



Robert **Bird** Group

Report on Existing Services
and Site Constraints
for
**Redevelopment of Darling Walk
Darling Harbour, Sydney**

Prepared For: Sydney Harbour Foreshore Authority

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APPENDIX

03329 SK-C01 Revision 11 Services Plan Existing and Proposed

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1.0 Overview

The Darling Walk precinct site is impacted by a complex range of below grade infrastructure services.

While every effort has been made to identify the existing services in and around the site, it should be noted that some services information was unavailable at the time of preparation of this report. In addition, records of services held by services authorities may be incomplete, and changes may have occurred since the compilation of services data. All interested parties are therefore advised that they must validate the accuracy and completeness of the information contained herein.

An initial search of services was carried out through the "Dial-Before-You-Dig" system in July 2003. This produced many drawings of varying levels of detail showing the extents of services over the whole area. A subsequent "Dial Before You Dig" search in January-February 2006 produced updates for some of these drawings. A further "Dial Before You Dig" search was carried out in June-August 2007 to determine where there may have been changes since previous investigations.

Further negotiations have been undertaken with the various services authorities to obtain more accurate and, if possible, electronic copies of services plans. This has included obtaining copies of the original design drawings and "work – as – executed" drawings in order to check the accuracy of electronic files.

A combined services plan has been produced. Levels information where available has been added to this plan. It should be noted that the survey on which this drawing is based, was carried out before the completion of the Cross-City Tunnel, and would be inaccurate in some areas affected. Detailed title survey (including plotting of easements) has been carried out since the original survey, and has been provided separately.

It is anticipated that the combined services plan and this report will both need to be continually updated as the project proceeds and more accurate information (supplemented by physical location on site) becomes available.

The physical position of all services near proposed construction must be located by cable location methods and / or by digging test pits, before detailed design can be undertaken.

2.0 Sydney Water Corporation

In 2003, Sydney Water Corporation provided CAD files on Australian Mapping Grid (MGA) coordinates, which had been extracted from their corporate database “Hydra”. They advised that this information was the most accurate information available. However, they cautioned that the electronic files were only as good as the information provided by constructors, and may have errors.

On 9th August 2007, Sydney Water provided three drawings from their current database, in the form of Adobe Acrobat ‘pdf’ files. These showed significant changes to reticulation sewer and water mains in the area. Some of the changes appear to have been more accurate plotting of existing assets. All changes that were noted on the new drawings in the immediate vicinity of the site have been traced onto our drawings. The original drawing file is provided with this report for reference purposes, but in all cases of discrepancies between the older drawing file and the new Adobe files, the new files must take precedence.

The Hydra database drawings and files that have been provided show the locations of Sydney Water assets, but not their size or levels.

We have further investigated the assets shown on the CAD files by:

- o detailed review of the database on Sydney Water computer terminals and
- o obtaining hard copies of Work as Executed drawings and Design drawings from the Sydney Water plan room at their offices in Bathurst Street.

Some information is not available, as “Work – as – Executed” drawings in some cases have not been submitted to Sydney Water for incorporation into their database. In particular, structural details for major culverts are not available.

Where invert levels are available, we have added them to the combined services plan. We have also provided indicative “top of pipe” levels assuming a 300mm thick roof slab.

Permission must be obtained before building over any Sydney Water services, regardless of whether or not the services are contained within easements.

2.1 Stormwater

Sydney Water Corporation owns and maintains major and minor stormwater infrastructure within the study area.

Major stormwater culverts include the following:

- o The Hay – Lackey drain.

This drain runs westwards on the northern side of Hay Street as a stone arch culvert of internal width 10 feet (3.05 m) and internal height 7 feet (2.1 m). It then bends northward along what used to be Lackey Street (between the Entertainment Centre and the existing Entertainment Centre car park), enlarging to a covered channel of internal width 11 feet 3 inches (3.43 m) and internal height 7 feet 3 inches (2.21 m). It then continues in a straight line towards Darling Harbour. North of Pier Street the drawings show the drain widening to 12 feet 2 inches (3.7 m) internal width, but “Work – as – Executed” drawings are not available, as the original work was within Railways land.

Where the Hay – Lackey Drain crosses the site, it has been duplicated as two covered channels. The western channel has an internal width of 10 feet (3.07 m) and an internal height of 7 feet 3 inches (2.21 m). The eastern channel (the original channel from Hay Street) has an internal width of 3.7 m and the same internal height (2.21 m). After it crosses Tumbalong Park from the south-west, it meets the James Street Drain and enlarges to an internal width of 3.9 m. These channels pass below the existing Darling Walk buildings, under the Western Distributor, and under the Imax theatre before discharging to Darling Harbour (Cockle Bay).

Sydney Water has so far been unable to provide levels on the Hay – Lackey drain. The cross-city tunnel contractors have dug down to the drain and obtained a level on the top of the drain beneath the Western Distributor. This level has been incorporated on the Services Plan.

The invert levels and top of structure levels have been estimated at two locations. This estimate has been based on an extrapolated gradeline from Lackey Street. The estimated level near the Imax building has been adjusted to match more closely with the level measured by the cross-city tunnel contractors.

It has been reported by the cross-city tunnel contractors that the Energy Australia vault 'O' (south of the Imax theatre) has its base just above the Hay – Lackey drain. This may provide physical confirmation of the approximate top-of-pipe level at this point.

o The James Street Stormwater Channel

This drain runs westwards along Bathurst Street, southwards along Sussex Street and westwards along James Street before crossing Harbour Street and entering the site. Where it enters the site it is a circular pipe of 1.35 m diameter, but immediately enlarges to a box section of internal width 5 feet (1.52 m) and internal height 4 feet (1.22 m). It then crosses beneath the existing Darling Walk buildings, beneath the existing lake, and joins the eastern Hay – Lackey channel.

This drain may need to be relocated to the south of the proposed development (along the northern side of the extension of Liverpool Street) to allow excavation of proposed basements. This would necessitate enlargement of the channel to compensate for the flatter gradient. The ultimate size has not been determined.

Discussions with Mr. David Dunkerley of Sydney Water Corporation indicated that Sydney Water would permit the diversion, but would be likely to apply some conditions including:

- (i) The channel currently would be running under pressure and thus its capacity should be increased rather than just maintaining existing capacity over the longer pipeline run.
- (ii) All changes of direction should incorporate large radius bends.

Mr. Dunkerley noted that the drain would not be heritage-listed.

Caution should be exercised in measuring the positions or size of culverts from the electronic records. The culverts are generally drawn to their internal dimensions, rather than external dimensions. In places the draftsmanship is not accurate, and some of the outer walls are not drawn equidistant from centrelines.

Sydney Water has not published their requirements for clearances from stormwater culverts. However, it will insist that no loads are applied to their assets, and 1.2m clearance is to be maintained from manhole openings. Generally speaking, building footings should be bear on ground strata below the culverts. Excavations near culverts should support and (if necessary) underpin the culverts.

2.2 Water Reticulation

Trunk water mains have been located as follows:

- o A 375 mm diameter trunk main runs northwards along the western side of Harbour Street south of Liverpool Street before reducing to 200 mm diameter from Liverpool Street northwards. It continues past the Darling Walk site and then diverts westwards beneath the Western Distributor towards the Convention Centre. Parts of this main have been diverted as part of the enabling works for the Cross City Tunnel, and therefore sections of redundant main remain, as plotted on the drawings.
- o A 250 mm diameter trunk main runs along the eastern side of Harbour Street.

- o Two 200 mm diameter trunk mains run down the extension of Liverpool Street. One main passes to the north of Tumbalong Park (south-east of the existing lake) before heading north-west to meet the 200mm main near the Convention Centre. The other main crosses Tumbalong Park and terminates there.

Sydney Water requires clearances of 300 mm to 1000 mm to be maintained from water mains, depending on the size of pipe and the vertical separation. This may be reduced for isolated structures such as piles. However, no load may be applied to any pipeline, so foundations must be founded below the mains, and driven piles must be pre-bored past the main.

Additional caution must be exercised in providing clearances at pipe bends and other fittings, where concrete thrust blocks are likely to be encountered.

For a review of water supply requirements, refer to Section 11.3.

2.3 Sewerage Reticulation (Gravity Mains)

Sewer gravity mains have been located in the vicinity of the site.

- o A deep trunk main known as the Darling Harbour Submain of 750 mm diameter runs southwards along Wheat Road and crossing beneath the Western Distributor to enter the site. It then bends in an arc, passes beneath the Hay – Lackey SWC and heads westward to pass beneath the main Darling Harbour SWC Amplification. It eventually runs diagonally under Darling Drive towards the major pumping station PS1 at William Henry Street.

Sydney Water has advised that this sewer was inspected in 2000 and found to be in good condition. It was laid in 1987 and would be expected to have a life of 100 years. It is operating as designed i.e. not overloaded.

- o A 375 mm diameter reticulation main runs from Liverpool Street northwards along the western side of Harbour Street, picks up a 300 mm diameter branch from across Harbour Street, enlarges to 450 mm diameter, picks up another 300 mm branch from across Harbour Street, and ultimately joins the 750 mm trunk main.

Sewer mains have been drawn with the line thickness reflecting actual pipe size. Invert levels have been added where they are known.

Recent changes to the sewer network include:

- o A new 300mm diameter sewer has been constructed running roughly east-west, from Harbour Street to Day Street, to the north of Bathurst Street.
- o An existing 300mm diameter sewer crossing Harbour Street south of Bathurst Street has been made redundant, following the construction of a new intercepting sewer on the eastern side of Harbour / Day Street.

Sydney Water requires clearances of 300 mm to 1000 mm to be maintained from sewers, depending on the size of pipe and the vertical separation. This may be reduced for isolated structures such as piles. However, no load may be applied to any pipeline, so foundations must be founded below the sewers, and driven piles must be pre-bored past the sewer unless they are separated by a distance equal to the depth of the sewer.

Additional caution must be exercised in providing clearances at pipe bends and other fittings for pressure mains (as described below), where concrete thrust blocks are likely to be encountered.

For a review of sewer connection requirements, refer to Section 11.4.

2.4 Sewerage Reticulation (Pressure Mains)

A 600 mm diameter rising (pressure) main runs eastward from the major pumping station PS1 through Darling Harbour. However, records show that it crosses Harbour Street south of Liverpool Street, and thus should not influence development of this site.

3.0 Energy Australia

On 7th July 2007, Energy Australia provided 39 drawings covering their known assets within the study area. These were provided in the form of Adobe Acrobat 'pdf' files. Examination of these drawings revealed considerable changes from drawings provided in 2003, and therefore an AutoCad drawing (dwg) file was obtained on 20th July 2007, covering the full area. The cable information from this drawing has been incorporated into our drawing. For full details of the cables, reference should be made to the original files.

3.1 Distribution Mains

Distribution mains carry power up to 11,000 volts (11kV). Cables are generally (but not always) located within conduits.

Distribution mains have been located as follows:

- o Along the western side of Harbour Street, within the eastern side of the site. The cables have been plotted from Energy Australia records. However, it appears that the plotted cable location may be in error because it does not match the survey of the easement, which is widened locally at junction pits. Energy Australia has been notified of this apparent discrepancy, but their plans have not yet been amended. Care must be taken for accurate cable location, especially in this area.
- o Running across the site next to the James Street drain, then heading in a stepwise fashion north-west, between the existing lake and the Darling Walk buildings, to ultimately meet a vault just south of the Western Distributor. Energy Australia drawings indicate that these cables have already been decommissioned.

Preliminary discussions with Energy Australia indicate that cables and conduits can be relocated, but estimates of cost have not been obtained. Newer 11,000 volt cables are thicker than existing cables and will require larger conduits and a larger radius at any bend than existing conduits.

It should be noted that major junction pits have to be designed for full OH&S requirements.

Refer to Section 11.5 for details of supply to the site.

3.2 Transmission Mains

The area bounded by Sussex Street, Harbour Street and the Western Distributor contains a substantial array of high voltage cables linking several major electrical junction pits ("vaults").

High voltage cables have been located as follows:

- o 33kV cables are located along the western side of Harbour Street, on the eastern side of the site.
- o Beneath the Western Distributor there are major junction pits (vaults) with multiple cables entering and leaving each vault. There are 3 rectangular vaults (numbered 8A, 8B and 8C) under the southern edge of the Western Distributor. An irregularly shaped vault owned by RTA (Vault 'O') is shared by a number of utilities, but predominantly by Energy Australia. Cables are typically 33kV and 132kV.
- o High voltage cables currently run along the northern side of Bathurst Street.

In 2003, Energy Australia planned to make major changes and additions to the transmission cables in the area. Much of this work had been prompted by the construction of the cross-city tunnel link. New works included:

- o A new 132kV ductline south of the Western Distributor and linking at its western end to vault 8C just north-west of Darling Walk. At its eastern end, it extends to a new vault 20 in Bathurst Street. The western end had not been completed at the time of enquiry.

- o The original 33kV transmission cable along Harbour Street clashed with the Bathurst Street Ramp. Energy Australia diverted the cables only slightly, as the cables still terminate at Vault 'O' nearby.
- o Extensive new cables and vaults were constructed north of Bathurst Street.

The latest drawings provided by Energy Australia show the new works.

Energy Australia is undertaking the construction of a new 4-metre diameter cable tunnel which passes beneath the north-western corner of the site, generally in a north-south direction. The proposed location has been plotted on the drawings. This will have an impact on the location of piles for any proposed building. Levels for the proposed tunnel have not been indicated on the drawings. However, we understand that the level on the tunnel crown varies between RL -27.1m AHD and RL -28.25m AHD.

Energy Australia has also indicated their intention to complete the last section of their new 132kV ductline between Vault 8C and Vault 20. The proposed alignment has been taken from information they have provided on 12 January 2007 and incorporated on the drawings.

4.0 Telstra

Telstra Corporation provided 4 large-scale drawings of cables in the area, in the form of AutoCAD "dwf" files. These have been converted to drawing files, and most of the linework (after trimming of notes etc) has been incorporated onto our drawings. For exact details of conduit size and configuration, refer to the original drawings.

It should be noted that Telstra ductwork often contain telecommunications cables owned by other service providers, as discussed in Section 5. Special care needs to be taken at the interface between Telstra conduits and cables from other providers, as the information provided is not entirely clear and has not been accurately identified.

4.1 Network Mains

Two (2) plans showing trunk network cables have been examined. Trunk cables are located along the western side of Harbour Street and extending north of the Darling Walk site south of the Western Distributor and towards the Convention Centre. No other trunk cables have been noted in the immediate area.

Care should be taken in foundation placement for buildings over the cables.

4.2 Local Mains

Two (2) plans showing local network cables have been examined. Local cables are located between the existing buildings and the trunk network.

Obviously cables to the existing buildings would need to be terminated and replaced with new cabling, prior to demolition and excavation.

5.0 Other Telecommunications

5.1 Optus / UEComm

Optus (which incorporates the former UEComm network) owns Telecommunications Cables in the area. Their cables are located in their own ducts and also within the ducts of other utilities. Optus have provided us with nine maps of the Optus network and nine maps of the UEComm network on 5th June 2007, in the form of Adobe Acrobat 'pdf' files. These are not accurate enough for plotting onto our drawings.

Optus and UECOMM cables generally do not appear to be affected by the proposed development. However, there appear to be cables in Bathurst Street which cross Day Street, and beneath the Western Distributor. These may be affected by any proposed external works.

5.2 Primus Telecom

Primus Telecom own cables in the area. Their cables are located within Telstra ducts. They have provided us on 5th June 2007 with nine maps in the form of Adobe Acrobat 'pdf' files. These are not accurate enough for incorporation into our drawings.

Primus Telecom cables generally do not appear to be affected by the proposed development. The nearest cables appear to be located east of Sussex Street.

5.3 PowerTel

PowerTel Limited own Fibre Optic Cables in the area. Their cables are located within Energy Australia ducts.

In their response to our request dated 5th June 2007, PowerTel have not advised the location of their cables. They refer us to Energy Australia for the location of their cables within the Energy Australia infrastructure.

5.4 VisionStream

VisionStream Pty Limited owns Fibre Optic Cables as part of their Nextgen Network. Their cables are located within Telstra ducts. On 5th June 2007 they provided us with seven A3 drawings in the form of Adobe Acrobat 'pdf' files, identifying the Telstra ducts / tunnels containing their cables.

Their assets are located on the southern side of Liverpool Street, crossing Harbour Street and running along the western side of Harbour Street. The cables then cross east-west in Telstra conduits just to the north of the site. For further information refer to the details of Telstra ducting.

5.5 Verizon

Verizon Business own Fibre Optic Cables and installations in the area. On 5th June 2007 they provided us with five A3 plans in the form of Adobe Acrobat 'pdf' files, identifying their ducts containing their cables. These are generally located outside the development site. However, a cable is identified on the southern side of Bathurst Street, linking to the Telstra conduit which crosses generally east-west just to the north of the site. The cables in Bathurst Street appear to follow the alignment of Telstra cables in that area, and may be contained in Telstra ducts.

5.6 AAPT

AAPT Limited advised on 5th June 2007 that they have assets within the vicinity of the site, and provided two A4-sized excerpts from their map database, in the form of Excel spreadsheet files. These are not accurate enough for incorporation into our drawings. However, their nearest cabling appears to be in Kent Street and Liverpool Street, and therefore should not affect this project.

5.7 PIPE Networks

Pipe Networks advised on 5th June 2007 that they have assets within the vicinity of the site. Their cables are located within Telstra, Nextgen and Powertel ducts. They have not provided us with details of their cables. They refer us to Telstra, Nextgen and Powertel for the location of their cables within their respective infrastructure.

6.0 Agility

Agility reported the existence of gas mains in the area, as follows:

- A 150 mm secondary main is located beneath the Western Distributor, connecting from the Sydney Convention Centre to Harbour Street. This main connects to another 150 mm secondary main which heads northwards beneath the Western Distributor towards Wheat Road, where it reduces in size to 110mm diameter. This main clashed with the proposed cross-city tunnel excavation, and the diversion has been completed and its as-built location documented. The diverted main appears to cross within the tunnel exhaust shaft structure, and is then aligned with the northern edge of the elevated walkway attached to the Western Distributor.

The latest reticulation plan from Alinta shows the 150mm diameter main west of the site on a slightly different alignment from that previously plotted. It also shows the connection to the Sega World site is located at the northern edge of the building, rather than the north-eastern face as previously plotted.

- A 250 mm secondary main runs along Harbour Street near Liverpool Street. This main should not be affected by the proposed development. A minor diversion was planned in September 2005.

Care should be taken to locate existing gas mains precisely before excavation proceeds, as the reticulation plans provided by Alinta are at a very small scale, with few reference points, and therefore it has not been possible to plot their location precisely.

7.0 RailCorp (Rail Corporation NSW)

RailCorp (formerly known as Railway Infrastructure Corporation (RIC)) provided a set of A3 sized drawings on 21st June 2007 in response to the Dial-Before-You-Dig request. These drawings are extremely difficult to read, having been scanned from very old drawings. In 2003 we obtained full sized drawings, and electronic files of the major cabling in the vicinity of the site. These have been incorporated on the drawing, but have not been updated to 2007 records. However, from comparison between the drawings provided recently and the drawings provided in 2003, it would appear that no major changes have occurred since that time. In particular, the most recent drawings of the cables in Bathurst Street and Day Street do not appear to have been updated since 25 July 2003.

7.1 Electrical Cables

RailCorp cables are located on the southern side of Bathurst Street and run southwards down Day Street before crossing Harbour Street and entering the site. The cables then run northwards along the western side of Harbour Street and then continue in a north-westerly direction diagonally under the Western Distributor. These cables are 33kV, but are not gas-filled.

The cables appear to pass just to the south-west of the proposed exhaust stack. The design of the northern basement entry ramp should be kept elevated until the ramp has passed over the 33kV cables, and then ramp downwards, as the cables are not deep.

Obsolete cables cross beneath the Darling Walk buildings from east to west. These have not been shown on the Services Plan, for clarity.

We note that the plotted position of RIC cables within the site may be slightly in error, as there is a discrepancy between the plotted position of cables and the surveyed easement. Extreme care should be exercised to locate the cables accurately in this area.

7.2 Other Assets

A RailCorp cable gassing station is located at the north-east corner of the site, west of Harbour Street and south of the Western Distributor. It supplies gas through a feed line running along the un-gassed main towards the gassed 33kV lines in Sussex Street. This cable gassing station will need to remain until all existing gassed mains have been replaced with un-gassed mains.

It was proposed that the gassing station be relocated as part of the cross-city tunnel works. The new gassing station would be much smaller, as the length of the old gas-filled electrical cables has been reduced by replacement with new cables that do not require gas filling. We have no information on this work having been completed. Ultimately, the new gassing station will be replaced with a small unit for gassing of pilot cables only. The location of the new (interim) gassing station will be determined by negotiation so that it minimises any constraint on proposed redevelopment of the site.

8.0 Cross City Tunnel

A meeting was held in 2003 with the services coordinator for the cross-city tunnel contractors Baulderstone Hornibrook – Bilfinger Berger joint venture. A part copy of their combined services plan was obtained for comparison with our Services Plan. No major differences were noted, although they reported that the location of the gas mains in their vicinity was not exactly as documented on Agility records.

Hard copies of roadworks and tunnel design drawings in the vicinity of the site were provided.

The cross-city tunnel drawings also indicated the use of rock anchors in association with the Harbour Street approach, and these anchors encroach into the site at the north-east corner. An easement, limited in height and depth (from RL 3.0 to RL -14.5) contains the anchors.

We have obtained “works-as-executed” drawings from Cross City Motorway, in the form of Adobe Acrobat “pdf” files, and these are provided with this report. Due to the large number of drawings, a separate list of drawings has been collated.

The approximate locations of the Cross City road tunnels and ventilation tunnel have been indicated on our drawing. These locations have been traced from drawings only, and have not been confirmed by survey or CAD file overlay.

9.0 Overland Flow

The site is located at the low point of a large catchment extending eastwards into the CBD. Overland flows will occur when the runoff from storms is higher than the capacity of the existing in-ground stormwater drainage network.

An examination of site levels does not reveal any major overland flow path through the site. Major overland flows would travel along Harbour Street. The depth of this overland flow has not been determined. It will be necessary to ensure that all habitable floor levels, entrances to basement car parks, and vents to underground car parks are located at least 300mm above the water levels in Harbour Street during the peak 100-year Average Recurrence Interval (ARI) storm event.

10.0 Summary of Infrastructure Constraints

The following potential constraints on site redevelopment have been noted:

1. The James Street stormwater drain crosses the site from east to west and may clash with any proposed basement excavation.
2. Electrical cables enter the site near the James Street drain and extend northwards through the site. (These have been marked as obsolete.) Other cables skirt the site along Harbour Street and just to the south of the Western Distributor.
3. Large banks of Telstra cables skirt the site. It should be possible to avoid these cables, by careful building setout.
4. A 4-metre diameter cable tunnel is proposed, crossing beneath the site at the north-western corner. This may have an impact on foundation location and excavation.

This review does not include potential clashes between proposed roads, carpark ramps, building services or proposed stormwater diversions with the existing services. The basement of any proposed structure should be located to clear major electrical, stormwater and sewer trunk services. Detailed design will need to take into account the clearance from and protection of other services.

It is anticipated that the services plan will be updated with further information as it comes to hand.

11.0 Supply of Infrastructure

The development envelope for the original precinct redevelopment proposed an approximate Gross Floor Area (GFA) of 75,000 square metres. It was expected to consist of generally retail and commercial usage, with possibly some hotel or entertainment facilities.

An investigation into existing infrastructure and the likely demands generated by a development of that size indicated that the proposed development was capable of being serviced with civil infrastructure as outlined below, subject to payment of the necessary contributions to the service authorities.

11.1 Roadworks

Vehicular access will be required to any basements beneath the site. Access could be from the south-eastern corner and the northern end of the site.

At the south-eastern corner, cars could enter the car park via a slip lane off Harbour Street, and leave via Harbour Street or Liverpool Street.

At the northern end of the site, a roadway would be required to be constructed, looping from the service road off Harbour Street westward to pass beneath the freeway viaducts, then continuing eastwards back to the Harbour Street service road just south of the Imax building. This roadway could link in with the roadworks for the Cross City Tunnel. This roadway could allow access to and from basement car parks as well as to the area around the Imax building.

The roadway width should be a minimum of 5.0m for a one-way carriageway, which is adequate for cars or trucks. The minimum width in a two-way section should be 6.0m, which can accommodate a car passing a service vehicle. Clearance beneath the freeway viaducts would be a minimum of 3.3 metres, and signage would need to be erected to warn heavy vehicles of the low clearance. Some surface shaping may be necessary to maintain this clearance. Drainage for the roadway would be to existing gully pits.

11.2 Stormwater

The existing site is occupied by buildings, driveways and hard landscaped surfaces. Therefore there will be no increase in stormwater runoff from the proposed development.

Twin box culverts run north-south on the western side of the site. The left culvert is the Hay-Lackey drain, and is 3.07m wide by 2.21m high. The right culvert is 3.708m wide by 2.21m high. Information obtained from Sydney Water indicates that these drains have reserve capacity, and site stormwater drainage lines may be connected to them.

11.3 Water Supply

Sydney Water records show a 200mm diameter water main runs along Harbour Street to the east of the proposed development, and 200mm diameter mains running east-west to the south and south-west of the site. A water service to the proposed development would come from these mains. These water mains service the current development with adequate pressure. Internal pressure boosting may be needed for higher building levels.

In their latest published standards (WSA03-2002) Sydney Water calculates the water demand for high-density commercial and retail uses at 63,000 litres per GFA hectare per day. Based on this criterion, the originally proposed maximum buildout of 75,000 square metres GFA would generate a maximum daily demand of 473 kL which equates to a peak hourly demand of 11 litres per second. This is well within the capacity of a 200mm diameter main.

In addition to the domestic connection described above, an internal fire service from the external mains would also need to be provided to the proposed building. Fire hydrants and a fire booster point would need to be provided in accordance with the relevant fire regulations.

Sydney Water requirements for water supply would be obtained by an application for a Compliance Certificate under Section 73 of the Sydney Water Act 1994.

11.4 Sewerage

Sydney Water records indicate that a trunk sewer main crosses the site at the northern end. This sewer is 750mm diameter and is very deep (Invert Level -2.58m AHD where it crosses below the twin stormwater culverts described above). Permission would need to be obtained from Sydney Water to build over this sewer. This is normally provided subject to assurance that no loads from the building could be applied to the sewer.

Reticulation mains of 450mm diameter run along the eastern side of the site parallel to Harbour Street. A connection to this gravity main services the current development on the site. This connection may need to be upgraded or relocated to service the proposed development.

Sydney Water has verbally advised that the trunk sewer mains in the area have reserve capacity. However confirmation of their requirements would be obtained by an application for a Compliance Certificate under Section 73 of the Sydney Water Act 1994.

The originally proposed maximum Gross Floor Area for this site was approximately 75,000 square metres. The proposed development was expected to consist of generally retail and commercial usage, with possibly some hotel or entertainment facilities.

Sydney Water typically calculates the demand for retail and commercial uses at approximately 160 Equivalent Persons (EP) per hectare of Gross Floor Area. Based on this criterion, the originally proposed development would have a demand population of 1200 EP. Using Sydney Water's methodology, this would generate peak dry weather flows of 10.9 litres per second. This is well within the capacity of the trunk mains around the site.

11.5 Electricity

Energy Australia has confirmed that the electrical reticulation network has sufficient capacity to meet the demands from this site. Up to three (3) substations may be required.

11.6 Telecommunications

The extent of Telstra network mains in the area indicates that supply of communications facilities to the site can be readily achieved.

12.0 Copyright

Drawings and CAD files issued with this report have been compiled from information provided by services authorities.

Sydney Water Corporation, Energy Australia and Telstra Corporation have provided this information with the strict provision that it is used for this project only, and not to develop a database of their respective infrastructure.

Recipients of this information are bound to this undertaking.

APPENDIX



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