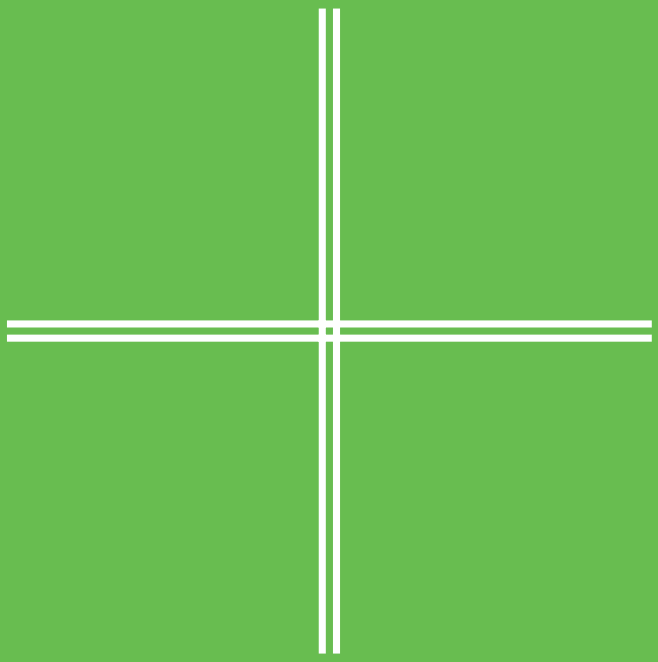
NSW GOVERNMENT | Transport for NSW

Modification to Showground Station
State Significant Infrastructure Approval (SSI-5100)

northwestraillink



North West Rail Link

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Prepared for

TfNSW

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Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	07-Oct-2012	For Internal Review	Danielle Phillips Principal Environmental Scientist	
1	09-Oct-2012	For TfNSW Review	Danielle Phillips Principal Environmental Scientist	
2	22-Oct-2012	Final	Julian Ardas Project Director	

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1. Introduction

The NWRL project has been identified by the NSW Government as a priority railway transport infrastructure project. The NWRL comprises an electrified railway with services operating between Chatswood and Tallawong Road, Rouse Hill extending the rail network to north west Sydney. It would include the construction of a two track alignment from Epping to Rouse Hill, 23 km in length with eight new stations and associated services.

Stations are planned at Cherrybrook, Castle Hill, Showground (formerly known as Hills Centre), Norwest, Bella Vista, Kellyville, Rouse Hill and Cudgegong Road. A stabling facility is proposed beyond the Cudgegong Road station site in an area known as Tallawong Road. Bus, pedestrian and cycling access facilities are proposed for all stations, with a total of 4,000 park and ride spaces to be provided at five of the stations, Cherrybrook, Showground, Bella Vista, Kellyville and Cudgegong Road Stations.

The NWRL has been declared Critical State Significant Infrastructure (SSI) through Clause 16 of State Environmental Planning Policy (State and Regional Development) 2011 and Clause 2, Schedule 5 of the Policy.

On 25 September 2012, a Modification of Minister's Approval was granted pursuant to Section 115ZI of the *Environmental Planning and Assessment Act 1979* for the Staged State Significant Infrastructure Approval for the NWRL project. In addition, on 25 September 2012 an Approval was granted pursuant to Section 115ZB of the *Environmental Planning and Assessment Act 1979* for the State Significant Infrastructure Application relating to the Major Civil Construction Works for NWRL.

Pursuant to Section 115ZI of the EP&A Act, Transport for NSW is seeking approval from the Minister for Planning and Infrastructure for the modification of the State Significant Infrastructure approval (SSI-5100) granted on 25 September 2012.

The proposed modification is associated with minor changes to Showground Station (Construction Site 6 as identified in the Environmental Impact Statement for Stage 1: Major Civil Construction Works (EIS 1)) and includes:

- Minor change to the location of Showground Station, to the south east and parallel with Carrington Road, and associated modification of the horizontal alignment of the tunnels.
- Vertical alignment changes to accommodate the changed location of Showground Station.
- Change to Showground Station construction site boundary (Site 6).
- Change to the Showground Road and Carrington Road construction access/egress arrangements.

2. Project Approval Background

The NWRL project, including alignment and stations, was considered at concept level in 2006-2008, including widespread consultation with the community and relevant stakeholders. The project is subject to an environmental assessment and approval process under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Concept Plan Approval (MP 06_0157) for the project was granted by the then Minister for Planning on 6 May 2008. With amendments to the EP&A Act in 2011, the Concept Plan Approval is taken to be a Staged Infrastructure Approval under Part 5.1 of the EP&A Act.

Since then, the concept design has been optimised to ensure that it appropriately responds to the travel needs of Sydney commuters, provides value for money and produces a better product outcome for the community. This has resulted in refinements to the project, which was addressed through a modification to the 2008 Staged Infrastructure approval. The modification, which provided clarification of the project definition and adjustments to the project alignment including station locations, was approved on 25 September 2012 (MP 06_0157 MOD 1).

Before works can commence on the project, an environmental assessment must be undertaken and approved by the Minister for Planning and Infrastructure for each stage or component of the project. Stage 1: Major Civil Construction Works (EIS 1) was approved by the Minister for Planning and Infrastructure on 25 September 2012 and is referred to in the remainder of this report as the '2012 SSI approval'.

As the concept design has developed, further optimisation has occurred at the approved Showground Station site and Transport for NSW is now seeking the Minister for Planning and Infrastructure's approval for the modification of the 2012 SSI approval.

3. Showground Station Existing Approval (Major Civil Construction Works)

3.1 2012 State Significant Infrastructure Approval

The approved Showground Station construction site would contain an area of approximately 65,000m^2 and be located to the south and west of the existing Castle Hill Showground complex and within The Hills Shire Council depot. The site is bounded by Showground and Carrington Roads. The construction site would require the temporary possession of limited areas associated with the southern portion of the Castle Hill Showground complex and the acquisition of The Hills Shire Council depot.

At Showground Station, open cut excavation works would occur on the site. This station excavation would then be used to undertake a Tunnel Boring Machine (TBM) maintenance program within the confines of the station box prior to advancing the next 5km to Castle Hill Station and then to Cherrybrook Station.

Showground Station would become the TBM support site for Showground Station to Cherrybrook Station portion of the drive in order to maximise efficiencies of TBM operation and to provide progressive access for the construction contractor undertaking works that form Stage 2 of the NWRL project. This would require the full range of support services to be provided including high voltage power supply, water supply, ventilation, work train, grout batching plant, drainage and water treatment, workforce facilities, spoil removal, and facilities to introduce pre-cast concrete lining elements.

Showground Station would be a significant spoil removal site with a total of approximately 475,000m^3 removed through the site, being some 85,000m^3 from the station excavation and about 390,000m^3 from the tunnelling works.

An acoustic shed would be established on the eastern portion of the site to enclose the TBM operations including pre-cast concrete segment and spoil handling. Acoustic panels would be placed over the remainder of the station box excavation during works outside of standard construction hours.

Spoil handling would occur outside of the acoustic shed, however this would generally only occur during standard daytime hours. Loading of spoil onto heavy vehicles outside of standard daytime construction hours would occur within the acoustic shed.

The south western portion of the site would be used for segment storage and a water treatment plant. The area immediately to the north of the station excavation would provide TBM services and a workshop, with the northernmost section comprising general laydown, offices, toilet facilities and car parking for construction workers.

Approved access to and egress from Showground Station would be from Showground and Carrington Roads. The access and egress from Showground Road would largely follow an existing road (to be upgraded) within the Showground complex, located towards the western boundary adjacent to Cattai Creek. A new signalised intersection at Showground Road was also approved.

The location and indicative layout of the Showground Station construction site, including vehicle access / egress, as approved on 25 September 2012, is illustrated in Figure 3-1.

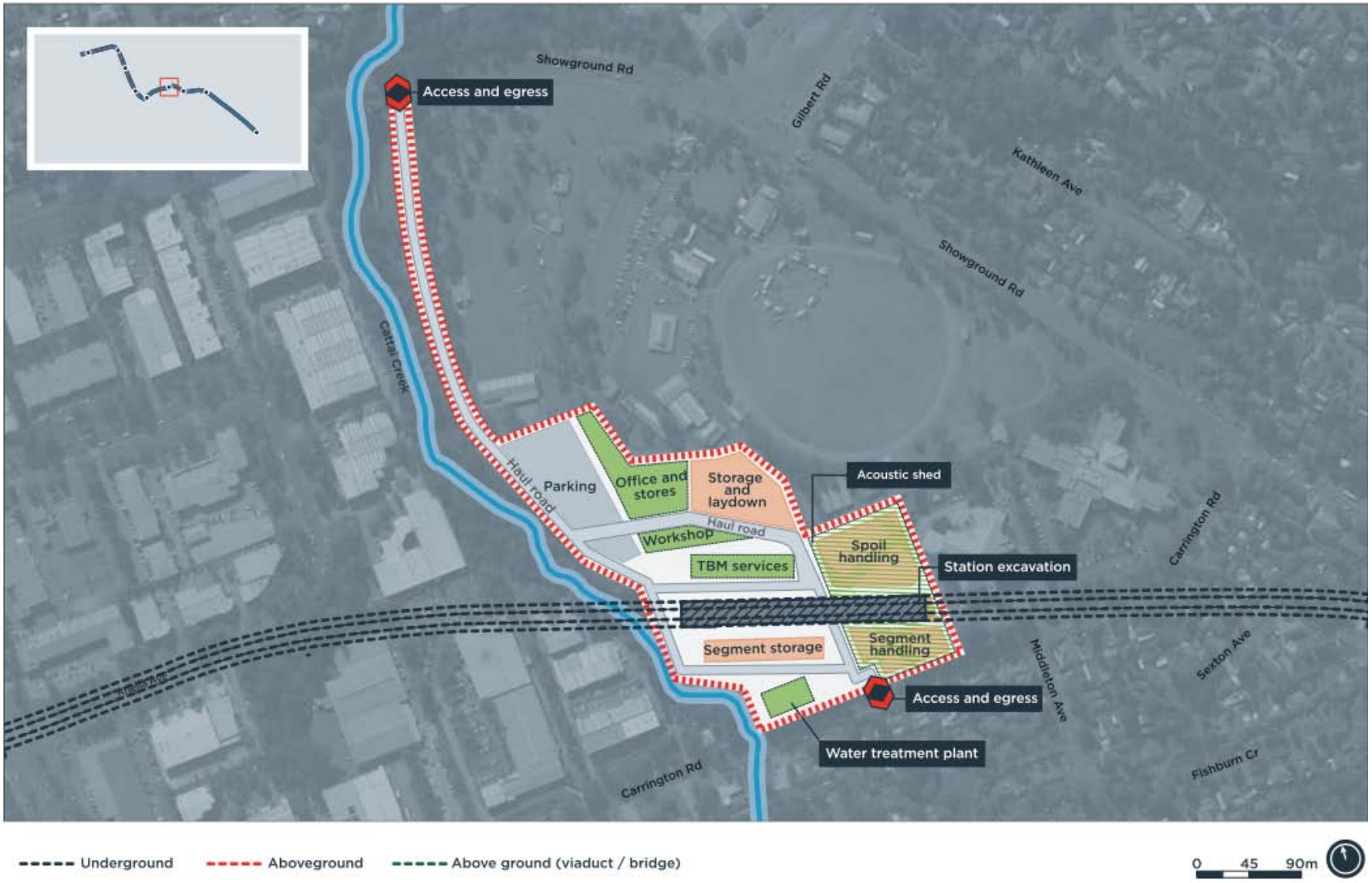

Figure 3-1 Approved Indicative Showground Station Layout (Source: EIS1)

3.2 Relationship to NWRL Stage 2: Stations, Rail Infrastructure and Systems (EIS 2)

This modification report assesses the change in impacts to Stage 1: Major Civil Construction Works of the NWRL.

Being a staged infrastructure project, this proposed modification to Stage 1 of the NWRL would also apply to subsequent stages of the project.

It is on this basis that this modification report has been prepared in parallel with the environmental impact assessment carried out for NWRL Stage 2: Stations, Rail Systems and Infrastructure (EIS 2).

EIS 2 has assessed the Showground Station changes presented in this modification report.

4. Description of the Proposed Modification

4.1 Proposed Modification

The proposed modification is associated with minor changes to Showground Station (Construction Site 6).

Table 4-1 provides a summary of the approved components of the 2012 SSI approval as they relate to Showground Station and construction site. It also outlines where modification is sought for individual project components or where components remain unchanged.

Table 4-1 Summary of Approved NWRL Project Components (as they relate to Showground Station) and Proposed Modifications

Project Component	Summary of Approved Component	Proposed Modification
Showground Station box	Located to the south and west of the Castle Hill Showground complex and within The Hills Shire Council Depot.	Minor change to the horizontal alignment of Showground Station. Refer to Section 4.1.1. Vertical alignment of the tunnel will be shallower at Showground Station to account for a minor change to the horizontal alignment. Refer to Section 4.1.2.
Showground Station Construction Site	Approximately 65,000m^2 construction footprint. The construction site would require the temporary possession of limited areas associated with the southern portion of the Castle Hill Showground complex and the acquisition of The Hills Shire Council Depot.	Change in the extent and area (85,000m^2) of the construction footprint. Refer to Section 4.1.3.
Construction Access/Egress	Access to and egress from the site is from Showground and Carrington Roads. The access and egress from Showground Road would largely follow an existing road (to be upgraded) within the Showground complex, located towards the western boundary adjacent to Cattai Creek. This would require a new signalised intersection on Showground Road (north of Castle Hill Showground). Access and egress from Carrington Drive would require a new signalised intersection at Doran Drive. Access to the Showground at Doran Drive would be closed to enable excavation of the station.	Change to the Showground Road and Carrington Road construction access/egress locations. Refer to Section 4.1.4.

The proposed modifications, which are associated with minor changes to Showground Station can be summarised as:

- Minor change to the location of Showground Station, to the south east and parallel with Carrington Road, and associated modification of the horizontal alignment of the tunnels.
- Vertical alignment changes to accommodate the changed location of Showground Station.
- Change to Showground Station construction site boundary (Site 6).
- Change to the Showground Road and Carrington Road construction access/egress.

A description of the proposed modifications is provided in Sections 4.1.1 to 4.1.4. An assessment of the potential environmental impacts associated with each of the modification components is provided in Chapter 6.

4.1.1 Change to the Location of Showground Station

Design development and recent stakeholder input have resulted in a proposed change to the location of Showground Station. The station would be moved slightly to the south east and parallel with Carrington Road, reducing the impacts on the Castle Hill Showground complex. A corresponding change to the horizontal alignment between Showground Road and Windsor Road is proposed, to accommodate the altered station location (refer to Figure 4-1).

4.1.2 Change to the Vertical Alignment

The vertical alignment of the rail line would be altered to accommodate the changed horizontal alignment between Showground Road and Carrington Road and the minor alteration to the location of Showground Station.

West of Showground Station, the tunnel would be shallower and pass closer to the alluvium geology beneath Cattai Creek. This closer proximity would potentially increase the risk of water ingress into the tunnels during construction. However, once the permanent lining in the tunnels is constructed, further seepage would be unlikely.

The likelihood of seepage during tunnelling, and therefore the need to undertake pre- tunnelling treatment, would not be known until test holes are drilled in advance of the TBMs. If required, grout would be injected from these holes and others as required to consolidate alluvial sediment above the tunnel alignment, to minimise the potential for water ingress and to increase structural stability of the geology during TBM tunnelling works.

4.1.3 Change to the Construction Site Boundary

The approved construction site boundary is approximately 65,000m^2. The modified construction site boundary would be approximately 85,000m^2 and is shown in Figure 4-1.

The Showground Station construction site boundary would be altered as a result of proposed changes to the access and egress arrangements from Showground Road, Carrington Road and within the site boundary (refer to Section 4.1.4). The approved access road footprint running south from Showground Road and along Cattai Creek would no longer be required. East of the proposed Showground Station box, the construction site boundary would be extended to Showground Road, encompassing the existing Hills Centre for Performing Arts and Hills Shire Council Chambers which would be acquired by TfNSW. The Hills Centre for Performing Arts would be demolished. The Council Chambers may be used during the construction phase, for example as a site office. The modified construction site boundary would be extended to encompass the residence on the western side of Cattai Creek which would be acquired by TfNSW. The modified boundary covers slightly more of the riparian corridor and part of Cattai Creek, however direct impacts to the creek and riparian zone are not anticipated.

To incorporate the access changes and the changed station location, the construction layout within the site including car parks, storage areas, spoil handling, workshops and other buildings and structures would also change, refer to Figure 4-2.

Figure 4-1 Proposed Modification to the Location of Showground Station and the Horizontal Alignment between Showground Road and Windsor Road

Figure 4-2: Proposed Modification to the Construction Site Boundary and Site Layout

4.1.4 Change to Construction Access/Egress Arrangements

Access and egress arrangements to the Showground Station construction site would be altered to minimise the impact on the Castle Hill Showground complex. The new Showground Road signalised intersection would be relocated to approximately 165m north west of the Showground Road/Carrington Road intersection.

To accommodate the altered location of Showground Station and enable excavation of the station box, a new intersection would be located approximately 150m south west of the existing Doran Drive/Carrington Road intersection.

The internal construction road arrangement would also be altered to allow for the changes to access/egress and the construction site layout.

Scope exists to provide public access to and from the Showground precinct via the western side (adjacent to Cattai Creek) of the construction site and/or the eastern side of the site. The location and form of the access facilities would be defined as part of the Construction Traffic Management Plan for the site.

4.2 Strategic Context in Relation to the Modification

The strategic context for the NWRL project has been established through the 2008 Staged Infrastructure approval (as modified 2012).

NSW 2021: A Plan to Make NSW Number One (NSW Government, 2011) (NSW State Plan 2021) is the primary document guiding the direction of development in NSW and Sydney. The plan identifies the NWRL as a key project to help deliver the NSW Government's policy goals including growth patronage in public transport by making it a more attractive choice.

The Draft NSW Long Term Transport Master Plan released in September 2012 confirms the NWRL as a priority transport project. The Draft Plan encompasses Sydney's Rail Future: Modernising Sydney's Trains released in June 2012 which sets the long term strategy to increase the capacity of Sydney's rail network, through investment in new services and upgrading of existing infrastructure.

The minor modifications proposed at Showground Station would provide similar or improved environmental and community outcomes and integrate with land use and existing transport services.

5. Consultation

During assessment of the proposed modification, further consultation has been undertaken with local councils and other key stakeholders which has specifically addressed the proposed changes to the project as identified in the application to modify the 2012 SSI approval.

Local councils and Councillors have been specifically consulted on potential impacts associated with the modifications.

In addition, the NWRL project team met with representatives from the current main tenant of The Hills Centre for Performing Arts, the Empower Church.

The proposed change in location of the Showground Road access came about through consultation with Roads and Maritime Services (RMS) and The Hills Shire Council, and took into account community and precinct user group feedback received during the EIS 1 exhibition period.

As part of ongoing community consultation, the project team will communicate the proposed changes and potential impacts outlined in the modification to local residents and businesses via:

- door knocking sensitive receivers
- letter box drops
- brochures
- maps & diagrams
- EIS 2 community information sessions
- one-on-one meetings
- the project website

A particular focus will be those residents, businesses and organisations now located closer to the station construction site, including the childcare centre and Gemhill Cottage (operated by North West Disability Services). Residences along Showground Road near the proposed construction access and those along Carrington Road will be door knocked.

Further consultation is planned with the Castle Hill and District Agricultural Society and other Showground complex user groups including the Budokan Judo Club, Castle Hill Players, Norwest Canine Association, Hawkesbury Harvest, Computer Pals for Seniors and the Country Womens' Association.

The project team is committed to working cooperatively and ensuring that community access to the Showground precinct is maintained.

6. Changes to Environmental Impact

The changed environmental impacts associated with the proposed modification for the 2012 SSI approval for EIS1 – Major Civil Construction Works are identified in this section.

To determine these changed impacts the following was undertaken:

- Consideration of each modification against a list of environmental categories to identify whether there would be a potential change in environmental impact compared to the approved project.
- Determination of whether the identified potential change in environmental impact is significant and warrants further assessment.

Table 6-1 identifies changes in environmental impacts associated with the proposed modification. In areas where there is potential for a significant change in environmental impact further assessment was carried out and is discussed in Section 6.1.

Table 6-1 Change in environmental impacts associated with the proposed modifications to the Staged Infrastructure Approval and EIS 1 Project Approval (✓ = significant change, X = no significant change)

Proposed Modification to Approval	Environmental Category													
	Soils and Groundwater	Traffic and Transport	Noise and Vibration	European Heritage	Indigenous Heritage	Local Business Impacts	Land Use and Community Facilities	Ecology	Visual Amenity	Climate Change and Greenhouse Gas	Surface Water and Hydrology	Air quality	General Waste management	Cumulative Impacts
Minor change to the location of the station and horizontal alignment.	x	✓	✓	x	x	x	x	x	x	x	x	x	x	x
Vertical alignment changes.	✓	x	✓	x	x	x	✓	x	x	x	✓	x	x	x
Change to Showground Station construction site boundary.	x	✓	✓	x	x	x	✓	✓	x	X	✓	x	x	x
Change to site access/egress.	x	✓	✓	x	x	x	✓	x	x	x	x	x	x	x

The modifications would not give rise to significant changes to European Heritage, Indigenous Heritage, Local Business Impacts, Visual Amenity, Climate Change and Greenhouse Gas Emissions, Air Quality, General Waste Management and Cumulative Impacts.

The environmental aspects considered in further detail include:

- Soils and groundwater
- Traffic and transport
- Noise and vibration
- Land use and community facilities
- Ecology
- Surface water and hydrology

For each key environmental category identified, the following is provided:

- A summary of potential construction impacts identified in EIS 1.
- Consideration of any significant changes or additional impacts as a result of the proposed modification to the SSI approval.

6.1 Soils and Groundwater

6.1.1 Approved Construction Impacts

Key construction impacts on soils and groundwater identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

- Potential ground movement (settlement) of up to 20mm in the immediate area surrounding Showground Station excavation, resulting from stress redistribution within the rock mass causing ground movement.
- Low potential for impacts relating to soil salinity.
- Groundwater drawdown within a narrow corridor surrounding the tunnel and station box. Long term drawdown of more than two metres is estimated for the water table underneath the upper reaches of Cattai Creek.
- Long-term groundwater inflow from rock to the Showground Station box of 0.033 Megalitres per day (ML/d, drained tunnel) and 0.047 ML/d (undrained tunnel).
- Potential substrate cracking of Cattai Creek resulting from tunnel boring, with potential to impact water holding capacity of Cattai Creek prior to tunnel lining.
- Moderate likelihood of encountering localised soil and groundwater contamination in the Showground Station construction site due to use of the land as council depot (fuel storage tanks, workshops, etc). The Hills Shire Council Depot site was built on a cut and fill platform infilling the original Cattai Creek channel. Soil and groundwater testing undertaken indicated that the fill material contains isolated areas of asbestos and hydrocarbon contamination. Elevated hydrocarbon levels within the groundwater have been recorded.

6.1.2 Construction Impacts as a Result of the Modification

Key construction impacts on soils and groundwater identified in the modified SSI assessment and relevant to consideration of changes to impact associated with the modification include:

- The construction site boundary now extends east to Showground Road into an area of moderate potential for soil salinity.
- The vertical alignment of the tunnels would be raised to approximately 5m depth from the crown of the tunnel beneath Cattai Creek and in closer proximity to lower stability geology (alluvium associated with Cattai Creek), potentially requiring stabilisation/treatment (e.g. grouting) of the alluvium under Cattai Creek prior to tunnelling (refer to Section 6.1.6).

6.1.3 Summary of Changes to Impact

Overall, the potential impacts on soils and groundwater during construction are considered to be largely neutral.

6.2 Traffic and Transport

6.2.1 Approved Construction Impacts

Key construction impacts on traffic and transport identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

Road Network Operation and Intersection Performance

- Primary access to the site was provided from Showground Road, north of Castle Hill Showground (near Cattai Creek). A secondary site access was provided from Carrington Road.
- Approximately 550 heavy vehicle movements and 336 light vehicle movements would occur at the Showground Station site per day. Heavy vehicle traffic would be concentrated on the new Showground Road access, limiting impact on Carrington Road. Carrington Road will accommodate some NWRL heavy vehicle access during construction.
- The signalised Showground Road intersection had a predicted performance Level of Service (LOS) B and Degree of Saturation (DOS) 0.83 in the morning peak and LOS B and DOS 0.81 in the afternoon peak. This translates to an intersection that has acceptable delays (wait time at this intersection of 15 to 28 seconds) and spare capacity at the intersection.
- The access to the Showground at Doran Drive would be closed to enable excavation of the station.
- Heavy vehicle access for the removal of spoil from the tunnelling and station excavation would occur through the Showground Road access. The principle heavy vehicle movements would be right in and left out of the site. Carrington Road and Victoria Avenue would provide a secondary access to the site should the Showground Road access be unavailable.

Buses

- Six bus routes operate along Showground Road and Carrington Road in the vicinity of the construction site. No re-routing of standard bus services would be required during construction.
- Special event bus services may be impacted through the need for alternative parking and bus rank location due to the Hills Centre for Performing Arts and Castle Hill Showground parking being unavailable.
- Existing bus stops on Carrington Road, 50m west of Middleton Avenue, may be required to be relocated east of Middleton Avenue to maintain access for through and construction traffic on Carrington Road.

Pedestrians and Cyclists

- An existing pedestrian route from Carrington Road through the Castle Hill Showground to Showground Road would be closed during construction.
- The existing cycle path which runs alongside Cattai Creek and under Showground Road into Fred Caterson Reserve would remain unaffected during construction.
- The northern footpath of Carrington Road would remain open, with provision of marked pedestrian path across the site entrance and traffic control as necessary to allow safe movement of pedestrians.

Parking, Taxis and Kiss-and-Ride

- Approximately 200 off-street parking spaces would be lost through the occupation of the Hills Centre for Performing Arts car park. Alternative parking arrangements during the construction period would be investigated.
- On-street parking is unlikely to be affected, except where no stopping zones are extended at the new site access point on Carrington Road.

6.2.2 Construction Impacts as a Result of the Modification

Key construction traffic impacts identified in this assessment and relevant to the modification include:

Road Network Operation and Intersection Performance

- Access to the site north of Castle Hill Showground (near Cattai Creek) would no longer be required.
- The signalised primary construction site access on Showground Road would operate with spare capacity in the morning and afternoon peaks and with LOS B in the morning and LOS A in the afternoon. The predicted queue lengths of 98m in the morning and 119m in the afternoon on the eastern approach to the construction site access would not impact on the operation of the Carrington Road/Showground Road intersection, which would be approximately 165m from the construction site access.
- The Carrington Road/Showground Road intersection performance would be improved by the modification. There would be an increase in capacity in the morning and afternoon periods and an improvement in LOS from D to C in the afternoon peak compared to existing conditions. The improvements are due to improved signal optimisation and co-ordination as well as the removal of vehicles that would have travelled via the intersection to access the Council Chambers and the Hills Centre for Performing Arts.
- The priority controlled construction access from Carrington Road, approximately 150m south west of the existing Doran Drive/Carrington Road intersection, would have minimal impact to the wider road network and would operate at LOS A.
- The modification would result in greater capacity and improved LOS at the Gilbert Road/Showground Road intersection during the morning peak. There would however be a minor reduction in capacity and LOS compared to existing conditions in the afternoon peak, with the DOS increasing from 0.88 to 0.94 and LOS reducing from B to C.
- A slight improvement would be experienced at the Victoria Avenue/Carrington Road intersection compared to the existing environment. LOS would remain the same for both morning and afternoon peaks, however the DOS would decrease from 0.85 to 0.76 in the morning and the afternoon DOS would remain consistent at 0.92.

Table 6-2 provides a comparison of predicted intersection performance (LOS and capacity) of existing, approved and proposed modification intersection arrangements.

Table 6-2 Comparison of Key Intersection Performance under Existing, Approved and Proposed Intersection Arrangements

Location	Existing				Approved (EIS 1)				Proposed Modification			
	LOS (AM)	DOS (AM)	LOS (PM)	DOS (PM)	LOS (AM)	DOS (AM)	LOS (PM)	DOS (PM)	LOS (AM)	DOS (AM)	LOS (PM)	DOS (PM)
Carrington Rd/Showground Rd	B	0.88	D	1.00	C	0.79	D	0.96	B	0.73	C	0.84
Gilbert Rd/ Showground Rd	D	0.99	B	0.88	C	0.82	B	0.67	C	0.89	C	0.94
Victoria Ave/ Carrington Rd	F	0.85	C	0.92	A	0.45	A	0.59	F	0.76	C	0.92
Showground Rd Construction Access	Not Applicable				B	0.83	B	0.81	B	0.65	A	0.77

Buses

- The six bus services currently operated by Hillsbus and Busways would not be impacted by additional NWRL construction traffic and peak period increases in bus travel times are not anticipated.
- There is potential that special event buses (e.g. Sydney Olympic Park/Royal Easter Show) would need to be relocated during construction, with alternative parking arrangements to be determined.
- Existing bus stops on Carrington Road, 50m west of Middleton Ave, may still need to be relocated east of Middleton Ave to maintain access for through and construction traffic on Carrington Road. The exact location would need to be determined as part of the development of the Construction Traffic Management Plan for the site. The location of the station box excavation means that Doran Drive would not be able to be used for construction traffic access (except in the very early phases of site establishment) such that the bus stops may be able to remain in place for at least some time during the NWRL works. In this regard impact on bus stop displacement has been minimised.

Pedestrians and Cyclists

- During construction the Carrington Road footpaths would remain open along both sides of the road.
- Informal footpath access would also continue to be available along the Showground Road frontage to the construction site.
- The existing pedestrian route from Carrington Road through the Castle Hill Showground to Showground Road would be closed during construction. However, scope exists to provide both pedestrian and cyclist access to and from the Showground precinct via the western side (adjacent to Cattai Creek) of the construction site and/or the eastern side of the site. The location and form of the access facilities would be defined as part of the Construction Traffic Management Plan for the site.
- The existing cycle path which runs alongside Cattai Creek and under Showground Road into Fred Caterson Reserve would remain unaffected during construction.

- The northern footpath of Carrington Road at the site access point, opposite Ashford Avenue, would be managed appropriately through the provision of a marked pedestrian path across the site entrance and traffic control as necessary during the construction period to allow the safe movement of pedestrians.

Taxis and Parking

- Parking would no longer be required for users of the Hills Centre for Performing Arts, which would be acquired by the project and closed.
- Special events related car parking and bus arrangements in the vicinity of the Showground construction site are being investigated and will be detailed further in the CTMP for the site. On-street parking is unlikely to be affected, except where 'No Stopping' zones are extended at the new site access point on Carrington Road.

6.2.3 Summary of Changes to Impact

Construction modelling results indicate that the modified signalised access on Showground Road and priority intersection on Carrington Road, would not adversely impact on the wider road network. The performance of most intersections would improve compared to the existing environment as a result of the modifications at Showground Station. The operation of the Carrington Road/Showground Road intersection and the new Showground Road construction access intersection would operate acceptably with the addition of the forecast peak construction traffic. The Carrington Road/ Showground Road intersection would perform better than both the existing environment and the approved conditions with extra capacity being created and reduced delay times.

Construction traffic would be concentrated along Showground Road, however the new construction site access intersection would be located closer to the Carrington Road intersection. Placing the construction site access at this location provides an improved scenario for the performance of the new signalised intersection compared to that already approved.

Overall, the impacts of the modification during construction on key intersections, buses, pedestrian and cycling access and parking are generally consistent with those previously approved.

6.3 Noise and Vibration

6.3.1 Approved Construction Impacts

Key construction impacts on noise and vibration identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

Sensitive Receivers

- The nearest sensitive receivers were the Hills Centre for Performing Arts, adjoining the eastern boundary of the site, the residence adjoining the south west corner of the site and the Castle Hill Showground complex.
- Other residential receivers were located to the south of the construction site on Carrington Road (30m) and on Showground Road to the north east of the site (185m).
- A child care centre is located on Carrington Road and commercial receivers are located along the western boundary and to the north west of the site.

Airborne construction noise

- Site establishment and station excavation activities were predicted to exceed the Noise Management Levels (NMLs) at the Hills Centre for Performing Arts and the residences to the south of the site by more than 10 dB during daytime operations.
- An acoustic shed for TBM and spoil removal operations was included in the model to reduce exceedances of the night-time NMLs. With the acoustic shed in place, night-time exceedances of up to 10 dB were predicted for residential receivers along Carrington Road and exceedances greater than 20 dB were predicted at the Hills Centre for Performing Arts.

On site night-time truck noise

- The typical maximum noise levels (L_{Amax}) associated with individual truck movements were predicted to be 60 dBA at the nearest residential receivers on Showground Road to the north of the site and 58 dBA for residences to the south on Carrington Road. These noise levels were predicted to exceed sleep disturbance screening criteria at residences on Showground Road and Carrington Road by up to 15 dB and 9 dB respectively. Further analysis was undertaken and found that maximum noise levels complied with the sleep disturbance NML of 65 dBA (external), were unlikely to cause awakening reactions and were lower than existing L_{Amax} noise levels. As a result, risk of sleep disturbance was concluded to be low.

Construction traffic noise

- The modelling predicted exceedances of the external sleep disturbance NML (65 dBA) by up to 11 dB and 14 dB for residences on Showground and Carrington Roads, respectively. L_{Amax} levels would be similar to those of other heavy vehicles already using these roads.

Ground-borne construction noise

- Ground-borne construction noise would not be appreciable at the nearest residences during the station box excavation as the major sources would be on the surface and undertaken during daytime periods when ambient noise levels are highest.
- The Hills Centre for Performing Arts, located approximately 50 m from the proposed station excavation works, would experience ground-borne noise levels of up to $L_{Aeq(15minute)}$ 43 dBA during rock breaker works, assuming that a large rock breaker would be utilised. Noise levels of this magnitude would be audible within the centre during quiet periods of performances.
- Due to the progression rates of each TBM, worst case ground-borne noise resulting from tunnelling was anticipated to only be apparent for several days while the tunnelling works are directly beneath a particular receiver. Night-time NLMs would likely be exceeded for up to four days as each TBM passes residential receivers within an approximately 40m slant distance from the railway tunnels.

Ground-borne vibration

- During rock breaker activities at Showground Station, ground-borne vibration levels were anticipated to remain well below the safe vibration levels associated with minor cosmetic building damage, because the nearest buildings are approximately 50m from the excavation works.

6.3.2 Construction Impacts as a Result of the Modification

Key construction noise and vibration impacts identified in this assessment and relevant to the modification, include:

Sensitive Receivers

- Previously, the Hills Centre for Performing Arts and the residence to the south west corner were the nearest sensitive receivers, however these properties would be acquired by TfNSW as part of the modified project.
- The nearest residential receivers would be located to the south of the construction site on Carrington Road and to the north east of the site on Showground Road (refer to Figure 6-1). With the extension of the construction site boundary further east to Showground Road, the distance between the construction works and these residences would be reduced to 40m.

Airborne construction noise

- The altered orientation of the station box to be parallel to Carrington Road would result in a minor change in the construction impacts on the adjacent commercial, childcare and residential receivers to the south and west:
    - Commercial receivers to the north west of the station site (Area B) would experience reduced noise impacts due to the relocation of the site access locations. Noise levels would comply with NMLs at the commercial receivers.
    - There would be minor exceedances of up to 8 dB at the nearest residences and exceedances of up to 17 dB at the childcare centre and in the immediate vicinity.
    - For the night-time TBM spoil management activities, an acoustic shed was included in the modelling to reduce exceedances of the NMLs south of the site. Similar to the approved project, despite the attenuation provided by the shed, exceedances of up to 10 dB are predicted at the residences on Carrington Road. As a result of the modification, exceedences of up to 10 dB are also predicted at the residences along Showground Road to the north east of the site. The exceedances are due to truck movements within the site (moving between the acoustic shed and the access to Showground Road).
- During station box construction, compliance with the NMLs at both residential and commercial receivers is predicted during the daytime. An exceedance of up to 6 dB is predicted at the childcare centre. Should construction extend into the evening, then exceedances of up to 12 dB would be likely at the nearest receivers. It is noted that exceedances at some receivers (including the childcare centre and some residences) are the result of assumed gaps in the noise wall to permit access to the site. There is potential to mitigate these exceedances by designing the site layout and access to minimise gaps in the noise walls, for example by overlapping noise wall sections at site access points, or by orienting the access points away from (for example) the childcare centre.

Figure 6-1 Sensitive Receivers to the Showground Construction Site

On site night-time truck noise

- Receivers to the north east of the station site (Area D) and south of the station site (Area E) are predicted to experience a minor increase in L_{Amax} truck noise under the modified project, due to the changed construction site layout resulting in modified locations of the on-site haul roads. The haul roads now have site access points on Showground Road and Carrington Road which result in minor exceedances of the sleep disturbance NML of up to 1 dB. Previously no exceedances of the NMLs were expected at these locations.
- At residences on Showground Road and Carrington Road, the maximum noise levels are predicted to exceed the sleep disturbance screening criterion by up to 17 dB at both locations. Further analysis was undertaken:
    - The L_{Amax} noise level of 62 dBA at Showground Road complies with the sleep disturbance NML of 65 dBA (external) and the maximum noise level of 66 dBA at Carrington Road shows a minimal exceedance of the sleep disturbance NML.
    - The maximum noise levels of 62 dBA (Showground Road) and 66 dBA (Carrington Avenue) are lower than the existing LAmax noise levels (75 to 83 dBA and 65 to 71 dBA, respectively).
    - On the basis of the above, the risk of sleep disturbance from truck movements on site remains low for the modified project.

Construction traffic noise

- Predicted noise level increases (L_{Aeq}) for Showground Road and Carrington Road associated with the modified construction traffic, would comply with the NSW Road Noise Policy 2 dB allowance above existing road traffic noise.
- The modelling predicted exceedances of the external sleep disturbance NML (65 dBA) of up to 10 dB and 14 dB for residences on Showground and Carrington Roads, respectively. However, L_{Amax} levels would be similar to those of other heavy vehicles already using these roads.

Ground-borne construction noise

- There would be no impact on the Hills Centre for Performing Arts which would be acquired as part of the modified project.
- There would be no change in ground-borne construction noise compared with the approved construction site layout. That is, ground-borne construction noise would not be appreciable at the nearest residences during the station box excavation as the major sources would be on the surface and works would be undertaken during daytime periods when ambient noise levels are highest.
- The potential ground-borne noise impacts associated with the excavation of the tunnels would be marginally higher for a short duration during the passby of TBMs.

Ground-borne vibration

- There is no change in vibration levels compared with the EIS1 layout. That is, vibration levels during rock breaker activities may be perceptible at the nearest residential and commercial receivers.

- On the basis that the nearest buildings are approximately 30m from the excavation works, vibration levels are anticipated to remain well below the safe vibration levels associated with minor cosmetic building damage.

6.3.3 Summary of Changes to Impact

- The Hills Centre for Performing Arts and a residence were previously the nearest sensitive receivers, however these properties would be acquired by TfNSW under the modified project.
- For the modified Showground Station construction site, predicted noise levels for site establishment and earthworks, excavation and construction at the site indicate similar moderate to high exceedances of the NMLs for the daytime period at the nearest sensitive receivers as the approved project.
- Where works are required out of normal construction hours for spoil handling and TBM operations, an acoustic shed has been included in the modelling to reduce impacts. Predicted noise levels for spoil handling and TBM operations at the site indicate minor exceedances of the NMLs for the night-time period at the nearest sensitive receivers, similar to the approved project.
- Maximum noise levels from on-site truck movements comply with sleep disturbance NMLs, are lower than existing LAmax noise levels and are unlikely to cause awakening reactions, therefore the risk of sleep disturbance would be low.
- Receivers to the north east of the station site on Showground Road (Area D) would experience an increase in construction noise compared to the approved project, as the construction site boundary would be extended to Showground Road.
- There would be a marginal change in ground-borne construction noise or vibration compared with the approved construction site layout.
- In comparison to the layout and activities assessed for the approved project (EIS1), the revised Showground Station site results in some increases and some decreases to noise and vibration impacts to the nearest receivers, compared to the approved project. Overall, the change in noise and vibration impacts as a result of the modified project would be minor.

6.4 Land Use and Community Facilities

The modification of the Showground Station construction footprint, which now covers an altered area of land, may have implications for land use and community facility impacts.

6.4.1 Approved Construction Impacts

Key land use and community facility impacts identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

- Temporary possession of areas associated with the Castle Hill Showground complex, car parking area at Hills Centre for Performing Arts and acquisition of the Hills Shire Council Depot. Castle Hill Showground would have a number of small pavilions and other infrastructure removed during construction works.
- Acquisition of 11 commercial properties, including Showground facilities/buildings.

6.4.2 Construction Impacts as a Result of the Modification

Key construction land use and community facility impacts identified in this assessment and relevant to the modification, include:

- Impacts to Castle Hill Showground complex would be greatly reduced through the now limited encroachment of the construction footprint into the complex. The proposed new site access from Showground Road would extend the construction footprint further east to Showground Road and the access road adjacent to Cattai Creek, included in the approved construction footprint, would no longer be required. This would significantly reduce construction activities within the Castle Hill Showground complex, with a corresponding reduction in impacts on previously affected pavilions and infrastructure. Access to the Showground complex would be maintained throughout construction.
- The construction site expansion to the east to Showground Road has led to additional land take for construction and would impact on the Hills Centre for Performing Arts and the Council Chambers. Demolition of the Hills Centre for Performing Arts would be required to accommodate the altered construction site layout. The Hills Shire Council Chambers would be acquired for the project, and may be used during construction.
- Demolition of the Hills Centre for Performing Arts would result in the loss of a community facility.
- An additional residential property in the south west corner of the construction site would be acquired and demolished by the project.
- Depth of the tunnels has decreased from the tunnel crown to the land surface under the industrial precinct to the west of Cattai Creek. Notwithstanding the reduced depth, development would not be constrained and any proposals would be considered to ensure the protection of both the running tunnels and the new development.
- The existing pedestrian route from Carrington Road through the Castle Hill Showground to Showground Road would be closed during construction. However, pedestrian and cyclist access to and from the Showground precinct would be maintained throughout construction, to be defined as part of the Construction Traffic Management Plan for the site.

6.4.3 Summary of Changes to Impact

Overall the alteration of the construction would present very few additional adverse land use impacts. Rather, the change would be beneficial due to the significant reduction of impacts to the Castle Hill Showground complex.

6.5 Ecology

The proposed modification would influence the potential ecological impacts the Showground Station construction site.

6.5.1 Approved Construction Impacts

Key ecological impacts identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

- Significant ecological impacts, especially for hollow-dependant fauna species, due to the impacts of clearance on two Threatened Ecological Communities (TECs) and 33 hollow bearing trees.

- Removal of 0.78 ha of Shale Sandstone Transitional Forest, listed as a critically endangered ecological community (CEEC) under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and endangered ecological community (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act).
- Potential impacts to the creek, resulting from the bored tunnel beneath the creek, surface works around the construction site, and water discharge to the creek, including:
    - Encroachment into riparian buffer
    - Loss of riparian habitat
    - Groundwater discharge
    - Weed invasion
    - Polluted surface water runoff
    - Increased velocity of surface runoff
    - Surface erosion and sedimentation
    - Bedrock cracking

6.5.2 Construction Impacts as a Result of the Modification

Construction ecological impacts identified in this assessment and relevant to the modification, include:

- Changes to impacts relating to vegetation clearance (refer to Table 6-3):
    - No removal of Shale Sandstone Transitional Forest (CEEC) – a 0.78 ha reduction in impact compared to the approved project.
    - A minor increase (0.07 ha) in the impact Sydney Turpentine Ironbark Forest (STIF) listed as an EEC under the TSC Act (not EPBC Act) compared to the approved project.
    - Increased impact (0.21 ha) on Planted/Exotic vegetation.
    - Overall reduction in vegetation clearance of 0.5 ha.
- Decreased impact on the number of hollows within the construction footprint from 33 to one hollow, in a *Eucalyptus fibrosa* (Red Ironbark).
- Potential impacts on Cattai Creek and Groundwater Dependent Ecosystems (GDE) as a result of grouting, if appropriate controls in are not in place, including:
    - Spillage or leakage of grout into creek resulting in the increased pH of creek water, which can cause death to aquatic fauna, and the setting of concrete instream, which can alter the creek hydrology and/or fill gaps between cobble / pebble habitat.
    - Disturbance to riparian vegetation or banks from drilling equipment resulting in the loss of riparian vegetation and decreased bank stability.
    - Minimal loss of fauna dependent on GDE habitat.
    - The overall impact of grouting on GDEs would be negligible, as there would be minimal disturbance to the alluvial aquifer and to the water table.

- Sensitive drilling techniques, such as angled drilling, would be used to access the top of the sandstone, thereby avoiding direct impacts to the STIF present in the riparian zone that may obtain a portion of its water needs from the zone of saturation.

Table 6-3 Summary of Impacts on Vegetation for the 2012 SSI Project and the Proposed Modification

Vegetation Communities	Conservation Status		Condition	Direct Impacts (ha)		
	TSC Act	EPBC Act		Original Footprint	Modified Footprint	Change
Shale Sandstone Transition Forest	EEC	EEC	Poor	0.78	-	-0.78
Sydney Turpentine Ironbark Forest	EEC	N/A	Poor	0.27	0.34	+0.07
Planted/Exotic	N/A	N/A	N/A	2.08	2.29	+0.21
TOTAL				3.13	2.63	-0.5

6.5.3 Summary of Changes to Impact

Some additional construction impacts in ecology would occur as a result of the proposed modification of the 2012 SSI approval, including:

- A minor increase in impact (0.07 ha), on Sydney Turpentine Ironbark Forest EEC (TSC Act).
- Minor increase (0.21 ha) in impacts on Planted/Exotic vegetation.
- Additional potential impacts on GDEs, aquatic and riparian ecology and water quality of Cattai Creek if appropriate controls in are not in place.

The proposed modification, however, would largely reduce ecological impacts during construction:

- Overall reduction in vegetation clearance of 0.5 ha.
- No removal of Shale Sandstone Transitional Forest, representing a 0.78ha reduction in impacts to a Commonwealth and State listed CEEC.
- EEC offsetting commitments would now go beyond requirements compared to the approved project.
- Decreased impact on the number of hollows within the construction footprint from 33 to one hollow.

6.6 Surface Water and Hydrology

6.6.1 Approved Construction Impacts

Key surface water and hydrology impacts identified in the approved 2012 SSI assessment (EIS 1, Submissions Report and Preferred Infrastructure Report) and relevant to consideration of changes to impact associated with the modification include:

- Part of the site spans Cattai Creek and is therefore flood affected, including the south west corner of the site, adjacent to Carrington Road. The northern section of the site, connecting to Showground Road is also flood affected but only by flooding greater than the 100 year ARI event.
- Flooding to the site has the potential for a range of impacts on proposed construction activities including damage to project works, delays in construction programming, safety risks to construction workers and exacerbation of pollution from the transport of sediment laden runoff. In addition, proposed works within the floodplain have the potential to change existing flood behaviour and adversely impact on the surrounding environment.

- Stockpiles located within the Cattai Creek floodplain or along overland flowpaths would have the potential to obstruct and alter flood behaviour. Flooding of stockpiles could also lead to significant quantities of soil being displaced by floodwaters into the downstream waterways with associated impacts on stream ecology.
- The Showground Station site was identified as being in an area of moderate to high soil risk. Construction works associated with excavation, spoil handling and stockpiling have the potential for erosion and sedimentation, affecting the water quality of downstream water bodies.
- The water generated from tunnel excavation would provide an additional source of potential adverse impact to water quality. Excess water from tunnel excavation would comprise a combination of rainfall runoff, water used in the excavation process and groundwater seepage, and would be treated onsite before being discharged.
- Proposed construction activities could lead to the release of potentially harmful chemicals and other substances into the downstream waterbodies. Potentially contaminating substances include acids and chemicals from washing processes, construction fuels, oils, lubricants, hydraulic fluids and other chemicals. Release of these substances may occur due to spills, as a result of equipment refuelling, failure and maintenance, treatment and curing processes for concrete, as a result of inappropriate storage and handling or from disturbance and inappropriate handling of contaminated soils. Contaminating substances have the potential to be transported in runoff and result in associated water quality and ecological impacts downstream.

6.6.2 Construction Impacts as a Result of the Modification

Key construction surface water and hydrology impacts identified in this assessment and relevant to the modification include:

- The proposed modification to the construction site boundary maintains a similar extent to the original proposal spanning Cattai Creek adjacent to Carrington Road. Consequently, the potential flood risks to construction activities in this area would be similar to the original proposal.
- Flood risks in areas adjacent to the access road along Cattai Creek have been reduced by the removal of the connection of the construction site with Showground Road.
    - The proposed changes in vertical alignment and associated revisions to the depth of tunnel west of Showground Station would increase the risk of water and/or sediment seepage into the tunnel during construction. If required, grouting works (described in Section 4.1.2) would be undertaken to consolidate alluvial sediment above the tunnel alignment. This has the potential to result in leaching of grout into the creek, resulting in adverse impacts on water quality and stream ecology as discussed in Section 6.5.
    - In the event that grout leaches in to the creek, remedial measures to remove the grout from the creek would require temporary bunding of the creek (refer to Section 7) which may have adverse impacts on flood behaviour. However, bunding would be short term and low level and so adverse flood impacts would be manageable.
- Potential impacts due to erosion and sedimentation identified in EIS 1 for the approved project would be similar under the proposed modification.
- Potential impacts on water quality due to the water generated from tunnel excavation identified in EIS 1 for the approved project would be similar under the proposed modification.

- Proposed construction activities potentially leading to the release of potentially harmful chemicals and other substances into the downstream waterbodies would have similar potential impacts under the proposed modification.

6.6.3 Summary of Changes to Impact

Modifications to the 2012 SSI approval would result in substantially similar surface water and hydrology impacts during construction. Additional impacts on Cattai Creek due to proposed construction measures to manage seepage of water into the tunnel would have the potential for additional impacts on Cattai Creek if appropriate controls are not in place. The potential for flooding to the construction site would be largely similar, although the connection of the site with Showground Road to the north has been removed, along with associated flood risks in this area.

7. Additional Mitigation and Management Measures

The Construction Environmental Management Framework for the NWRL details the environmental, stakeholder and community management systems and processes for the construction of the NWRL. Mitigation measures to avoid, reduce and manage identified potential impacts of Stage 1: Major Civil Construction Works were presented in EIS 1. Additional mitigation measures for soils and groundwater, land use and community facilities and surface water and hydrology are not considered to be required, as measures already proposed for the approved SSI project would be sufficient to manage the change in impacts resulting from the proposed modification.

Mitigation measures proposed to manage the impacts of the modification on traffic and transport, noise and vibration and ecology are provided in Table 7-1.

Table 7-1 Showground Station Modification Mitigation Measures

No.	Mitigation Measure	Applicable to*
Construction		
T34	Provision of public access for vehicles, pedestrians and cyclists to and from the Showground precinct via the western side (adjacent to Cattai Creek) of the construction site and/or the eastern side of the site. The location and form of the access facilities would be defined as part of the Construction Traffic Management Plan for the site.	Showground Station
NV19	Prior to construction, investigate reasonable and feasible measures to minimise gaps in the noise walls and resulting exceedances at some receivers (including the childcare centre and some residences) during construction. Measures to be investigated include overlapping of noise wall sections at site access points, or orienting the access points away from (for example) the childcare centre.	Showground Station
E23	Conduct pre-disturbance river health assessment (e.g. macroinvertebrate surveys) to provide comparison after rehabilitation. This should include a site within the impacted area and an upstream survey site as a control point for general catchment disturbances.	Showground Station
E24	Prior to grouting works, undertake pressure testing to determine correct grouting application (viscosity and applied pressure) to avoid surface penetration.	Showground Station
E25	Should grouting works be required, environmental management measures would include: - Monitor creek water for pH changes before, during, and after grouting. - Avoid the use of grout containing chemical acrylics or polyurethane compounds. - Where feasible, drilling rigs would be set up on existing hardstand surfaces (outside Cattai Creek riparian channel), to avoid impacts on riparian vegetation and creek bank stability. - In order to manage the potential for grout leaking through the bedrock and alluvium into Cattai Creek, the following would be incorporated into the environmental management framework for the site works (where required): • Real time monitoring of water quality during grouting; • Provision of adequate sand bags to isolate grout within the channel; • Diversion of flow above the site; • Adequate provision on site of a suitable equipment to remove grout from the creek and a neutral pH solution to dilute any leakage; and • Rehabilitation of the disturbed section of creek following treatment.	Showground Station

8. Conclusion

Pursuant to section 115ZI of the Environmental Planning & Assessment Act 1979, Transport for NSW is seeking the Minister for Planning and Infrastructure's approval for the modification of the 2012 State Significant Infrastructure approval. The proposed modifications are:

- Minor change to the location of Showground Station, to the south east and parallel with Carrington Road, and associated modification of the horizontal alignment of the tunnels.
- Vertical alignment changes to accommodate the changed location of Showground Station.
- Change to Showground Station construction site boundary (Site 6).
- Change to the Showground Road and Carrington Road construction access/egress.

These modifications do not result in consequential changes to the existing approvals for the NWRL.