Bovis
Lend Lease

Darling Walk

Construction Management Plan

Including

Traffic & Pedestrian Management Plan
Noise and Vibration Management Plan
Waste Management Plan
Erosion and Sediment Control
Flora and Fauna Management

DATE	REVISION	PURPOSE	APPROVED BY
11/06/08	A	Submission of Environmental Assessment	RE
30/07/08	B	Minor Revisions	RE
4/09/08	C	Include EHS appendices	RE
19/11/08	D	Preferred Project Report revisions	RE

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Definitions

“BLL” Bovis Lend Lease
“Subcontractor” A company contracted to Bovis Lend Lease
“DA” Development application
“CM” Construction Manager

1.0 Site Establishment

1.1 Introduction

The Darling Walk site is located on Harbour Street in Darling Harbour between the Chinese Gardens and Imax. It currently comprises a large area of public domain and the purpose built 2 storey Sega World building, constructed in the 1990's as a games and amusement complex.

The proposed development will involve the demolition of the existing building and associated public domain. The new development will incorporate 4 levels of basement parking, a ground level retail floor including a childrens theatre and up to 8 storeys of A grade office space. The associated public domain area will be upgraded including a new Childrens Playground.

The scope of works covered by this Construction Management Plan includes basement excavation , basement structure , structure above ground up to roof , façade , services fitout and finishes ,and demolition of the redundant foot bridge link that connected to SEGA World .

1.2 Site Working Hours

Subject to Authority approval, works will be undertaken between the hours of 7.00am and 7.00pm Monday-Friday and between 7.00am and 5.00pm on Saturdays. No work will be undertaken on Sundays or public holidays.

1.3 Contact Details

Construction Manager – Richard Eaton Mobile No: 0408 252 679

1.4 Parking

No on-site parking will be available for tradesman or site personnel .

1.5 Security and Hoarding Management

The site will be enclosed by hoardings for the construction phase as follows :

Harbour Street : Class A painted plywood hoarding along Harbour Street extending north from the Liverpool St footbridge and up to the Bathurst St. intersection. The erection of the hoarding will be undertaken at the commencement of the demolition phase .The Bathurst St, Harbour St and,

Western Distributor off Ramp pedestrian crossings will be maintained. Access shall be maintained to the Cross City Tunnel kiosk building on this corner.

Liverpool Street Footbridge : Whilst the elevated footbridge secures the southern site boundary , a 1200 mm high painted plywood screen shall be erected during the demolition phase on the existing bridge parapet . Footbridge access will not be impeded.

Western Frontage : Class A painted plywood hoarding will be erected during the demolition phase . The hoarding will continue from the western end of the Liverpool Street footbridge and extend to the west of the existing lake. The hoarding will continue past the existing childrens playground and connect to the existing footbridge which links to Bathurst Street. Access will be maintained for pedestrians on the eastern side of Tumbalong Park (approx 5 m wide access) and along the eastern side of the childrens playground.

Bathurst Street Footbridge : The Class B hoarding be erected over this footbridge for the duration of the demolition phase will be replaced with a 3000 m high plywood screen.

Architectural, construction and structural details of the hoardings will be in accordance with the relevant SHFA policy to ensure there is no obstruction to sightlines. Graphics to be applied to future detail and subject to SHFA detail. The hoardings shall be regularly cleaned and maintained to a premium standard.

Structural certification will be prepared and signed by a suitably qualified practicing structural engineer.

Access Control

To ensure that controlled access is maintained on the project, a swipe card system will be implemented. All construction workers will be issued with a swipe card at their induction. This will allow BLL to monitor employees on at any given time.

1.6 Site Sheds and Amenities

Lunch, change and ablution facilities will be provided for the use of all site personnel. It is proposed to locate. Workforce accommodation in the north west sector of the site

Additional workforce accommodation shall be located to the west of the new basement / building footprint to as the workforce numbers increase.

Once the basement becomes available the fitout trades will be located on level B2

1.7 Safety Information

BLL have a safety and environmental management system called “EH&S” (Environment, Health and Safety”).

All employees required to work on site must first complete the BLL site induction.

In addition, the Subcontractor must induct their employees into their safe work procedures and submit to BLL a copy of the induction register.

An EH&S meeting and site inspection will be held weekly to deal with issues which may arise on site.

The EH&S Meeting will be attended by BLL employee representatives and sub-contractor employee representatives , and chaired by a representative of BLL.

BLL will also periodically conduct its own internal safety audits. The audit team will consist of:

BLL Safety Manager
Site Safety Officer
Subcontractor Representative

An EH&S information board will be erected and a copy of the BLL EH&S policy will prominently be displayed on the board

A Subcontractor's start on site will be conditional on the submission and approval of an Environmental Health and Safety plan. The plan must be submitted one week prior to their start date to allow sufficient time for BLL review

1.8 First Aid Facilities

BLL will ensure First Aid Facilities as specified by OH&S legislative requirements are provided. In accordance with Workcover requirements a first aid shed will be established on site once the workforce numbers exceed 50. This will occur during the latter stages of bulk excavation.

Subcontractors are to provide a First Aid Officer for their company works.

A nominated first aider will be on site whenever work is being carried out. This will be either a BLL or Subcontractor representative.

1.9 Approved plans to be on-site

In accordance with the conditions of consent, BLL will maintain a copy of the approved and certified plans, specifications and documents incorporating conditions of approval and certification on site at all times.

1.10 Dilapidation Survey

A dilapidation survey will be undertaken for adjacent structures and services infrastructure. Copies of the report will be submitted to the Private Certifying Authority prior to any work commencing on site.

1.11 Site Notice

In accordance with the conditions of consent, BLL will display, at the boundaries of the site, BLL's, PCA and Structural Engineer details.

1.12 Temporary Power

Construction power is to be provided from 2 separate sources, subject to available capacity. The installation of the construction power supplies shall commence as early as possible to minimise the need for generators.

1.13 Neighbours

Following briefing sessions with neighbours & stakeholders , BLL shall establish a forum to discuss issues, project progress and special activities.

Meetings will be held on a regular basis for as long as required. Details from the following plans will be presented at these meetings:

- Traffic & Pedestrian Management Plans
- Construction Management Plan
- Construction program
- Plans for any temporary lane / road closures

Further to the above plans being issued, other information and registers will be available for the stakeholders such as site contact details and feedback registers.

2.0 Construction Methodology

2.1 Services Infrastructure Protection and Access

The following services infrastructure have been identified on the site:

Rail Corp : Electrical cables, major pit and gassing station
Sydney Water : Stormwater, sewer & water mains
Energy Australia : HV Electrical cables & pits
Telstra : Network Mains, Local Mains & associated pits
Agility : Gas mains

Full detail of the existing services infrastructure is contained within the Robert Bird Group Report, “Existing Services and Site Constraints“.

Extensive site investigation of the exact location of the services has and will continue to be undertaken. The correct identification, location and knowledge of the depth of the services is the key component of protecting the services.

Within or adjacent to construction activities steel road plates will be used to cover at risk services pits prior to works over . The service authorities / Rail Corp will be provided with the contact details of the BLL Site Manager & CM and an emergency access procedure shall be implemented to enable Service Providers / Rail Corp safe access during normal working hours. The service providers / Rail Corp will be invited to provide their own padlock to the main gate on Harbour Street so that it can be daisy changed with other padlocks so that after hours access is available.

As stated above dust shall be suppressed using pond water . Dust suppression shall also be achieved by requiring tarpaulins over truck trailers and bogies to ensure containment of material during transit .

Vehicles exiting the site shall pass over a cattle grid shaker / cleaning facility to minimise dust and debris out on Harbour Street .Street sweeping of Harbour St will be undertaken as required to control any dust and/ or debris .

2.2 EXCAVATION

Following the completion of demolition works and in conjunction with site remediation the bulk excavation stage will commence . Refer Bulk Excavation site plan .

The basement perimeter piling and part excavation will be undertaken during the site remediation phase , which is the subject of a separate Development Application .

Additional piles will be installed under this Application to support the northern half of the northern building (where there is no basement) . This will involve approximately 50 piles of between 900 mm & 1050 in diameter . Ground beams bearing on piles will be installed where necessary to bridge over in ground services .

Known ground obstructions in the line of the piling such as existing piles will be removed by over boring or excavating . The resultant void will then be backfilled with a very lean concrete mix which can be easily drilled through .

Following the removal of contaminated waste basement bulk excavation shall continue . Temporary rock anchors will be installed progressively as the excavation proceeds . Two or three rows of temporary rock anchors will be required to restrain the piles until the piles can be laterally supported from the new floor slabs .

It is anticipated that rock will be encountered at a depth of approximately 4 m below existing ground level along the eastern side of the site and at approximately 8 m below existing ground level along the western side of the basement excavation . Excavation in rock will be done by ripping where possible to alleviate the noise and vibration caused by hammering .

Within the basement footprint , columns shall be founded on pads . Detail excavation of the footing pads will be done by rock saws mounted on smaller excavators and the sawn pad broken out by hammering .

To the north of the basement , columns are founded on the load bearing piles or bridging beams .

Other important excavation activities which will be undertaken as part of the works are as follows :

- Dust Control by using hoses , water trucks
- Cattle grids at the vehicle exits
- Tarpaulins over truck trailers and bogies to ensure containment of material during transit .

- All material removed from site is to be sorted and disposed of in accordance with the Waste Minimisation and Management Act of 1995

- Street sweeping of Day St and Harbour St when required to control any dust and/ or debris

- Provision of jersey kerbs and / or chainwire fencing to secure the perimeter of the deep excavation

- Provision of jersey kerbs to the ramp and pedestrian access into the excavation

- Construction Traffic Management for trucks entering & leaving the site

- Structural and / or Civil Certification of all temporary and permanent retaining structures .

- Establishment of sedimentation and environmental controls to the site and surrounding stormwater systems .

- Dewatering shall be undertaken in accordance with the Dewatering Plan

2.3 Basement Construction

The basement consists of 4 levels of reinforced concrete construction (with post tensioning to the western half) . The lowest level ,B4, shall be slab on ground construction . The floors (approximately 10,000m2 each) shall be broken into 6 – 8 concrete pours .

- On completion of the bulk excavation and concurrent with detail excavation , the 2 tower cranes bases shall be prepared with reinforced concrete pads and rock anchored bases installed . The tower cranes shall be erected using a 200 t to 250 t mobile crane from within the site .

- Temporary services (electricity , water , stormwater and nurse call) shall be installed to level B4 along with the installation of permanent in ground services . Similarly to detail excavation the trenching for in ground services shall be undertaken using rock saws and then broken out with excavators using hammers . Scaffold stairs shall be provided into the excavation .

- The critical early activity for the basement construction is the forming , reinforcing and pouring of the lift over run pits . Caltite or an equivalent concrete additive will be used to obtain waterproof lift overrun pits . The earliest possible assembly of the core jump forms is a priority .

- The pouring of ground slabs shall closely follow the installation of in ground services and completion of footing pads . Concrete pumps shall be positioned within the site to best serve the slab being poured . The western side of the excavation shall be accessed around the northern end of the site .

- Conventional formwork systems will be utilised for the falsework to the suspended levels . Penetrations in the suspended floors shall be provided for later Alimak installation , later formwork hoist installation and around the tower crane masts . The stripped formwork material will be loaded out of the basement floors and recycled onto the upper floors using the formwork hoist .

- The suspended slabs to the eastern half of the basement shall be conventionally reinforced so that shrinkage away from the eastern perimeter piling is minimised and therefore risk of movement of Harbour Street is eliminated . Post tensioning shall be installed to the western suspended slabs to reduce demands on steel fixing resources .

2.4 Structure to the Roof

Two separate buildings , separated by a 20 m view corridor will rise above the ground plane . Both buildings will consist of 9 floors above ground along the Harbour St (east) elevation and 5 floors above ground along the west elevation . Commencing above level 1 the buildings shall have a 12 m wide atrium running north / south .

- Construction of the floor plates will be undertaken with conventional formwork systems using bondek metal formwork to the slab soffits where possible . The floor plates for each building will be broken into 4 – 5 pours . Concrete shall be pumped from within the site .

- Construction of the cores will be undertaken using self climbing jump forms . Three of the four cores on the project originate in the basement and the north core to the north building starts at ground level .

- Prefabricated metal stair formwork systems complete with integral balustrades will be installed immediately behind core construction to enable early & safe permanent access to the floors .

- Concrete structure above the ground floor will be fully post tensioned .

- Scaffold will be erected based off level 1 to provide edge protection to the atrium within the buildings . The atrium edge scaffold shall then provide access to install balustrades and linings . On completion of the concrete structure and after installation of structural steel for the atrium lifts , a birdcage scaffold will be built at high level , spanning between the edge protection scaffold on either side of the atrium , to provide access for roof construction .

- The perimeter fall protection to the buildings shall be erected in advance of the structure and will consist of a mixture of scaffold and formwork screens . Formwork screens will be erected from level 2 of the north building and level 1 of the south building on the higher Harbour Street elevation . Prior to removing the formwork screens for façade installation , perimeter safety fencing and safety system shall be installed .

- The erection of structural steel to the roofs will be undertaken using tower cranes to lift the main roof beams into position and to lift up small mobile cranes (approx 5 T) to work off the roof slabs and erect secondary steel framing .

2.5 Materials Handling

The key to delivering Darling Walk is well managed and efficient materials handling . The Main Works Site Establishment Plan shows the main materials handling plant .

A dedicated materials handling team member will manage and supervise deliveries to the project to alleviate congestion of the materials handling areas and ensure minimum disruption on Harbour Street . Once the ground floor slab between the 2 buildings has been poured and stripped , this area becomes an additional materials handling zone .

- Craneage for each building will be provided by a hammerhead tower crane . located within the atrium . The tower cranes will be erected to full height on completion of the bulk excavation and penetrations will be formed around the towers in basement slabs , ground floor and level 1 slab . Erection and the later demobilisation will be undertaken from within the site using 200 – 250 t mobile cranes . All unloading / loading of trucks will occur within the site .

- A series of loading platforms will be employed to assist with the delivery and removal of materials and rubbish . Loading platforms will be installed to the east and west half of each floor from level 2 and above . The central atrium floor of level 1 shall be the ‘loading platform’ for this level .

- A formwork hoist shall be installed within each building to speed formwork material recycling onto upper floors and reduce demand on crane lifting .

- Man and materials hoists shall be installed to the south elevation of the north building and the north elevation of the south building . It is envisaged that the hoists will serve all floors from basement B3 to level 9 roof . A permanent lift within each building shall be installed and commissioned early as a builders lift to allow the earliest possible removal of the external man and materials hoists .

- Forklifts will provide horizontal movement of materials to the basement , ground floor area and external areas .

- The efficient removal of rubbish and debris from the work areas is a critical component of providing a safe project . Rubbish will be delivered to the on grade materials handling area via cranes or hoists . A forklift with a rotator attachment shall be used to empty rubbish skip bins into larger 15 – 18 m3 bins

- Mobile concrete pumps setup within the construction site shall be used for the project . It is envisaged that 2 static lines per building , located adjacent to each core will be installed .

- All penetrations and construction loads superimposed on the structure by plant and equipment (hoist , platforms , forklifts , mobile cranes etc) shall be certified in advance by the project consulting structural engineer .

2.6 Façade

Two façade types will be utilised on the project . The western façade shall be a stick build system built externally from the perimeter scaffold . The majority of the remaining elevations will be a curtain wall façade installed from the floor slab .

- The initial façade setout and installation of fixing brackets for the curtain wall façade will be conducted inside the perimeter fencing (installed prior to removal of formwork screens) . Safe work practices will be developed with the sub-contractor to manage the risk of falling persons and objects .

- All curtain wall façade panels will be craned onto the loading platforms of the respective floors , distributed across the floor and lifted into position via a certified small crawler crane from the floor above . Some corner or projecting panels may require the use of the tower crane for installation .

2.7 Services , Fitout & Finishes

Services will be progressively installed from in ground services during bulk excavation to final commissioning at practical completion . Service trades include mechanical , electrical , hydraulic , fire , security , lifts & escalators , communications , audio visual .

Fitout and finishes will be installed commensurate with the standard required for an A grade commercial building .

3.0 NOISE AND VIBRATION MANAGEMENT

A construction Noise and Vibration Plan has been developed in consultation with Acoustic Logic Consultancy Pty Ltd and is attached in Appendix 2. The Internal Noise criteria are based on Australian Standard 2107-2000 .

The plan will be used to manage impacts from excavation and construction activities on the adjoining properties and structures. As noted in the Plan , the noise generated during excavation is similar to that experienced during demolition and noise levels will typically then decrease with the subsequent stages of construction .

3.1 Identification of Potentially Affected Sensitive Receivers

- The management plan identifies the following sensitive noise receivers
- Residential
  - Receiver 1- Mellienium Towers
  - Receiver 2- Emporio Apartments
- Commercial & Retail
  - Receiver 3- 168-174 Day St
  - Receiver 4- 176-182 Day St
  - Receiver 5- IMAX

3.2 Specific Criteria for Imax Cinemas

The Noise & Vibration Plan states that noise intrusion into Imax cinemas shall comply with NC-25 and that the noise impact assessment indicates that noise from construction activity complies with the nominated criterion of 30 dBa for cinemas .

Given that the Imax outdoor dining areas do not face the new development and that the noise criteria for such usage are higher than 30 dBa , noise from construction activity complies with required criteria .

3.3 Construction Noise Criteria

- All work will comply with " The City of Sydney Code of Practice for Construction Hours / Noise 1992 " and Australian Standard 2436-1981 " Guide to Noise Control on Construction, Maintenance and Demolition Sites " .
- Construction activities and the operation of any mechanical equipment shall not exceed the following noise criteria:

  a) Noise criteria :

  - Between 7 am to 8 am $L_{av\ max} \leq$ background + 5dB(A)
  - Between 8 am to 7 pm $L_{av\ max} \leq$ background + 10dB(A)

3.4 Construction Vibration Criteria

- Construction activities and the operation of any mechanical equipment shall not exceed the following vibration criteria:

  a) Vibration Criteria:

LOCATION	**Vibration Limitation PPV**
Nearby Residential building Facade	10 mm/s
Cross City Tunnel	20 mm/s
Services Authorities Infrastructure :	20 mm/s - Steel Structure
(drains , sewers , etc)	5 mm/s - Brick/ masonry
	2mm/s – Other Fragile Structure

3.5 Noise & Vibration Monitoring- Reporting & Response

- A noise monitoring program is provided in section 6.8 in the Noise & Vibration management plan- the key items include
  - The use of two noise & two vibration loggers in location of potentially worst affected adjoining buildings as nominated by the acoustic consultant.
  - Noise and vibration monitoring shall be provided and recordings shall be obtained on a fortnightly basis.
  - In the event of exceedence of the criteria, then downloading of loggers to be conducted more frequently

4.0 TRAFFIC & PEDESTRIAN MANAGEMENT PLAN

- A Traffic and Pedestrian Management Plan has been developed in conjunction with Masson, Wilson & Twiney Pty Ltd and is attached in Appendix 3.

4.1 Loading and Unloading

- All demolition materials / spoil shall be loaded within the site.
- All deliveries will be coordinated with BLL prior to arrival on site
- All loads are to be covered, securely fastened and reliably stacked on vehicles
- All hazardous materials to be transported and stored as per codes and regulations
- Only trade construction vehicles will be allowed on site

4.2 Ingress and egress of vehicles to the site

- Demolition construction traffic shall utilise the existing Harbour St entries and the existing Day St / Harbour St intersection to exit the site.
- All construction traffic is to be coordinated with BLL prior to arrival on site.

4.3 Traffic management methods

- All vehicles are to be directed by the demolition sub-contractor to the nominated work areas
- All vehicles prior to leaving site will be checked for cleanliness and washed down if required
- Construction vehicles are not permitted on site without approval from BLL
- All demolition material shall be covered prior to leaving site
- Transportation of hazardous materials will be carried out in accordance with Authority Requirements, Demolisher's Safety Plan and BLL Safety Requirements
- The maintenance and cleaning of vehicles and construction plant will not be carried out in areas from where oil or washing may be discharged into a watercourse, street gutter or stormwater drainage system. Waste arising from such activities will be collected and disposed of off-site in a manner approved by the EPA
- A truck wheel cleaning facility will be maintained for the effective cleaning of wheels prior to trucks leaving site
- Fuelling of vehicles, earthmoving plants and mobile equipment will not be carried out without an operator or driver being in attendance at all times
- To restrict traffic and noise impacts, trucks transporting materials from the site will be confined to the main road system and avoid local roads as far as is practicable

4.5 Pedestrian Management methods

- Wayfinding signage will be provided on the Eastern side of Harbour St to direct pedestrians onto the Liverpool or Bathurst Street footbridges.
- All pedestrians have the right of way, especially within the site.
- Pedestrian thoroughfares around exterior of site to be maintained and clearly marked.
- All visitors will report to the BLL site office to sign visitor register (Appendix 1).
- All visitors must sign out on leaving the site.
- All visitors must be suitably attired to enter the site e.g.; proper footwear, hardhat, high visibility vest, glasses, etc.
- An inducted person must accompany all visitors to the site.
- No private car parking will be available within the site. Visitors will be advised to park in the surrounding public car parks.
- The construction area will be suitably segregated from the public and adjoining pedestrian areas.

- Access to, from and around the workface is to be via defined access routes detailed in the induction process

5.0 WASTE MANAGEMENT

5.1 Compliance with Planning Requirements

- All hazardous materials removed from the site will be disposed of at an approved waste disposal facility in accordance with the requirements of the relevant legislation, codes, standards and guidelines.
- As detailed below in the BLL Waste Management Plan, any existing concrete of suitable volume will be taken to a concrete recycling works.

5.2 BLL Waste Management Plan

- See Appendix 4 for the BLL Waste Management Plan

6.0 STORMWATER , EROSION AND SEDIMENT CONTROL

6.1 Compliance with Planning Requirements

The stormwater , soil erosion and sediment control measures have been designed in accordance with the document *Managing Urban Stormwater – Soils & Construction* Volume 1 (2004) by Landcom. Refer Appendix 5 for the BLL Erosion and Sediment Control Plan .

These measures will include:-

- Construction of truck entry/exit points including truck cleaning facilities. The truck entry/exit points will be managed by a gate controller.
- The site will be fenced with a 2400mm high plywood A Class hoarding with chainwire/shadecloth gates constructed in accordance with authority requirements to control dust and prevent the public from entering the site.
- All existing on-site stormwater drainage pits will be cleaned of rubbish and silt. All drainage grates shall then be covered with suitable geotextile fabric securely fixed in position.
- On going dust suppression will be by use of a water spray.

7.0 FLORA AND FAUNA MANAGEMENT

In accordance with planning requirements, BLL will comply with the following requirements:

Protection of Trees – Street Trees

“All street trees that are not approved for removal shall be protected at all times during construction.

Protection of Tress – On-site Trees

“All trees on the site that are not approved for removal are to be suitably protected by way of tree guards, barriers or other measures as necessary are to be provided to protect roof system, trunk and branches, during construction”.

Appendix 1

Visitor Register

Visitor Register					
Date	Name	Company	Security Pass No.	Signature In	Out

Appendix 2

Acoustic Logic Noise and Vibration Management Plan

ACOUSTIC LOGIC CONSULTANCY
noise and vibration consultants
abn 11 068 954 343

9 April, 2008

Report: 2008246/3103A/R5/GW

Prepared for: Bovis Lend Lease

DARLING WALK

EXCAVATION/ CONSTRUCTION AND VIBRATION

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1. SUMMARY

This report presents an approach to noise and vibration management of the Darling Walk, 1 - 25 Harbour St Darling Harbour. This report was commissioned by Bovis Lend Lease and presents an advanced study of noise emanating from the site. The study has been undertaken to determine the levels of noise emissions, which will result at the various premises which either border or are in close proximity to the site.

Demolition of the existing 2 storey SEGA World building is the first major activity on site. SEGA World was purpose built in the mid 1990s to accommodate a first floor amusement and entertainment complex with retail/ food tenancies on the ground floor. The surrounding has a post tensioned reinforced level 1 concrete slab supporting a structural steel roof and wall frame, lightweight panelised façade and metal deck roof.

The report identifies that noise levels will vary from the different construction processes, and that demolition/excavation and piling will be the noisiest activity, and external and internal finishing will generate the least noise. Noise levels from all activities are calculated to all potentially worst affected receiver locations. If noise levels are acceptable at these locations they will also be acceptable further a field. The receiver locations studied in this report are those residential/ commercial facilities across Harbour St. It is noticed that Harbour St, Cross City Tunnel and Day St are combined at this section. The sensitive receivers around the site have been identified and the most affected receivers are listed below.

Residential Receivers:

1. Millenium Towers located at the corner of Day and Bathurst St.
2. Emporio Apartments located at Cnr Day & Liverpool St.

Commercial Receivers:

3. Union Offices located at 176-182 Day St.
4. Global College located at 188 Day St.
5. Police Building located at the corner of Day and James St.
6. Imax Building.
7. Cross City Tunnel.

Detailed site map and noise receiver locations refer to Figure 1 below. If noise emissions comply at above locations it shall comply with all other noise receivers.

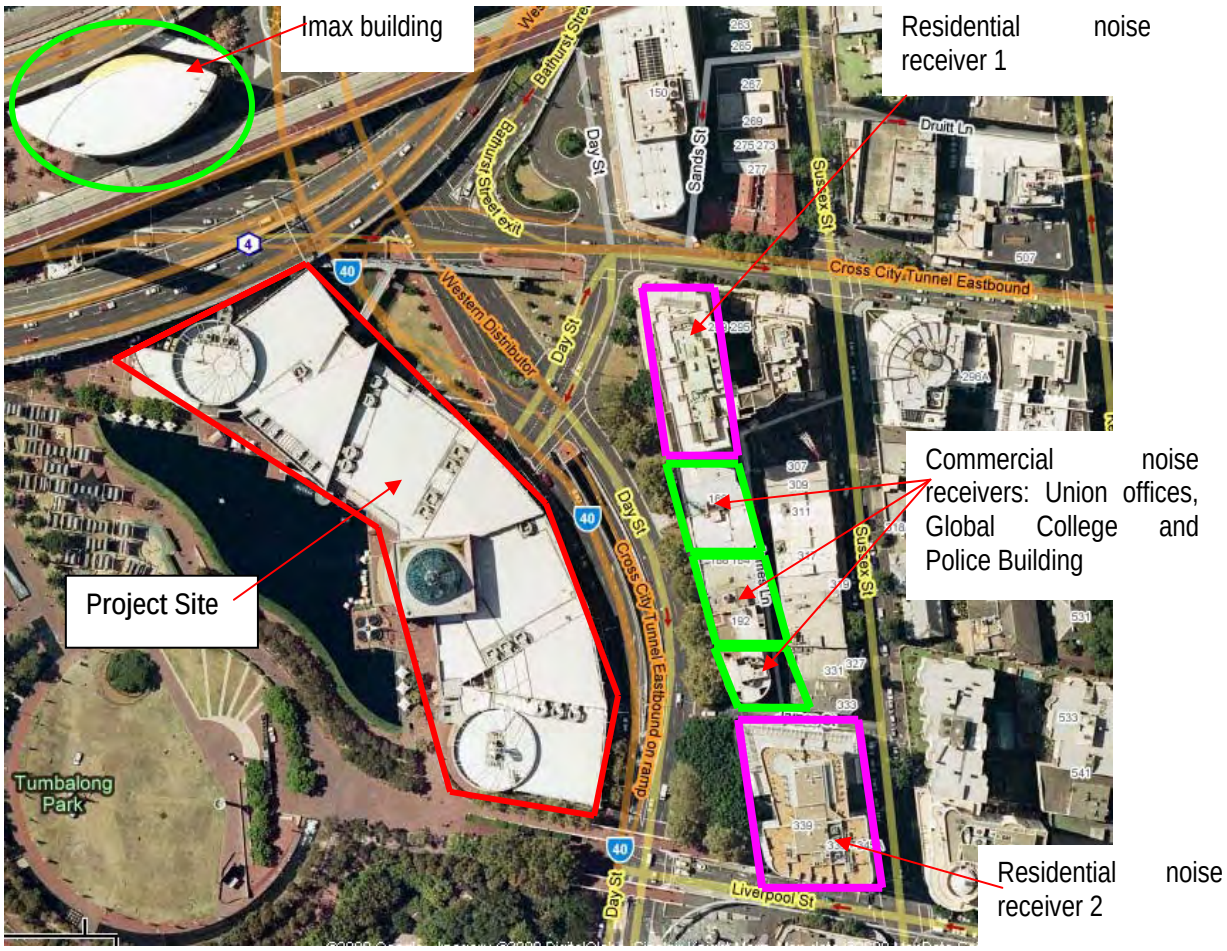


Figure 1 Site Map and Noise Receiver Locations

The results of the assessment are presented in a tabulated form for each receiver location. The tables identify provide the following information;

1. The time period,
2. The subject construction activity,
3. The resultant noise level at the affected premises, the calculated noise levels also take into account any mitigate measures which will be applied to the construction activities, and represent the attenuated level.
4. The measured background noise levels,
5. The relative magnitude of the activity to the background noise level.
6. The resultant internal noise levels at the receiver location from the subject construction activity,
7. Internal noise criteria based on Australian Standard 2107-2000 “Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors”
8. The relative magnitude of the activity to the nominated internal noise criterion.
9. The construction noise criterion,
10. The nomination whether noise from the construction activity complies with the nominated criterion.

A critical component of this report is the formulation of noise control strategies for all the different construction processes. These strategies include the formulation of site management procedures, whether they can be operational or time based. The formulation of noise mitigative treatments including the erection of noise barriers, wrapping of hydraulic hammers and the selection of alternate equipment have been reviewed. The practical

achievable noise reduction from the attenuation measures is determined and included in the calculations of noise impact. The level of attenuation which may be potentially provided is either calculated or based on measurements taken on other construction projects. A detailed noise management plan forms part of this report.

The objective of this study in all cases is to minimise noise emissions from the construction process.

In the report construction noise criteria are formulated based on the following factors;

1. The sensitivity of the various receiver locations,

2. A consideration of the procedures and requirements set out Australian Standard 2436-1981' Guide to Noise Control on Construction, Maintenance and Demolition Sites".

3. The requirements to control noise emissions from the construction site to levels, which does not cause undue disturbance to the identified receiver locations.

4. The noise mitigation measures available.

5. Council's "Code of Practice for Construction Hours/Noise within the Central Business District"

The calculated noise levels presented in this report will be verified by on-site measurements, and a noise monitoring programme. In addition, the implementation of noise control measures as detailed in this report will also be monitored, and an appropriate reporting format will be devised so that this information can be presented to Council on a regular basis.

In conclusion, provided all measures outlined in this report are fully implemented, demolition/excavation and construction noise from the Darling Walk Site will be strictly controlled, and the impact on the surrounding environs minimised.

2. INTRODUCTION

This report presents an approach to noise management of the Darling Walk Site. This report was commissioned by Bovis Lend Lease and presents an advanced study of noise emanating from the site.

The principal objective of this study was to undertake advanced evaluation of all work to be performed during the demolition/excavation and construction phase of the project and forecast potential levels of noise.

The report firstly identifies that noise emissions from different construction activities and processes vary. The resultant noise levels from the construction sites will be dependent on which activity and process is taking place at any given period.

With the identification of which construction process, the noise levels are calculated at all potentially affected receiver locations. The results of this evaluation indicated that the site can comply with the formulated construction noise assessment criteria. This requires that the site comply with the conditions set out in this report.

3. NOISE CONTROL STRATEGY

This report presents the strategy which will be followed to regulate noise emissions from the Darling Walk Site.

3.1 CONSTRUCTION NOISE CRITERION

The noise emission from the site shall comply with Sydney City Council “Code of Practice for Construction Hours/Noise within the Central Business District” Details are as below.

TABLE 1

CATEGORIES OF WORKING HOURS, AND NOISE CRITERIA

DAY	TIME ZONE	CATEGORY	NOISE CRITERIA (which must not be exceeded)
Monday to Friday	00.00 - 07.00 07.00 - 08.00 08.00 - 19.00 19.00 - 23.00 23.00 - 24.00	4 1 1 2 4	Background + 0 dBA Background + 5 dBA Background + 5 dBA + 5 dBA to be determined on a site basis Background + 3 dBA Background + 0 dBA
Saturday	00.00 - 07.00 07.00 - 08.00 08.00 - 17.00 17.00 - 23.00 23.00 - 24.00	4 1 1 2 4	Background + 0 dBA Background + 5 dBA Background + 5 dBA + 5 dBA to be determined on a site basis Background + 3 dBA Background + 0 dBA
Sundays and Public Holidays	00.00 - 07.00 07.00 - 17.00 17.00 - 24.00	4 3 4	Background + 0 dBA Background + 3 dBA Background + 0 dBA

NOTE: 00.00 or 24.00 means 12.00 midnight.

1. All noise levels to be $L_{A\,av\,max}$ (15 minute) measured at the nearest Nominated Occupancy.

2. The permissible noise level is to be complied with during each fifteen (15) minute period during the relevant Category of Hours.

3. The guidelines for control of construction noise as outlined in AS2436 shall be applied, where appropriate.

4. Background is "Background Noise Level" as defined in para 18.j (page 5).

For the control and regulation of noise from demolition, demolition/excavation and construction sites AS2436 nominates the following:

1. That reasonable suitable noise criteria be established.

2. That all practicable measures be taken on the building site to regulate noise emissions, including the sitting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes.

3. The undertaking of noise monitoring to assist in the management and control of noise emission from the building site.

3.2 NOISE MANAGEMENT

The finding of this report, which studied the noise impact of the site, indicated that ***'the site can work during normal construction hours and fully comply with the above proposed criteria'.***

4. STUDY OVERVIEW

The following report presents a number of proposed strategies to be used by the Bovis Lend Lease to reduce *Environmental Noise Impact* and the possibility of complaint.

The aim of this study is to undertake an analysis of noise impact arising from site activities undertaken in normal construction hours, i.e. 7:00am to 7:00pm Monday to Friday, and 7:00am to 5:00pm Saturday. No work is permitted on Sundays.

During the above hours it is anticipated that works will fully comply with suitable noise control criteria. These activities will be carefully managed and appropriate noise mitigate measures will be strictly implemented where required. The formulation of noise management plans for the various activities will arise from the assessment carried out in this report and the strict enforcement of all determined control measures.

5. CONSTRUCTION NOISE

The level of noise generated by a construction site is largely dependent on the activities, which are in progress. It can not be categorically stated that all construction sites emit the same level of noise no matter what stage or part of the construction programme they are at.

The generalisation, that all construction work is noisy is fallacious. The levels of noise generated are dependent on the activities occurring. In addition, it is possible to undertake construction work in a controlled manner so that noise is minimised. This requires the formulation of noise control strategies, and stringent supervision.

A study of a typical construction site is presented below to show the varying levels of noise generation from various activities.

5.1 CATEGORISATION OF CONSTRUCTION ACTIVITIES

The construction activities, which occur during the typical process in constructing a building from start to finish, can be separated into five categories, namely;

1. Demolition

2. Demolition/excavation

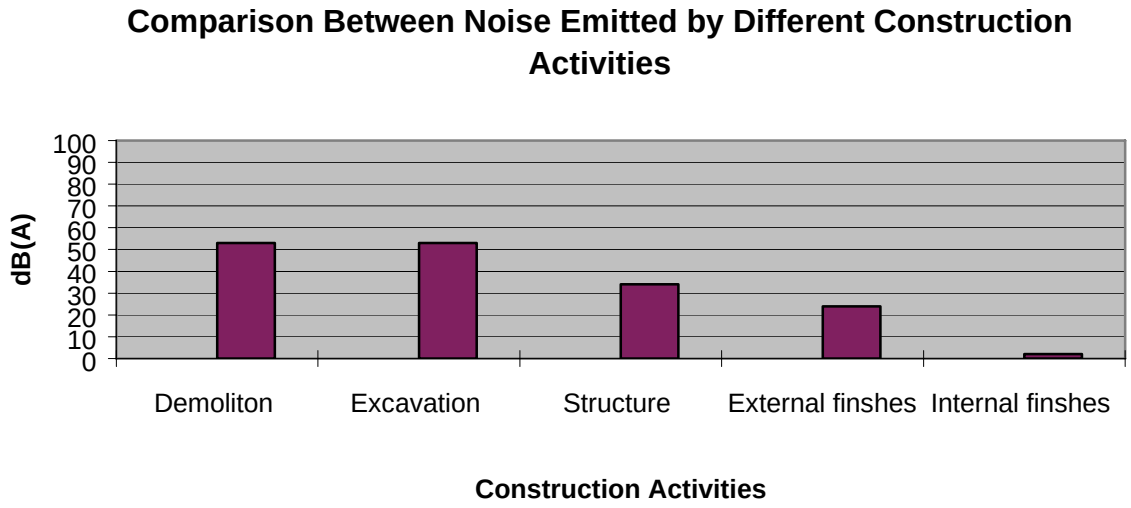
3. Erection of structure

4. Installation of facade/external finishes

5. Internal fit out/internal finishes

The noise levels generated by each of these activities will vary and be largely dependent on the process undertaken. The graph below illustrates typical sound pressure levels resultant at a residential location (approximately 55 metres) from an active construction site. The levels in the table below are derived from measured field attenuation from the GPO Re-Development, No. 1 Martin Place site to a residential receiver. As such these levels represent a real case scenario and are not theoretical. The objective of presenting these sound levels is to present a relative comparison between the five categories of construction activities described above. The comparative levels presented below indicate the maximum noise, which can be generated by the specific activities.

The histogram below shows that the nosiest construction activities are the demolition and demolition/excavation, which generate equivalent noise levels due to the similar activities



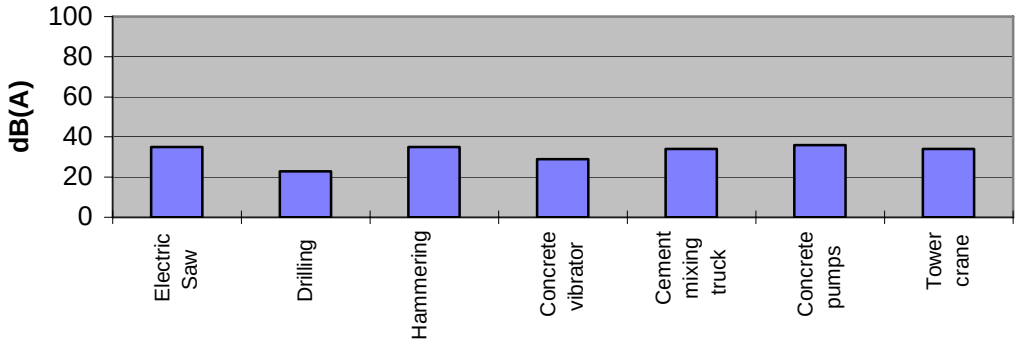
Erection of structure is next, and then external finishes. Internal finishes is the quietest of activities as it occurs internally. The histogram above represents the maximum noise levels emitted by the entire construction activity, but does not take into account, that within each process there are loud and quiet component processes. To further clarify this point each of the five construction activities outlined above will be further broken down into discrete processes. This will permit the determination of which components of a particular process generate the highest noise levels.

5.2 ERECTION OF STRUCTURE

This activity refers to the erection of the structure of the building, which includes lift cores, and general building structure. Lift cores are generally constructed in advance of the remainder of the building structure using either jump or slip forms.

The general processes involved in this activity include the delivery of materials, erection of formwork, installation of structural steel, pouring of concrete, and stripping of formwork. All materials for form working and structural steel are transported to the work face using the site tower cranes and man/material hoist. Concrete is pumped up the building using concrete pumps.

COMPARISON OF NOISE LEVELS EMITTED BY DIFFERENT PROCESSES DURING ERECTION OF STRUCTURE



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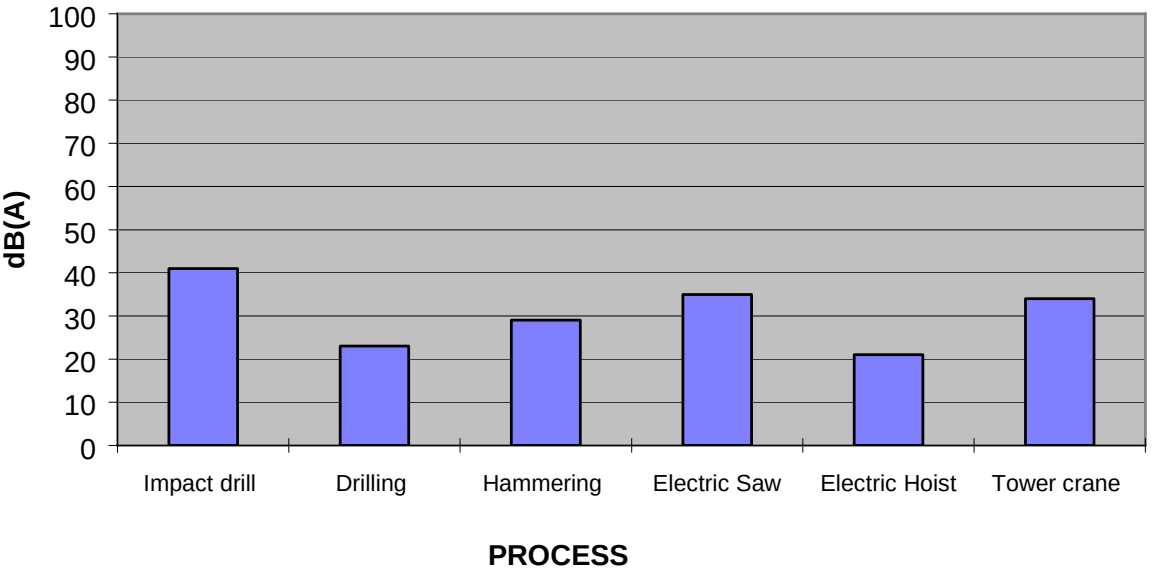
5.3 EXTERNAL FINISHES

This can involve processes ranging from the erection of facade systems, curtain walls pre-cast etc, to the installation of windows and the fixing of stone. Typical noise levels, which may be generated by this activity, are illustrated in the chart, which follows.

COMPARISON OF NOISE LEVELS EMITTED BY DIFFERENT PROCESSES DURING EXTERNAL FINISHES



5.4 INTERNAL FINISHES

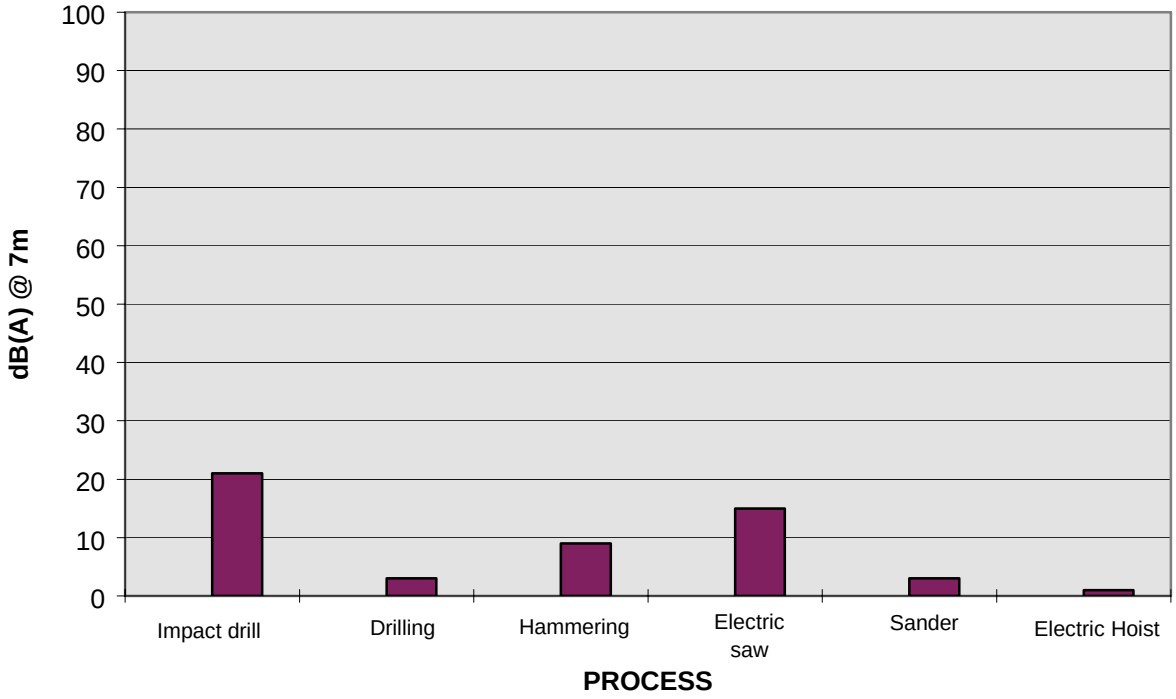
This involves all internal fit out work including painting, partitioning joinery and the laying of carpet and other finishes, as well as the installation of services.

This work is generally carried out once the facades have been erected. All work covered under this section will be contained within the building, with the facade providing a barrier to the direct transmission of noise to the exterior.

The services work includes plumbing mechanical, lifts, fire and electrical.

Typical noise levels, which may be generated by this activity, are illustrated in the chart,which follows.

COMPARISON OF NOISE LEVELS EMITTED BY DIFFERENT PROCESSES DURING INTERNAL FINISHES



The above histogram clearly shows that noise levels emitted from this activity are significantly quieter than the four previously discussed activities

5.5 DISCUSSION

From the information presented in the above section it can be clearly seen that the noise emitted from a construction site will be dependent on which activities are taking place. More specifically, the particular process within those activities. For example there is a difference of 16 dB(a) between using a hydraulic hammer and loading a truck during demolition. A difference of 16dB(A) is substantial. Therefore by limiting the activities which take place on a construction site at particular time's noise emissions can also be regulated.

6. SITE DESCRIPTION AND POTENTIALLY AFFECTED LOCATIONS

The Darling Walk site is located on Harbour St in Darling Harbour between the Chinese Gardens and Imax. It currently comprises a large area of public domain and the purpose built 2 storey Sega World building, constructed in the 1990's as a games and amusement complex.

The proposed development will involve the demolition of the existing building and associated public domain. The new development will incorporate 4 levels of basement parking, a ground level retail floor including a children's theatre and up to 8 storeys of A grade office space. The associated public domain area will be upgraded including a new children's Playground.

The following are the residential and other noise sensitive locations in close proximity to the site.

Location 1.Millenium Towers located at the corner of Day and Bathurst St.
Location 2.Emporio Apartments located at Cnr Day & Liverpool St.
Location 3.Union Offices located at 176-182 Day St; Global College located at 188 Day St; Police Building located at the corner of Day and James St.
Location 4.Imax Building.
As construction will be carried out during 7am to 7:00 pm Mondays to Fridays and 7am to 5:00pm on Saturdays the above listed premises will not be affected at night

7. NOISE CRITERIA

The noise goals for demolition/excavation and construction activities on this project are aimed at minimising adverse impacts within the surrounding commercial and residential/hotel buildings. The noise goals adopted by the code of practice are outlined below:

- 7am to 8am $L_{av\ max} \leq$ Background + 5 dB(A)
- 8am to 7 pm $L_{av\ max} \leq$ Background + 10 dB(A)

Demolition/excavation and construction noise intrusion into Imax cinemas shall comply with criteria NC-25 while the cinemas are on operation.

The existing background noise levels were measured along Day St. The typical background noise is presented as below.

Table 1 – Measured Background Noise Level

Measurement Location	Time Period	Background Noise Level L_{90} dB(A)
Along Day St	7am-8am	59
	8am- 7pm	60

8. VIBRATION CRITERIA

Two sets of vibration criteria will be used on this project, namely;

- Australian Standard 2187
- Australian Standard 2670

The criteria and the application of these Standards are discussed in separate sections below.

8.1 AS2187

Australian Standard 2187-1993, "SAA Explosives Code, Part 2 - Use of Explosives" stipulates in Section 11 acceptable levels of ground vibration to limit the probability of structural damage and human discomfort. The criteria presented in this Standard are summarised below.

AS2187 RECOMMEND PEAK PARTICLE VELOCITY

	Type of building or structure	Particle velocity (Vp) mm/s
1.	Historical buildings and monuments, and buildings of special value and significance	2
2.	House and low rise residential buildings: Commercial buildings not included in item 3 below	10
3.	Commercial and industrial buildings or structures of reinforced concrete or steel construction	25

This standard will be used principally for the determination of potential structural damage to surrounding buildings. The Standard does not provide suitable criteria for the determination of acceptable levels of vibration for human comfort in sensitive areas, such as a dental surgery.

8.2 AS2670

Australian Standard 2670.2 - 1990 "Evaluation of human exposure to whole body vibration, part 2: continuous and shock induced vibrations in buildings (1 to 80Hz)", provides criteria for the assessment of annoyance of human beings subject to continuous and intermittent vibration.

The criteria set out in this standard will be used to determine the acceptability of vibration levels for human comfort and satisfactory work environment.

8.3 VIBRATION CRITERIA APPLICABLE FOR THIS PROJECT

Structural Damage

The structural vibration criteria applicable to this project will depend on the building type affected.

Human Comfort

Based on Australian Standard 2670.2 - 1990 the applicable human comfort criterion will be that vibration velocity levels do not exceed 0.5mm/sec RMS.

9. DETERMINATION OF CONSTRUCTION NOISE IMPACT

Using the noise levels presented in Table 1 below, the resultant noise impact was determined at the worst affected locations. These locations were identified in Section 6, above. If noise levels comply with the criteria at these locations, then they will be acceptable at all other locations.

All construction noise sources were assumed to be located at the nearest point on the construction site to the receiver locations under study. In this way the worst and majority case noise level situations are determined, with noise levels arising from an activity occurring on any other part of the site being equal to or lower than those determined for the nearest point scenario.

The calculations determine the A-Weighted max noise levels over a 15-minute period, from all sources, which may operate simultaneously. Noise emanating from the respective activities will comply with the required criterion, provided all noise from all individual plant and equipment comply.

10. SOUND DATA

Noise impact will be determined from all processes and equipment, which are involved in the activities outlined below by defining the levels of sound, which they generate.

The A-weighted sound pressure levels at 7m distance for all the component parts of the above-described activities are outlined in the tables below.

Sound Data

CONSTRUCTION ACTIVITY	EQUIPMENT /PROCESS	SOUND PRESSURE LEVEL @7m - dB(A)
Piling Works	Bored Piling	88
	CFA Piling	88`
Demolition/excavation	Bulldozer- Caterpillar D7, D9	88
	Bulldozer- Caterpillar D10	93
	Front End Loader – Wheeled	90
	Jack Hammers with Silencing Bags	83
	Air Track Drill-800 CFM Compressor	96
	Scraper Caterpillar 631	89
	Scraper Caterpillar 651	85
	Grader Caterpillar 16	85
	Compactor Caterpillar 825	85
	Compactor Vibrating Plate	92
	Vibratory Roller	89
	Water Cart	88
	Dump Trucks- 35 Tonne	96
	Excavator – Kato 750	86
	Rock Breaker Hydraulic on Kato 750	97
	Truck	80
	Crane- Truck Mounted	85

Construction	Compressor- 600CFM	75
	Compressor- 1500 CFM	80
	Backhoe	88
	Spreader- Asphalt, concrete	70
	Asphalt Truck	92
	Asphalt Paver	89
	Tip Truck	83
	Generator- Diesel	79
	Spraying Machine	75
	Mechanical Broom	83
	Concrete Truck	83
	Concrete Pump	84
	Concrete Vibrators	80
	Drill- Air	85
	Drill- Pneumatic	85
	Welders	85
	Concrete Saw	93
	Concrete Leveller	90
	Cherry Picker- on Truck	80

The noise levels presented in the above table are derived from the following sources, namely:

1. Noise data provided by client.
2. On-site measurements
3. Table D2 of Australian Standard 2436-1981
4. Data held by this office from other similar studies.

11. NOISE PREDICTIONS

11.1 PILING WORKS

11.1.1 Noise Receiver 1

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Piling Works	61	59	2	5	YES
08.00 to 19.00	Piling Works	61	60	1	10	YES

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Piling Works	61	59	2	5	YES
08.00 to 17.00	Piling Works	61	60	1	10	YES

11.1.2 Noise Receiver 2

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	5	5	YES
08.00 to 19.00	Piling Works	64	60	4	10	YES

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	5	5	YES
08.00 to 17.00	Piling Works	64	60	4	10	YES

11.1.3 Noise Receiver 3

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - MONDAY To FRIDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	5	39[1]	45	-6	5	YES
08.00 to 19.00	Piling Works	64	60	4	39[1]	45	-6	10	YES

Notes;

1. The above assessment assumes that 6mm glass is used in the windows of the commercial buildings.

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - SATURDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	5	39[1]	45	-6	5	YES
08.00 to 17.00	Piling Works	64	60	4	39[1]	45	-6	10	YES

Notes;

1. The above assessment assumes that 6mm glass is used in the windows of the commercial buildings.

11.1.4 Noise Receiver 4

LOCATION 4- IMAX BUILDING - MONDAY To FRIDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	<5	23[1]	30	-7	YES
08.00 to 19.00	Piling Works	64	60	4	23[1]	30	-7	YES

Notes;

1. The above assessment is based on a review of the cinemas external shell by this office.

LOCATION 4- IMAX BUILDING - SATURDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Piling Works	64	59	5	23[2]	30	-7	YES
08.00 to 17.00	Piling Works	64	60	4	23[2]	30	-7	YES

Notes;

1. The above assessment is based on the cinemas structure by this office.

11.2 DEMOLITION/EXCAVATION

11.2.1 Noise Receiver 1

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	< 64[1]	59	<5	5	YES
08.00 to 19.00	Demolition/excavation Works	65[1]	60	5	10	YES

Notes:

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise receivers

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	< 64[1]	59	<5	5	YES
08.00 to 17.00	Demolition/excavation Works	65[1]	60	5	10	YES

Notes:

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise receivers.

11.2.2 Noise Receiver 2

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	< 64[1]	59	<5	5	YES
08.00 to 19.00	Demolition/excavation Works	65[1]	60	5	10	YES

Notes:

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	< 64[1]	59	<5	5	YES
08.00 to 17.00	Demolition/excavation Works	65[1]	60	5	10	YES

Notes:

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

11.2.3 Noise Receiver 3

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - MONDAY To FRIDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<63[1]	59	<5	38[2]	45	-7	5	YES
08.00 to 19.00	Demolition/excavation Works	68[1]	60	8	43[2]	45	-2	10	YES

Notes;

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

2. The above assessment assumes that 6mm glass is used in the windows of the commercial buildings.

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - SATURDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<63[1]	59	<5	38[2]	45	-7	5	YES
08.00 to 17.00	Demolition/excavation Works	68[1]	60	8	43[2]	45	-2	10	YES

Notes;

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

2. The above assessment assumes that 6mm glass is used in the windows of the commercial buildings.

11.2.4 Noise Receiver 4

LOCATION 4- IMAX BUILDING - MONDAY To FRIDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<64[1]	59	<5	23[2]	30	-7	YES
08.00 to 19.00	Demolition/excavation Works	69[1]	60	9	26[2]	30	-4	YES

Notes;

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

2. The above assessment is based on the cinema structure information reviewed by this office.

LOCATION 4- IMAX BUILDING - SATURDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<64[1]	59	<5	23[2]	30	-7	YES
08.00 to 17.00	Demolition/excavation Works	69[1]	60	9	26[2]	30	-4	YES

Notes;

1. It is proposed to rip the majority of the site in lieu of hammering where possible.

   A localised imperforate line of sight barrier installed between the site and the noise receiver

   Compressors shall be screened from the noise

2. The above assessment is based on the cinema structure information reviewed by this office.

11.3 CONSTRUCTION

11.3.1 Noise Receiver 1

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Construction Works	< 61	59	<2	5	YES
08.00 to 19.00	Construction Works	62	60	2	10	YES

LOCATION 1 – RESIDENTIAL BUILDING-MILLENIUM TOWERS (168 DAY SY) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Construction Works	< 61	59	<2	5	YES
08.00 to 17.00	Construction Works	62	60	2	10	YES

11.3.2 Noise Receiver 2

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - MONDAY To FRIDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Construction Works	< 61[1]	59	<2	5	YES
08.00 to 19.00	Demolition/excavation Works	62[1]	60	2	10	YES

LOCATION 2 – RESIDENTIAL BUILDING-EMPORIO (CORNER OF DAY AND LIVERPOOL ST) - SATURDAY						
TIME	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACKGROUND NOISE LEVEL L_{90} dB(A)	EXCEEDENCE ABOVE B'GROUND	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERIA	COMPLIES YES/NO
07.00 to 08.00	Construction Works	< 61[1]	59	<2	5	YES
08.00 to 17.00	Construction Works	62[1]	60	2	10	YES

11.3.3 Noise Receiver 3

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - MONDAY To FRIDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Construction Works	<60	59	<1	35[2]	45	-10	5	YES
08.00 to 19.00	Construction Works	65	60	5	38[2]	45	-7	10	YES

LOCATION 3- COMMERCIAL BUILDING ACROSS DAY ST (UNION OFFICES, GLOBAL COLLEGE AND POLICE BUILDING) - SATURDAY									
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL AS2107	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	PERMISSIBLE EXCEEDENCE ABOVE B'GROUND/ CRITERION	COMPLIES YES/NO
07.00 to 08.00	Construction Works	<60	59	<1	35[2]	45	-10	5	YES
08.00 to 17.00	Construction Works	65	60	5	38[2]	45	-7	10	YES

11.3.4 Noise Receiver 4

LOCATION 4- IMAX BUILDING - MONDAY To FRIDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<61	59	<2	20	30	-10	YES
08.00 to 19.00	Demolition/excavation Works	66	60	6	23	30	-7	YES

LOCATION 4- IMAX BUILDING - SATURDAY								
PERIOD HOURS	ACTIVITY	EXTERNAL LEVEL OF NOISE AT AFFECTED OCCUPANCY L_{10} dB(A)	BACK- GROUND L_{90} MEASURED AT THE AFFECTED OCCUPANCY	EXTERNAL LEVEL OF ACTIVITIES RELATIVE TO B'GROUND	INTERNAL NOISE LEVEL AT AFFECTED L_{avmax} dB(A)	CRITERION: INTERNAL NOISE LEVEL	LEVEL OF ACTIVITIES RELATIVE TO INTERNAL CRITERION	COMPLIES YES/NO
07.00 to 08.00	Demolition/excavation Works	<61	59	<2	20	30	-10	YES
08.00 to 17.00	Demolition/excavation Works	66	60	6	23	30	-7	YES

12. VIBRATION - ACCEPTABLE WORK PRACTICES

Department of Environment and Conservation NSW "Assessing Vibration: A Technical Guideline" (Feb 2006) will be used to assess human discomfort caused by vibration generated by demolition activities.

Vibration Criteria for building damage will be based on the following:

- Highly sensitive structures – 2mm/s PPV
- Sensitive structures – 10mm/s PPV
- Other non-sensitive or modern structures – 20mm/s (vibration in these structures would most likely be limited by human comfort criteria).

The following vibration criteria shall be applied to this project.

Location		Vibration Limitation PPV
Nearest Residential Building Façade		10 mm/s
Cross City Tunnel		20 mm/s
Service Authorities Infrastructure (Drains, Sewers, etc)	Steel Structure	20 mm/s
	Brick/ Masonry Structure	5 mm/s
	Other Fragile Structure	2 mm/s

To regulate vibration emanating from both the demolition and excavation processes the demolition and excavation contractors will need to operate particular machinery at certain distance from affected buildings to comply within the criteria. The following is an estimate of the distances that may be required for the various equipments.

Piling

Bored or CFA piling shall be 1m from brick/masonry service authority structure to comply with 5mm/s PPV.

Ripping

10m from nearest residence to comply with 10mm/sec PPV.

Milling

No limit from nearest residence to comply with 10mm/sec PPV and 0.5mm/sec RMS for human comfort.

13. ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continual communication is required between all parties, which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process, which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation process is to:

Inform and educate the groups about the project and the noise controls being implemented.

Increase understanding of all acoustic issues related to the project and options available.

Identify group concerns generated by the project, so that they can be addressed.

14. STATEMENT OF INTENT TO COMPLY

The calculation procedure used to predict the noise levels above has been verified with field measurements on building sites in the inner city including the Grace Plaza, GPO, 400 George Street, Aston and Sydney Central Plaza projects.

In addition, a contact number of the Liaison Officer will be advertised outside the building site, so that residents and other interested parties may contact him, should they believe a noise breech is occurring.

15. FINAL STATEMENT

The finding of this document indicates that noise levels and vibration levels from construction activities taking place on the Darling Walk, Darling Harbour will comply with the criteria nominated in Section 3 of this report at all times, provided times of operation indicated in this document and the recommendations are observed.

Demolition activities noise levels generated by the project site will comply with the requirements of Sydney City Council "Code of Practice for Construction Hours/Noise within the Central Business District" with the recommendations provided in this report.

Vibration levels from demolition and construction activities will fully comply with the vibration criteria nominated in Section 8, provided the recommendations in this document are observed.

Report prepared by,

Acoustic Logic Consultancy Pty Ltd

George Wei

APPENDIX: CONSTRUCTION NOISE/ VIBRATION MANAGEMENT PLAN

14 March, 2008

Report: 2008246/0503A/R0/GW

Prepared for: Bovis Lend Lease

DARLING WALK, DARLING HARBOUR

CONSTRUCTION NOISE AND VIBRATION ASSESSMENT AND MANAGEMENT PLAN

ACOUSTIC LOGIC CONSULTANCY PTY LTD

9 Sarah St, Mascot, NSW 2020 Tel: 8338 9888 Fax: 8338 8399

TABLE OF CONTENTS

1. INTRODUCTION

This document presents a discussion on the process which will be followed in order to manage noise and vibration from the construction of the proposed Darling Walk Darling Harbour.

In recognition of the requirement to minimise noise emissions from the site to surrounding residential and commercial premises Bovis Lend Lease have commissioned this study. The principal objective of this study is to undertake advanced evaluation of all work to be performed during the demolition, excavation and construction phase of the project and forecast the potential impact of noise. The noise forecasts will be used to formulate and streamline effective regulation and mitigation measures. As a part of this process on going testing will be used to evaluate the noise regulation strategies and ensure that they are effective.

To further ensure compliance with appropriate standards on going monitoring will be instigated.

The principal issues which will be addressed in this document are:

- Identification of the specific activities that will be carried out and associated noise sources,
- Identification of all potentially affected sensitive receivers including residences, schools and properties containing noise sensitive equipment,
- Determination of appropriate noise and vibration objectives for each identified sensitive receiver,
- Noise and vibration monitoring, reporting and response procedures.
- Assessment of potential noise and vibration from the proposed construction activities including noise from construction vehicles and any traffic diversions,
- Description of specific mitigation treatments, management methods and procedures that will be implemented to control noise and vibration during construction
- Identification of the noise and vibration standards which will be applicable to this project.
- Formulation of a strategy for construction to comply with the standards identified in the above point.
- Construction timetabling to minimise noise impacts including time and duration restrictions, respite period and frequency,
- Procedures for notifying residents of construction activities that are likely to affect their amenity through noise and vibration,
- Establishment of direct communication networks between affected groups, Planning NSW, Bovis Lend Lease and Acoustic Logic Consultancy.

2. PROJECT OBJECTIVE

The objective of this management plan is to minimise noise & vibration emissions from the construction work associated with this project and assist in maintaining a satisfactory environment around the site. .

3. NOISE CRITERIA

The noise goals for excavation and construction activities on this project are aimed at minimising adverse impacts within the surrounding commercial and residential/hotel buildings. The noise goals adopted by the code of practice are outlined below:

- 7am to 8am $L_{av\ max} \leq$ Background + 5 dB(A)
- 8am to 7 pm $L_{av\ max} \leq$ Background + 10 dB(A)

Excavation construction intrusion into Imax cinemas shall comply with criteria NC-25 whilst cinemas in operation.

4. VIBRATION CRITERIA

Australian Standard 2187-1993, "SAA Explosives Code, Part 2 - Use of Explosives" stipulates in Section 11 acceptable levels of ground vibration to limit the probability of structural damage and human discomfort. The criteria presented in this Standard are summarised below.

AS2187 RECOMMEND PEAK PARTICLE VELOCITY

	Type of building or structure	Particle velocity (Vp) mm/s
1.	Historical buildings and monuments, and buildings of special value and significance	2
2.	House and low rise residential buildings: Commercial buildings not included in item 3 below	10
3.	Commercial and industrial buildings or structures of reinforced concrete or steel construction	25

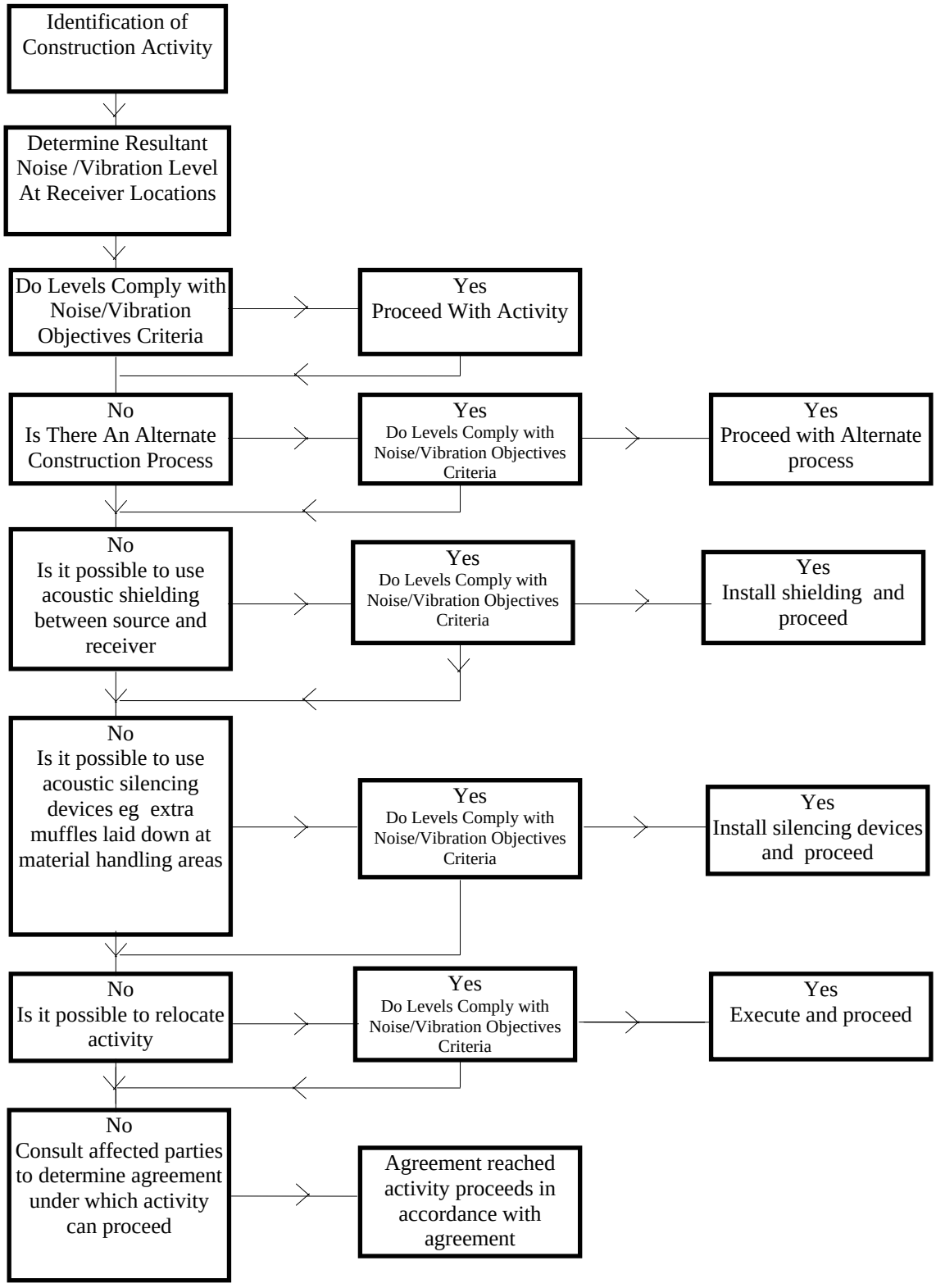
5. CONTROL OF CONSTRUCTION NOISE

As a part of the noise management plan a detailed study will be undertaken of each of the proposed activities which will occur as a part of the demolition, excavation and construction works on this project.

The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart which follows illustrates the process which will be followed in assessing construction activities.

CONTROL OF NOISE AND VIBRATION



6. NOISE CONTROL METHODS

The determination of appropriate noise control measures will be dependant on the particular activities and construction appliances. This section provides an outline of available methods.

6.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

6.2 ACOUSTIC BARRIER

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.

Barriers can also be placed between the source and the receiver.

The degree of noise reduction provided by barriers is dependant on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15 dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

6.3 SILENCING DEVICES

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

6.4 MATERIAL HANDLING

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

6.5 TREATMENT OF SPECIFIC EQUIPMENT

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

6.6 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. A noise plan will be developed for this project outlining work procedures and methods for minimising noise.

6.7 REGULAR NOISE CHECKS OF EQUIPMENT

To determine the requirement for silencing devices on machinery it is proposed to undertake fortnightly noise check. Noise levels of all machines on site will be measured and if they are found to be higher than nominated for that equipment type, items such as mufflers and engine shrouds will be examined to ensure they are in good working order.

A record of these measurements will be kept on a form similar to that shown below.

This measure is expected to maintain noise at constant levels, and prevent any increases.

BOVIS LEND LEASE

DARLING WALK DARLING HARBOUR

Construction Appliance Compliance Certificate

Month .....

Year .....

Plant Item .....

Allowable Noise Level .....

Measured Noise Level .....

Complies Yes ☐ No ☐

Issuing Engineer .....

Sub-Contractor .....

Project Manager .....

6.8 NOISE MONITORING

Noise monitoring can be undertaken to determine the effectiveness of measures which are been implemented. The results of monitoring can be used to devise further control measures.

6.9 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

7. ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

In order for any construction noise management programme to work effectively, continual communication is required between all parties which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

Inform and educate the groups about the project and the noise controls being implemented.

Increase understanding of all acoustic issues related to the project and options available.

Identify group concerns generated by the project, so that they can be addressed.

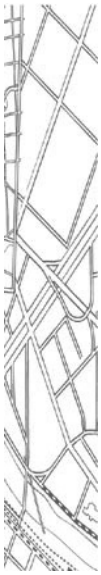
Ensure that concerned individuals or groups are aware of and have access to the Bovis Lend Lease. Complaints Register which will be used to address any construction noise related problems should they arise.

To ensure that this process is effective, regular scheduled meetings will be required for a finite period, until all issues have been addressed and the evidence of successful implementation is embraced by all parties.

An additional step in this process is to produce a newsletter informing the groups of the progress of the works and the upcoming construction activities.

Appendix 3

Masson Wilson Twiney Pedestrian and Traffic Management Plan



Traffic Management Plan

Darling Walk Redevelopment - Main Construction Works Traffic Management Plan

21 July 2008

Prepared for

Bovis Lend Lease

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Author: Kamoru Adetunmbi
Reviewer: Bruce Masson

Contents

1. Introduction

A traffic and pedestrian management plan for demolition of the Sega World Building was prepared by Masson Wilson Twiney on behalf of Bovis Lend Lease Pty Ltd. It is now required to prepare a traffic and pedestrian management plan for the construction of a new building and basement excavation after the completion of the demolition.

The new building consists of 4 levels of basement parking, a ground level retail floor including a children's theatre and up to 8 storeys of office space in two towers. The associated public domain area will be upgraded, including a new Children's Playground.

This report forms a component of the Project Application for the proposed development. The report covers traffic management plans for the construction of the main building and associated external works. This includes bulk excavation works, structural works, materials handling, façade and associated civil works.

The establishment plans for the bulk excavation works and the main works are provided in **Appendix A**.

The report is based on the description of the construction works provided by Bovis Lend Lease and on a visit to the site to obtain information on the site and existing traffic and pedestrian situations. This report includes an overview of the proposed construction works with respect to traffic and describes the potential impacts on the surrounding road network. The location of the site relative to surrounding road network is shown in **Figure 1**.

Traffic control plans for specific requirements of the proposed works are provided in **Figures 2- 5**. This document also indicates the Standard RTA Traffic Control Plans (TCP) on which the traffic management plan is based. The standard TCPs and the symbols used in the plan are provided in **Appendix B,** while the general notes pertaining to the standard layouts is contained in **Appendix C**. The routes of trucks exiting the site during bulk excavation are shown in **Appendix D**.

RTA Guidelines[1] specifies that Traffic Management Plans must be prepared by a person in possession of a current "Select/Modify Traffic Plans qualification or higher with name and certificate attached. The relevant certificates are provided in **Appendix E.**

As part of the construction of the new building it is necessary to carry out the diversion of a stormwater culvert that presently crosses the site onto a route around the site and then join an upstream section of the existing culvert in James Street cul-de-sac. The traffic management plan prepared for this work is provided in **Appendix F**.

The remaining part of this report is set out as follows:

- Chapter **2** - documents the existing traffic conditions.
- Chapter **3** - describes the works and construction phases.
- Chapter **4** - indicates the vehicular access and pedestrian requirements
- Chapter **5** discusses the traffic control plans for the proposed works
- Chapter **6** - describes impacts of the proposed works, including issues such as hours of operation, pedestrians, public transport and emergency vehicles.

Finally it is noted that the construction works will necessitate the diversion of a stormwater culvert that presently crosses the site onto a route around the site. This will be the subject of a separate construction management plan.

[1] Road Occupancy Manual – RTA (2007)

2. Background Situation

2.1 Site Location

The Darling Walk site is located on the western fringe of the Sydney CBD area. Being a sub precinct of the Darling Harbour, it is also located in close proximity to the Exhibition and Convention Centres, the IMAX Theatre and the Chinese Garden. The site has direct frontage to Harbour Street, a four-lane arterial road, which connects to the Western Distributor/Bradfield Highway as well as the Cross City Tunnel Motorway.

The site location is shown in **Figure 1**.

2.2 Existing Road Network

An appreciation of the existing traffic conditions can be gained by examining the road network, traffic volumes and the operation of intersections. These aspects are discussed below.

1. **Harbour Street** – is an arterial road running north-south along the frontage of the site. It has generally 2 traffic lanes in each direction. Access to the Cross City Tunnel is available in the middle of the road for northbound traffic to the south of Day Street. Vehicular accesses to the site are available from Harbour Street. Wide footpaths exist on either side of the road. Footbridges also exist across Harbour Street near the northern and southern boundaries of the Sega World. Signalised pedestrian crossings also exist across Harbour Street at the intersections of Day Street and Bathurst Street. The street carries up to 1,200 vehicles per hour in each direction during the morning and evening peak hours.
2. **Day Street** – is a short road connecting Harbour Street to Bathurst Street with a triangular open space between the three streets. A signalized pedestrian crossing exists across its intersection with Bathurst Street, leading pedestrians from Bathurst Street to the Bathurst Street footbridge over Harbour Street.
3. **Bathurst Street** – in the vicinity of the site is a one-way street providing access from the Western Distributor to the southern part of the Sydney CBD.
4. **Liverpool Street** – provides a one-way westbound link between the southern part of the CBD and the Darling Harbour entertainment area. A footbridge exists from the northern and southern footpath of the street across Harbour Street, providing direct pedestrian access to Darling Harbour.

3. Construction Program

3.1 Description of the works

The construction program involves the following items of works:

- Piling
- Site Sheds construction
- Bulk Excavation
- Scaffolding
- Plant Deliveries & Pick up
- Structural Works, construction of new site access
- Civil Works
- Services
- Roof installation
- Façade construction
- Fit-outs and Finishes
- External Works
- Construction Waste Collection
- Material Deliveries
- Tower Cranes
- Mobile Cranes

The construction works will be carried out over a period of 29 months, from November 2008 to Mar 2011. It should be noted that during the demolition of the site, it is proposed to install Class A-hoardings around the site. These hoardings will remain throughout the construction works and all construction activities, including bulk excavation will take place within the site. A pedestrian way-finding signage plan shown in Figure 5 will assist pedestrians to find alternative routes.

The pedestrian crossings at the intersections of Bathurst Street/Day Street and Harbour Street/Bathurst Street/Western Distributor Off-Ramp will be maintained during the works. The pedestrian crossings at the intersection of Harbour Street/Day Street and the signalised crossings across the site access on the western side of Harbour Street will be closed due to installation of hoardings on the footpath thereby closing pedestrian access to the footpath.

These preliminary and continuing construction enabling elements are covered in the separate demolition traffic management plan.

3.2 Staging of the works

Note that the RTA guidelines define work as short and long-term work. The relevant TCP should be used with reference to the type of work as defined below:

- **Long-term work** – work requiring traffic control and taking longer than one work shift and where some form of traffic control must remain when the site is left unattended and may need to operate both day and night;

- **Short-term work** – work requiring traffic control during work taking less than or equal to one work shift and where traffic control is not required when the work is complete and where road conditions are returned to normal when the work ends.

Applicability of long or short-term plans is specified in **Chapter 5** below.

A brief description of each aspect of the construction works and truck generation is outlined below:

Item 1 – Piling Phase This involves installation of cast in-situ concrete piles in the site. The works, including loading and unloading will take place within the site and no lane closure will be needed.

4 piling rigs will be delivered in November 2008 and then picked up in February 2009. 700 piles will be installed and around 560 trucks will visit the site to deliver concretes and other materials associated with the piling works during the 4 months of piling works.

Item 2 – Construction of Site Sheds. This involves construction of temporary sheds or containers for the contractors' staff. The sheds and containers will be erected in December 2008 and removed from site when work is completed in March 2011. It is estimated that 60 trucks will deliver the containers and the sheds progressively from December 2008 and another 60 trucks will remove the materials at the end of the works.

Item 3 – Bulk Excavation
Bulk excavation works will be carried out over 8 months, between December 2008 and July 2009. 10 major items of plants will be delivered at the beginning of the works and then picked up by trucks at the end of the work in July 2009. Around 110,000m^3 of material will be taken out by trucks. Around 7,400 trucks (dog & trailers) will remove the materials for disposal.

Item 4 – Scaffolding

Scaffold will commence to be erected in September 2009 to facilitate building construction. The scaffolds will be dismantled progressively from September 2010. 30 trucks will deliver the materials and 30 trucks will remove the materials after dismantling.

Item 5 – Plant Deliveries and Pick Up

100 trucks will deliver construction plant from July 2009 to the end of the works as needed. The plant will be removed progressively by 100 trucks until the end of the works in March 2011. All loading and unloading will take place within the site.

Item 6 – Structural Works

This includes major concrete works and reinforcement for the structural elements of the building. Around 35,000m^3 of fresh concrete will be delivered by 7,000 trucks over a period of 8 months, between July 2009 and February 2010. The following numbers of trucks will visit the site over a period of 8 months between July 2009 and February 2010:

- 7,000 trucks to deliver 35,000m^3 of fresh concrete
- 200 concrete pumps
- 400 trucks to deliver around 8,000 tonnes of reinforcement bars
- 60 trucks for post-tensioning materials

Item 7: Civil Works

This involves construction of roads and driveways associated with the development. The work will be carried out over 12 months, between February 2010 and February 2011. 200 trucks (dogs and trailers) will deliver roadbase materials and 60 trucks will deliver bitumen. This includes reconstruction of Harbour Street/Day Street intersection.

Item 8: Services

These works include installation of hydraulic, mechanical, electrical, fire and other services. All installation will be carried out within the site. The installation of services will be carried out over 16 months, from November 2009 to February 2011. The following number of trucks will make deliveries during installation of services:

- Hydraulic – 200 trucks (50 large and 150 small trucks)
- Mechanical – 250 trucks (100 large and 150 small trucks)
- Electrical – 350 trucks (100 large and 250 small trucks)
- Fire – 100 trucks (50 large and 50 small trucks)
- Other services – 100 trucks

Item 9: Tower Cranes

Two tower cranes will be erected within the site in April 2009 and dismantled in September 2010. 20 trucks will deliver the crane components in April 2009 and 20 trucks will pick up the components in September 2010.

Item 10: Mobile Cranes

It is estimated that up to 100 mobile cranes will visit the site between December 2009 and 2011.

Item 11: Façade

300 trucks will make deliveries to the site during façade installation between February and September 2010.

Item 12: Roof Installation

Construction of roof will be carried out in 6 months between March and August 2010. 100 trucks will deliver structural steel and 50 trucks will deliver roof sheet and insulation.

Item 13: Fit-outs and Finishes

Installation of fit-outs and finishes will be carried out over 12 months between April 2010 and March 2011. Around 300 trucks will deliver materials over 12 months as follows:

- Ceiling Grid & Tiles – 25 trucks
- Blockwork – 30 trucks
- Linings/Wall finishes – 80 trucks
- Metalwork/balustrades – 120 trucks
- Floor finishes – 40 trucks

Item 14: External Works

This involves installation of landscaping, playground equipment and furniture. The works will be carried out over 7 months, between September 2010 and March 2011. 120 trucks will deliver materials for hard landscaping, playground equipment and furniture and also soft landscaping.

Item 15: Waste Collection

This involves collection of construction waste for disposal at landfill or other sites. Around 1400 skip bins will be collected by trucks during the main construction works between August 2009 and March 2011.

Item 16: Sundry Deliveries

It is estimated that various miscellaneous deliveries will be made during the construction of the buildings between August 2009 and March 2011. It is estimated that up to 500 trucks will make deliveries during this time.

4. Vehicle and Pedestrian Requirements

4.1 Vehicle Types

Construction vehicles likely to be generated by the proposed construction activities include:

- Articulated vehicles for delivery of machinery and tower cranes
- Heavy and medium rigid trucks for construction material removals,
- Mobile cranes and concrete pumps
- Staff cars and delivery vans

As discussed in Section 3, all construction vehicles will be able to park on-site while carrying out loading and unloading. There will be no parking of staff cars in the site. Some staff will come by public transport as the site is located within walking distance of major public transport facilities, including train stations, monorail stations and STA bus stops. The workers who require parking for their cars will be able to park in the public pay parking stations available in the vicinity of the site.

4.2 Construction Vehicle Access

All construction vehicles will enter and exit the site via Harbour Street. 4 gates are proposed for entering and/or exiting the site. The gates shown in the establishment plans in Appendix A are:

- Gate 1: located just north of Liverpool Street, for exiting the site for exiting the site after completion of structure.
- Gate 2: located about 50m north of Liverpool Street for entering the site.
- Gate 4: Existing signalised exit driveway at the intersection of Harbour Street/Day Street
- Gate 5: Existing entry Driveway to Macdonald Restaurant. This gate will be reworked during construction phase.

It is proposed that the marshalling area for trucks be in Hickson Road, subject to consultation with the Roads and Traffic Authority (RTA) and Sydney Harbour Foreshore Authority (SHFA) as to details.
The route of trucks will be as follows:

- Entry – From Hickson Road southbound to Sussex Street, turn right into Liverpool Street, right into Harbour Street, and left into the site via any of the three gates (Gate 2, Gate 4 and Gate 5) shown in **Appendix A**. It should be noted that signage at Gate 4 at the signalised intersection of Day Street/Harbour Street will be modified to permit entry of construction vehicles. New signage will be "No Entry" and "Construction Vehicles Excepted".
- Exit – Trucks will exit from either the existing signalised driveway at the intersection of Day Street and Harbour Street or the proposed Gate 3 during

main works. Routes of exiting trucks would be as follows depending on the destination:

- North: turn left to travel north via the Harbour Bridge
- West: travel straight in Day Street and Bathurst Street to access Western Distributor via Kent Street and Druitt Street, or turn right into Harbour Street, Goulburn Street and right into George Street.
- South: Right into Harbour Street, left into Goulburn Street, right into George Street, Regent Street, Cleveland Street and then South Dowling Street.

The proposed entry and exit routes provide shortest distances to the arterial roads and avoid the use of local roads by trucks.

4.3 Construction Traffic Flow

The numbers of trucks visiting the site during each item of works are outlined in Section 3.2. These have been separated into months and maximum number of trucks expected to visit the site during a peak hour has been calculated during each month. A summary of number of trucks expected to visit the site during each month of the construction works is provided in Table 4.2.

In calculating the maximum hourly truck volumes, it was assumed that there are 20 working days in a month and deliveries will take place during 6 hours per day. This results in conservatively higher volume than what is likely to occur. The project application actually seeks approval for construction works over 6 days per week (Monday to Saturday) and hours of work will be 7:00am - 7:00pm, Monday to Friday, and 7:00am – 5:00pm on Saturday. There will be no work on Sundays and public holidays.

Around 20,400 trucks will visit the site during the 29 months of construction works. The maximum number of trucks visiting the site per hour varies from 2 during some months to the highest number 17.

As outlined in Section 2, Harbour Street currently carries around 1,200 vehicles per hour in each direction during the morning and evening peak hours. These include some vehicles travelling to the Sega World complex that have been eliminated after demolition of the site. The volume of trucks visiting the site is considered minimal compared to the existing volume of traffic in Harbour Street.

The estimated maximum truck generation of 21 trucks per hour would have minimal impact on traffic operation in Harbour Street. Therefore the traffic impact of the construction activities will be low.

Furthermore Intersection analysis to assess the existing performance of the signalised intersections of Harbour Street with Liverpool Street and Day Street was recently

undertaken as part of the traffic planning for the Darling Walk Redevelopment. Results of the analysis are presented in Table 4.1.

Table 4.1 – Intersection Operations in Harbour Street

	Morning Peak		Evening Peak	
	Level of Service	Average Delay per vehicle	Level of Service	Average Delay per vehicle
Harbour St-Day St	B	25.1 seconds	B	24.4 seconds
Harbour St-Liverpool St	A	14.0 seconds	B	22.8 seconds

Note LOS A is the highest potential spare capacity, LOS F = Over capacity, poor operation.

Both intersections were found to operate satisfactorily under existing traffic conditions at level of service B or better in both peak periods. As stated in Section 2, Harbour Street currently carries around 1,200 vehicles per hour in each direction. Additional 21 trucks per hour less the existing traffic generation of the Sega World Building will result in insignificant changes to the operations of these intersections.

Table 4.2: Construction Truck Volumes

	Total Number of Trucks	NUMBER OF TRUCKS PER MONTH																											
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
		2008	2008	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2011
Total Number of Trucks	**20399**																												
Piling	564	282	282																										
Site Sheds Construction	120		60																										
Bulk Excavation	7420		935	925	925	925	925	925	925	935																			
Scaffolding	60											30												30					
Plant Deliveries & Pickup	200									10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Structural Works (Concrete & Reinforcement)	7845									981	981	981	981	981	981	981	981												
Civil Works	260																20	20	20	20	20	20	20	20	20	20	20	20	20
Services	1000													63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
Tower Cranes erect & dismant	40						20																						
Mobile Craness	100														7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Façade	300																38	38	38	38	38	38	38	38					
Roof Installation	175																	22	22	22	22	22	22						
Fitouts & Finishes	295																		25	25	25	25	25	25	25	25	25	25	25
External Works	120																							17	17	17	17	17	17
Waste Collection	1400										70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Sundry Deliveries	500		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
TOTAL TRUCKS PER MONTH		**282**	**1295**	**943**	**943**	**943**	**963**	**943**	**943**	**1944**	**1079**	**1109**	**1079**	**1142**	**1148**	**1149**	**1206**	**247**	**271**	**272**	**272**	**272**	**272**	**297**	**230**	**230**	**230**	**230**
TRUCKS PER DAY (Assume 20 working days)		**18**	**84**	**61**	**61**	**61**	**63**	**61**	**61**	**126**	**70**	**72**	**70**	**74**	**75**	**75**	**78**	**16**	**18**	**18**	**18**	**18**	**18**	**19**	**15**	**15**	**15**	**15**
MAX TRUCKS PER HOUR (Assuming 6 hours of delivery per day)		**3**	**14**	**10**	**10**	**10**	**10**	**10**	**10**	**21**	**12**	**12**	**12**	**12**	**12**	**12**	**13**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**

4.4 Pedestrian Access

As the Sega World constitutes an entertainment precinct, pedestrians currently walk on every side of the building as follows:

- Eastern side: Pedestrians walk on the wide footpath along the Harbour Street frontage of the site. Pedestrians also cross Harbour Street from this footpath to the opposite side of the road, via the signalised intersections with Day Street and Bathurst Street.

  The leg of the pedestrian crossing in Day Street/Harbour Street intersection is proposed to remain closed during the construction works as the class A hoardings will remain on the footpath, closing access to pedestrians who presently walk to and through the site.

- Western Side: Pedestrians walk in the public domain area between the Sega World building and the pond and also between the pond and Tumbalong Park. Although hoarding will be installed in the western frontage of the site, access will be maintained for pedestrians on the eastern side of Tumbalong Park and along the eastern side of the children's playground

- Northern side: Pedestrians walk from Bathurst Street across the footbridge into the Sega World building and along the western side of the building. This pedestrian footbridge will remain open for the duration of construction works.

- Southern side: Pedestrians walk from Liverpool Street across the Liverpool Street footbridges to the public domain area west of the site. Access for pedestrians will continue to be available via the Liverpool Street footbridges.

A Pedestrian Way-finding Signage Plan that will be implemented during the construction works is shown in **Figure 4**.

5. Traffic Control Plans

The Standard RTA Traffic Control Plans applicable to the construction work are discussed in the following sub-sections. The recommended Standard Traffic Control Plans are provided in **Appendix A**.

5.1 Bulk Excavation and Main Construction Works

The Class A-hoardings that will be installed around the site during demolition works will remain throughout the construction works and all construction activities, including bulk excavation will take place within the site.

Closure of any road or lane will not be required, however as heavy vehicles will visit the site to make deliveries it will be necessary to warn other drivers. The estimated number of trucks visiting the site per day varies from 11 to 102 trucks per day (See **Table 2**).

It will be necessary to provide advanced warning signage of truck movements to other drivers in Harbour Street. As Harbour Street is a divided road, only northbound drivers need to be notified. The signs should also be installed in Liverpool Street on the approach to the intersection of Harbour Street. The appropriate warning signs include **TRUCKS** (W5-22) and **TRUCKS TURNING** (W5-205).

The following standard RTA TCPs should be implemented for this work:

- Standard RTA **TCP No 195** shows warning signs and devices on the approach to an access road for trucks.

The traffic control plan for the site, based on TCP 195 is provided in **Figure 5**.

5.2 Construction of Temporary Site Accesses (Gate 2)

During the main works-civil phase, an existing unsignalised access to the site from Harbour Street will be closed off. A new gate (Gate 2) will be constructed south of the access.

The closing of the existing gate will be carried out within the site, and traffic in Harbour Street will not be affected. Also plant and equipment for constructing the new entry

will for the most part be located within the site and majority of the works will be carried out inside the site. However, because the footpath and the kerb in Harbour Street will be removed to construct the driveway, the kerbside lane in Harbour Street will be affected. It will be necessary to close off the kerbside lane such that the work area will be separated from the traffic in Harbour Street.

The work will be carried out at night and completed in one night. Standard **RTA TCP No 92** for short-term lane closure on a divided 4-lane road will be implemented to provide guidance for traffic in Harbour Street during construction of Gate 2.

As this work will be carried out at night, it is essential that flashing arrow signs be included in the signs and devices installed. Also, signs for nightworks should replace the standard signs.

As workers will be standing on the road close to the edge of the adjacent traffic lane, the speed limit should be reduced to 40km/h in the work area and for at least 100m on the approaches to the work area. Therefore 'Roadwork Speed Limit' (R4-212) signs will be installed. Authorisation of the use of the 'Roadwork Speed Limit' (R4-212) sign shall be obtained through RTA's Traffic Management Centre. The nearest Police Station needs to be notified by the Sydney Harbour Foreshore Authority in writing of the Authority's intention to implement a roadwork speed limit 7 days prior to works commencing.

The traffic control plan shown in **Figure 2** will be implemented.

6. Impacts of the Proposed Works

An assessment of the traffic impacts of the construction works has been undertaken in accordance with the RTA Guidelines for preparing a traffic management plan. The Construction Traffic Management Plan will require approval by the Sydney Harbour Foreshore Authority. Any road occupancies or temporary speed zone will also require approval by the RTA. The assessment of the Traffic Management Plan is provided below

A. **Description or detailed plan of the proposed measures**.

The construction works will be undertaken between the hours of 7:00am – 7:00pm, Monday- Friday, and 7:00am-5:00pm on Saturdays, subject to Authority approval. The works will be completed over a period of 29 months from November 2008 to March 2011.

The construction program involves the following works:

- Piling
- Site Sheds construction
- Bulk Excavation
- Scaffolding
- Plant Deliveries & Pick up
- Installation and Dismantling of Tower Cranes
- Structural Works, construction of new site access
- Civil Works
- Installation of Services
- Roof installation
- Façade construction
- Fit-outs and Finishes
- External Works
- Construction Waste Collection
- Material Deliveries
- Marshalling of trucks will be at appropriate areas in Hickson Road in consultation with the Roads and Traffic Authority and Sydney Harbour Foreshore Authority.

Around 20,400 trucks will visit the site during the 29 months of construction works. The maximum number of trucks visiting the site per hour varies from 2 during some months to the highest number 17. Trucks will enter Harbour Street from Liverpool Street and turn left into the site via any of the gates. Trucks will exit the site and travel north via the Harbour Bridge or via Day Street.

The Class-A Hoardings installed during demolition of the site will remain in place during construction works. Therefore all works, including loading and unloading will take place within the site. Two additional gates will be constructed from Harbour Street, and appropriate traffic control plans have been developed for these works.

Standard RTA Traffic Control Plans (as required) are recommended in accordance with AS1742.3 and RTA Guidelines. The traffic control plans will be implemented to inform the public and minimise impact of the works.

B. Identification and assessment of impact of proposed measures.

During the construction works, the number of construction trucks expected to visit the site varies from around 10 trucks per day to 130 trucks per day depending on the items of works being carried out. The impact of the construction trucks on traffic operations at the signalised intersections of Harbour Street/Liverpool Street and Harbour Street/Day Street will be minimal as the existing traffic visiting Sega World Building will be eliminated after and the construction traffic arriving and departing in any one hour will be low I the context of traffic already travelling through the are.

Implementation of standard RTA Traffic Control Plans will ensure that adequate warnings and guidance are available to other road users, thus minimising the impact.

On Harbour Street, it is proposed to continue closure of the footpath on the western side that is proposed to be implemented during the demolition phase for the duration of the construction works. Pedestrians will use the footpath on the eastern side of Harbour Street to access the footbridges at the northern and southern boundaries of the site.

The signalised pedestrian crossing across Harbour Street at its intersection with Day Street will also be closed. Alternative pedestrian crossing facilities exist at the intersection of Harbour Street/Bathurst Street and also at the Liverpool Street and Bathurst Street footbridges. Pedestrian Way-finding Signage Plan will be implemented to assist pedestrians, especially visitors, in locating alternative pedestrian facilities. In addition there will be no generation of public pedestrian movements by facilities on the site and public movement through the site by pedestrians will not be possible during construction. Pedestrian movements on Harbour Street that would otherwise have occurred on Harbour Street along the frontage of the site would be low.

Therefore the impact on pedestrians will be low.

C. Measures to ameliorate the impact of re-assigned traffic

The construction will not require re-assignment of traffic onto roads that it does not presently use. Trucks warning signage will be installed in Liverpool Street and Harbour Street on the approaches to the site to warn other drivers to anticipate trucks turning in and out of the site.

It is proposed to carry out the very limited works affecting Harbour Street at night when traffic volumes are lower to reduce impact of lane closure on traffic conditions in Harbour Street. Advanced warning signs will be installed in Harbour Street on the approaches from Liverpool and Bathurst Streets to inform drivers of a closed lane.

Pedestrian way-finding signage plan will be implemented to assist pedestrians to locate alternative pedestrian facilities in and across Harbour Street.

D. Assessment of Public Transport service affected

There will be no re-direction of public transport traffic during the project.

E. Details of provision made for emergency vehicles, heavy vehicles, cyclists and Pedestrians.

No change to access for emergency vehicles is proposed. Heavy vehicles will continue to have access along and from Harbour Street, including during lane closures at night.

There is no designated cycle route in Harbour Street. Cyclists will therefore not be affected by the proposed works.

Pedestrian way-finding signage plan, shown in **Figure 4,** will be implemented to direct pedestrians to alternative pedestrian crossing facilities, including signalised crossings and footbridges at Bathurst and Liverpool Streets.

F. Assessment of effect on existing and future developments with transport implications in the vicinity of proposed measures.

The proposed measures will be temporary and the effect on any existing development will be negligible. Future developments will not be affected by the works.

G. Assessment of effect of proposed measures on traffic movements in adjoining Council areas.

The works will have no effect on adjoining Council areas.

H. Public consultation process

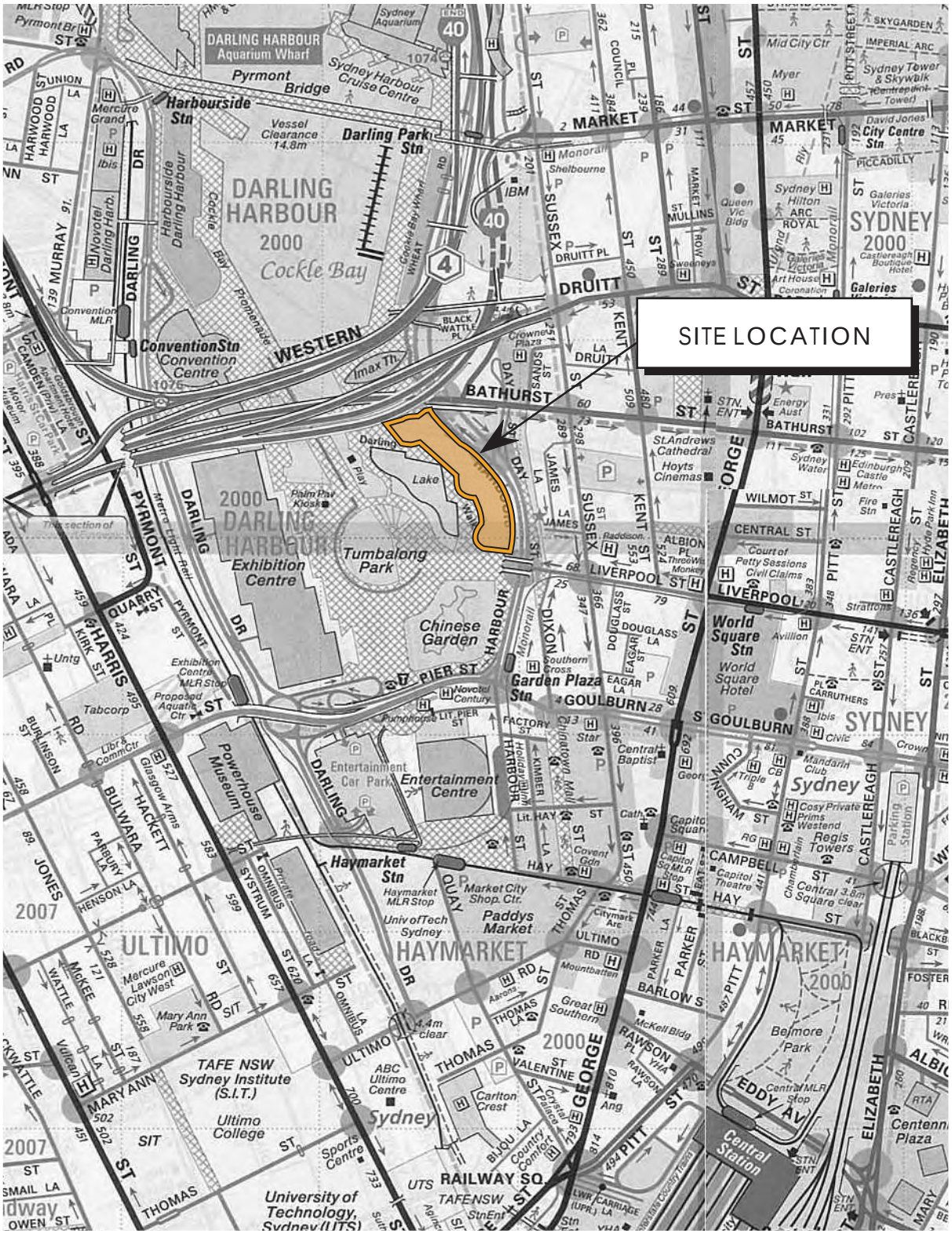
Public consultation will be undertaken in accordance with the conditions of consent. RTA and SHFA will be consulted on the use of Hickson Road for marshalling of trucks. In addition, SHFA will be consulted regarding installation of Hoardings on the western side of the site. Any other parties suggested for consultation by SHFA will be spoken to directly.

The name and telephone number of the Construction Manager are as follows:

Name:	Richard Eaton
Contact (Mobile No):	0408 252 679

SITE LOCATION

DARLING WALK



MASSON | WILSON | TWINEY

TRAFFIC AND TRANSPORT CONSULTANTS

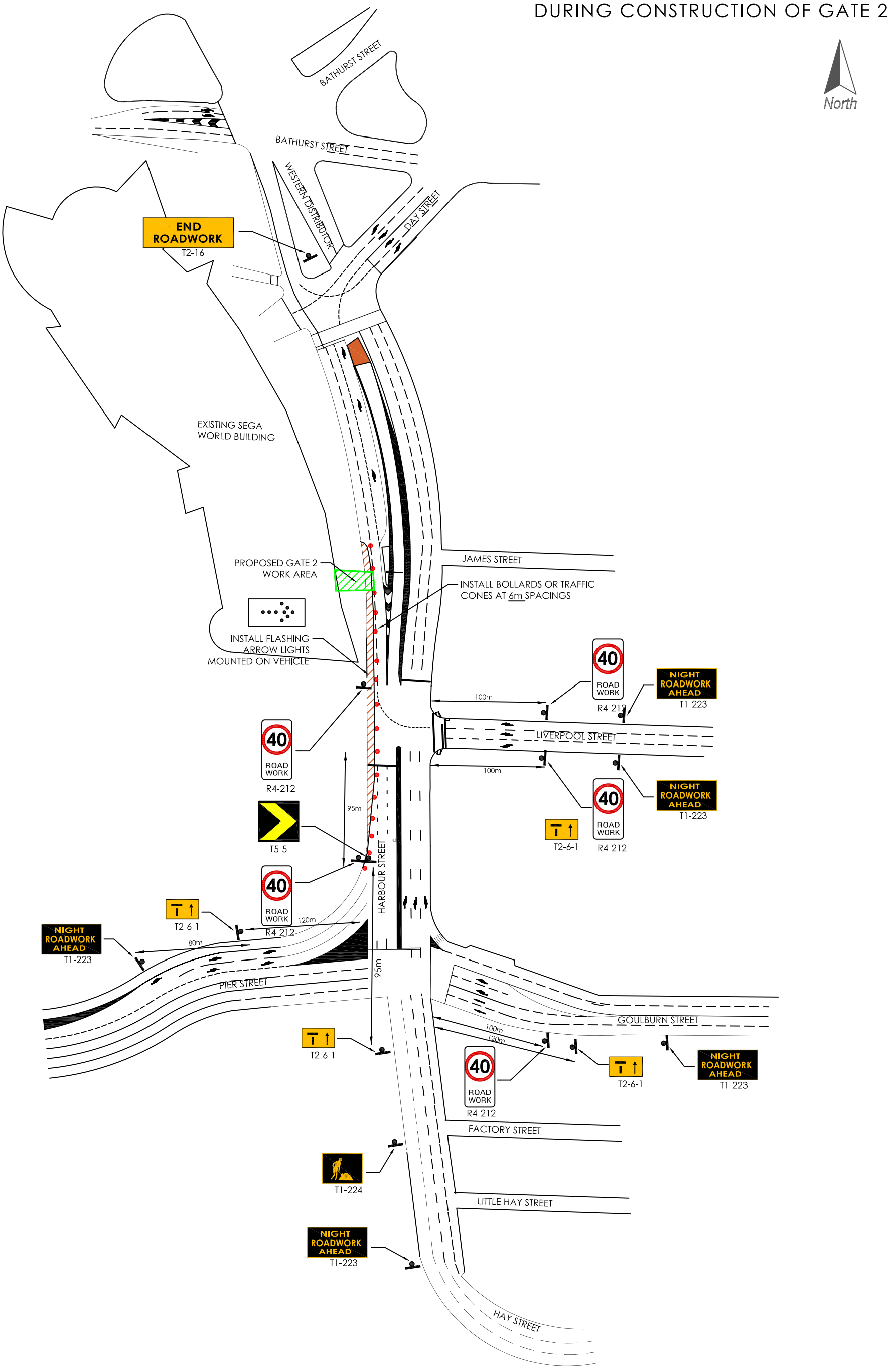
Figure 1

Filename: 073372di01.ai

Date: 2 April 2008

DARLING WALK

TRAFFIC CONTROL PLAN FOR CLOSURE OF KERBSIDE LANE IN HARBOUR STREET DURING CONSTRUCTION OF GATE 2



Scale: N.T.S.

MASSON | WILSON | TWINEY
TRAFFIC AND TRANSPORT CONSULTANTS

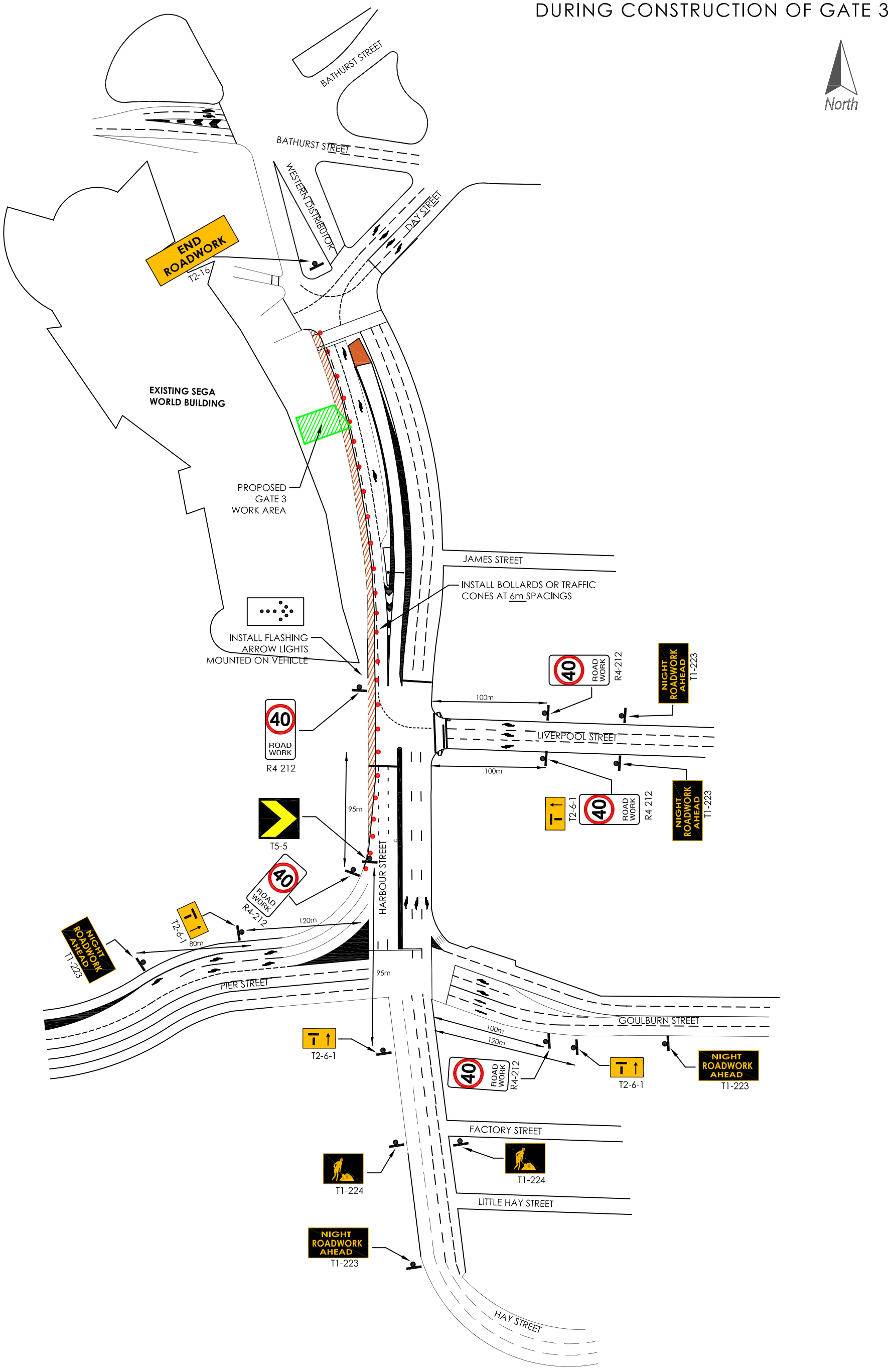
Filename: 073372da30_GATE-2_TMP

Figure 2

Date: 04.April.2008

DARLING WALK

TRAFFIC CONTROL PLAN FOR CLOSURE OF KERBSIDE LANE IN HARBOUR STREET DURING CONSTRUCTION OF GATE 3



Scale: N.T.S.

MASSON | WILSON | TWINEY
TRAFFIC AND TRANSPORT CONSULTANTS

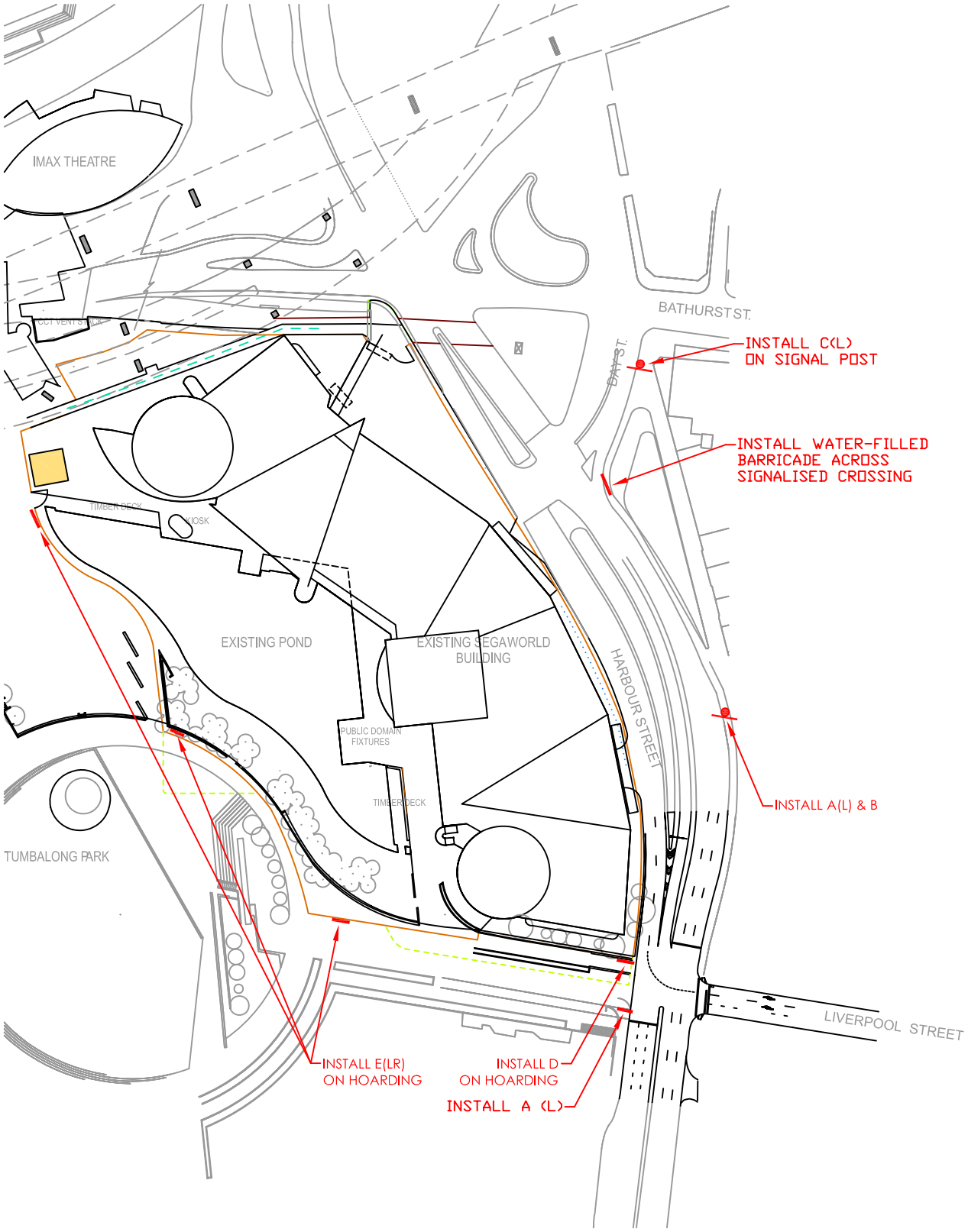
Filename: 073372da31_GATE-3_TMP

Figure 3

Date: 04.April.2008

DARLING WALK

PEDESTRIAN WAY - FINDING SIGNAGE PLAN



Scale: N.T.S.

MASSON | WILSON | TWINEY
TRAFFIC AND TRANSPORT CONSULTANTS

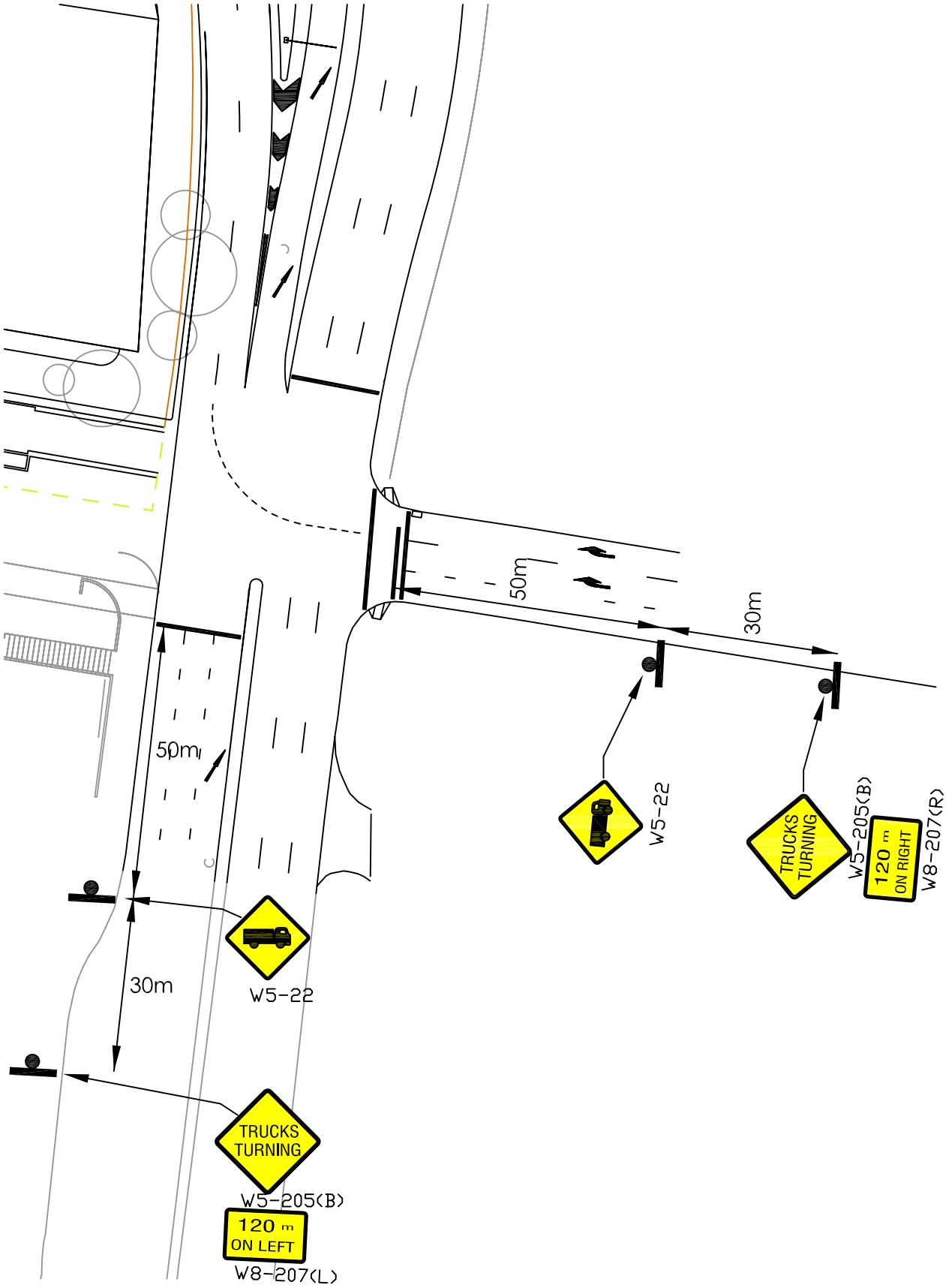
Figure 4

Date: 04.April.2008

Filename: 073372da33 Pedestrian Way finding Signage Plan

DARLING WALK

TRUCK WARNING SIGNAGE PLAN



Scale: N.T.S.

MASSON | WILSON | TWINEY
TRAFFIC AND TRANSPORT CONSULTANTS

Figure 5

Date: 04.April.2008

Filename: 073372da32 Truck Warning Signage

Appendix A - Main Works Establishment Plans

IMAX THEATRE

EWAY OVER HEAD SHOWN HED

FREEWAY OVER HEAD SHOWN DASHED

CONTINUOUS ACCESS TO CCT KIOSK TO BE PROVIDED

TUNNEL ENTRY RAMP

CCT VENT STACK

BATHURST STREET

SITE ACCOMMODATION

CAROUSEL

CCT KIOSK

PED. ACCESS TO PYRMONT/ DARLING HARBOUR & ULTIMO MAINTAINED

EXISTING GASSING STATION TO BE PROTECTED CONTINUOUS ACCESS TO BE PROVIDED

DAY STREET

SECURITY CABIN

CBD ACCESS MAINTAINED

ACCESS TO EXISTING CCT VENT STACK TO BE PROVIDED FOR MAINTANANCE.

SITE OFFICE

CONSTRUCTION WORKERS GATE

RAMP UP

GATE 5 TRUCK ENTRY ONLY

GATE 4 TRUCK ACCESS

SHAKER GRID

SEDIMENT BASIN

CLASS 'A' HOARDING TO FOLLOW EXISTING KERB

HARBOUR STREET

TUNNEL ENTRY RAMP

GATE 2 RELOCATED TRUCK ENTRY ONLY

FUTURE ACCOMMODATION/ SUB CONTRACTOR OFFICES

TUMBALONG PARK

ACCESS GATES

GATE 1 FUTURE ACCESS

LIVERPOOL S

DARLING HARBOUR, ULTIMO & PYRMONT PEDESTRIAN ACCESS MAINTAINED

LEGEND

- EXISTING STRUCTURE COLUMNS TO BE RETAINED
- SITE SHEDS
- CLASS 'A' HOARDING STAGE 1
- 3M HIGH PLYWOOD SCREEN ON FOOTBRIDGE COMPLETE WITH HANDRAIL
- PROPOSED BASEMENT FOOTPRINT ENCLOSED BY JERSEY KERB WITH FENCE PANEL OVER
- MATERIAL HANDLING/ TEMPORARY ROADS
- EXCAVATION RAMP

NOTES

IN-GROUND SERVICES AND SERVICES PITS WILL BE PROTECTED DURING WORKS.

PEDESTRIAN MANAGEMENT PLAN TO BE PREPARED & ACCESS ISSUES TO BE ADDRESSED.

LIGHTS ADJACENT TO PUBLICALLY ACCESSED WALKWAYS TO BE RETAINED

0 10 20 50 m

DARLING WALK

BULK EXCAVATION PHASE PLAN 1:1000 @ A3 17/04/2008 DC 003

PROJECT DOCUMENTATION

fjmt francis-jones morehen thorp

Bovis Lend Lease

Lend Lease Development

IMAX THEATRE

WAY OVER HEAD SHOWN
IED

FREEWAY OVER HEAD SHOWN
DASHED

CONTINUOUS ACCESS TO CCT
KIOSK TO BE PROVIDED

TUNNEL ENTRY RAMP

CCT VENT STACK

SITE ACCOMMODATION

CAROUSEL

CCT KIOSK

PED. ACCESS TO PYRMONT/ DARLING
HARBOUR & ULTIMO MAINTAINED

EXISTING GASSING STATION TO BE PROTECTED
CONTINUOUS ACCESS TO BE PROVIDED

BATHURST STREET

DAY STREET

SECURITY CABIN

CBD ACCESS MAINTAINED

ACCESS TO EXISTING CCT
VENT STACK TO BE PROVIDED
FOR MAINTANANCE.

SITE OFFICE

CRANE

R 75,000

CONSTRUCTION
WORKERS GATE

GATE 5 TRUCK
ENTRY ONLY

GATE 4
TRUCK ACCESS

SEDIMENT BASIN

PROPOSED GROUND FLOOR
FOOTPRINT

CLASS 'A' HOARDING TO
FOLLOW EXISTING KERB

STAGE 1

TUNNEL ENTRY RAMP

HARBOUR STREET

CRANE

R 65,000

GATE 2
TRUCK
ENTRY ONLY

FUTURE ACCOMMODATION/
SUB CONTRACTOR OFFICES

JAME

TUMBALONG PARK

ACCESS GATES

GATE 1

LIVERPOOL ST

DARLING HARBOUR, ULTIMO &
PYRMONT PEDESTRIAN ACCESS
MAINTAINED

LEGEND

- EXISTING STRUCTURE COLUMNS TO BE RETAINED
- SITE SHEDS
- CLASS 'A' HOARDING STAGE 1
- 3M HIGH SCREEN ON FOOTBRIDGE COMPLETE WITH HANDRAIL
- PROPOSED BASEMENT FOOTPRINT ENCLOSED BY CHAIN WIRE FENCE
- LOADING ZONE/ MATERIAL HANDLING
- MAN & MATERIAL HOIST

NOTES

IN-GROUND SERVICES AND SERVICES PITS WILL BE PROTECTED DURING WORKS.
PEDESTRIAN MANAGEMENT PLAN TO BE PREPARED & ACCESS ISSUES TO BE ADDRESSED.
LIGHTS ADJACENT TO PUBLICALLY ACCESSED WALKWAYS TO BE RETAINED

0 10 20 50 m

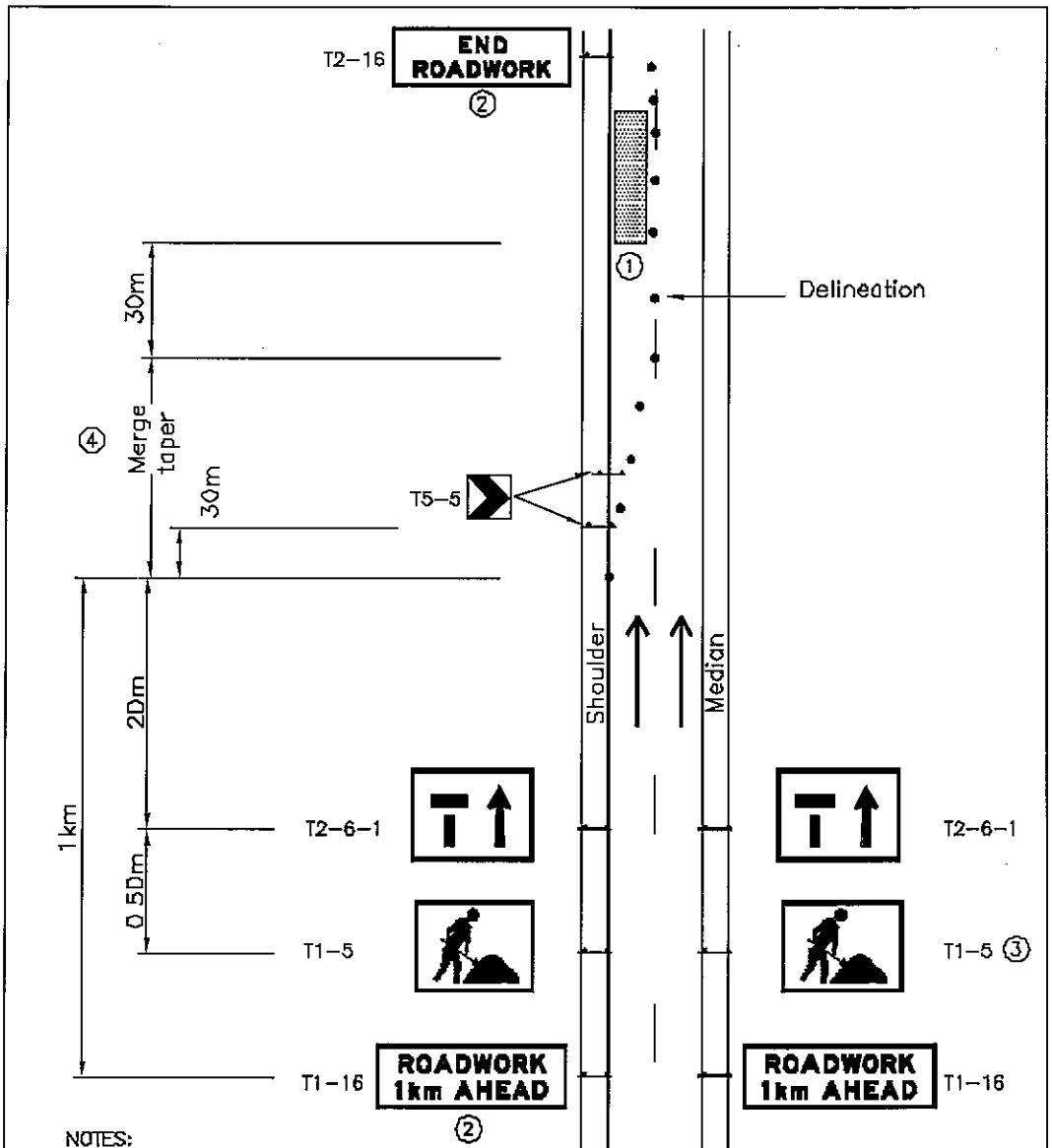
DARLING WALK MAIN WORKS-ESTABLISHMENT PLAN

1:1000 @ A3 17/04/2008 DC 002

PROJECT DOCUMENTATION

fjmt francis-jones morehen thorp | Bovis Lend Lease | Lend Lease Development

Appendix B - Standard TCPs and Symbols



NOTES:

① No personnel movement into right–hand lane.

② Signs T1–16 and T2–16 are optional where ADT is less than 10,000 vehicles per day.

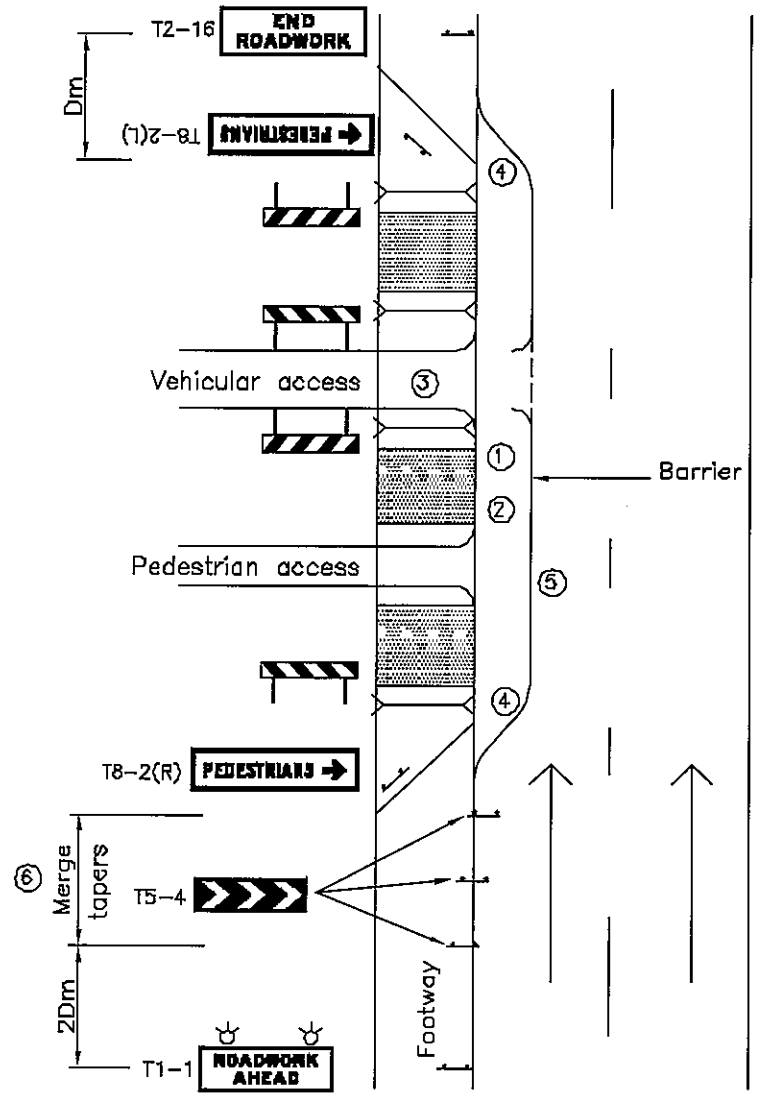
③ T1–16, T1–5 and T2–6–1 signs may be duplicated in accordance with Section 3.2.4, *Duplication of Signs*.

④ The length of merge tapers is to be determined from *Traffic Control at Work Sites*, Table 5.2, *Recommended taper lengths*.

SHORT TERM WORK (UP TO ONE DAY)
2 LANE / DIVIDED

T000092

TCP 92



NOTE:

(1) Prohibit vehicles stopping along the length of narrowed carriageway.

(2) Provide a minimum clear width of 1.2m (desirable 2.0m) for pedestrian traffic and a minimum traffic lane width of 3.0m (desirable 3.5m).

(3) Arrange vehicular access across the work area using portable barriers or plastic mesh fencing.

(4) Provide a full width temporary ramp for prams and an all-weather surface on all pedestrian areas.

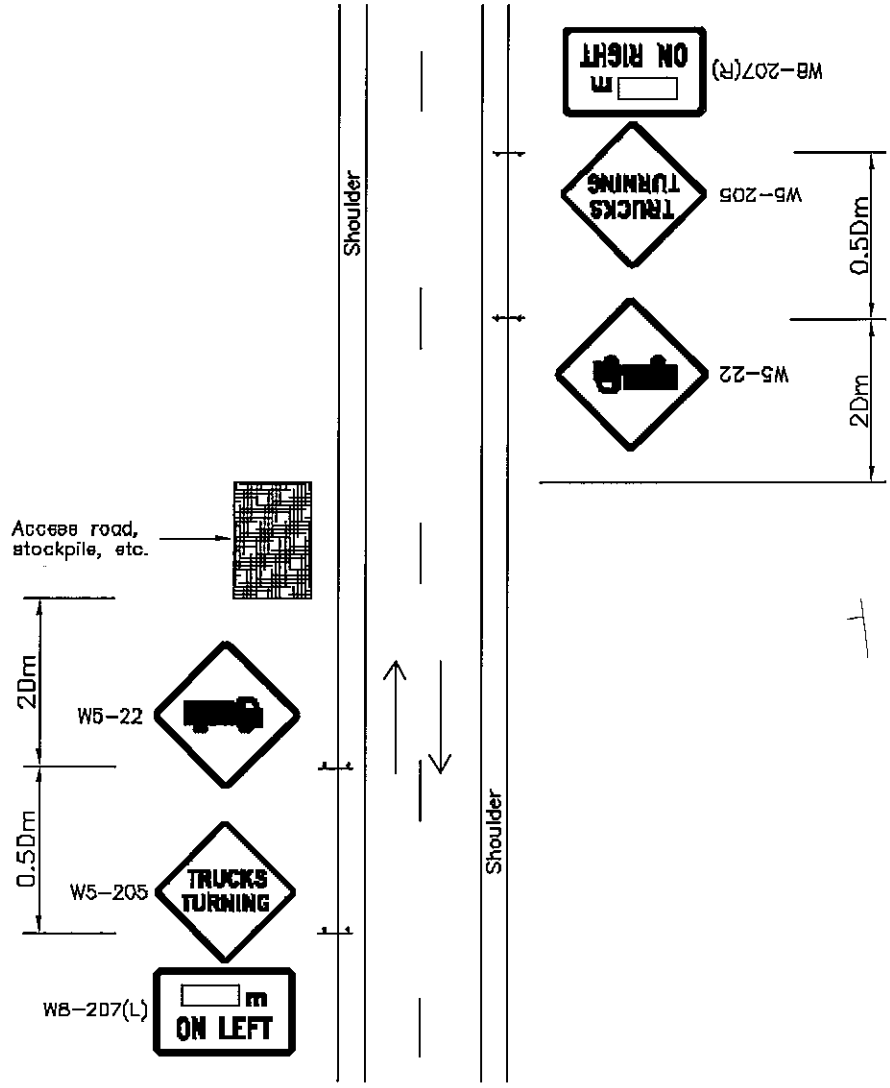
(5) Ensure that the requirements of *Traffic Control at Work Sites*, Section 3.6, *Safe clearances between workers and through traffic*, are met for pedestrians.

(6) The length of merge tapers is to be determined from *Traffic Control at Work Sites*, Table 5.2, *Recommended taper lengths.*

LONG TERM WORK
ALL ROADS
WORK OCCUPY THE FULL WIDTH OF A FOOTWAY

T000109

TCP 109



NOTE:

(1) For use where roadside is generally undeveloped, ADT is more than 1,500 vehicles per day, sight distance is restricted and there are more than 20 truck movements per shift.

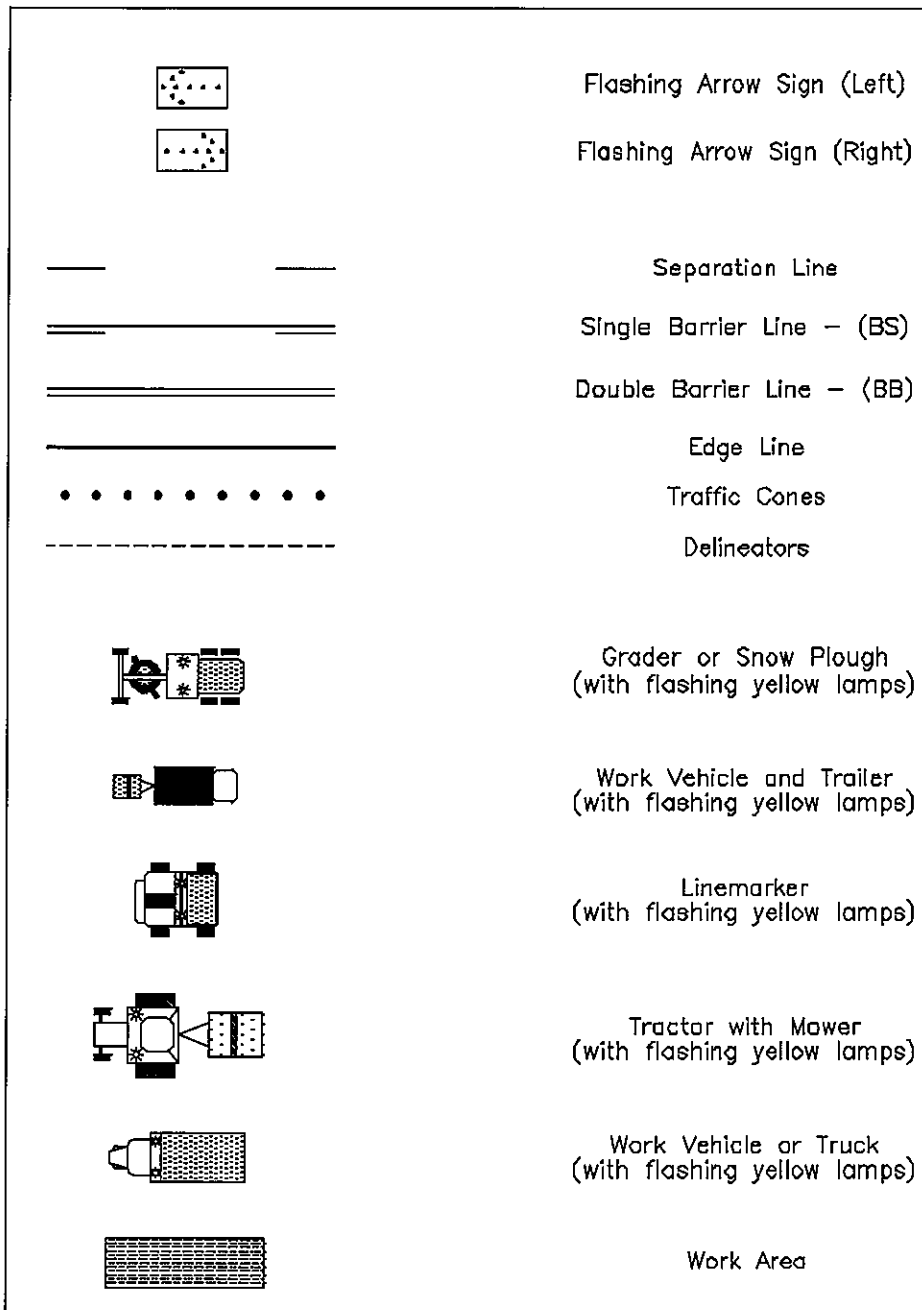
(2) See *Traffic Control at Work Sites*, Section 7, *Providing for works traffic*.

(3) See *Traffic Engineering Manual*, Section 19, *Miscellaneous devices*.

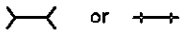
ACCESS TO DEPOT, STOCKPILE, QUARRY, GRAVEL PIT ETC.
ALL ROADS

T000195

TCP 195


Flashing Arrow Sign (Left)
Flashing Arrow Sign (Right)
Separation Line
Single Barrier Line – (BS)
Double Barrier Line – (BB)
Edge Line
Traffic Cones
Delineators
Grader or Snow Plough
(with flashing yellow lamps)
Work Vehicle and Trailer
(with flashing yellow lamps)
Linemarker
(with flashing yellow lamps)
Tractor with Mower
(with flashing yellow lamps)
Work Vehicle or Truck
(with flashing yellow lamps)
Work Area
LIST OF STANDARD SYMBOLS
SHEET 1 OF 3
T000358

T000358

	Antiglare screen
	Barrier Board Position
	Barrier Board
	Daytime Strobe
	Flashing Yellow Lamps (for sign mounting)
	Rotating Flashing Yellow Lamps (for vehicle mounting)
	Traffic Controller
	Reflector Carrier & Spotter
	Sign – single sided
	Sign – double sided
	Traffic Signal Position
	Traffic Signal Display
	Pedestrian Containment Fencing

LIST OF STANDARD SYMBOLS
SHEET 2 OF 3

T000359

T000359

Appendix C - General Notes on Traffic Control Plans

These requirements apply when workers are working within the road reserve.

Standard RTA TCP

- Those requirements shown in the standard RTA TCP's should be referred to by the personnel on site, including signs, advance warning lengths, taper lengths, etc.
- The minimum RTA certification for personnel on site involved in the supervision or installation of temporary construction traffic arrangements should include RTA's "Introduction to Traffic Control at Road works" and "Traffic control Using a Stop / Slow Bat".

Work Clearances

- The RTA Guidelines require a clearance of 1.2m and over between the edge of the work area and the nearest edge of a lane carrying traffic when there is no intervening physical barrier. In addition, to the clearance the following is required as a minimum:
  - A Workers symbolic (T1-5) sign in advance of the work area.
  - Delineation of the edge of the traffic lane with cones, bollards or similar means.

Signs

- T1-5 (digger symbol) must only be used when personnel are on the road and should be covered at other times. This symbolic sign is required at all road works sites.
- Sign size A is considered appropriate on local roads.
- All signs must be kept a minimum of 1m from the travel path.

Nightworks

- Flashing arrow signs are essential at night for lane closures.
- Signs for nightworks should replace standard signs used during daylight
- The work area is to be fully lit by floodlighting
- Cones and bollards used to delineate edge of traffic lane shall have retro-reflective band of Class 1 material.

Excavations

- Excavations shallower than 0.5 metres and within 3.0 metres of the travel path or edge line shall be defined by plastic mesh fencing, barrier boards (perpendicular to the traffic flow), cones, bollards or similar delineation while the adjacent lane is not under traffic control.
- Should the above requirement not be fulfilled, then RTA TCP 108 may be used in lieu of RTA TCP 109.

Delineation

- Barrier boards shall be located at right angle to the travel path or otherwise 4m from the travel path. Cones (at a spacing of 4m) are considered appropriate for day time use however may only be used when personnel are in attendance.
- All work areas should be separated from traffic and pedestrians by a minimum of mesh fencing. When used mesh fencing must be located 1.2m from the travelled path.

Disclaimer

Masson Wilson Twiney Pty Limited and its employees and officers accept no liability for any loss or damage arising as a result of any reliance placed on the information provided. Such liability is hereby explicitly excluded.

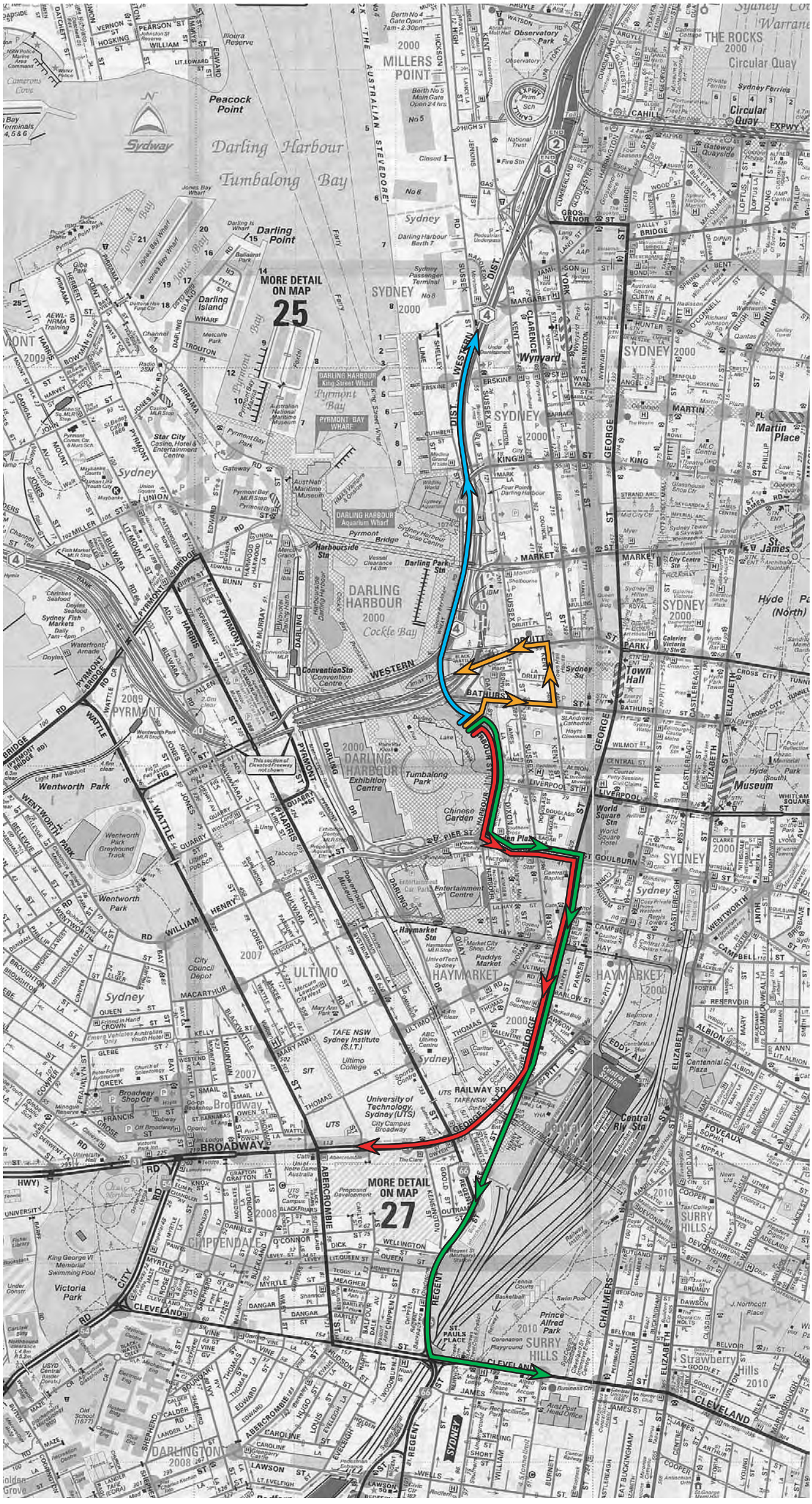
This information is general in nature. Detailed information on appropriate training and documentation of work site operations are found in the RTA Traffic Control at Work Sites 2006, Australian Standard Documents and associated Work Site Manuals. Traffic Control at work sites must be undertaken with specific reference to Work cover Requirements and the Companies own Occupational Health and Safety Manuals.

Appendix D - Routes of Construction Trucks

TRUCK ROUTES DURING BULK EXCAVATION

DARLING WALK PROJECT

North



Key

- To North via Harbour Bridge
- To West via Goulburn St, George St and Broadway
- To South via Goulburn St, George St, Regent St, Clevenland St and South Dowling St
- West via Day St, Bathurst St, Kent St, Druitt St and Western Distributor

MASSON | WILSON | TWINEY

TRAFFIC AND TRANSPORT CONSULTANTS

Figure 1

Filename: 073372di05.ai

Date: 11 June 2008

Appendix E - Traffic Planning Certificate

Design Audit Traffic Plans

RTA

Certificate No. **2243002144**

Kamoru ADETUNMBI

Expiry Date: 29/12/2009

Signature

This is not proof of identity

Appendix F - Stormwater Diversion Works TMP

Stormwater Diversion Works TMP

Introduction

Traffic and pedestrian management plans for demolition of the Sega World Building and for main construction of the new development were prepared by Masson Wilson Twiney on behalf of Bovis Lend Lease Pty Ltd.

As part of the construction of the new building it is necessary to carry out the diversion of a stormwater culvert that presently crosses the site onto a route around the site and then join an upstream section of the existing culvert.

This report forms a component of the Development Application for the proposed stormwater diversion works from the public domain on the western side of the Sega World Building, in the access way between the two Liverpool Street footbridges and to the western footpath of Harbour Street.

1.1 Description of the Works

The stormwater diversion works involve diversion of the existing stormwater pipe that runs from the pond in the public domain area on the western side of Sega World, then under the Sega World Building, to the western footpath of Harbour Street. In order to construct the basement carpark, it will be necessary to remove the section of the pipe under the Sega World building and divert this pipe around the site. The new culverts will be laid in trenches with depths varying from 2.7m to 4.7m. There will also be miscellaneous delivery and pick-up of excavators, shoring and rollers or compacting equipment.

The works will involve:

- Excavation of trenches and loading of around 3,000m^3 of spoil into approximately 300 trucks for disposal in landfill
- Casting of concrete culvert bases in-situ – around 30 truckloads of concrete will be required
- Installation of pre-cast crowns – around 25 truck deliveries will be required
- Filling of trenches with selected backfill or pavement material – around 60 truck deliveries will be required.

- Mobile crane – approximately 20 visits to lift in pre-cast crown units.
- Miscellaneous trucks (excavators/shoring/plant/sundry materials) – 30 trucks

1.2 Vehicle Types

Construction vehicles likely to be generated by the proposed construction activities include:

- articulated vehicles for delivery of machinery,
- heavy and medium rigid trucks for construction or excavation material delivery or removals,
- concrete pumps, and
- contractor vehicles and delivery vans

In general, all construction vehicles will park on-site while carrying out loading and unloading. The exception to this will be for work on Harbour Street. There will be no parking of staff cars in the site. Some staff will come by public transport as the site is located within walking distance of major public transport facilities, including train stations, monorail stations and STA bus stops. The workers who require parking for their cars will be able to park in the public pay parking stations available in the vicinity of the site.

1.3 Construction Vehicle Access Routes

Access routes for construction vehicles would depend on the location of works, and these are described as follows:

- Works in the Darling Harbour Public Domain Area and in the area between footbridges:
  - Construction/deliver trucks will either enter site directly from Liverpool Street or turn left from Harbour Street.
  - Exiting trucks will turn left into Harbour Street and either travel north via the Harbour Bridge or turn right into Day Street depending on the destination.
- Works within the Construction Site:
  - Construction/delivery trucks will enter the site from Harbour Street
  - Exiting trucks will turn left into Harbour Street, right into Harbour Street or into Day Street depending on the destination.

1.4 Construction Traffic Volumes

The number of trucks visiting the site during the 18 weeks of stormwater diversion works is estimated to be as follows:

• Spoil from excavation	300 trucks
• In-site concrete bases	30 trucks
• Precast crowns	25 trucks
• Backfill or road base	100 trucks
• Cranes	20 trucks
• Miscellaneous	30 trucks
• Total	505 trucks

This is equivalent to an average of around six trucks per day, and a maximum of ten trucks per day.

It is noted that the works will be carried out simultaneously with the demolition of the Sega World Building during which 30 trucks per day will visit the site. In combination, the demolition and stormwater works will generate a total of about 40 trucks per day.

2. Traffic Impacts of the Works

2.1 Impact of Construction Traffic

Harbour Street currently carries around 1,200 vehicles per hour in each direction during the morning and evening peak hours. These include some vehicles travelling to the Sega World complex which would cease when construction works commence. Compared with the background traffic on Harbour Street, the combined volume of demolition and stormwater diversion traffic would be minimal.

Accordingly, the estimated maximum truck generation of 40 trucks per day (demolition and stormwater works) would have minimal impact on traffic operation in Harbour Street.

2.2 Pedestrian Access

Pedestrian access along the western footpath of Harbour Street will be closed during the construction works as described in the MWT Main Traffic Report.l

Western Side:

Pedestrians walk in the public domain area between the Sega World building and the pond and also between the pond and Tumbalong Park. Although hoardings will be installed along the western frontage of the site, access will be maintained for pedestrians on the eastern side of Tumbalong Park and along the eastern side of the children's playground.

Northern Side

Pedestrians walk from Bathurst Street across the footbridge into the Sega World building and along the western side of the building. This pedestrian footbridge will remain open to pedestrians during the works. However access to Sega World from the footbridge will be closed by A Class Hoarding.

Southern Side

Pedestrians walk from Liverpool Street across the Liverpool Street footbridges to the public domain area west of the site. Access for pedestrians will continue to be available via the Liverpool Street footbridges.

Pedestrians also walk along the footpath in Harbour Street and enter Tumbalong Park via the at-grade pedestrian access between the two footbridges in Liverpool Street. The stairs from the Harbour Street footpath up to the southern Liverpool Street footbridge will remain open for these pedestrians. Pedestrians with walking difficulties who may not be able to use these stairs will be directed to use the at-grade access to the Chinese Gardens via the northern footpath of Pier Street, around 100m to the south. Advisory signs will be placed at the corner of Pier Street and Harbour Street and also south of Liverpool Street.

3. Assessment of Traffic Management Plan

An assessment of the traffic impacts of the stormwater diversion works has been undertaken in accordance with the RTA Guidelines for preparing a traffic management plan. The required assessment of the Traffic Management Plan is provided below.

A. Description or Detailed Plan of the Proposed Measures

The stormwater diversion works generally include the following:

- Excavation of trenches and loading of around 3,000m^3 of spoil into approximately 300 trucks for disposal in landfill
- Casting of concrete culvert bases in-situ – around 30 truckloads of concrete will be required
- Installation of pre-cast crowns – around 25 truck deliveries will be required
- Filling of trenches with selected backfill or pavement material – around 100 truck deliveries will be required.
- Cranes – 20 trucks
- Miscellaneous deliveries – 30 trucks

The Class-A Hoardings installed for demolition of the site will necessitate closure of footpath. Some aspects of the work will also require closure of the at-grade pedestrian access into Tumbalong Park from the western footpath of Harbour Street.

Standard RTA Traffic Control Plans (as required) are recommended in accordance with AS1742.3 and RTA Guidelines. The traffic control plans will be implemented to inform the public and minimise impact of the works.

B. Identification and Assessment of Impact of Proposed Measures

During the stormwater works, the number of construction trucks expected to visit the site will be a maximum of 10 trucks per day. The impact of the construction trucks on the operation of the signalised intersections of Harbour Street with Liverpool Street and Day Street will be minimal as the existing traffic visiting the Sega World Building will be eliminated on commencement of demolition.

Implementation of standard RTA Traffic Control Plans will ensure that adequate warnings and guidance are available to other road users, thus minimising the impact.

On Harbour Street, it is proposed to close the footpath on the western side for the duration of the works. Pedestrians will use the footpath on

the eastern side of Harbour Street to access the footbridges at the northern and southern boundaries of the site. The at-grade pedestrian access from Harbour Street to Tumbalong Park will also be closed to pedestrians when work is carried out between the two Liverpool Street footbridges. Alternative at-grade access to Tumbalong Park is available via the footpath in Pier Street, about 100m south of the closed access.

The signalised pedestrian crossing across Harbour Street at its intersection with Day Street will also be closed. Alternative pedestrian crossing facilities exist at the intersection of Harbour Street and Bathurst Street and also at the Liverpool Street and Bathurst Street footbridges. A pedestrian way-finding signage plan will be implemented to assist pedestrians, especially visitors, in locating alternative pedestrian facilities. Therefore the impact on pedestrians will be low.

The impact of the proposed lane closures on the operation of the intersection of Liverpool Street and Harbour Street has been assessed. When two northbound lanes will be closed, the impact was found to be low if night working hours are limited to 9:00pm to 7:00am. When only one northbound lane is closed, the traffic operation at 8:00pm is acceptable and longer working hours from 8:00pm to 7:00am are proposed.

C. Measures to Ameliorate the Impact of Reassigned Traffic

As part of the demolition traffic management plan, warning signage will be installed in Liverpool Street and Harbour Street on the approaches to the site to warn other drivers to anticipate trucks turning in and out of the site.

It is proposed to carry out the works affecting northbound traffic in Harbour Street at night when traffic volumes are lower, to reduce impact of lane closures on traffic conditions in Harbour Street. The hours of work will be limited to between 9:00pm and 7:00am when two northbound lanes are closed, and between 8:00pm and 7:00am when only one northbound lane is closed. Advance warning signs will be installed in Harbour Street on the approaches from Liverpool Street and Bathurst Street to inform drivers of closed lanes.

A pedestrian way-finding signage plan, shown in **Figure 3,** will be implemented to assist pedestrians to locate alternative pedestrian facilities in and across Harbour Street.

D. Assessment of Public Transport Services Affected

There will be no re-direction of public transport traffic during the project.

E. Details of Provision for Emergency Vehicles, Heavy Vehicles, Cyclists & Pedestrians

No change to access for emergency vehicles is proposed. Heavy vehicles will continue to have access into Harbour Street, including during lane closures at night.

There is no designated cycle route in Harbour Street. Cyclists will therefore not be affected by the proposed works.

A pedestrian way-finding signage plan will be implemented to direct pedestrians to alternative pedestrian crossing facilities, including signalised crossings and footbridges at Bathurst Street and Liverpool Street.

F. Assessment of Effect on Existing and Future Developments with Transport Implications in the Vicinity of Proposed Measures

The proposed measures will be temporary and the effect on any existing development will be negligible. Future developments will not be affected by the works.

G. Assessment of Effect of Proposed Measures on Traffic Movements in Adjoining Council Areas

The works will have no effect on adjoining Council areas.

H. Public Consultation Process

Public consultation will be in accordance with the conditions of consent. RTA and SHFA will be consulted on the use of Hickson Road for marshalling of trucks. In addition, SHFA will be consulted regarding the installation of hoardings on the western side of the site.

Bovis Lend Lease will consult with NSW Police Service regarding alternative parking arrangement at James Street during the Item 4 works, as the area is currently used for parking of staff cars.

The name and telephone number of the Construction Manager are as follows:

Name: Richard Eaton
Contact (Mobile No): 0408 252 679

Appendix 4

BLL Waste Management Plan

Bovis
Lend Lease

Darling walk
Waste Management Plan

Objectives

The objectives of the Waste Management Plan are based on the hierarchy of avoidance/reduce, re-use, recycle, treat and dispose as outlined in the National Waste Minimisation and Recycling Strategy.

To re-use and/or recycle a minimum of 80% of all Hard Waste Material, and Soft Waste Material generated on the construction site, thus achieving up to 80% reduction/avoidance in waste to landfill.

Best Practice should be adopted wherever possible, to achieve waste minimisation and reduction. Key areas that will be targeted in the Waste Management Plan are:

- To avoid, whenever possible, the generation of wastes
- Demolition Materials (including hazardous building materials i.e. asbestos)
- Construction Materials
- Excavated Fill Materials
- Domestic & Human Waste
- Wastewater
- Litter generation due to construction activities

In addition the project will:

- liaise with Subcontractors to identify areas where they can reduce waste and reuse materials in their respective trades;
- meet local, state and federal waste minimisation legislation and environmental standards;
- prevent pollution and damage to the environment; and
- protect the safety and health of our employees, site personnel and the public.

Key Management Issues

The waste management strategy has been developed from best practice models. Waste Materials generated on site are to be managed such that recycling is maximised and the volume of waste transported to landfill is minimised.

Construction waste minimisation requires early planning and establishment of "Waste minimisation Culture" by all participants in the Design, Construction and End User process. Waste minimisation is a key element in life cycle analysis, material selection and specification.

Materials selected must be fit for use. The use of building materials that are fully recycled and/or include recycled material in their production will be maximised where practicable.

All disposal documentation from construction processes should be supplied to BLL and filed in the site records for verification purposes.

Site Controls

Planning

A Waste Management Contractor will be involved in the early stage of the project to ensure effective planning for the waste management.

Major Subcontractors will be asked to submit prior to commencement on site waste minimisation details including as a minimum the following:

- practical measures associated with their works to prevent waste entering on site;
- waste streams resulting from their works which can be recycled and will be actively managed as part of their waste reduction plan; and
- alternative products containing recycled material that could be utilised in their works, in place of more traditional materials, which conform and meet with the design specification.

All suppliers of building materials will be encouraged to nominate packaging minimisation and reuse initiatives, which have been implemented, as part of product supply to the project.

Bulk handling and reusable/returnable transport containers will be encouraged.

Site set up will include measures to prevent litter entering the stormwater drains and waterways feeding to the adjacent parks, roadways and waterways.

Waste Management will be addressed at the design coordination meetings.

A Waste storage and Handling Diagram Waste will be prepared for the site showing details of the designated storage locations of Segregated waste, water / washout waste etc.

Pre Construction Phase:

Demolition

Specialist subcontractors will be used to remove classified material identified in the Hazardous Materials Report These materials will be removed separately first and disposed of in accordance with relevant Authority requirements.

Demolition will be conducted in a manner to maximise material recycling and removed from site by the demolisher . Materials such as copper , aluminium , steel , concrete , masonry/ stone and timber shall be separated and transported to various recycling depots .

Construction Phase:

Excavated Fill Materials

Any fill materials identified as requiring excavation from within development footprints will, where suitable, be re-used on the site as part of the site engineering or landscape works.

In the event that excavated soils are deemed unsuitable for re-use on site, the excavated fill materials will require initial waste classification testing in accordance with relevant authorities. Depending on the outcome of the waste classification, a suitably licensed landfill will be chosen to receive and dispose of the soils. Appropriate waste documentation and permits will be maintained throughout this process.

Options for either re-use or off-site disposal of excavated soil materials will be assessed at the design stage of the project.

Waste Bins

The Subcontractors will be responsible for the daily cleaning of their respective work areas and placing of their waste in the bins.

Adequate number of litter bins be made available within the construction site areas, including work and lunch areas. These bins will be regularly emptied.

The Subcontractors working on site will place all their waste in the bins on site.

Waste Water / Washout Areas

Washout processes and facilities for paint and/or finishing trades are to be minimised and water recycling for these activities are encouraged where possible.

Utilisation of BLL guidelines/management plan for disposal of paint and associated wastes are to be implemented.

Finishing trades washout facilities will NOT be plumbed to any building services and will be of a stand-alone nature. The maintenance of these facilities should be the subcontractor's responsibility and should comply with all appropriate Environmental Legislation and local authority guidelines.

Packaging

All suppliers of building materials will be encouraged to nominate packaging minimisation and reuse initiatives, which have been implemented, as part of product supply to the project. Bulk handling and reusable transport containers will be encouraged.

Recycled Materials

Suppliers will be encouraged to nominate products that include a recycled component and ability/opportunity for recycling of unused components in accordance with the specified 80% waste reduction target. Product selection will include a selection factor associated with recyclability and percent of recycled product.

Domestic & Human Waste

All domestic waste including litter will be managed via a similar bin system that will be provided in the vicinity of designated eating areas, kiosks and kitchen. Materials collected for recycling will include:

- Paper/Cardboard
- Food waste
- Aluminium Cans
- Drink containers: Glass & co-mingled
- General waste

Construction and demolition waste bins and domestic waste bins will be located in separate designated areas on the site to ensure appropriately safe storage and collection of waste. Waste areas will be clearly signposted and colour coordinated to define acceptable waste types suited for each bin and secured where required. The location of the waste bins and recycling areas will be marked on the site waste management plans.

All human waste and associated waste water will be collected via the provision of portable toilet and sanitary systems during the construction and demolition period. Where practicable, temporary connection will be made to the existing sewer services on site. Where these facilities are too remote to prevent connection, a licensed waste contractor will be appointed to manage the waste collection and disposal in addition to general maintenance and cleaning of the toilets.

Training

Communication and education material on the waste management system will be part of the Site Environmental Awareness Program that will be incorporated into the site induction program.

Additional third party training will be investigated when a waste contractor is nominated.

The responsibility to ensure that waste materials go into the correct bins will be with everyone on site.

Performance Measures

A Waste Management Contractor will be involved in the early stage of the construction project to ensure effective planning for the waste management.

The Waste Management Contractor will coordinate waste recycling, recovery and disposal of all waste during all stages of the project.

The waste system (bins / signage / training) is in place prior to any major waste generation works.

All waste transportation and disposal documentation to be maintained on-site and signed as received or disposed by the appropriate contractor or waste receiving facility.

Destination of all wastes to be approved by the receiving waste facility prior to the commencement of works.

Monitoring and Reporting

The Waste Management Contractor will be responsible for providing monthly reports to the SM: the number and size of bins taken away, tonnage's and m^3 taken away and tonnage's and m^3 recycled. This will include the final destination of materials for recycling.

The Waste Management Contractor will be responsible for providing dockets to the SM for the removal and appropriate disposal of scheduled waste from the project.

The SM will produce monthly reports and other statistic information as per BLL EH&S requirements.

The BLL Project EH&S Manager will formally audit the progress on waste management from the above monthly reports to ensure waste reduction targets are met and appropriate waste documentation maintained.

Corrective Actions

Non-conformances are to be recorded by way of the System Defects.

The Subcontractor and BLL SM/CM if applicable shall review and analyse the cause of detected non-conformance and develop a corrective action to prevent recurrence. Details of the non-conformance including any immediate corrective actions undertaken are to be recorded, reviewed and accepted by the CM.

It is the responsibility of the CM to immediately initiate corrective actions following approval. The non-conformance and corrective action must include details of the action proposed, desired performance target and action close out date. The system defects report should be signed, dated and filed.

All corrective and preventative action taken by the Subcontractor will be carried out by and at the cost of the Subcontractor.

If such corrective and preventative action leads to further non-conformance, any further action shall be subject to approval by the CM in consultation with the Project EH&S Manager.

Waste Management Implementation Plan

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
Waste Identification					
A Waste storage and Handling Diagram Waste will be prepared for the site showing details of the designated storage locations of Segregated waste, water / washout waste etc.	Prior to works commencing	In accordance with the Waste Management Plan.	CM/SM	Review of Diagram prior works commencing.	Diagram Map prepared & containing all relevant details.
Hazardous building materials to be identified in Hazardous Materials Building Survey	prior demolition works commencing	Independent surveyor to prepare a Hazardous Materials Register	CM	To be reviewed by PM and incorporated into WMP.	Preparation of a functioning HazMat Register for building materials.
Project waste types to be identified and quantified.	Prior to works commencing	Coloured bins will be supplied for the nominated waste streams in accordance with the Waste Management Plan.	CM/ PM	To be reviewed by PM and incorporated into Waste Management Plan.	List of relevant waste streams and volumes from construction & demolition.
Waste Disposal					
Remove all hazardous building materials off-site.	Prior demolition works	Appropriately licensed contractor to remove and transport waste to licensed landfill	SM	Air quality monitoring daily. Clearance Survey by hygienist as required.	Non detect asbestos during ambient air monitoring. Landfill disposal dockets.
Segregation and storage construction/ demolition and domestic waste prior off site disposal.	At all times	Waste contractor to address and follow legislative requirements.	SM	Weekly inspection of Waste Collection Areas.	No cross contamination of wastes. No spillage or loss of wastes from collection containers in storage compound. Waste Dockets.
Transport and handling of demolition/ construction waste and domestic waste by licensed contractors.	At all times	Only approved contractor to be used. Appropriate SWMS for transportation of waste	SM	Random inspection of waste transport licenses. Random inspection of waste transport vehicles.	Correct covers and containers for waste transfer. No spillages/loss of waste during transport.
Demolition/ construction and domestic waste disposal to correct licensed waste receiving facilities.	All times	Only approved waste receiving facilities to be used.	SM	Waste classification reports. Inspect as required.	Waste disposal dockets correspond to waste types/ volumes.
Disposal of excavated fill materials deemed for off-site disposal.	Prior construction	Waste soils (if any) classified in accordance with	SM	Waste classification reports. Inspect as required.	Waste disposal dockets correspond to waste types/

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
		relevant authority Guidelines (eg: DEC, EPA etc). Licensed waste contractor and landfill used			volumes.
Collection and storage of wastewater from site operations (i.e. paint washing) or temporary facilities (i.e. toilets).	At all times.	Design and installation of appropriate wastewater collection/storage system.	SM	Weekly inspection of bunds, drains and sumps.	No wastewater spills or uncontrolled discharges.
Appropriate disposal of all wastewater from site operations (i.e. paint washing) or temporary facilities (i.e. toilets).	At all times	Collection and disposal of wastewater by approved licensed contractor	SM	As required	Waste disposal dockets correspond to waste types/ volumes.
Recycling					
Waste building or demolition materials (i.e. concrete, timber, steel, etc) to be segregated and stored in separate site bins.	All times	Appropriately designed waste storage areas with designated recycling bins.	SM	Weekly inspection	Clean waste bin area. No cross contamination of waste types.
Segregated waste building/demolition materials are appropriately recycled.	All times	Approved waste recycling contractor to collect bins for recycling.	SM (Environment Manager if appropriate)	Established collection schedule. Audit actual recycling volumes compared to waste recycling targets (%).	Waste recycling dockets. Waste recycling targets are met.
Minimisation					
Excavated material to be reused or recycled where possible.	As required	Independent contractor to test soils for environmental/ geotechnical parameters.	CM/SM	Soil testing report to confirm suitability for re-use. Review by Environment Manager.	No contaminated soils re-used on site.
Any fill imported onto the site is to consist of certified clean material only	As required	Indentation of material	CM/SM	Certificate of suitability.	Certificate provided prior to bring to site.
Minimise packaging and maximise use of recycled products by contractors.	At all times	Review contractor materials and packaging proposals	CM/SM	Inspect material deliveries/ specifications.	Proven examples of minimal packaging and recycled materials.
Site Offices					
Recycling bins shall be provided with the site working area.	As required	Coordinated with existing operational facility	CM/SM	Ensure waste is disposed in accordance with existing operations	monthly EH&S Managers review
Site amenities shall be provided on-site as required	Prior to works commencing	Coordinated with site population numbers	CM/SM	Ensure waste is disposed in accordance with	all waste disposed of appropriate

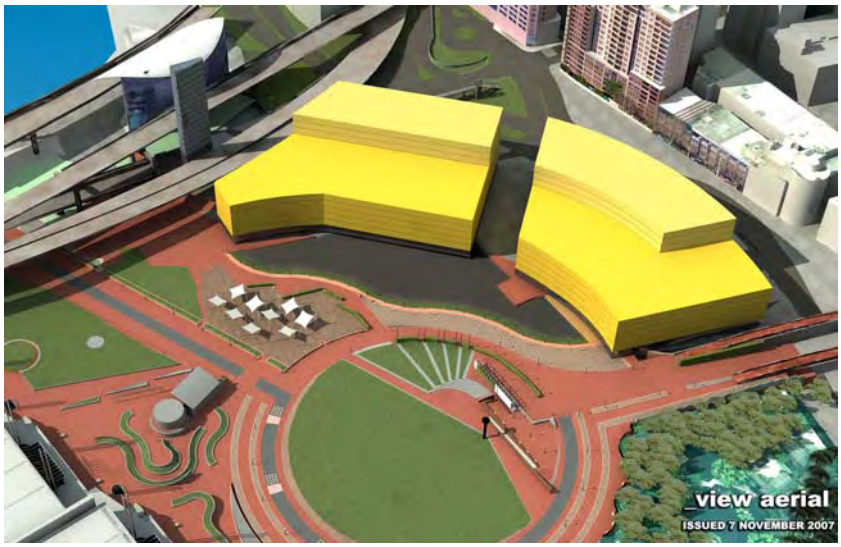
Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
				existing facilities requirements	

Appendix 5

Hyder Consulting Stormwater , Erosion and Sediment Control Plan

Bovis Lend Lease

Darling Walk: Site Stormwater and Erosion and Sediment Control Report



April 2008

Report no:NS03788-ES

Hyder Consulting

Bovis Lend Lease

Darling Walk: Site Stormwater and Erosion and Sediment Control Report

Author: Michael Kurtz

Checker: John McDermott

Approver: John McDermott

Report no: NS03788-ES Revision 03 Date: April 2008

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Contents

1 Introduction

The major project (MP 06_0054) to which this report relates is the Darling Walk Entertainment Complex.

The major project includes the demolition of the existing SEGA centre complex and construction of a campus style commercial development comprising two 9-storey buildings. The site is bounded by Harbour Street to the east, the extension of Liverpool Street to the south, Tumbalong Park to the west and the Western Distributor to the west and is located in the south-eastern sector of Darling Harbour (Refer Appendix A).

The major project comprises:-

- Demolition of existing structures on the site including the SEGA centre complex;
- Excavation to a depth of around 12 metres below existing ground level to accommodate the proposed basement car park;
- Associated roadworks on Harbour Street;
- Adjustments to signalised intersections to suit proposed site entry and exit points;
- Diversion of stormwater drainage from James Street via Harbour Street and along the extension of Liverpool Street;
- Construction of the proposed development with a maximum 68,000m^2 of GFA of commercial floor space, including up to 5,000m^2 GFA of retail floor space and up to 1,000m^2 GFA of floor space for cultural, recreation and entertainment uses,
- Construction of two buildings up to a maximum height of 37.3m AHD.
- Basement car parking totalling 800 car spaces including 200 spaces to service the commercial buildings and a 600 space public carpark; and
- Public domain improvements including a new pedestrian path through the site.

2 Site Stormwater

2.1 Existing Conditions

Existing stormwater drainage infrastructure is located in the immediate vicinity of the site. This includes:

- Street stormwater drainage lines within Harbour Street,
- Hay-Lackey trunk drainage system – this system consisting of three major box culverts, is the main drainage system within Darling Harbour and is located immediately west of the site,
- James Street trunk drainage line - a Sydney Water owned line which currently runs through the middle of the site. It drains a large catchment of the city and runs down James Street, crosses Harbour Street, and through the site. It is proposed to deviate this line around the southern side of the site, along the extension of Liverpool Street. The deviated line would rejoin the Hay-Lackey line at the existing junction point.

The existing Sega Centre site currently drains into an open pond area which then overflows into the Hay-Lackey trunk stormwater drainage line.

2.2 Proposed Site Drainage Conditions

The developed site will predominantly act as a discrete catchment draining towards the western edge of the site. Some site areas such as some of the open vehicular access areas off Harbour Street may be required to drain into the Harbour Street drainage system, however this area will be minimised and not expected to affect the capacity of the existing Harbour Street drainage system. This will be subject to future detailed analysis.

The remaining catchment will predominantly comprise roof areas with some open landscaped areas to the west of the site. It is proposed that the whole of the remainder of the site will drain into the Hay-Lackey drainage line, at its existing junction point.

All roof water will be collected and drained towards a rainwater tank located along the western side of the site. The tank will be used for water reuse and the water will be reticulated back into the building for toilet flushing and other appropriate uses, as well as around the landscaped areas for irrigation. Overflow from the tank will be connected to the Hay-Lackey trunk drainage line.

Surface drainage outside of the building will be collected and taken through a GPT or a similar trash collection system prior to discharge into the Hay-Lackey trunk drainage system.

2.3 Stormwater Quality

Stormwater from the site will be discharged into existing systems which flow into Darling Harbour. It is therefore critical that the water discharged from the site is treated to a high quality prior to discharge into the existing systems.

Water from the site is sourced from two main areas, the rainwater storage tank and from the stormwater network located within the landscaped areas.

Water from the rainwater storage tanks is predominantly from roof areas. These areas will be a source of clean water and hence will not require treatment prior to discharge from the tank.

Water from the external landscaped areas, will contain trash, grit and sediments and therefore will be treated prior to discharge from the site.

Details of the treatment system is subject to ongoing design development, however it is considered likely to be a combination of controls at the source, (surface grates, trash baskets etc) and controls at the outlet (GPTs etc).

3 Erosion and Sediment Control

Prior to any earthworks commencing on the site, erosion and sediment control measures will be put in place generally in accordance with Sydney City Council requirements and Landcoms publication Managing Urban Stormwater: Soils and Construction 4th Edition, March 2004. These measures include:-

- Installation of an A-Class hoarding to the perimeter of the work site area with site access gates as required,
- Sediment control devices such as sandbags and / or sediment fences installed at existing stormwater pits,
- Retention of existing hard paved areas to minimise dust and control sediments in stormwater runoff,
- The provision of a sediment control basin as noted on the drawing utilising the existing pond and overflow to the Hay Lackey Street stormwater drainage culvert,
- Temporary diversion swales as required to direct stormwater to sediment control basin for treatment,
- The provision of a temporary truck site exit grid to service vehicles exiting the site during the construction stage.

All as noted on the Civil Engineering drawing C002 (Refer Appendix B).

2.1 Sediment Basin

The sediment control basin has been designed to cater for the catchment being approximately 2.36 hectares. The calculated capacity of 493m^3 is the minimum volume required to collect the sediment generated during the construction works (Refer Appendix C). As indicated on the architectural drawings, the basement carpark is to have a finished floor level of approximately RL -8.00 which is around 12 metres below ground surface level. The entire basement carpark area of the site will form a 'large hole in the ground'. This hole will collect water which will then be pumped into the sediment control basin.

The sediment control basin will be maintained on site throughout the excavation works ensuring that it operates effectively in accordance with Council's requirements and Landcoms publication Managing Urban Stormwater: Soils and Construction 4th Edition, March 2004. The water in the sediment control basin shall be lowered periodically to maintain the minimum storage volume at the lower level of the settling zone identified by pegs or marks on the existing concrete walls to clearly show the level at which design storage capacity is available.

Water from the basin will be utilised where possible for dust control. The excess water from the sediment basin will be discharged to the existing Hay Lackey Street stormwater drainage culvert. Prior to any off site

discharge from the basin, water will be tested to ensure that it complies with the above standards.

4 Mitigating Measures

The following measures shall be initiated to monitor and mitigate environmental, pedestrian and vehicular conflicts and possible conflicts with existing services infrastructure and proposed building structures including road networks.

- Test pit existing services at specific locations to determine alignment and level prior to finalisation of design.
- Install all necessary erosion and sediment controls prior to commencement of works.
- Maintain all erosion and sediment controls.
- Provide adequate temporary signage and line markings during construction to clearly guide pedestrians and vehicles.
- Provide adequate protection to all pedestrian routes during construction.
- Ensure the design is compliant with all necessary standards and guidelines. Sight distance requirements shall be checked at all conflict points between vehicles and pedestrians / cyclists.
- Stormwater drainage shall be monitored to ensure all gross pollutant traps, silt arrestors and drains are clean and functioning.

Appendix A

Location Plan

Darling Walk Entertainment Complex

Major Project (MP 06_0054)

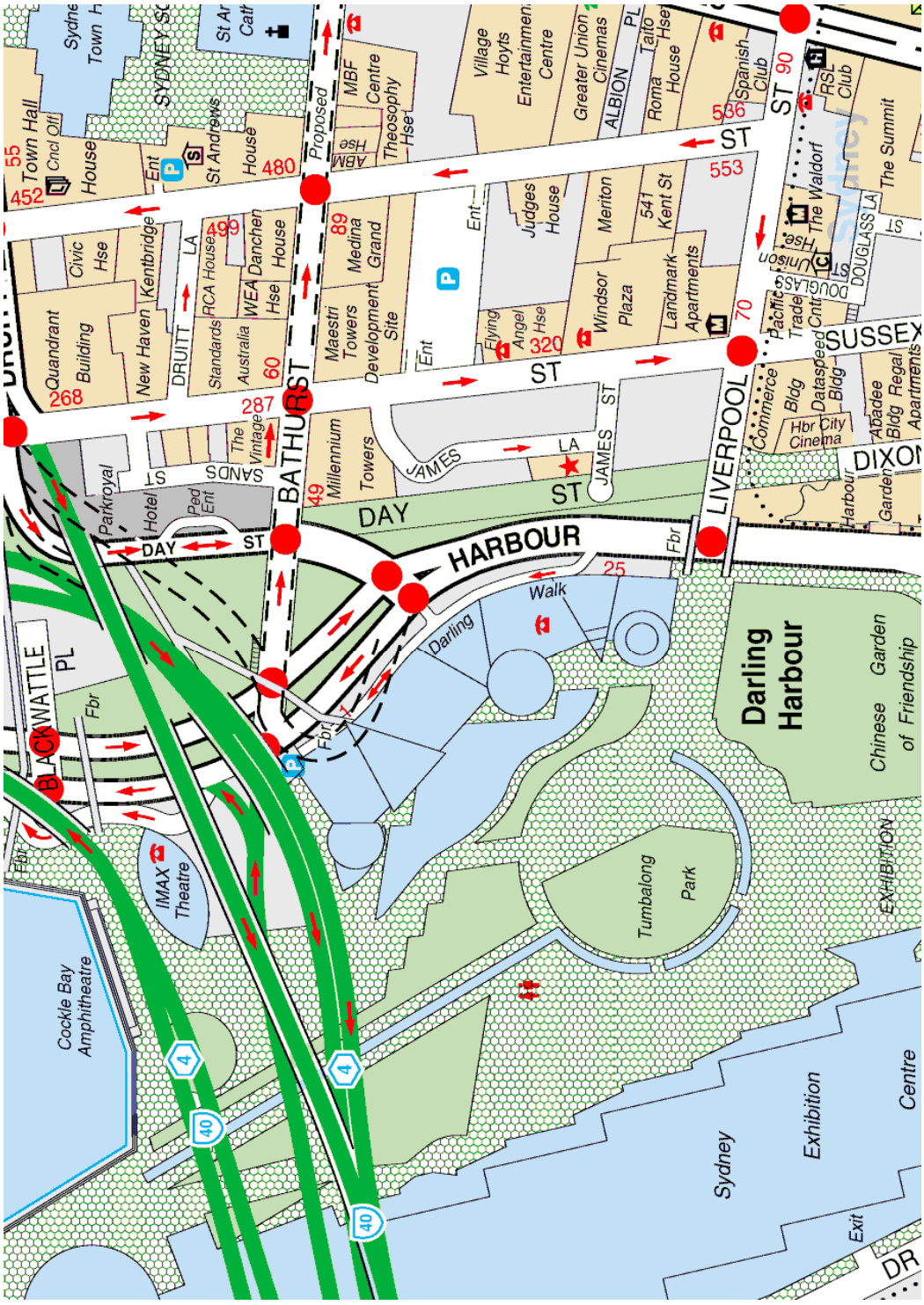

Figure A.1 – Location Plan – Darling Walk Entertainment Complex

Scale: Not to Scale.

Appendix B

Sediment and Erosion Control Plan and Details

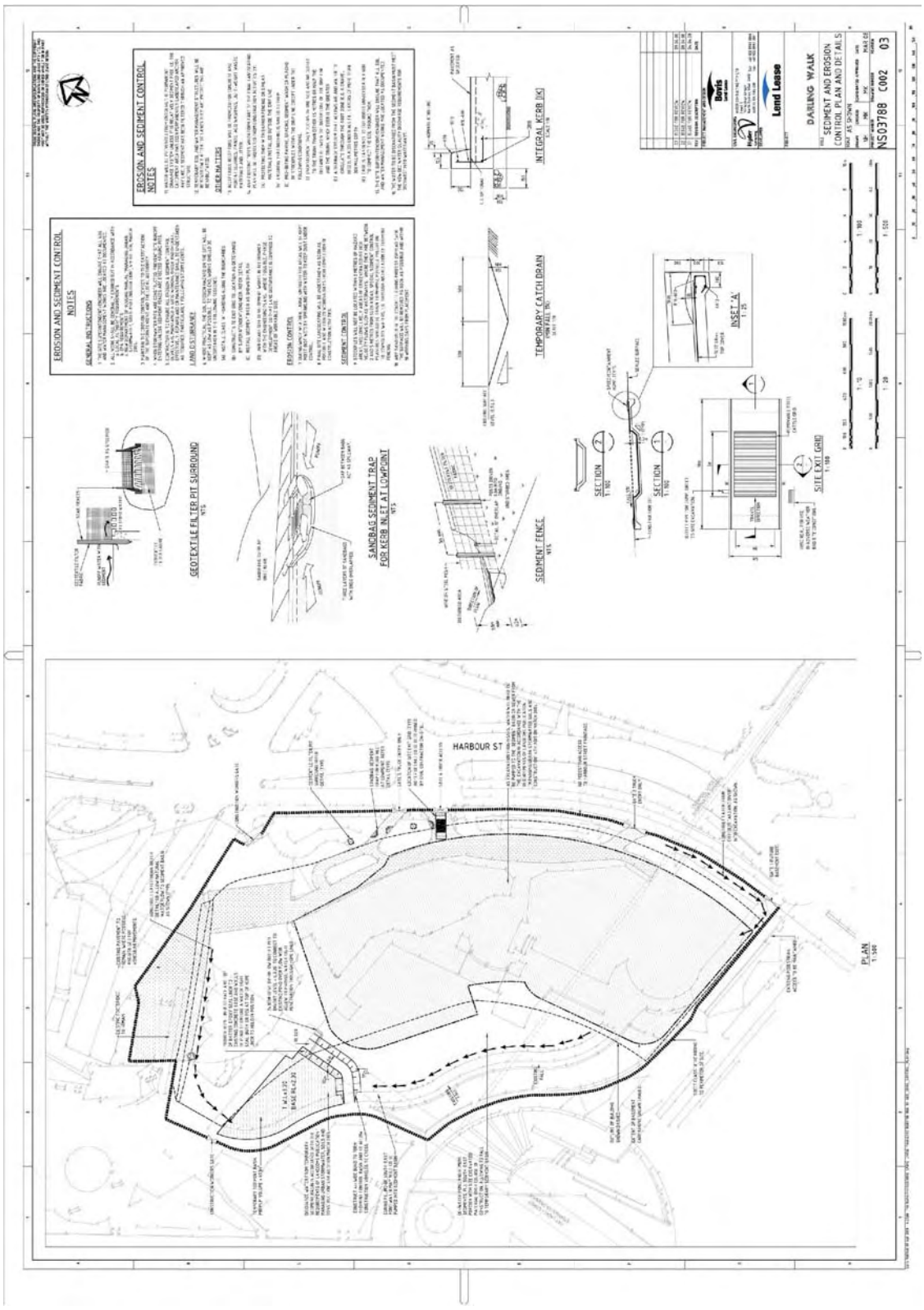

Figure B.1 Sediment and Erosion Control Plan and Details

Appendix C

Sediment Basin Calculations

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: DARLING WALK

Site location: DARLING HARBOUR

Precinct:

Description of site:

Site area	Site						Remarks
	2.36						
Total catchment area (ha)	2.4						Approx.
Disturbed catchment area (ha)	2.4						Approx.

Soil analysis

Soil landscape							DIPNR mapping (if relevant)
Soil Texture Group							Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5						See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75						See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	23.3						See Section 6.3.4 (h) and Appendix L
Rainfall intensity: 2-year, 6-hour storm	12.8						See IFD chart for the site
Rainfall erosivity (R-factor)	3540						Automatic calculation from above data

Comments:

- 2year, 6hr storm obtain from http://www.bom.gov.au/hydro/has/ifd.shtml . Site coordinates obtained from google earth

-Soil type "gy" landscape soil map by Soil Conservation services of NSW
-Appendix "C", table C.20 (Blue book) has soil hydraulic group "C".

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

DARLING WALK $0.00278 \times C_{10} \times F_Y \times I_{y,tc} \times A$

ARLING HARBOUR

Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years

C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction runoff coefficients are given in Appendix F

F_y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)

A is the catchment area in hectares (ha)

$I_{y,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr						C_{10}
			$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
2.36	2.4	11	50.3	83.0	93.7	107.8	126.2	140.3	0.76
n.gov.au/hydro/has/ifd.shtml . Site coordinates obtained from google earth									

Peak flow calculations, 2

ARI yrs	Frequency factor (F_y)	Peak flows						Comment
		2.36						
		(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m3/s)	
$1_{yr,tc}$	0.80	0.200						
$5_{yr,tc}$	0.85	0.352						
$10_{yr,tc}$	0.95	0.444						
$20_{yr,tc}$	1.00	0.537						
$50_{yr,tc}$	1.15	0.724						
$100_{yr,tc}$	1.20	0.839						

3. Volume of Sediment Basins: *Type C* Soils

Basin volume = settling zone volume + sediment storage volume

Settling Zone Volume

The settling zone volume for *Type C* soils is calculated to provide capacity to allow the design particle (e.g. 0.02 mm in diameter) to settle in the peak flow expected from the design storm (e.g. 0.25-year ARI). The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle. Peak flow/discharge for the 0.25-year, ARI storm is given by the Rational Formula:

$$Q_{tc,\,0.25} = 0.5 \times [0.00278 \times C_{10} \times F_y \times I_{1yr,\,tc} \times A\,] \; (m^3/sec)$$

where:

$Q_{tc,0.25}$ = flow rate (m^3/sec) for the 0.25 ARI storm event

C_{10} = runoff coefficient (dimensionless for ARI of 10 years)

F_y = frequency factor for 1 year ARI storm

$I_{1\,yr,tc}$ = average rainfall intensity (mm/hr) for the 1-year ARI storm

A = area of catchment in hectares (ha)

Basin surface area (A) = area factor x $Q_{tc,\,0.25}$ m^2

Particle settling velocities under ideal conditions (Section 6.3.5(e))

Particle Size	Area Factor
0.100	170
0.050	635
0.020	4100

Volume of settling zone = basin surface area x depth (Section 6.3.5(e)(ii))

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 100 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.5(e)(iv)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	$Q_{tc,\,0.25}$ (m^3/s)	Area factor	Basin surface area (m^2)	Depth of settling zone (m)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)	Basin shape		
								L:W Ratio	Length (m)	Width (m)
2.36	0.100	4100	411	0.6	247	247	493	4	40.5	10.1

Figure C.1 Sediment Basin Calculations

Appendix D

Rainfall IFD Data – Sydney

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Intensity-Frequency-Duration Table

Location: 33.875S 151.200E NEAR.. DARLING WALK Issued: 8/4/2008

Copy Table

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

Average Recurrence Interval

Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	101	129	163	183	209	243	269
6Mins	94.3	121	153	172	196	228	252
10Mins	77.2	99.1	127	142	164	191	212
20Mins	56.6	73.1	94.8	107	124	146	163
30Mins	46.0	59.7	78.0	88.8	103	122	136
1Hr	31.2	40.5	53.5	61.2	71.2	84.4	94.5
2Hrs	20.3	26.4	34.9	39.9	46.5	55.1	61.8
3Hrs	15.6	20.3	26.7	30.6	35.6	42.2	47.3
6Hrs	9.90	12.8	16.9	19.2	22.3	26.4	29.6
12Hrs	6.34	8.21	10.7	12.2	14.2	16.8	18.7
24Hrs	4.12	5.33	6.98	7.95	9.22	10.9	12.2
48Hrs	2.64	3.42	4.49	5.12	5.94	7.02	7.85
72Hrs	1.97	2.55	3.33	3.80	4.41	5.21	5.82

(Raw data: 40.84, 8.2, 2.55, 85.87, 16.75, 5.22, skew=0)

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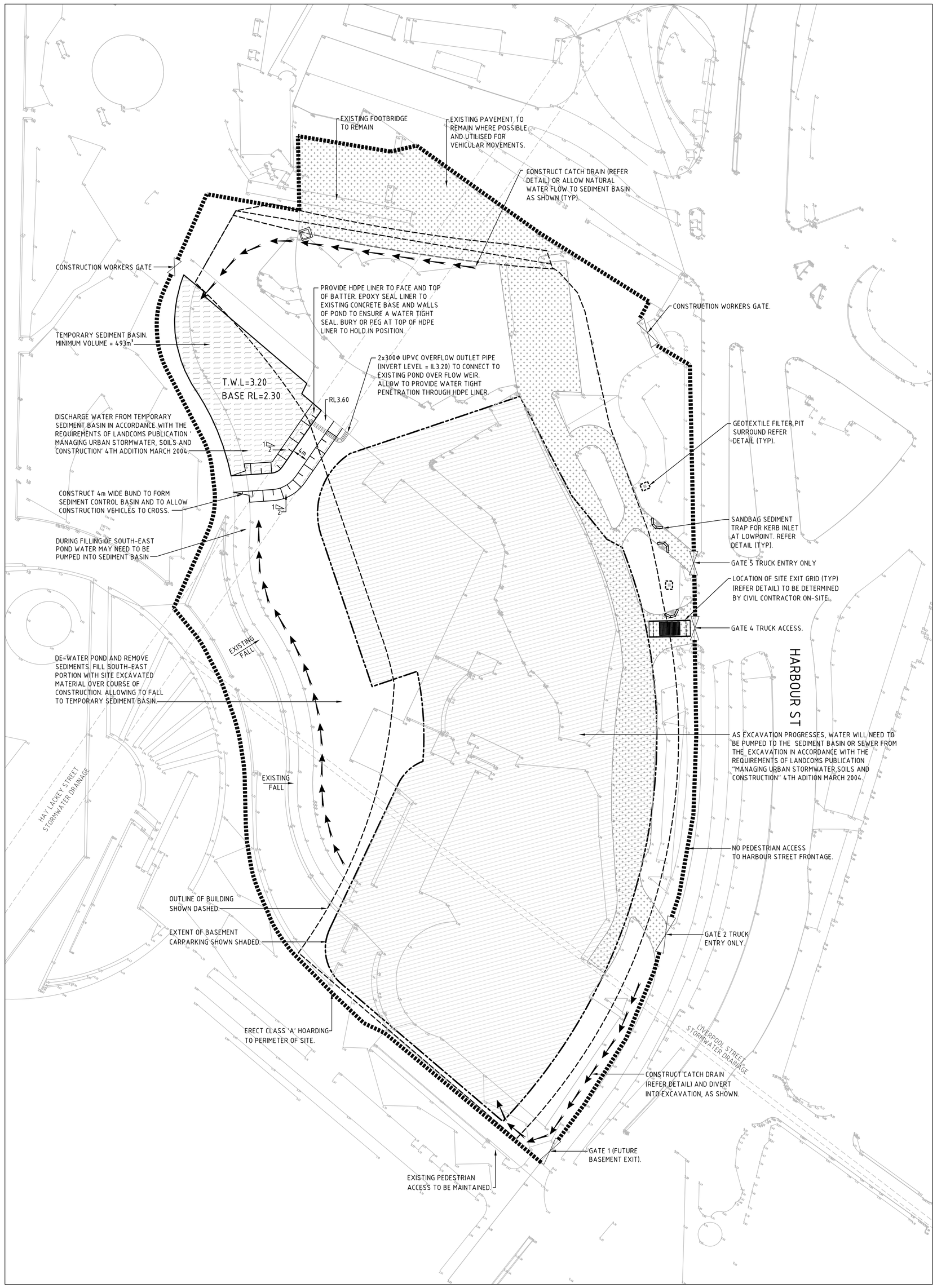
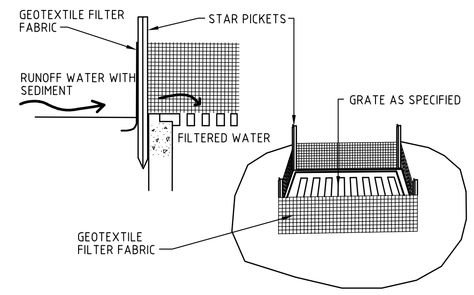
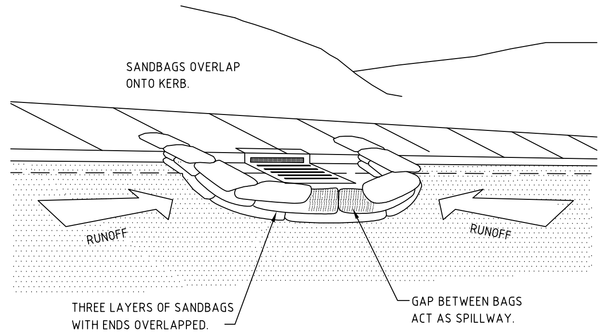
Figure D.1. Rainfall IFD data – from Bureau of Meteorology



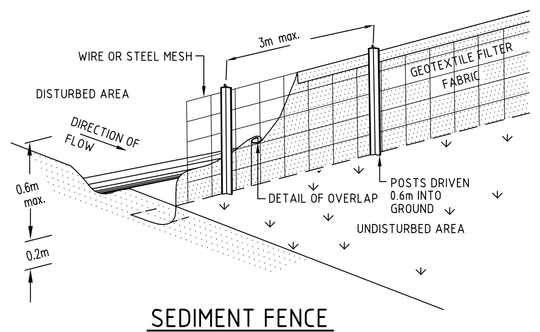
PLAN
1 : 500



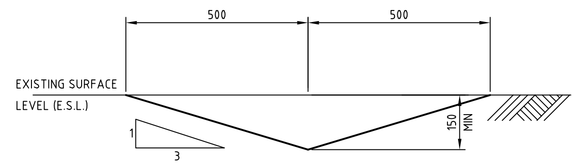
GEOTEXTILE FILTER PIT SURROUND
NTS



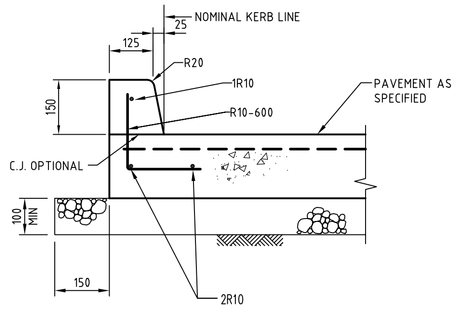
SANDBAG SEDIMENT TRAP FOR KERB INLET AT LOWPOINT
NTS



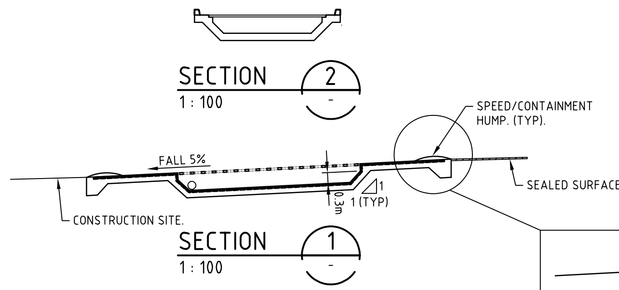
SEDIMENT FENCE
NTS

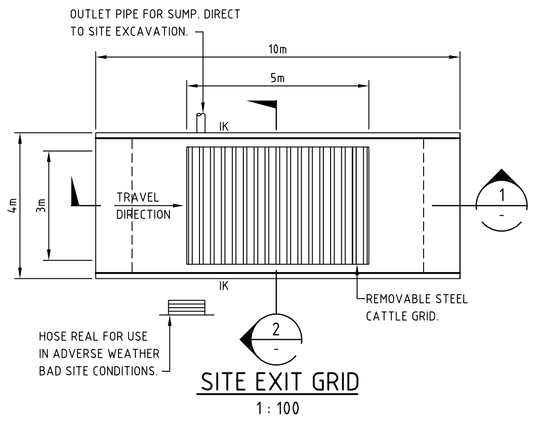


TEMPORARY CATCH DRAIN
(MIN FALL 1%)
SCALE 1:10



INTEGRAL KERB (IK)
SCALE 1:10





SITE EXIT GRID
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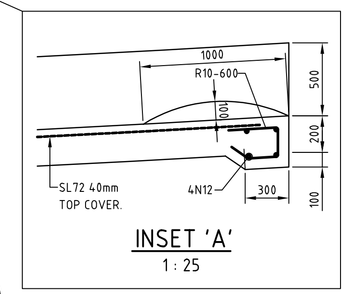

INSET 'A'
1 : 25

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE SITE SUPERINTENDENT/ENGINEER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
2. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

LAND DISTURBANCE

6. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   (A) INSTALL CLASS 'A' HOARDING ALONG THE BOUNDARIES
   (B) CONSTRUCT SITE EXIT GRID TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL
   (C) INSTALL SEDIMENT BASIN AS SHOWN ON PLAN
   (D) UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

7. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
8. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

SEDIMENT CONTROL

9. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
10. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.

EROSION AND SEDIMENT CONTROL NOTES

11. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.
12. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

OTHER MATTERS

13. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
14. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   (A) PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
   (B) ENSURING THAT NOTHING IS NAILED TO THEM
   (C) PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.
   (I) ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
   (II) A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
   (III) CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.
15. THE SITE SUPERINTENDENT/ENGINEER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
16. THE WATER TO BE DISCHARGED FROM THE SEDIMENT BASIN MUST MEET THE NSW DEC WATER QUALITY DISCHARGE REQUIREMENTS FOR DISCHARGE INTO WATERWAYS.

REV	REVISION DESCRIPTION	DATE
03	ISSUE FOR REVIEW	09.04.08
02	ISSUE FOR REVIEW	08.04.08
01	ISSUE FOR REVIEW	04.04.08

PROJECT MANAGEMENT AND DESIGN
Bovis Lend Lease

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Hyder Consulting
HYDER CONSULTING PTY LTD
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ABN 76 104 485 289
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Fax: +61 (0)2 8907 9001

DEVELOPER
Lend Lease

PROJECT
DARLING WALK

TITLE
SEDIMENT AND EROSION CONTROL PLAN AND DETAILS

SCALE AS SHOWN

DRAWN	CHECKED	COORDINATED	APPROVED	DATE
NH	MK	MK		MAR 08

PROJECT NUMBER NS03788 | DRAWING NUMBER C002 | REVISION 03

0 100 200 400 600 800 1000mm
1 : 10
0 500 1000 1500 2000mm
1 : 20
0 2 4 6 8 10m
1 : 100
0 10 20 30 40 50m
1 : 500

Date Plotted: 09 Apr 2008 - 4:28pm File Name: F:\NS03788\E-CAD\C-Civil\D-Final\C002-NS03788-NSK-00-SED_EROS_CONTROL_PLAN.dwg

Appendix 6

Air Pollution Control Management Plan

Objectives

Construction must not prejudice air quality.

Maintain the current levels of local air quality during construction activities.

To minimise the generation of dust on the project site.

To implement appropriate controls to suppress dust and other suspended particulates in accordance with the consent conditions and risk management requirements.

To minimise all potential odour issues relating to contaminated soil or groundwater.

Key Management Issues

Major sources of air emissions from the proposed construction works at the site are primarily associated with traffic movements (soil dust and diesel emissions), excavation /stockpiling and handling of soils on site (soil dust) and demolition of buildings and structures (building and materials dust). In addition, the likely presence of acid sulphate soils on the site may give rise to potential odour emissions as a result of excavation or soil disturbance.

The generation of dust, air emissions or odours from the site can be a major nuisance to adjacent land users, create unsafe working conditions on site and result in environmental degradation via the loss of topsoil and placement of dust onto sensitive ecosystems and adjacent water bodies. In view of this, the following management issues have been identified:

- Dust generating from construction activities from the site affecting adjoining properties or public access (Environmental Class P2 Risk).
- Dust generated on the construction site affecting site operations (Environmental Class P2 to P1 Risk).
- Odours (i.e. volatile hydrocarbons) emitted from any disturbed contaminated soils/ groundwater affecting site workers or site personnel (Environmental Class P2 Risk).

Refer to *Hazardous Building Materials Action Plan.*

Site Controls

The minimisation of air-borne pollution is a key component for this environment management plan for the site. Construction and demolition phase air quality impacts shall be minimised or avoided by incorporation of appropriate air quality control measures.

Air Quality Monitoring Equipment Diagram will be prepared for the excavation phase, detailing the locations and type of equipment eg dust gauges or dust loggers.

The installation and application of air quality controls during the construction shall be in accordance with the following principles:

Planning

- Ensure that all equipment used and all facilities erected on site are designed and operated to control the emission of smoke, dust, fumes and any other air impurity into the atmosphere;
- spray earthworks, roads and other surfaces as necessary with water;

- seal temporary haul roads where appropriate which will be in use for prolonged periods;

Construction

- Schedule the civil works program in a manner to minimise the length of time that excavations and stockpiles are left exposed.
- Provide adequate truck washdown and wheel washing facilities on site to preventing tracking of muds/ sediment onto public roadways and generating dust.
- Transport routes and traffic areas shall be clearly defined by marker posts or other suitable barriers to prevent unnecessary vehicle movement onto other areas. These roads shall operate under defined speed limits.
- A water cart will be employed as required to dampen work areas and exposed soils to prevent the emission of excessive dust from the site.
- Trucks transporting material from the site shall be covered immediately after loading to prevent wind blown dust emissions and spillages. The covering must be maintained until immediately before unloading the trucks.
- All access roads shall be surfaced in selected materials and where required, hard surfaced. Mud stone, clay stone and shale stone shall not be used.
- Subcontractors will maintain all construction equipment to ensure exhaust emissions comply with the relevant Air Regulations issued under State Legislation.
- All waste material will be removed from the site in a manner described in the Waste Management Plan.
- No cleared vegetation, demolition materials and other waste material shall not be burnt on the site.
- No excavation or similar works involving disturbance of large volumes of soil will be permitted during extremely windy conditions.
- Progressively revegetate and landscape disturbed areas to minimise long durations of soils exposed to weathering. Seed stockpiles with local grasses.
- Development and implementation of a Hazardous Building Materials Action Plan.

Training

Communication and education material on the air quality and dust controls and procedures will be part of the Site Environmental Awareness Program that will be incorporated into the site induction program.

Performance Measurements

- Achieve air quality monitoring targets.
- No visible dust for more than 15 continuous minutes during construction activities.
- No odour or dust complaints received from adjoining operations, near by residents or from statutory Authorities.

Monitoring and Reporting

The SM will perform air quality monitoring to determine of the acceptable air quality thresholds are being met for each of the nominated monitoring parameters. This information will be used to determine the effectives of existing air quality mitigation measures and provide for any remedial actions if required.

The Site Manager will visually monitor levels of dust deposition and air quality, the effectiveness of dust emission controls and the construction site and the impacts of any nuisance on adjoining properties.

The SM may require the Subcontractor to carry out additional Air monitoring if a complaint regarding Air Quality is received.

The SM in consultation with the EM will advise the monitoring location and the monitoring required will be manned monitoring.

Corrective Actions

Non-conformances are to be recorded by way of the System Defects.

The Subcontractor (and EM/ CM/ SM if applicable) shall review and analyse the cause of detected non-conformance and develop a corrective action to prevent recurrence. Details of the non-conformance including any immediate corrective actions undertaken are to be recorded, reviewed and accepted by the CM.

It is the responsibility of the CM to immediately initiate corrective actions following approval. The non-conformance and corrective action must include details of the actions proposed, desired performance target and action close out date. The system defects report should be signed, dated and filed.

All corrective and preventative action taken by the Subcontractor will be carried out by and at the cost of the Subcontractor.

If such corrective and preventative action leads to further non-conformance, any further action shall be subject to approval by the CM in consultation with the EM.

Air Quality Management Plan

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
Planning					
Prepare an Air Pollution Management Diagram Detailing the locations and type of equipment being used at all stages of works.	Prior to works commencing. Review prior following works stages.	In accordance with the Air Quality Management Plan	CM	Review of diagram prior works commencing.	Diagram covers all key areas and site specific considerations. Detailing the locations and type of equipment eg dust gauges or dust loggers.
Design, implement and maintain Air Quality Monitoring Program	Prior to works commencing	In accordance with the Air Quality Management Plan	CM	Air Quality Monitoring Program to detail key parameters, methodology and guidance levels. Monitoring Plan to show monitoring locations.	No exceedance of target values for each parameter. Scheduled air monitoring performed correctly.
Areas to be disturbed will be limited in order to minimise surface with potential to generate dust.	Prior to works commencing.	In accordance with Air Quality Management Plan.	SM	Weekly inspection or as required.	No visible dust. Acceptable dust monitoring levels.
Dust Controls					
Exposed surfaces and stockpiles to be kept moist by spraying with water or dust suppressant	Daily or as necessary when dry and windy weather conditions prevail.	In accordance with the Air Quality Management Plan.	SM	Daily inspection and monitor activities for dust generation.	No visible dust. No reported dust monitoring exceedances.
Exposed surfaces and stockpiles left for longer than 4 week to be stabilised by sealing, seeding or spraying with water or dust suppressant.	Four weeks from completion of activity.	In accordance with the Air Quality Management Plan	SM	Daily inspection and monitor moisture content of exposed areas.	No visible dust. No reported dust monitoring exceedances.
Avoid soil disturbance works during periods of high wind or other	At all times.	In accordance with Air	SM	Monitoring of predicted meteorological	No works performed during high wind

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
extreme weather conditions.		Quality Management Plan.		conditions.	or rainfall events.
Immediate stabilisation works & landscaping batters of disturbed grounds undergoing rehabilitation.	As required	In accordance with the SEMP & landscaping works	CM/ SM	Daily/weekly inspection Project planning and design meetings.	Appropriate stabilisation of works. No areas left exposed for prolonged periods.
Truck wheel wash/shaker facility to be installed near access gate	Prior to construction commencing	Detailed work method statement to be prepared by sub-contractor	CM	Pre-construction inspection.	No dust generated by traffic on leaving site
Maintain clean traffic routes and 20km/hr speed limit within site and at site entrance/exist.	Ongoing	Appoint street sweeper and water kart.	SM	Weekly inspection of exterior roadways or immediately after rainfall events.	No complaints from public or authorities. No dust from exterior roads. No speeding vehicles.
All parking areas and roads to be sealed or constructed from gravel or non-dust generating materials.	Prior to construction	In accordance with the Air Quality Management Plan	SM	Pre-construction inspection.	No parking on unsealed areas. No parking off-site
Trucks transporting loose material to and from the site to be covered.	At all times	In accordance with the Air Quality Management Plan.	SM	To be put into tenders for sub-contractors. Compulsory inspection at gate prior to entrance into site.	No visible loose material from trucks. No community complaints.
Appropriate controls during removal and handling of building materials containing asbestos or lead-based paints.	At all times.	In accordance with Hazardous Building Materials Management Plan.	CM/SM	Intensive air quality monitoring during and after works. Clearance by occupational hygiene officer.	Building & area cleared of hazardous dust. Non detect asbestos/ lead dust during monitoring.
Dust Quality Controls					
Minimise potentially	At all times	In	SM	Dust monitoring	No contaminants

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
contaminated dusts being generated from any contaminated site soils.		accordance with Air Quality Management Plan.		to include for acid sulphide soils parameters when contaminated soils encountered or disturbed.	detected in dust monitoring samples.
Vapour & Emission Controls					
No elevated Volatile Organic Compound (VOC) vapours within work areas.	At all times	In accordance with Air Quality Management Plan. Applied for HS&DG use or in contaminated areas.	CM/SM	Intensive air vapour monitoring (and personal air monitoring if required) during and after works by consultant.	No elevated VOCs detected during works. No works performed whilst elevated VOCs are detected in work areas.
Combustible waste material shall not be burnt on site	At all times	Covered in site induction.	SM	Continuous monitoring. To be put into tenders for sub-contractors.	No fires or incineration on site from construction or demolition works.
Plant and equipment to be fitted with standard pollution/noise control devices.	Prior to construction commencing	In accordance with the Air Quality Management Plan	SM	Routine inspection. To be put into tenders for sub-contractors.	Copies of compliance certificates to be supplied. No complaints from site personnel or adjacent land users.

Appendix 7

BLL Hazardous Materials Action Plan

Objectives

To identify any asbestos or hazardous building materials in site buildings or structures to be refurbished, disturbed or demolished prior to site works.
To appropriately remove any asbestos or hazardous building materials in site buildings or structures to be refurbished, disturbed or demolished prior to site works.
To appropriately store, transport and dispose of all potential asbestos and hazardous building materials to an EPA licensed waste facility.
To prevent any impact to air quality or site work areas and adjoining properties via inappropriate handling, removal or disposal of asbestos or other hazardous building materials.

Key Management Issues

Asbestos is commonly used as an acoustic insulator, brake pads (i.e. lifts), thermal insulation (i.e. pipes and cables), fire proofing (i.e. steel beams) and in building materials such as ceiling tiles or wall panels, pipes, floor tiles, linoleum and mastic. Asbestos is made up of microscopic bundles of fibres that may become airborne when distributed. These fibres may become inhaled into the lungs with significant potential risks to human health.

Other key hazardous building products include fluorescent light fittings with capacitors containing PCBs and building materials coated with lead-based paints. Both of these materials pose significant potential risks to the environment and human health if removed, handled and/or disposed inappropriately.

Given the (Darling Walk) SEGA World building was completed in 1997 it is unlikely that asbestos will be found during demolition. The Hazardous Materials Survey found no samples of asbestos and nor was asbestos contamination found during soil contamination testing. The Hazardous Materials survey did find SMF's ,lead paint and identified the possibility of PCB's and therefore safe work measures need to be implemented to ensure that environmental and human health risks are appropriately minimised and managed during this process.

These measures must be instituted to prevent risks such as:

1. Exposure of site workers, site personnel or adjacent land users to asbestos or lead dust during demolition (Environmental Class P1 Risk)
2. Inappropriate disposal of asbestos contaminated waste (Environmental Class P2 Risk)

Site Controls

The first step in the sequence of operations is to plan the environmental management activities and integrate these with the construction program.

A Hazardous Materials Building Survey has been conducted to identify all Hazardous building materials to assist in the management of removal, handling, storage and disposal of such materials.

Unexpected find policy.

1. If working in an area and a suspicious material is discovered then notify nearest BLL supervisor.
2. BLL to ensure the material is inspected by a competent person.
3. If the material still cannot be identified then the area is to bunded off with sufficient signage and all personnel working near the area made aware of the situation.
4. BLl to contact Hygienist for inspection and test if required.
5. Hygienist to inspect area and give a written all clear to enable work area to be reopened.

Demolition Phase:

The removal, handling, storage and disposal of hazardous building materials (including asbestos) during the demolition program shall be minimised by incorporation of appropriate control measures in the specification and contract arrangements, and quality assurance inspection and monitoring during demolition.

The installation and maintenance of controls during demolition phase shall be in accordance with the following principles:

1. A Hazardous Materials Building Register is to be prepared for the site prior to the demolition, disturbance or removal of any site buildings and structures to identify the presence, location and type of hazardous building materials present on or within the proposed structures to be demolished. The register will incorporate hazard identification tags on actual structures and be included in the HS&DG Register.
2. A HS&DG Register is to be maintained. This document is to be supported by MSDS (supplied by the contractor) for the relevant hazardous materials and dangerous goods outlined in the HS&DG Site Register. This information is to be obtained prior to commencement on site and filed in the site First Aid files.
3. A HS&DG Diagram will be prepared for the site that details the designated storage locations for all dangerous goods on the site including key areas where these materials are used. The Diagram will also include a list of key buildings or structures noted to contain Hazardous Building Materials.
4. All hazardous building materials will be handled and removed in accordance with SWMS and supported, where required, by inspection and monitoring visits by the SM and relevant Occupational Hygiene Surveyors. Appropriate mitigation measures will be implemented, where required, to stabilize waste during the removal, storage or disposal process.
5. All hazardous building material waste will be stored in appropriately designed bins (i.e. asbestos bin will be double-lined with HDPE liner) within designated waste storage areas on site.
6. No hazardous building materials will be re-used or disposed on site.
7. All hazardous building material waste will be disposed to an approved facility and the area remediate to the satisfaction of an Occupational Hygiene Surveyor and the DEC. Records of disposal and clean-up measures are to be maintained with site records.
8. Emergency procedures regarding exposure to hazardous building materials shall be displayed in a prominent position within the site working area or addressed in the site induction with the appropriate training included.

Training

Communication and education material on the noise and vibration controls and procedures will be part of the Site Environmental Awareness Program that will be incorporated into the site induction program.

Performance Measures

1. Appropriate MSDS for hazardous building materials maintain in site First Aid Files.
2. A hazardous materials building survey report to be prepared.
3. The HS&DG Register to include list of buildings and materials containing hazardous materials.
4. Hazardous building materials to be identified by tagging.
5. Appropriate MSDS in place for hazardous building materials present on site.
6. No waste disposal incidents or disposal of wastes without appropriate documentation/approvals.
7. Non detect air quality monitoring results.

Monitoring and Reporting

An initial hazardous building survey is to be performed on the site with the findings presented in the form of a report and Hazardous Building Materials Register. The Register will be incorporated into the site HS&DG Register to be maintained by the nominated SM. Supporting MSDS are to submitted by Subcontractors and filed by BLL in the First Aid files.

Environmental and human health incidents shall be reported immediately to the CM who in turn will report to the project EH&S Manager. The CM shall if required, report the environmental incident and corrective action within 7 days of the event to the relevant authorities nominated local office.

Air quality monitoring performed over the duration of the demolition works and for a duration after the completion of the works will include monitoring for asbestos and lead dust. If required, additional personal air monitors will be attached to site personnel involved in the demolition, removal, handling or disposal of these materials. Refer to the *Air Quality Management Plan* for monitoring methodology, frequency and target levels.

The SM will carry out routine site inspections to check hazardous material removal and disposal procedures. Where required, an independent Occupational Hygiene Surveyor will be employed by the contractor to confirm adequate removal of these materials and a return to safe working conditions. In the event remedial measures are required, the BLL project EH&S Manager will detail the proposed measures along with the recommendations for implementation to the CM/SM and Client if deemed appropriate.

Corrective Actions

Non-conformances are to be recorded by way of the System Defects.

The Subcontractor and the BLL SM/CM if applicable, shall review and analyse the cause of detected non-conformance and develop a corrective action to prevent recurrence. Details of the non-conformance including any immediate corrective actions undertaken are to be recorded, reviewed and accepted by the CM.

It is the responsibility of the CM to immediately initiate corrective actions following approval. The non-conformance and corrective action must include details of the actions proposed, desired performance target and action close out date. The system defects report should be signed, dated and filed.

All corrective and preventative action taken by the Subcontractor will be carried out by and at the cost of the Subcontractor.

If such corrective and preventative action leads to further non-conformance, any further action shall be subject to approval by the SM in consultation with the EH&S Manager.

Hazardous Building Material Management Plan

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
Hazardous Building Material Register					
A HS&DG Diagram will be prepared for the site that details the designated storage locations for all dangerous goods on the site including key areas where these materials are used.	Prior to works commencing	In accordance with the Hazardous Substances/Dangerous Goods Management Plan.	CM/SM	Review of Diagram prior works commencing.	Diagram Map prepared & containing all relevant details. The diagram will also include a list of key buildings or structures noted to contain Hazardous Building Materials.
Hazardous building materials to be identified in Hazardous Materials Building Survey	60 Days prior demolition works commencing	Contractor to supply Hazardous Building Materials Register.	CM	Preparation of a Hazardous Building Materials Register.	All Hazardous Building Materials listed in Register. All Hazardous Building Materials

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
					tagged. Appropriate MSDS present in file.
Hazardous Building Materials Register to be maintained in HS&DG Register	At all times	Incorporate information in Registers.	SM	Inspections prior, during and after materials removal.	Register is current.
Demolition					
Removal of asbestos and related building products during demolition	At all times	Removal procedures in contractor SWMS (i.e. sprays to stabilise asbestos/dust). Dust monitoring to be performed. Approved licensed contractor	SM	As required. Inspection by Occupational Hygiene Surveyor for clearance.	No asbestos dust particulates detected during monitoring. Correct SWMS followed. Appropriate PPE worn.
Removal of PCBs in any light fittings during demolition	At all times	Removal procedures in contractor SWMS. Approved licensed contractor	SM	As required	No damaged light fittings during the removal process. Correct SWMS followed. Appropriate PPE worn.
Removal of timber/metal structures containing lead-based paints during demolition	At all times	Removal procedures in contractor SWMS (i.e. sprays to stabilise paints /dust). Dust monitoring to be performed. Approved licensed contractor.	SM	As required	Minimal disturbance to paint materials achieved. Correct SWMS followed. Appropriate PPE worn.
Temporary storage & Disposal					
Storage of asbestos, PCBs in light fittings and Lead-based paints in appropriate waste disposal bins.	At all times	Waste disposal bins provided and marked. SWMS supplied.	SM	As required	Waste correctly stored in marked bins. No cross contamination of wastes.
Transport of asbestos, PCBs in light fittings and	At all times	Approved licensed waste transporter	SM	As required	All transport vehicles covered with appropriate signage and permits.

Control	Timing	Methodology	Responsibility	Monitoring and Reporting	Performance Measure
Lead-based paints during demolition.		used.			
Disposal of asbestos, PCBs in light fittings and Lead-based paints during demolition.	At all times	Approved DEC licensed landfill facility used.	SM	As required	Landfill waste dockets provided. Landfill dockets correspond to removed waste volumes/types.