8.0 Management Measures

8.1 Introduction

Chapter 7.0 identified that there is potential for heritage items to be potentially impacted directly or indirectly, by vibration and settlement associated with tunnelling activities, vibration associated with surface works and visual impacts. These impacts can be managed or mitigated through the implementation of measures. The following sections outlines the proposed measures based on the impact type.

8.2 General

The project would result in an alteration, both real and perceived, to the interactions between people, traffic and the built environment. This will be particularly evident around the St Peters interchange. It is recommended that this impact be mitigated through the development and implementation of an interpretation plan during detailed design, which would identify opportunities to reflect the history of the areas in the newly built fabric. The plan should be developed in conjunction with the urban design to develop specific suitable interpretation in areas where there will be changed use including, but not limited to:

- Alexandra Canal and the industrial heritage of the area; and
- The St Peters Brickpit geological site.

Further detail of the recommended Non-Aboriginal heritage interpretation plan is provided in the following sections of this report.

The construction environment management plan would also be prepared following detailed design and implemented prior to and during construction, detailing how construction impacts on heritage would be minimised and managed. As a minimum, the plan will include the following elements:

- Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the Heritage Act;
- A list, plan and GIS layer showing the location of identified heritage items;
- The significance assessment and Statement of Significance for each site (refer to the relevant sections in **Chapter 6.0**);
- Mitigation measures identified for relevant items and details on when the measures are to be implemented;
- Protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance; and
- An unexpected finds procedure in the event that further sites are identified during works, including skeletal remains.

8.3 Significant impact

The assessment has found that there would be a significant impact to seven items, primarily due to the proposed demolition, acquisition or modifications required. These items are:

- Warehouse 'Rudders Bond Store', Sydney LEP 2012 I1405.
- Terrace group – 28-44 Campbell Street, Roads and Maritime section 170 #4305629.
- House – 82 Campbell Street, Roads and Maritime section 170 #4305643.
- Service Garage, Marrickville LEP 2011 I312.
- Alexandra Canal, State Heritage Register #01621, Sydney LEP 2012 I3, Marrickville LEP 2011 I270, Botany LEP I1 and RNE # 4571712.
- St Peters Brickpit Geological Site, RNE #16240.

Three items, being the Rudders Bond Store, and the houses at 28-44 and 82 Campbell Street, are proposed for demolition as a result of the project. The houses have been assessed as being of local significance, while the Rudders Bond Store is of State significance. As outlined in **Chapter 7.0**, the first option assessed was to avoid the impacts through planning and design, followed by reduction in footprint or modification in construction methodology. This has not been possible for the reasons provided in **Chapter 7.0.** The impact significance of the items can therefore be ameliorated through the implementation of two management measures: archival recording and salvage, as elaborated below.

Firstly, prior to the commencement of construction works, all three items should be subject to a full archival recording following the NSW Heritage Division guidelines *How to Prepare an Archival Recording* (NSW Heritage Office, 1998b) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006).

Secondly, consideration should be given as to whether elements of the houses could be salvaged and used to maintain or restore other properties managed by Roads and Maritime. Similarly, a feasibility study should be undertaken to determine whether the Rudders Bond Store, in particular the laminated columns, could be relocated and re-erected. The brickwork and cladding are not considered to be of particular significance, however, the laminated columns are rare and consideration should be given to their reuse. In addition to this, options would be investigated during detailed design for ways in which the history of the Ralph Symonds company can be documented in a manner that would present It to a national audience and in partnership with stakeholders such as the City of Sydney and Powerhouse Museum. The focus would be on their development of innovative timber construction methods during and after the Second World War.

In addition to the proposed complete demolition of the above three items, the project would require the construction of stormwater discharge points into Alexandra Canal, which would have a direct impact. Secondary direct impacts would also occur as a result of vibration intensive construction activities occurring in close proximity of the embankments. To minimise the potential impacts on the canal, the following management measures are to be implemented:

- Monitoring of the canal should be undertaken during the works to ensure vibration is not impacting on the canal walls;
- A condition report of the canal brickwork adjacent to the bridge crossings and drainage discharge points, including areas beneath the bridges and areas impacted by associated construction works, would be undertaken prior to the commencement of construction. Any rehabilitation and conservation requirements would be determined in consultation with Sydney Water.
- An archival recording of the canal walls should be undertaken, involving both scale drawings and photography, prior to the removal of the sandstone blocks;
- The sandstone blocks should be numbered and recorded in such a way that those not displaced by the discharge points can be replaced in their previous location;
- Sandstone blocks displaced by the discharge points should be stockpiled for use in repairs of other sections of the canal; and
- Heritage interpretation regarding the canal should be installed in proximity to the item, ideally at the Campbell Road pedestrian and cyclist bridge given this would have greater pedestrian accessibility, in accordance with an interpretation plan.

The works within the non-statutory listing for the St Peters Brickpit Geological Site, while noting that this site has been an active landfill, would result in the modification of the geological site, but ultimately, the geological features are such that they would be preserved within behind a new landform or terraced retaining walls at the St Peters interchange In addition, the public access created by the interchange could allow for greater public knowledge of the geological and palaeontological significance of the site and the Sydney basin more generally, through the following mitigation measures:

- Interpretation of the geology of the area within the interchange and surrounds, including opportunities to:
    - the geological interpretation of the site in consultation with City of Sydney; and
    - Integrate the geological/palaeontological discovery of the *Paraclytosaurus davdii*.

- Retaining an exposed section of the fresh shales and siltstones, including features associated with deposition of the sedimentary rocks, later formed fractures such as joints and faults, if safe to do so for both landform stability and ongoing access for interpretation;
- Photographic and drawn archival recording of the geological features prior to and/or during construction; and
- An assessment and/or consultation with a palaeontologist to determine whether the project impact area has potential to contain further specimens of scientific interest.

The project proposes to acquire the Service Garage, located on the corner of Princes Highway and Canal Road. The acquisition and location of the service garage within the St Peters interchange would result in a change in use. As the building has been used as a service garage since the 1940s, this has been assessed as a significant heritage impact. A statement of heritage impact is provided in **Section 9.3.1**A photographic archival recording would be undertaken prior to the current use ceasing. The archival recording should conform to the guidelines provided in *How to prepare archival records* (NSW Heritage Office, 1998a) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). The archival recording should be integrated into on-site future interpretation of the item.

8.4 Acquisition

The curtilage of the Goodsell Estate Heritage Conservation Area has been identified as potentially being impacted by the project. The impacts to the Goodsell Estate Heritage Conservation Area are considered to be minimal and no mitigation is required.

8.5 Vibration (surface and tunnelling)

Vibration has been identified as a secondary direct impact for both the surface and subsurface (tunnelling) works. The following mitigation measure is proposed to address potential impacts for both secondary direct impacts.

The potential impacts on heritage items due to construction vibration would be confirmed during detailed design. If required, mitigation and management measures to minimise impacts would be investigated, and monitoring would be carried out at properties identified as being above recommended criteria. Property dilapidation surveys would also be carried out for all heritage items located within the preferred project corridor or properties within recommended safe working setbacks (in the case of potential surface vibration impacts).

Detailed mitigation and management measures would be developed for each heritage item directly impacted by the project once final disturbance areas have been identified through detailed design. These mitigation and management measures would be included in the construction environmental management plan(s) for the project.

8.6 Settlement

Settlement has been identified as a secondary direct impact associated with the tunnelling works. Any potential impacts would result in cosmetic damage, depending on the structure and its location. The potential impacts on heritage items due to settlement would be confirmed during detailed design. If required, mitigation and management measures to minimise impacts would be investigated. Property dilapidation surveys would also be carried out for all heritage items located within the preferred project corridor.

8.7 Visual impacts

Table 59 provides a summary of the aesthetic significance, the project and provides an indication as to whether the heritage significance would be impacted. **Section 7.2.4** discussed the potential visual impacts and determined there was unlikely to be major visual modifications to the outlook at the majority of identified heritage items. There would be alterations to the visual outlook from the terraces located at 2-34 Campbell Road, St Peters. It is recommended that landscaping treatments to mitigate these impacts be investigated during detailed design.

The exception to this is Alexandra Canal, a State heritage item. The Conservation Management Plan (NSW Government Architect's Office, 2004) for the item indicates that the open air space above the canal is important to the significance of the item. The document also recommends that the number of new bridge crossings be limited in order to maintain the open air space. The need for the bridge crossings as part of the project is detailed in Chapter 4 of the EIS and Technical Working Paper: Traffic and Transport (AECOM, 2015) for the New M5.

The impacts of the new crossings can be minimised though the design of the bridges. The Conservation Management Plan for the item recommends that the following is considered for any new crossings:

- The bridges should have a minimum two metre freeboard above Mean High Spring Tide to allow the canal to stay open to small craft in line with policy 39 of the Conservation Management Plan
- However, the scale should be limited to ensure the crossings do not overwhelm the canal, in line with policy 36 of the Conservation Management Plan
- The bridges should be set back from the edge of the Canal to allow for unimpeded pedestrian access, in line with policy 40 of the Conservation Management Plan
- Ensure high quality urban design in relation to the crossings and pedestrian connections to reflect their historical and geological context and the industrial character of the place.

These considerations have been assessed in the statement of heritage impact, which is provided in **Section 9.2**.

As no impacts to heritage significance have been identified as arising out of the visual modifications to the environment for other heritage items, no statement of heritage impact for those items are required. The landscape design for the project would be further developed during detailed design and would take into consideration the heritage significance of items in the vicinity. The design would seek to further minimise and mitigate the minor visual impacts identified.

8.8 Archaeological potential

In addition to listed items with known archaeological potential identified within existing heritage registers (refer to **Chapter 6**), a review of historical parish maps and plans was undertaken for the study area to gain an understanding and appreciation of the potential archaeological heritage present within the identified impact areas. This review identified additional areas of archaeological potential within Sydney Park. An archaeological testing and excavation methodology has been prepared and can be found in **Appendix C**.

In addition, there remains the potential to encounter deposits or relics in any context. The works in the St Peters Interchange area retains the potential to encounter late 19th and early 20th century refuse deposits and brick wasters (bricks that did not fire properly or were faulty in some way) from the surrounding bricks works. Within road reserves there is potential to encounter earlier road surfaces beneath the current asphalt or evidence of the dismantled tram network in the vicinity of the Princes Highway andCampbell Street intersection. Should such deposits or relics be encountered they are unlikely to be of archaeological significance due to their ubiquitous nature and lack of provenance, making their ability to contribute to archaeological research minimal. The unexpected finds procedure employed for the project includes provisions for the assessment of the archaeological significance of all deposits or relics. The assessment of the St Peters Geological Brickpit identified that it was unknown whether the site may still contain paleontological specimens of scientific interest. It is recommended that a palaeontologist be consulted.

8.9 Assessment of the suitability of the proposed measures

The SEARs for the historical impact assessment require the effectiveness and reliability of the proposed management and mitigation measures be evaluated (**Section 1.4**).

The management of the heritage assets within the construction and operation area would be undertaken through a Non-Aboriginal Heritage Management Plan. Such management documents are commonly used as heritage management tools and their effectiveness and reliability is supported by Heritage Council of NSW advocacy. Should impacts be unavoidable, the management plan would contain management and mitigation measures relevant to the type and significance of the site, as outlined in this section of the technical working paper. The use of archival recordings, recommended for those items proposed for demolition, is a standard management measure, as recommended in NSW Heritage Division guidelines *How to Prepare an Archival Recording* (NSW Heritage Office, 1998b) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006).

The level of effectiveness in mitigating the impact to individual items and conservation areas has been ranked in the following manner:

- Highly effective – the measure completely mitigates the impacts to the item's/area's heritage significance;
- Moderately effective – the measure largely mitigates the impacts to the item's/area's heritage significance, but the impact is not fully mitigated;
- Somewhat effective – the measure only partly mitigates the impacts to the item's/area's heritage significance;
- Ineffective – the measure is not effective in mitigating the impacts to the item's/area's heritage significance.

The rankings of the effectiveness of the measures are shown in **Appendix B**. As every effort has been made to effectively mitigate the impacts of the project through avoidance in the first instance, followed by reduction in footprint or modification in construction methodology, the measures selected are, for the most part highly effective.

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9.0 Statements of Heritage Impact

9.1 Introduction

The objective of a statement of heritage impact is to evaluate and explain how the proposed development, rehabilitation or land use change will affect the heritage value of the site and/or place. A statement of heritage impact should also address how the heritage value of the site/place can be conserved or maintained, or preferably enhanced by the proposed works. These statements of heritage impact have been prepared in accordance with the following guidelines: NSW Heritage Office & Department of Urban Affairs and Planning *NSW Heritage Manual* (1996); and NSW Heritage Office *Statements of Heritage Impact* (NSW Heritage Office, 2002). The guidelines pose a series of questions as prompts to aid in the consideration of impacts due to the project. Where the questions in the guidelines do not adequately capture the potential impacts of the current proposal, the guidelines allow for the development of relevant questions.

It has been determined above that the majority of items within the project area have the potential to be subject to negligible to minor heritage impacts, mostly associated with surface vibration or subsurface vibration and settlement associated with tunnelling. As these impacts are expected to be negligible for affected heritage items, impacts will not affect the heritage significance of the items (refer to **Section 8.5**) and, therefore, a statement of heritage impact has not been prepared in relation to these impacts.

Statements of heritage impact have been prepared for the following items which would be significantly or physically impacted by acquisition by the project:

- Alexandra Canal (refer **Section 6.12.6**);
- Rudders Bond Store (refer **Section 6.12.21**);
- Terraces and houses on Campbell Street (refer **Sections 6.12.8** and **6.12.9**);
- Service garage (refer **Section 6.12.11**); and
- Goodsell Heritage Conservation Area (refer **Section 6.12.7**).

These items are shown in Figure X.

9.2 Alexandra Canal

Alexandra Canal is identified as an item of State significance, being listed on the State Heritage Register (SHR #01621) as well as the heritage registers of Marrickville Council (I270), City of Sydney (I13) and City of Botany Bay (I1). As an asset of Sydney Water, it is also listed on that agency's Section 170 Heritage and Conservation Register (ID# 4571712).

9.2.1 Proposed impacts

The project proposes the construction of three new crossings of the Alexandra Canal, being:

- A road bridge that would provide a continuation of Campbell Road across the canal to Bourke Street (Campbell Road bridge) and an adjacent pedestrian and cycleway (Campbell Road pedestrian and cyclist bridge) (**Figure 33**).
- A road bridge that would connect with Gardeners Road (the Gardeners Road bridge). The Gardeners Road bridge would be of a similar design to the Campbell Road bridge.

The crossings would provide a clear span across the canal to avoid piers within the centre of the canal. In order to achieve this, however, the abutment piers for the road bridges would be located one metre from top of the sandstone embankment walls. Construction of the crossings would be managed to ensure there are no direct impacts to the sandstone embankments on either side of the canal. The crossings would result in direct vibrational impacts and indirect visual impacts.

The St Peters interchange and the crossings would also involve the construction of stormwater discharge points into the canal at the Campbell Road bridge crossing location. The discharge points are in the form of a 3300 by 2400 millimetre channel in the western wall and a 525 millimetre pipe in the eastern wall. These outlets would require the removal of sections of the Broken Range Ashlar embankment walls, which have been identified in the Conservation Management Plan for the item as being of high significance. Fabric of high significance should be retained and restored as it has been identified as being of State significance (NSW Government Architect's Office, 2004:70).

Figure 33 Visual representation of the Campbell Road crossing of the Alexandra Canal. View north west.

9.2.2 Process questions

The questions of greatest relevance are those relating to new development adjacent to a heritage item:

- How is the impact of the new development on the heritage significance of the item or area to be minimised?
- Why is the new development required to be adjacent to a heritage item?
- How does the new development affect views to and from the heritage item? What has been done to minimise negative effects?
- Is the development sited on any know, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?
- Is the new development sympathetic to the heritage item? In what way (eg form, siting, proportions, design)?
- Will the additions visually dominate the heritage item? How has this been minimised?
- Will the public, and uses of the item, still be able to view and appreciate its significance?

Each of these will be addressed below.

How is the impact of the new development on the heritage significance of the item or area to be minimised?

The Conservation Management Plan for the canal includes policies intended to protect the heritage significance of the item. **Table 63** provides the policies relevant to the project and provides commentary on how the policy has been integrated into the design or how impacts would be mitigated.

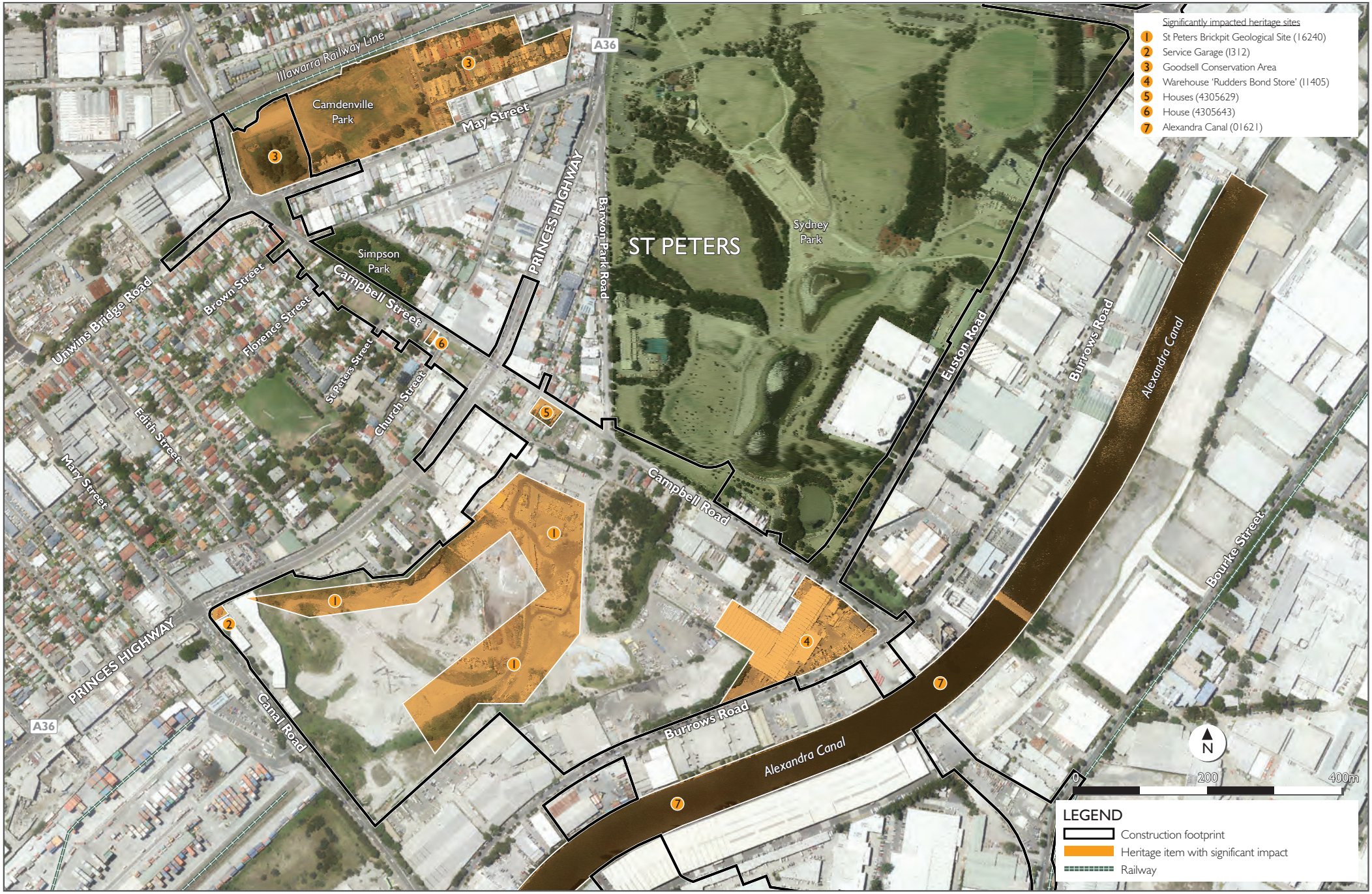

Figure 34 Heritage items with significant impacts

- **Why is the new development required to be adjacent to a heritage item?**

By its very nature, the canal forms a physical barrier between east and west for traffic, pedestrians and cyclists. The crossings are required to bridge this barrier and improve traffic flow throughout the area.

- **Is the development sited on any know, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?**

The Conservation Management Plan identifies that the canal has limited archaeological potential, being confined to occupation deposits associated with the construction of the canal (NSW Government Architect's Office, 2004: 73) and the State Heritage Register statement of significance indicates that the canal has no historical archaeological potential. However, it has been identified in **Section 6.12.6**, that a wharf was constructed at the intersection of Campbell Road and the canal. Relatively little is known about this wharf and it is unclear whether pylons are retained beneath the water surface. While the proposed bridge and the construction methodology do not impact on this area, it is located in close proximity to works. It is therefore recommended that consideration be given during construction to ensure the approximate location of the wharf is avoided. No other known deposits or relics are located within the curtilage of the canal that may be impacted by the proposed works. Nevertheless, stop work provisions would be provided in the Non-Aboriginal Construction Management Plan in the unlikely event that relics or deposits are encountered.

Table 63 Policies contained within the Alexandra Canal Conservation Management Plan relevant to the New M5 project (Source: NSW Government Architect's Office, 2004)

Policy No.	Policy	Page No.	Response
19	Any development within the defined curtilage of the canal should accordingly take responsibility for the conservation of the listed heritage items within that curtilage. Stabilisation of the canal walls should be conducted ahead of any construction or redevelopment within the curtilage area. Responsibility for any conservation/ stabilisation work should fall equally with the SWC and the development proponent.	64	The construction of the stormwater outlets into the canal would necessitate the removal of two sections of the Broken Range Ashlar embankment walls. These sections would be reinstated following the insertion of the channel and pipe, reusing the sandstone blocks were possible. Stabilisation of the surrounding sections of wall would be undertaken as necessary. Any rehabilitation and conservation requirements would be determined in consultation with Sydney Water.
28	Any development proposal within the site curtilage of the Alexandra Canal must also plan for the conservation of the canal. This includes programming restoration works with the development, stabilisation of the canal walls, reversal of intrusive fabric in the canal and responsibility for water treatment and water disposal in the canal.	66	If necessary, conservation of the canal walls would be undertaken in the vicinity of the crossings and stormwater discharge points. This would be determined in consultation with Sydney Water.
29	Ensure that all proposed work to this site is assessed for heritage impacts against the policies of the CMP	66	This table (**Table 63**) assesses the proposed works against the policies of the Conservation Management Plan.
34	Any new developments within the curtilage of the site would prepare a statement of heritage impact and outline all positive and negative impacts on the significance of the Alexandra Canal and any of the heritage items within the curtilage area associated with the canal. It must outline a strategy that protects the stability of the embankment walls.	67	**Section 9.2** includes a statement of heritage impact to assess the potential impacts to the heritage significance of the canal. The strategy to protect the stability of the embankment walls would be included in the Construction Management Plan. In summary, however, the crossing abutments would be placed 3.5 metres from the canal walls. The canal walls would undergo condition assessment prior to construction commencing and would be monitored with in situ vibration monitors throughout the construction.
36	Any new development should be of a small enough scale so as to not overwhelm the existing landscape, in terms of form, scale or height.	67	The crossings are simple in form and have been kept to a minimum in terms of scale. In order to form a clear span across the canal, the piers do sit close to the sandstone embankment walls, forming a pinch point. However, this is mitigated as there is no necessity for a pier in the canal itself.
37	The open air space over the canal should be retained as far as possible and bridges over the canal should be restricted.	67	This is addressed in detail below the table.

Policy No.	Policy	Page No.	Response
38	Before any new crossings or bridges are undertaken, existing crossings should be considered to see if they can have a dual function. Any new crossings should be designed to have a multi-purpose function such as a pipe/pedestrian bridge if possible.	67	The Gardeners Road bridge would be a dual traffic and pedestrian/cycle bridge. The Campbell Road bridge proposes a separate pedestrian/cycle bridge running adjacent to the vehicular bridge. It is necessary to provide a bridge in order to allow for a continuous pedestrian/cycle path from Sydney Park and across the canal and grade separation at the local roads, while moderating the changes in elevation.
39	Any new and replacement crossings or bridges must maintain a minimum two metre freeboard height above Mean High Water Spring Tide to allow the Canal to remain navigable to small craft.	67	The crossings maintain a minimum two metre freeboard height above Mean High Water Spring Tide. There are no piers proposed within the canal and therefore the crossings do not pose a navigation hazard.
40	Any new and replacement crossings or bridges must maintain pedestrian access along the banks and be set back off the significant sandstone embankment walls as set down in the engineering report Appendix A (of the CMP) to protect the stability of the walls.	67	The crossings would not impede pedestrian access along either bank and the design includes pedestrian access in the vicinity of the crossings.
41	All fabric of Exceptional, High and Moderate grading of significance shall be conserved to protect it at a State Significant level.	70	The proposed construction of additional stormwater outlets into the canal would result in impacts to two sections of Broken Range Ashlar embankment wall, graded as of high significance. During the reconstruction of the wall sections, the sandstone blocks would be reinstated, where possible, in their former positions. The disturbance of the sandstone has been minimised by redirecting stormwater to existing discharge points where possible, rather than creating new points. The design also incorporates one larger channel to limit the number of points required. The channel replaces up to four smaller discharge points.
59	Ensure all works to the site are undertaken by skilled trades people with experience working on heritage sites.	72	The construction of the crossing would be undertaken by skilled trades people, who would take advice from heritage professionals as and when necessary.
63	All Broken Range Ashlar embankment walls of Alexandra Canal are to be conserved.	72	It would be necessary to remove two sections of the Broken Range Ashlar embankment walls, however, they would be reinstated, to the extent possible, in their original locations.
64	All items of High and Moderate Significance are to be conserved or restored to their original format.	72	As stated above, the removed sandstone blocks would be replaced following the insertion of the proposed pipe and channel in their original format. This would require careful recording and numbering of the blocks to ensure they can be repositioned in their original locations.

Policy No.	Policy	Page No.	Response
68	All new pipes entering Alexandra Canal will follow the Engineering guidelines set down in “Strategic Bank Stabilisation Plan for Alexandra Canal” DPWS 2002. All existing pipes entering Alexandra Canal that are causing damage to the Gauged Bond Ashlar should be replaced so that they will follow the Engineering guidelines set down in this CMP	72-73	The pipes entering the canal as a result of the project have been designed to comply with or exceed the engineering guidelines. Both locations would be provided with scour protection mattresses to ensure that the additional water flow would not damage the canal indirectly.
70	Recognise the potential presence and significance of archaeological remains within the site.	73	The potential relics associated with the former wharf have been identified. No direct impacts are anticipated to this area. In the unlikely event that unidentified archaeological deposits and relics are encountered, stop work procedures would be included in the Environmental and Construction Management Plans.
71	Ensure excavation works are avoided in areas of archaeological sensitivity wherever possible. If excavation in these areas is essential and are of a minor nature, ensure works are supervised by a qualified historical or Aboriginal archaeologist.	73	There are no known archaeological sensitivities in the areas of disturbance and the supervision of a qualified historical archaeologist is not warranted.
76	New penetrations to the canal should be kept to an absolute minimum and should be reviewed by a suitably qualified heritage professional and follow the Engineering guidelines included in “Strategic Bank Stabilisation Plan for Alexandra Canal” DPWS 2002.	73	New discharge points into the canal have been minimised to the extent possible and have been designed to comply with or exceed the engineering guidelines.
82	Photographically record the site and canal before, during and after any major changes and use this record in the site’s interpretation. Place copies of this record with the Botany, South Sydney and Marrickville Library Local Studies Collection.	74	A photographic archival recording would be undertaken prior to the start of construction.

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- **Is the new development sympathetic to the heritage item? In what way (eg form, siting, proportions, design)?**

The crossings and discharge points have been designed to minimise the impact on the canal. The bridges have been designed to be minimalist and simple so as not to detract from the surroundings. In allow for the slender superstructure and narrow piers, the bridges have been designed using the balanced cantilever technique.

The height above the canal has also been kept to a minimum (giving due regard to the requirement to allow two metres freeboard at spring high tide) and will thereby minimise overwhelming the existing landscape (CMP Policy 36). In this way the proportions are sympathetic to the canal and maintain to the extent possible the open air space over the canal (CMP policy 37).

The visual impacts of the proposed stormwater outlets would be minimised through the use of sandstone to obscure the concrete pipes and box culvert. The stormwater design has also increased the length of pipes required outside the curtilage of the canal in order to connect with existing stormwater discharge points. This design has allowed at least four fewer new discharge points with the associated impacts to the State significant Broken Range Ashlar sandstone wall sections.

- **Will the crossings visually dominate the heritage item? How has this been minimised? How does the new development affect views to and from the heritage item? What has been done to minimise negative effects?**

The specific crossing locations, at Campbell Road and Gardeners Road, have been selected based on the requirements of vehicular traffic, however, the spatial arrangement of the canal is such at this point that the visual impacts are also minimised. The Conservation Management Plan, in policy 37, recommends that open air space over the canal should be retained as far as possible, with the number of crossings kept to a minimum. While the construction of the crossings is necessary, the visual impact, particularly the maintenance of the open air space, has been minimised through the placement of the crossings. From the present crossing at Ricketty Street, the Campbell Road bridge would not be visible, due to the eastward curve of the canal. The reverse is equally true; the Ricketty Street Bridge would not be visible from the Campbell Road bridge, thereby maintaining the sense of open space.

The greatest impact to the open space above the canal would be from the Gardeners Road bridge, with the Ricketty Street bridge being evident to the south and the Campbell Road bridge visible to the north. This has been minimised to the extent possible through the design of the bridge, as discussed above.

Appreciation of uninterrupted views along the canal would still be available to the south of the Ricketty Street bridge and also to the north of the Campbell Road bridge.

- **Will the public, and uses of the item, still be able to view and appreciate its significance?**

The significance of the canal within the public conscience has the potential to be increased by the proposed crossings. At present, the views of the canal are fleeting and limited to the crossing at the Ricketty Street bridge and along Airport Drive. The amenity of these two areas is such that they do not invite people to exit their vehicles and appreciate or explore the canal. The increased number of crossings, and particularly the pedestrian/cycle bridge adjacent to the Campbell Road bridge would increase access to and visibility of the canal. This, it is anticipated, would be capitalised on through the provision of interpretive signage in association with the Campbell Road pedestrian and cycle bridge.

9.2.3 Statement of heritage impact

The impacts identified above are summarised in Table 64.

Table 64 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	The proposed stormwater discharge points would impact on the State assessed aesthetic significance. The statement of significance summarises thus: *"Aesthetically, intact original sections of the canal, comprising pitched dry packed ashlar sandstone, provides a textured and coloured finish which is aesthetically valuable in the cultural landscape."* The discharge points would impact on two intact sections of the ashlar sandstone walls. These works would be somewhat mitigated through the reinstatement of sandstone blocks and their re-use to finish the discharge points, thereby minimising the visual disruption. The stormwater design has been sympathetically thought through to enable the necessary discharge to be achieved with only two points and thereby limiting the impact to fabric of State significance.
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	The construction of the additional crossings would have a minor impact on the significance of the canal. The statement of significance states that "*It is a major landmark and dramatic component of the industrial landscape of the area, particularly as viewed from the Ricketty Street Bridge and along Airport Drive."* The construction of the crossings would open up further views of the canal and allow for a greater appreciation of the industrial heritage of the item.
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	None.
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	The Campbell Road pedestrian and cycle bridge would increase public access to, and appreciation of, the Alexandra Canal.

In summary, while there would be impacts to fabric of heritage significance, these impacts can be mitigated through increased public access and interpretation along the Campbell Road pedestrian and cycle bridge, together with the reinstatement of sandstone removed for the insertion of the proposed discharge points.

9.3 Rudders Bond Store

The Rudders Bond Store and associated office, located at 53-57 Campbell Road, is listed on the City of Sydney LEP 2012 (I1405). The heritage significance of the store has been assessed for the purposes of this project and is deemed to hold State historical, aesthetic, technical and rarity significance.

9.3.1 Proposed impact

The store sits within the area of the St Peters interchange and as such there is no potential to retain the store or the associated office. The store and office would require complete removal.

9.3.2 Process questions

The process questions from the *Statements of Heritage Impact* guideline of greatest relevance are those relating to the demolition of a building:

- Have all options for retention and adaptive re-use been explored?
- Can all the significant elements of the heritage item be kept and any new development be located elsewhere on the site?
- Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?
- Has the advice of a heritage consultant been sought?
- Have the consultant's recommendations been implemented? If not, why?

Have all options for retention and adaptive re-use been explored?

The store is located in the path of the St Peters interchange connection to the Campbell Road and Euston Road intersection. The design of the St Peters interchange has been considered to limit the footprint and impacts of the project. The location of the New M5 ramps and connection to the Campbell Road/ Euston Road/Burrows Road intersection has been position to satisfy road geometry requirements and network integration.

It is not possible to achieve the desired traffic and public amenity outcomes if the store is retained. It is therefore not possible under this design to retain the store and office *in situ* nor adaptively re-use or repurpose the structure.

Can all the significant elements of the heritage item be kept and any new development be located elsewhere on the site?

It is proposed, pending a structural assessment, that a portion of the stores laminated timber columns be salvaged for use elsewhere (to be determined during the detailed design. This course of action is proposed based on the aesthetic significance and rarity of the store, specifically the cathedral-like proportions of the interior space, as well as being the only identified laminated timber columned structure on a heritage list in NSW. These values can be appreciated whatever the location of the store. It is considered that while some of the significance would be lost by moving the store from its current context, this is preferable to loosing these values altogether. It is noted here that the bricks and corrugated iron cladding are not considered significant fabric and do not warrant salvage and reconstruction. It is anticipated that these elements would be replaced with new, sensitively selected materials during the reconstruction of the store within its new capacity.

It is not considered that the heritage significance of the office warrants its relocation and conservation. The impacts can be mitigated through an archival recording prior to demolition.

Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?

The demolition of this heritage item is essential for the construction of the project. As the store and office are located within the construction footprint of the St Peters interchange connection, it is not possible to postpone the demolition of the store.

Has the advice of a heritage consultant been sought?

This document contains the advice of a heritage consultant, which comprises:

- An investigation into the historical context of the store,
- A significance assessment following Heritage Division guidelines
- An assessment of the proposed impacts and investigation of alternatives to demolition; and
- Consideration of mitigation measures based on the significance.

The first three points can be found in **Section 6.12.21** and the last in **Section 8.2**.

Have the consultant's recommendations been implemented? If not, why?

While the salvage and re-use of the laminated timber columns from the store has been recommended, further investigation into the feasibility of this is required. This includes from an engineering/structural perspective as well as identifying a potential use and location for the reconstructed store. A full archival recording should be completed prior to the salvage/demolition commencing. Further options for documenting the history of the Ralph Symonds company would be explored during detailed design.

9.3.3 Statement of heritage impact

The impacts identified above are summarised in **Table 65**.

Table 65 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	The demolition of the store and associated office would result in an irreversible loss of fabric and values of State significance. It is anticipated that this would in part be mitigated through the salvage and reuse of at least a section of the store (focussing on the significant laminated timber columns). The project would mitigate the demolition and its impact on the aesthetic, technical and rarity significance. However, this would need to be investigated further during detailed design to determine if such a solution is feasible. An archival recording of the store and associated office prior to the start of demolition/salvage works would partially mitigate the historical significance of the store.
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	None.
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	None.
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	None.

In summary, the demolition of the store and office would result in an irreversible loss of fabric and values of State significance, however, it is anticipated this can be partially mitigated through archival recording, salvage and reuse of elements of the store structure. Option for documenting the history of the Ralph Symonds company in partnership with City of Sydney and the Powerhouse Museum would be explored during detailed design.

9.4 Terraces and houses on Campbell Street

The terraces at 28-44 and 82 Campbell Street, St Peters, are listed on Road and Maritime's Section 170 Heritage and Conservation Register (ID # 4305629 & ID #4305643). These items have been assessed as being of local significance. For the purposes of this project, the remainder of the houses on the south western side of Campbell Street between Unwins Bridge Road and Church Street have also been assessed. It has been determined that these houses are adequately represented elsewhere in the area and hold no particular historical, aesthetic, associative or other significance that warrants their retention. This statement of heritage impact examines the proposed demolition of the listed houses together.

9.4.1 Proposed impacts

The project would require the demolition of the terraces and houses along south western side of Campbell Street between Unwins Bridge Road and Church Street, together with the terraces at 28-44 Campbell Street. The terraces are by no means rare within the Marrickville and Sydney local government area. Similar examples within the project area that would not be significantly impacted include terraces within locally listed conservation areas such as Goodsell Estate Heritage Conservation Area (Marrickville LEP 2011, C16) and the Cooper Estate Heritage Conservation Area (Sydney LEP 2012 C2) and individually listed examples such as the Narara Terrace at 4-18 Unwins Bridge Road (Marrickville LEP 2011 I282), Terrace housing at 105-119 May Street (Marrickville LEP 2011 I273) and the Terrace Group at 2-34 Campbell Road (Sydney LEP 2012 I12).

9.4.2 Process questions

The process questions from the *Statements of Heritage Impact* guideline of greatest relevance are those relating to the demolition of a building:

- Have all options for retention and adaptive re-use been explored? Can all the significant elements of the heritage item be kept and any new development be located elsewhere on the site?
- Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?
- Has the advice of a heritage consultant been sought?
- Have the consultant's recommendations been implemented? If not, why?

Have all options for retention and adaptive re-use been explored? Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible? Can all the significant elements of the heritage item be kept and any new development be located elsewhere on the site?

The project has undergone an extensive options analysis and development process. The residences on Campbell Street are located on or close to the front property boundary. It is therefore not possible to widen the road without first removing the houses. The widening of the road has been determined necessary to meet the project objectives and postponing the demolition is unlikely to result in a different option becoming available.

Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why?

This report constitutes the advice of a heritage consultant and the recommendations would be implemented following project approval. It has been recommended that an archival recording be undertaken prior to demolition.

9.4.3 Statement of heritage impact

The impacts identified above are summarised in Table 66.

Table 66 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	None
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	The demolition of the terraces and houses is unavoidable within the objectives of the project. The loss of fabric can be mitigated through archival recording prior to demolition.
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	None.
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	None.

9.5 Service Garage

The Service Garage at 316 Princes Highway, St Peters, is identified on the Marrickville LEP 2011 as item I276. It holds historic, aesthetic and rarity value.

9.5.1 Proposed impacts

There are no direct physical impacts proposed to the service garage. It would be acquired and would cease to operate as a service garage. However, it is proposed that the structure would be retained with possible re-use opportunities, such as a commercial/retail purpose. The aesthetic and rarity value would not be impacted by the acquisition at this time. The potential modifications required for the change of use would need to be assessed at a future time, once approved. The service garage has operated in that capacity since at least 1946, and there would be some loss of significance associated with the change in use in this respect.

9.5.2 Process questions

The process questions from the *Statements of Heritage Impact* guideline of greatest relevance are those relating to the change of use of a building:

- Does the existing use contribute to the significance of the heritage item?
- Why does the use need to be changed?
- What changes to the fabric are required as a result of the change of use?
- What changes to the site are required as a result of the change of use?

Does the existing use contribute to the significance of the heritage item?

Yes. Based on a historical photograph from 1946 (**Plate 72**), it would appear that the garage has continued to operate on this site until the present.

Why does the use need to be changed?

It has been deemed a safety hazard with the increased pedestrian and cycle activities in the area to maintain an active garage once construction is complete. The garage would be repurposed to form a distinct entrance into the St Peters interchange and associated pedestrian and cycle routes.

What changes to the fabric are required as a result of the change of use?

No change to the fabric is proposed at this time. Once the exact use of the garage has been determined and if changes to the fabric are necessary, a separate statement of heritage impact would be prepared outlining the project and the associated potential impacts to heritage significance.

What changes to the site are required as a result of the change of use?

The surrounding area would be landscaped and the structure would be incorporated into the urban design for the project. The exact details of which would be determined during detailed design.

9.5.3 Statement of heritage impact

The impacts identified above are summarised in **Table 67**.

Table 67 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	None
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	None
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	It appears as though the site has operated to service and maintain vehicles since at least 1946. A minor negative impact would result from the loss of continuity of operation. However, there would be no impact to the fabric of the structure as a result of the project.
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	None.

9.6 St Peters Brickpit Geological Site

The St Peters Brickpit Geological Site is a registered item on the non-statutory Register of the National Estate (ID # 162040). The site consists of around five hectares on the corner of the Princes Highway and Canal Road. The site was used to as a quarry for shale and clay, by the nearby Bedford Brickworks (former). The fringes of the site with street frontages are now used by various industrial and light industrial companies, with the curtilage of the item being a 'U' shaped polygon within the central void.

According to the non-statutory Register of the National Estate listing, the site "provides an excellent opportunity to observe geological structures in fresh shales in siltstones including features associated with deposition of the sedimentary rocks, later formed fractures such as joints and faults (including normal and reverse faults) and recent mass movements …" (Australian Heritage Commission, 1991). The shale contains fossils of bivalves, isopods, soft marine organisms (guilielites) and insects as well as plant fragments. Vertebrate fossils have also been identified at the Brickpit and include fish and an amphibian known as *Paracyclotosaurus davidii*. The 2.3 m long amphibian is thought to have lived in fresh water lakes and have hunted like a crocodile. The heritage significance of the site therefore relates to its geological significance and is not associated with the brick making operations. Further details regarding the brickpit site can be found in **Section 6.12.22**.

The non-statutory Register of the National Estate listing does not contain an assessment against the criteria, however the Statement of Significance summarises the values thus:

> *St Peter's Brickpit contains a section of prior Botany Bay shoreline sediments of late Pleistocene/early Holocene Age (18,000 to 6,000 years bp). These sediments provide important evidence of the extent to which the waters of Botany Bay rose at the end of the last glaciation. The deposits found within the brickpit are a rare occurrence of this shoreline (Criterion A.1 and B.1). The Ashfield shale in the vicinity of the brickpit has been a rich source of fossils of upper Triassic Age (approximately 210 million years bp). With both vertebrate and invertebrate fossils identified including an amphibian named PARACYCLOTOSAURUS DAVIDII, a member of the sub-class Labyrithodontia. This species has only been identified from this site. It is one of the few species of this sub-class of this age discovered in Australia to date. This species has contributed to the understanding of the evolution of the Australian amphibian fauna (Criterion A.1). The quarry is used extensively as a teaching resource by local tertiary institutions. It provides an excellent opportunity for students of geology to observe structures in fresh shale and siltstone of the Ashfield formation. These structures include joints, faults and recent mass movement on the edges of the quarry. There is also potential for significant additional fossil finds within the Ashfield formation the former Botany Bay shoreline deposits are of research value, providing evidence of former sea levels around Botany Bay. The shell within the deposit, may yield information on environmental conditions that existed as sea levels rose at the end of the last glaciation (Criterion C.1). The site contains a representative example of Ashfield shale which is the lowest formation of the upper Triassic Wianamatta group of the Sydney Basin the shoreline deposits provide an important example of the former shoreline of Botany Bay (Criterion D.1). The site is of historic interest for the way it demonstrates part of the geographical spread of the St Peter's brick-shale deposits and so complements the restored Bedford Brickworks to the north (Criteria A.4 and B.2).*

9.6.1 Proposed impacts

The St Peters interchange would sit within the St Peters Brickpit Geological Site. The construction of the interchange would result in alterations, including cut and fill, within the non-statutory curtilage. The project would result in the geological formations, noted above, being obscured by landscaping, but will not necessarily result in their removal.

9.6.2 Process questions

The process questions from the *Statements of Heritage Impact* guideline of greatest relevance are those relating to the change of use, these have been modified to account for the non-structural nature of the item:

- Does the existing use contribute to the significance of the heritage item?
- Why does the use need to be changed?
- What changes to the site are required as a result of the change of use?

Does the existing use contribute to the significance of the heritage item?

The site has been used for the deposition of refuse since the 1970s and continues to be used for the disposal of building and construction waste. This use does not positively contribute to the geological significance of the site.

Why does the use need to be changed?

The rational for the project has been outlined in **Section 1.0** and detail concerning the selection of this site as the preferred location for the interchange is provided in Chapter 4 of the EIS. This includes minimising the impact on residential areas and areas of open space. The brickpit site has therefore been selected as it is the site that will have the least impact on the local community, while providing the connectivity required for the project.

What changes to the site are required as a result of the change of use?

The works within the non-statutory listing for the St Peters Brickpit Geological Site would result in the modification of the geological site, but ultimately, the geological features are such that they would be preserved within behind a new landform or terraced retaining walls at the St Peters interchange. Other exposed cuttings that display geological features may be obscured through landscaping and other construction activities. The impacts would be mitigated through the following means:

- Interpretation of the geology of the area within the interchange;
- Retaining an exposed section of the fresh shales and siltstones, including features associated with deposition of the sedimentary rocks, later formed fractures such as joints and faults, if safe to do so for both landform stability and ongoing access for interpretation;
- Photographic and drawn archival recording of the geological features prior to and/or during construction; and
- An assessment and/or consultation with a palaeontologist to determine whether the project impact area has potential to contain further specimens of scientific interest.

The site is currently not open to the public to appreciate the geological significance of the area. The St Peters interchange would provide an opportunity to educate and provide greater access to the geological history of the Sydney basin. It is therefore considered that the project would have a positive impact on the site.

9.6.3 Statement of heritage impact

The impacts identified above are summarised in **Table 68**.

Table 68 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	None
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	None
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	The construction of the interchange would result in the removal or concealment of the currently exposed cuttings.
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.

Impact Type	Impact
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	The potential for access and interpretation within the interchange would allow for greater public knowledge of the site. The interpretation will contribute to a greater understanding of the geological and palaeontological history of the Sydney basin. An interpretation plan would be prepared during detailed design would could consider opportunities such as the: - Integration of the geological item in consultation with City of Sydney; and - Integration of the geological/palaeontological discovery of the *Paraclytosaurus davdii* into the interchange.

It is concluded that the project result in the modification of the geological site, but ultimately, the geological features would be preserved within undisturbed or newly exposed cuttings. In addition, the public access created by the interchange would allow for greater public knowledge of the geological and palaeontological significance of the site and the Sydney basin more generally, through the mitigation measures outlined above.

9.7 Goodsell Estate Heritage Conservation Area

The Goodsell Estate Heritage Conservation Area (C16) is located on the corner of Bedwins Road and May Street, opposite the Waugh and Josephson Industrial Buildings (I280) and the Town and Country Hotel (I281). The conservation area backs on to the Illawarra Railway line. It is listed on the Marrickville LEP 2011 as an item of local significance (C16) holding historical, aesthetic and representative.

9.7.1 Proposed impacts

The local road upgrade includes the realignment of the intersection of Bedwin Road, Unwins Bridge Road, Campbell Street and May Street. The project includes the acquisition of the south western corner of the conservation area for road widening and the temporary occupation of an area of the park. The majority of the area that would be temporarily occupied is currently part of Camdenville Park and is a fenced area providing a depression for the collection of stormwater runoff. The project would result in an amendment to the curtilage of the item. The stormwater basin would also be augmented to cater for the project.

9.7.2 Process questions

The process questions from the *Statements of Heritage Impact* guideline are not relevant to the proposed impacts. Therefore the following questions have been developed to specifically address the project:

- Will the acquisition of land and the revision of the curtilage impact on the heritage significance of the conservation area?
- Are any known or potential archaeological deposits affected by the proposed works?

Will the acquisition of land and the revision of the curtilage impact on the heritage significance of the conservation area?

The significance of the conservation area is vested in the built form of the workers housing in the north eastern portion of the conservation area. This area has been assessed as demonstrating the pattern of the built form in the area as they responded to the progressive release of land. The proposed works would not directly impact on the housing, its form or the narrow and dense streetscape to which aesthetic significance has been ascribed. The proposed revised curtilage leaves an area of park as a buffer between the proposed intersection and the terraces along Unwins Bridge Road. It is therefore concluded that the project would not impact on the heritage significance of the conservation area.

Are any known or potential archaeological deposits affected by the proposed works?

Historical aerials from 1943 indicate that the corner proposed for acquisition and the site of the intersection works was under a building associated with the brickworks. This building extended out into the present intersection. It is considered that *in situ* archaeological deposits associated with the structure are unlikely, given the works that have previously been undertaken to form, maintain and upgrade the intersection since the demolition of the building.

9.7.3 Statement of heritage impact

The impacts identified above are summarised in **Table 69**.

Table 69 Summary of the nature of the impacts

Impact Type	Impact
Major negative impacts (substantially affects fabric or values of state significance)	None
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)	None
Minor negative impacts (reversible loss of local significance fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)	None
Negligible or no impacts (does not affect heritage values either negatively or positively)	None.
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)	None.
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)	None.

It is concluded that the project would not impact on the heritage significance of the heritage conservation area.

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10.0 Findings and Recommendations

Roads and Maritime is seeking approval under Part 5.1 of the *Environmental Planning & Assessment Act 197*9 to construct and operate the New M5 (the project); which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway east of King Georges Road and St Peters. The project would also include an interchange at St Peters and connections to the existing road network.

Fifty seven listed heritage items are located within the preferred project corridor or within 50 metres of surface disturbance or tunnelling activities. The heritage significance of these items was confirmed by pedestrian and vehicular survey between 20 to 23 April 2015 and on 21 May 2015.

The construction of the project would result in both direct and indirect impacts to 57 heritage items. The direct impacts consist of the demolition of three listed heritage items, being the Rudders Bond Store and houses at 28-44 and 82 Campbell Street, St Peters. Strategies for the mitigation of impacts have been proposed for both sets of items. In addition, the construction of three new bridge crossings would occur within the curtilage of the State Heritage Register listed Alexandra Canal which would result in visual impacts to the item as well as secondary direct impacts due to vibration intensive activities. It is proposed to mitigate the direct and visual impacts to the canal through sensitive detailed design of the bridge crossings, in line with the policies outlined in the Conservation Management Plan and an archaeological assessment (NSW Government Architect's Office, 2004).

Other direct impacts involve local road upgrades resuming portions of the curtilages of the Goodsell Estate Heritage Conservation Area and modifications to the St Peters Brickpit Geological Site. The impacts to the Goodsell Estate Heritage Conservation Area are considered to be minimal and no mitigation is required. Interpretation strategies have been recommended for the St Peters Brickpit Geological Site which would be considered during detailed design for incorporation into the interchange design.

There is also the potential for direct impacts due to potential eligibility for at-property acoustic treatment. This would be confirmed during detailed design, in consultation with landowners, and with consideration of potential impacts to heritage values.

The potential impacts to heritage items due to ground movement and construction vibration would be confirmed during detailed design. If required, mitigation and management measures to minimise impacts would be investigated (such as the modification of construction methodology), and monitoring undertaken at properties identified as being above recommended criteria. Property dilapidation surveys would also be undertaken for all items located within the preferred project corridor or properties within recommended safe working setbacks.

In summary, it is concluded that the impacts of the project can be mitigated through the following measures:

- Development of an interpretation plan, which would identify opportunities to reflect the history of the New M5 areas in the newly built fabric. The plan should be developed in conjunction with the urban design to develop specific suitable interpretation in areas where there will be changed use including, but not limited to:
    - Alexandra Canal and the industrial heritage of the area; and
    - The St Peters Brickpit geological site.
- In relation to the Alexandra Canal:
    - Monitoring of the canal should be undertaken during the works to ensure vibration is not impacting on the canal walls;
    - A condition report of the canal brickwork adjacent to the bridge crossings and drainage discharge points, including areas beneath the bridges and areas impacted by associated construction works, would be undertaken prior to the commencement of construction. Any rehabilitation and conservation requirements would be determined in consultation with Sydney Water.
    - An archival recording of the canal walls should be undertaken, involving both scale drawings and photography, prior to the removal of the sandstone blocks;
    - The sandstone blocks should be numbered and recorded in such a way that those not displaced by the discharge points can be replaced in their previous location;
    - Sandstone blocks displaced by the discharge points should be stockpiled for use in repairs of other sections of the canal; and

- Heritage interpretation regarding the canal should be installed in proximity to the item, ideally at the Campbell Road bridge given this would have greater pedestrian accessibility, in accordance with an interpretation plan

- In relation to the St Peters Brickpit Geological Site
  - Interpretation of the geology of the area within the interchange and surrounds, including opportunities to:
    - the geological interpretation of the site in consultation with City of Sydney; and
    - Integrate the geological/palaeontological discovery of the *Paraclytosaurus davdii*.
  - Retaining an exposed section of the fresh shales and siltstones, including features associated with deposition of the sedimentary rocks, later formed fractures such as joints and faults, if safe to do so for both landform stability and ongoing access for interpretation;
  - Photographic and drawn archival recording of the geological features prior to and/or during construction; and
- In relation to Rudders Bond Store:
  - The bond store should be subject to a full archival recording following the NSW Heritage Division guidelines *How to Prepare an Archival Recording* (NSW Heritage Office, 1998b) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006);
  - Consideration should be given as to whether the laminated timber columns could be salvaged and re-erected and clad elsewhere within the St Peters interchange or the local area. The cladding and brick walls are not considered to be of heritage significance and are not included within the reuse proposal.
  - Investigate options for documenting the history of the Ralph Symonds company and presenting it to a national audience, in partnership with stakeholders such as the City of Sydney and Powerhouse Museum. The focus would be on their development of innovative timber construction methods during and after the Second World War.
- In relation to the house at 82 Campbell Street and terrace group at 28-44 Campbell Street:
  - The buildings should be subject to a full archival recording following the NSW Heritage Division guidelines *How to Prepare an Archival Recording* (NSW Heritage Office, 1998b) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006);
  - Consideration should be given as to whether elements of the houses could be salvaged and used to maintain or restore other properties managed by Roads and Maritime.
- In relation to the Service Garage:
  - A photographic archival recording is undertaken prior to the current use ceasing. The archival recording should conform to the guidelines provided in *How to prepare archival records* (NSW Heritage Office, 1998a) and *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006). The archival recording should be lodged with the relevant local libraries and the State Library of NSW. The archival recording should be integrated into on-site interpretation of the item.
- The curtilage of the Goodsell Estate Heritage Conservation Area has been identified as potentially being impacted by the project. The impacts to the Goodsell Estate Heritage Conservation Area are considered to be minimal and no mitigation is required.
- Detailed mitigation and management measures would be developed for each heritage item directly impacted by the project with regard to vibration (surface and tunnelling) and settlement once final disturbance areas have been identified through detailed design. These mitigation and management measures would be included in the construction environmental management plan(s) for the project.
- Visual impacts have been identified to the terraces at 2-34 Campbell Road, St Peters. Individually tailored landscape treatments would be developed during detailed design.
- The individual contribution of views into and out of additional heritage properties and the long-term impact of construction, if any, will be considered during detailed design. Landscape would be determined during detailed design to appropriately manage such impacts.

- The need to provide at-property acoustic treatment of the two heritage listed properties would be confirmed during detailed design. Any required treatment would be sympathetic to the heritage values of each item and would be undertaken in accordance with the Burra Charter. Where this involves incorporating noise-proofing within heritage structures, the advice of a conservation architect would be sought.
- This review identified additional areas of archaeological potential within Sydney Park. The archaeological testing and, if necessary, excavation methodology is provided in **Appendix C** which would be implemented with respect to the areas of archaeological potential within Sydney Park. There remains the potential to encounter deposits or relics in any context. The Roads and Maritime *Standard Management Procedure: Unexpected Heritage Finds* (Roads and Maritime, 2015) would be followed and incorporated into the construction environmental management plan.

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Appendix A

Figures

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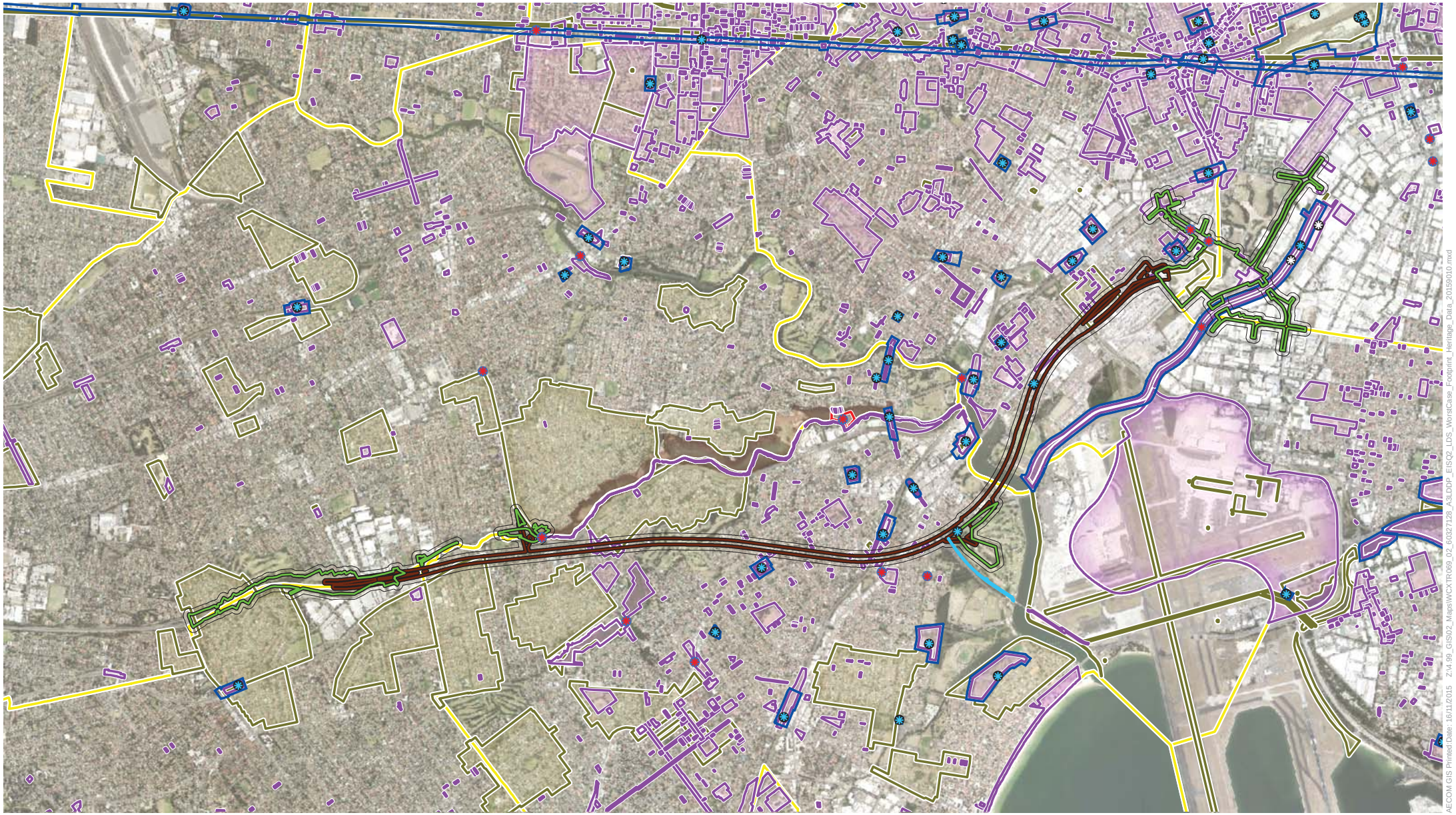


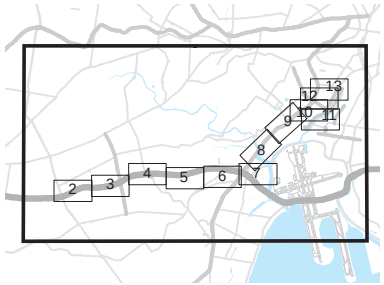
Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
Western Outfall Main Sewer
State Heritage Register areas
Register National Estate
Local Governmnet Area
Section 170 heritage areas

Section 170 heritage points
State Heritage Register locations
Local Council heritage items

0 600 1200 m

N



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TITLE
PROJECT AND STUDY AREA
HERITAGE LOCATIONS

PROJECT
WESTCONNEX STAGE 2

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- Construction Footprint
- Sub-surface, including main alignment tunnels
- Study Area (50m Buffer)
- Register National Estate
- Local Governmnet Area

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0 60 120 m

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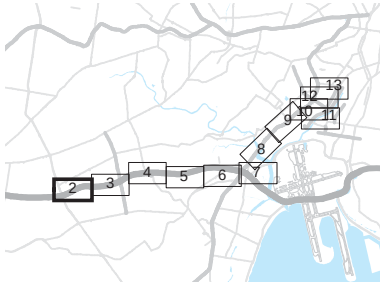

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TITLE
PROJECT AND STUDY AREA
HERITAGE LOCATIONS

PROJECT
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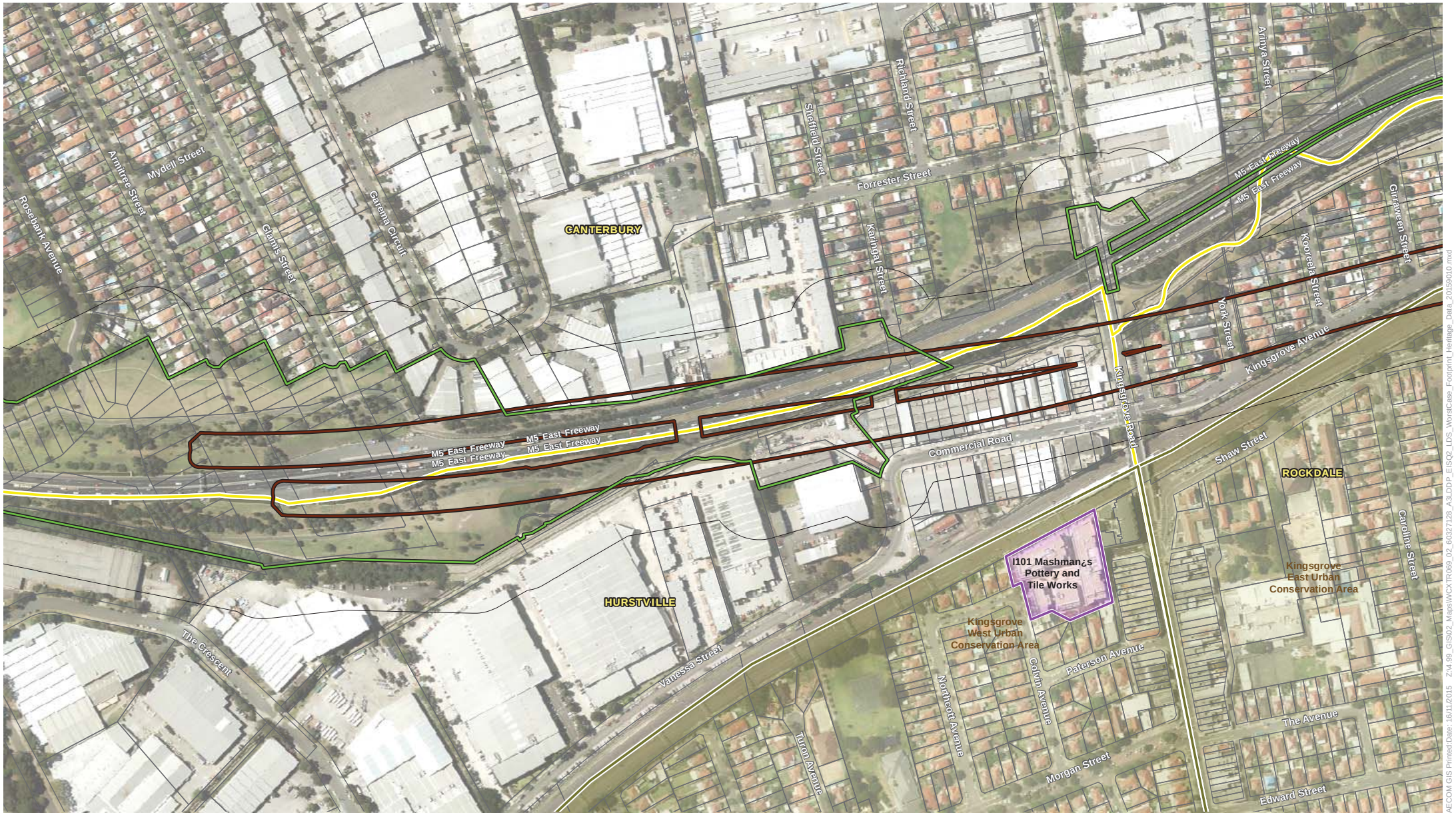

Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)
LEP heritage
Register National Estate
Local Governmnet Area

0 60 120 m

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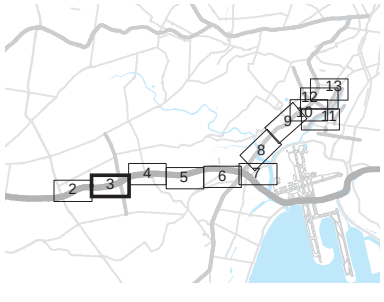

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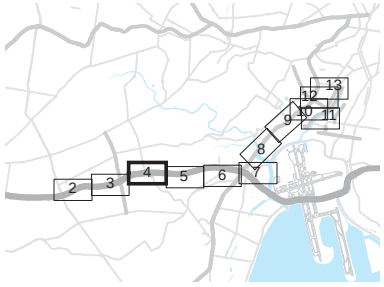
Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
Register National Estate
Local Governmnet Area

Section 170 heritage points

0 60 120 m

N



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- Construction Footprint
- Sub-surface, including main alignment tunnels
- Study Area (50m Buffer)
- LEP heritage
- State Heritage Register areas
- Register National Estate
- Local Governmnet Area

0 60 120 m

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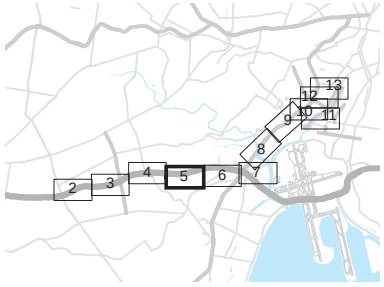

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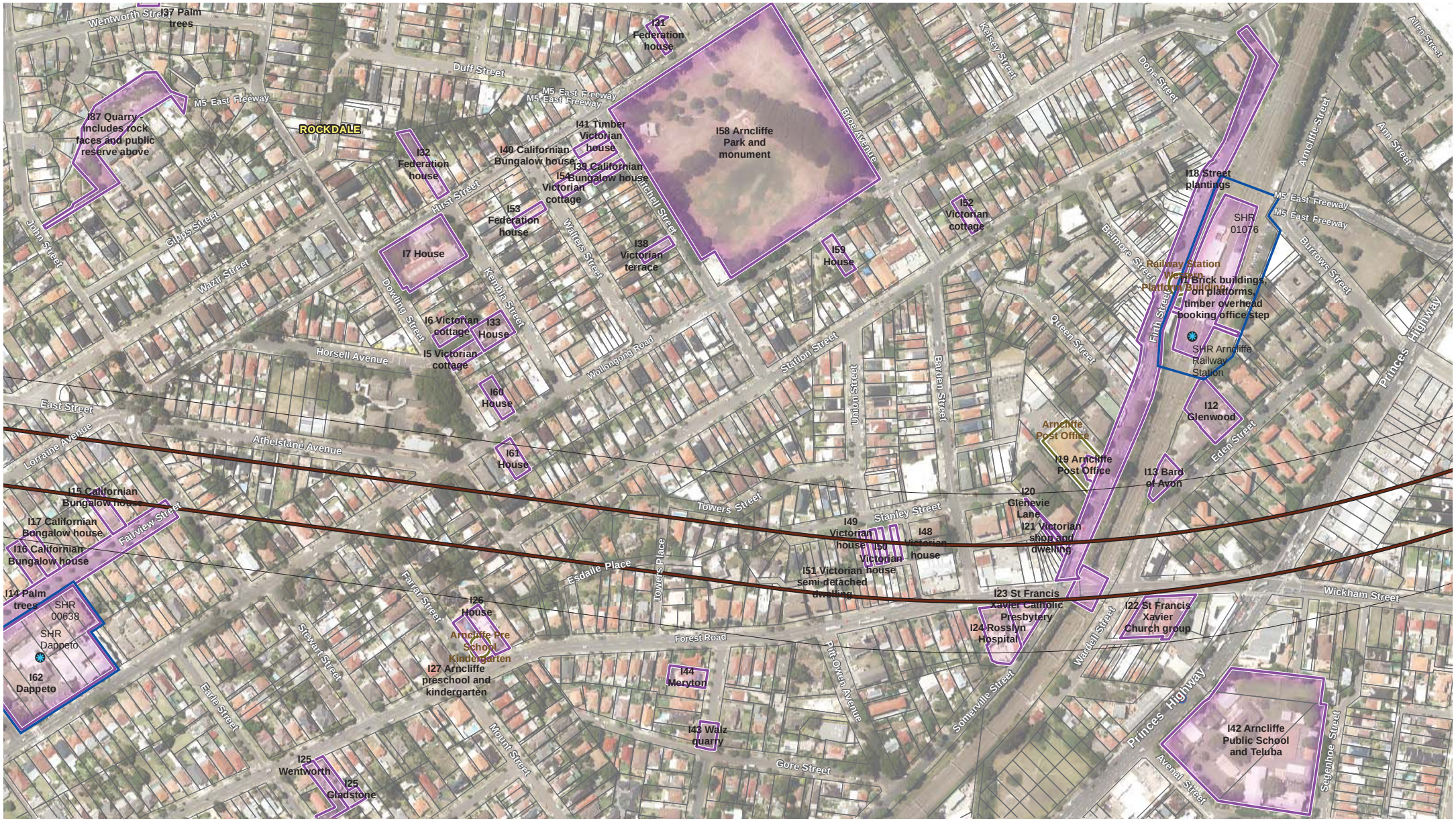

Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
State Heritage Register areas
Register National Estate
Local Governmnet Area

Section 170 heritage points
State Heritage Register locations

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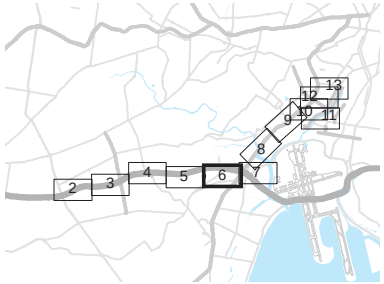

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Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
Western Outfall Main Sewer
State Heritage Register areas
Register National Estate
Local Governmnet Area
State Heritage Register locations

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0 60 120 m

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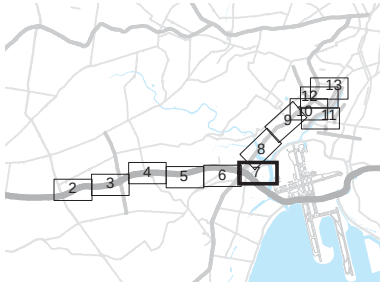

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HERITAGE LOCATIONS

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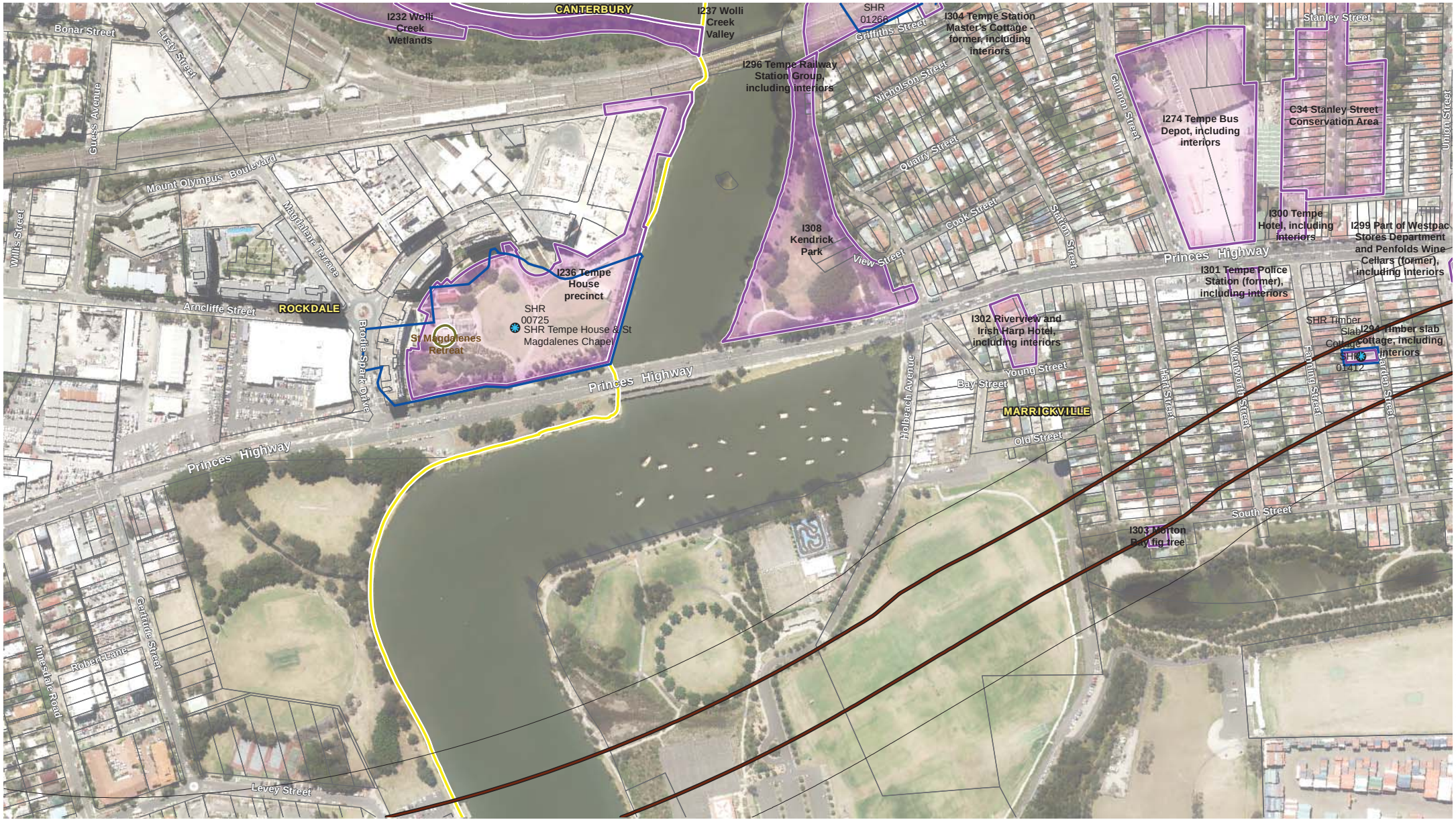

- Construction Footprint
- Sub-surface, including main alignment tunnels
- Study Area (50m Buffer)
- LEP heritage
- State Heritage Register areas
- Register National Estate
- Local Governmnet Area
- State Heritage Register locations

0 60 120 m

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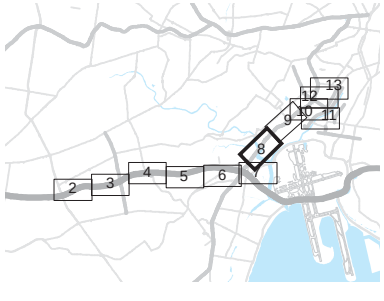

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COORDINATE SYSTEM GDA 1994 MGA Zone 56

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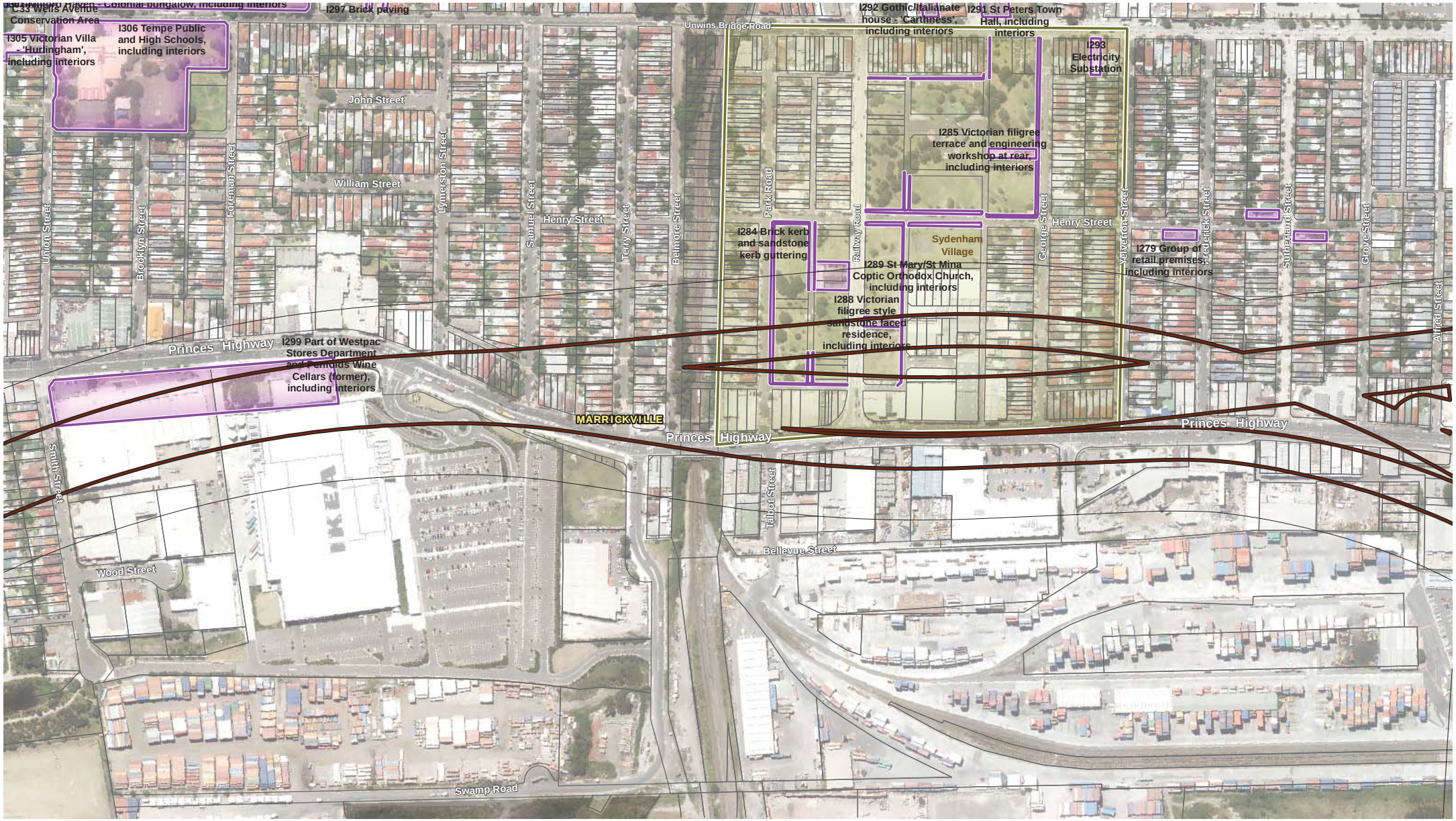

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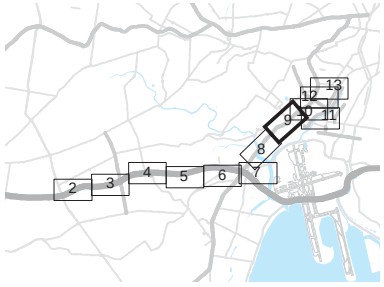

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TITLE
PROJECT AND STUDY AREA HERITAGE LOCATIONS

PROJECT
WESTCONNEX STAGE 2

CLIENT
WESTCONNEX DELIVERY AUTHORITY

DRAWN	PROJECT #	MAP #	REV	Project
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CHECK	DATE 16/11/2015	WCXTR069 02 60327128		

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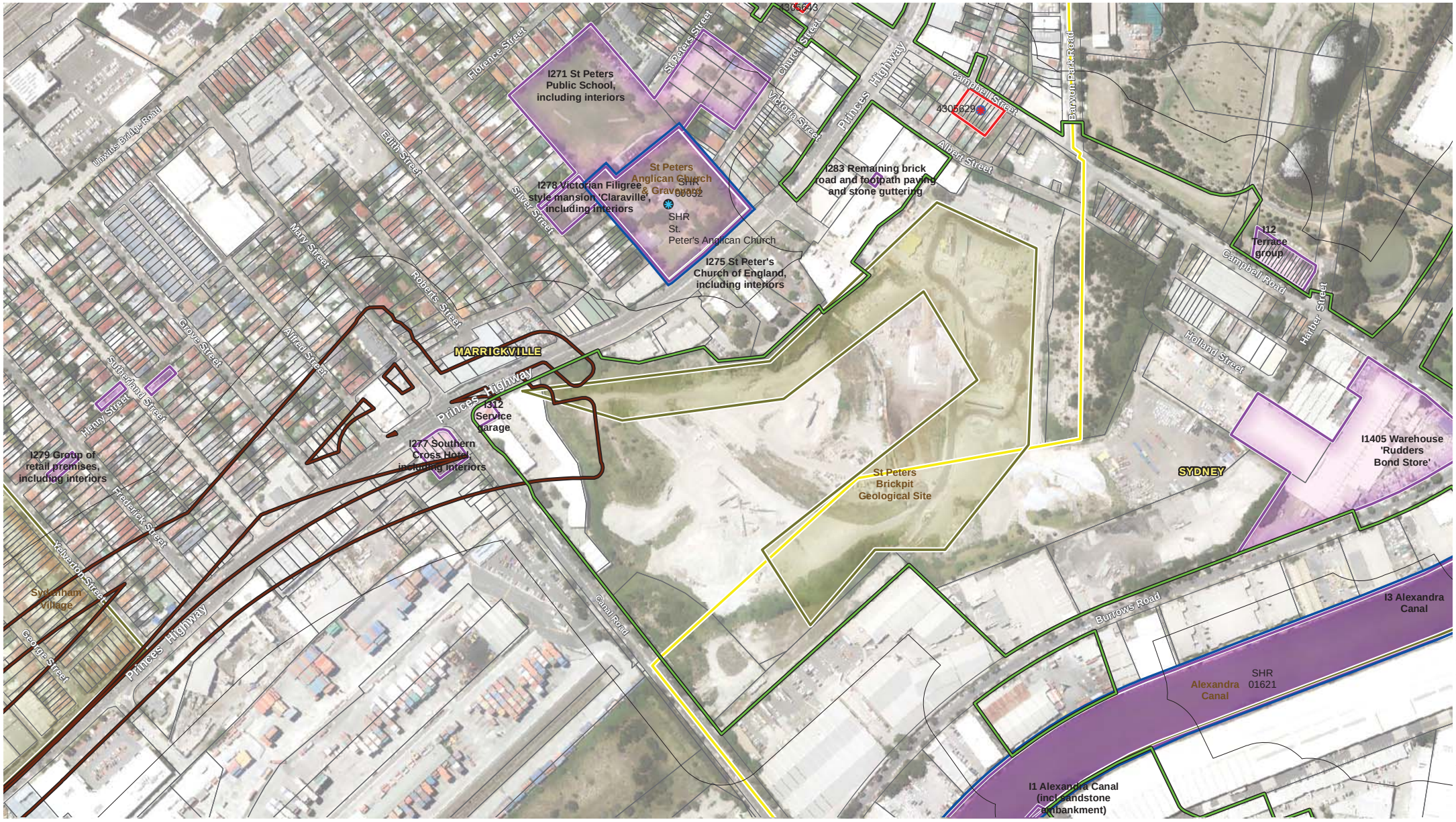


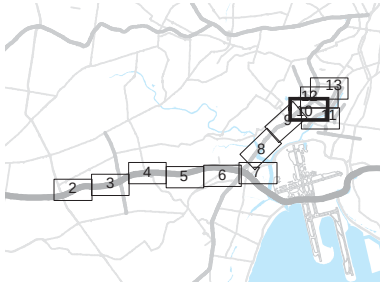
Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
State Heritage Register areas
Register National Estate
Local Governmnet Area
Section 170 heritage areas

Section 170 heritage points
State Heritage Register locations

0 60 120 m

N



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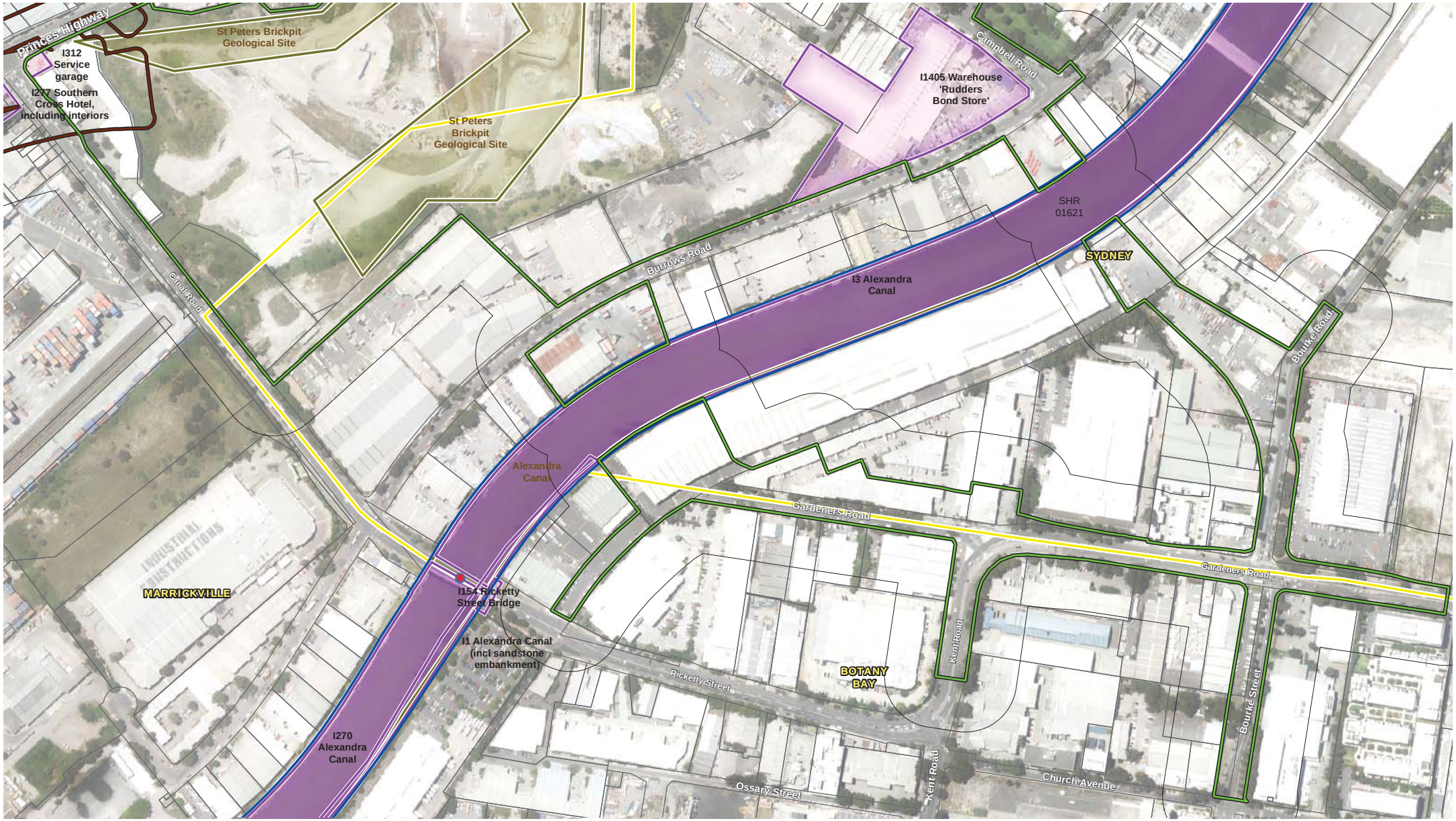
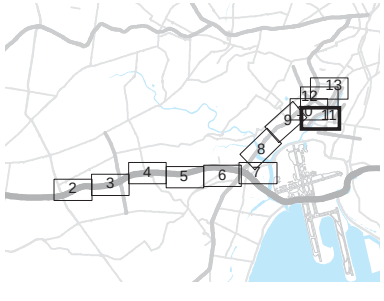


Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)
LEP heritage
State Heritage Register areas
Register National Estate
Local Governmnet Area
Section 170 heritage points

0 60 120 m

N



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HERITAGE LOCATIONS
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	16/11/2015			

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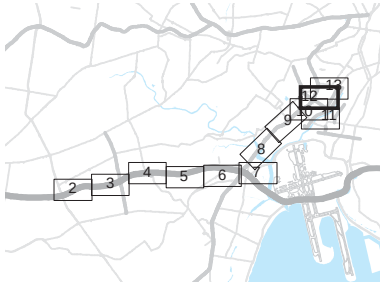
Construction Footprint
Sub-surface, including main alignment tunnels
Study Area (50m Buffer)

LEP heritage
State Heritage Register areas
Register National Estate
Local Governmnet Area
Section 170 heritage areas

Section 170 heritage points
State Heritage Register locations
Local Council heritage items

0 60 120 m

N



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WESTCONNEX DELIVERY AUTHORITY

DRAWN	PROJECT #	MAP #	REV	Project
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CHECK	DATE			
	16/11/2015	WCXTR069 02 60327128		

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- Construction Footprint
- Sub-surface, including main alignment tunnels
- Study Area (50m Buffer)
- LEP heritage
- State Heritage Register areas
- Register National Estate
- Local Governmnet Area
- Section 170 heritage areas
- Section 170 heritage points
- State Heritage Register locations
- Local Council heritage items

0 60 120 m

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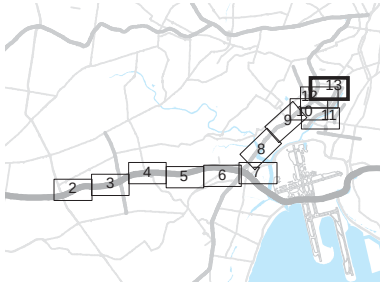

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CHECK	DATE			WCXTR069 02 60327128
	16/11/2015			

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Appendix B

Impact assessment table

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Appendix B Impact assessment table

Table 70 Potential impact summary

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Western surface works	Register National Estate	RNE #102089	Pallamanna Parade Urban Conservation Area	Change in heritage conservation area values Vibration from surface works Visual	The preferred project corridor at this location follows the existing motorway alignment and passes through conservation area. The curtilage of this urban conservation area was determined prior to the construction of the M5 East Motorway and has not been updated since. Impacts to heritage values within the conservation area would be localised to specific areas already associated with major transport network infrastructure. The M5 East Motorway would be widened to cater for the western portal and associated ancillary facilities. This would extend into the heritage conservation area. Visual impacts due to changes due to new noise walls and the Kingsgrove motorway operations which would be visible above the noise walls may affect certain properties. However, there would be no direct impacts in the sense that there will be no demolition of houses or structures in the urban conservation area.	Negligible direct impact - change in heritage values Low to negligible indirect impact - visual Negligible secondary direct impact – vibration (surface works)	Maintain safe surface working distances as shown in **Table 58**.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					Landscaping would provide screening of the project from the heritage conservation area, once established. For these reasons, visual impacts would be low to negligible. Buildings that are within 50 metres of the construction footprint have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the heritage conservation area that are within safe working distances. Temporary visual impacts may also occur while the Kingsgrove North construction compound (C1), the Kingsgrove South construction compound (C2) and the Commercial Road construction compound (C3) are operational during construction.			
Arncliffe surface works Main alignment	State Heritage Register Sydney Water Heritage and Conservation	SHR #1647 #4572728	Western Outfall Main Sewer	Vibration and settlement (tunnelling) Vibration (surface works)	This site would be located near the Arncliffe surface works and has the potential to be directly and/ or indirectly impacted during construction and operation.	Secondary negligible direct impact – vibration and settlement (tunnelling).	Settlement and vibration impacts are negligible and do not require mitigation,	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
tunnels	Register			Visual	Potential impacts may include: - Vibration impacts during surface construction, however surface works would adhere to safe working distances. A program of monitoring would be undertaken to identify early potential risks to the heritage item. - Settlement during and after construction, however this would be less than 15 millimetres, which may result in cosmetic damage. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. - Visual impacts during construction and operation, however this would not affect the listed aesthetic significance. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Negligible indirect impact - visual	however, a condition survey report and monitoring will be undertaken as a precautionary measure. Maintain safe surface working distances as shown in **Table 58**. Visual and modification impacts to be managed through urban design and interpretation plan	Highly effective Highly effective
Main alignment tunnels	State Heritage Register Rockdale LEP Sydney Trains section 170 register	SHR #01076 I1 #4801150	Arncliffe Railway Station Group	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. However, only part of the LEP listed item would be located within the study area (being Forest Road bridge). The station buildings and nearby structures, which form part of the State Heritage	Negligible secondary direct impact – vibration and settlement (tunnelling)	Settlement and vibration impacts are negligible and do not require mitigation, however, a	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					and Sydney Trains Section 170 listing are beyond the study area. Potential impacts may include: - Settlement during and after construction. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures		condition survey report and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I13	Bard of Avon	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction. However, settlement is not predicted at this item as it is offset from the main alignment tunnels. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I15	Californian bungalow house	Vibration and settlement (tunnelling)	The property would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than five millimetres, which is considered to be	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures with the tunnelling activities occurring at depth (around 60 metres). An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		condition survey report and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I16	Californian bungalow house	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction. However, settlement is not predicted at this item as it is offset from the main alignment tunnels. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Main alignment tunnels	Rockdale LEP 2011	I18	Street plantings	Vibration and settlement (tunnelling)	The heritage listed street trees would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. The main alignment tunnels would be around 60 metres below ground at this point would unlikely have an impact on tree roots.	Secondary negligible direct impact	None	-
Main alignment tunnels	Register of National Estate Rockdale LEP 2011	RNE #19170 I19	Arncliffe Post Office	Vibration and settlement (tunnelling)	The preferred project corridor would be just located within the southern curtilage of the heritage item. Potential impacts may include: - Settlement during and after construction. However, settlement is not predicted at this item as it is offset from the main alignment tunnels. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					The heritage item has a dual listing under the Rockdale LEP 2011 (I19). However, the preferred corridor does not extend to the curtilage as per its listing under the Rockdale LEP 2011.			
Main alignment tunnels	Rockdale LEP 2011	I20	Glenevie Lane	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which is considered to be negligible, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I21	Victorian shop and dwelling	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I22	St Francis Xavier Church Group	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I23	St Francis Xavier Catholic Presbytery	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than five millimetres,	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation,	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		however, a condition survey report and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I24	Rosslyn hospital	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than five millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment	Rockdale LEP 2011	I35	House	Vibration and settlement	The heritage item would be located within the preferred project corridor. Potential impacts may include:	Secondary negligible direct impact	Settlement and vibration impacts are	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
tunnels				(tunnelling)	- Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I48	Victorian house	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Main alignment tunnels	Rockdale LEP 2011	I49	Victorian house	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I50	Victorian house	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					program of monitoring would be undertaken to identify early potential risks to the heritage item.			
Main alignment tunnels	Rockdale LEP 2011	I51	Victorian semi-detached dwelling	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I56	House	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I61	House	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than five millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Rockdale LEP 2011	I165	Stotts Reserve	Vibration and settlement (tunnelling)	The reserve is located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than 10 millimetres, which may result in cosmetic damage only to any structures within the reserve.	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					- Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures (although noting this item is listed for its natural heritage). An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item. It is noted that an Aboriginal heritage site is located within Stotts Reserve. Impacts to this item have been considered in Technical working paper: Aboriginal heritage. Values of settlement and vibration would differ to the values presented in this assessment, which identifies the greatest value within the heritage curtilage. The values presented in the Aboriginal heritage assessment relate to the location of the actual item.		and monitoring would be undertaken as a precautionary measure.	
Main alignment tunnels	Rockdale LEP 2011	I81	Stone Federation House	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction. However, settlement is not predicted at this item as it is offset from the main alignment tunnels.	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					- Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.		survey report and monitoring would be undertaken as a precautionary measure.	
Bexley Road surface works	Rockdale LEP 2011	I237	Wolli Creek Valley	Visual	The Wolli Creek Valley is listed as an area of natural significance. The item is located less than ten metres from the Bexley Road surface works. Temporary and permanent infrastructure is located within developed or cleared open space areas and as such, there would be no alterations or impacts to the curtilage of the item. There would be no change to the geomorphology of Wolli Creek as a result of temporary groundwater treatment plant discharges. These temporary and permanent structures would have no impact on the heritage significance of the item.	Negligible direct impact	Visual impacts to be managed through urban design and interpretation plan	Highly effective
Main alignment tunnels	Register of National Estate	RNE #102106	Kingsgrove East Urban Conservation Area	Change in heritage conservation area values Vibration and settlement (tunnelling)	The preferred project corridor passes under the northern extent of the conservation area. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only.	Negligible secondary direct impact – vibration and settlement (tunnelling) Negligible direct impact –change in heritage values	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
				Visual	- Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. - Visual impacts from the Kingsgrove motorway operations complex which could occur however this would be reduced in part by distance and the screening effect of surrounding industrial developments. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area and within 50 metres of the main alignment tunnels.	Negligible indirect impact – visual	and monitoring would be undertaken as a precautionary measure. Visual impacts are unlikely given the distance to the heritage conservation area and only distant views would be available.	Highly effective
Bexley Road surface works Main alignment tunnels	Register of National Estate	RNE #102071	Clemton Park Urban Conservation Area	Change in heritage conservation area values Vibration from surface works Visual	Impacts to heritage values within the conservation area would be localised to specific areas already associated with major transport network infrastructure, or have been previously disturbed by previous road infrastructure projects (such as the M5 East Motorway, and the M5 East Motorway filtration trial). Visual impacts due to Bexley Road South motorway operations complex would be visible and may affect certain properties.	Negligible direct impact – change in heritage values Negligible indirect impact – visual Minor secondary direct impact – vibration (surface works)	Maintain safe surface working distances as shown in Table 58.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					Temporary visual impacts may also occur while Bexley Road North construction compound (C4), the Bexley Road South construction compound (C5) and the Bexley Road East construction compound (C6) are operational during construction. However, there would be no direct impacts in the sense that there will be no demolition of houses or structures in the urban conservation area. The works within the urban conservation area are restricted to the current motorway road reserve, land used to support the M5 East Motorway or vacant land. Buildings that are within 50 metres of the construction footprint have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area. Landscaping would provide screening of the Bexley Road South motorway operations complex from the heritage conservation area, once established.			

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Main alignment tunnels	Register of National Estate	RNE #102106	Bardwell Park Urban Conservation Area	Vibration and settlement (tunnelling)	The preferred project corridor passes under the south-western extent of the conservation area. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area and within 50 metres of the main alignment tunnels..	Negligible secondary direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Bexley Road surface works Main alignment tunnels	Sydney Trains Section 170 Heritage and Conservation Register	#4801898	Bexley North Railway Station Group	Vibration and settlement (tunnelling) Vibration from surface works Visual	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling and surface works. However, vibration levels are anticipated to be below potential	Negligible secondary direct impact – vibration and settlement (tunnelling). Negligible secondary direct impact – surface works (vibration) and visual	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					damage levels relevant to heritage structures. - Structures that are within 50 metres of the construction footprint have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. - Visual An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Negligible indirect impact – visual	a precautionary measure. Maintain safe surface working distances as shown in **Table 58**.	Highly effective Highly effective
Main alignment tunnels	Rockdale LEP 2011	Sydney Trains Section 170 Heritage and Conservation Register #4805728	Arncliffe (Forest Road) overbridge	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					risks to the heritage item.			
Bexley Road surface works	Section 170 - Roads and Maritime	#4305006	Wolli Creek Culvert	Vibration from surface works	This item is located within ten to 20 metres to the construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works)	Maintain safe surface working distances as shown in **Table 58**.	Highly effective
Local road works St Peters interchange	State Heritage Register Sydney LEP 2012 Marrickville LEP Botany Bay LEP Register of National Estate Section 170 Sydney Water Heritage and Conservation Register	SHR #01621 I3 (Sydney LEP) I270 (Marrickville LEP) I1 (Botany LEP) RNE # 4571712	Alexandra Canal	Modification Visual Vibration (surface works)	Three new bridges would be constructed across Alexandra Canal. This has the potential to generate the following impacts on the heritage values of the canal: - Visual, due to the introduction of three new bridges, including two road bridges and one dedicated pedestrian/cyclist bridge. - Changes to the navigability of the canal. - Direct modification to the embankment, to enable new surface water discharge points and scour protection. - Vibration, due to surface works occurring in close proximity to the	Significant direct impact – modification Significant indirect impact – visual Significant direct impact – vibration (surface works)	Visual and modification impacts to be managed through urban design and interpretation plan Maintain safe surface working distances as shown in **Table 58**.	Moderately effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					embankments of the canal. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.			
Local road works	Marrickville LEP 2011	I271	St Peters Public School, including interiors	Vibration (surface works) At-property acoustic treatment	The eastern curtilage of the heritage item is located around 50 metres from construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item. The properties have also been identified for consideration for at property acoustic treatment, which would be confirmed during detailed design.	Negligible secondary direct impact – Vibration (surface works) Minor direct impacts – At-property acoustic treatment	Maintain safe surface working distances as shown in **Table 58**.	Highly effective
Local road works	Marrickville LEP 2011	I273	Terrace housing, including interiors	Vibration (surface works) Visual	The item would be directly located to surface works associated with the local road works, and would have minor impacts to the visual setting of the heritage item. The item also has the potential to be directly impacted due to vibration impacts associated with surface	Potential minor direct impact – vibration (surface works) Minor indirect	Maintain safe surface working distances as shown in **Table 58**. Visual impacts	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					construction. However surface works would adhere to safe working distances. An existing condition survey report and a program of monitoring would be undertaken to identify early potential risks to the heritage item.	impact – visual	to be managed through urban design and landscaping plan	
St Peters interchange Local road works	State Heritage Register Marrickville LEP 2011 Register of National Estate	SHR#00032 I275 RNE #1716	St Peter's Anglican Church and Graveyard	Vibration (surface works)	The south-eastern curtilage of the heritage item is located within around 40 metres to 50 metres of construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Negligible direct impact	Maintain safe surface working distances as shown in **Table 58**.	Highly effective
Main alignment tunnels St Peters interchange	Marrickville LEP 2011	I277	Southern Cross Hotel	Vibration and settlement (tunnelling) Vibration (surface works) Visual	The heritage item would be located within the preferred project corridor and adjacent to the St Peters interchange. Potential impacts may include: - Settlement during and after construction, however this would be less than 18 millimetres, which may result in cosmetic damage. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be within criteria for heritage buildings.	Negligible secondary direct impact – vibration and settlement (tunnelling) and vibration (surface). Negligible indirect impact – visual.	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					- Vibration impacts resulting from surface works. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. - Visual impacts associated with the St Peters interchange, and associated motorway operations complexes (such as ventilation facilities). An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		a precautionary measure. Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and landscape plan	Highly effective Highly effective
Local road works	Marrickville LEP 2011	I280	Waugh and Josephson industrial buildings, former, showroom, offices and workshops, including interiors	Visual Vibration (surface works)	The item would be directly located to surface works associated with the local road works. However, at this location, the Campbell Road/Unwins Bridge Road and May Street intersection would be realigned to provide greater setback from the heritage curtilage from its eastern boundary. Widening of Unwins Bridge Road at the intersection, however, would result in a minor reduction in setback from its southern boundary. However, overall, the building would retain its landmark qualities as no part of it would be obscured by the works.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual	Visual impacts to be managed through urban design and interpretation plan Maintain safe surface working distances as shown in **Table 58**.	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					Construction works also has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.			
Local road works	Marrickville LEP 2011	I281	Town and Country Hotel, including interiors	Visual Vibration (surface works)	Surface works associated with the local road works would be undertaken directly adjacent to the heritage item. However, at this location, the realignment of the Campbell Road/Unwins Bridge Road/Bedwin Road/May Street intersection would be realigned to provide greater setback of the building from the road carriageways. As such, the project would not have a significant impact on the visual context of the heritage item in terms of its landmark qualities at this intersection. Construction works also has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual	Visual impacts to be managed through urban design and interpretation plan Maintain safe surface working distances as shown in **Table 58**.	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Local road works	Marrickville LEP 2011	I282	Group of Victorian Filigree and Victorian Italianate terrace houses – Narara, including interiors.	Vibration (surface works) Visual	The item would be directly located to surface works associated with the local road works, and would have minor impacts to the visual setting of the heritage item. Construction works also has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing survey condition report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Potential minor direct impact – vibration (surface works) Minor indirect impact – visual	Visual impacts to be managed through urban design and interpretation plan Maintain safe surface working distances as shown in **Table 58**.	Highly effective Highly effective
Local road works St Peters interchange	Marrickville LEP 2011	I283	Remaining brick road and footpath paving and stone guttering	Vibration (surface works)	This item is located within 30 to 40 metres to the construction footprint and has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances.	Negligible secondary direct impact	Maintain safe surface working distances as shown in **Table 58**.	Highly effective
Main alignment tunnels	Marrickville LEP 2011	I284	Brick Kerb and sandstone kerb guttering	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.		will be undertaken as a precautionary measure.	
Main alignment tunnels	Marrickville LEP 2011	I288	Victorian filigree style sandstone faced residence, including interiors	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than five millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Marrickville LEP 2011	I289	St Mary / St Mina Coptic Orthodox Church	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction. However, settlement is not predicted at this item as it is offset from the main alignment	Nil – Marrickville Council have determined to demolish the item	Nil	n/a

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					tunnels. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.			
Main alignment tunnels	State Heritage Register Marrickville LEP 2011	SHR #01412 I294	Timber Slab Cottage, including interiors	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Main alignment tunnels	Marrickville LEP 2011	I299	Part of Westpac stores department and Penfolds wine cellar (former), including interiors	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as a precautionary measure.	Highly effective
Main alignment tunnels	Marrickville LEP 2011	I303	Moreton Bay Fig Tree	Vibration and settlement (tunnelling)	The heritage item would be located within the preferred project corridor. Potential impacts may include: - Settlement during and after construction, however this would be less than ten millimetres, which is considered to be negligible. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures.	Secondary negligible direct impact	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring will be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					The main alignment tunnels would be around 45 metres below ground at this point would unlikely have an impact on tree roots.			
St Peters interchange Main alignment tunnels	Marrickville LEP 2011	I312	Service Garage	Vibration and settlement (tunnelling) Vibration (surface works) Visual impacts Acquisition	The heritage item would be located within the construction footprint, and directly above the eastern portal. Potential impacts may include: - Settlement during and after construction however this would be less than ten millimetres, which is considered to be cosmetic only. - Vibration impacts during tunnelling. - Change in use and visual impacts associated within the integration of this item within the urban design of the interchange. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Secondary direct minor impact – vibration and settlement (tunnelling) and vibration (surface works) Significant direct impact – acquisition Minor indirect impact – visual impacts	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure. Any cosmetic damage will be rectified. Maintain safe surface working distances as shown in **Table 58**. Visual impacts will not impact heritage	Highly effective Highly effective n/a

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
							significance and do not require mitigation. The change of use and acquisition impacts will be mitigated through archival recording and interpretation	Somewhat effective
Local road works	Marrickville LEP 2011	C16	Goodsell Estate Heritage Conservation area	Acquisition Modification Change in heritage conservation area values Visual	An area of Camdenville Park, which is located within the Godsell Conservation Area would be directly impacted by the project as a result of: - The realignment of the Campbell Road/Unwins Bridge Road/Bedwin Road/May Street intersection. This would result in the permanent loss of an area along the western extent of the conservation area. - Construction activity associated with the augmentation of the stormwater detention basin for additional flood storage and surface water treatment.	Minor secondary direct impact – vibration (surface works) Minor direct impact – acquisition and modification Minor indirect impact – visual Minor indirect impact – conservation area values	No impacts to heritage significance have been identified. No mitigation warranted.	n/a

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					This has the potential to generate the following impacts on the heritage values of the conservation area: - Impacts to heritage values within the conservation area, which would be localised to the western curtilage of the conservation area. - Visual, due to the realignment and widening of roads, and alterations to the existing stormwater detention basin which is vegetated. However, proposed landscaping would minimise the potential for adverse impacts. - Direct acquisition of land within the curtilage of the conservation area, resulting in the permanent loss of this area. - Modification to areas within the conservation area associated with the upgrade of the stormwater detention basin. This would result in the excavation of the basin of around two metres from current level. Surface road works would also occur within or adjacent to the conservation area, which have the potential to have vibration impacts on structures within the conservation area.			

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area and within 50 metres of the main alignment tunnels.			
St Peters interchange	Register of National Estate	RNE #16240	St Peters Brickpit Geological Site	Modification Visual impacts Vibration (surface works)	The heritage item would be directly impacted as a result of the St Peters interchange and the construction of a share pathway along the northern boundary of the interchange.	Significant direct impact – modification Significant indirect impact – visual Significant secondary direct impact – vibration (surface works)	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure. Maintain safe surface working distances as shown in **Table 58**.	Highly effective Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
							The acquisition, modification and visual impacts will be mitigated through interpretation	
Main alignment tunnels	Register of the National Estate	RNE #100061	Sydenham Village	Vibration and settlement (tunnelling)	The conservation area would be located above the preferred project corridor and there would be no changes to the conservation values of the heritage conservation area. Potential impacts to structures within the conservation area may include: - Settlement during and after construction, however this would be less than ten millimetres, which may result in cosmetic damage only. - Vibration impacts during tunnelling. However, vibration levels are anticipated to be below potential damage levels relevant to heritage structures. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to relevant structures within the conservation area and within 50 metres of the main alignment tunnels.	Secondary negligible direct impact – vibration and settlement. Secondary negligible direct impact – conservation area values	Settlement and vibration impacts are negligible and do not require mitigation, however, a condition survey report and monitoring would be undertaken as a precautionary measure.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Local road works	Roads and Maritime Heritage and Conservation Register	#4305629	Terrace group – 28-44 Campbell Street	Demolition	The project would involve the demolition of this item to enable the widening of Campbell Street. This impact cannot be avoided.	Significant direct impact – demolition	Archival recording and salvage and reuse	Somewhat effective
Local road works	Roads and Maritime Heritage and Conservation Register	#4305643	House	Demolition	The project would involve the demolition of this item to enable the widening of Campbell Road. This impact cannot be avoided.	Significant direct impact – demolition	Archival recording and salvage and reuse	Somewhat effective
Local road works St Peters interchange	Sydney LEP 2012	I12	Terrace group	Visual Vibration (surface works) At-property acoustic treatment	The item is located directly adjacent to the surface works associated with the widening of Campbell Road and opposite the St Peters interchange. A new pedestrian bridge would also be constructed to the north-west of the heritage curtilage. Construction compounds would also be located in the vicinity of the heritage item. Permanent structures and the widening of the road would change the visual setting of this heritage item. Construction works also has the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working	Minor secondary direct impact – vibration (surface works) Minor indirect impact –visual Minor direct – At-property acoustic treatment	Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and interpretation plan	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item. The properties have also been identified for consideration for at property acoustic treatment, which would be confirmed during detailed design.			
Local road works	Sydney LEP 2012 Sydney Water Section 170	I18 #4571730	Water Board pump house, including Interior and substructure	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is the potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual	Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and landscape plan	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Local road works	Sydney LEP 2012	I20	Industrial Building, 'Frank G Spurway'	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is the potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual	Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and interpretation plan	Highly effective Highly effective
St Peters interchange	Sydney LEP 2012	I1405	Warehouse 'Rudders Bond Store'	Demolition	The project would involve the demolition of this item. This impact cannot be avoided.	Significant direct impact – demolition	Archival recording and salvage and reuse	Somewhat effective
Local road works	Sydney LEP 2012	C2	Cooper Estate conservation area	Vibration (surface works) Change in heritage area values	Surface works associated with the local road works would occur in proximity to the conservation area. Existing buildings would screen the majority of the project from the conservation area, and works associated with the project would be within an existing road corridor. As such, there would be no change to the visual setting of the conservation area.	Negligible direct impact – Change in heritage area values Negligible secondary direct impact – vibration (surface works)	Maintain safe surface working distances as shown in **Table 58**.	Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					Structures within the conservation area have the potential to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances.			
Local road works	Proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings)	#3	Macdonaldtown Stormwater Channel	Visual Vibration (surface works)	Surface works associated with the local road works would occur within the curtilage of the stormwater canal, which presently passes under Euston Road. The project would require the widening of Euston Road, which would require additional sections of the canal to be covered. The works would not require a direct modification of the canal structure, but would be directly impacted by the project as a result of: - Change to the visual setting of the item - Impacts from vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Minor indirect impact – visual	Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and interpretation plan	Highly effective Highly effective

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
Local road works	Proposed amendment to Sydney LEP 2012 (Industrial and warehouse buildings)	#14	Former Alexandria Spining Mills	Visual Vibration (surface works)	Surface works associated with the local road works would occur in proximity to the heritage item. However, works associated with the project would be within an existing road corridor. As such, there would be no significant change to the visual setting of the heritage item. There is the potential for the item to be directly impacted due to vibration impacts associated with surface construction. However surface works would adhere to safe working distances. An existing condition survey report and program of monitoring would be undertaken to identify early potential risks to the heritage item.	Minor secondary direct impact – vibration (surface works) Negligible indirect impact – visual	Maintain safe surface working distances as shown in **Table 58**. Visual impacts to be managed through urban design and interpretation plan	Highly effective Highly effective
Local road works	Sydney LEP 2012 Marrickville LEP	C47 C2	King Street conservation area (Sydney LEP) King Street/Enmore Road conservation area (Marrickville LEP)	Change in heritage conservation area values	No surface works associated with the local road works would occur immediately adjacent to or within the heritage conservation area boundaries. There would be no change to the visual setting of the conservation area. King Street is a major state road, part of the Princes Highway, running through the retail precinct of Newtown. It serves as one of the key connections between the Sydney CBD and areas in the south of Sydney. It is a four-lane, two-way road with two lanes in each direction.	No impact – Change in heritage conservation area values	No mitigation required.	n/a

Impact area	LEP and / or other register	LEP no. (or other ID if LEP does not apply)	Item	Impact type	Comment	Degree of impact	Mitigation measure	Effectiveness of measure
					King Street has a posted speed limit of 50 kilometre per hour and on-street parking in non-clearway periods. The project does not propose to modify King Street, including speed limits or on-street parking arrangements along King Street. In future years, King Street is expected in most cases to experience reduced or similar peak hour volumes under the 2021 'with project' scenario and 2031 cumulative scenario when compared to the without project scenario (refer to Technical Working Paper: Traffic and Transport (AECOM, 2015). The exception to this would occur in the 2031 cumulative case, where AM peak hour volumes southbound would increase when compared to the 'without project' scenario. However, this is in the opposing direction to the dominant AM peak hour and is within the design carrying capacity of the road.			

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Appendix C

Archaeological Monitoring and Excavation Methodology

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Archaeological Monitoring and Excavation

Introduction

As identified in **Chapter 8**, a proposed methodology to manage the potential to disturb areas of archaeological potential would be implemented for the following potential areas of archaeological potential:

- Potential air raid shelters near the corner of Campbell and Euston Roads;
- Kilns and ancillary structures associated with the Brickworks Pty Ltd City Yard; and
- Kilns and ancillary structures associated with the NSW Brick Company Ltd.

This section provides details regarding the manner in which these site would be tested and, if warranted, salvaged prior to construction works. Test excavation and salvage has been recommended within the areas marked as being of archaeological potential prior to the commencement of construction in these areas.

The final methodology would be contained within the Construction Environmental Management Plan and finalised in consultation with Department of Planning and Environment, City of Sydney Council and NSW Office of Heritage (Heritage Division).

Proposed Methodology

Test excavation

Prior to works within the areas of archaeological potential, an appropriately qualified archaeologist would supervise the excavation of test trenches to determine the archaeological preservation and the location of the identified potential relics. Excavation would be undertaken by personnel using a smooth edged mud bucket or by hand shovel, dependant on the location, depth, safety considerations and prevailing soil conditions, to remove top soil. An archaeologist would monitor the works and would halt excavations when evidence of intact deposits or relics are encountered.

Should archaeological testing reveal substantial, intact or significant archaeological features, deposits and/or relics, construction in the immediate area will cease with an appropriate works exclusion area established and the NSW Heritage Division will be contacted. Based on a review of the outcome of the test excavations, a detailed research design and salvage excavation methodology, building on that provided below will be developed in consultation with the NSW Heritage Division.

Recording

If relics, features or deposits are uncovered, the machine or work personnel would stop and the find will be inspected by the archaeologist. The following methodology would be implemented:

- Establish a survey datum to record the location of the features, deposits and/or relics;
- Archaeological excavation and/or cleaning with hand tools, as required, in order to define the feature, deposits and/or relics;
- Produce scaled plans and cross-sections, as required;
- Photographically record all phases of the excavations and recording with an appropriate photographic scale and photographic log;
- Complete a context recording form for each feature, which should be sequentially numbered and also record the location, dimensions and characteristics of the feature, context and/or spit; and
- Artefacts should be bagged according to the feature, context and/or spit from which they were retrieved.

Excavation

Should test excavations reveal substantial or intact archaeological features, deposits and/or relics that are considered to be of archaeological significance, a program of salvage excavation would be undertaken, following consultation with the Office of Environment and Heritage (Heritage Division). The size and location of the excavation trenches would be determined by the location, nature and extent of the archaeology revealed during test excavations. The focus of the excavation would be to mitigate the impact to the archaeological record by investigating the archaeology to the extent necessary to understand and interpret the feature or relic.

The following should guide the excavation:

- The location of the excavation trenches should be recorded, in relation to the extant structures and other features, using Differential Global Positioning System to produce a detailed site plan;
- The squares should be excavated according to context, or in two centimetre spits in the absence of identifiable contexts;
- Spoil from the squares should be sieved through three millimetre mesh and all artefacts retrieved;
- Artefacts should be bagged according to the feature, context and/or spit from which they were retrieved; and
- Squares should be excavated to sterile soil or until safe working limits are reached.

In relation to recording, the following should be undertaken:

- A plan of the site prior to excavation;
- Standardised context recording form completed for each feature, context and/or spit which should be sequentially numbered and record the location, dimensions and characteristics of the feature, context and/or spit;
- A plan of features and contexts (if found) prior to excavation;
- Plan and sections of the trench on completion of excavation;
- Photographic record of the excavation including the site prior, during and on the completion of the excavation using an appropriate photographic scale.

Artefact Analysis & Collections Management Policy

Should artefacts be uncovered during the excavation, they would be cleaned according to their material type (ie. washing for glass and ceramic, dry brushing for bone and metal). Hazardous materials would be recorded by photographs and discarded appropriately.

The artefacts retrieved would be entered into a database containing the following as a minimum:

- Unique artefact number;
- Locational information;
- Material type;
- Form/function;
- Colour/decoration;
- Dimensions;
- Weight; and
- Additional comments if necessary.

The artefact database would be developed with regard to quantity and nature of the material retrieved. At the conclusion of the analysis, artefacts from contexts that are not secure or that are not of State or Local significance would be disposed of. Building materials would be recorded photographically and catalogued and a small sample of items kept for further analysis and the remaining items discarded. Once the scope of the artefact collection is established, a further discard policy would be developed in consultation with the Office of Heritage (Heritage Division) and the Department of Planning and Environment to identify what materials are to be discarded, retained only as samples, retained for long-term storage and retained for possible display. Following confirmation of the policy, the collection would be culled and the remainder prepared for long-term storage.

Once catalogued and analysed, Roads and Maritime would confer with relevant stakeholders to establish the preferred recipient of the permanent artefact collection. Storage, conservation, curation and display would be determined at this time and in light of the quantity and nature of the recovered material.

Reporting

A report would be produced detailing the excavation, including the implementation of the methodology, the results of the test excavations and analysis of artefacts retrieved (if any). The following headings would be used as a minimum:

- Executive Summary;
- Introduction;
- Site History;
- Research Design;
- Methodology;
- Excavation results, including descriptions of features and artefacts identified (if any);
- Analysis;
- Conclusion and future management recommendations (if required).

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