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Recommendations and Tree Protection Plan).
- Cyclone chain wire link fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist.
- Installed prior to the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating "NO ACCESS - TREE PROTECTION ZONE".

### C2 Crown protection

Tree crowns/canopy may be injured or damaged by machinery such as; excavators, drilling rigs, trucks, cranes, plant and vehicles. Where crown protection is required, it will usually be located at least one meter outside the perimeter of the crown.

Crown protection may include the installation of a physical barrier, pruning selected branches to establish clearance, or the tying/bracing of branches.

### C3 Trunk protection

Where provision of tree protection fencing is impractical or must be temporarily removed, truck protection shall be installed for the nominated trees to avoid accidental mechanical damage.

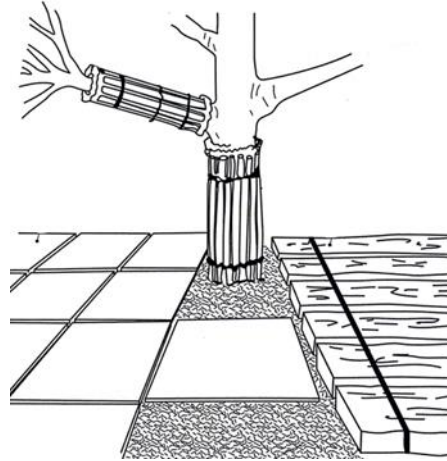
The removal of bark or branches allows the potential ingress of micro-organisms which may cause decay. Furthermore, the removal of bark restricts the trees' ability to distribute water, mineral ions (solutes), and glucose.

Trunk protection shall consist of a layer of either carpet underfelt, geotextile fabric or similar wrapped around the trunk, followed by 1.8 m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with an approx. 50 mm gap between the timbers).

The timbers must be secured using galvanised hoop strap (aluminium strapping). The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.



Tree protection fencing



Trunk protection fencing

#### C4 Ground protection

Tree roots are essential for the uptake/absorption of water, oxygen and mineral ions (solutes). It is essential to prevent the disturbance of the soil beneath the dripline and within the TPZ of trees that are to be retained. Soil compaction within the TPZ will adversely affect the ability of roots to function correctly.

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.

If the grade is to be raised within the TPZ, the material should be coarser or more porous than the underlying material.

#### C5 Root protection and investigation

If incursions/excavation within the TPZ are unavoidable, root investigation may be needed to determine the extent and location of roots within the area of construction activity. The location and distribution of roots are found through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation. Root investigation does not guarantee the retention of the tree.

If the project arborist identifies conflicting roots that requiring pruning, they must be pruned with a sharp implement such as; secateurs, pruners, handsaws or a chainsaw back to undamaged tissue. The final cut must be a clean cut.

## C6 Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they should be installed using horizontal directional drilling (HDD). The horizontal drilling/boring must be at minimum depth of 600 mm below grade. Trenching for services is to be regarded as “excavation”.



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## Appendix E AMS CSR



# Sydney Metro: Central Station – Combined Services Route

Archaeological Method Statement

Report to Laing O'Rourke

September 2019



 artefact

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## EXECUTIVE SUMMARY

This Archaeological Method Statement (AMS) outlines the archaeological methodology to manage potential construction impacts to significant non-Aboriginal archaeological remains within the footprint of the Combined Services Route (CSR), as required under the Minister's Conditions of Approval for the Sydney Metro City & Southwest Chatswood to Sydenham project Critical State Significant Infrastructure (CSSI) approval (SSI15\_7400).

On 22 March 2017, the Premier of NSW and the Minister for Transport and Infrastructure announced Central Walk as the first step in revitalising Central Station. Central Walk would involve the construction and operation of a new east concourse and a new eastern entry (from Chalmers Street). These works have been addressed in a separate Archaeological Method Statement (AMS). The current AMS responds to management of impact to potential archaeological remains associated with the CSR only.

A modification report for Central Walk was lodged with the Department of Planning and Environment and publicly exhibited from 21 June 2017 to 2 August 2017. The modification was approved under Section 115ZI of the EP&A Act on the 21 December 2017.

Section 6.6.1 of the Central Walk Modification Report (SSI Mod 2) detailed how potential impacts to Central Station would be reduced via the construction a combined services route (CSR). The existing services routes at Central Station are contained within the underground service and pedestrian tunnels beneath the existing platforms (refer to Chapter 7 of the Environmental Impact Statement (EIS) for further details). In order to avoid damage to the existing services and to provide uninterrupted access for the construction of the Metro platforms, the services must be relocated into a combined service route around Central Station.

The CSR has the potential to impact on archaeological remains associated with the Devonshire Street Cemetery, First, Second and Third phases of the development of Central Railway Station.

The assessment of archaeological potential and significance provided in this AMS is based on the Archaeological Assessment and Research Design (AARD) prepared for the CSSI approval.<sup>1</sup> Where necessary these assessments have been amended to account for additional information obtained during the preparation of the AMS. The AMS also outlines the archaeological management approach based on the AARD and in response to the construction methodology and program. The recommended archaeological management approach is outlined in the following table:

Date	Archaeological resource	Potential	Significance	Management
1820 - 1865	Devonshire Street Cemetery	Low	State	Monitoring/salvage
1855 - 1874	First and second railway station	High	Local/State	Testing/monitoring/salvage
1900 - present	Third Central Station	Moderate	Local/no significance	Monitoring/Unexpected finds

<sup>1</sup> Artefact Heritage 2016a. *Sydney Metro City & Southwest - Chatswood to Sydenham Non-Aboriginal Archaeological Assessment and Research Design*. Report prepared for Jacobs / Arcadis / RPS.; and Artefact Heritage 2017. *Central Walk – Addendum Archaeological Assessment and Research Design*. Report prepared for JAR.

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## 1.0 INTRODUCTION

### 1.1 Background

Planning approval for Sydney Metro City & Southwest Chatswood to Sydenham was granted by the Minister for Planning under Part 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act) on 9 January 2017.

On 22 March 2017, the Premier of NSW and the Minister for Transport and Infrastructure announced Central Walk as the first step in revitalising Central Station. Central Walk would involve the construction and operation of a new east concourse and a new eastern entry (from Chalmers Street).

A modification report for Central Walk was lodged with the Department of Planning and Environment and publicly exhibited from 21 June 2017 to 2 August 2017. The modification was approved under Section 115ZI of the EP&A Act on the 21 December 2017.

Section 6.6.1 of the Central Walk Modification Report (SSI Mod 2) detailed how potential impacts to Central Station would be reduced via the construction a combined services route (CSR). The existing service routes at Central Station are contained within the underground service and pedestrian tunnels beneath the existing platforms (refer to Chapter 7 of the Sydney Metro City and Southwest Environmental Impact Statement (EIS) for further details). In order to avoid damage to the existing services and to provide uninterrupted access for the construction of the Metro platforms, the services must be relocated into a combined service route around Central Station. The CSR will extend as a circular route around the site, utilising existing service infrastructure where this is available and providing new installations as required to complete the system. The CSR will provide for communications services (voice, data and IT connectivity, requiring 6 to 8 cables) and high voltage electrical (HV) services that will service the whole site, both existing and the new infrastructure installations that are being introduced as part of the Central Station Main Works

Although the CSR was identified as a concept in the EIS and SSI Mod 2, the detailed design process has since identified an optimised route from an operational and maintenance perspective. In order to demonstrate consistency of the design with the project approval a Consistency Assessment is required to be approved by Sydney Metro. The assessment has found that constructability is consistent with what was identified in Mod 2.

A separate AMS for Aboriginal archaeological management at the Central Walk site has been prepared by Artefact Heritage, which refers to this AMS and is consistent with its methodology.

Several AMS's for pre-construction works have been prepared by Artefact Heritage for the project in consultation with the former Heritage Division of the Office of Environment and Heritage (OEH) as a delegate of the NSW Heritage Council (now Heritage, Department of Premier and Cabinet (DPC)). This AMS has been informed by, and is in accordance with, the following project assessment and management documents:

- Artefact Heritage 2016a. Sydney Metro City & Southwest - Chatswood to Sydenham Non-Aboriginal Archaeological Assessment and Research Design (ARD)
- Artefact Heritage 2016b. Sydney Metro City & Southwest - Chatswood to Sydenham Aboriginal Cultural Heritage Assessment Report (CHAR)
- Artefact Heritage 2017. Central Walk – Addendum ARD
- Artefact Heritage April 2018 updated May 2018. Central Station Main Works – Early Works: Archaeological Method Statement (AMS)

- Artefact Heritage July 2018. Central Station Main Works – Platforms and Sydney Yard enabling works (AMS)
- Artefact Heritage May 2018 updated June 2018. Central Station Main Works – Early Works: Archaeological Method Statement for piling and Excavation (AMS)
- Artefact Heritage September 2018. Sydney Yard Access Bridge Construction Project – Excavation Directors Report (results report)
- Artefact Heritage February 2019. Additional Archaeological Works, Central Station Main Works Station Box (advice memo)
- Sydney Metro Authority 2019. Sydney Metro Unexpected Heritage Finds Procedure
- Sydney Metro Authority 2019. Sydney Metro Exhumation Management Plan.

### 1.2 Project background

The Sydney Metro network consists of Sydney Metro Northwest (previously known as the North West Rail Link), Sydney Metro City & Southwest and Sydney Metro West.

As part of the Central Walk project, the existing services routes at Central Station are contained within the underground service and pedestrian tunnels beneath the existing platforms (refer to Chapter 7 of the Sydney Metro City and Southwest EIS for further details). In order to avoid damage to the existing services and to provide uninterrupted access for the construction of the Metro platforms, the services must be relocated into a combined service route around Central Station. The CSR will extend as a circular route around the site, utilising existing service infrastructure where this is available and providing new installations as required to complete the system. The CSR will provide for communications services (voice, data and IT connectivity, requiring 6 to 8 cables) and high voltage electrical (HV) services that will service the whole site, both existing and the new infrastructure installations that are being introduced as part of the Central Station Main Works

### 1.3 Site location

The CSR footprint is located within Central Station, which is located within the City of Sydney Local Government Area (LGA) and in the Parish of Petersham. The site location is bound by, and within, an active rail corridor, platforms, rail buildings and rail infrastructure, in addition to portions of Chalmers Street and commercial buildings.

Central Railway Station is listed on the State Heritage Register (SHR) (SHR Item No. 01255), Railcorp Section 170 Heritage and Conservation Register (SHI No. 4801296), and Sydney Local Environmental Plan (LEP) 2012 (LEP Item No. 1824) as an item of state significance (Figure 2).



Figure 1: Project overview and station locations





Figure 2: Heritage listings for Central Railway Station including Central Walk



### 1.3.1 Archaeological management zones

A plan of archaeological management for the Central Walk site was prepared as part of the 2016 *Sydney Metro City & Southwest - Chatswood to Sydenham AARD*.<sup>2</sup> An Addendum ARD for the project as modified was also produced in 2017 to guide the Central Walk project.<sup>3</sup>

The Central Walk works are located within Archaeological Management Zones (AMZ's) CS 4, and CS 10. This AMS is based on the recommendations of the AARD for archaeological management in these AMZs, with some revisions as a result of additional research and resulting refinement of assessments of archaeological potential and significance.

The following table defines the extent of each AMZ. If additional works are required outside these management zones during construction, the closest management zone will be used as a comparison, or the Excavation Director will approve the most appropriate management measures consistent with similar impacts outlined in this AMS.

**Table 1: Archaeological Management Zone and contemporary land use in the Central Station site**

AMZ	Description of Area	Lot	Address
CS 4	Sydney Yard siding area located between the rail corridors of the T1 line (associated with platform 16) and the country services line (associated with platform 15).	Lot 118 DP1078271	Central Station, Haymarket, NSW
CS 10	Area coinciding with Platforms 16-25 and intervening rail corridor; extending from Platform 16 to the eastern edge of Chalmers Street.	Lot 118 DP1078271	Central Station, Haymarket, NSW

### 1.4 Conditions of approval

The Minister's Conditions of Approval for the Sydney Metro City & Southwest Chatswood to Sydenham project were amended in December of 2017 to reflect the Central Walk project modification.

Amended condition E17 states that an AMS must be prepared in consultation with the Heritage Council of NSW (or delegate) prior to the commencement of archaeological investigation.

Under Amended condition E17 the final methodology must:

- (a) Provide for the detailed analysis of any heritage items discovered during the investigations;
- (b) Include detailed site specific archaeological management and artefact management strategies;

<sup>2</sup> Artefact Heritage 2016a. *Sydney Metro City & Southwest - Chatswood to Sydenham Non-Aboriginal Archaeological Assessment and Research Design*. Report prepared for Jacobs / Arcadis / RPS

<sup>3</sup> Artefact Heritage 2017. *Central Walk – Addendum Archaeological Assessment and Research Design*. Report prepared for JAR



- (c) Include cored soil samples for soil and pollen for the Pitt Street site within the Tank Stream Valley; and
- (d) Provide for a sieving strategy

This AMS satisfies amended condition E17 and will be provided for review to the Heritage DPC. Both the nominated Primary and Secondary Excavation Directors have reviewed and endorsed this AMS.

Condition E18 requires the nomination of an Excavation Director who complies with the Heritage Council of NSW's Criteria for Assessment of Excavation Directors (July 2011). Information on the nominated Excavation Directors has been provided for comment to the Heritage Division as a delegate of the NSW Heritage Council. On 7 May 2018 the former Heritage Division responded to the nominations for Primary and Secondary Excavation Directors stating that they understood both nominated people had undertaken similar types of archaeological work previously. The Primary Excavation Director would oversee the archaeological excavations and advise on archaeological issues. The Primary Excavation Director would provide clearance once archaeological management has been completed in an area, as per the methodology outlined in Section 6.16. This meets the requirements of Condition E18.

Condition E19 requires an Unexpected Heritage Finds Procedure to be prepared in accordance with any guidelines and standards prepared by the Heritage Council of NSW or OEH and by a suitably qualified and experienced heritage specialist. The Sydney Metro Unexpected Heritage Finds Procedure has been prepared for the project and would be implemented for the CSRc project works as per the archaeological methodology described in Section 6.11.

Condition E20 requires an Archaeological Relics Management Plan be prepared when an unexpected relic is discovered. This would be prepared as per the archaeological methodology described in Section 6.2. It is noted that under E20 an Archaeological Relic Management Plan would only be required for archaeological remains of State significance that were not identified in the AARD or this AMS.

### 1.5 Authors

This report has been prepared by Jenny Winnett (Secondary Excavation Director – Historical Archaeology), Dr Iain Stuart (Primary Excavation Director – Historical Archaeology) and Dr Sandra Wallace (Project Director).

## 2.0 PROPOSED WORKS

### 2.1 Introduction

The existing services routes at Central Station are contained within the underground service and pedestrian tunnels beneath the existing platforms (refer to Chapter 7 of the Environmental Impact Statement (EIS) for further details). In order to avoid damage to the existing services and to provide uninterrupted access for the construction of the Metro platforms, the services must be relocated into a combined service route around Central Station.

The site wide CSR will be delivered across the following 2 phases:

- Phase A – Western Baggage Tunnel, Northern Baggage Tunnel, and Platform 1 works
- Phase B – Darling Harbour Goods Line, Mortuary Sidings, Mortuary Tunnel, Sydney Yard, Water Main Tunnel, and Sydney Network Base (Phase is currently under development).

### 2.2 Phase A

The Phase A works will comprise of civil construction works cabling and electrical works, which are described in greater detail below, commencing around the northern corner of the site and progressing in an anti-clockwise direction (see Figure 3 for overview). The scope of Phase A works includes the following:

1. Western Baggage Tunnel (WBT) and Northern Baggage Tunnel (NBT)
  - a. Concrete riser/encasement for comms/HV dropping down from Platform 1 through the WBT roof
  - b. Concrete Encasement of HV along the eastern side of the WBT from the riser transitioning into Galvanised Steel Troughing (GST) when crossing the portal of the NBT before continuing into Service Tunnel Riser 2 (STR2)
  - c. Comms in cable tray from the riser along the WBT with connection into existing CENA36 comms riser
  - d. Comms in cable tray along the NBT to the back of house area at the eastern end of the tunnel.
2. Platform 1
  - a. Trenched portion containing buried HV/comms conduits
  - b. Conduits tied to cable tray in the southern hollow portion of platform 1

#### 2.2.1 Construction methodology

The CSR will extend as a circular route around the site and will be constructed using existing service infrastructure where this is available and providing new installations as required to complete the system. The sequence of construction is in principal as outlined below:

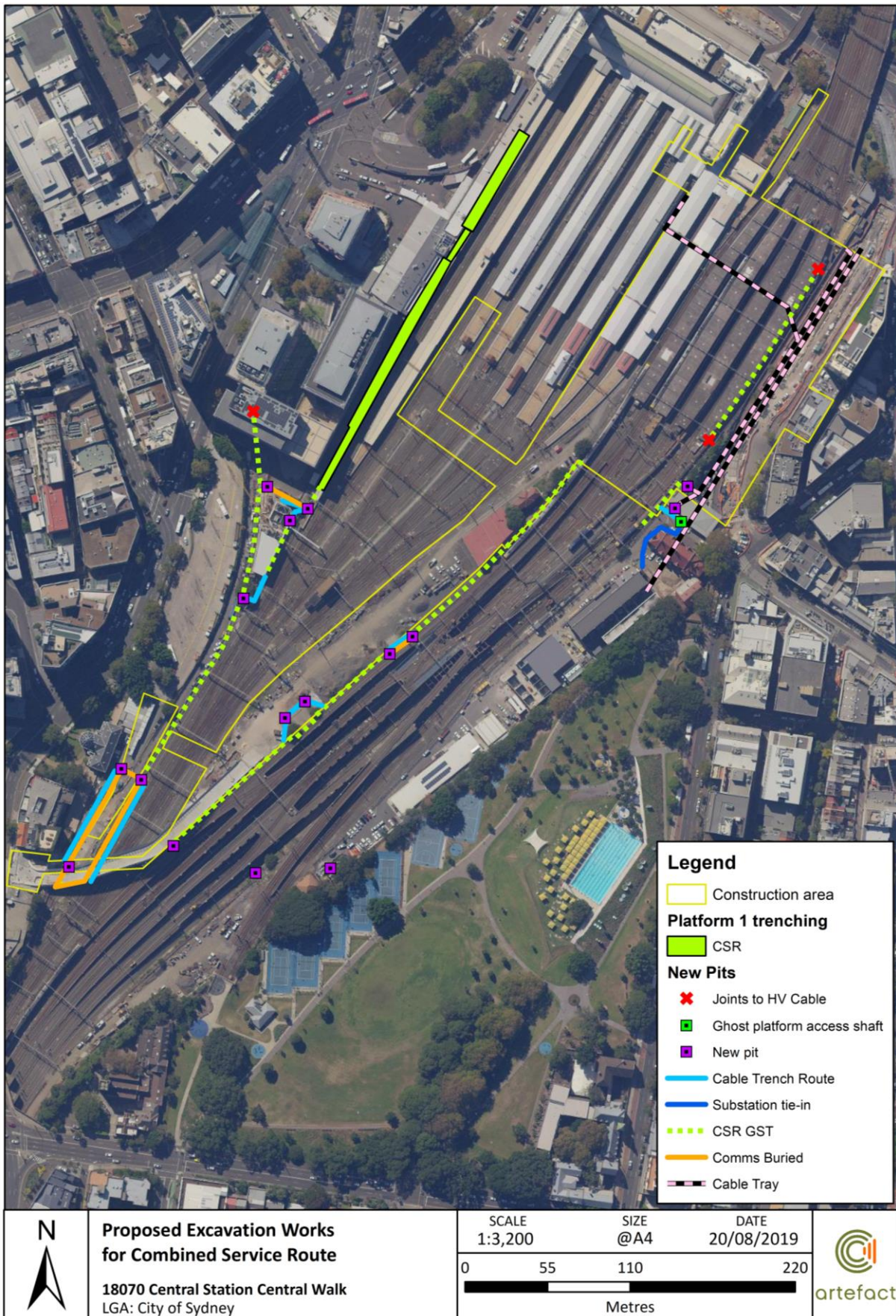
1. Subway Passage System: North and West Baggage Tunnels Install ceiling and wall mounted cable trays to support new Comms. Services. Wall fixed GST for HV services, transitioning to concrete encasement of GST at southern end of west baggage tunnel

2. Intercity Platform 1- From the west baggage tunnel: the communications/HV services transition vertically within a concrete riser to Platform 1, where separate communications and HV pits will be trenched into the platform in areas constructed on fill
3. Intercity Platform 1- In the area where the platform has been extended: new services will be suspended on cable trays in the existing hollow of the platform. Openings will be created in the western brick wall supporting the platform slab for the passage of services
4. Trenching near Western Boundary: Adjacent to the Lee Street Substation the CSR will comprise a trenched route
5. Darling Harbour Goods Line: Installation of galvanised steel trough (GST) cable route for HV and Comms. along the Darling Harbour Cut. The GST would be installed on either a post into the ground or on top of a brick embankment wall
6. Lee Street Substation: Installation of galvanised steel trough (GST) cable route for HV services around Lee Street Substation. HV services will be transitioned from Platform 1 to GST on posts around the Lee Street substation, with a small area of local trenching to connect to the existing pits
7. Mortuary Station / Mortuary Tunnel: Where the dive embankment wall tapers off to the south, GST on posts mounted into the ground will be extended into the yard. Services will then be trenched in ground and connected to the existing pit that accesses the Mortuary Tunnel. CSR services will then be extended through the Mortuary Tunnel with approximately 6/No. 150mm core holes introduced for installation of new cables
8. Route to SYAB: A new pit will be constructed adjacent to SYAB on the east side, with services brought vertically and then run along the top of the SYAB wall. This will then connect to a new padmount transformer in Mortuary Yard south of the SYAB.
9. Sydney Yard: Install GST on top of east batter wall of SYAB and extend on posts through Sydney Yard
10. Water Main Tunnel: Extend CSR services through the Water Main Tunnel
11. Trenching around the former Railway Institute Building: Construction of HV pits and trenching to the around the Railway Institute Building and Prince Alfred Substation
12. Connection to Prince Alfred Substation: HV Connection to Prince Alfred Substation at Basement Level.

The AMS will cover any scope of works that require ground penetration along the CSR as overlaid in the various trigonometric surveys and plans.



Figure 3: Key features of the CSR



## 3.0 HISTORICAL CONTEXT

The following history has been adapted and summarised from the CSMW AARD with additional new information and figures added as relevant.<sup>4</sup> Historical background of the Devonshire Street Cemetery has been adopted from the archaeological results memo produced by Artefact Heritage on 8 February 2019.<sup>5</sup> For a complete historical overview of the Central Station site, refer to the documents referenced in Section 1.1.

### 3.1 The Devonshire Street Cemetery

By 1820 the Old Sydney Burial Ground, located on George Street at the corner with DrUITT Street (now occupied by Sydney Town Hall), had reached capacity, was overgrown and used as an informal dumping ground. A second cemetery was proposed for the southern outskirts of town. The new site had been reserved by Governor Macquarie in 1818 and was chosen due to the remote location of the cemetery at the edge of town, beyond the cattle and hay markets. Located at the farthest outer limit of the town past the Brickfields, the cemetery was situated at a suitable distance to avoid inconveniencing the gentrifying township and was significant in that there were allotments for various religious denominations.

The new burial grounds, originally called the Sandhills Cemetery due to its landscape of a steep sand ridge, and later, the Devonshire Street Cemetery following the formation of Devonshire Street, were officially consecrated in 1820. The government Order issued on the 29th January 1820 closed the Sydney burial ground and opened the Devonshire Street Cemetery. The Central Walk study area is primarily located with the Roman Catholic burial ground (Figure 5).<sup>6</sup>

Elizabeth Street formed the eastern boundary of the Devonshire Street Cemetery and at that time it was known as Elizabeth Street South. Elizabeth Street ran over the sand ridge on which the cemetery was situated. By all accounts it was a steep rise “a hill-not a mole-bill but a mountain”.<sup>7</sup> Public agitation from local residents was for Elizabeth Street to be lowered and this seems to have occurred around 1841 once more properties were developed, although the precise date has yet to be established. This excavation seems to have caused the cemetery wall and sides of the cutting to collapse.

By 1900, the grounds had become neglected with a Citizen’s Vigilance Committee member stating ‘a *thick, disorderly, and in some places almost impenetrable scrub covers most of the ground; and tombstones lie scattered in careless confusion all over the place. Where standing, they present grotesque attitudes like a party of a drunken men crossing a field*’.<sup>8</sup>

On 11 December 1900, an Act of Parliament passed enabling the construction of Central Railway Station. Two proposals for this station had been considered – the first at Hyde Park and the second over the Devonshire Street Cemetery. The latter proposal was adopted and the clearing of the Devonshire Street Cemetery, along with the demolition of the Benevolent Asylum, Carters Barracks and the Police Barracks and other buildings commenced in 1901.

On the 17 January 1901, the government issued notices declaring that representatives of any deceased in the Devonshire Street Cemetery must remove their relatives’ remains and monuments within two

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<sup>4</sup> Artefact Heritage 2016a

<sup>5</sup> Artefact Heritage ‘Memo – DRAFT Additional Archaeological works, Central Station Main Works Station Box’ 8 February 2019

<sup>6</sup> Keith A Johnson & Malcolm R Sainty, *Sydney burial Ground 1819-1901: Elizabeth and Devonshire Streets and History of Sydney’s Earliest Cemeteries from 1788*, Library of Australian History, Sydney, 2001. p, 205.

<sup>7</sup> “ANATOMY OF LATEST BRITISH AND FOREIGN INTELLIGENCE.” The Sydney Gazette and New South Wales Advertiser (NSW : 1803 - 1842) 10 March 1836: 2

<sup>8</sup> Joseph Waugh, ‘The Sydney Burial Ground’, *The Deacon’s Treasure No. 25*, December 1998, p. 27, citing the Citizen’s Vigilance Committee.



months<sup>9</sup>. The exhumations were conducted under the supervision of the Department of Public Works with detailed records kept by the State Records. It became apparent that due to the large number of graves identified under paths and various other objects, trenching was required over the entire area at a depth of several feet to retrieve the remains. By 1902, most of the remains had been exhumed. Relatives of the deceased had collected approximately 8500 remains, whilst the approximate remaining 30,000 remains and 2800 monuments were transported to the new Bunnerong Cemetery at Botany, today known as the Pioneer Memorial Park within the Eastern Suburbs Memorial Park.

Accounts of the exhumation work filled the Sydney newspapers in 1901. There appears to have been no plan and the Government was rapidly forced to begin the work by clearing the vegetation to allow relatives to actually find the graves they were looking for. That being completed individual exhumations began with families and undertakers involved. Finally, a process of trenching was undertaken. The Evening News described the work as

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*It is gruesome to watch the men at work in the trench. They dig forward, and as they draw out a spadeful, turn it over, and the bones are picked up and put into a sieve near by; then the earth is shaken off and they are placed, carefully in a coffin that stands near.*<sup>10</sup>

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However, newspaper reports suggest that the work of exhumation may not have gone all that smoothly. The sensationalist newspaper Truth published “the gruesome facts which have recently been brought under our notice” The allegations were that only the Anglican and the Jewish sections of the cemetery were properly trenched to a depth of 9 feet and the remaining areas were not properly exhumed with claims that excavations barely reached 4 feet below the surface “while all descriptions of bones are strewn among the sand and earth without any attempt being made to gather them for conveyance and burial at La Perouse.”<sup>11</sup>

Archaeological investigation undertaken as part of the CSMW has since identified that numerous graves, many including skeletal material, were not removed during these works. The survival of such remains appears to be related primarily to the topography of the former sandhills and is not consistent throughout the station site. This has been discussed further in Section 4.3.1.

The sand hills were noted as being significantly higher than the level of the existing station line on the eastern side, with infill required to create a level platform on the western side. In addition to the land resumptions of the Devonshire Street Cemetery and the Benevolent Asylum, the Central Railway Station project required the resumption of the steam tram depot at the corner of Pitt Street and Garden Road, the Convent of the Good Samaritan on Pitt Street, the Sydney Female Refuge, the Police Superintendent’s Residence on Pitt Street, the Christ Church parsonage on Pitt Street, the Police Barracks on Garden Street, along with various residential properties along Railway Parade.

To the south of Devonshire Street (today represented by the alignment of the Devonshire Street tunnel) was an area named the Cleveland, or Government, Paddocks (named after the Cleveland estate to the east). This was reportedly the location of an Aboriginal camp until the mid-nineteenth century.<sup>12</sup> The surviving portion of this space is today known as Prince Alfred Park (Figure 6).<sup>13</sup> These paddocks were owned by the government and used ostensibly for public recreation and pasturage.

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<sup>9</sup> The Devonshire-street Cemetery Act, 1901 formalised this procedure later in 1901.

<sup>10</sup> "Nobody's Friends at Devonshire Street Cemetery." Evening News (Sydney, NSW : 1869 - 1931) (Sydney, NSW), 06 July 1901 1901, EVENING NEWS SUPPLEMENT, 1

<sup>11</sup> The Cemeteries Scandal

<sup>12</sup> City of Sydney, Prince Alfred Park (Cleveland Paddocks), 2013, <http://www.sydneybarani.com.au/sites/prince-alfred-park-cleveland-paddocks/>, viewed 2 May 2018.

<sup>13</sup> Rappoport Pty Ltd & NSW Government Architects Office. 2013. *Central Station Conservation Management Plan*. pp. 32 – 35.

Their location at the outer edge of the town, and the perceived insalubriousness of the area around the Benevolent Asylum, led to complaints of robbery and theft in the paddock by the 1840s.<sup>14</sup> Sketches from this time show that the paddock consisted of undulating sand dunes with thin grass where on dark nights the “ditches and holes serve effectually to conceal any footpads.”<sup>15</sup>

**Figure 4: View of the eastern boundary wall of Devonshire Street Cemetery in 1901<sup>16</sup>**



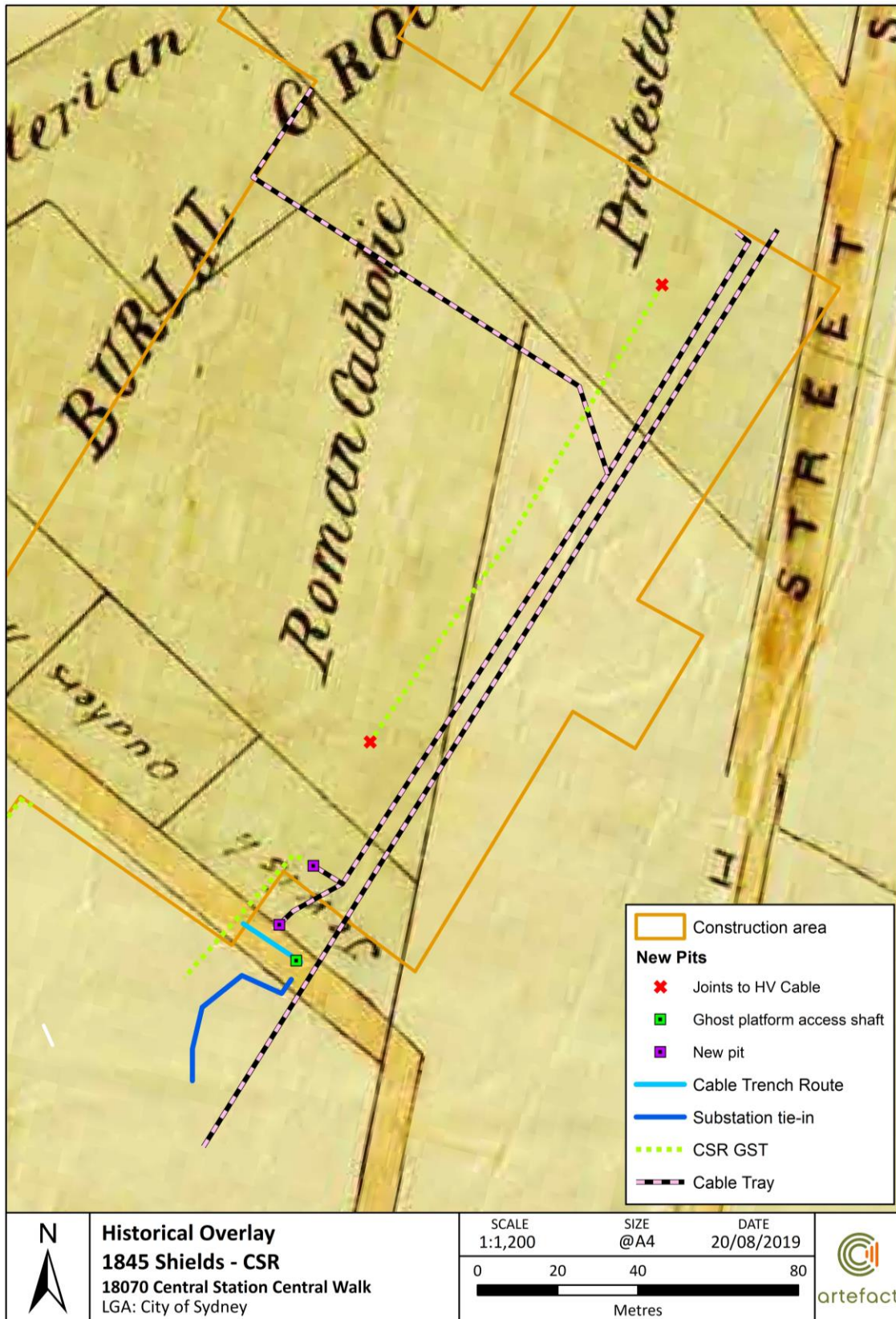
<sup>14</sup> *The Australian Magazine* 15 May 1847

<sup>15</sup> *Ibid.*

<sup>16</sup> RAHS



Figure 5: The Devonshire Street Cemetery c.1845<sup>17</sup>



<sup>17</sup> Detail from Assistant City Surveyor Frances Webb Shields' 1845 survey of the City of Sydney, version produced in 1896-1897, copied from the 1845 plan. Accessed via the City of Sydney Council's 'Historical Atlas of Sydney' on 10 May 2019 <https://atlas.cityofsydney.nsw.gov.au/maps/city-of-sydney-sheilds-1845/>

In a 1901 newspaper article on the subject of exhumations from Truth titled 'Devonshire Street Cemetery : A General Clearance', it was reported that; 'the ground in each section has been trenched to a considerable depth, and...when Mr. O'Sullivan<sup>18</sup> withdraws his men, not a bone or human relic will be within the compass of the acres that have held thousands of bodies for the last 80 years'. In addition to this, a July 1901 article by the Telegraph titled 'Buried Alive' reported: many of the graves in the cemetery contain the remains of several bodies. These are shovelled into a sieve, shaken, and the bones emptied into a box preparatory to removal to Botany. Archaeological investigation undertaken as part of the CSMW has since identified that numerous graves, many including skeletal material, were not removed during these works. The survival of such remains appears to be related primarily to the topography of the former sandhills, and is not consistent throughout the station site. This has been discussed further in Section 4.3.1.

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<sup>18</sup> O'Sullivan was the Minister for Public Works

<sup>19</sup> City of Sydney, Prince Alfred Park (Cleveland Paddocks), 2013, <http://www.sydneybarani.com.au/sites/prince-alfred-park-cleveland-paddocks/>, viewed 2 May 2018.

<sup>20</sup> Rappoport Pty Ltd & NSW Government Architects Office. 2013. *Central Station Conservation Management Plan*. pp. 32 – 35.

<sup>21</sup> *The Australian Magazine* 15 May 1847

<sup>22</sup> *Ibid.*



Figure 6: Sydney St Lawrence - Sydney Railway, Sketch of proposed Terminus in the Cleveland Paddock 01 Jan 1853<sup>23</sup>



## 3.2 Central Railway Station

### 3.2.1 First and second railway stations (1855 – 1900)

The development of railway technology in England in the early 1830s coincided with the opening up of agricultural and pastoral settlement of the interior of New South Wales. The need to ship wool and other produce from the interior to the coastal ports for export drove the economic demand for the growth of railways.<sup>24</sup> By 1846, a railway line was proposed to operate between the two main settlements at Sydney and Parramatta, with the Parramatta station to be constructed near Mort Street in what is now the suburb of Granville. Various proposals were put to the Colonial Government and following correspondence, approval was received by the Secretary of State for Colonies to sell Crown Land for the purposes constructing railways.<sup>25</sup> After much debate as to an appropriate location of the Sydney terminus, the Sydney Railway Company applied for land grants from the Government for the construction of the station between Devonshire and Cleveland Streets. By 1853 the location of the terminus and associated infrastructure had settled on the Government Paddocks with a goods line running to serve Darling Harbour<sup>26</sup>. The exact site of the first Sydney railway terminus was fixed in December 1853.

The first Sydney railway terminus was officially opened in 1855, with the first train departing on the 26 September.<sup>27</sup> The first Sydney train station was originally called Redfern Station, with the current Redfern Station originally named Eveleigh Station. The station was not a grand affair due to the Sydney Railway Company's dire financial situation resulting in the decision to construct a temporary station rather than a 'grand terminus'.<sup>28</sup>

The original station consisted of a galvanised corrugated iron shed of about 100 feet by 30 feet, covering a raised wooden platform and single rail track. The site also contained a small number of semi-permanent iron buildings for carriages, offices and public rooms.<sup>29</sup> Almost immediately, the single main line tracks were duplicated.<sup>30</sup> The passenger platform, enclosed by the iron train shed was soon discovered to be too short for operations and 100 foot wooden extension was added in 1856.<sup>31</sup> Associated with the station was a series of workshop buildings (located on the eastern side of the site). The 1857 City of Sydney detail plan (Figure 7) illustrates the location of the station building and second platform, carriage sheds and workshops.

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<sup>23</sup> [Sketch book 6 folio 87] State Records, NRS 13886

<sup>24</sup> Rappoport Pty Ltd & NSW Government Architects Office. 2013. p. 31

<sup>25</sup> Hagarty, D 2005, *The building of the Sydney Railway: the known story of the work of six men - a naval surveyor, four engineers, and the contractor who, with many others, built the first railway from Sydney to Parramatta 1848-1857*, Australian Railway Historical Society, New South Wales Division, Redfern, N.S.W. pp 23-39.

<sup>26</sup> Singleton 1955, p111-112.

<sup>27</sup> R. McKillop, D Ellsmore and J Oakes, 2008. *A Century of Central: Sydney's Central Railway Station 1906 to 2006*, (Australian Railway Historical Society), p. 7.

<sup>28</sup> Hargerty 2005:197

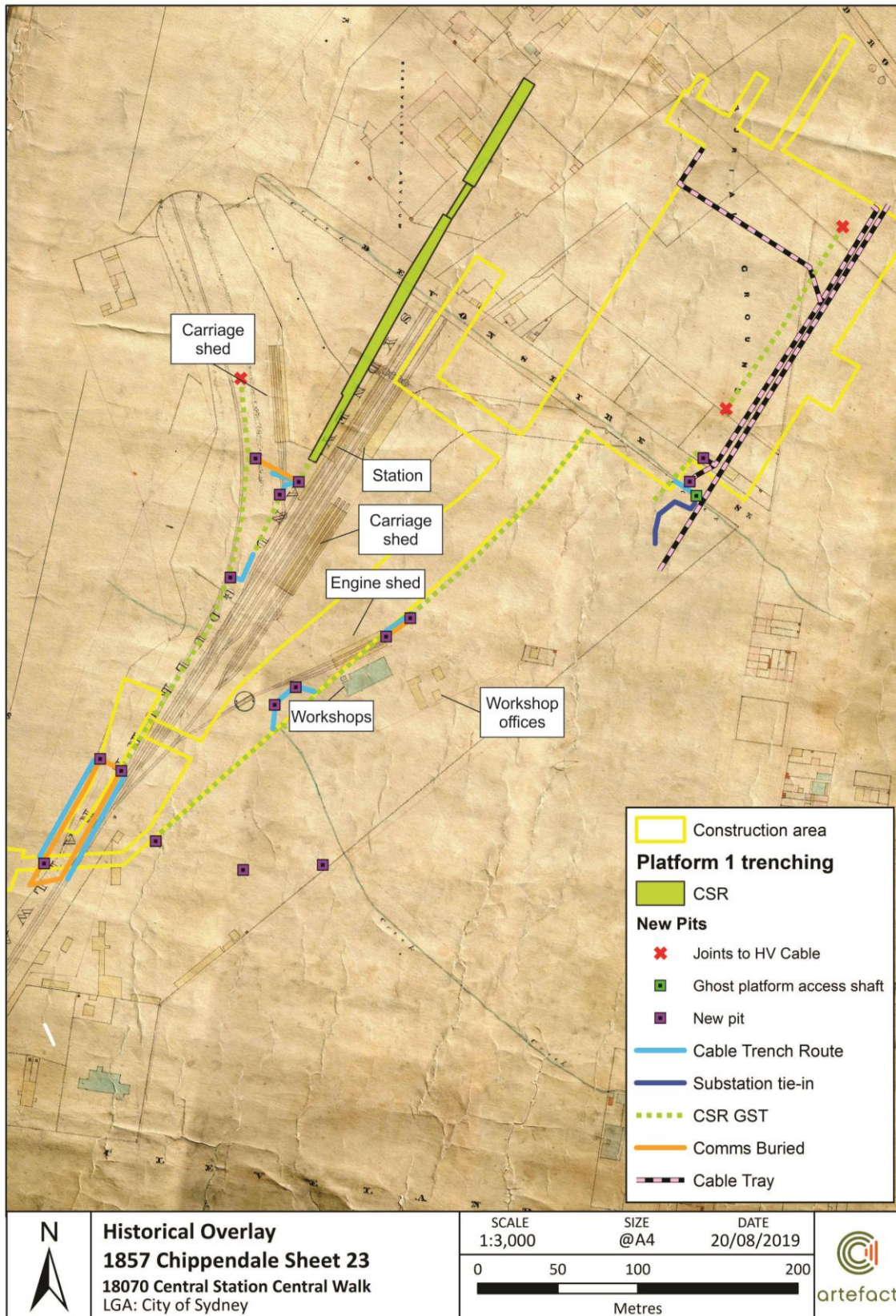
<sup>29</sup> McKillop, Ellsmore and Oakes, 2008. *A Century of Central*, p. 8.

<sup>30</sup> Singleton, CC. November 1941. *History of Sydney Railway Station Part 1 First Station*, *Australian Railways Historical Society Bulletin*, Vol. 8, No. 49, p. 56.

<sup>31</sup> Singleton, CC. November 1941. *History of Sydney Railway Station Part 1 First Station*, *Australian Railways Historical Society Bulletin*, Vol. 8, No. 49, p. 56.



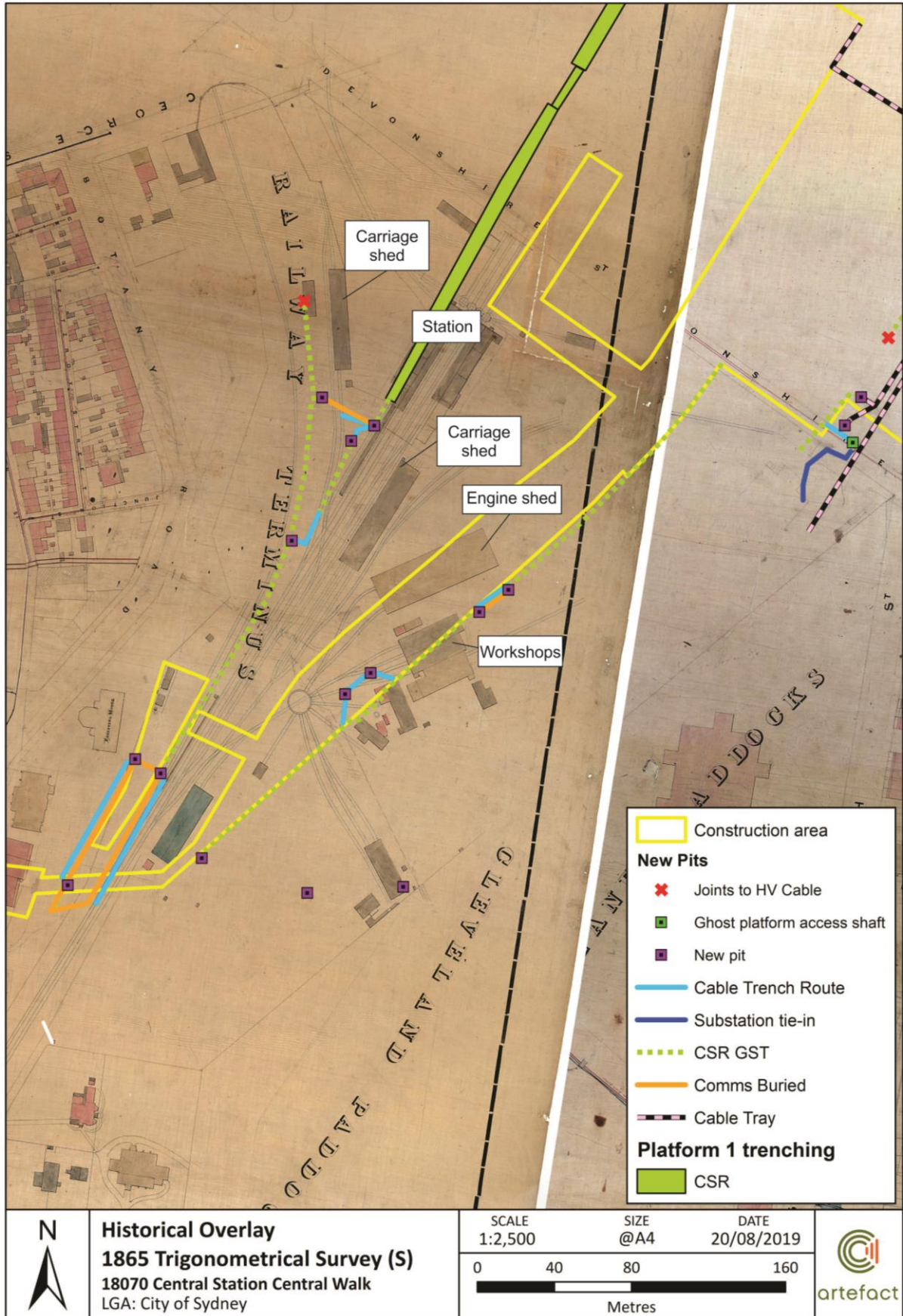
Figure 7: City of Sydney – Detail Plans: Plan A Chippendale February 1857 with elements of the first station in proximity to the Central Walk excavation works labelled<sup>32</sup>



<sup>32</sup> Plan A Chippendale Sheet signed by Edward J. Burrows February 1857, Accessed 10 May 2019 via the Historical Atlas of Sydney <http://atlas.cityofsydney.nsw.gov.au/>



Figure 8: Trigonometric Survey of Sydney Sheets S1 and S2 (1865). Sheets overlap and annotated



Excavation works were carried out within the Cleveland Paddocks in 1864 for the in-filling of Darling Harbour. These excavation works worked favourably at Old Redfern Station as an extension of the yard was achieved. By this time, the locomotive stock had risen to 13, and a new stone engine shed with capacity for 16 engines to accommodate the new engines and a goods yard were constructed in 1866.<sup>33</sup> The site became crowded as demand for passenger facilities and railway maintenance increased (Figure 8), leading to the development of a second station site.

**Figure 9: 1871 Photo of First Sydney Railway station carriage buildings<sup>34</sup>**



Designs for the second Sydney Station were completed in 1871 by Engineer-in-Chief, John Whitton. The permanent structure was constructed in 1874. Designed in a Neo-Classical style the building was constructed of red brick with lighter facings and a galvanised iron roof. The main feature of the site was a train shed spanning 236 by 43 feet, covering the main lines and both the arrival and departure platforms (Figure 10).

By the 1880s the development of workshops, siding yards and carriage works had expanded to such a degree that a new site was chosen in Eveleigh to house further expansion (Figure 11).<sup>35</sup> During this period, various improvements were made and by 1896 the number of passenger platforms had increased to two single-platforms and two double-platforms, with a profusion of sidings, the Prince Alfred goods yards, station buildings, workshops and carriage sheds, as well as the Mortuary Station facilities and Darling Harbour goods line. During this period, the Devonshire Street Cemetery had been declared at capacity, and took no more burials from 1865 onwards.

**Figure 10: 1895 photo of the second railway station, facing south-east from Pitt Street<sup>36</sup>**



<sup>33</sup> Singleton C.C. November 1941. History of Sydney Railway Station Part 1 First Station, *Australian Railways Historical Society Bulletin*, Vol. 8, No. 49, p. 56.

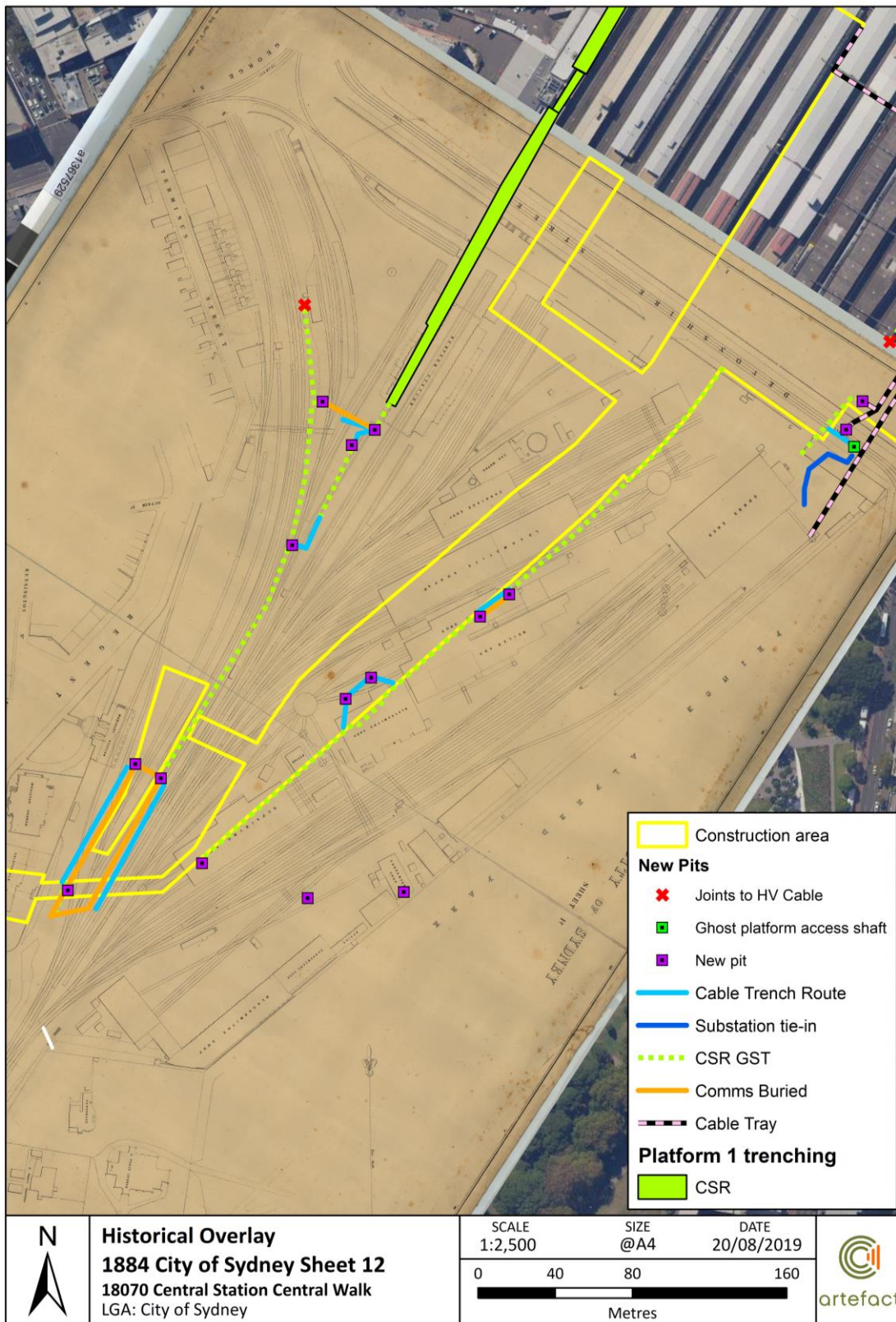
<sup>34</sup> State Records of NSW. <http://gallery.records.nsw.gov.au/index.php/galleries/through-the-lens-central-railway-station/> viewed 1 June 2016.

<sup>35</sup> Rappoport Pty Ltd & NSW Government Architects Office. 2013. pp. 38 – 39.

<sup>36</sup> Kerry & Co. 1895. "Original Redfern Railway Station, Sydney". National Library of Australia, <http://nla.gov.au/nla.obj-148351252/view> viewed 1 June 2016.



Figure 11: Central Railway Station in 1884<sup>37</sup>



<sup>37</sup> City of Sydney detailed section plans, plan I2. Accessed 10 May 2019 via SLNSW [https://search.sl.nsw.gov.au/primo-explore/fulldisplay?docid=SLNSW\\_ALMA2193462470002626&context=L&vid=SLNSW&search\\_scope=BJM&tab=default\\_tab&lang=en\\_US](https://search.sl.nsw.gov.au/primo-explore/fulldisplay?docid=SLNSW_ALMA2193462470002626&context=L&vid=SLNSW&search_scope=BJM&tab=default_tab&lang=en_US)



Figure 12: 1901 photo of the Devonshire Street Cemetery with the goods sheds of the second railway station at Central Station in the background<sup>38</sup>



Figure 13: Detail of a photograph taken in November of 1870 showing the Goods Sheds. Source AMAC November 2016, courtesy of Bill Phippen



<sup>38</sup> RAHS photographic collection: no. 22566017

### 3.2.2 Third station expansion (1901 - 1930)

The third station was designed by Government Architect Walter Liberty Vernon on the site of the former Devonshire Street cemetery. The foundation stone was laid on 30 April 1902 by Edward O'Sullivan, Minister for Public Works. The new railway terminus and main concourse level were completed in 1906.

Despite the new station the problem of access to the City remained. In order to rectify this, the City Rail project commenced in 1922. Electric trains operated along the Illawarra Line from June 1926. The city underground system opened later that year, connecting St James and Museum Stations to the network. The project included the advanced design feature of the 'flying junctions' or flyovers, which allowed trains to change tracks on approach to Central Station. In order to cater for the additional railway lines, Central Station had four additional double platforms constructed on its eastern side by 1926 (today's platforms 16 – 23; Figure 15). The construction of these new platforms resulted in the demolition of the existing three eastern platforms, rail sidings and goods sheds.<sup>39</sup>

### 3.2.3 Eastern Suburbs Railway (ESR)

With the rapid expansion of Sydney city, it became apparent that new ways of incorporating Central into the growing metropolis were required. The largest renovations were the incorporation of platforms 24 and 25 for the ESR in 1979. The ESR involved the excavation of new tunnels north of the station with two double platforms constructed underneath what is now the footpath on Chalmers Street. The platforms were constructed on top of each other although the lower platforms were never used and have no railway lines attached to them.<sup>40</sup>

**Figure 14: Photograph showing excavation of the ESR, extending across the total width of Chalmers Street. Source: City of Sydney Archives late 1940s excavation Syd Ref Coll SRC136**



<sup>39</sup> *Ibid.* pp. 53 – 54.

<sup>40</sup> Rappoport Pty Ltd & NSW Government Architects Office 2013. pp. 56 – 57.

### 3.2.4 Twentieth century station modifications (1930 – present)

A number of renovations were made to Central Station after the completion of its primary facilities in 1926. With the rapid expansion of Sydney city, it became apparent that new ways of incorporating Central into the growing metropolis were required. The largest renovations were the incorporation of platforms 24 and 25 for the Eastern Suburbs Railway in 1979. The Eastern Suburbs Railway involved the excavation of new tunnels north of the station with two double platforms constructed underneath what is now the footpath on Chalmers Street. The platforms were constructed on top of each other although the lower platforms were never used and have no railway lines attached to them.<sup>41</sup>

Today, Central Railway Station is the busiest train station in NSW, averaging around 40,000 passenger station exits between 6:00am and 9:00am on an average work day.<sup>42</sup>

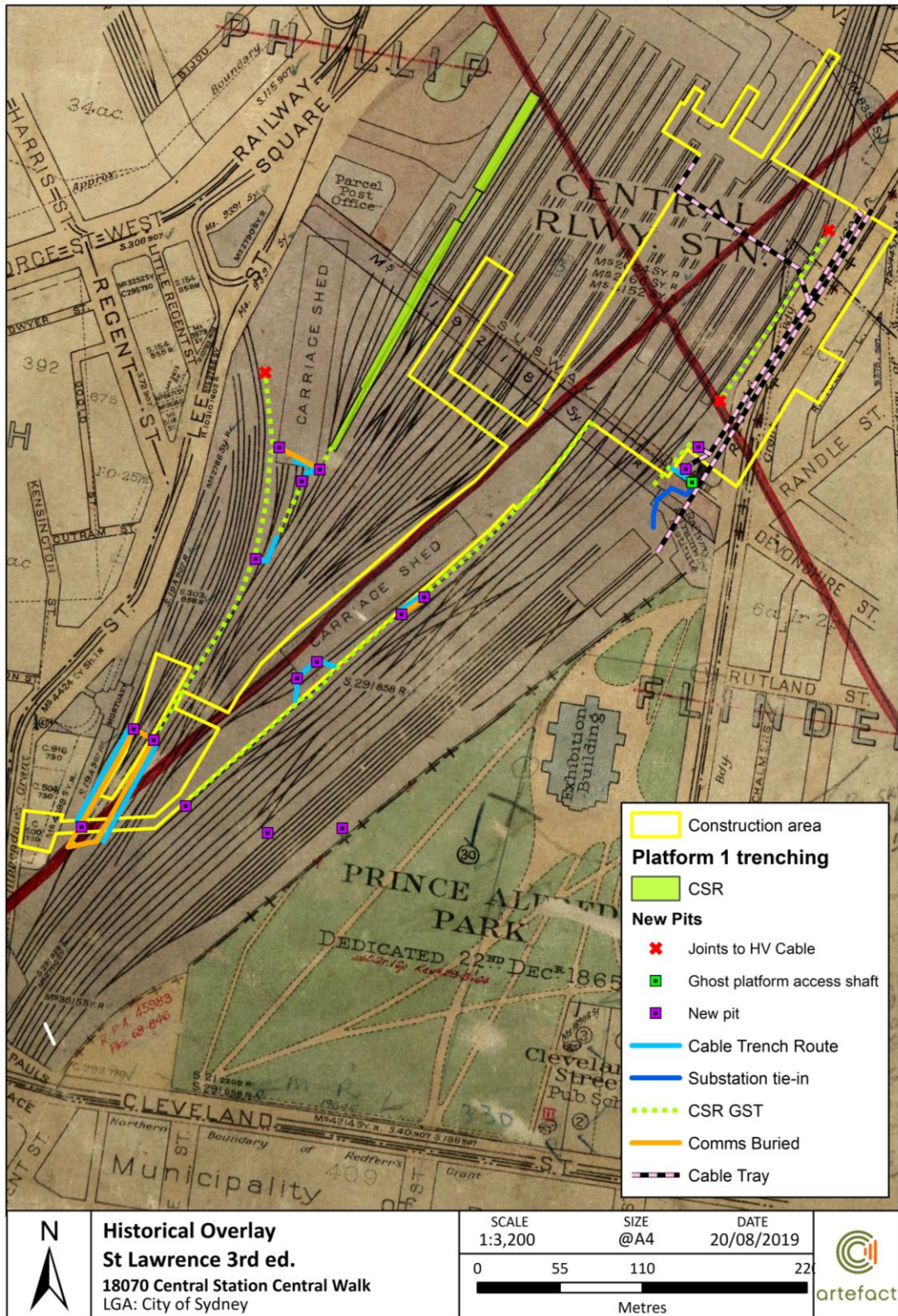
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<sup>41</sup> Rappoport Pty Ltd & NSW Government Architects Office 2013. pp. 56 – 57.

<sup>42</sup> Transport for NSW, 2014. Train Statistics: Everything you need to know about Sydney Trains and NSW TrainLink.



Figure 15: Central Railway Station in the mid-20<sup>th</sup> century. Detail from plan of the Parish of St Lawrence, 3<sup>rd</sup> edition<sup>43</sup>



<sup>43</sup> Undated plan of the county of St Lawrence, Parish of Cumberland, 3<sup>rd</sup> edition. Accessed via NSW Lands and Registry Services, Historic Lands Record Viewer [http://www.nswlrs.com.au/land\\_titles/historical\\_research/parish\\_maps](http://www.nswlrs.com.au/land_titles/historical_research/parish_maps)



## 4.0 ARCHAEOLOGICAL POTENTIAL

### 4.1 Recent archaeological investigations

Several recent archaeological investigations have taken place within and adjacent to Central Station. The results of these excavations indicate that archaeological evidence of the Devonshire Street Cemetery and the earliest phases of Central Railway Station can and do remain preserved. Some of these remains are far more intact than previously expected. The results of these excavations, some ongoing, have been included in the following sections, and illustrated in Figure 17.

#### 4.1.1 Sydney Metro – Central Station Main Works – Artefact Heritage (ongoing)

Artefact Heritage were engaged by Laing O'Rourke to archaeologically manage construction activities for the CSMW study area, which is part of the Sydney Metro City & Southwest – Chatswood to Sydenham project. The project works included excavations for a range of activities in the Sydney Yards, the platforms, and around Randle Lane and Chalmers Street, including the establishment of the station box, service investigations and installations, the removal of the platforms.

##### 4.1.1.1 Randle Lane

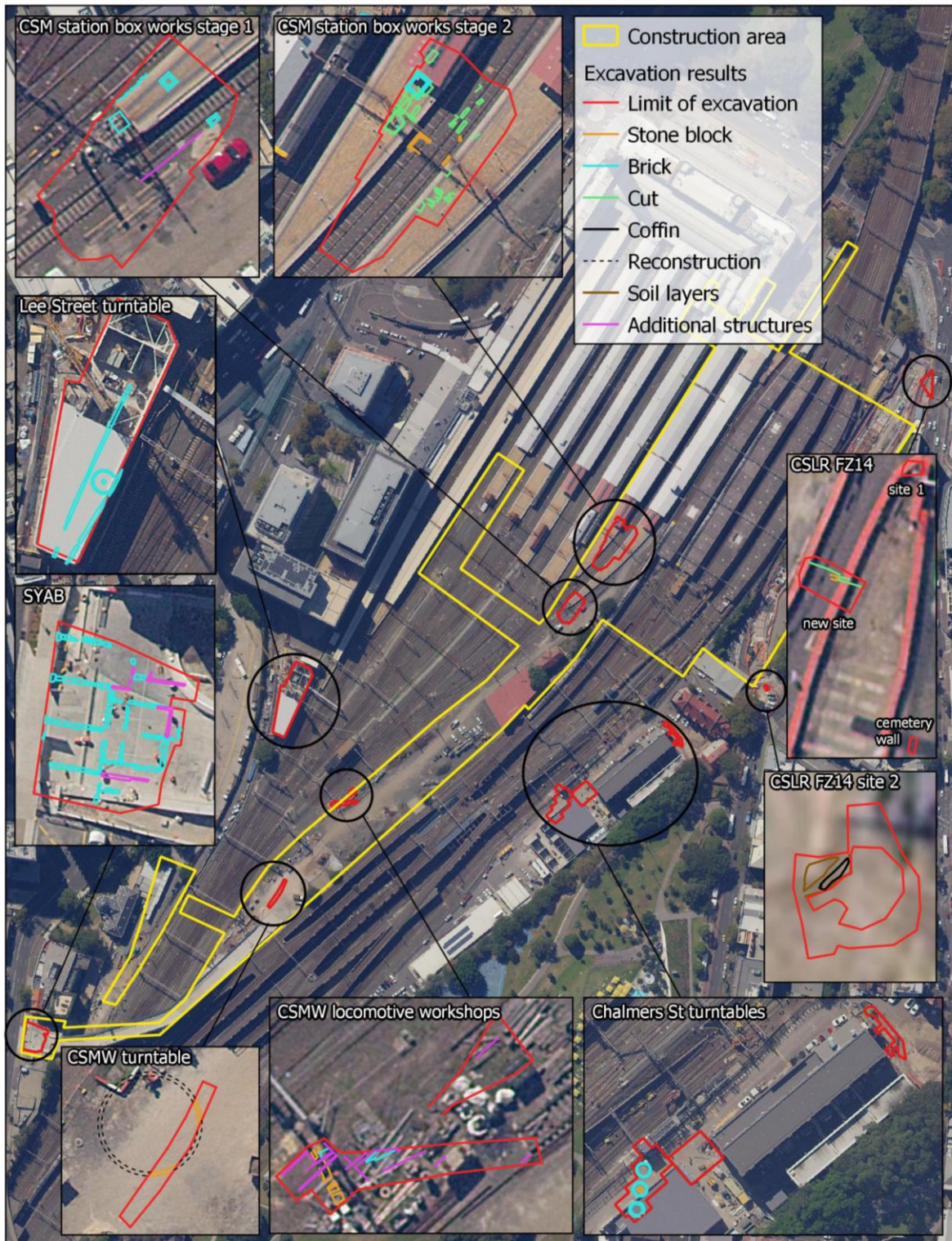
In November 2018, service investigations were conducted on Randle Lane consisting of the excavation of four slit trenches. In all trenches natural shale was encountered at most 500mm below the ground surface where modern services had been installed. Where no services had been installed the shale was typically located 200-300mm below the surface. However, in one trench at the rear of 7-9 Randle Street revealed that the building footings were situated over sandstock footings three courses deep (Figure 16). These footings were founded on shale at a depth of 400mm.

**Figure 16: Evidence of previous structures within Randle Lane. Artefact Heritage 2018.**





Figure 17: Overview of known archaeological investigations undertaken within and adjacent to Central Station.



Source: D:\GIS\GIS\_Mapping\18070\_CSM\_Station\_Box\MXD\18070\_CSM\_Station\_Box.qgz



### 4.1.1.2 First Redfern station and second station expansion

In November 2018, during excavations for the installation of an elevator and stairs to access the Olympic Tunnel within Platform 22/23, a brick feature was identified within the hoarding. The feature consisted of a wall measuring more than 6m long, 480mm wide, and continuing to a depth of at least 1.5m. The feature was interpreted as possibly being the original platform surface prior to infilling and raising the platform to the current level.

On 31 January 2019, during archaeological monitoring of service investigation works, a brick wall was identified to the south of the construction site storage sheds. This wall was interpreted as being associated with the Locomotive Workshop (Second Station Expansion). A program of targeted test excavation was undertaken prior to the planned excavations for the stormwater drainage and feeder route (Figure 20). A program of targeted test excavations was also undertaken in the likely location of the First and Second Station Expansion turntables. The excavation identified well preserved subsurface elements of both the Locomotive Workshop and the Turntable (Figure 18).

### 4.1.1.3 Devonshire Street Cemetery

Archaeological monitoring of parallel to Platform 13 identified a sandstone structure in November 2018. This was determined to be a vault (referenced as 'Vault 1') and excavation commenced on 30 November 2018. To date, excavation has identified four vaults (three sandstone lined), a single sandstone lined grave cut and 72 grave cuts. Articulated and disarticulated human remains have been excavated. These are in the process of being analysed by Dr Denise Donlan.

Archaeological testing within an area north of the Devonshire Street tunnel was undertaken to investigate an area likely to contain re-deposited sands and thus potentially containing Aboriginal objects as well as archaeological remains from the former Devonshire Street Cemetery. During removal of an area of recent fill a brick structure was identified. Archaeological excavation focused on clearing the area and the structure was revealed to be rectangular in shape with evidence of partial filling by brick demolition rubble. A human pre-molar was found in the sieving residue on the 15<sup>th</sup> January 2019 and excavation ceased. This structure has been referenced as 'Vault 2'.

Further excavation in the area identified several grave cuts into the underlying natural clay (Figure 19). Wet sieving of material from Aboriginal test pits excavation throughout this area also identified human remains, in the form of small fragments of bone, mostly less than 1cm, captured in a 3mm mesh sieve. The fragmentary human remains were identified as having their origin in a light-grey sand deposit that appears to be a redeposited and highly disturbed remnant from the original Botany Sands that extends over much of the Stage 2 test area.

The sand was found to overly a yellow clayish sand which is a natural deposit. In turn this layer overlies a grey clay with extensive red mottles which rests on a shale deposit. This stratigraphic sequence occurs over the majority of the northern portion of the Station Box site. This possibly reflects the historic process of cutting down of the sandhills and levelling the Central Station site with fill (presumably from the sandhills) to make a level surface for the railway lines and platform<sup>44</sup>.

The results of the early archaeological investigations have further reinforced the assumption that the ground-surface within the former Devonshire Street Cemetery undulated considerably, and this has led to differentiating levels of preservation throughout the Central Station site.

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<sup>44</sup> The project team includes Dr Sam Player, geomorphologist who is assisting in determining the stratigraphic sequence across the station box site.

Figure 18: Results of Test Trenches One and Two. G. Hazell 2019



Figure 19: Ortho of the excavations showing the base of grave cuts and excavated vaults. G. Hazell 2019

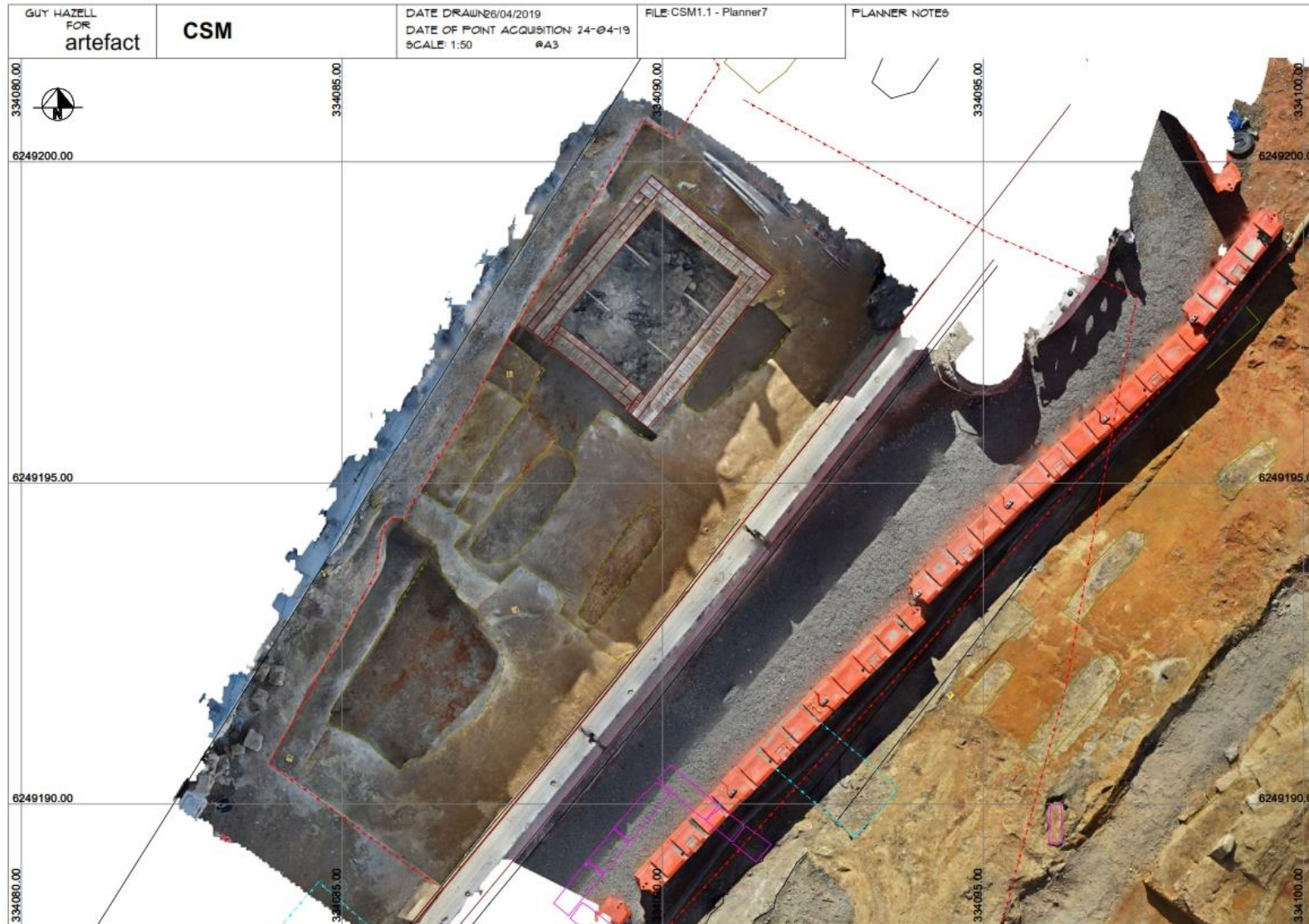
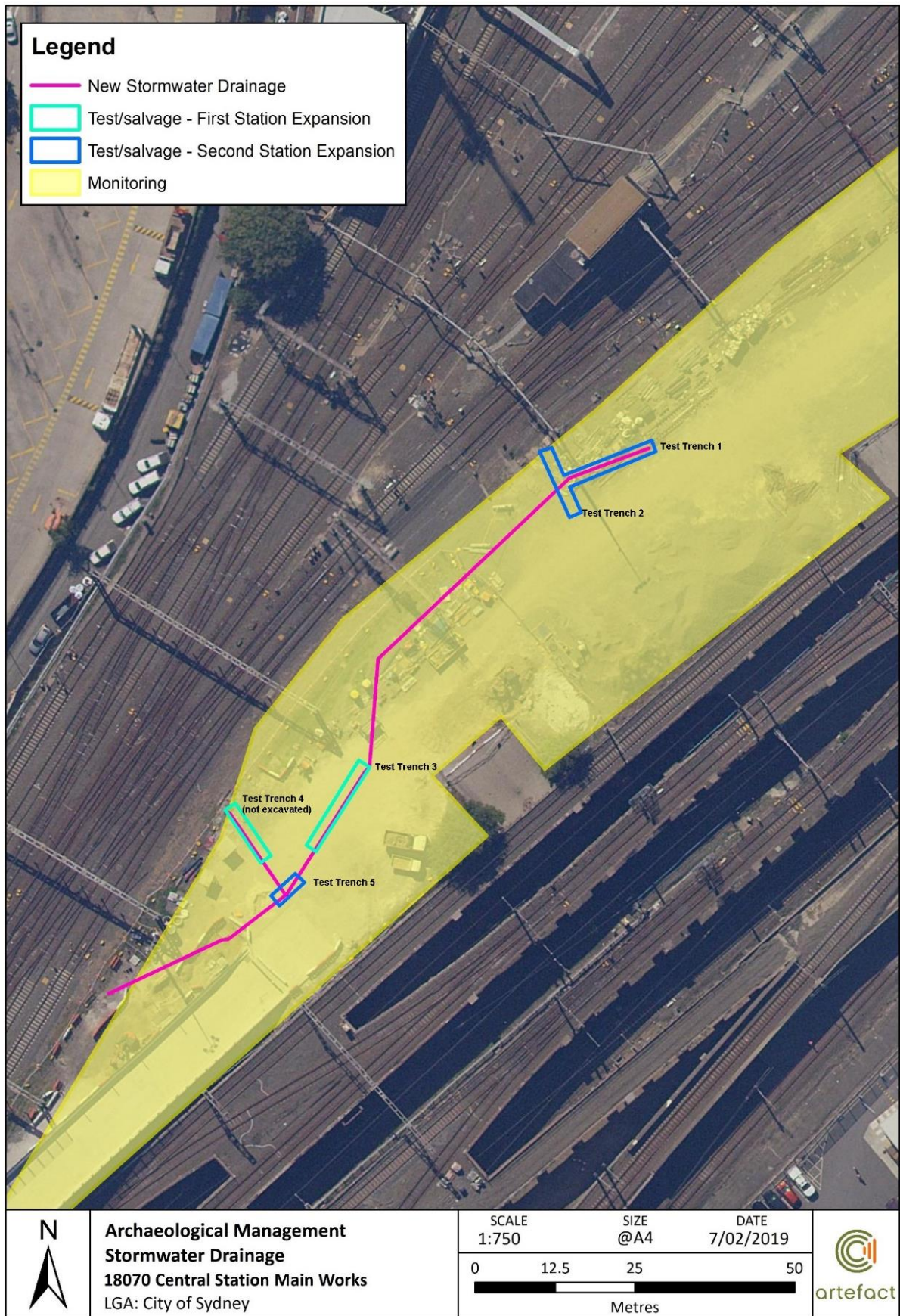




Figure 20: Location of testing undertaken for CSMW drainage works



### 4.1.2 Sydney Yard Access Bridge (SYAB) – Artefact Heritage

Artefact Heritage were engaged by Laing O'Rourke to archaeologically manage construction activities for the SYAB, which is part of the Sydney Metro City & Southwest – Chatswood to Sydenham project. The construction of SYAB involved excavations within Sydney Yard in AMZ CS 4. Monitoring works in November 2017 uncovered brick remains of a former structure, likely associated with the 'Railway Shop' which was part of the 'second station' development phase of Central Railway Station. The remains were recorded with only a minor portion removed (one course of bricks) and assessed as being of local significance. Access pits to drains and footings of stanchions associated with the third phase of construction of Central Station in the twentieth century were investigated, recorded, and removed. These were assessed as not meeting the threshold for local significance.<sup>45</sup>

### 4.1.3 CBD and South East Light Rail (CSELR) – Artefact Heritage and GML

Artefact Heritage were engaged by Acciona to archaeologically manage investigation and construction activities for the CBD and South East Light Rail (CSELR) project. The utility and civil works involved excavations within the Former Radio Workshop of Central Station, and within the road corridors of the surrounding streets.

In late October and early November 2018, two sets of human skeletal remains were unexpectedly discovered in Fee Zone 14. The first at the corner of Elizabeth Street and Chalmers Street, Surry Hills (Site 1), and the second near the junction of Chalmers Street and Randle Street, Surry Hills (Site 2). Upon discovery works in the area ceased and the loose remains were recovered and lodged with the NSW Coroners Court for assessment. Once it had been determined that the remains were likely associated with the Devonshire Street Cemetery a permit was approved to investigate and exhume additional potential remains. The investigations of the two sites were undertaken in March and April 2019. The investigations identified the remains of an *in situ* coffin at Site 2, containing additional skeletal remains. A possible grave cut was identified at Site 1, though no *in situ* remains were identified. Instead the soil primarily consisted of fill containing loose skeletal remains were recovered from the fill. To date no other skeletal remains have been uncovered outside of these two isolated areas.

The investigation at Site 2 identified an intact section of the Botany Sands, confirmed by Geomorphologist Dr Sam Player. Although intact Botany Sands were not identified at Site 1, redeposited sands were evident in the fill. However, an inspection of the stratigraphy outside the buildings on the east side of Chalmers Street confirmed that no evidence of the Botany Sands was present, and the soil quickly came down onto virgin shale. This demonstrated that the Botany Sands likely only survives in discrete pockets in the area.

On 15 May 2019, on the western side of Chalmers Street, approximately 8m south of the pedestrian crossing from Chalmers Street to Elizabeth Street, a sandstone feature was identified that was preliminarily interpreted as being a possible burial.<sup>46</sup> In addition to the sandstone feature (Figure 17) a human tooth was recovered during the sieving of the soil above it. Redeposited Botany Sands were also identified in the vicinity, further reinforcing the likelihood that the find is a burial associated with the Devonshire Street Cemetery.

In March 2018 a sandstone structure was identified on the west side of Elizabeth Street during trenching for the installation of a conduit alignment. The feature was identified as likely representing the remains of the boundary wall of the former Devonshire Street Cemetery. The remains were

<sup>45</sup> Artefact Heritage December 2017. *Memo – Archaeological monitoring summary report*; Artefact Heritage September 2018 *Sydney Yard Access Bridge Construction Project Excavation Directors Report*

<sup>46</sup> Artefact Heritage May 2019. *Memo – Section 146 Notification of Relics*



assessed as potentially being State significant and a s146 notification was provided to the former NSW Heritage Division (now Heritage DPC).

#### 4.1.4 Lee Street Turntables and First Station archaeology – AMAC

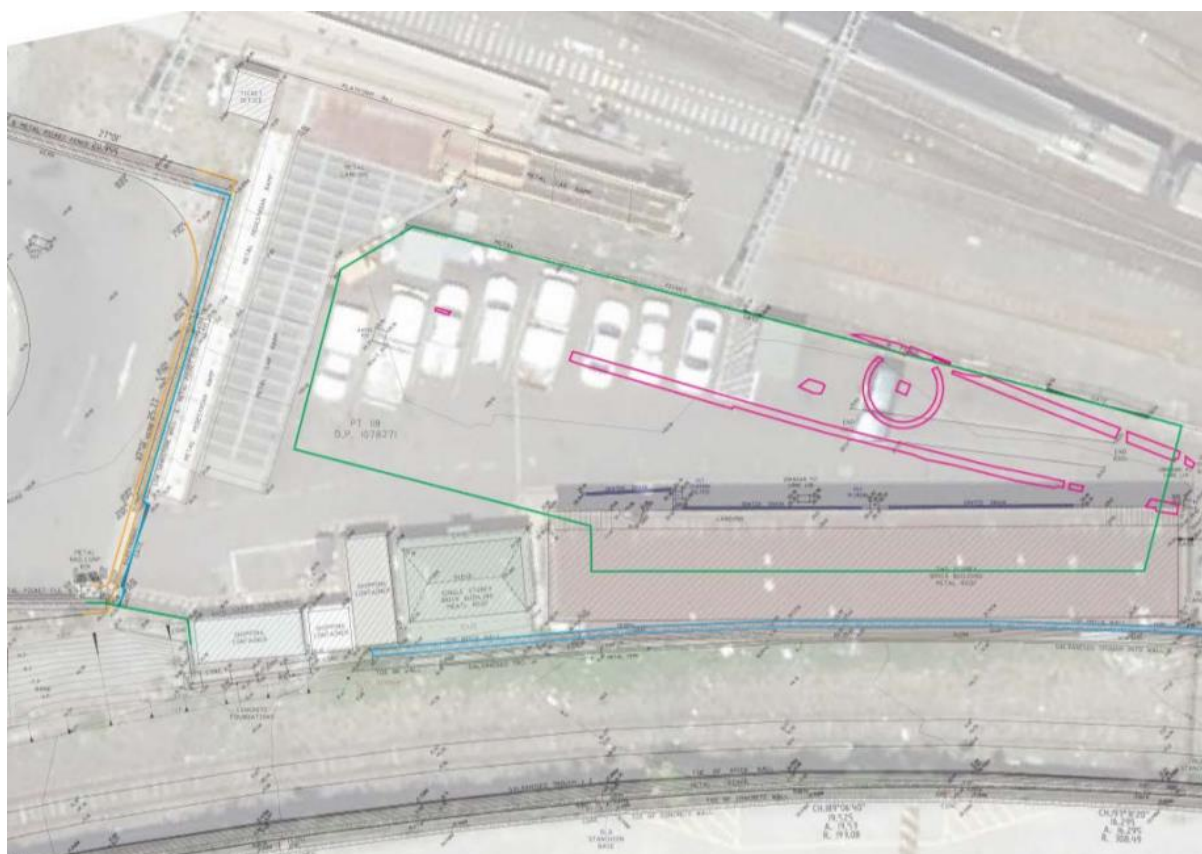
From September to November 2016 archaeological monitoring was undertaken of excavation work undertaken for the Lee Street Substation site. Footings of a platform and remains of a turntable were identified.<sup>47</sup>

The key archaeological remains identified were parallel brick footings which seem to relate to an extension of the platform associated with the Second station period and the expansion of passenger facilities c1880's. The platforms are shown on the 1884 City of Sydney Detailed Series map.

Based on stratigraphic evidence, the turntable dates from before the platform construction. The turntable appears to have been decommissioned prior to the construction of the Second Sydney Station in the 1880s.

The implications of these results are that archaeological remains from the first and second station eras can survive despite the main structures being demolished and built over by later railway infrastructure.

**Figure 21: Overlay of the former survey plan, Six Maps aerial and the survey of archaeological results. J. Baloh for AMAC, November 2016.**



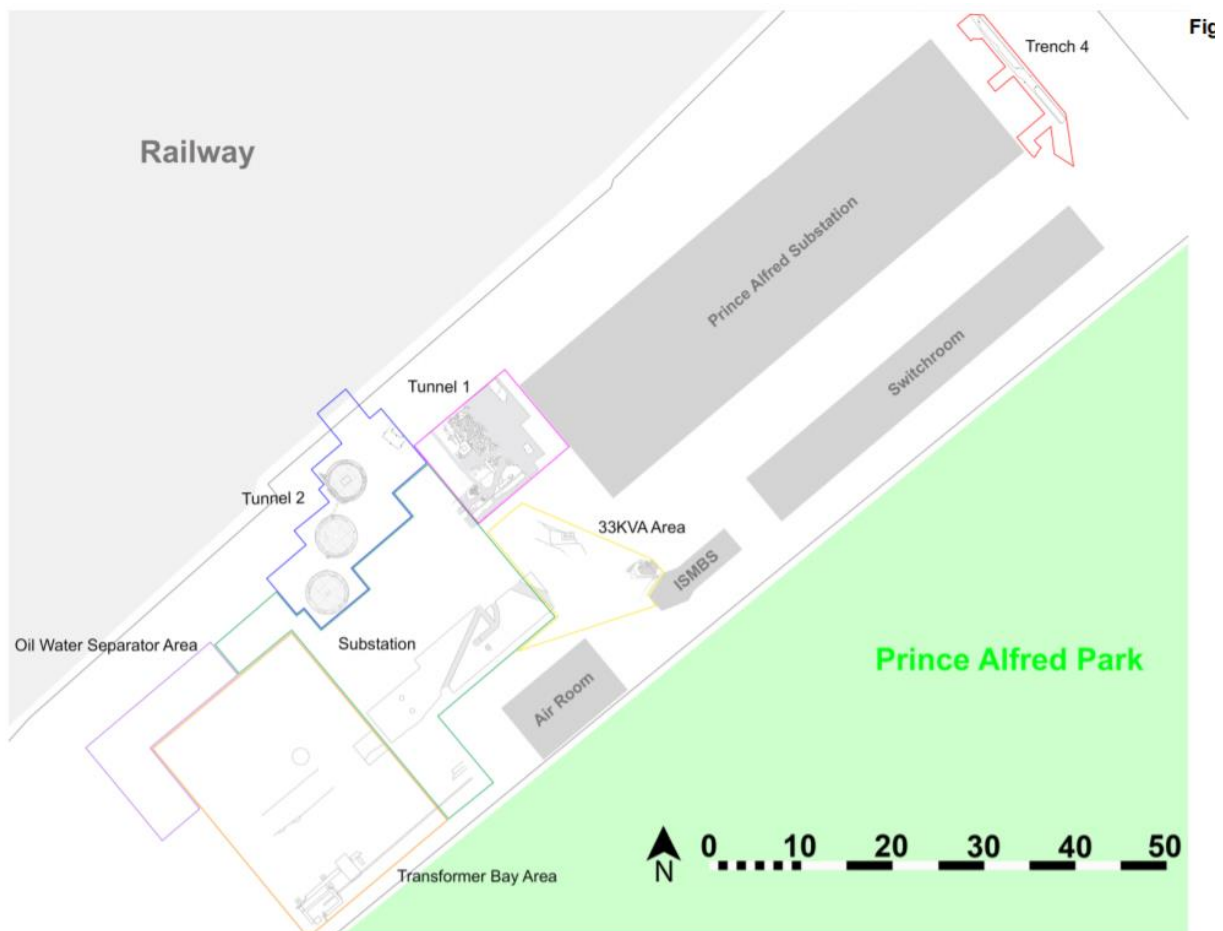
<sup>47</sup> AMAC Group 2016 Archaeological Assessment and s60 Permit Application Chalmers Street Substation, Report for Abergeldie on behalf of Transport for NSW

#### 4.1.5 Chalmers Street Turntables – Archaeological Management & Consulting Group (AMAC)

AMAC undertook archaeological integrations within the Chalmers Street substation site between 2016 and 2019. The majority of the site was found to be heavily truncated and a vast number of services have left the archaeological record in a fragmentary state. Three c.1870 wagon turntable footings, a sandstone crane foundation and counterweight from the Second Sydney Station phase were salvaged. Other relics retained in situ were a c.1855 well shaft, c.1855-1865 culvert, pit and sandstone wall footings associated with the First Sydney Station phase. Second Station phase relics that were recorded and removed included macadam sandstone road base, late 19th century buffer stops and a disturbed sandstone footing for the 1870 Goods Shed (Figure 22).

One of AMAC’s areas of investigation, referred to as Trench 4 (see Figure 22), is in close proximity to proposed CSR excavation works. This trench was found to contain disturbed basalt stone paving and a concrete slab associated with construction of the Prince Alfred Substation, constructed c.1925. These features were located above a deep natural clay fill, suggesting that the areas had been heavily disturbed during construction of the substation. Several 20<sup>th</sup> century services were also identified. It was concluded that Trench 4 had been subject to mass excavation and re-filling, likely as a result of the c.1925 demolition of the 1870 Goods Shed and the construction of the Prince Alfred Substation, Switch Room and their associated services. As such, the entire area was considered a disturbed 20th century context and no evidence of 19th century activity was encountered.

**Figure 22: Overview of archaeological results. Source: AMAC June 2019.**



## 4.2 Geotechnical testing

The AARD stated that:

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*Geotechnical investigations conducted for the Sydney Metro project have shown that underneath the rail corridor between platform 15 and 16, local Quaternary sands are present at a depth between 0.6 metres and 1.7 metres. These sand deposits are up to 3.6 metres thick. The degree to which these sand deposits represent imported or redeposited local sand as fill or back-fill, or in situ Tuggerah sands, is unknown.*

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Additional geotechnical works, with an extensive number of boreholes across the station box area were completed in 2018 and present an altered interpretation of the subsurface nature of the site.

On the eastern side of the footprint of the former cemetery, adjacent to the Central Walk study area, geotechnical investigations have shown that the area consists of modern fills directly overlying Ashfield Shale (Figure 23). Whilst unlikely, there is some potential that residual pockets of intact sand, with unexhumed burial remains, may exist. Excavation works for the construction of the east concourse would involve horizontal excavation to a depth of up to 6 metres below the Chalmers Street level.

### 4.2.1 Shale soil transition and location of the Botany sands

It was assumed based on the results of earlier geotechnical testing that the shale soil transition was close to the western edge of the station box, and potentially outside the project area. The latest geotech work undertaken as part of the CSMW identifies the Ashfield shale transition with associated residual soils in the majority of the CSMW study area, across the northern half of the station box and extending to the north of the Devonshire Street tunnel around the southern branch of the pedestrian tunnel. The shale is overlain by some residual soils, varying in depth, but in some places close to the surface and likely to be overlain only by ballast fill.

A layer of Quaternary sand is identified in the geotechnical results extending for around 40m south of the Devonshire Street tunnel at around 10m depth. This is overlain by redeposited fill which may represent the infill of the former creek line as well as fill put in place during the construction of the tunnel and levelling of the cemetery.

There is no clear evidence in the geotechnical results of intact dune formations that are associated with the Botany Sands formation. It is possible that the Botany Sands proper did not extend into the study area, and that the sand hills, on which the cemetery was located were formed by the progression of mobile dunes into the study area after deforestation. This would be consistent with the historical accounts of windblown sand around the brickfields nearby.

Once the cemetery was in place the dune landscape would have become more stable with the construction of retaining walls around the cemetery, cemetery infrastructure and vegetation (grass and the occasional larger trees as evidenced in historical photos).

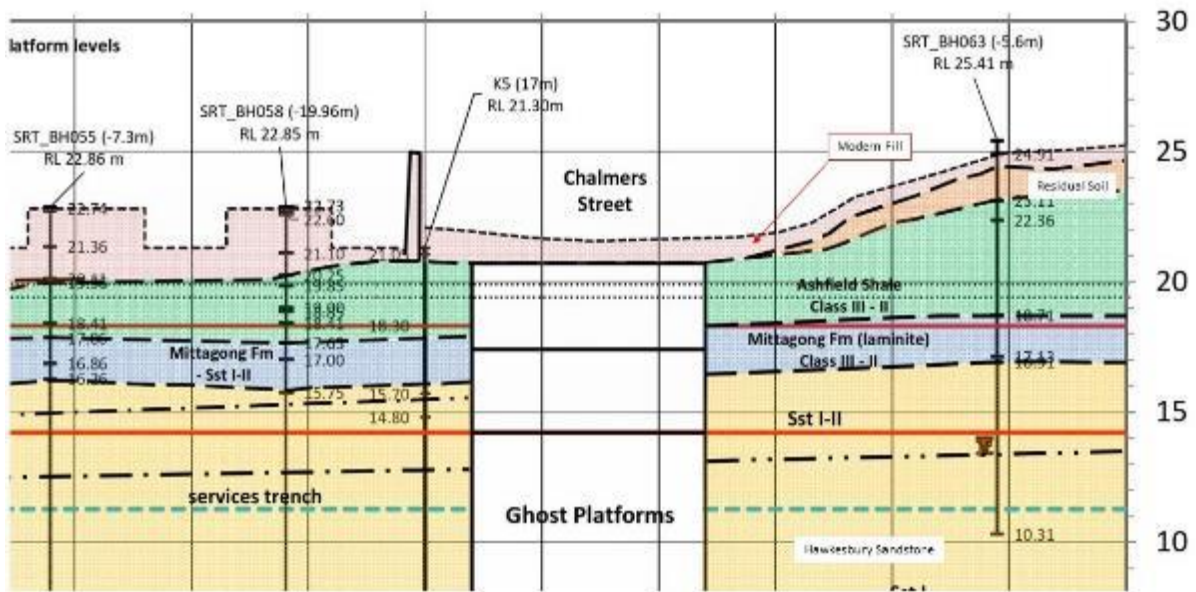
### 4.2.2 Location and nature of fill and re-deposited soils

The geotechnical testing has confirmed that fill was located across the CSMW site. The testing data did not clearly differentiate between fill that may be of archaeological value and that which is modern ballast fill or imported fill with no archaeological potential.

The nature of topsoil movement and fill introduction, especially to the north of the Devonshire Street Tunnel at the site of the former cemetery, is unknown. Historical photos suggest that large amounts of sand were moved to the south as the cemetery was cleared and in some photos clay is obviously present (testified to be the deep wagon ruts). This is consistent with the geotechnical testing results which show residual soils (silty clay with high plasticity) below the ballast, or layers of sand/gravel fill.

Excavation works for the CSMW have identified pockets of brown/grey sand in several locations. This has been interpreted as being material mixed and redeposited during resumption of the Devonshire Street Cemetery. Where this sand exists, it often contains fragmented human and other artefactual remains.

**Figure 23: Geological cross section of Central Station, detail of Central Walk study area, in the vicinity of the unused Eastern Suburbs Railway platforms.**



### 4.3 Revised assessment of archaeological potential

Archaeological resources associated with the following phases of development have the potential to be located within the CSR footprint:

- Devonshire Street Cemetery
- First and second Sydney railway terminals
- Third (current) railway station

#### 4.3.1 Devonshire Street Cemetery

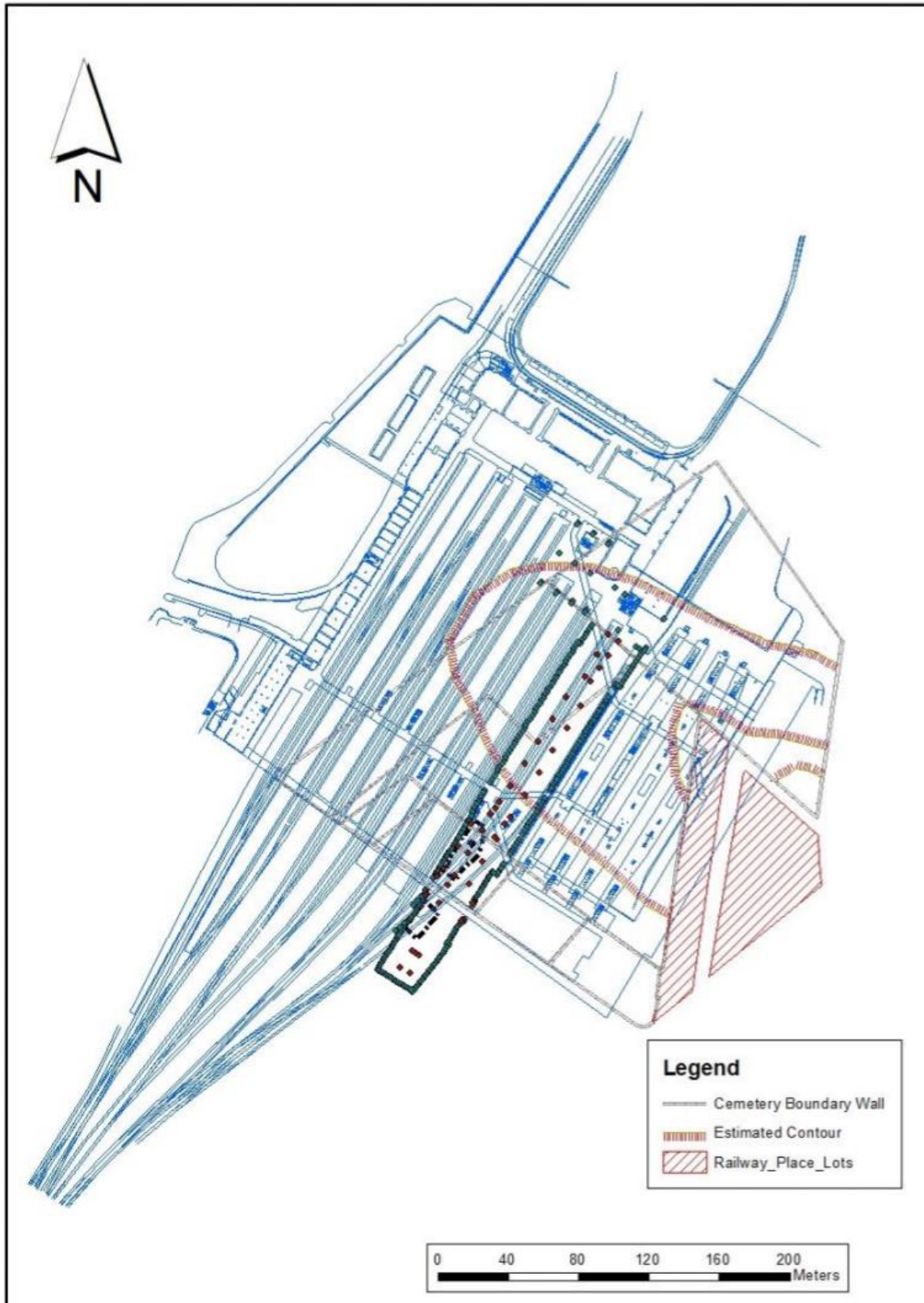
Excavation works for the CSR within the boundary for the former cemetery are primarily within cable tray (i.e. no in-ground impacts), with the exception of two service pits to be excavated adjacent to the Devonshire Street Tunnel, within the former Jewish portion of the Devonshire Street Cemetery.

Archaeological investigation undertaken by Artefact Heritage for the CSMW has confirmed that the cemetery resumptions in 1902-3 were in places incomplete. The work has identified burial vaults, grave cuts, articulated skeletal remains and disturbed Botany Sands containing fragmentary skeletal material. The excavation has confirmed that the potential for cemetery archaeology to be preserved varies considerably, and survival of remains is largely dependent on the historical topography of the area (see Figure 24). However, due to the extensive impact to the area for construction of the



Devonshire Street Tunnel, the two service pits have limited potential to encounter in situ archaeological remains associated with the Devonshire Street cemetery.

**Figure 24: Approximation of the historical contours of the Devonshire Street Cemetery and Railway Place. Iain Stuart/Artefact Heritage 2018.**



### 4.3.2 First and second railway stations

During this phase land use is predominantly associated with the development of Sydney's first railway station and the expansion of the railway station. Earthworks and industrial rail infrastructure developed on the site at this time. Road building and grading occurred in the area as nearby subdivisions were laid out and built on. Construction of early water and sewerage infrastructure also occurred. The growth of Central Station during this phase involved the progressive increase in railway lines and accompanying rail infrastructure across the site. Archaeologically recognisable items would include rail beams, sleepers and ballast; signalling equipment and rail point technology. The latter pieces of equipment, if preserved, would provide a potentially datable technological assemblage. These technological changes would assist in individuating phases of the intertwined and interconnected development of rail infrastructure at the station.

Limited excavation works are required within the areas identified as having potential to contain archaeological remains associated with the first terminal and second station expansion. Works include installation of a new pad mount substation, NDD for GST installation and the excavation of service pits and trenching.

Communications and HV trenching and the installation of GST posts are required around the entire perimeter of the Lee Street substation, which was archaeologically investigated by AMAC in November 2016 (AMAC 2016; Figure 21). AMAC identified that this area contained two north-south oriented brick footings dating to the late 19<sup>th</sup> century and second station phase. The remains were interpreted as representing the southern extent of former Platform 1. Trenching in this area has the potential to encounter additional remains associated with the extension of the former platform.

The CSR will require trenching and installation of GST for communications and HV within Sydney Yard. Archaeological investigation undertaken by Artefact Heritage as part of the CSMW has identified that the yards have high archaeological potential to contain significant archaeological remain from the 1<sup>st</sup> and 2<sup>nd</sup> Station periods. The trenching and service pits for Central Walk are within an area previously occupied by an engine shed associated with the first station phase, a fitting shop during the second station phase and feeder tracks for the turntable identified during testing during the CSMW. It is expected that the trenching works will encounter archaeological remains associated with these buildings.

A trench will be excavated through the driveway of the Railway Institute (north and adjacent to the Prince Alfred Substation). During the second station phase this area contained the brick goods sheds. Excavation undertaken by AMAC between 2016-18 indicates that this area had been subject to mass excavation and re-filling as a result of the c.1925 demolition of the 1870 Goods Shed and the construction of the Prince Alfred Substation, Switch Room and their associated services. As such, the entire area was considered a disturbed 20<sup>th</sup> century context and no evidence of 19<sup>th</sup> century activity was encountered. These results, in combination with the current utilities plans for the area, indicate that the CSR excavation in this location is unlikely to encounter archaeological remains of the goods shed.

Trenching works are also required to the north and south of Mortuary Station, approximately 40m north-east of an area excavated by Artefact Heritage prior to the construction of the SYAB, connecting into the existing SYAB pad mount. A small outbuilding potentially associated with the former Wesleyan Chapel was identified in this area. The trenching will be located in an area used as mortuary station railway line in the later 19<sup>th</sup> century, until its decommissioning. The area is unlikely to have contained structural remains.

The expansion of Central Station in the early twentieth century involved the removal of prior station platforms and their replacement with the current alignment of platforms 1 – 23. Investigation undertaken by Artefact Heritage for the CSMW to date has identified that platforms 12/13 and 14/15

have been constructed with an arched concrete base and brick superstructure which form the platform edges. The concrete base has been constructed into the underlying natural deposits, whilst the area between the platform faces has been filled. This internal fill rests at a higher level than the concrete arch base, sitting on top of the underlying natural soil. In-platform excavation works required for the Central Walk project have some potential to encounter earlier platform infrastructure within the existing platform fill. Archaeological remains associated with nineteenth century platforms would consist of brick and concrete footings and walls. Remains of former station signs, canopy pylons and supports could also be present.

### 4.3.3 Earlier phases of the third (current) Central Railway Station)

The large-scale expansion of Central Station in 1906 – 1926 involved extensive excavation works and the construction of the present structures on the site today. Archaeological remains associated with this phase of construction may be present. The present-day above-ground railway platforms were completed by the 1920s, although they have been subsequently altered and extended since their original construction. Alterations include the excavation and construction of new below-platform utility services and several phases of resurfacing and platform elevation adjustment. In particular, renovations to the station platforms during the 1990s laid several courses of brick to increase the height of the platforms.

Early twentieth century services such as terracotta drain pipes which have been identified through NDD during the CSMW early works could also be present.

Other archaeological remains could consist of twentieth century access pits to drains, rail infrastructure, stanchion pads, loose rail and sleepers, rail bolts, and disused signalling equipment.

### 4.3.4 Summary of potential archaeological remains

Archaeological potential is defined by the NSW Heritage Office Archaeological Assessment Guidelines<sup>48</sup> as 'the degree of physical evidence present on an archaeological site'. This section draws on the above historical analysis to consider archaeological potential of the study area.

Archaeological potential can be subdivided into the following categories, based on the likely occurrence of archaeological material:

- High Potential - areas with known archaeological remains;
- Moderate Potential - areas that may have archaeological remains based on other lines of evidence such as maps or documents;
- Low Potential - areas that are likely to have minimal archaeological remains based on analysis of known or likely disturbance;

Based on historical information, land use data and evidence of sub-surface impacts, a summary of the potential archaeological remains in the CSR footprint are provided in Table 2 below.

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<sup>48</sup> Heritage Office 2009

**Table 2: Summary of potential archaeological remains at the Central Walk study area**

Phase	Types of remains	Potential	Works with the potential to impact remains
Devonshire Street Cemetery	Potential archaeological remains such as skeletal material, coffin furniture, personal items such as jewellery and clothing, coffin timber, disarticulated human skeletal material and artefacts. Redeposited sands also have the potential to contain fragmented human remains and artefacts.	Low	In-ground works with low potential to encounter remains of the cemetery include: <ul style="list-style-type: none"> <li>Service pits adjacent to Devonshire Street Tunnel</li> </ul>
First and Second Railway Station remains	This area was predominantly the location of the main rail sidings and train storage areas, including the locomotive shops, carriage shop, fitting shop, blacksmiths shop, and repairing shop. Buildings consisted of stone, wood and brick train sheds and workshops, of which former footings and discarded industrial objects are likely to be present. Rail siding lines also present, likely partially remaining below modern ground surface.	Moderate	In ground works with low potential to encounter remains associated with the First station phase platform 1 include: <ul style="list-style-type: none"> <li>Installation of pad mount substation and HV trenching south of the Lee Street substation</li> </ul> In ground works with low potential to encounter remains associated with the First Station phase include: <ul style="list-style-type: none"> <li>Communications and HV trenching to the north of the Lee Street substation</li> </ul> In ground works with low potential to encounter remains associated with the Second Station phase include: <ul style="list-style-type: none"> <li>Communications and HV trenching to the north of the Lee Street substation</li> </ul> In-ground works with low potential to encounter remains of the Second station phase Goods Sheds include: <ul style="list-style-type: none"> <li>Communications and HV trenching in Institute Drive</li> </ul>
First and Second Railway Station remains	This area was predominantly the location of the main rail sidings and train storage areas, including the locomotive shops, carriage shop, fitting shop, blacksmiths shop, and repairing shop. Buildings consisted of stone, wood and brick train sheds and workshops, of which former footings and discarded industrial objects are likely to be present. Rail siding lines also present, likely partially remaining below modern ground surface.	High	In ground works with high potential to encounter remains associated with the First station phase Engine Shed and Second station phase Fitting Shops include: <ul style="list-style-type: none"> <li>Communications and HV trenching, GST NDD and service pits in the Sydney Yard</li> </ul>
Third Central Station	Potential archaeological remains include twentieth century access pits to drains, terracotta pipes, rail infrastructure, stanchion pads, loose rail and sleepers, rail bolts, and disused signalling equipment.	Moderate	In-ground works with moderate potential to encounter remains of the third station include: <ul style="list-style-type: none"> <li>Communications and HV trenching and service pits</li> </ul>



## 5.0 ARCHAEOLOGICAL SIGNIFICANCE

### 5.1 Assessment of significance

The following statements of archaeological significance have been adapted from the AARD. The results from the SYAB project, and the results from the early works monitoring for CSMW have also informed the assessment of the level of significance of potential archaeological remains within the study area. A reassessment of significance would be provided in the Final Excavation Report once the nature of finds is known and the research question have been addressed.

#### 5.1.1 Devonshire Street Cemetery

The Devonshire Street Cemetery was the second formal burial ground established in the colony in 1820 and continued in use until the 1860s. Despite the cemetery's exhumation and levelling in 1901 and 1902, as well as the lack of evidence that human remains have been located or recovered since the cemetery was exhumed, it is possible that some remnants of human remains, coffin furniture or headstones may be present, although most likely to be fragmentary and in re-deposited fill.

Archival records can supply some information on the identities of the people who were buried at the cemetery, however this record may not be complete. Pauper's graves and lacunae within the historical record may mean that some interments are incompletely documented. The division of the burials into separate congregational areas may have material distinctions between the burial evidence of the graves. Forensic, osteological and isotopic analysis of skeletal remains can yield information about the health and diet of the interred, information which is not available from other sources. Burial ornamentation such as tombstones and tomb structures provide valuable symbolic evidence of funerary practices and attitudes towards death. These types of symbolic values are understood for wealthier burials from historic records, however the large number of poor or historically unmentioned people in the early colony are not as clearly understood from archival records. Burials from the period of the early colony at around 1820, particularly during the convict period (before 1840), and up to 1865 when the cemetery closed, are rare and highly valuable archaeological resources.

Legible in situ archaeological remains associated with the Devonshire Street Cemetery would be State significant under Criteria A, D, E and F.

#### 5.1.2 First and second railway station expansion

The first railway station at Central (then Redfern Station) represents the terminus of the second railway in Australia and the first railway in New South Wales. The construction of this railway, station, and associated buildings was considered a significant event in the colony at the time, as demonstrated by the crowds that turned up for both the beginning of construction of the station and for the first train trip at the station. The technology to construct locomotives and railway infrastructure in the 1850s is relatively rare compared to the majority of rail infrastructure apparent today, which is predominantly of a later period of manufacturing. Material evidence of the buildings associated with the first railway station, such as the Engine Shop, would be State heritage significant because of their potential research and technical value, and historical connections with the development of infrastructure in NSW.

Archaeological remains associated with the second railway station, including material evidence of the Fitting Shop, would also have historical associations. The second railway station was the central terminus of the expanding railway network in the 1870s. By the 1870s when the second station was constructed, railway networks had been established in rural areas in order to transport goods, particularly wool, to Sydney ports for export. As the terminus point and one of the principal

maintenance stations for the goods rail network, archaeological remains associated with the second railway station could have historic, associative, technical values and research potential.

A number of carriage sheds and workshops were constructed in the study area, dating from the first station (1850's) and second station. stone and brick Footings related to these buildings in this area may exist below the present Sydney Yard and adjacent to the Prince Alfred Substation. Intact remnants of some of these buildings may represent some of the earliest material evidence of railway infrastructure in Australia. Residual rail infrastructure such as signalling equipment and railway point switches could provide evidence of continuation of use of the station, as well as evidence of technological change over time. Archaeological remains would have historical and associative significance and, if relatively intact, could provide information about railway functions and engineering at the advent of the rail industry in NSW.

Should intact and extensive remains be present, these would be of State significance (Criteria A, E and F).

### 5.1.3 Earlier phases of third (current) Central Railway Station

Archaeological remains associated with buried infrastructural elements of the third railway station, are examples of the frequent upgrading of the technology and the continual alteration of the railway station. Former rail lines and building footings associated with post-1906 construction are unlikely to meet the threshold of local heritage significance.

Intact structures of the original platform surfaces for the third Central Station would meet the threshold of local significance (Criteria A and C).

## 5.2 Summary of significance potential archaeological remains

The following section outlines the potential archaeological remains for each site code within the study area and archaeological significance and has been divided by phase. It has been adapted from the AARD<sup>49</sup> and further refined through detailed historical research. A summary of archaeological potential is illustrated in Figure 25.

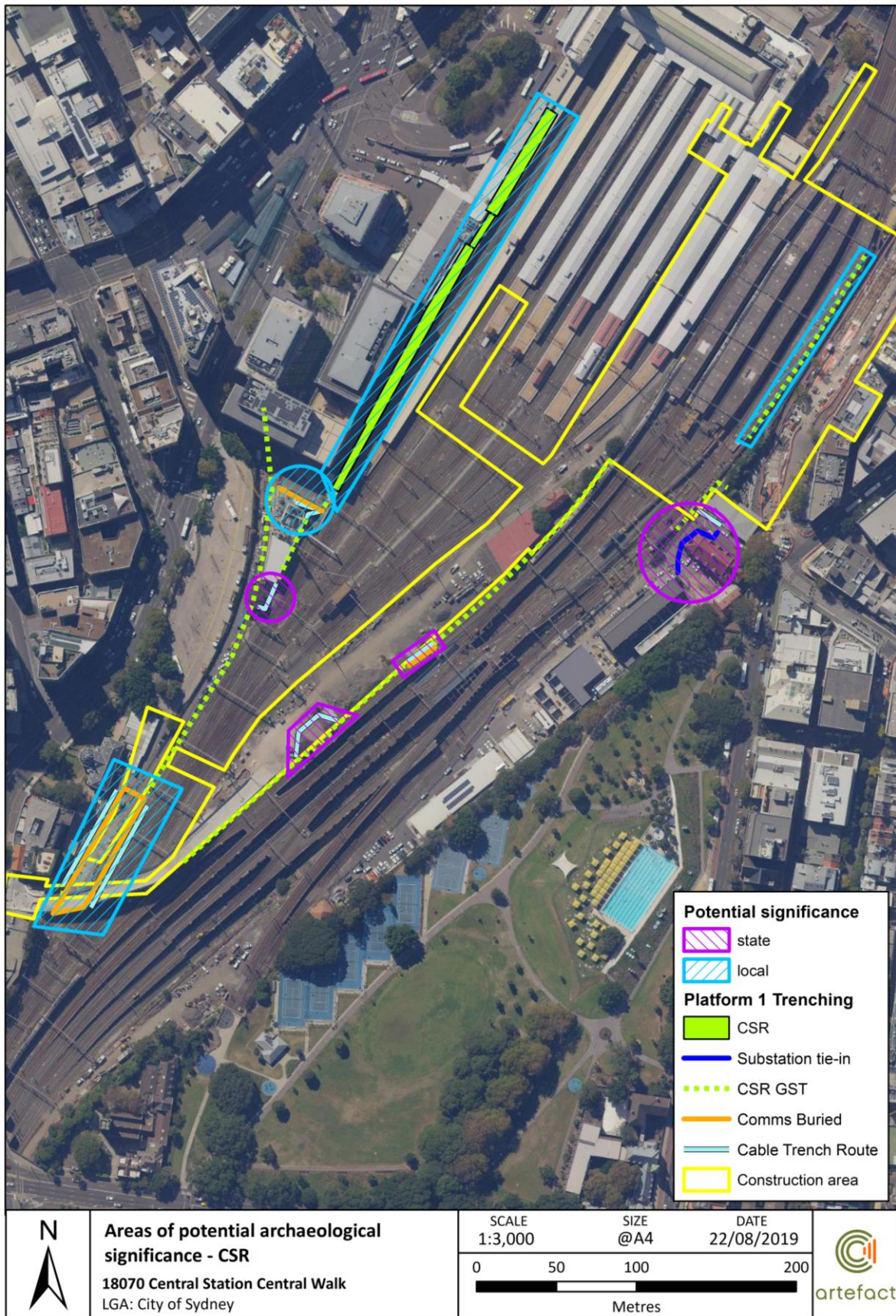
**Table 3: Summary of significance of potential archaeological remains at the Central Walk study area**

Date	Archaeological resource	Potential	Significance
1820 - 1865	Devonshire Street Cemetery	Low	State
1855 - 1874	First and second railway station	High	Local/State
1900 - present	Third Central Station	Moderate	Local/no significance

<sup>49</sup> Artefact 2016a



Figure 25: Areas of potential significant archaeology within Central Walk excavation areas



## 5.3 Research design

Archaeological resources within the study area have the potential to respond to a number of current research themes. Excavation for the Central Walk project has the potential to further refine our understanding of the development of the early landscape, the Devonshire Street Cemetery and Central Station. Additional research questions may be added if the archaeological resource allows for further, or more in-depth, investigation.

The archaeology within the study area has the potential to contribute to research areas such as:

- Social history and burial practices
- Environmental factors and scientific analysis
- Industrial archaeology
- Landscape archaeology

The ARD presented a number of research questions. As there is low potential for the Central Walk works to encounter intact remains associated with the Devonshire Street Cemetery, research questions relating to this phase have not been reproduced below. Refer to the ARD for these research questions.

Additional questions have been added in response to the potential archaeological resource within the Central Walk study area, primarily associated with Railway Place residences and data relating to the formation of the early 20<sup>th</sup> century landscape post-1903 resumption

### 5.3.1 Infrastructure associated with the first and second Central Railway Station

The area to the south of the Devonshire Street tunnel was originally occupied by the first and second railway stations and the infrastructure which supported the station function is located within the study area. Archaeological remains of these structures could provide information related to the development of the rail industry. Evidence could include building footings, refuse pits relating to industry, postholes from timber structures, and flooring surfaces. Evidence of the development of the rail industry within the study area would relate to the NSW Historic Theme of 'Industry', 'Technology', 'Transport', and 'Utilities'.

#### *Industrial archaeology*

- Are there intact remains of the first and second Sydney railway stations below the rail corridor? Are these remains legible?
- Has the development of Central Station over time, particularly construction works associated with the building of the third (current) station, completely removed earlier archaeological deposits associated with the first and second stations?
- Can archaeological evidence of former structures from the first and second railway stations be discriminated from later post-1906 building adaptations?
- Is there archaeological evidence before 1906 of the changes in use of former goods sheds, engine workshops and fitting shed if they were converted into other types of station buildings?

It is possible that miscellaneous finds of railway infrastructure could be recovered most of this will be of little archaeological research potential, however if pre-1915 items of rail are recovered these may have some archaeological research potential for technological information regarding the evolution of



rail design and the nature of rail imported into Australia prior to the establishment of BHP as an Australian based rail supplier.

### 5.3.2 Third Station expansion

The study area currently occupies the third Central Station and has undergone continuous expansion and upgrades since it was constructed in 1906. Archaeological remains relating to the third station expansion may provide evidence of the rapid technological development of the rail industry in the early twentieth century. Evidence may include earlier drains, culverts and structural remains associated with earlier workshops, rail sheds and offices.

Evidence of the development of the rail industry within the study area would relate to the NSW Historic Theme of 'Industry', 'Technology', 'Transport', and 'Utilities'.

### 5.3.3 Transformation of the landscape of the Cleveland Paddocks

At the end of the project, enough archaeological evidence should have been collected to document the transformation of the pre-colonial landscape which was known as the Cleveland Paddocks into Central Station and the Sydney Yard. The archaeological research aim would be to document this transformation utilising information collected in the course of the project to answer questions about the transformation of this landscape. Evidence of the transformation of the landscape of the Cleveland paddocks would relate to the NSW Historic Theme of 'Environment – cultural landscapes'.

- Was the original landscape sandhills, and how far did they extend?
- What was the original drainage and how were the creeks transformed?
- What evidence of excavation and transformation (such as levelling) is there?
- Is there any evidence of the original vegetation on the site?

## 6.0 WORK STAGE SPECIFIC ARCHAEOLOGICAL METHODOLOGY

### 6.1 Introduction

A complete series of archaeological methodologies for the approved project has been previously produced in the ARD.<sup>50</sup> The following section includes methodologies to be adopted during management of archaeological resources for the CSR. These have been defined in Table 4, and illustrated in Figure 26.

**Table 4: Definition of archaeological methodologies**

Methodology	Definition
Monitoring and recording	<p>Archaeological monitoring is where an archaeologist is in attendance and supervising construction excavation work with potential to expose or impact archaeological remains.</p> <p>Monitoring is generally undertaken where there is lower potential for significant archaeological remains and/or where minor excavation work is in an area of archaeological sensitivity.</p> <p>If archaeological remains are identified during monitoring, they would be excavated and recorded by the site archaeologist</p>
Test excavation	<p>Archaeological test excavation is typically undertaken prior to impact, in areas where the survivability of the archaeological resource is unknown.</p> <p>The process of archaeological testing will involve the manual excavation of defined areas once overburden has been removed by machine. Manual excavation would be undertaken using hand tools, by a qualified archaeological team.</p> <p>On completion of archaeological testing, archaeological management of the area during excavation can be finalised i.e. movement to salvage excavation or a monitoring methodology</p>
Salvage excavation	<p>Archaeological salvage refers to open-area archaeological excavation under the control of the Excavation Director undertaken prior to impact. Salvage includes the horizontal excavation of the entire historical archaeological site.</p> <p>Manual excavation would be undertaken using hand tools, by a qualified archaeological team.</p>

### 6.2 Archaeological management of specific work stages

It is proposed that management of the potential archaeological resource include the following processes. These have been illustrated in Figure 26 and Figure 27 and discussed further below.

- Archaeological testing of excavation works for the installation of HV and Communications and construction of pad mount to the south of the Lee Street substation and in the Sydney Yards
- Monitoring of trenching for HV and Communications south of Mortuary Station, at Lee St substation, adjacent to the Devonshire Street tunnel entrance and within driveway of the Railway Institute.

<sup>50</sup> Artefact Heritage 2016a, chapter 12

### 6.2.1 Archaeological testing for pad mount substation, service pits and trenching for the installation of HV and communications

Archaeological testing and salvage (if necessary), would occur prior to excavation works south of the Lee Street substation and in the Sydney Yards. These areas have moderate to high potential to contain archaeological remains associated with the first and second phases of Central Station.

The process of archaeological testing will involve the manual excavation of defined areas once overburden has been removed by machine. The vertical extent of the testing program would be determined by the depth of impact, or by the presence of intact natural deposits. Manual excavation would be undertaken using hand tools, by a qualified archaeological team. The archaeological remains would be cleaned by hand, investigated (excavated) and recorded in detail by the archaeological team. In urban archaeological sites careful machine excavation may also be employed to assist the detailed archaeological excavation process. The excavation recording methodology would be as per Section 6.5.

Construction works would not proceed until the salvage excavation is completed and the Excavation Director has provided clearance. If state significant items are found, the exposed section would be recorded with the option of leaving it intact if the design can be changed to avoid impact.

Should hazardous materials or contaminants be identified during archaeological excavation, ground excavation would cease until appropriate controls or remediation is conducted by Laing O'Rourke.

If the planned testing does not provide enough information to inform a refined assessment of archaeological potential for the remainder of the works, additional testing may be required prior to bulk excavation commencing. This would be confirmed by the Excavation Director once the results of the testing program are known.

If Aboriginal objects are located, further testing focussed on Aboriginal archaeology would be required which would also require input from historical archaeologists to manage excavation of post-contact archaeological layers. The historical archaeological management would continue in accordance with this AMS.

### 6.2.2 Monitoring of excavation within platforms 16-23, service pits, HV and communications trenching

NDD excavation for the installation of HV and communications to the south of Mortuary Station, to the north of the Lee St substation and north of the Prince Alfred substation (near the eastern entry) would be subject to archaeological monitoring. These locations have been subject to previous considerable impact, and therefore have low to moderate potential to contain an intact archaeological resource.

If archaeological remains are identified during monitoring, they would be recorded by a qualified archaeologist, protected, and assessed to determine their heritage significance. If significant archaeological remains are identified, the area would be expanded where feasible to ensure the full extent of the archaeological remains are recorded. Localised stoppages in the construction work would be required to facilitate this process. Works would not recommence until the monitoring archaeologist has completed the recording and is satisfied that further investigation is not required. The excavation recording methodology would be as per Section 6.5.

The requirements for management under archaeological monitoring may be downgraded to the management under the Sydney Metro Unexpected Heritage Finds Procedure at the discretion of the Excavation Director.

Should hazardous materials or contaminants be identified during archaeological monitoring, ground excavation would cease until appropriate controls or remediation is conducted by Laing O'Rourke.

### 6.2.3 Sydney Metro Unexpected Heritage Finds Procedure

Monitoring or testing works would revert to Sydney Metro Unexpected Heritage Finds Procedure at the discretion of the Excavation Director where it was found that significant archaeological remains were not likely to be impacted.

## 6.3 Heritage induction

Archaeological heritage will be included in the general project induction for all personnel in consultation with the Excavation Director. At a minimum, this would include an overview of the project and employee obligations, archaeological management and the role of the archaeological team. Toolbox meetings will also be undertaken as and when required; covering specific environmental issues and heritage control measures as identified in the Cultural Heritage Management Plan (CHMP). Personnel directly involved in implementing heritage control measures on site will be given specific training in the various measures to be implemented. Records of all training are to be filed in accordance with the project filing system.

## 6.4 Contractor responsibilities

The contractor would set up site and then operate under the direction of the archaeologists during archaeological investigation. This would include but not be limited to:

- Provide a heritage site induction to contractors in consultation with the Excavation Director
- Demolish existing buildings (retaining in-ground foundations and ground slab) on the site and remove rubble and spoil material from site
- Set out and secure the work area for the construction and archaeological team
- Provide machine plant to assist the removal of fill where required under the supervision of the archaeological team
- Provide shoring, if required
- Provide pressurised water and a sieving area, if required.



Figure 26: Archaeological management for CSR north

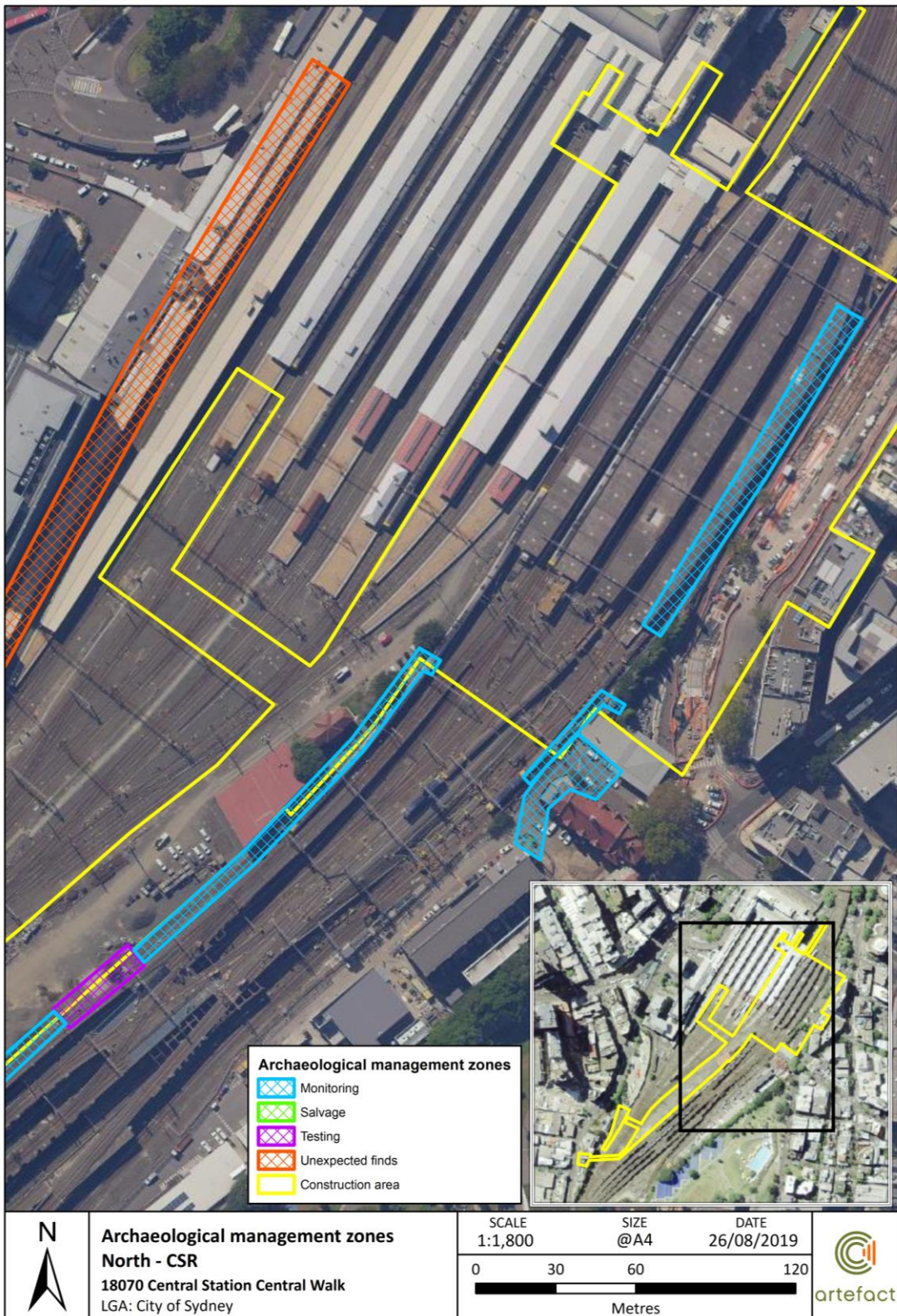
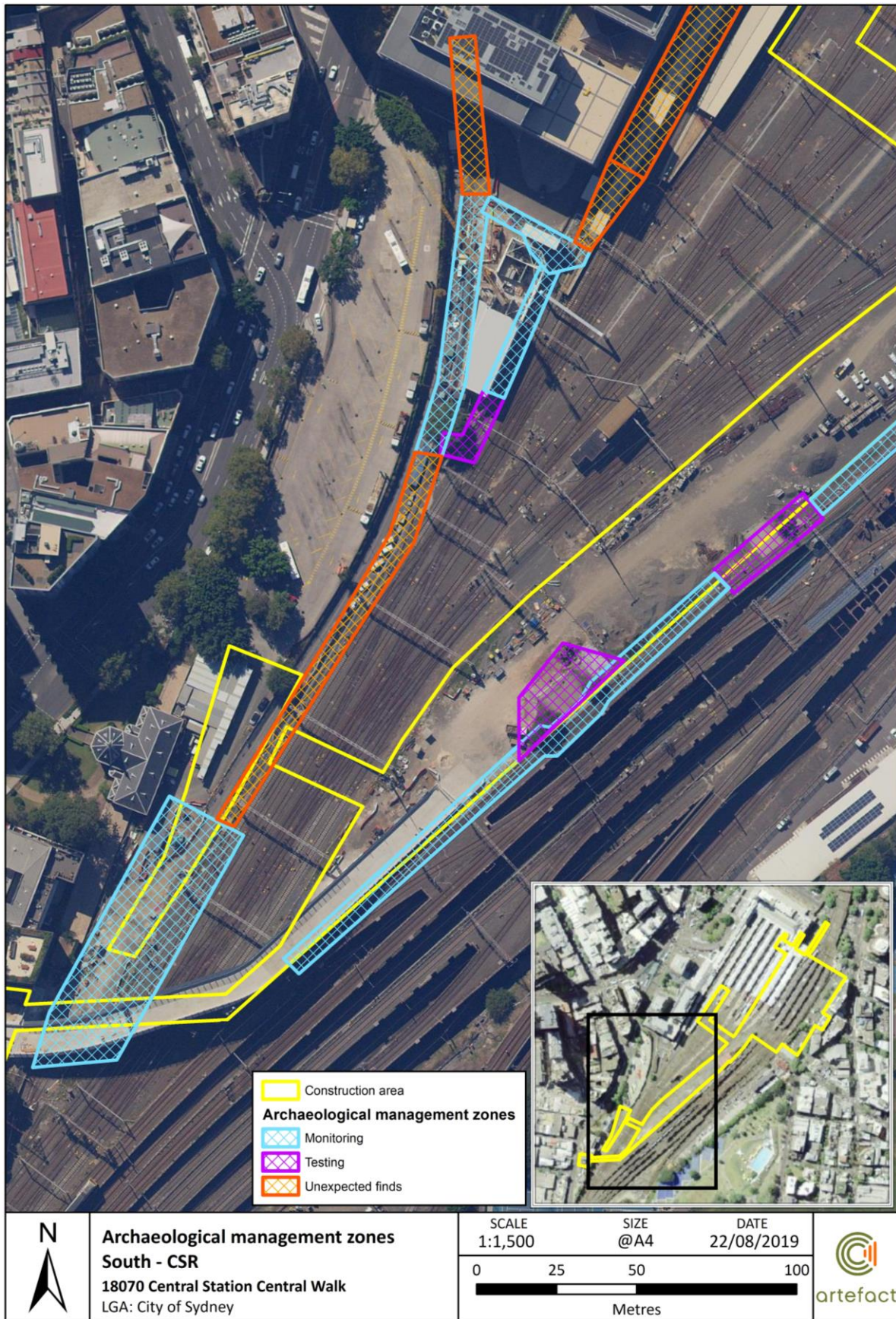




Figure 27: Archaeological management for CSR south



## 6.5 Excavation recording methodology

A record of archaeological investigation would be made in accordance with the methodology outlined in the AARD.<sup>51</sup> The recording methodology includes the following:

- A site datum would be established
- Survey and scaled plans of the area, trench locations and any significant archaeological features uncovered in the monitoring, test and salvage program. The plans would include elevations recorded with a dumpy level. Should a large amount of archaeological resources be identified during the excavation, the site would be digitally surveyed and recorded
- Scaled section drawings where appropriate
- Photogrammetry where appropriate
- Digital photography, in RAW format, using photographic scales and photo boards where appropriate. A photographic record of all phases of the work on site would be undertaken
- A standard context recording system will be employed: The locations, dimensions and characteristics of all archaeological features and deposits will be recorded on a sequentially numbered context register. This documentation will be supplemented by preparation of a Harris matrix showing the stratigraphic relationships between features and deposits
- Artefact collection by context. Large or redundant artefactual materials from individual contexts would be sample collected. Hazardous material would not be collected.
- Registers of contexts, photos, samples and drawings would be kept.

## 6.6 Sieving strategy

Sands, residual clay spoils (intact and re-deposited), and intact occupation deposits within the study area have demonstrated considerable potential to contain human remains, historical archaeological remains and Aboriginal artefacts. The sieving strategy incorporates methodologies for both non-Aboriginal heritage and Aboriginal artefacts.

Soil and sand deposits retrieved from the excavation area would be hand sieved through a 3 mm mesh, by either wet or dry sieving. The Excavation Directors would determine whether to proceed with wet or dry sieving, or a combination of both throughout the excavation. All bone remains would be dealt with under the Sydney Metro Exhumation Management Plan.<sup>52</sup>

All recovered stone artefacts would be cleaned, dried and bagged with a brief analysis conducted in the field. This analysis would include logging artefact type, raw material, and dimensions. These items would then be taken off site to be analysed in detail by relevant specialists in consultation with Aboriginal stakeholder groups.

## 6.7 Artefact collection and recording methodology

Artefacts are likely to be uncovered during archaeological investigations. Artefacts from secure or in situ contexts would be collected and recorded (by context). Retrieval of artefacts should focus on

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<sup>51</sup> Artefact June 2017, Section 7.8

<sup>52</sup> Transport for NSW 2018. *Sydney Metro Exhumation Management Plan*



diagnostic pieces and other items whose analysis would contribute to the research questions for this site are retained.

Should diagnostic or significant artefacts be present within the fill layers (out-of-context), a sample would be retained as part of the archaeological record.

Artefacts would be collected by context and bagged with a label recording their registered context number, site code, date and initials of the collecting individual/s. A record and description of relevant artefacts would be included in their corresponding context sheet and photographed where necessary.

### 6.7.1 Modern deposits

Artefacts from modern (post-1960) deposits would be sample collected to demonstrate the nature and context of the remains.

### 6.7.2 Historic fills and secondary deposits

Similarly, artefacts collected from historic fills and other bulk deposits that lack stratigraphic integrity will be recorded and a representative sample collected.

### 6.7.3 Primary deposits

All artefacts from primary deposits would be collected by context and bagged. Diagnostic or unique/fragile artefacts would be bagged separately under their corresponding context.

In addition:

**All human remains or potential human remains should be collected, and**

**All Aboriginal objects or potential aboriginal objects should be collected**

### 6.7.4 Building materials

Building and structural materials would be collected by type and sampled. For example, one full brick and one partial brick of the same type, two samples of mortar, stone, timber and plaster (bagged by context). All collected samples would be noted on their corresponding context sheet and recorded in a building material sample register.

### 6.7.5 Organic or fragile materials

Metal and fabric or organic materials such as timber, leather, bone or shell would be stored in plastic bags for conservation purposes under their corresponding context. If significant and diagnostic fabric or leather items are found, these would be submitted to a conservation specialist with two months of collection.

### 6.7.6 Hazardous materials

Artefacts manufactured from hazardous material such as asbestos or found within a contaminated deposit would not be collected, although their presence within the context would be recorded in their corresponding context sheet. Such artefacts be disposed of in an appropriate manner according to guidelines for dealing with hazardous waste.



## 6.8 Artefact discard guidelines

### 6.8.1 All deposits

Non artefactual material is not to be collected from sieves or the field unless in response to a targeted research question such as retention of soil samples. In the event that non artefactual material has erroneously entered artefact collections this may be disposed of at any stage without further recording. Non artefactual material includes:

- Hazardous material
- Modern material resulting from the demolition and excavation process (includes items such as dynabolts, geofab, food wrappers and containers, construction PVC)
- Fragments of construction material including railway ballast, broken bricks, pipes and tiles, metal items such as railway spikes
- Unmodified stones and rocks
- Metal items that have rusted to an unrecognisable form
- Items such as ceramic or glass that are smaller than 1cm x 1cm and which show no diagnostic features (visible pattern, decoration or makers mark)
- Pieces of wood that are not identifiable in form &/ are too small for species identification (5cm x 3cm)
- Items with no contextual ID (e.g. 'cleanup near grave cut x').
- Degraded items that cannot be identified.

### 6.8.2 Redeposited Botany Sands

This deposit has been recorded as 'grey sand fill' during excavation for the CSMW. Taking the AMS into account it should be noted that – the grey sand is not a primary deposit but rather a secondary deposit created by the process of exhumation c1901. Therefore, it would be considered under the category of Historic fills and secondary deposits. Secondary contexts are those in which identified disturbance to the archaeological record has taken place. Artefacts found within these contexts have a diminished capacity to inform on the history of the location. Fill deposits are a characteristic type of secondary deposit.

It is also noted that sieving has identified Densely Graded Base (DGB) mixed into the sand deposit – this material is a very modern deposit and can be discarded. A sample (~ 10 items) of each artefact type should be retained from the fill deposit. These items should be at least briefly catalogued.

As above:

**All human remains or potential human remains should be collected, and**

**All Aboriginal objects or potential aboriginal objects should be collected**

### 6.8.3 Discard after cataloguing

All artefactual material from primary contexts must be retained and must be catalogued. Items may be evaluated for discard based on the criteria provided in the CSMW Artefact Discard Policy (Artefact July 2019).

Discard other than of those non artefactual materials and excels to samples in secondary deposits should occur after cleaning and at a minimum cataloguing of the artefacts. Decisions around discard at this stage would be made around considerations such as adequate sample size, relevance to research questions and condition of the remains. Assessments and decisions to discard at this stage should be documented and decisions made by suitably experienced and qualified people under the direction of the Excavation Director. Note that non-archaeological material collected in error may be discarded during or prior to cleaning.

### 6.8.4 Integrity

No staff, volunteer, or immediate family of persons involved in these processes can benefit from any discarded object. Donations to other facilities in the public domain or returns to the project are permissible.

### 6.8.5 Occupational Health and Safety

Live ammunition, toxic or radioactive materials, or other hazardous substances should be disposed of appropriately according to appropriate guidelines.

### 6.8.6 Human Remains

Human remains (including potential human remains) must be treated with dignity and respect.

## 6.9 Artefact analysis methodology

Where possible artefact cleaning and preliminary cataloguing would occur on site, otherwise artefacts would be catalogued and stored off site at the Sydney Metro facility at Rosebery. Retained artefacts would be cleaned processed, catalogued and analysed by an archaeologist experienced in historical artefact assemblages. Artefact analysis would include production of a database in accordance with best practice archaeological data recording. The resulting information would be included in the final excavation report.

## 6.10 Environmental sampling methodology

A geomorphologist would be engaged to assist in identification and interpretation of the nature of soil deposits. On identification of intact sands, soil samples would be collected for analysis. A geomorphologist will be engaged to attend site during excavation, take soil and sediment samples where required, and provide detailed reporting for the excavation report. The geomorphologist can provide geomorphology reporting and Optically Stimulated Luminescence dating for archaeological excavations.

If natural soils are encountered, bulk samples of those deposits could be sent to a qualified specialist for analysis. Artefact will engage a specialist if the collection of such samples is found to be warranted. Examples of potential deposits suitable for sampling may include natural sands, accumulate deposits within wells and cesspits.

In order to prevent cross-contamination, the following sample collection and excavation process should be followed:

- The location, quantity and material of samples will be determined by the Excavation Director prior to its collection

- Samples would be stored in a safe, secure and climate controlled location while excavations are in progress. This would be chosen by the Excavation Director
- Each collected sample would be given a unique catalogue number and a sample register would be recorded throughout the excavation
- 'Clean excavation' procedures would be followed during the sample collection process. This would include:
  - Latex gloves would be worn by individuals excavating soil samples. Gloves would be changed for each sample to prevent cross-contamination
  - Excavation tools/brushes would be cleaned prior to and after the collection of each sample to prevent cross-contamination
  - All bags containing samples for analysis would be bagged and labelled appropriately to prevent cross contamination and ensure they are handled and stored correctly.

### 6.11 Unexpected Finds Procedure

Unexpected archaeological finds would be managed under the Sydney Metro Authority Unexpected Heritage Finds Procedure.<sup>53</sup> Unexpected finds would also apply to the identification of intact sand deposits during excavation works.

### 6.12 Archaeological Relic Management Plan

An Archaeological Relic Management Plan as require under E20 would be prepared if archaeological remains of State significance were located that were not described in the AARD or AMS. The Plan would be prepared in consultation with the NSW Heritage Council (or delegate). Works would not recommence in the location until the requirements of the Plan have been implemented.

### 6.13 Exhumation Management Plan

Discovery of suspected human remains would be managed under the Sydney Metro Unexpected Heritage Finds Procedure and the Sydney Metro Exhumation Management Plan.<sup>54</sup> All suspected bone must be treated as potential human skeletal remains and work around them must stop while they are protected and investigated.

If potential human skeletal remains are found during the project, works would cease immediately in that area and the remains would be managed under the Sydney Metro Exhumation Management Plan produced as per the Conditions of Approval (Condition E26 and E27) for the approved project.<sup>55</sup>

The discoverer will immediately notify machinery operators so that no further disturbance of the remains will occur, as well as notify the foreman/site supervisor, principal contractor, project archaeologist and Sydney Metro Environmental Representative. This requirement will form part of the site induction. The Sydney Metro Exhumation Management Plan will be enacted, noting the special provisions that are in place for remains within Central Station that relate to the former Devonshire Street Cemetery. If these provisions as outlined in the Sydney Metro Exhumation management Plan are met, notification to the Police, corner or NSW Health Department are not required.

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<sup>53</sup> Sydney Metro Authority 2019. *Sydney Metro Unexpected Heritage Finds Procedure*

<sup>54</sup> Transport for NSW 2017; Transport for NSW 2018

<sup>55</sup> Transport for NSW 2018. *Sydney Metro Exhumation Management Plan*

Dr Denise Donlon is the nominated forensic anthropologist for the Project. She would be consulted in the event of a discovery of suspected human remains.

### 6.14 Aboriginal archaeological methodology

The Central Walk site and CSR footprint is within Method Area 2 as outlined in the Aboriginal Cultural Heritage Assessment Report (CHAR). In accordance with the provisions for MA2 Aboriginal archaeological test/salvage excavation would be undertaken where intact natural soil profiles with the potential to contain significant deposits, or Aboriginal objects, are located during historical archaeological excavations. It should be noted that the CHAR states that identification of intact natural soil deposits would only be a trigger at Central Station if it was within the station box area.

Based on the results of the CSMW archaeological investigation, which identified that natural soils have been cut down in the northern area of the station, the CSR footprint is unlikely to have Aboriginal archaeological potential. In addition, soil profiles in the majority of the Sydney Yard are within the shale soil transition and intact sand contexts with the potential for deep Aboriginal archaeological deposits are unlikely to be present. The trigger for test or salvage excavation for Aboriginal archaeology would therefore be the identification of an Aboriginal objects during CSR excavations.

If suspected Aboriginal objects were identified during works, the Aboriginal archaeological team would be notified by the Excavation Director and a qualified archaeologist experienced in Aboriginal archaeology would assess the find. If Aboriginal objects were identified the Registered Aboriginal Parties (RAPs) would be notified and would participate in test and salvage excavation as required under the CHAR.

### 6.15 Contaminated materials

Due to the potential for contaminants across the study area, the controlled archaeological excavation would also be undertaken in accordance with the specified work health and safety protocols established for the site, prior to the commencement of works on site. Should the discovery of contaminants on site likely result in the potential harm to archaeological staff working on site, there may be a requirement to deviate from the proposed archaeological methodology, in order to ensure the health and safety of onsite staff. This may include the use of protective clothing, face masks, and specified gloves, additional washing protocols, through to the need to cease hand excavation on site.

Should the requirement to employ mechanical excavation rather than hand excavation arise, archival recording of archaeological material would need to be taken in the form of photographic, and possibly 3D scanning, from a safe distance (as specified in the work health and safety requirements of the remediation specialists).

### 6.16 Clearance

A written clearance confirmation would be provided by the Primary Excavation Director to Laing O'Rourke once archaeological management has been completed in an area. Construction would continue under the Sydney Metro Unexpected Heritage Finds Procedure.<sup>56</sup>

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<sup>56</sup> Transport for NSW 2017. *Sydney Metro Unexpected Heritage Finds Procedure*



## 6.17 Reporting

A preliminary findings report would be prepared following completion of the works outlined in this AMS in accordance with the AARD.<sup>57</sup> This report would outline the main archaeological findings, post-excavation and analysis requirements, and identify if further archaeological work would be required, or if results would be appropriate for public interpretation.

An archaeological excavation report for Central Walk would be prepared within two years following the completion of the program of archaeological works, as required under Condition E18 of the Minister's Conditions of Approval for the project. Progressive draft updates will also be submitted to Laing O'Rourke throughout the project. The final report would comprehensively describe and interpret the findings of the excavation program within the context of the research design. This would include artefact analysis, environmental and building material sample analysis, stratigraphic reporting and production of Harris Matrices, production of illustrations and detailed site plans interpretation of site plans and illustrations final excavation report detailing the archaeological program and results would be prepared. It would include photographs and plans, catalogue and analysis of artefacts, and also respond to the research questions. The report would also include a reassessment of archaeological significance based on the investigation results. The report would be prepared in accordance with the standard conditions of archaeological permits issued under the Heritage Act:

- a. An executive summary of the archaeological programme;
- b. Due credit to the client paying for the excavation, on the title page;
- c. An accurate site location and site plan (with scale and north arrow);
- d. Historical research, references and bibliography;
- e. Detailed information on the excavation, including the aim, the context for the excavation, procedures, treatment of artefacts (cleaning, conserving, sorting, cataloguing, labelling, scale photographs and/or drawings, location of repository) and analysis of the information retrieved;
- f. Nominated repository for the items;
- g. Detailed response to research questions (at minimum those stated in the approved Research Design);
- h. Conclusions from the archaeological programme. The information must include a reassessment of the site's heritage significance, statement(s) on how archaeological investigations at this site have contributed to the community's understanding of the site and other comparable archaeological sites in the local area and any relevant recommendations for the future management of the site information and artefacts;
- i. Details of how this information about this excavation has been publicly disseminated (for example provide details about Public Open Days and include copies of press releases, public brochures and/or information signs produced to explain the archaeological significance of the site).

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<sup>57</sup> Artefact 2016a:314

## 6.18 Curation of archaeological material

Storage and curation strategies have been adapted from the Salvage and Storage Strategy of the Sydney Metro Integrated Management System.<sup>58</sup>

Collection of artefacts would be in the context of the AARD, which state that “retrieval of artefacts would focus on those whose analysis would contribute to research agendas or would be representative of the site”.<sup>59</sup>

Following excavation, all collected artefactual material would be stored by Artefact Heritage in order to conduct post-excavation material analysis. Once post-excavation analysis and salvage excavation reporting has been completed, ongoing curation and long-term care of the collection would be at the discretion of Transport for NSW. Archaeological materials may be incorporated into interpretative or public display depending on the nature of recovered finds.

Large archaeological items, or items that require special care (i.e. material that is in danger of deterioration post-excavation), would be stored in appropriate facilities co-ordinated with and managed by Sydney Metro under the projects salvage strategy.

## 6.19 Public engagement

There is potential for significant archaeological remains within the study area, in particular the Devonshire Street Cemetery . There is opportunity to interpret the archaeology and engage the public with the significance and stories of Central Station’s past.

Significant findings from the archaeological investigation program would be included in heritage interpretation for the project. Preliminary results reporting and final reporting would identify significant findings which should be considered as part of heritage interpretation.

There may also be opportunity for public engagement such as open days or media releases during archaeological investigations. This could include hoarding signage, pamphlets, media releases, information on the project website, social media and blog content during the excavation process.

If substantial archaeological remains are uncovered there would be an opportunity to publish the results.

## 6.20 SHR listing update

Prior to completion of the Project, an updated Central Station listing nomination form must be prepared in consultation with all relevant stakeholders including Heritage DPC under the authority of the Heritage Council of NSW. Archaeological results obtained during the Central Walk and CSMW projects would be included in the listing update.

## 6.21 Archaeological team

The archaeological team would be finalised based on availability at the time of excavation, but would comprise a combination of the below staff:

- Primary Excavation Director – Dr Iain Stuart (Principal, Artefact Heritage)
- Secondary Excavation Director – Jenny Winnett (Principal, Artefact Heritage)

<sup>58</sup> Transport for NSW 2016a: 5 – 6

<sup>59</sup> Artefact 2016a:315

- Site Director – Adele Zubrzycka (Senior Heritage Consultant, Artefact Heritage), Julia McLachlan (Heritage Consultant, Artefact Heritage), Jayden van Beek (Heritage Consultant, Artefact Heritage)
- Excavation Director (Aboriginal) – Dr Sandra Wallace (Director, Artefact Heritage)
- Forensic Anthropologist – Dr Denise Donlon (Senior Lecturer in Anatomy and Curator, Shellshear Museum, University of Sydney)
- Archaeologists – Jessica Horton, Duncan Jones, HollyMae Steane Price, Ryan Taddeucci, and others as needed.
- Archaeological Surveyors - Guy Hazell and Gala Hazell (ArcSurv)
- Environmental sampling – Sam Player and Dr Mike McPhail
- Artefact specialists - Jeanne Harris (Urban Analysts), Jenny Winnett, Michael Lever, and others as needed

The Excavation Directors meet the requirements of the AARD, CHAR and Condition E18.

The Primary Excavation Director would oversee the archaeological excavations and advise on archaeological issues. The Primary Excavation Director would provide clearance once archaeological management has been completed in an area, as per the methodology outlined in Section 6.16. The Secondary Excavation Director would support the Primary Excavation Director where needed. The Aboriginal archaeological excavation director would manage Aboriginal archaeological test and salvage in accordance with the CHAR including co-ordinating appropriate consultation with the RAPs. The Forensic Anthropologist would respond to finds of potential human remains in accordance with the Sydney Metro Exhumation Management Plan. This would be in accordance with the CHMP and relevant conditions of approval (E18).

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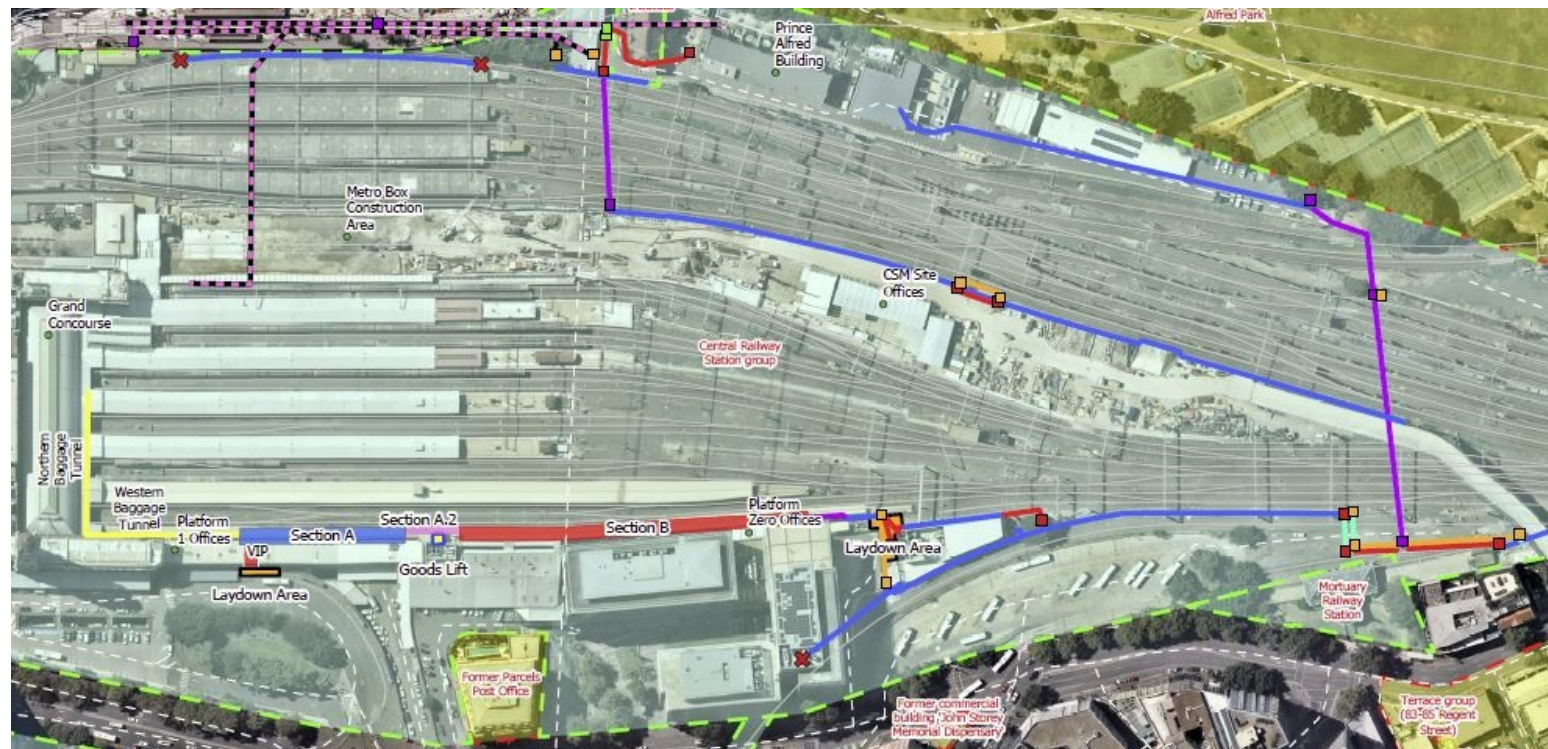
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## Appendix F OCP HIA CSR

# SYDNEY METRO CITY & SOUTHWEST CENTRAL STATION MAIN WORKS

## HERITAGE IMPACT ASSESSMENT

### STAGE 3: COMBINED SERVICES ROUTE (CSR)



Prepared for Laing O'Rourke Australia

Revision C – 1 July 2019

Job No. 18014



**Cover Image**

*Aerial view showing mark up for Combined Services Route (CSR) Work Areas, Laing O'Rourke and EcoQuest Environmental, 28 June 2019*

Source: Laing O'Rourke Australia

**Report Register**

The following report register indicates the development and issue number of this report, undertaken by OCP Architects.

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C	1 July 2019	Updated in response to additional information provided and LOR review	KU

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## 1 INTRODUCTION

This heritage impact assessment (HIA) has been prepared to assess the impact of Stage 3 design works required to facilitate construction of the Central Station Main Works, approved under the Sydney Metro City & Southwest Chatswood to Sydenham project (SSI 15\_7400, approved 9 January 2017 and Modification 2 approved on 21 December 2017). It has been prepared in accordance with the requirements of SWTC Appendix B06 (Item 2.2(a)(ii)) and structured in accordance with the Transport for NSW *Management Requirements – Technical Management – Central Station Main Works (MR-T)*, 22 February 2018, Annexure C: Specific Design Documentation, Item C7 Heritage Works.

This report specifically addresses design works associated with the Combined Services Route (CSR) for high voltage electrical (HV) and communications (Comms.) services that will service the whole of Central Station including the new Sydney Metro Station at Central. The route extends around the SHR listed Central Station site as a combined services ring around the perimeter of the station that utilises existing service infrastructure where this is available and provides new installations as required to complete the system, including where existing services are to be relocated, to provide uninterrupted access for construction of the Metro tunnel.

The CSR was included in the Environmental Impact Statement that was approved under SSI 15\_7400 as part of the concept design (refer EIS Chapter 7, Project Description – Construction, Part 7.10.9, p231) and has progressed through a detailed design process. This Stage 3 HIA has been prepared to identify the overall trend of heritage impact associated with the project as the detailed design has been progressively resolved. It does not address in detail heritage impacts to known or potential archaeological resources other than to identify potential impacts associated with ground disturbance, which should be managed in accordance with relevant Archaeological Method Statements (AMS) prepared for the project.

### 1.1 Assessment Methodology

This HIA has been prepared on the basis of the NSW Heritage Division guideline *Statements of Heritage Impact*, which forms part of the NSW Heritage Manual prepared by the then Heritage Office and Department of Urban Affairs and Planning in 1996. The principles contained in the Australian ICOMOS *Charter for the Conservation of Places of Cultural Significance (The Burra Charter)* 2013 are also used as a methodology for assessing heritage impact.

The assessment of heritage significance is based on consideration for the assessments provided in the *Central Station Conservation Management Plan*, prepared by Rappoport P/L and the NSW Government Architect's Office in June 2013 (*Central Station CMP*), which included gradings of significance for the major elements of the site and some components. It is noted, however, that the CMP has not been endorsed by the NSW Heritage Council and while it provides a foundation for the assessment and grading of significance, some revisions to the gradings are required and measures have been taken to address this in specific instances. Reassessment of gradings of significance has already occurred for some specific areas of Central Station in consultation with the Office of Environment and Heritage during the course of preparing documentation for the CSMW project to date.



## 1.2 Basis of Assessment

This HIA has been informed by a site inspection attended by OCP Architects, with representatives from Laing O’Rourke and AGJV on 21 January 2019 to review areas affected by installation of the CSR, in addition to a review of the following CSMW documentation prepared by LOR and AGJV for Design Stage 3:

<b>Drawing Set: Central Station Main Works Combined Services Route</b>					
<b>Dwg. No. Prefix: SMCSWCSM-DJV-SR-00-DWG-UT-</b>					
<b>Drawing Title</b>	<b>Dwg. No.</b>	<b>Revision</b>	<b>Drawing Title</b>	<b>Dwg. No.</b>	<b>Revision</b>
<i>Combined Services Route – Drawing Index – Sheet 1 of 1</i>	300001	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W01, W02] – Sheet 1 of 2</i>	320101	A, 19/02/19
<i>Combined Services Route – General Notes – Sheet 1 of 2</i>	300002	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W01, W02] – Sheet 2 of 2</i>	320102	A, 19/02/19
<i>Combined Services Route – General Notes – Sheet 2 of 2</i>	300003	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W03, W04] – Sheet 1 of 1</i>	320103	A, 19/02/19
<i>Combined Services Route – Reference Documents - Sheet 1 of 1</i>	300007	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W05, W06, W07] – Sheet 1 of 1</i>	320104	A, 19/02/19
<i>Combined Services Route – Pit Setout Schedule – Sheet 1 of 1</i>	300501	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W08] – Sheet 1 of 2</i>	320105	A, 19/02/19
<i>Combined Services Route – HV Schedule – Sheet 1 of 1</i>	300502	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W08] – Sheet 2 of 2</i>	320106	A, 19/02/19
<i>Combined Services Route – Railcorp Services Schedule – Sheet 1 of 1</i>	300503	A, 19/02/19	<i>Combined Services Route – DHGL Cable Tray Details and Views – Sheet 1 of 2</i>	320107	A, 19/02/19
<i>Combined Services Route – General Arrangement Plan – Sheet 1 of 1</i>	310010	B, 19/02/19	<i>Combined Services Route – DHGL Cable Tray Details and Views – Sheet 2 of 2</i>	320108	A, 19/02/19
<i>Combined Services Route – Proposed CSR Cable Routes – Sheet 1 of 1</i>	310011	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W06C] – Sheet 1 of 2</i>	320109	A, 19/02/19
<i>Combined Services Route – HV Schematic – Sheet 1 of 1</i>	310012	A, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W06C] – Sheet 2 of 2</i>	320110	A, 19/02/19

<b>Drawing Set: Central Station Main Works Combined Services Route</b>					
<b>Dwg. No. Prefix: SMCSWCSM-DJV-SR-00-DWG-UT-</b>					
<i>Combined Services Route – Detailed Site Plan – Sheet 1 of 9</i>	313101	B, 19/02/19	<i>Combined Services Route – DHGL Sections &amp; Details – Sheet 1 of 1</i>	320111	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 2 of 9</i>	313102	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W09, W12] – Sheet 1 of 2</i>	320112	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 3 of 9</i>	313103	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W09, W12] – Sheet 2 of 2</i>	320113	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 4 of 9</i>	313104	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W10, W14] – Sheet 1 of 1</i>	320114	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 5 of 9</i>	313105	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W11, W13, W16, W17] – Sheet 1 of 1</i>	320115	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 6 of 9</i>	313106	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W19, W21] – Sheet 1 of 2</i>	320116	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 7 of 9</i>	313107	B, 19/02/19	<i>Combined Services Route – Section &amp; Isometric View [W19, W21] – Sheet 2 of 2</i>	320117	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 8 of 9</i>	313108	B, 19/02/19	<i>Combined Services Route – Pit Plan, Section &amp; Details [W25, W26, W28] – Sheet 1 of 2</i>	320118	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – Sheet 9 of 9</i>	313109	B, 19/02/19	<i>Combined Services Route – Isometric [W25, W26, W28] – Sheet 2 of 2</i>	320119	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – ESR and Ghost Platform - Sheet 1 of 1</i>	313110	A, 19/02/19	<i>Combined Services Route – Plan &amp; Section [W27] – Sheet 1 of 1</i>	320120	A, 19/02/19
<i>Combined Services Route – Detailed Site Plan – 3D Isometric Views - Sheet 1 of 1</i>	313121	A, 19/02/19	<i>Combined Services Route – GST in Western baggage Tunnel – Sheet 1 of 1</i>	320121	A, 19/02/19
<i>Combined Services Route – HV Pulling Plan – Feeder 600 - Sheet 1 of 6</i>	313151	A, 19/02/19	<i>Combined Services Route – CSR Sections and Details – Sheet 1 of 1</i>	320122	A, 19/02/19
<i>Combined Services Route – HV Pulling Plan – Feeders 572, 573 &amp; 519 - Sheet 2 of 6</i>	313152	A, 19/02/19	<i>Combined Services Route – CSR Sections and Details – Sheet 1 of 1</i>	320123	A, 19/02/19

<b>Drawing Set: Central Station Main Works Combined Services Route</b>					
<b>Dwg. No. Prefix: SMCSWCSM-DJV-SR-00-DWG-UT-</b>					
<i>Combined Services Route – HV Pulling Plan – Feeders 576, 577 &amp; 520 - Sheet 3 of 6</i>	313153	A, 19/02/19	<i>Combined Services Route – CSR Sections and Details – Sheet 1 of 1</i>	320124	A, 19/02/19
<i>Combined Services Route – HV Pulling Plan – Feeder 579 - Sheet 4 of 6</i>	313154	A, 19/02/19	<i>Combined Services Route – CSR Sections and Details – Sheet 1 of 1</i>	320125	A, 19/02/19
<i>Combined Services Route – HV Pulling Plan – Feeders 578, 639 &amp; 631 - Sheet 5 of 6</i>	313155	A, 19/02/19	<i>Combined Services Route – HV Pit and Sump Detail – Sheet 1 of 1</i>	320126	A, 19/02/19
<i>Combined Services Route – HV Pulling Plan – Feeders 616 &amp; 633 - Sheet 6 of 6</i>	313156	A, 19/02/19	<i>Combined Services Route – Typical Trench Sections – Sheet 1 of 1</i>	350101	A, 19/02/19
<i>Combined Services Route – Plan and Longitudinal Section – Underbore 01 – Sheet 1 of 1</i>	313201	A, 19/02/19	<i>Combined Services Route – Typical Underbore Sections and GST Sections – Sheet 1 of 1</i>	350102	A, 19/02/19
<i>Combined Services Route – Plan and Long Section – Trench 3A – Sheet 1 of 2</i>	313202	A, 19/02/19	<i>Combined Services Route – Typical Post Details – Sheet 1 of 1</i>	350103	A, 19/02/19
<i>Combined Services Route – Plan and Long Section – Trench 3A – Sheet 2 of 2</i>	313203	A, 19/02/19	<i>Combined Services Route – Western Baggage Tunnel - Cross Sections – Sheet 1 of 1</i>	350104	A, 19/02/19
<i>Combined Services Route – Plan and Long Section – Trench 3B – Sheet 1 of 2</i>	313204	A, 19/02/19	<i>Combined Services Route – Western Baggage Tunnel - Cross Sections – Sheet 1 of 1</i>	350105	A, 19/02/19
<i>Combined Services Route – Plan and Long Section – Trench 3B – Sheet 2 of 2</i>	313205	A, 19/02/19	<i>Combined Services Route – Western Baggage Tunnel – CSR Profile – Sheet 1 of 1</i>	350106	A, 19/02/19
<i>Combined Services Route – Plan and Long Section – Underbore 02 – Sheet 1 of 3</i>	313206	A, 19/02/19	<i>Combined Services Route – Cable Trays Beneath Platform 1 – Typical Section – Sheet 1 of 1</i>	350107	A, 19/02/19
<i>Combined Services Route – Route – Plan and Long Section – Underbore 02 – Sheet 2 of 3</i>	313207	A, 19/02/19	<i>Combined Services Route – Ghost Platform – Comms Cable Tray Sections – Sheet 1 of 1</i>	350108	A, 19/02/19
<i>Combined Services Route – Route – Plan and Long Section – Underbore 02 – Sheet 3 of 3</i>	313208	A, 19/02/19	<i>CSR Containment Plan – Site Wide</i>	320701	Preliminary

<b>Drawing Set: Central Station Main Works Combined Services Route</b>					
<b>Dwg. No. Prefix: SMCSWCSM-DJV-SR-00-DWG-UT-</b>					
			<i>CSR Containment Plan – ESR Concourse and Ghost Platform Level</i>	320702	Preliminary
			<i>CSR Containment Plan – Metro NS Concourse and Olympic Tunnel</i>	320703	Preliminary
			<i>CSR Containment Plan – Northern Concourse Olympic Tunnel</i>	320704	Preliminary
			<i>CSR Containment Plan – Sections – Sheet 1</i>	320751	Preliminary
			<i>CSR Containment Plan – Sections – Sheet 2</i>	320752	Preliminary
			<i>Cable Containment Typical Installation Details</i>	320761	Preliminary

<b>Other Documentation</b>
<i>Water Mains and Mortuary Tunnel Inspection and Condition Assessment Report by SAS TTI Joint Venture, December 2018</i>
<i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement, Artefact May 2019</i>
<i>Central Station Main Works – Station Box and Sydney Yards Archaeological Method Statement, Artefact , Rev 4, 16 August 2018)</i>
<i>Aboriginal Cultural Heritage Assessment, Artefact Heritage, October 2016, p.35</i>
<i>Construction Method Statement for Project Wide CSR Civil Construction, Laing O’Rourke 2019</i>



### 1.3 Heritage Context

The CSR provides a circular route around the Central Station site. It also will be in the vicinity of other statutory listed heritage items that are subject to their own individual listing. Relevant statutory listings and applicable heritage curtilages are identified in the table below.


ITEM NAME	ADDRESS	SIGNIFICANCE	HERITAGE LISTINGS	HERITAGE MAP (SLEP 2012)
Central Railway Station group including buildings, station yard, viaducts and building interiors		State	SHR No. 01255 RailCorp S170 register (No. 4801296) SLEP 2012 (Item 824)	
Former “Railways Institute” building including fence and interior	101 Chalmers St, Surry Hills	State	SHR No. 01257 SLEP 2012 (Item 1472)	
Former Mortuary Station, including interior, grounds, fence and railway platforms	50 Regent Street, Chippendale	State	SHR No. 00157 RailCorp S170 register (No. 4803219) SLEP 2012 (Item 194)	
Railway Square / Ultimo Railway Overbridge	George Street, Chippendale	State	SHR No. 01232 RailCorp S170 register (No. 4801079) SLEP 2012 (Item 180)	

FIGURE 1.1: STATUTORY LISTED CURTILAGES FOR THE CENTRAL STATION SITE.

## 2 PROPOSED DESIGN AND IMPACT ASSESSMENT – COMBINED SERVICES ROUTE

The CSR for Central Station will provide for Communications (Comms) services (voice, data and IT connectivity, requiring 6 to 8 cables) and High Voltage electrical (HV) services that will service the whole site, both existing and the new infrastructure installations that are being introduced as part of the Central Station Main Works. It will extend as a circular route around the site, utilising existing service infrastructure where this is available and providing new installations as required to complete the system.

The route is broadly illustrated in the marked up aerial image below:

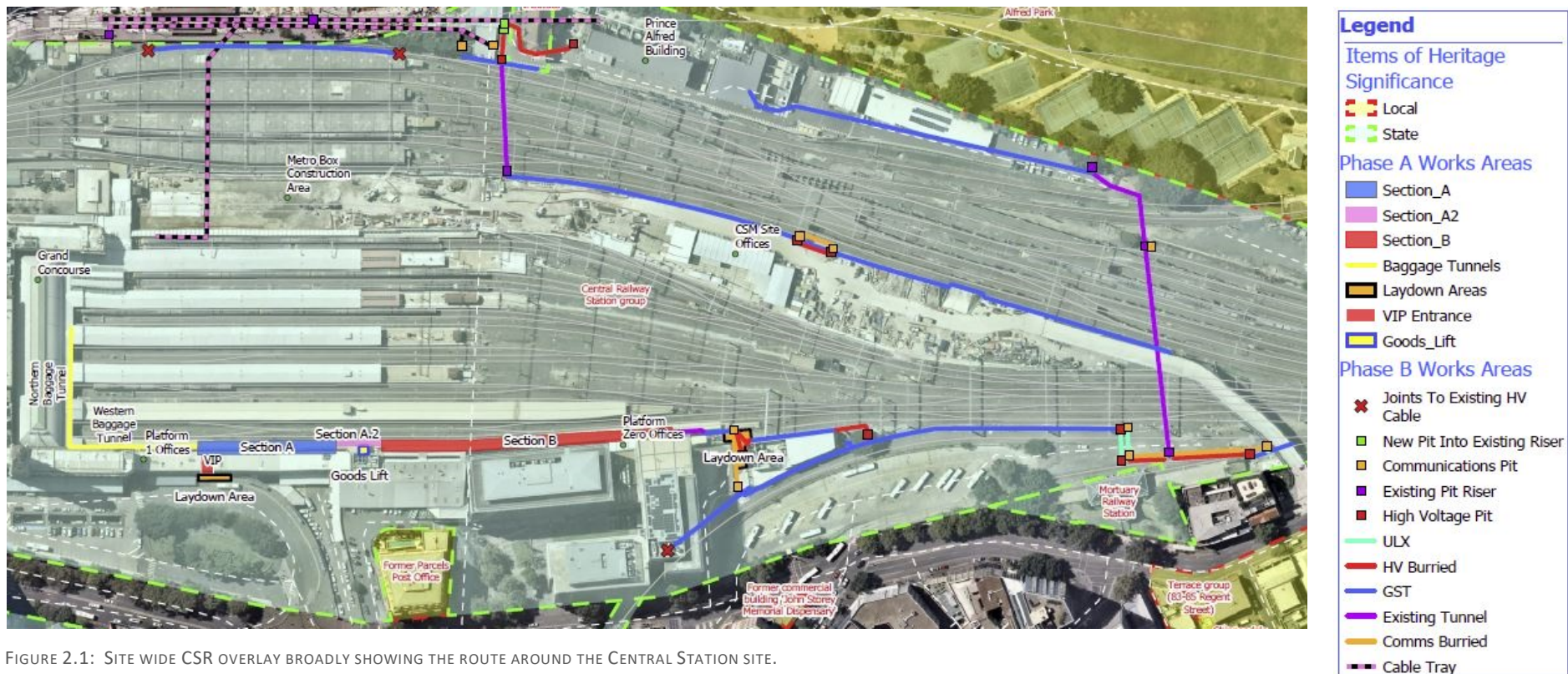


FIGURE 2.1: SITE WIDE CSR OVERLAY BROADLY SHOWING THE ROUTE AROUND THE CENTRAL STATION SITE.


The work comprises civil construction works and cabling and electrical works, which are described in greater detail below, commencing around the northern corner of the site and progressing in an anti-clockwise direction. A heritage impact assessment is included with the relevant component of work described.


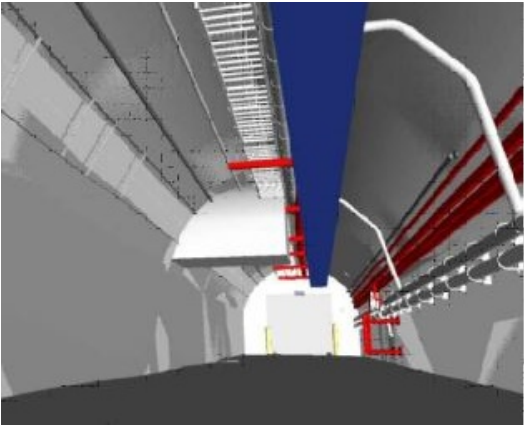
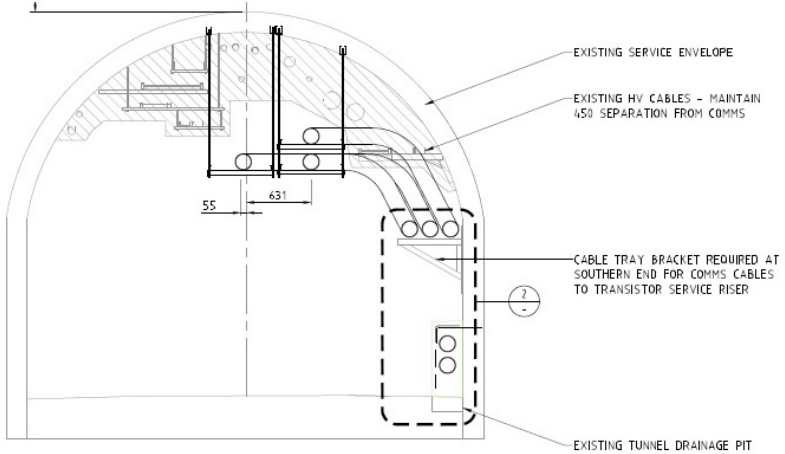


## 2.1 Item 1 – Subway Passage System: North and West Baggage Tunnels

The development of an underground system of tunnels and subways for the transport of luggage was an innovative feature in the design of Central Station, the importance of which was recognised by extension of the system at the time that Central Electric Station was constructed. The subway system provided access to the platforms above and also to offices, maintenance depots, kitchens and loading docks. Changes in both the volume and handling of luggage and parcels over time and a prioritising of passenger movement below the platforms in the late 20th century resulted in many of the tunnels being converted to pedestrian subways.

The CSR utilises Subway No. 1 in the northern part of the site and Subway No. 2 in the west, both of which are original to the first stage of construction of the current Central Station constructed in 1906. These tunnels, which are connected around the northern corner, have remained as service tunnels and are not accessible to the public. They retain the original concrete fabric, comprising concrete barrel vaults with groins at intersections and concrete floors. The nature of their service use has evolved and the tunnels now include a range of later exposed services.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
1	<p>Install ceiling and wall mounted cable trays to support new Comms. Services.</p> <p>Wall fixed GST for HV services, transitioning to concrete encasement of GST at southern end of west baggage tunnel.</p>	 <p>FIGURE 2.2: WESTERN BAGGAGE TUNNEL (SUBWAY No. 2) SHOWING ORIGINAL CONCRETE FABRIC INCLUDING BARREL VAULT AND LATER SERVICE INSTALLATIONS.</p>	<p><b>High</b> (overall form of baggage tunnels, original finishes and openings to ancillary areas)</p> <p><b>Little</b> (exposed electrical and service installations)</p>	<p>The approach utilises the existing ‘back-of-house’ tunnels for services. In principle, this approach is supported from a heritage perspective as it:</p> <ul style="list-style-type: none"> <li>- retains a service use for the tunnels as per the original design intent, albeit for a different purpose;</li> <li>- avoids the need to provide required services in publically accessible areas; and</li> <li>- accords with the precedent set by previous works in accordance with the principle that new services in heritage buildings should aim to use existing service routes where these are concealed.</li> </ul> <p>While the new work will not affect the overall form and layout of the tunnels, the installation of new services will result in minor heritage impacts associated with penetrations for fixings for the new elements. In addition to anchors for ceiling hung and wall mounted cable trays, reinforcing dowels will be drilled into the</p>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
1 (cont.)		 <p>FIGURE 2.3: NORTHERN BAGGAGE TUNNEL (SUBWAY No. 1) SHOWING ORIGINAL CONCRETE FABRIC INCLUDING BARREL VAULT AND LATER SERVICE INSTALLATIONS.</p>		<p>tunnel wall and utilised to tie the concrete encasement for HV services to the wall. New fixings are proposed to be set with chemical anchors.</p> <p>The impact of physical intervention to the heritage fabric must be minimised by ensuring that all new fixings are installed in a neat and consistent manner i.e. in a straight line offset from walls a consistent length, at regular height and intervals. In addition, it is important that fixings into heritage masonry fabric be stainless steel, including dowels, anchor rods and any other fixings, to minimise rust and subsequent damage to the masonry fabric.</p>
		 <p>FIGURE 2.4: INDICATIVE GRAPHIC SHOWING NEW INSTALLATIONS (IN COLOUR) WITHIN NORTHERN BAGGAGE TUNNEL (FROM DWG. 313121).</p>		 <p>FIGURE 2.5: CROSS SECTION THROUGH BAGGAGE TUNNEL SHOWING NEW SERVICE INSTALLATIONS FIXED TO TUNNEL SURFACES (SECTION C, DWG. 350105)</p>



## 2.2 Item 2 and Item 3 – Intercity Platform 1

The Country and Interstate Platforms (Platforms 1-15) were built in 1906 as part of the third Central Station Terminus. The platforms were originally built with brick walls beneath the level of the platform and with timber framed platform awnings, clad with corrugated iron.

As the length of trains terminating at Sydney Terminus increased, Platform 1 was progressively extended into the Sydney Yards (1937, then again in 1949). When diesel hauled locomotives were introduced for country services in 1965, Platform 1 was finally extended to its present length of 370 metres; it was at this time that the cantilever steel awning was introduced. The extension of Platforms 1, 2 and 3 to the south of the Devonshire Street Tunnel, overlap with the site of the first and second Redfern station passenger terminal.



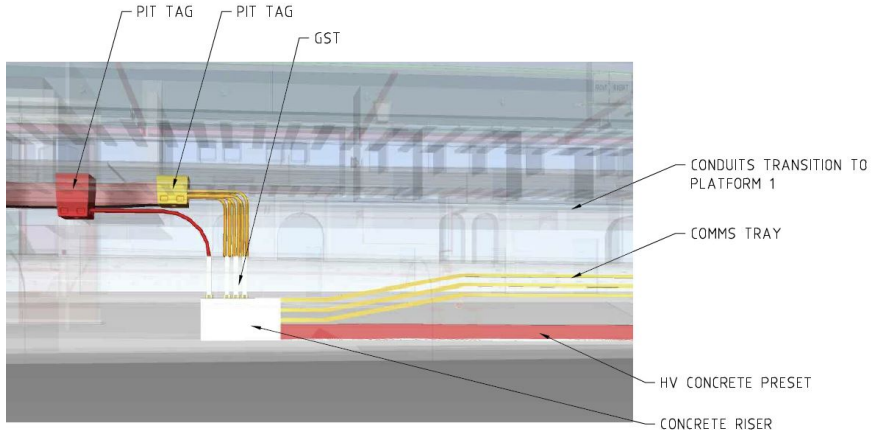
The walls of Platforms 1 and 2/3 beneath platform level are face brick (English bond) in both the original and extended sections, although the detailing provides evidence of where the extensions occurred. For Platform 1 where early extension of the platform occurred, the brickwork at the top of the extended section is corbelled and vertical joints denote where extension has occurred (refer Figure 2.6). By contrast to the original sections at the northern end, which are constructed on earth fill, the extensions incorporate a cavity within the platform. There is an existing opening in the platform wall providing access to the cavity (refer Figure 2.7).



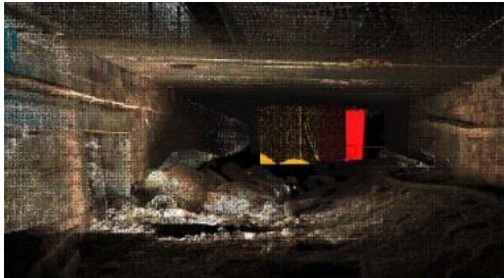
FIGURE 2.6: JOINT IN WALL OF PLATFORM 1 WHERE PLATFORM HAS BEEN EXTENDED TO THE SOUTH.



FIGURE 2.7: EXISTING OPENING, IDENTIFIED BY RED ARROW, PROVIDING ACCESS TO THE CAVITY WITHIN THE EXTENDED SECTION OF PLATFORM 1.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
2	From the west baggage tunnel, the Comms./HV services transition vertically within a concrete riser to Platform 1, where separate Comms. and HV pits will be trenched into the platform in areas constructed on fill.	 <p>FIGURE 2.8: SURFACES OF PLATFORM 1 AT THE SOUTHERN END WILL NOT BE IMPACTED BY THE WORKS.</p>  <p>FIGURE 2.9: VIEW NORTH ALONG PLATFORM 1 WHERE TRENCHING IS REQUIRED FOR THE CSR.</p>  <p>FIGURE 2.10: INDICATIVE GRAPHIC SHOWING VERTICAL TRANSITION TO PLATFORM 1 (FROM DWG. 313121).</p>	<p><b>High</b> (overall form of baggage tunnels and original finishes)</p> <p><b>High</b> (Typical transverse views across intercity Platforms)</p> <p><b>Moderate</b> (north-south views along Platform 1)</p> <p><b>High</b> (original brick supporting walls)</p> <p><b>Moderate</b> (brick platform walls of extension)</p> <p><b>Moderate</b> (Platform 1-3 canopy structure)</p> <p><b>Little</b> (Brick paving c.1998, original sections and extensions)</p>	<p>There will be moderate localised heritage impact to the fabric of the west baggage tunnel in transitioning vertically from to Platform 1, which will require penetration of the original concrete vaulted roof. In the overall context of Central Station, however, the work is relatively minor and allows for installation of required services for ongoing use of the site for its original purpose. The extent of heritage impact must be mitigated by the following measures:</p> <ul style="list-style-type: none"> <li>- The penetration should be of the minimum size required to facilitate the new installation.</li> <li>- Measures to limit vibration must be implemented to avoid impacts to surrounding fabric, including saw cutting for the new opening. Where jackhammering is necessary, safe working distances for cosmetic damages must be observed as per British Standard 7385 <i>Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration in accordance with the CSMW CEMP.</i></li> <li>- The penetration should be coordinated at platform level to minimise the extent of trenching i.e. vertical transition point should be coordinated with line of trenching required.</li> <li>- Protective sheeting should be laid down to protect platform surfaces to be retained. Refer CAS-C <i>Temporary Protection of Retained Elements.</i></li> </ul>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
2 (cont.)		<p>FIGURE 2.11: DETAILED LAYOUT SHOWING TRANSITION FROM WESTERN BAGGAGE TUNNEL TO PLATFORM 1 (SECTION B, FROM DWG. 350106)</p>		<p>For the in platform service trenching, the heritage impacts to the fabric are minor given its little significance. The making good of this work, however, will be critical to minimise long term visual impacts. Visual and physical impacts should be minimised by:</p> <ul style="list-style-type: none"> <li>- The line of excavation must be sited to avoid impact on the existing canopy structure.</li> <li>- The excavation zone should be set out based on the geometry of the existing platform tiles i.e. the joints, to avoid breaking the edges of the surfaces and tiles that will be retained. The initial saw cut should be set in from the final edges to ensure that the repair of the joint aligned edges on completion is neat.</li> <li>- A suitable replacement tile that closely matches the existing must be sourced, unless sufficient reserves of the existing tiles are available in Sydney Trains heritage store (which is preferable). If matching tiles are not available samples must be submitted of any proposed replacement tile.</li> </ul> <p>Brick platform walls of high significance will not be affected by the proposed works.</p>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
3	In the area where the platform has been extended, new services will be suspended on cable trays in the existing hollow of the platform. Openings will be created in the western brick wall supporting the platform slab for the passage of services.	 <p>FIGURE 2.12: HOLLOW BENEATH SUSPENDED PLATFORM SURFACE.</p>	As previously described at Item 2 above.	<p>There will be physical impact in creating new openings / installation of lintels in the platform support wall. This minor impact is in part mitigated by not being in a visible location. In the event of existing openings in platform walls (of Moderate significance) being enlarged for safe access, this must be set out based on the existing geometry of the brick work and made good. The work is acceptable in heritage terms as it facilitates the discreet installation of services to support ongoing use.</p> <p>The heritage impact of suspending new services within the existing hollow of the extended area of Platform 1 is negligible. Brackets will be fixed to the underside of the platform and there will be no impact to the platform surface at this end.</p>

### 2.3 Item 4 – Trenching near Western Boundary

This area of the site is part of the Western Yard (Precinct 1, as defined by the *Central Station CMP*). A remnant section of steel palisade fence with spear-headed cast iron pickets on a sandstone plinth remains at the southern end of Platform 1, extending west towards the cutting for the Darling Harbour Branch Line. The fence was constructed as part of the 1906 Terminus to delineate the Western Yard and while it is consistent in style with the enclosure to Mortuary Station, it was constructed later.



Located between the boundary fence and the platform is a hardwood buffer stop at the terminating end to the sidings. There is limited information about the buffer stops in the *Central Station* CMP except to note that most have been replaced over time.<sup>1</sup> The buffer stop adjacent to Platform 1 is similar in detailing with the buffer stops at the terminating ends of the Intercity Platforms, suggesting that it is likely non-original, however further research would be required to confirm its age. It is noted, however, that a majority of similar buffer stops for the Intercity Platforms will not be affected by the CSR works and that similar examples also exist at other Sydney railway stations e.g. Rockdale Station.



FIGURE 2.13: WESTERN BOUNDARY FENCE WHERE IT EXTENDS AROUND THE CUTTING FOR THE DARLING HARBOUR GOODS LINE.


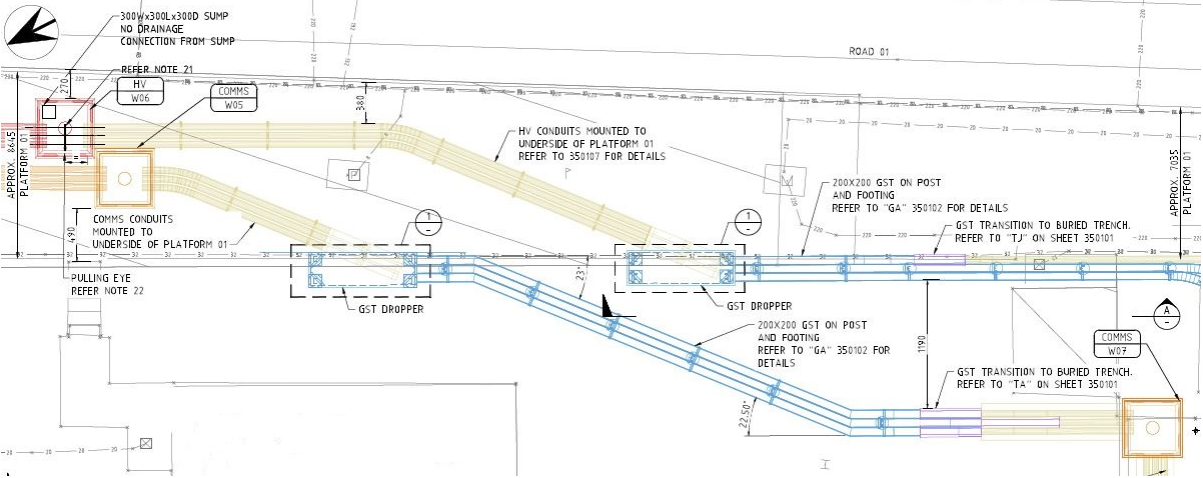


FIGURE 2.14: DETAIL VIEW OF THE WESTERN BOUNDARY FENCE ADJACENT TO PLATFORM 1 (FOREGROUND) EXTENDING AROUND THE DHGL IN THE BACKGROUND.



FIGURE 2.15: HARDWOOD BUFFER STOP AT THE TERMINATING END OF THE SIDINGS, ADJACENT TO PLATFORM 1, WITH REMNANT BOUNDARY FENCE IN THE BACKGROUND.

<sup>1</sup> Rappoport and NSW Government Architect's Office, Central Station Conservation Management Plan, June 2013, Inventory Sheet for Item 3.12, Country and Interstate Platforms, p.5

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
4	Adjacent to the Lee Street Substation the CSR will comprise a trenched route.	 <p>FIGURE 2.16: CSR SERVICES WILL BE TRENCHED IN THE AREA ADJACENT TO THE LEE STREET SUBSTATION AND THE REMNANT BOUNDARY FENCE.</p>	<p><b>High</b> (Western Yard precinct overall)</p> <p><b>High</b> (remnant stone and steel palisade boundary fence)</p> <p><b>High</b> (Prince Alfred Sewer)</p> <p><b>Moderate</b> (hardwood buffer stops)</p>	<p>From the southern end of Platform 1, the services transition via GST on posts for a short distance adjacent to the platform to a shallow trench.</p> <p>The trench, for Comms. services, will be located adjacent to and not directly impact on the remnant boundary fence, which would remain physically intact and accessible (in accordance with current access limitations). Owing to the proximity to the fence to excavation, however, measures must be taken to ensure its protection from damage during works. Refer CAS-C <i>Temporary Protection of Retained Elements</i>.</p> <p>The potential relocation of the buffer stop has been identified (refer Figure 2.15). In this event, a buffer stop would be required for operational safety further south on the line. Relocation of the existing buffer stop would result in negligible heritage impacts. If this is not feasible and the buffer stop needs to be removed completely and replaced, there would be minor heritage impacts which would be mitigated by:</p> <ul style="list-style-type: none"> <li>- the retention of similar buffer stops at the terminating ends of the Intercity Platforms generally; &amp;</li> <li>- photographic recording of the buffer stop prior to its removal in accordance with consent condition E14.</li> </ul> <p>HV services are transitioned from Platform 1 in a similar manner towards the Lee Street substation and not in proximity to sensitive heritage items in this area (refer Item 6 below).</p>
		 <p>FIGURE 2.17: TRANSITION DETAIL FROM PLATFORM 1 TO TRENCH VIA GST ON POSTS (BLUE LINWORK). (PLAN A FROM DWG 320104).</p>		

## 2.4 Item 5 and Item 6: Darling Harbour Goods Line and Lee Street Substation

The railway overbridge, variously known as the Railway Square Overbridge, Ultimo Railway Overbridge and George Street Overbridge, is part of the historic Darling Harbour Branch Line which runs in part through the Central Station site linking the Sydney Central Yards to Darling Harbour. Sometimes referred to as the 'Dive', the Darling Harbour Branch Line cutting and the tunnel system is the earliest surviving cutting and overbridge system in NSW having been opened in 1855 in conjunction with the opening of the first passenger rail line between Sydney and Parramatta. It is individually listed on the State Heritage Register.

Within the Central Station site, the Darling Harbour Cut is bordered by the bus parking area (formerly the Botany Road Sidings) to the west and by the Lee Street Substation to the east. The cut is defined by the c. 1926 battered brick embankment walls, parts of which reportedly contain sandstone footings that incorporate remnants from the Prince Alfred Sewer. The 1857 Prince Alfred Sewer was constructed along the line of a natural watercourse. It is reputed to be a brick oviform drain that crosses Sydney Yard to the Western Yard and runs into the cutting made for the Darling Harbour Branch Line. Part of the Blackwattle Bay stormwater system, the sewer section that ran through the yard was part of the original phase of construction of the system (refer Figure 2.18).

The *Central Station Main Works – Station Box and Sydney Yards Archaeological Method Statement*, Artefact (Rev 4, 16 August 2018) states in relation to the sewer:

*Subsequent renovations to the sewerage line (the Prince Alfred Sewer) and to Central Station has significantly impacted the integrity of the original drain. Current Sydney Water plans indicate that none of the original stone and brick drains remain below Central Station. Portions of the original fabric, or undocumented branches of the sewerage line could still remain. Preserved evidence of the sewer could include sandstock brick barrel drains, sandstone culverts and arches, and isolated artefact deposits*

The sandstone footings of the adjacent railway overbridge were recorded in 1996 as containing the remnant sewer (1996 CMP). At the opposite end to the east, recent works associated with redevelopment of the Cleveland Street School in Prince Alfred Park have located the sewer remaining in the vicinity of the school, extending into Prince Alfred Park.

A portion of the original brick embankment walls of the cutting on both the eastern and western sides has been removed, with the embankment shotcreted at the northern end. The brick walls are surmounted by a c.1926 pipe rail and a folded metal balustrade, which is more intact on the western side, much of the eastern wall now supporting a contemporary metal balustrade. The sandstone footings are recorded as predating the brick walls, although the footings were not evident during inspection, with walls adjoining ballast at the base. Various metal support brackets (including early examples) and brick culverts, now infilled, were evident.

The track, a single bidirectional track, is not currently in use but is considered to have opportunity to be a future operational rail line. There is existing Sydney Trains service infrastructure, including 33kV cables attached at low level to each side of the cut and stormwater services on the east, with fixings installed both in mortar joints and also directly into brickwork.





FIGURE 2.18: INDICATIVE LINE OF THE PRINCE ALFRED SEWER LINE (DOTTED RED LINE), WHICH FOLLOWS THE LINE OF A NATURAL WATERCOURSE. MARKED IN BLUE IS THE LOCATION OF THE TURNTABLE ASSOCIATED WITH THE FIRST CENTRAL STATION, WHICH WAS RECENTLY UNCOVERED AS PART OF THE ARCHAEOLOGICAL PROGRAM BEING IMPLEMENTED IN CONJUNCTION WITH CSMW.

SOURCE: 1865 TRIGONOMETRIC SURVEY OF SYDNEY (CITY OF SYDNEY ARCHIVES) OVERLAID ON RECENT SITE AERIAL IMAGE (SIX MAPS)





FIGURE 2.19: VIEW SOUTH ALONG DARLING HARBOUR. NOTE SHOTCRETE ON EASTERN EMBANKMENT IN THE FOREGROUND AND EXISTING TRANSITION OF SERVICES INTO THE DIVE.



FIGURE 2.20: DETAIL OF EASTERN EMBANKMENT SHOWING THE EXPOSED END OF THE 1926 BRICKWORK (OUTLINED) FOLLOWING MODIFICATION OF THE EMBANKMENT.



FIGURE 2.21: VIEW SHOWING MODERN FENCING INSTALLED ON THE EASTERN EMBANKMENT WALL.



FIGURE 2.22: BRICK CULVERT, BRACKETS AND SYDNEY TRAINS SERVICES PRESENT ON EAST EMBANKMENT WALLS.




FIGURE 2.23: EXPOSED EDGE OF WESTERN BRICK EMBANKMENT WALL (OUTLINED) INDICATING REMOVAL OF ORIGINAL FABRIC WHERE SHOTCRETE HAS BEEN APPLIED.



FIGURE 2.24: DETAIL VIEW SHOWING ORIGINAL PIPE RAIL AND FOLDED METAL BALUSTRADE ON THE WESTERN WALL. BEYOND IS THE CONCRETE BOUNDARY WALL OF THE BUS DEPOT, WHICH IS NOT PART OF THE CENTRAL STATION SITE.



STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
5	Installation of galvanised steel trough (GST) cable route for HV and Comms. along the Darling Harbour Cut.	 <p>FIGURE 2.25: WESTERN WALL OF CUTTING SHOWING EARLY BALUSTRADE AND BEYOND, CONCRETE BOUNDARY WALL OF THE BUS DEPOT.</p>	<p><b>High</b> (Darling harbour Branch Line cutting, including track and bed)</p> <p><b>High</b> (brick retaining walls)</p> <p><b>High</b> (pipe rail and folded metal balustrade)</p>	<p>A number of options for installation of the GST in the dive have been considered. These are identified below, with comments on associated issues:</p> <ol style="list-style-type: none"> <li>1. Posts into the ground (east or west). While this would ensure that new services avoid impact on the wall faces, it requires coordination with and acceptance from Sydney Trains to ensure that access to their existing wall mounted services is retained.</li> <li>2. On top of brick embankment wall (east or west). This would avoid impact to the face of the brick wall, however physical impacts would occur from fixings to the top of the wall, including the potential need to core footings. Physical impact on the early balustrade would also be likely on either side. In addition to physical impacts from fixing GST posts on top of the wall, there would be some visual impact associated with the new installation being set high. This would, however, be limited as visual access to this area is primarily from the yard and bus depot, which are not publically accessible. Even if the physical and visual impacts are manageable, it is noted that there would be operational constraints for the installation being set high i.e. it would limit the ability to access the services. A cherry picker would be required to enable access and maintenance from the rail bed,</li> </ol>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
				which is problematic, in particular if the service route requires emergency repair work.
5 (cont.)	<p>GST Options in Darling Harbour Goods Line (continued)</p> <p>3. GST posts fixed into concrete wall of bus depot.</p> <p>While this option would avoid any direct physical impacts to heritage fabric it would similarly set the installation at a high level, requiring a cherry picker to access from the rail bed. Beyond this constraint, the primary factor affecting the viability of this option relates to access and asset maintenance as the concrete boundary wall of the depot is not part of the Central Station site and is managed by a different state agency (TfNSW State Transit Authority of NSW, not TfNSW / RailCorp).</p> <p>This is not considered to be a viable option.</p> <p>4. GST posts fixed into the brick wall face.</p> <p>This option allows GST posts to be fixed to the wall above the existing Sydney Trains installations, overcoming potential access restrictions to these (refer Point 1). There would be direct physical impacts in fixing to the wall and visual impacts in concealing part of the brick wall face.</p> <p>5. Transition of services on gantry</p> <p>This option would transition services from GST post installations to the south of the Lee Street Substation to a gantry crossing over the cutting and then to GST on posts positioned on top of the western wall from where it tapers to a lower level. Construction of a gantry, with associated supports on each side of the cutting, would give rise to localised physical impacts. The gantry would also create minor visual impact in providing a bridging structure with attached services over the cutting, a situation which does not occur in its current presentation. Subsequently, installing GST on posts on the western wall would generate moderate physical and visual impacts to the brick wall, also arising from partial removal of the folded metal balustrade that would be anticipated.</p>			

Design development for Comms. and HV services in this area has been ongoing to resolve the operational requirements balanced against the heritage considerations. The heritage impact of the final solution is assessed below.

#### 2.4.1 Proposed Option: All services in GST on posts into ground located along the east side of the Darling Harbour Goods Line.

This option, comprising more detailed resolution of Option 1 described above, is preferred from a heritage perspective because:

- it requires a minimum of physical impact on the built fabric of the DHGL;
- while the new installation would have some visual impact by partially concealing the eastern brick wall, in being set low it reduces the extent of visual impact in the area more broadly;
- new work is concentrated on the eastern side of the cutting, which has already been subject to greater intervention including modification to the folded plate balustrade, a greater number of services affixed to its face and associated intrusive interventions (refer Figure 2.26).



FIGURE 2.26: EXAMPLES OF EXISTING INTRUSIVE INTERVENTIONS TO THE EASTERN WALL OF THE DHGL, INCLUDING PIPEWORK, FIXTURES, REMOVAL OF BRICKWORK AND CONCRETE PATCHES. NOTE REMNANT SECTION OF FOLDED METAL BALUSTRADE ON THIS SECTION OF WALL.



FIGURE 2.27: EXISTING GST AND CABLE TRANSITIONS FOR SYDNEY TRAINS SERVICES ON THE EASTERN EMBANKMENT BELOW EXISTING REINFORCED CONCRETE BEAM.

The services would require transition from the higher level of the Lee Street substation, both at its northern end for both Comms. and HV services and to the south of the substation for HV, to the lower area within the DHGL in GST or cable form. While similar in principle to the transitioning of existing Sydney Trains installations in the area (refer Figure 2.27), the installation of new steel frameworks to support the new services is proposed to create an orderly arrangement.

- At the north end, the steel transitioning frameworks are proposed to be fixed to the existing reinforced concrete beam, including from cantilevered frame, and supported at their base by a new concrete pad footing without impacting on existing significant built fabric, including the early steel palisade fence and sandstone base. This will not impact on built fabric of heritage significance. The installation of new pad footings should be implemented with regard for the recommendations of relevant Archaeological Method Statements, including *Sydney Metro: Central Station Main Works – Station Box and Sydney Yards, Archaeological Method Statement* (Artefact, August 2018) and *Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement* Artefact (May 2019).



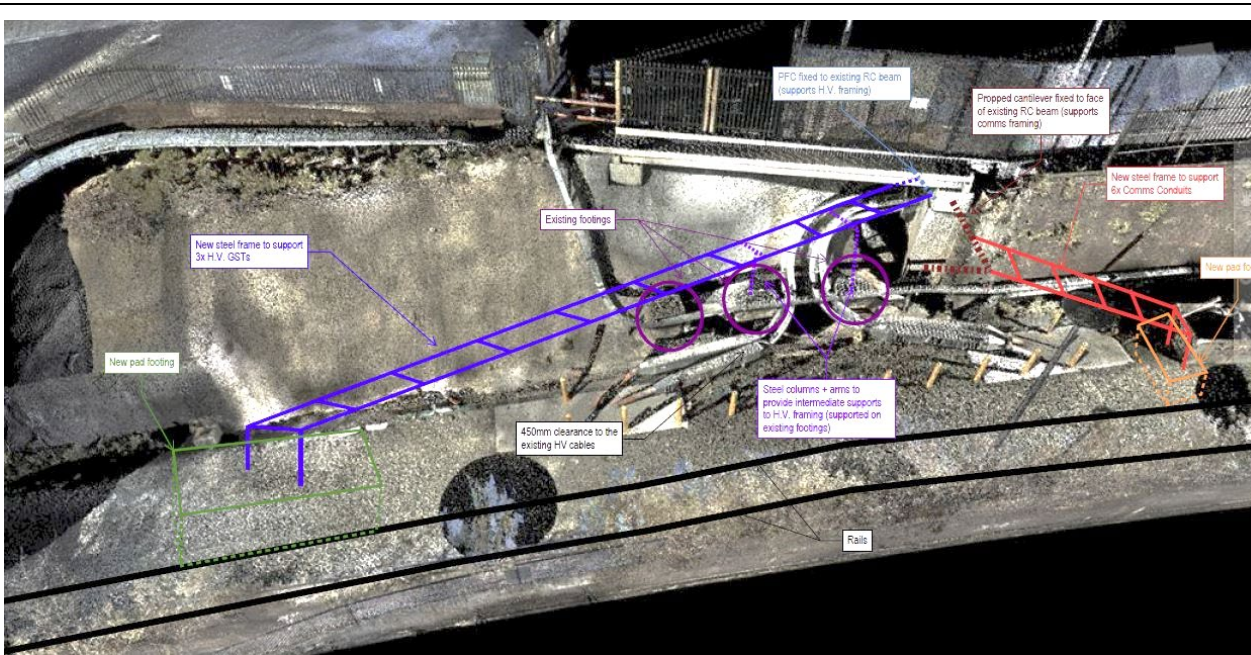


FIGURE 2.28: SCHEMATIC LAYOUT SHOWING STEEL FRAMES FOR TRANSITIONING SERVICES AT THE NORTH END OF THE DHGL (LAING O’ROURKE).



FIGURE 2.29: VIEW SHOWING JUNCTION OF EARLY STEEL PALISADE FENCE AND MODERN PALISADE FENCE AT THE NORTH END OF THE DHGL. THE TRANSITION METHODOLOGY WILL NOT AFFECT THE HERITAGE FENCE OR BRICK EMBANKMENT WALL AT THIS END.

- In the area south of the Lee Street substation, the new steel frame will be installed in the area where there is an existing break in the folded plate balustrade so that this and the new services will not generate additional impact on this element. The frame will, however, need to be fixed to the face of the brick embankment wall, so there will be some additional physical impact to this element. It is generally accepted practice to introduce new fixings to unit masonry into the mortar joints to avoid damage to the masonry. The engineering advice, however, indicates that surface mounted brackets will need to be fixed directly into the brickwork to provide adequate structural base to support the framework and the services that it supports. As such, there would be moderate physical impacts in fixing to the face of the wall.



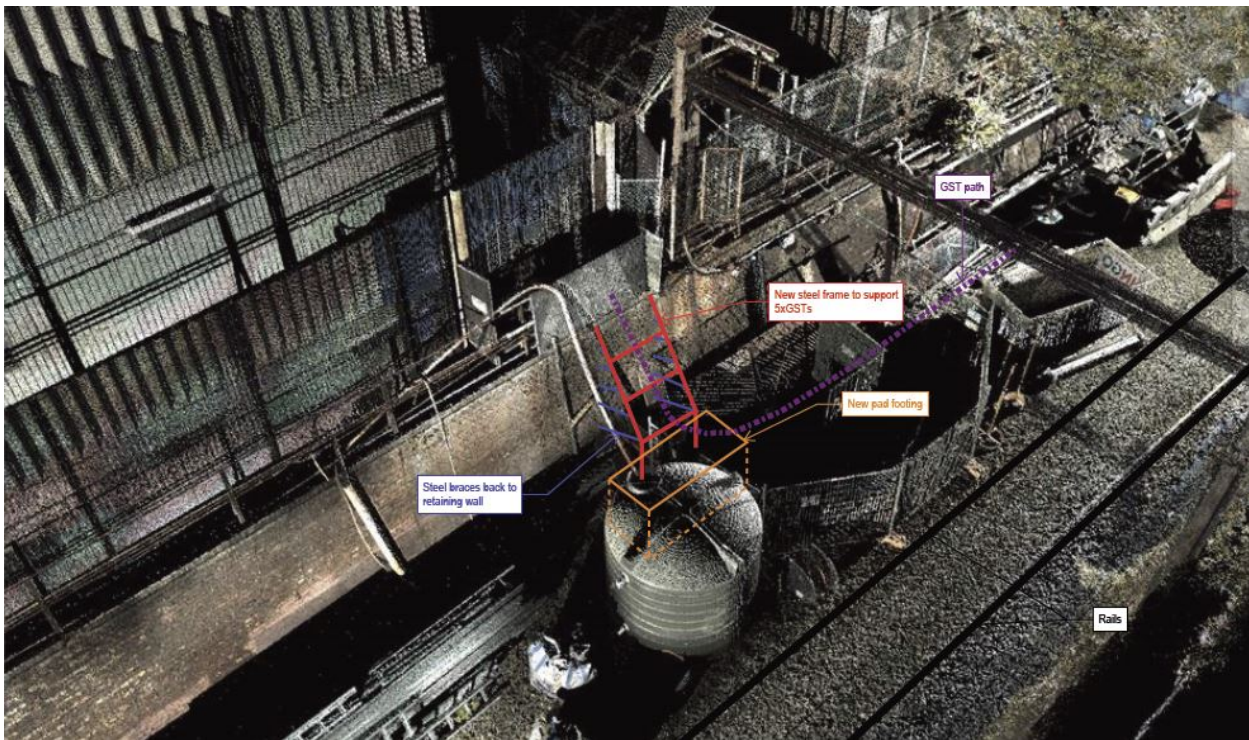


FIGURE 2.30: SCHEMATIC LAYOUT SHOWING STEEL FRAMES FOR TRANSITIONING SERVICES SOUTH OF LEE STREET SUBSTATION (LAING O'ROURKE).



FIGURE 2.31: CURRENT VIEW, INDICATIVELY SHOWN BY RED ARROW, OF THE LOCATION WHERE SERVICES WILL BE TRANSITIONED INTO THE DIVE.



It is acknowledged that consideration of many options by the project team has occurred with the intent of developing a proposal that best addresses heritage and operational requirements and that the operational requirements are inherently tied to the significance of the place as a working station. Of the various options that have been considered, the proposed option as described above is preferred from a heritage perspective as:

- the existing folded metal balustrade would be retained on both east and west sides of the wall;
- this option involves the least physical impact to the existing built fabric;
- visual impacts are minimised as the installation does not extend above the dive.

There will be some degree of heritage impact associated with any option for new services in this area, which should be mitigated by the following measures:

- Where fixings into brick masonry fabric are required, including for transitioning frames if necessary, the number of fixings must be minimised to reduce the physical impact i.e. maximise spacing for new structural supports.
- New fixings into heritage masonry fabric, including dowels, anchor rods and any other fixings, must be stainless steel to minimise rust and subsequent damage to the masonry fabric.
- New fixings must be installed in a neat and consistent manner.
- New post installations must be installed at regular intervals to ensure a neat presentation.
- The east and west embankment walls, including folded metal balustrade, and the current presentation of the Darling Harbour Goods line and cutting should be archivally recorded prior to implementation of new work.
- Existing vegetation on top of the embankment wall in the vicinity of works should be fully removed to minimise ongoing maintenance issues.
- The installation of footings for posts should be implemented with regard for the recommendations of relevant Archaeological Method Statements (Artefact, August 2018 and Artefact, May 2019), noting that the Prince Alfred Sewer is recorded historically as crossing the area of the cutting.

It is noted that this work affects post 1920 fabric only will not impact on the 1855 arched sandstone overbridge (SHR No. 01232), which is situated in the central portion of the tunnel system, approximately underneath Parramatta Road (George Street) and part of the earliest surviving railway infrastructure in NSW.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
6	Installation of galvanised steel trough (GST) cable route for HV services around Lee Street Substation.	 <p>FIGURE 2.32: GST ON POST AROUND LEE STREET SUBSTATION (BLUE LINEWORK).</p>  <p>FIGURE 2.33: EAST FAÇADE OF THE LEE ST SUBSTATION.</p>	<p><b>High</b> (Western Yard precinct overall)</p> <p><b>Little</b> (Lee Street Substation)</p>	<p>HV services will be transitioned from Platform 1 to GST on posts around the Lee Street substation, with a small area of local trenching to connect to the existing pits.</p> <p>The new services will not exceed the height of the existing substation and will not give rise to additional visual impacts either into or from the site.</p> <p>The installation of footings for posts and trenching work should be implemented with regard for the recommendations of the <i>Sydney Metro: Central Station Main Works – Station Box and Sydney Yards, Archaeological Method Statement</i> (Artefact, August 2018) and <i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement</i>, (Artefact, May 2019).</p>



## 2.5 Item 7 and Item 8: Mortuary Station / Mortuary Tunnel and Route to SYAB

The Mortuary Station was completed in 1869 to handle the movement of bodies to the new cemetery at Rookwood once the burial grounds in Sydney were declared full. Constructed in the Gothic Revival style by colonial architect James Barnet, it was used for its original purpose until 1938, after which it was used variously for consignment of animals, for parcels dispatch, a restaurant and venue for hire.

From the 1920s, construction began on electrification and the city railway, with Bradfield adopting a series of overhead electrical wires owing to ease of installation and the safety of an overhead power supply, especially in large stabling yards with complicated track arrangements. The system was supported by masts, trestles and cross-span structures which over time began to characterise the yards at Central Station. By 1934, lines serving Platforms 1 to 10 were wired and by 1957, all platforms in Sydney Yard were electrified, with examples structures from both periods – and later – remaining in the yards.



FIGURE 2.34: THIS IMAGE, CAPTURED IN THE EARLY 1950S, SHOWS MAST STRUCTURES LIKELY INSTALLED C.1934, PRIOR TO FULL ELECTRIFICATION OF PLATFORMS 1-10. MORTUARY STATION IS IDENTIFIED BY RED ARROW.

SOURCE: NOEL REED, [HTTPS://TDJ.TO/M/171969/RE-THE-VIEW-FROM-CENTRAL](https://tdj.to/m/171969/re-the-view-from-central) ACCESSED 24/8/2018



FIGURE 2.35: MORTUARY STATION ADJACENT TO SYDNEY YARD, SHOWING INDUSTRIAL LANDSCAPE CHARACTERISED BY OVERHEAD WIRING STRUCTURES (UNDATED IMAGE).

SOURCE: AUSTRALIAN RAILWAY HISTORIC SOCIETY COLLECTION



FIGURE 2.36: CURRENT VIEW NORTH EAST FROM MORTUARY STATION SHOWING OHWS WITHIN THE YARD.

The following information relating to the Mortuary Tunnel is derived from *Water Mains and Mortuary Tunnel Inspection and Condition Assessment Report* by SAS TTI Joint Venture (December 2018).

*The Mortuary Tunnel is a concrete tunnel traversing the rail corridor, connecting the Mortuary Station platform in the west to a railway easement adjacent Prince Alfred Park in the east. The roof (and the floor in some circumstances depending on tunnel bedding conditions) has been reinforced using rail beams, whilst the walls are unreinforced mass concrete...*

*The tunnel dimensions were measured to be approximately 2460mm high by 1820mm wide, and approximately 179 metres in length. There are up to nine precast troughs that have been cast into either side of the tunnel length which provides an orderly system for the support of high voltage cabling that runs from one end of the tunnel to the other. There are two dish drains that facilitate the channelling of water to the sump.*



FIGURE 2.37: TYPICAL VIEW WITHIN MORTUARY TUNNEL  
SOURCE: SAS TTI JV

*There are several locations within the tunnel whereby a number of electrical cables and conduits penetrate the tunnel walls. Some appear to be in use whilst others are redundant. Ladder access is at both termini of the tunnel, as well as an access point being located between the sump and the eastern side of the tunnel to a gallery level.*

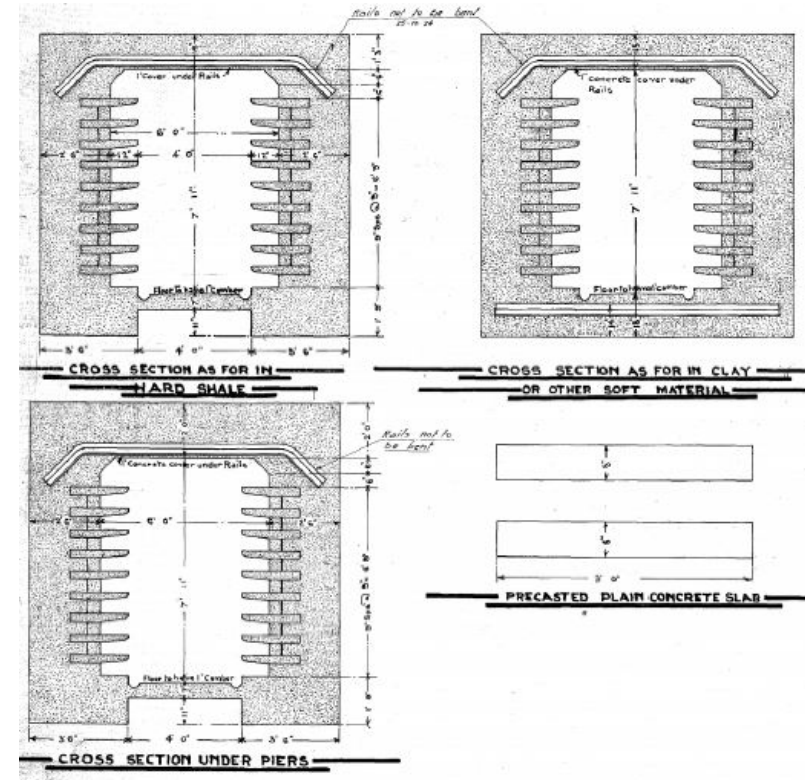





FIGURE 2.38:  
TYPICAL CROSS SECTIONS FOR VARIOUS CONSTRUCTION TYPES IN MORTUARY TUNNEL

Based on the above information, the physical fabric and the drawings dated to 1924, it seems likely that the Mortuary Tunnel relates to Bradfield’s work at the station when developing Central Electric. It is notable as a relatively early service tunnel that adaptively reuses railway infrastructure for its construction (rail reinforcement).

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
7	<p>Where the dive embankment wall tapers off to the south, GST on posts mounted into the ground will be extended into the yard.</p> <p>Services will then be trenched in ground and connected to the existing pit that accesses the Mortuary Tunnel.</p> <p>CSR services will then be extended through the Mortuary Tunnel with approximately 12/No. 150mm core holes introduced for installation of new conduits.</p> <p>A new pit will be constructed adjacent to SYAB on the east side, with services brought vertically and then run along the top of the SYAB wall.</p>	 <p>FIGURE 2.39: VIEW OVER SYDNEY YARD IN 2018 SHOWING OVERHEAD WIRING STRUCTURES. NOTE SYAB IN THE BACKGROUND (RIGHT).</p>  <p>FIGURE 2.40: VIEW SOUTH EAST FROM MORTUARY STATION TOWARDS SYAB OVER THE WESTERN YARD.</p>	<p><b>Exceptional</b> (Mortuary Station)</p> <p><b>High</b> (Western Yard precinct overall)</p> <p><b>High</b> (Mortuary Tunnel)</p>	<p>The installation of GST on posts within the yard to the south of the Darling Harbour railway cutting will be compatible with the industrial rail character of the existing overhead wiring structures (OHWS) that are present throughout the yards, which in themselves represent service upgrade facilities subsequent to electrification of the Sydney Terminus.</p> <p>The installation will be located within the Western Yard at a sufficient distance from the rear of Mortuary Station so as not to greatly alter the nature of views to and from the Mortuary building, which are characterised by the existing industrial landscape (refer Figure 2.36).</p> <p>With regard to ground disturbance works, the following comments are based on previous assessment as follows:</p> <ul style="list-style-type: none"> <li>- <i>Historical Archaeological Assessment &amp; Research Design, Artefact Heritage, October 2016, p.v:</i> the area for this work, known as CS8, has been assessed to have Nil-Low potential for 19th and 20th century rail remains, with recommended mitigation being implementation for an Unexpected Finds Procedure.</li> <li>- <i>Aboriginal Cultural Heritage Assessment, Artefact Heritage, October 2016, p.35:</i> For Aboriginal archaeological potential this assessment indicates that <i>Across the remainder of the Central Station site [i.e. excluding primary excavation area beneath Platforms 13-15] there is low- moderate potential</i></li> </ul>



STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
7 (cont.)		 <p>FIGURE 2.41: VIEW WEST TOWARDS SYAB. MORTUARY TUNNEL IS LOCATED BELOW GROUND IN THIS AREA.</p>		<p><i>for Aboriginal objects to occur in sub-surface contexts where natural soil contexts remain.</i></p> <p>The installation of footings for posts and trenching work should be implemented with regard for the recommendations of <i>Sydney Metro: Central Station Main Works – Station Box and Sydney Yards, Archaeological Method Statement</i> (Artefact, August 2018) and <i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement</i> (Artefact May 2019).</p> <p>The installation of CSR services within Mortuary Tunnel from a heritage perspective supports the ongoing original use of the tunnel as a service facility, which is a positive outcome. Furthermore, use of the existing tunnel minimises the degree of trenching and other ground disturbance works that would be associated with underbore/ULX works. In particular, the route supersedes early consideration of running services through the Yard in the vicinity of the railway turntable located during the archaeological program.</p> <p>The physical intervention to the tunnel fabric is relatively minor and acceptable in this context, however it is noted that implications for water penetration to the tunnels must be understood by Contractors and new penetrations must be adequately sealed to ensure that the tunnels do not flood. This assessment and recommendation apply equally to the construction of a new service pit to the tunnel adjacent to SYAB.</p>



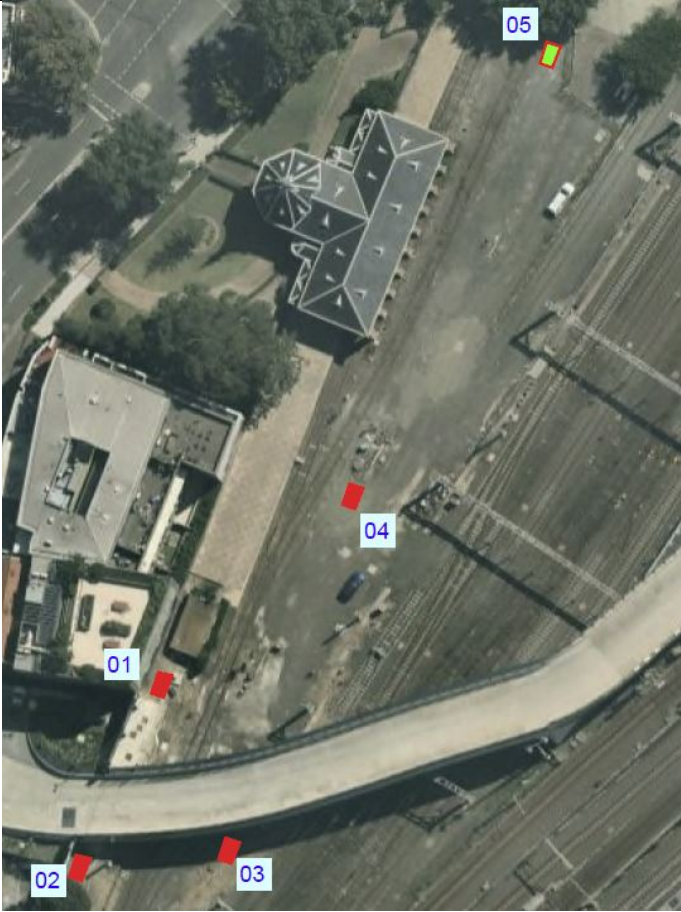
STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
8	Installation of padmount transformer in Sydney Yard.		<p><b>Exceptional</b> (Mortuary Station)</p> <p><b>High</b> (Western Yard precinct overall)</p> <p><b>Little</b> (SYAB)</p>	<p>The new services require installation of a substation within the Sydney Yard. A number of options in the vicinity of SYAB were proposed with consideration for operational constraints (op. constraints) as follows:</p> <ol style="list-style-type: none"> <li>1. North of SYAB (near Apartment) Op. Constraints: footprint impacts key GLT services, near residence / sensitive receiver, sloped location.</li> <li>2. South side of SYAB (near Petrol Station) Op. Constraints: footprint impacts key GLT services, perched sloped location, adjacent to OHWS.</li> <li>3. South side of SYAB (SYAB Pier 1) Op. Constraints: footprint impacts GLT services to Signalling DB, access issues (within rail corridor).</li> <li>4. South side of Mortuary Station Op. Constraints: potential services impact, access issues (in corridor environment), between tracks.</li> <li>5. North side of Mortuary Station Preferred for operation: easily accessible, within yard area, minimal impact to existing services.</li> </ol> <p>While Option 5 above was preferred for operational reasons, when subject to heritage assessment it was concluded that both Options 4 and 5 provide an undesirable outcome as these locations are within the S170 curtilage for Mortuary Station.</p> <p>Options 1, 2 and 3 are located to the south of Mortuary Station, outside the listed heritage curtilage, and being more visually remote from Mortuary are preferred locations from a heritage perspective.</p>


FIGURE 2.42: SYAB SUBSTATION LOCATION REVIEW.  
SOURCE: LAING O’ROURKE AUSTRALIA, 29 MARCH 2019


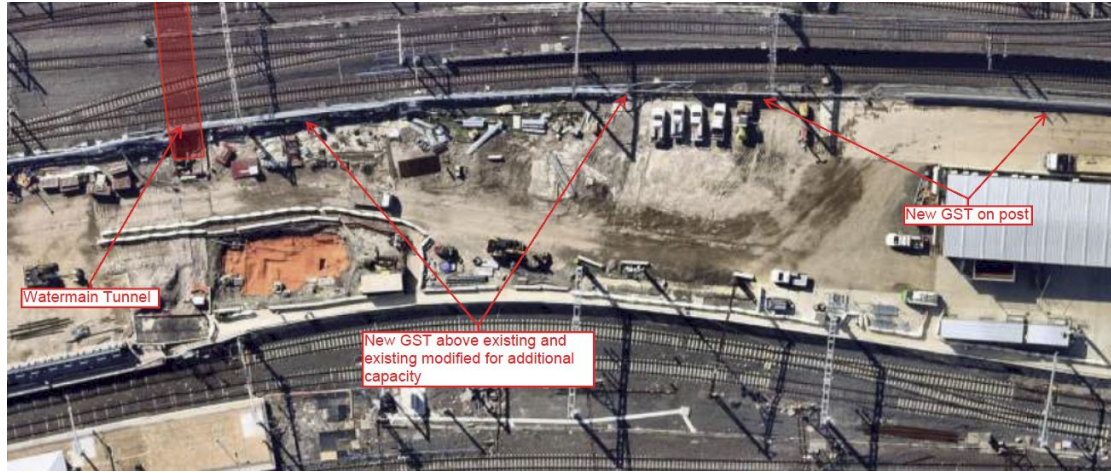
Final determination of the location of the new substation is still under investigation, with the area south of the Lee Street Substation (adjacent to the west substation) likely to be the preferred location i.e. one that can provide a balance in addressing the identified heritage and operational constraints. In principle, the location of the new substation in this area is not anticipated to have significant heritage impacts, in particular considering the location of other substations in the vicinity and the relatively small location of the new substation proposed. Appropriate care must be taken, and protection as relevant of significant fabric in the vicinity e.g. DHGL embankment walls, in craning the new substation into place to avoid damage.

This new substation may be subject to further heritage assessment if any major changes in its design and/or location occur.

## 2.6 Item 9: Sydney Yard

The Sydney Yards precinct effectively comprises a large railyard, situated in the centre of the overall site between the Western Yard and Central Electric precincts. The track layouts to platforms 1 – 12 that feed into the Sydney Yards essentially remain unchanged from the 1906 configuration; Platforms 13 – 15 and associated section of their track layouts have recently been demolished in advance of excavation works for the new Metro tunnel. The precinct principally contains the railway tracks and vacant land interspersed with overhead wiring structures associated with the electrification of Sydney Yard. The most recent addition to the Sydney Yard is the Sydney Yard Access Bridge (SYAB) constructed to retain access to the yard in anticipation of changes that will be occurring in conjunction with development of the Metro station. The former Cleaner’s Amenities Building and Rolling Stock Officer’s Building have recently been removed following implementation of archival recording procedures.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
9	Install GST on top of east batter wall of SYAB and extend on posts through Sydney Yard	 <p>FIGURE 2.43: VIEW TO SYAB FROM SYDNEY YARD.</p>	<b>High</b> (Sydney Yards overall for the historic and continual use as a railway yard since 1850s)	No adverse heritage impacts will arise installing new services on the recently constructed SYAB. The route will approximate the height of the existing walled edge and will not give rise to additional visual impacts.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
9 (cont.)		 <p>FIGURE 2.44: VIEW SOUTH IN SYDNEY YARD LOOKING TOWARDS SYAB AND SHOWING OHWS TO EACH SIDE.</p>		<p>The installation of GST on posts and modification of existing GST services for additional capacity within Sydney Yard will be compatible with the industrial rail character of the existing overhead wiring structures (OHWS) and services that are present throughout the yards, which in themselves represent upgrade facilities subsequent to electrification of the Sydney Terminus. No adverse heritage impacts, including visual impacts, are anticipated from this work.</p> <p>The <i>Central Station Main Works – Station Box and Sydney Yards Archaeological Method Statement</i>, (Artefact, Version 4, 16 August 2018) denotes the Sydney Yard area as CS4 and has recommended test/salvage and/or archaeological monitoring where trenching for new services is required. The CSR works should be implemented in accordance with relevant management practices identified in this Archaeological Method Statement, and any subsequent AMS as relevant, to ensure that any potential archaeological resources are appropriately managed.</p>
		 <p>FIGURE 2.45: ANNOTATE AERIAL IMAGE SHOWING GST LOCATION IN SYDNEY YARD EXTENDING TO THE AREA OF THE WATER MAIN TUNNEL. SOURCE: LAING O'ROURKE.</p>		



## 2.7 Item 10: Water Main Tunnel

The origins of the water main tunnel are not well documented, with technical drawings not being available at the time of the structural condition assessment undertaken by SAS TTI Joint Venture. A general arrangement plan from 1970 indicates that the service tunnel was in existence by that time.

The physical characteristics of the tunnel are recorded in their *Inspection & Condition Assessment Report* (2018) as follows:

*The tunnel was measured during the inspection to be approximately 1875mm in height, by 1520mm wide, and it is approximately 67 metres in length. It is a brick walled tunnel with a reinforced concrete slab roof measuring approximately 350mm in thickness. The floor of the tunnel is concrete and is tapered with a drainage point covered by a steel grille.*

*There are a number of services that are accommodated by the tunnel, such as water mains, compressed air lines and electrical services which are supported by a combination of embedded and bolted brackets and concrete saddles all of varying condition. A makeshift string of lighting does not appear to be in working order.*



FIGURE 2.46: TYPICAL VIEW WITHIN WATER MAIN TUNNEL SHOWING SOME OF THE MAIN FEATURES AND EXISTING SERVICES.  
SOURCE: SAS TTI JOINT VENTURE

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
10	Extend CSR services through the Water Main Tunnel.		Further information is required to determine a definitive level of significance.	The Water Main Tunnel likely has some significance for its association with the development of service provisions at Central Station over time. It is currently utilised as a service tunnel as per the original design intention and the installation of CSR services within the tunnel from a heritage perspective further supports this use, which is a positive outcome. Physical intervention for installation of services will be relatively minor and acceptable in this context, however it is noted that implications for water penetration to the tunnels should be understood and new penetrations must be adequately sealed to ensure that the tunnels do not flood.





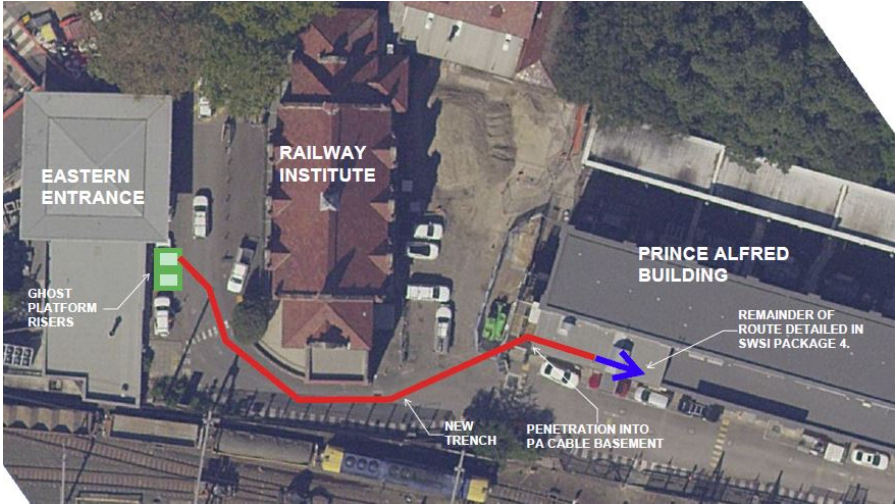
## 2.8 Item 11 & 12: Trenching around the former Railway Institute Building & Connection to Prince Alfred Substation



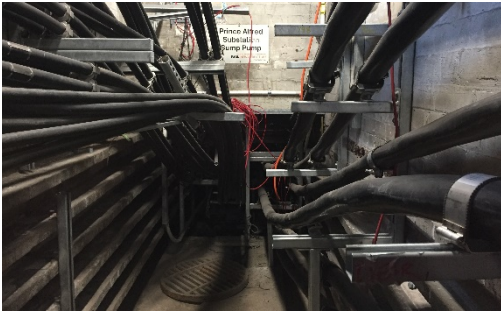
The Prince Alfred Sidings are located on the eastern perimeter of the site and traditionally contained a number of substantial buildings, some of which were demolished for construction of the Airport Rail Link. The Prince Alfred Substation remains the most substantial building in this precinct and while the former Railway Institute remains prominent, it is no longer part of the Central Station site.


The Railway Institute Building was constructed between 1891 and 1898 as a social and educational facility for railway employees. The stages of expansion which were undertaken in the first thirty years of its operation are evident on its exterior and are defined by architectural style and materials employed for each stage. The Railway Institute Building of 1891 incorporates many distinguishing characteristics of the Federation Anglo-Dutch style, such as red brickwork, Flemish gables, shallow pilasters, moulded bricks and picturesque massing. The 1898 section was constructed more simply, although brick type and detailing closely matched the earlier structure. Despite its vernacular scale and details, the building has landmark qualities, including in views from the west across Sydney Yards.

The Prince Alfred Substation is a three storey with two storey annexe constructed in the 1920s as part of the electrification of the NSW railway conceived by Bradfield. It was one of fifteen substations built in NSW for electrification of the suburban lines and one of three designed by Bradfield. While the internal equipment has been replaced, the building continues to function as the Prince Alfred Substation. The building is a face brick building built in Inter War Stripped Classical style. The façade is divided into bays and articulated by horizontal sandstone banding at sill height. The windows are steel framed. The two-storey annexe is of consistent style, with less embellishment.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE			
Item	Description of Work and Images	Significance	Comment on Stage 3 Heritage Impact
11	<p>Construction of HV pits and trenching to the around the Railway Institute Building and Prince Alfred Substation.</p> <div style="display: flex; justify-content: space-around;">   </div> <p>FIGURE 2.47: FORMER RAILWAY INSTITUTE BUILDING VIEWED FROM SYDNEY YARD.</p> <p>FIGURE 2.48: ROADWAY ADJACENT TO THE RAILWAY INSTITUTE LEADING TO PA SIDINGS.</p>	<p><b>Exceptional</b> (Railway Institute overall)</p> <p><b>High</b> (Prince Alfred Substation)</p>	<p>From the eastern exit pit of the Water Main Tunnel, CSR services need to connect to the Prince Alfred and Chalmers Street Substations. The route will extend around the former Railway Institute building in a buried trench approximately 1600mm deep extending to a pit adjacent to the Prince Alfred Substation. For the HV route around the PA Substation, the buried conduits will need to penetrate the existing basement wall to make the final connection.</p> <p>The trenching works around the Railway Institute building and PA Substation will be implemented within the existing asphalt roadway that provides access to</p>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE		
Item	Description of Work and Images	Comment on Stage 3 Heritage Impact
11 (cont.)	 <p>FIGURE 2.49: DIAGRAM SHOWING INDICATIVE ROUTE OF TRENCHING AROUND THE RAILWAY INSTITUTE.</p>	<p>the Prince Alfred Sidings (refer Figure 2.48). As such, works will be in the vicinity of the heritage listed buildings but would not have direct physical impact on them. Regardless, the work must be undertaken with due care to avoid damage to heritage fabric in the vicinity of works, including:</p> <ul style="list-style-type: none"> <li>- Measures to limit vibration must be implemented to avoid impacts to surrounding fabric, including saw cutting for new openings. Where jackhammering is necessary, safe working distances for cosmetic damages must be observed as per British Standard 7385 <i>Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration</i> in accordance with the CSMW CEMP.</li> <li>- Temporary protection measures for retained heritage fabric should be considered and implemented in the event of identified risk in accordance with the requirements of CAS-C <i>Temporary Protection of Retained Elements</i>.</li> </ul> <p>It is also noted that archaeological assessment of this area around the former Railway Institute Building and PA Substation has occurred and works must be undertaken in accordance with relevant recommendations resulting from this assessment (refer <i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement, Artefact May 2019</i>).</p> <p>The impacts of the trenching work will be minimised by implementation of the above recommendations. It is noted that the work will have no adverse visual impacts on the former Railway Institute building and PA Substation, which will retain a visual presentation to the Yard.</p>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE			
Item	Description of Work and Images	Significance	Comment on Stage 3 Heritage Impact
12	<p>HV Connection to Prince Alfred Substation at Basement Level.</p>  <p>FIGURE 2.50: DETAIL VIEW AT NORTHERN CORNER OF PA SUBSTATION SHOWING BRICK ADDITION.</p>  <p>FIGURE 2.51: BASEMENT OF PA SUBSTATION SHOWING EXISTING PENETRATION TO BRICK WALL AND SERVICES.</p>  <p>FIGURE 2.52: EXISTING SERVICES IN PA SUBSTATION.</p>		<p>From the trench, the HV services will penetrate the existing basement wall of the Prince Alfred Substation. The penetration will occur at sub ground level into the north eastern side of the building, which has already been subject to modification for service upgrades to maintain its function as a working substation, including single storey brick addition at the northern corner.</p> <p>There will be some physical impact associated with penetration of the brick basement wall. The penetration should be made neatly to the minimum dimension necessary to facilitate passage of the services to minimise the extent of impact and the new penetration must be adequately sealed to ensure that the Basement does not flood. Where spare pipes from existing penetrations in suitable locations can be utilised in lieu of additional penetrations, this should occur (refer Figure 2.53).</p> <p>Internally, it is proposed to install 3/No. new 11kV cables within the existing tunnel at Basement level on the western side of the building. The Basement is characterised by a range of existing services, including attachments to the heritage fabric, and the impact of providing new services in the proposed location will be negligible. Wherever possible, new services should utilise existing support frameworks to minimise new</p>



STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Description of Work and Images		Significance	Comment on Stage 3 Heritage Impact
12 (cont.)	 <p>FIGURE 2.53: EXISTING PENETRATIONS INTO PA SUBSTATION LINED WITH PIPES, SHOWING A NUMBER OF SPARE PIPES.</p>			<p>fixings to the basement walls and any new fixings required into masonry should be stainless steel.</p> <p>In the context of existing penetrations to the fabric of the building, the existing services present and upgrading works facilitating ongoing use of the Substation, the overall impact of the work is assessed to be minor. As the works occur below ground, there will be no change to the external presentation of the Prince Alfred Substation.</p>

## 2.9 Item 13: Transition from Water Main Tunnel to Existing Riser to Devonshire Street Tunnel

The Devonshire Street Tunnel was an integral part of Henry Deane’s grand urban plan for the development of the Central Station site. During the main phase of construction c. 1903-06, a section of the original alignment of Devonshire Street was excavated between the resumed Devonshire Street Cemetery and the northern frontage of the previous (second) station. The subterranean pedestrian thoroughfare followed the alignment of Devonshire Street, which continued when the tunnel was extended with construction of Central Electric in the 1920s. From c. 1926 commuters could access the Devonshire Concourse at the eastern end of the tunnel, south of the platforms, and travel westward through the tunnel to Railway Square, which greatly influenced pedestrian movement at the station.

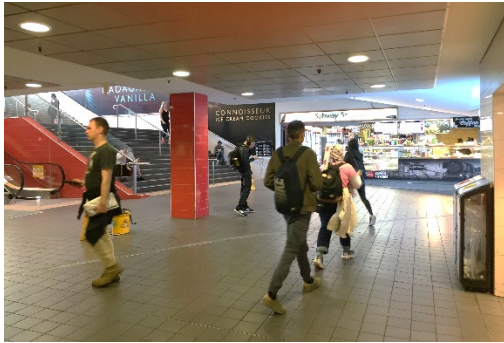

The concrete walls of the tunnel function as retaining walls and the ceiling slab is reinforced with steel beams to support the overhead railway lines. The Central Station CMP notes - *Since its inception, the tunnel interior has been constantly modified and there are no original surface finishes in situ.* In 2011, the Devonshire Concourse was renovated with a newsagent, new indicator boards and a ticketing area to accommodate greater passenger footfall. The entrance canopy adjacent to Chalmers Street was demolished and replaced and new acoustic ceiling and contemporary red tiling were introduced at concourse level.


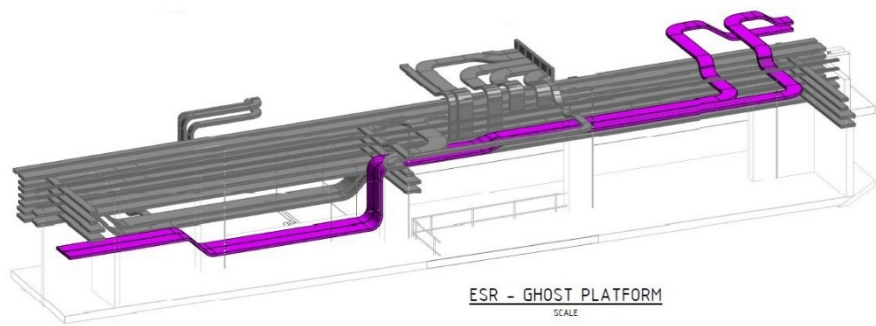


STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
13	Transition from Water Main Tunnel to ESR Concourse via Devonshire Street Tunnel riser	 <p>FIGURE 2.54: PARTIAL VIEW OF BRICK ENCLOSURE AT REAR OF EASTERN ENTRANCE CANOPY TO DEVONSHIRE STREET TUNNEL.</p>	<p><b>High</b> (overall Devonshire Street Tunnel)</p> <p><b>High</b> (tunnel alignment)</p> <p><b>Moderate</b> (east entry canopy)</p> <p><b>Little</b> (enclosure behind canopy, applied finishes; ceiling, floors and paving)</p>	<p>From the eastern exit pit of the Water Main Tunnel, CSR services will transition to GST which in part will be mounted to the rear face of the building behind the 2011 entrance canopy to the Devonshire Street tunnel. GST will extend a short distance where services will connect to an existing Comms. riser extending down to concourse and ghost platforms (Trackside 23 Southern Comms. riser).</p> <p>The attachment of GST services to the rear face of the modern brick enclosure of Little significance and transition to an existing riser will not generate an undue level of heritage impact. By using an existing riser, physical impacts will be negligible, however use of stainless steel fixings for new attachments to the brick enclosure is recommended. While visible from the rail corridor, the run of services in this area is short, limiting the extent of visual impact. Neat installation of services will mitigate against any visual impacts from the rail corridor.</p> <p>There will be no visual impacts from Chalmers Street and the eastern entrance to the Devonshire Street Tunnel associated with this work.</p>
		 <p>FIGURE 2.55: INDICATIVE LAYOUT FOR GST TRANSITION FROM WATER MAIN TUNNEL TO EXISTING RISER.</p>		

## 2.10 Item 14 and Item 15: Risers to Ghost Tunnels (Platforms 26/27) & Installation of Comms. Cables

Following initial excavations in the 1950s, ESR Platforms 24-27 were eventually built, with the ESR Concourse and Platforms 24/25 built by 1979. No rail line was ever built, however, to link to Platforms 26/27 and hence they became known as ‘ghost’ platforms. The platforms are located above Platforms 24 and 25 and have concrete walls and columns, tunnel openings as well as space for the installation of offices or equipment. The enclosure around the escalator is face brickwork. Some existing services on cable trays are run through the tunnel.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
14	New HV riser through to Devonshire Street Tunnel, transitioning to ghost tunnels (Platform 26/27).	 <p>FIGURE 2.56: DEVONSHIRE CONCOURSE BELOW EASTERN ENTRY FROM CHALMERS STREET.</p>  <p>FIGURE 2.57: ROADWAY TO PA SIDINGS ADJACENT TO THE DEVONSHIRE STREET ENTRANCE.</p>	<p><b>High</b> (Devonshire Street Tunnel overall)</p> <p><b>High</b> (tunnel alignment)</p> <p><b>Moderate</b> (eastern entry)</p> <p><b>Little</b> (applied finishes; ceiling, floors and paving)</p> <p><b>Moderate</b> (underground platforms overall)</p>	<p>The work involves a new vertical penetration extending down adjacent to the Devonshire Street entrance (eastern entry) through the asphalted ground surface and down to the ghost platforms (in accordance with approved works, Modification 2).</p> <p>There would be minor heritage impacts to the fabric of the original tunnel structures associated with new penetrations for the HV riser. Other fabric physically affected by the proposal, including the external ground surface and applied finishes, is of modern origin and may be altered without giving rise to adverse heritage impacts. The new riser must be well detailed, however, to avoid adverse visual impacts in the Concourse.</p> <p>There would be no impact to the tunnel alignments, which is a particular aspect of significance.</p>


STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
15	 <p>FIGURE 2.58: PLATFORMS 26/27 AT CENTRAL STATION SOURCE: SYDNEY LIVING MUSEUMS.</p>	 <p>ESR - GHOST PLATFORM SCALE</p> <p>FIGURE 2.59: SCHEMATIC LAYOUT (PART) OF NEW COMMS. SERVICES TO BE INTRODUCED WITHIN THE GHOST PLATFORMS, RELATIVE TO EXISTING SERVICES WITHIN THE TUNNEL (FROM DWG. 320702).</p>	<p><b>Moderate</b> (underground platforms overall)</p>	<p>Within the ghost tunnels, new Comms. services will be run on ceiling mounted cable trays similar to existing installations in this area. The tunnels have not been used for rail services since their construction and over time have been ‘adapted’ for accommodation of services. The extension of CSR services through these tunnels is therefore compatible with the existing nature of use and consistent with the introduction of other new services in this area as part of CSMW. This approach is appropriate from a heritage perspective as it consolidates a viable use of the area for services that are fundamental to the operation of the station and avoids physical and visual impacts to other areas of the station.</p> <p>The heritage impact associated with installations of new fixings is negligible when installed in accordance with the following mitigation measure:</p> <ul style="list-style-type: none"> <li>- new fixings must be installed in a neat and consistent manner i.e. in a straight line offset from walls a consistent length, at regular height and intervals, and comprise stainless steel fixings.</li> </ul>

## 2.11 Item 16: ESR Concourse Ceiling

Despite being a planned component of Bradfield’s scheme for Central Electric, circumstances were such that the ESR Concourse and Platforms 24/25 were not opened until 1979. The associated design and original colour scheme was particular to the ESR Concourse and Platforms, reflecting its later date of construction.

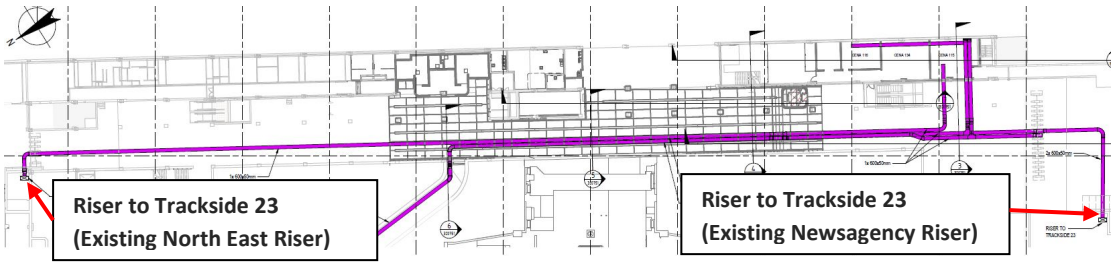
The ceilings are comprised of suspended painted metal panels with joints orientated transversely along the length of the concourse. The ceilings are currently painted a pale grey colour, replacing a previously green painted finish as evident in the 2013 CMP. The ceilings incorporate recessed troughs that accommodate fluorescent light fittings and a range of services, some intrusive, including sprinklers, speakers, security cameras and mechanical vents. The metal panels are in poor condition overall, in part from owing to the addition of services and fixtures however areas where panels are deformed, cut or have open joints are evident.

The concrete walls of the ESR Concourse are tiled (grey glazed wall tiles), however these have now been painted off white. Mounted on the walls are what is collectively known as the ‘Railway Remembrance Wall’, a collection of twenty one war memorial honour boards and plaques and two frames of photographs commemorating railway employees who served in the World Wars. The honour boards are of high heritage significance.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
16	Install cable trays for Comms. services within the existing ceiling of the ESR Concourse.	 <p>FIGURE 2.60: VIEW NORTH ALONG ESR CONCOURSE.</p>	<p><b>Moderate</b> (ESR Concourse overall)</p> <p><b>Moderate</b> (1970s strip metal panelled ceilings)<sup>2</sup></p> <p><b>High</b> (war memorial honour boards)</p>	<p>The proposal within the ESR Concourse is to run cable trays for Comms. within the existing ceiling space. The cable trays will be run from an existing riser (Trackside 23 Southern Comms. riser as addressed at Item 13) east above the south concourse and to existing back of house area (Cena 115), then extending north above the ESR Concourse. To implement this, it is proposed to remove the existing metal ceiling panels and reinstate these subsequent to works. Services will be connected at the northern end to an existing riser (north riser to trackside 23).</p>

<sup>2</sup> It is noted that the ceiling has minor inherent heritage value and the assessed significance accounts for its contribution in terms of the development of the ESR. The design, configuration, details and character of the ceiling is, however, poor and has a high tolerance for change, in particular considering its current poor condition and interventions for services.


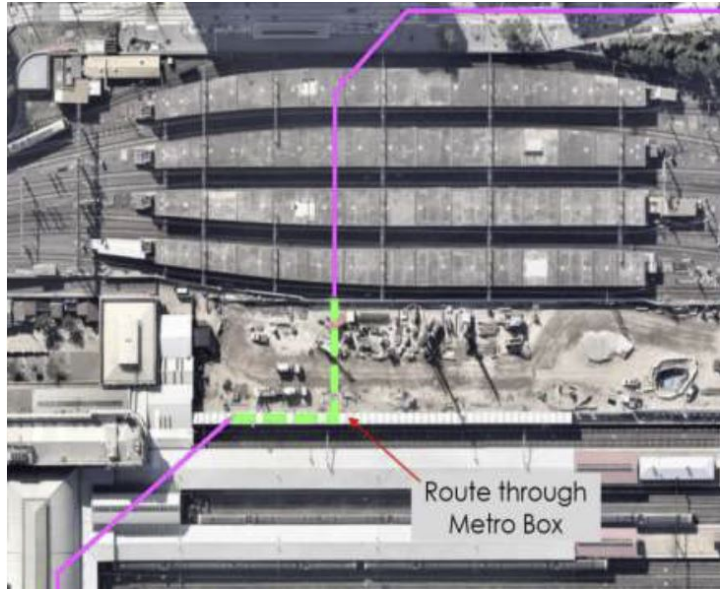


STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE				
Item	Work	Image	Significance	Comment on Stage 3 Heritage Impact
16 (cont.)		 <p>FIGURE 2.61: DIAGRAMMATIC LAYOUT OF COMMS. ROUTE THROUGH ESR CONCOURSE, BETWEEN EXISTING TRACKSIDE 23 RISERS (NORTHERN AND SOUTHERN ENDS) (DWG. 320702).</p>		<p>No long term heritage impacts to significant fabric are anticipated from this work, however it will be essential for the removal work to be carefully implemented to:</p> <ul style="list-style-type: none"> <li>- avoid impact to the ceiling panels;</li> <li>- avoid impact to the war memorial honour boards.</li> </ul> <p>Temporary protection measures for retained heritage fabric, in particular the war memorial honour boards, should be implemented in areas of identified risk. Refer <i>CAS-C Temporary Protection of Retained Elements</i>.</p>

## 2.12 Item 17: Olympic Tunnel



The Olympic Tunnel (Subway No. 4) comprises an extension of the northern baggage tunnel to provide a link to the ESR Concourse, which was opened in 1979. This tunnel, previously closed to the general public, was opened for public use in time for the Sydney Olympics in 2000 thereby providing an uninterrupted pedestrian connection with the Main Concourse. The Olympic Tunnel (Subway No. 4) has white painted lining boards, concrete floor and ripple iron ceilings, with various surface mounted services (sprinklers and pipework, fluorescent lights, power) exposed. The current applied finishes date to c.2000 as part of an ‘upgrade’ to support the public use of the tunnel.

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE			
Item	Description of Work and Image	Significance	Comment on Stage 3 Heritage Impact
17	Install new Comms. services within Olympic Tunnel.	<p><b>Moderate</b> (Olympic Tunnel overall)</p> <p><b>Little</b> (applied finishes, including</p>	<p>The retained sections of the Olympic Tunnel will be closed to the public and retained for service purposes on completion of the project in accordance with the SSI approved works. New cabling for the eastern half of the Olympic Tunnel under Platforms 16 to 23 will be behind the wall linings. Services will be connected to an existing riser (north riser to trackside 16).</p>



STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE			
Item	Description of Work and Image	Significance	Comment on Stage 3 Heritage Impact
17 (cont.)	 <p>FIGURE 2.62: VIEW WEST ALONG THE OLYMPIC TUNNEL, IN THE AREA BENEATH PLATFORMS 16 TO 22.</p>  <p>FIGURE 2.63: DIAGRAMMATIC LAYOUT OF COMMS. ROUTE THROUGH OLYMPIC TUNNEL, METRO BOX AND NORTH SOUTH CONCOURSE BACK TOWARDS NORTHERN BAGGAGE TUNNEL.</p>	plywood linings and ripple iron ceiling)	<p>Cable trays and/or brackets will be used for the final arrangement once it is converted into a services tunnel. The route will then pass via the new Metro Box, where it will not affect any existing heritage fabric, and continue via the western side of the Olympic Tunnel towards the north baggage tunnel.</p> <p>The work will physically impact on the existing applied finishes within the tunnel – the plywood linings and potentially the ripple iron ceiling. The fabric itself is not significant and removal of or intervention to it will not give rise to adverse heritage impacts. The work should, however, be installed in a neat and consistent manner to ensure that visual impacts are minimised for the period that the tunnel remains open to the public. Given the ultimate designation of the tunnel for service use in accordance with SSI approval, any visual impacts within the tunnel will be temporary.</p> <p>The heritage impact associated with installations of new fixings within the moderately significant Olympic Tunnel is negligible when installed in accordance with the following mitigation measure:</p> <ul style="list-style-type: none"> <li>- new fixings must be installed in a neat and consistent manner i.e. in a straight line offset from walls a consistent length, at regular height and intervals, and comprise stainless steel fixings.</li> </ul>

### 2.13 Item 18: Eastern Boundary Wall

The eastern boundary of Central Station is demarcated by a brick retaining wall that is contemporary with the construction of the city rail network constructed in the 1920s. The wall incorporates blind recessed panels on each face which are rendered and painted ‘Fadeless Green’ (1936 era) on the side facing the platforms. The wall murals lining the eastern boundary wall represent workers and events in the history of Central Station and were installed as part of the 150th anniversary of NSW Railways in circa 2005.

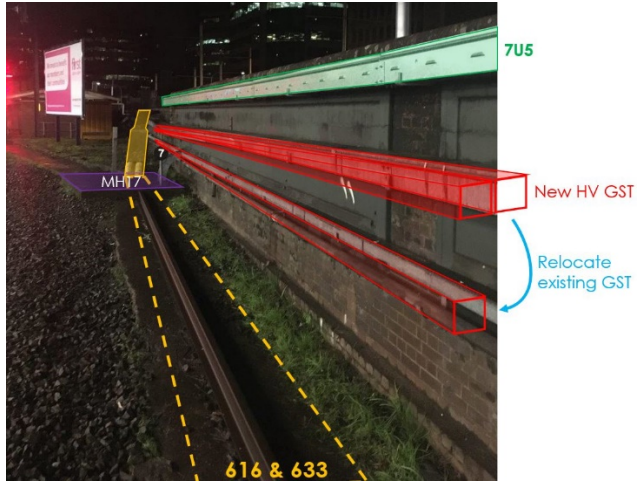
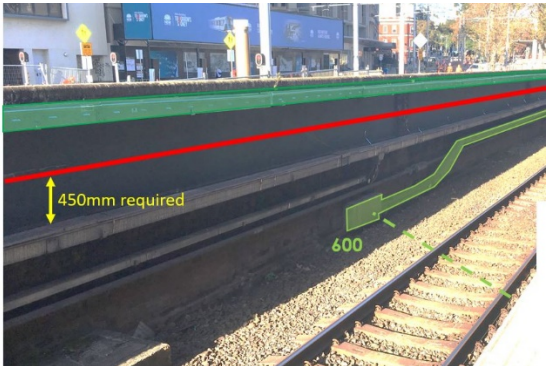
STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE			
Item	Description of Work and Image	Significance	Comment on Stage 3 Heritage Impact
18	<p>Terminate the existing live HV connection at the point where it is buried adjacent to the northern end of the boundary wall. Connect new services to existing and extend HV services in GST south along the boundary wall.</p>  <p>FIGURE 2.64: EXISTING HV SERVICES (BURIED) AT THE NORTHERN END OF THE EAST BOUNDARY WALL.</p>  <p>FIGURE 2.65: DETAIL VIEW OF EASTERN BOUNDARY WALL VIEWED FROM PLATFORM 23 SHOWING FACE BRICK WALL AND RENDERED PANELS.</p>	<p><b>High</b> (Chalmers Street brick boundary wall)</p> <p><b>Moderate</b> (brick wall murals)</p> <p><b>High to Moderate</b> (Typical transverse views across Suburban Platforms)</p> <p><b>Moderate to Little</b> (north-south views along Platform 23)</p>	<p>Modification of the route of the existing buried live HV services is required as the existing location clashes with SSI approved (Modification 2) excavation for the Central Walk. The new HV services would be supported on brackets fixed to the boundary wall in a manner similar to other existing Sydney Trains services.</p> <p>A number of options for installation of the HV electrical services on the east boundary wall have been considered. These are identified below, with comments on associated issues:</p> <ol style="list-style-type: none"> <li>1. Posts into the ground.</li> </ol> <p>This option would avoid physical impact to the brick wall, however is not feasible owing to the presence of existing in ground services. A post system would furthermore block access to existing wall mounted GST, which is not acceptable for existing operations, noting that the narrow area does not allow posts to be positioned with sufficient clearance from the wall.</p>




STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE		
Item	Description of Work and Image	Comment on Stage 3 Heritage Impact
18 (cont.)	 <p>FIGURE 2.66: DETAIL VIEW OF EAST BOUNDARY WALL SHOWING VARIOUS BRACKETS, TRANSFORMER, 600 DISTRIBUTION FEEDER AND CONCRETE PLINTHS AT THE LOWER LEVEL.</p>  <p>FIGURE 2.67: SLEEPER WALL AND EXISTING SYDNEY TRAN SERVICES LOCATED TO THE SOUTH OF THE BRICK EAST BOUNDARY WALL.</p>	<p>2. Extend services in GST below existing Sydney Trains services. Insufficient clearances as well as some existing installations (including transformer, 600 feeder and concrete plinth/hobs) prevent installation of GST at the lower level (refer Figure 2.66).</p> <p>3. Extend services in GST above existing Sydney Trains Services. With consideration for the restrictions on installation of services both in ground and at the lower level of the wall, this is the only feasible option for providing a continuous HV route at the eastern boundary of the site. Implementation of this option is, however, further complicated by:</p> <ul style="list-style-type: none"> <li>- requirements for services to adopt minimum separations in the order of 450mm from existing GST services, which are not HV; and</li> <li>- recent installation of 7U5 feeder services in GST by Transport for NSW (refer Figure 2.68 to Figure 2.70 below, showing 7U5 feeder annotated in green).</li> </ul> <p>The strategies below are proposed to mitigate the impact of the CSR work in this location. (Note 7U5 feeder works installed by others have been subject to separate impact assessment).<sup>3</sup></p> <ul style="list-style-type: none"> <li>- At the northern end, the existing GST will be relocated lower to allow for new GST to be installed in the same alignment as existing without further visual impact on the rendered panels (refer Figure 2.68). Existing fixings will be reused where possible to minimise physical impacts. NOTE: This strategy is not feasible across the full length of the wall owing to the existing 600 distribution feeder below, preventing lowering of existing services (refer Figure 2.69).</li> </ul>

<sup>3</sup> GML Heritage, *Feeder 7U5 Statement of Heritage Impact*, March 2019.



STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE		
Item	Description of Work and Image	Comment on Stage 3 Heritage Impact
	 <p>FIGURE 2.68: ANNOTATED PHOTOGRAPH SHOWING NORTHERN END OF EAST BOUNDARY WALL AND PROPOSAL TO RELOCATE EXISTING GST TO ALLOW FOR NEW SERVICES IN AREA OF EXISTING IMPACT. (SOURCE: LAING O’ROURKE)</p>  <p>FIGURE 2.69: ANNOTATED PHOTOGRAPH SHOWING EXISTING ‘600’ DISTRIBUTION FEEDER. MINIMUM SEPARATION REQUIREMENTS DRIVE THE NEED TO POSITION NEW SERVICES AS SHOWN IN RED. (SOURCE: LAING O’ROURKE)</p>	<ul style="list-style-type: none"> <li>- At the southern end, minimum separation requirements determine the position of new GST at the top of the brick line, below the rendered panel, transitioning down to a pit (MH11, refer Figure 2.70). This will allow original the detailing of the panels to remain legible in this location.</li> </ul> <p>There will be moderate physical impacts to the existing boundary wall to provide new bracket fixings as required to support the GST and visual impacts from the installation. These impacts must be minimised by the following actions:</p> <ul style="list-style-type: none"> <li>- New fixings must be installed in a neat and consistent manner i.e. in a straight line, and comprise stainless steel fixings. (Note: While fixing into joints is typically preferred and should occur wherever possible, this may be prevented by:             <ul style="list-style-type: none"> <li>- concealed joints where panels are rendered; and</li> <li>- engineering requirements to provide an adequate structural base to support the services).</li> </ul> </li> <li>- New fixings should be installed at maximum spacing suitable to the application, using smaller fixings, reversible or flush with brick, with the potential to cap in the future.</li> <li>- The boundary wall should be archivally recorded prior to implementation of work.</li> </ul> <p>Beyond the brick wall to the south, services will continue in front of the existing sleeper wall on a new framework, with negligible heritage impacts anticipated. HV services will be connected to existing at the southern end of the platform.</p>

STAGE 3 DESIGN WORK FOR COMBINED SERVICES ROUTE		
Item	Description of Work and Image	Comment on Stage 3 Heritage Impact
	 <p>FIGURE 2.70: ANNOTATED PHOTOGRAPH SHOWING PROPOSED LOCATION OF GST AT THE SOUTHERN END OF THE WALL, BELOW THE RENDERED PANEL (RED LINEWORK). (SOURCE: LAING O'ROURKE)</p>	<p>The new services will be on the inside face of the boundary wall and will not be visible external to the SHR curtilage. Existing views to the site along Chalmers Street will not be affected by the work. While the GST would be visible from Platform 23 looking southeast towards Chalmers Street, the introduction of an additional GST line will only have a minor additional visual impact given the presence of existing rail and electrical infrastructure, including the recent installations, and the mitigation strategies proposed. It is noted that the incremental changes together have a cumulative impact on the overall significance of the boundary wall, however the impact on the overall site and its major heritage values will be minor considering the relatively small area of the site affected by these changes. The work is fundamental to the ongoing operation of the site as a major transport complex and supports this aspect of the site's significance.</p> <p>There will be no impact to the existing murals, which are on the street facing elevation of the wall.</p>

### 3 CONDITIONS OF APPROVAL & REVISED ENVIRONMENTAL MANAGEMENT MEASURES

This section identifies relevant conditions of approval and the revised environmental management measures (REMMs) that identify the mitigation measures documented in the Environmental Impact Statement.

Approval Condition	Requirement	Comment
E10	The Proponent must not destroy, modify or otherwise physically affect any Heritage item not identified in documents referred to in Condition A1.	Works for the Combined Services Route are in accordance with the nature of approved works overall, with the items identified in this heritage impact assessment resulting from the detailed design resolution of the broad scope of approved work.
E13	The Proponent must prepare a Heritage Archival Recording Report, including photographic recording of the heritage items in documents referred to in Condition A1.	Archival photographic recording prepared in accordance with NSW Heritage Division published guidelines has been implemented in the areas of the ESR Concourse, Darling Harbour Goods Line, eastern boundary wall, Sydney Yard and Olympic Tunnel prior to commencement of works.  The Heritage Archival Recording Report will be submitted on completion to nominated authorities as required by the approval condition.
E15	The Proponent must salvage items of heritage value from heritage listed buildings and structures to be demolished before demolition, and assess options for its sympathetic reuse (including integrated heritage displays) on the project or other options for repository, reuse and display.	The CSR works do not involve demolition of building and structures; no items of heritage value are proposed for removal.
E16	The Proponent must prepare a Salvage Report, including photographic recording of the heritage items identified for salvage in documents referred to in Condition A1.	Sydney Metro have prepared a Salvage Register in conjunction with the input of heritage specialists. No items of heritage value are proposed for removal in conjunction with the CSR works.

Approval Condition	Requirement	Comment
E17	The Archaeological Assessment Research Design Report (AARD) in the PIR must be implemented. Final Archaeological Method Statements must be prepared in consultation with the Heritage Council of NSW (or its delegate) before commencement of archaeological excavation works.	The CSR works are to be implemented with regard for the recommendations of relevant Archaeological Method Statements, including <i>Sydney Metro: Central Station Main Works – Station Box and Sydney Yards, Archaeological Method Statement (Artefact, August 2018)</i> and <i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement Artefact (May 2019)</i> .

REMM	Requirement	Comment
NAH1	Archival recording and reporting of the following heritage items would be carried out in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998a), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006):  The Rolling Stock Officers' Garden, Rolling Stock Officers' Building and Cleaners' Amenities Building in Sydney Yard and any other component of the Sydney Terminal and Central Railway Stations group to be removed or altered.	Archival photographic recording prepared in accordance with NSW Heritage Division published guidelines has been implemented in the areas of the ESR Concourse, Darling Harbour Goods Line, eastern boundary wall, Sydney Yard and Olympic Tunnel prior to commencement of works.  The Heritage Archival Recording Report will be submitted on completion to nominated authorities as required by the approval condition.
NAH2	An archaeological research design would be prepared and implemented to identify the need for archaeological testing or monitoring. Archaeological mitigation measures recommended in the archaeological research design would be carried out in accordance with Heritage Council guidelines, and	The CSR works are to be implemented with regard for the recommendations of relevant Archaeological Method Statements, including <i>Sydney Metro: Central Station Main Works – Station Box and Sydney Yards, Archaeological Method Statement (Artefact, August 2018)</i> and <i>Sydney Metro: Central Station Main Works – Central Walk, Archaeological Method Statement Artefact (May 2019)</i> .



REMM	Requirement	Comment
	where identified in the archaeological research design, would be supervised by a suitably qualified Excavation Director with experience in managing State significant archaeology.	
NAH3	An Exhumation Policy and Guideline would be prepared and implemented. It would be developed in accordance with the Guidelines for Management of Human Skeletal Remains (NSW Heritage Office, 1998b).	Refer to Sydney Metro Project Exhumation Management Plan
NAH4	The method for the demolition of existing buildings and / or structures at Chatswood dive site, Victoria Cross Station, Martin Place Station, Pitt Street Station, Central Station and Waterloo Station would be developed to minimise direct and indirect impacts to adjacent and / or adjoining heritage items.	Contractor obligation.  Works should be carried out by the Contractor in accordance with this requirement and with regard for the requirements of <i>CAS-C Temporary Protection of Retained Elements</i> (OCP Architects, Rev.A 24 October 2018).
NAH7	The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Martin Place Station and Central Station would be developed with input from a heritage architect.	The design of the CSR has been developed with consideration for the characteristics of its heritage context and seeks to minimise physical and visual heritage impacts. Wherever possible, existing service infrastructure is utilised where this is available with new installations as required to complete the system. In consultation with the heritage architect, options have been considered for sensitive areas to determine the best approach with regard to heritage significance, the functional requirements of the installation and existing constraints at the site as described in this report.
NAH13	The design and detailed construction planning of work at Central Station would consider the requirements of the Central Station Conservation Management Plan	The CSMW respond to the CMP requirements for Central Station to maintain an ongoing role as a major transport hub in NSW. The works have been guided from their inception by the input of heritage specialists and relevant

REMM	Requirement	Comment
	<p>(Rappoport and Government Architects Office, 2013) and include consideration of opportunities for the retention, conservation and / or reuse of original and significant heritage fabric and movable heritage items.</p> <p>Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development.</p>	<p>statutory authorities acting in accordance with accepted best conservation practice, including via regular meetings by the Heritage Working Group.</p> <p>The following CMP policies and strategies have been applied in development of the proposal:</p> <p><i>The government agency/ies responsible for the Central Station CMP area should:</i></p> <ul style="list-style-type: none"> <li>- <i>recognise that the continuing and sustainable use of Central Station as a major transport hub in NSW is an essential part of its outstanding heritage value; and</i></li> <li>- <i>recognise that the outstanding heritage values can be successfully balanced with the need for Central Station to continue as a major transport interchange in NSW including both major change and the management of ongoing minor technical adaptation, maintenance and repair</i></li> </ul> <p><i>The heritage impact of all service runs, placement of equipment etc. are to be kept to a minimum.</i></p> <p><i>Seek early advice from RailCorp’s heritage officers and/or from consultants with heritage experience to: review all new services proposals, consider and discuss alternatives, assess heritage impact, gain approval from heritage authorities when necessary and supervise installation.</i></p> <p><i>Services impacting on structural elements require input from a heritage engineer.</i></p> <p><i>Placement of new services are to be installed in a manner that causes the least damage to the building fabric. For example if these services are removed in the future little or no damage will be evident (reversible options preferred).</i></p>

REMM	Requirement	Comment
		The design proposals for the CSR are in accordance with the intent of the CMP to retain and conserve the significant heritage values of Central Station while ensuring its ongoing use as a major transport complex. The CSR works support the primary railway use of the site and have been developed with the input of heritage specialists to promote understanding of the significance of Central Station and minimise negative heritage impacts of the work.

## 4 CONCLUSION

The installation of new infrastructure provisions over a large-scale operational rail site is a complex exercise. From a heritage perspective, the major considerations are how the proposal relates to the significant qualities of the heritage precinct, including its industrial character – as expressed in the existing materials of the site and its elements – and potential archaeological resource.

The Stage 3 design for the Combined Services Route (CSR) provides a circular route for Comms. and HV services to serve the whole of Central Station as part of the Power Supply Upgrade Program to meet expected power requirements of the future rail network. Wherever possible, the design has made use of existing service tunnels, passages and risers to both minimise the extent of physical intervention to fabric of the station and to minimise adverse visual impacts within the SHR curtilage. Many new services have otherwise been concealed, for example within ceiling spaces. Where this has not been possible, options have been considered for sensitive areas to determine the best approach with regard to heritage significance, the functional requirements of the installation and existing constraints at the site. In this way, the CSR as designed achieves a balance between the operational and heritage requirements of the site and its surroundings which does not result in undue levels of impact to the significant values of Central Station, including its physical fabric and views, or other heritage items in its vicinity. The work facilitates its ongoing function for the original purpose i.e. as an operational railway facility, which is a fundamental aspect of significance of the place, and is appropriate in this regard.

Overall, the Stage 3 design for the CSR is broadly consistent with approved impacts in this area under SSI 15\_7400, and has been developed to resolve detailed aspects of the design. A minor increase in the overall trend of heritage impacts has been identified additional to the approved impacts that is the inevitable result of detailed design resolution of the approved concept design. For all components of work identified in this HIA, measures have been taken to minimise the extent of heritage impacts and no major issues adversely affecting the trend of heritage impacts have been identified. A number of additional mitigating strategies are recommended, as summarised below, to ensure that important heritage values that contribute to the character and significance of the place will be retained as far as possible.

## 4.1 Recommendations

The proposed works have been developed in consultation with experienced heritage architects. The proposal constitutes a considered response to the site's significant values and the heritage impacts, including potential heritage impacts, identified in this report are manageable when implemented in accordance with the following recommendations:

1. New fixings where required into masonry fabric must be installed in a neat and consistent manner and comprise stainless steel fixings.
2. New fixings should be in to mortar joints wherever possible.
3. Existing openings should be used in lieu of additional penetrations wherever possible. The size, number and extent of new fixings and penetrations into existing fabric should be restricted to the minimum necessary for the new installation/s.
4. Any new penetrations into existing tunnels and/or basement areas must be adequately sealed to ensure that flooding does not occur.
5. Measures to limit vibration must be implemented to avoid impacts to surrounding fabric, including saw cutting for new openings as relevant. Where jackhammering is necessary, safe working distances for cosmetic damages must be observed as per British Standard 7385 *Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration* in accordance with the CSMW CEMP.
6. Visual and physical impacts of in platform trenching (Platform 1) should be minimised by:
  - Setting out the excavation zone to avoid impact on the existing canopy structure.
  - Setting out the excavation zone based on the geometry of the existing platform tiles (joints).
  - The initial saw cut should be set in from the final edges to ensure that the repair of the joint aligned edges on completion is neat.
  - A suitable replacement tile that closely matches the existing must be sourced, unless sufficient reserves of the existing tiles are available in Sydney Trains Heritage store. If matching tiles are not available, samples must be submitted of any proposed replacement tile.
7. Any new penetrations to brick masonry fabric should be of minimum dimension necessary for the new installation, based on the existing geometry of the brick work, and made good. Areas where this may apply include supporting walls of Platform 1 and Basement walls of Prince Alfred Substation.
8. Visual and physical impacts of GST installation on the Darling Harbour Branch Line embankment wall should be minimised by:
  - Minimising the number of fixings to reduce the physical impact to the brickwork i.e. maximise spacing for new structural supports.
  - Installing stainless steel fixings in a neat and consistent manner as per recommendation 1.
  - Archival recording the embankment wall prior to implementation of work. (Note: Darling Harbour Dive recording completed).
  - Removing existing vegetation on top of the embankment wall in the vicinity of works to minimise ongoing maintenance issues.
9. Final location of the substation within the Yard should be subject to heritage assessment if any major changes to the design and location other than as addressed in this report are proposed.



10. Visual and physical impacts of GST installation on east boundary wall should be minimised by:
  - Installing stainless steel fixings in a neat and consistent manner as per recommendation 1, at maximum spacing suitable to the application.
  - Reusing existing fixings wherever possible.
  - Locating new GST as detailed in Section 2.13 to minimise visual impact of the new installation. At the southern end, this includes installing the GST below the rendered panel so that the original detailing remains legible. At this end, new stainless steel fixings should be set into the mortar joints of the face brickwork that is below the rendered panel if feasible from an engineering perspective.
  - Archival recording of the boundary wall prior to implementation of work. (Note: Eastern boundary wall recording completed).
11. Any new installation within the SHR curtilage that is not concealed must be of high quality and well detailed to avoid adverse visual impacts e.g. new risers in Devonshire Concourse and Northern Concourse.
12. Temporary removal of any fabric for reinstatement must be executed with due care to avoid physical impact to it and surrounding heritage fabric.
13. Implementation of measures for temporary protection of retained fabric in close proximity to works must be undertaken in accordance with CAS-C *Temporary Protection of Retained Elements* (OCP Architects, October 2018). Proposals for protection must be submitted to the heritage architect for approval prior to implementation.
14. Any ground disturbance works must be implemented in accordance with the recommendations of relevant Archaeological Method Statements.
15. Archival photographic recording of any element that needs to be removed within the SHR curtilage must be implemented in accordance with consent condition E14.