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FLOOD RISK ASSESSMENT REPORT

FOR THE PROPOSED DEVELOPMENT AT:

5-7 PARKES STREET PARRAMATTA

Prepared By: Steve Arraj
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(1) Site Analysis

(1.1) Location

The site is located at the southern side of Parkes Street and on the eastern side of Anderson Street, Parramatta.

(1.2) Surrounding Area

The site is bounded by Parkes Street to the north, Anderson Street to the west, Jubilee Park to the east and an existing Hotel to the south.

(1.3) Adopted Flood Levels

The flood levels for the site have been determined from the Lower Parramatta River Floodplain Risk Management Study prepared by SKM dated May 2005 which states the following levels:

At Parkes Street (approx. 50m upstream of western boundary)
SKM Section CHURCH_PARKES_104

1 in 20 Year A.R.I Flood Level	R.L. 11.69 v = 3.5 m/s
1 in 100 Year A.R.I Flood Level	R.L. 11.75 v = 4.0 m/s
P.M.F. Flood Level	R.L. 12.95 v = 7.4 m/s

At Parkes Street Boundary (approx. 10m downstream ofeastern boundary)
SKM Section CHURCH_PARKES_209

1 in 20 Year A.R.I Flood Level	R.L. 9.84 v = 0.0 m/s
1 in 100 Year A.R.I Flood Level	R.L. 9.92 v = 1.4 m/s
P.M.F. Flood Level	R.L. 11.31 v = 4.5 m/s

The flood levels across the site have been interpolated from these issued levels and are plotted in Appendix 'B' of this report.

(1.4) Existing Buildings/Structures within the Site

The site currently contains a single story brick and timber commercial building surrounded by a paved car park.

(1.5) Easements or any other constraints

The site is not burdened by any easements.

(2) Existing Flood Risk Categorization – Pre-Development State

Risk of Flooding on Site:

Parramatta City Council's *Local Floodplain Risk Management Policy* Section 6 defines the following as a High Flood Risk Precinct.

High Flood Risk Precinct

"The high flood risk precinct is where high flood damages, potential risk to life, evacuation problems are anticipated or development would significantly and adversely affect flood behavior....This has been defined generally as the area of land below the 100 year flood that is either subject to a high hydraulic hazard or where there are significant evacuation difficulties."

In this regard, our assessment of the risks outlined is as follows:

(2.1) High Flood Damage

The current building has a floor level at R.L 11.19m AHD. This is estimated to be a minimum of 100mm above the 1 in 100 year interpolated flood level for the site.

The car park area is marginally below the 100 year flood level and flows would be expected to enter from the driveway in Anderson Street and flow at shallow depths around the existing building. It is important to note that a kerb around the perimeter and the building itself pose significant obstructions to the 100 year flood flows.

The flow depths through the site are approximated to be between 200mm to 300mm based on the interpolated flood levels from the SKM report and the site survey plan.

Accordingly, the site **IS** not susceptible to High Flood Damage

(2.2) Potential Risk to Life

The site in its current form has one commercial building surrounded by the 1 in 100 year flood zone. The ground floor level of the building is marginally above the flood level and presents some form of refuge for events up to this magnitude. Accordingly, the site is considered to have a **MEDIUM** potential risk to life.

(2.3) Evacuation Problems Anticipated.

Egress from the site is currently directed to Anderson Street, however it is possible for pedestrians to egress via Parkes Street or Jubilee Park to the east. All of these site frontages are below the 1 in 100 year flood level. The northern side of Parkes Street immediately adjacent to the site is shown as flood free ground according to the flood mapping in SKM's Report

The approximate flow depths at all three frontage based on interpolation of the flood levels and comparison with natural ground levels is estimated to be between 200mm to 300mm in depth.

Given the depth and of flows in this case, the current property does have evacuation problems and it is considered **MEDIUM** risk.

(2.4) Risk Categorisation

Given this analysis of the key indicators of categorising the Flood Risk Precinct, we conclude that the site in its **current form** would be classified as a **"Medium Flood Risk Precinct"**

(3) Flood Risk Categorization – Post-Development State

A similar analysis can be provided for the site as proposed. The design of the building can be modified to minimize the Flood Risk and therefore re-classify the site. The new classification is then applied to Council's Floodplain Matrix to ensure compliance with the relevant constraints.

(3.1) High Flood Damage

The only elements subject to flood damage are the columns and metal flow through grills or flood gates along the perimeter of the building. Given the maximum depth of flow in the 1 in 100 year event is in the order of 300mm, the proposed concrete columns and walls can be designed to withstand this load. Metal grill fencing would simply be replaced if damaged by floating debris, alternatively a swinging flood gate arrangement could be implemented.

Accordingly, the site is **NOT** susceptible to High Flood Damage

(3.2) Potential Risk to Life

The development proposal sets the ground floor of the development a minimum of 500mm above the 1 in 100 year flood level. Accordingly, the site is considered to have a **LOW** potential risk to life.

(3.3) Evacuation Problems Anticipated.

The proposal provides egress from the site to Anderson Street, Parkes Street and Jubilee Park. All of these egress points are between 200mm and 300mm below the interpolated 100 year ARI flood level.

Although there is potential to wade through relatively shallow flood waters in Parkes Street to reach flood free ground on the other side of the road, a shelter in place strategy would be more appropriate for the proposed development.

The site is located in close proximity to hospital and medical services and emergency response times can be expect to be short.

Relatively shallow flow depths for events up to the 100 year flood will enable emergency services personnel to access the site if required.

Public awareness can be heightened with the provision of signage marking proposed flood heights and directing pedestrians to the safest egress point. (These details should be required at the detailed design stage and made a condition of any Development Consent)

Accordingly, the evacuation of the site would be classified as a **MEIUM** risk.

(3.4) Development Would Significantly and Adversely Affect Flood Behaviour.

The proposed building footprint incorporates a consolidated and graded flood storage area which is inaccessible to occupants via the provision of metal flow through grill fencing or flood gates around the perimeter of the site.

The footprint of the existing building will be eliminated and the flood storage available on site increased by $150m^3$.

The flow direction through the site is from west to east and the proposed driveway ramp, stair and lift cores pose a reduced obstruction to flood waters flowing through the site.

The exiting car park rises to a crest at the north western corner of the site before falling away towards Jubilee Park to the east. This causes flood flow in the pre developed state to pond in the western portion of the site before over topping the crest and then flowing around the existing building.

The proposed floodway slab area is evenly graded at 1.5% and enables floodwaters to have a significantly improved travel direction from west to east.

Given the position of the existing building in the pre-developed state poses a significantly greater obstruction to floodwaters than the proposed penetrations through the floodway as well as the location of the flows entering the site, it is considered that he impact on flows and velocities through the site would not be adversely affected.

Accordingly, the development would **NOT** significantly and adversely affect flood behaviour.

(3.5) Risk Categorisation

Given this analysis of the key indicators of categorizing the Flood Risk Precinct, we conclude that the majority of the site **as proposed** would **not** be classified as a "High Flood Risk Precinct"

By demolishing the existing structure and constructing a building sympathetic to the flooding of the area, the flood risks can be significantly reduced.

Given the nature of the proposal and the evacuation depths and distance to flood free ground as discussed above, we would contend that the building can be assessed as a Medium Flood Risk Precinct.

The assessment using the Flood Development Matrix therefore should assess the "Medium Flood Risk Precinct"

(4) Flood Matrix Assessment

(4.1) Floor Level (Matrix Assessment Criteria 2 & 5)

Criteria 2: Habitable floor levels to be equal to or greater than the 100 year ARI flood level plus freeboard

The 1 in 100 year flood levels for this site have been determined as R.L. 11.28m AHD at the western boundary of the site and R.L. 10.13m AHD at the eastern boundary of the site. These levels have been calculated by a linear interpolation of issued flood levels upstream and downstream of the site.

The minimum required freeboard to the 100 year flood level is 0.5m. Accordingly, the minimum habitable floor level required for the development is R.L. 11.78m AHD.

The proposal has set the lowest commercial floor level at R.L 11.80m AHD and the first residential floor level at R.L. 14.80m AHD. The minimum residential floor level is above the adopted PMF level for this location of R.L. 12.35m AHD. Both are above the minimum required floor level and compliant with the Floodplain Matrix requirement.

Criteria 5: A restriction is to be placed on the title of the land, pursuant to Section 88B of the Conveyancing Act, where the lowest habitable floor area is elevated more than 1.5m above finished ground level, confirming that the sub floor space is not to be enclosed.

The sub floor area has been designed as a flood storage and flow through area to ensure the floodway is not compromised. It is agreed that a restriction will need to be registered on title to ensure the sub floor area is not enclosed and further that no materials are stored in the sub floor area to ensure no blockage of flows or reduction in flood storage volume.

It is further suggested that a positive covenant also be required to ensure all flood gates or flow through grills are adequately maintained and that any mechanical warning systems are regularly tested and maintained.

To ensure this is provided, Council will need to impose a development consent condition requiring the creation of the Positive Covenant and Restriction as to User. Council will also need to condition that the only body empowered to modify or remove these covenants is Parramatta City Council.

(4.2) Building Components & Method (Matrix Assessment Criteria 1)

Criteria 1: All structures to have flood compatible building components below the 100 year ARI flood level plus freeboard.

In this case, this refers to all structural components below R.L. 11.78m AHD. This can be identified as the following items:

1. Columns
2. Stair and Lift shafts
3. Flood gates/ grills

Items 1 & 2 will be designed by the structural Engineer for the project. They will need to be able to withstand the lateral loads imposed by the floodwater which pass through the flood affected zone. Given the height of the proposed building, these components will need to be of re-enforced concrete or concrete filled re-enforced concrete block construction.

Council will need to impose a development consent condition requiring the Structural Engineer for the project to provide design certification that all structural elements are capable of withstanding the lateral flood flows.

Furthermore, the soffit of the ground floor slab will need to be a minimum of 300mm above the 1 in 100 year flood level. Given that the lowest floor level is at RL 11.80 and the 100 year level is RL 11.28m, an available structural depth of 220mm is available for the ground floor slab at the Anderson Street frontage. The available depth increase to 400mm approximately 5m to the east and continues to increase in the easterly direction. This is considered achievable in regards to the structural design elements for the project as the transfer level will be at level one or the first residential level.

The Flood gates or grills will be fabricated from metal. In the case of flood gates, they will need to be hinged at the top and a float operated pin mechanism provided at the base. The pin will release once floodwater approach the base of the flood gates.

Alternatively, should an open grill solution be suggested, shear bolts can be provided to hold them in place so that floodwaters are not impeded should the grills become blocked. Design details can be provided at the Construction Certificate stage and an appropriate development consent condition can be applied to ensure compliance.

(4.3) Structural Soundness (Matrix Assessment Criteria 1)

Criteria 1: Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including the 100 year ARI flood level plus freeboard.

As mentioned previously, the structure will be supported on re-enforced concrete columns and the stair and lift cores will predominately be re-enforced concrete walls or some portions may be able to utilise concrete filled re-enforced concrete block construction.

Again, Council will need to impose a development consent condition requiring the Structural Engineer for the project to provide design certification that the structure itself is capable of withstanding the lateral flood flows.

(4.4) Flood Affectation (Matrix Assessment Criteria 1)

Criteria 1: Engineers report required to certify that the development will not increase flood affectation elsewhere, having regard to (i) Loss of Flood Storage (ii) changes in flood levels, flows and velocities caused by alterations to the flood flows; and (iii) the cumulative impact of multiple potential developments in the vicinity.

(i) Loss of Flood Storage

With the design of the basement levels as proposed, the available flood storage on site in the 1 in 100yr ARI event is calculated at 491m^3. This compares with existing flood storage of 340m^3. The net resultant is that the available flood storage in the 1 in 100yr ARI event will be increased by 151m^3. This residual volume can then account for the OSD storage required for the site as permitted by The Upper Parramatta River Catchment Trust Guidelines.

(ii) Changes in flood levels, flows and velocities caused by alterations to the flood flows

It is intended to permit flood waters to flow through the site unimpeded and the construction of a evenly graded floodway slab will ensure flood storage is increased. The removal of the existing building from the site will improve the flow of floodwaters through the site as previously described. The post developed state will have significantly fewer obstructions than the pre developed site and therefore flood behaviour will be more sympathetic with the flood regime for this area.

Given the position of the existing building in the pre-developed state poses a significantly greater obstruction to floodwaters than the proposed penetrations through the floodway as well as the existing kerb that obstruct flow entering the site, it is considered that he impact on flows and velocities through the site would not be adversely affected in the post developed state.

(iii) The cumulative impact of multiple potential developments in the vicinity.

In this regard, the cumulative impacts of this type of development within the 1 in 20 year and 1 in 100 year A.R.I. Flood Zone would be positive. In this case, the development provides a benefit by creating additional flood storage in the flood plain.

The removal of the existing building from the site will improve the flow of floodwaters through the site. The post developed state will have fewer obstructions than the pre developed site and therefore flood behaviour will be more sympathetic with the flood regime for this area

The overland flowpath will be improved from the pre-developed state as there are fewer obstructions and the surface will be an evenly graded concrete slab. The development will also enable a commercial floor level with appropriate freeboard to the 100 year flood level.

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(4.5) Car Parking and Driveway Access (Matrix Assessment Criteria 1, 3, 5 & 7)

Criteria 1: The minimum surface level of open spaces or carports shall be a s high as practical, but no lower than 0.1m below the 100 year ARI flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100 year ARI flood level.

The basement carpark is accessed via a ramp from Anderson Street. The surface level at the top of the ramp has been set at RL 11.80m AHD. This level is 520mm above the 1 in 100 year interpolated flood level at the western boundary of the site. All retaining walls surrounding the ramp will be set a minimum of 500mm above the 1 in 100 year flood level and therefore compliant with Council's Floodplain Matrix criteria.

Criteria 3: Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed parking, must be protected from inundation by floods equal to or greater than the 100 year ARI flood. Ramp levels to be no lower than 0.5m above the 100 year ARI flood level.

All garaged vehicle parking spaces are accessed via the driveway ramp. The access point to the basement car park rises to a peak height of R.L.11.80m AHD. This is 0.52m above the 1 in 100 year ARI flood level and therefore compliant with Council's Floodplain Matrix criteria.

Criteria 5: The level of the driveway providing access between the road and parking spaces shall be no lower than 0.2m below the 100 year ARI flood level.

The flood level at the driveway access to the site has been determined as R.L. 11.28mm AHD (Anderson Street frontage)

The existing gutter level at the driveway access to the site varies between R.L.10.78m and R..L.10.91m. This is 370mm to 500mm below the 100 year ARI flood level. The boundary levels at the driveway are calculated to be R.L 11.05m AHD (utilizing a 3% cross fall)

The depth of floodwaters at the driveway access to the site at the boundary is therefore 230mm. To address this issue, the Site Emergency Response Plan will need to ensure vehicles do not exit the site in flood events. A alarm system will need to be implemented to ensure this action.

Criteria 6: Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100 year ARI flood level, shall have adequate warning systems, signage, exits and evacuation routes.

Although the physical car spaces are located below the 100 year ARI flood level, access to these spaces is via the ground floor level which is greater than 0.5m above the 100year ARI flood level. The car spaces are physically bunded by concrete structures which prevent inundation by all events up to and including the 100 year ARI event with allowance of significantly greater than a 0.5m freeboard.

For events in excess of the 100year flood event up to the PMF flood event, it is proposed that a flood warning system and evacuation procedure be put into place to address these issues. (This will be discussed in more detail further into this assessment) It should be noted that it is not intended to attempt to evacuate vehicles in storm events exceeding the 100 year ARI flood event, as flows in Anderson Street are likely to make vehicles unstable. (PMF level is 1.8m above kerb level at driveway location)

Criteria 7: Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year ARI flood.

All flood events up to the 100 year flood event will not enter the car park areas and therefore this will not be an issue. Events greater than the 100 year flood that may breach the basement car park (PMF level is R.L. 12.53m AHD and approximately 800mm above the ground floor slab). As the driveway has a curved radius at the bottom of the ramp, a vehicle floating off the site is unlikely.

Nevertheless, the criteria refers to the 100 year flood event and the basement car park is entirely protected with significant freeboard to the 100 year flood level. Accordingly, the issue of preventing vehicles floating of site is compliant with Council's Floodplain Matrix criteria.

Criteria 4: Applicant to demonstrate the development is consistent with any relevant flood evacuation strategy or similar plan.

The site will have a flood risk management plan incorporated into the strata by-laws to ensure occupant awareness of the flood risks in this precinct.

A "shelter in place" strategy will be adopted as the urban nature of the catchment ensures that flood durations will be relatively short (hours rather than days)

The site is located in close proximity to hospital and medical services and emergency response times can be expect to be short. Emergency services personnel would be able to access the site in four wheel drive vehicles in events up to the 100 year flood if necessary

Public awareness can be heightened with the provision of signage marking proposed flood heights as well as alarm systems requiring basement evacuation of occupants in extreme events. (These details should be required at the detailed design stage and made a condition of any Development Consent)

For events greater than the 100 year ARI flood up to the PMF event, pedestrian evacuation is proposed to be to the upper levels of the building which are above the PMF level.

If necessary, it is possible to evacuate via the Parkes Street entry in storm events up to and including the 100 year event as ponding depths are estimated at between 200mm to 250mm with a flow velocity of 1.4m/s. this results in a Velocity Depth (VD) ratio of 0.35.

Accordingly, the evacuation strategies listed are compliant with Council's Floodplain Matrix criteria.

Criteria 6: Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon SES or other authorized emergency service personnel.

The flood evacuation plan proposed will need to form part of the by-laws of the body corporate. A shelter in place strategy will be adopted as the duration of flooding is relatively short and all residential properties are above the PMF level

A vertical evacuation to higher levels in the building during events greater than the 100 year ARI event will ensure pedestrians are not put at risk, and the prohibition of vehicles exiting the site in these events (can be done by linking the float alarm to the mechanism for the garage access door will reduce the need for emergency services personnel to assist.

Therefore, compliance with Council's Floodplain Matrix criteria can be achieved.

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(4.6) Evacuation (Matrix Assessment Criteria 3,4 & 6)

Criteria 3: Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (e.g. second storey) or off site

(i) Pedestrian Evacuation

The proposal is for a commercial/residential flat building consisting of ground floor commercial tenancies and residential apartments above.

All first floor residential levels are above the PMF level of R.L. 12.53m AHD. The ground floor commercial areas are approximately 800mm below the PMF flood level however they can be evacuated by internal stairs in a vertical direction up the building.

It should be noted that habitable floor levels are only required to be 500mm above the 1 in 100 year flood level. This has been achieved in this development.

It is not intended to evacuate the development in significant flood. The commercial level is a minimum of 520mm higher than the 100 year flood level and all the residential levels are well above the PMF level. Therefore, a "Shelter in Place" strategy will be adopted.

If necessary, it is possible to evacuate via the Parkes Street entry in storm events up to and including the 100 year event as ponding depths are estimated at between 200mm to 250mm with a flow velocity of 1.4m/s. this results in a Velocity Depth (VD) ratio of 0.35.

A flood warning system would be appropriate to warn occupants and this would be triggered once flood waters breach the boundary of the property.

Detailed design and operation of the alarm warning system as well as the preparation of a flood risk management plan can be prepared at the Construction Certificate Application stage. Development consent condition can be applied to ensure compliance with this requirement.

(ii) Vehicle Evacuation

It is not intended to attempt to evacuate vehicles in storm events exceeding the 20 year ARI flood event, as flows in Anderson Street are likely to make vehicles unstable. The alarm system and evacuation manual will need to re-enforce this requirement. Details will be provided in a comprehensive Flood Evacuation Manual prepared at CCA stage.

(4.7) Management & Design (Matrix Assessment Criteria 2,3 & 4)

Criteria 2: Site Emergency Response Flood plan required where the site is affected by the 100 year ARI flood level.

A Site Emergency Response Plan is considered essential for this development. This can be done at the CCA stage and an appropriate development consent condition can be provided to ensure compliance with Council's Floodplain Matrix criteria in this regard

Criteria 3: Applicant to demonstrate that he area available to store goods above the 100 year flood level plus freeboard.

All goods will be stored at ground floor level or above. Given that the ground floor is set at R.L. 11.80m AHD and is greater than 0.5m above the 100 year flood level of R.L.11.28m AHD, compliance with Council's Floodplain Matrix criteria has been achieved. Any items stored in the basement are similarly protected by the level of the access driveway in comparison to the 100 year flood level.

Criteria 4: No storage of materials below the 100 year ARI flood level.

The proposal has not allowed for any storage of materials below the 100 year ARI flood level. To ensure occupants do not store materials in the floodway area, the zone will be enclosed by either flood gates or open grill fencing. Restricted key access will also be provided. A restriction as to user will also need to be applied to the title of the property as a protective measure. This should be condition as part of the consent to ensure compliance with Council's Floodplain Matrix criteria.

(5) Conclusions and Recommendations

In order to prevent any impacts on other properties within the catchment, any proposed development on this particular site would need to ensure that the flood storage available on the site is not reduced and that obstructions to the flow path are minimised.

The area taken by the basement walls, columns and any lift or stair shafts will need to be compensated for by re-grading the existing ground level beneath the proposed building.

From the calculations in the appendices, the available flood storage will be increased in the post –developed state by approximately 150m^3.

The removal of the current commercial building from the site and the proposed method of construction will mean the flood behaviour at the site will be consistent with the flood regime for this portion of the catchment.

By grading the floodway slab and located the driveway close to its current location, floodwaters are able to flow through the site with significantly less obstructions.

The architectural plans have ensured that the ground floor level is set a minimum of 520mm above the 1 in 100 year ARI Flood Level (i.e. R.L. 11.80m AHD)

Vehicle access to the parking area is from Anderson Street. The basement car park will be constructed as a watertight structure and mechanically ventilated. The crest to the basement car park has been set a minimum of 500mm above the 100 year flood level.

For events greater than the 20 year ARI storm up to the PMF event, the basement car park will not be evacuated of vehicles. The float alarm for these events can be linked to the roller shutter at the access ramp to ensure this occurs.

The Site Emergency Response Flood plan for the site needs to adopt a shelter in place strategy. The duration of flooding is relatively short and the floor levels of the building have been set accordingly.

If necessary, it is possible to evacuate via the Parkes Street entry in storm events up to and including the 100 year event as ponding depths are estimated at between 200mm to 250mm with a flow velocity of 1.4m/s. this results in a Velocity Depth (VD) ratio of 0.35.

Appropriate warning signs, flood alarms, flood depth indicators and directional signs will need to be incorporated into the detailed design documentation for the site.

A Site Emergency Response Flood Plan will be provided for the site to set out the key requirements to manage the flooding of the site and appropriate actions.

With these factors in mind, it is recommended that Council approve the development subject to conditions requiring the flood storage to be maintained, access and freeboards to be as discussed in this report, appropriate signage and flood indicators being provided and Council's general conditions relating to the disposal of stormwater from development sites.

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(6) Appendices

(a) Floodplain Matrix
Assessment Criteria

(b) Survey Plan & Calculation of
Pre Development Flood Storage
(HKMA DWG No 6273-C-DA01)

(c) Basement Footprints & Calculation of
Post Development Flood Storage
(HKMA DWG Nos 6273-C-DA02)

(d) Site Stormwater Discharge
(HKMA DWG No 6273-C-DA03 & 6273-C-DA04)

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APPENDIX 'A'

Floodplain Matrix
Assessment Criteria

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FLOODPLAIN MATRIX

Planning & Development Controls

Flood Risk Precincts (FRP's)

Planning Consideration	Low Flood Risk									Medium Flood Risk									High Flood Risk								
	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential *	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential *	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development	Sensitive Uses & Facilities	Critical Uses & Facilities	Subdivision	Filling	Residential *	Commercial & Industrial	Tourist Related Development	Open Space & Non-Urban	Concessional Development
Floor Level		3			2, 5	2, 5	2, 5							2, 5	2, 5	2, 5	1, 5	4, 5								1, 5	4, 5
Building Components		2												1	1	1	1	1								1	1
Structural Soundness		2												1	1	1	1	1								1	1
Flood Affectation		2	2	1	2	2	2					1		1	1	1	2	1								1	1
Car Parking & Driveway Access		1, 3, 5, 6			1, 3, 5, 6	1, 3, 5, 6	1, 3, 5, 6	2, 4, 6, 7						1, 3, 5, 6, 7	1, 3, 5, 6, 7	1, 3, 5, 6, 7	2, 4, 6, 7	1, 5								2, 4, 6, 7	1, 5
Evacuation		2, 4, 6	5		3, 4	4	4					5, 3, 4		3, 4, 6	3, 4, 6	3, 4, 6	1, 4	3, 6								1, 4	3, 4, 6
Management & Design		2, 3, 4	1									1		2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4	2, 3, 4								2, 3, 4	2, 3, 4

Not Relevant | Unsuitable Land Use | * For redevelopment of an existing dwelling refer also to 'Concessional Development' provisions

Floor Level

1. All floor levels to be equal to or greater than the 20 year *ARI flood level* plus *freeboard*.
2. Habitable floor levels to be equal to or greater than the 100 year *ARI flood level* plus *freeboard*.
3. All floor levels to be equal to or greater than the *PMF* level plus *freeboard*.
4. Floor levels to be equal to or greater than the *100 year ARI flood level plus freeboard*. Where this is not practical due to compatibility with the height of adjacent buildings, or compatibility with the floor level of existing buildings, or the need for access for persons with disabilities, a lower floor level may be considered. In these circumstances, the floor level is to be as high as practical, and, when undertaking alterations or additions, no lower than the existing floor level.
5. A restriction is to be placed on the title of the land, pursuant to S.88B of the Conveyancing Act, where the lowest *habitable floor area* is elevated more than 1.5m above finished ground level, confirming that the subfloor space is not to be enclosed.

Building Components & Method

1. All structures to have *flood compatible building components* below the 100 year ARI *flood* level plus *freeboard*.
2. All structures to have *flood compatible building components* below the *PMF*.

Structural Soundness

1. Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a 100 year ARI *flood* plus *freeboard*.
2. Engineers report to certify that the structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF level.

Flood Affectation

1. Engineers report required to certify that the development will not increase *flood affectation* elsewhere, having regard to: (i) loss of flood storage; (ii) changes in flood levels, flows and velocities caused by alterations to flood flows; and (iii) the cumulative impact of multiple potential developments in the vicinity.
2. The impact of the development on flooding elsewhere to be considered having regard to the three factors listed in consideration 1 above.

Car Parking and Driveway Access

1. The minimum surface level of open spaces or carports shall be as high as practical, but no lower than 0.1m below the 100 year ARI flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100 year ARI flood level.
2. The minimum surface level of open parking spaces or carports shall be as high as practical, but no lower than 0.3m above the 20 year ARI flood level.
3. Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods equal to or greater than the 100 year ARI flood. Ramp levels to be no lower than 0.5m above the 100 year ARI flood level.
4. The driveway providing access between the road and parking spaces shall be as high as practical and generally rising in the egress direction.
5. The level of the driveway providing access between the road and parking spaces shall be no lower than 0.2m below the 100 year ARI flood level.
6. Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100 year ARI flood level, shall have adequate warning systems, signage, exits and evacuation routes.
7. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving a site during a 100 year ARI flood.

Evacuation

1. Reliable access for pedestrians required during a 20 year *ARI peak flood*.
2. Reliable access for pedestrians and vehicles required to a publicly accessible location during the *PMF peak flood*.
3. Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (eg. second storey) or off site.
4. Applicant to demonstrate the development is consistent with any relevant *flood evacuation strategy* or similar plan.
5. Applicant to demonstrate that evacuation in accordance with the requirements of this DCP is available for the potential development resulting from the subdivision.
6. Adequate flood warning is available to allow safe and orderly evacuation without increased reliance upon SES or other authorised emergency services personnel.

Management and Design

1. Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this the relevant FRMS and FRMP.
2. Site Emergency Response Flood plan required where the site is affected by the 100 year ARI flood level, (except for single dwelling-houses).
3. Applicant to demonstrate that area is available to store goods above the 100 year *flood* level plus *freeboard*.
4. No storage of materials below the 100 year *ARI flood level*.

Notes

i. *Freeboard* equals an additional height of 500mm.

ii. The relevant environmental planning instruments (generally the Local Environmental Plan) identify development permissible with consent in various zones in the LGA. Notwithstanding, constraints specific to individual sites may preclude Council granting consent for certain forms of development on all or part of a site. The above matrix identifies where flood risks are likely to determine where certain development types will be considered "unsuitable" due to flood related risks.

iii. Filling of the site, where acceptable to Council, may change the FRP considered to determine the controls applied in the circumstances of individual applications.

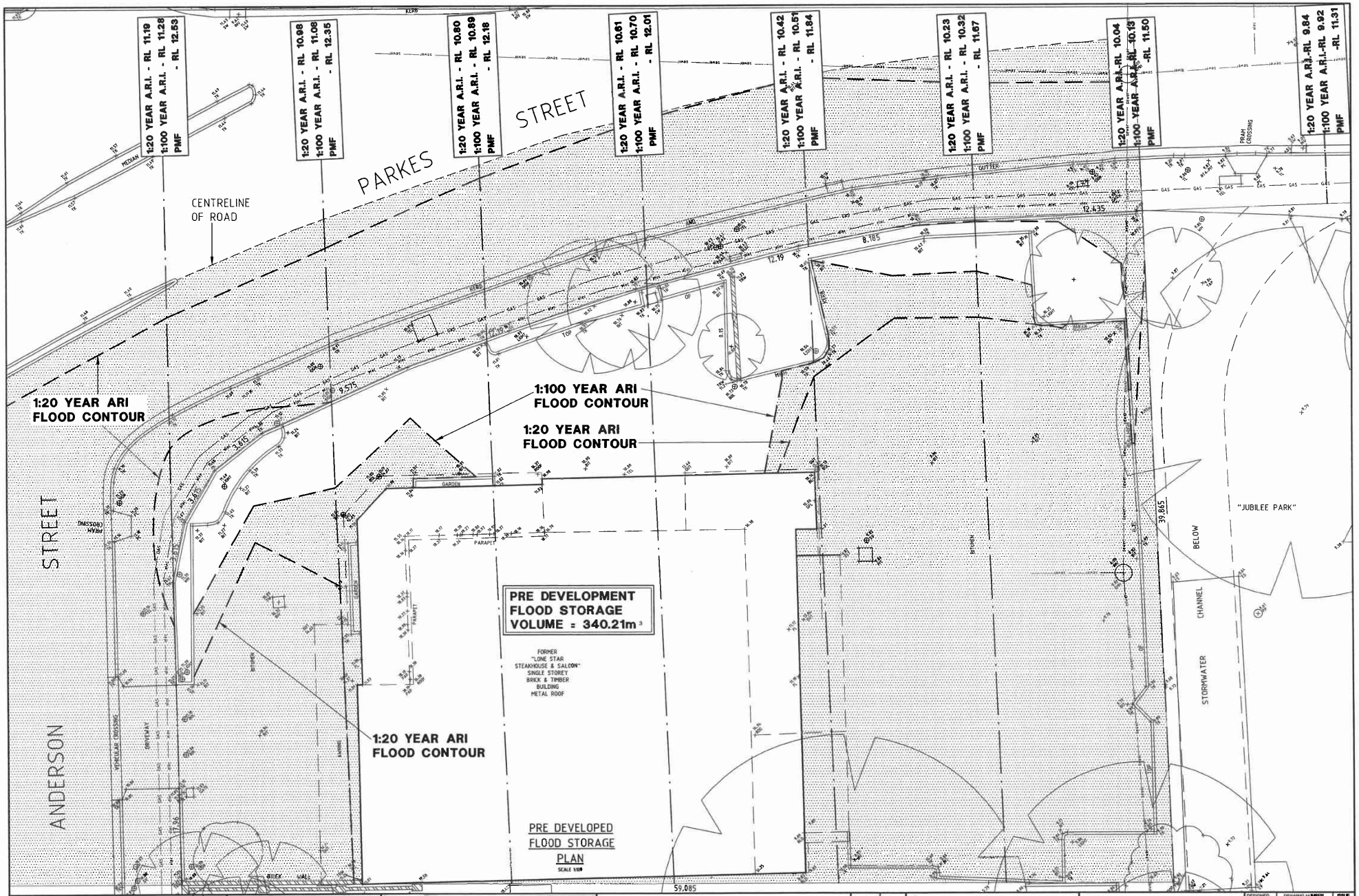
iv. Any fencing that forms part of a proposed development is subject to the relevant Flood Effects and Structural Soundness planning considerations of the applicable land use category.

v. Development within the floodplain may be subject to the Foreshore Building Line objectives of the LEP and REP.

vi. Terms in italics are defined in the glossary of this policy. Development types are specified in each land use category. These development types are generally as defined within Environmental Planning Instruments applying to the local government area.

APPENDIX 'B'
Survey Plan & Calculation of Pre Development Flood Storage
(HKMA DWG No 6273-C-DA01)

A Division of TRM Group Pty Ltd ACN 076 351 696
HKMA ENGINEERS
Civil & Structural Consulting Engineers
Suite 7, 241-245 Pennant Hills Road, Carlingford PO Box 2986 Carlingford NSW 2118
Phone 02 9687 9222 Facsimile 02 9687 9393 www.hkma.com.au



ISSUE	DESCRIPTION	BY	DATE
B	FLOOD CONTOURS EXTENDED BEYOND SITE BOUNDARY	CE	26/07/11
A	ISSUE FOR DEVELOPMENT APPLICATION	CE	19/11/10

FOR COUNCIL ISSUE
CHECKED BY: STEVE ABOU AJLOUNI
Date: 24/11/11

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS ENDORSED BELOW
Responsible Principal's Signature:
Date:
RAYMOND NADDAF B.E. ME AUST. C.P.ENG. MIPES

HKMA ENGINEERS
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241-245 PENNANT HILLS ROAD, CARLINGFORD
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PROJECT
PROPOSED MIXED USE DEVELOPMENT
5 PARKES STREET
PARRAMATTA

DRAWING TITLE
PRE-DEVELOPED
FLOOD STORAGE DRAWING

DESIGNED	DRAWING NUMBER	ISSUE
CE	6273-C	B
CHECKED SA	DA01	
DATUM AHD		
SCALE 1:100	SHEET 1 OF 4	

APPENDIX 'C'

Basement Footprints & Calculation of Post Development Flood Storage

(HKMA DWG Nos 6273-C-DA02)

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Suite 7, 241-245 Pennant Hills Road, Carlingford PO Box 2986 Carlingford NSW 2118
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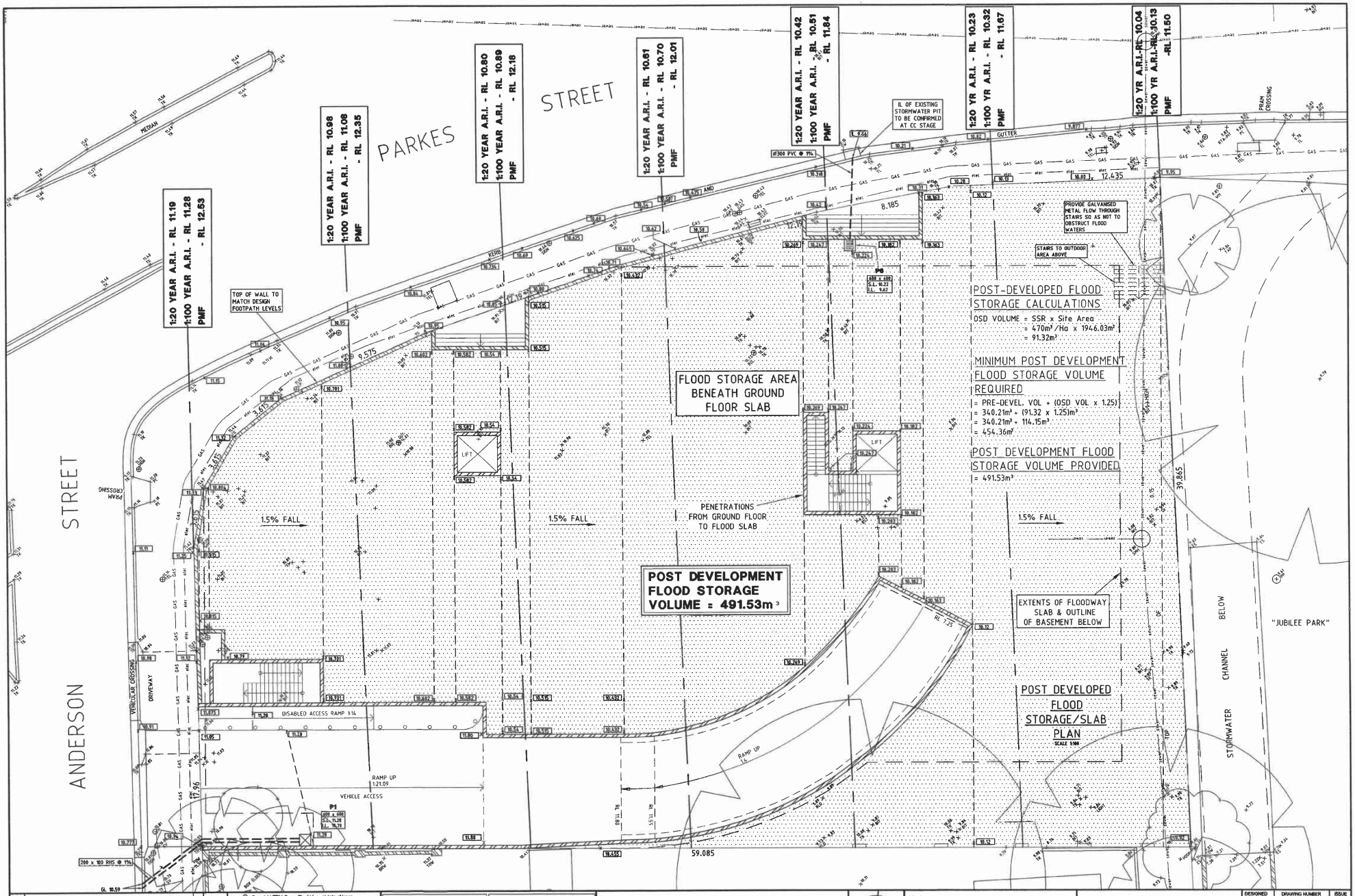

ISSUE	DESCRIPTION	BY	DATE
C	AMENDED TO SUIT ARCHITECTURAL CHANGES	CE	26/07/11
B	AMENDED TO SUIT ARCHITECTURAL CHANGES	CE	16/02/11
A	ISSUE FOR DEVELOPMENT APPLICATION	CE	15/11/10

FOR COUNCIL ISSUE
CHECKED BY: STEVE ABOUD B.E.(Civil)
Date: 26/7/11

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Responsible Principal's Signature:
Date:
RAYMOND HADDAD B.E. ME AUST. C.P.ENG. NPER

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PROJECT
PROPOSED MIXED USE DEVELOPMENT
5 PARKES STREET
PARRAMATTA

DRAWING TITLE
POST-DEVELOPED FLOOD STORAGE DRAWING

DESIGNED	DRAWING NUMBER	ISSUE
CE	6273-C DA02	C
CHECKED SA		
DATUM AHD		
SCALE 1:100	SHEET 2 OF 4	

APPENDIX 'D'

Site Stormwater Discharge
(HKMA DWG No 6273-C-DA03& 6273-C-DA04)

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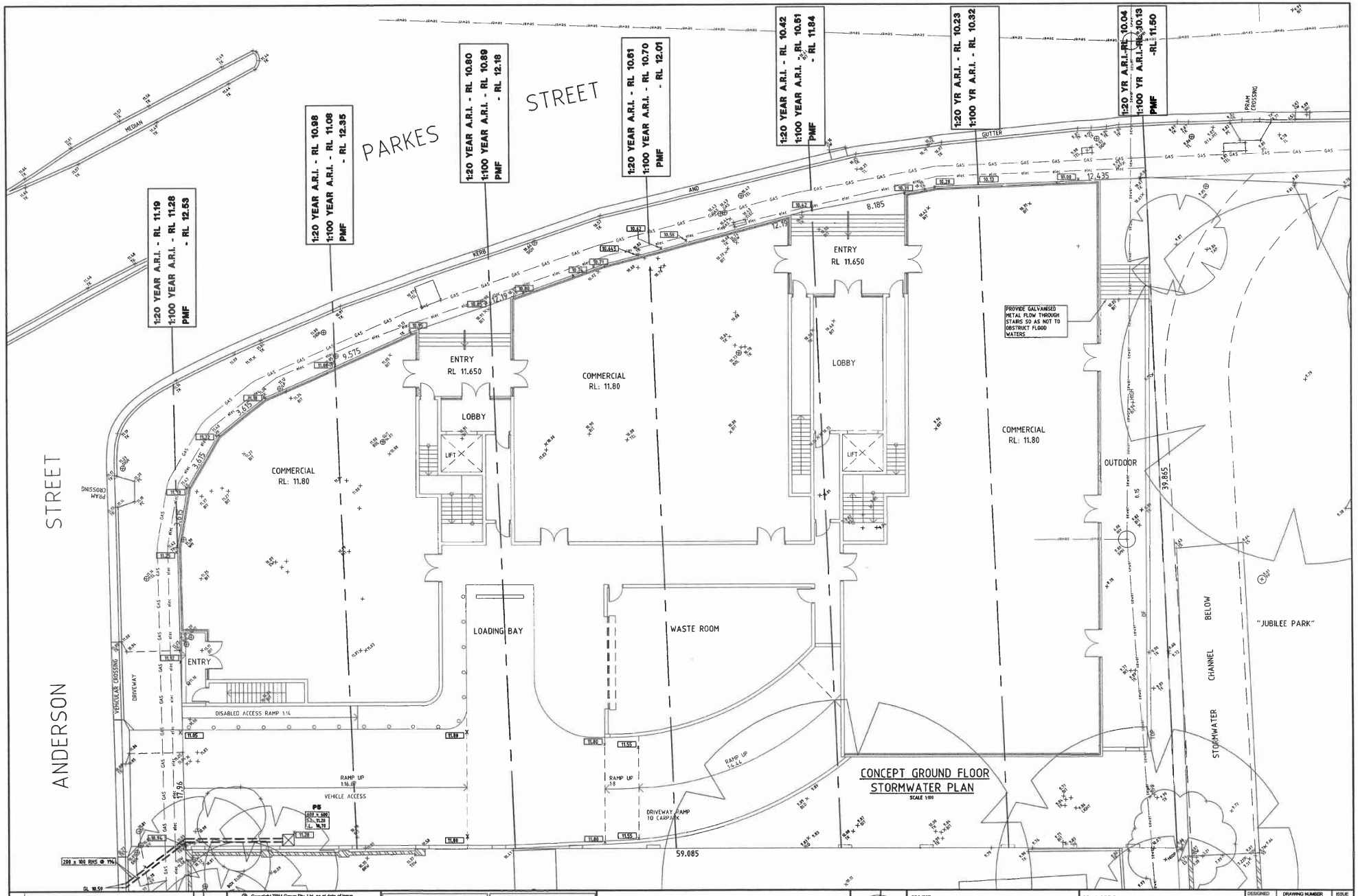

ISSUE	DESCRIPTION	BY	DATE
C	AMENDED TO SUIT ARCHITECTURAL CHANGES	CE	26/07/11
B	AMENDED TO SUIT ARCHITECTURAL CHANGES	CE	16/03/11
A	ISSUE FOR DEVELOPMENT APPLICATION	CE	19/11/10

FOR COUNCIL ISSUE
CHECKED BY
Signature:
Date: 26/7/11
STEVE ANDAJ B.E.(CIVIL)

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Responsible Principal's Signature: Date:
RAYMOND HADDAD B.E. ME AUST. C.P.ENG. MIPER

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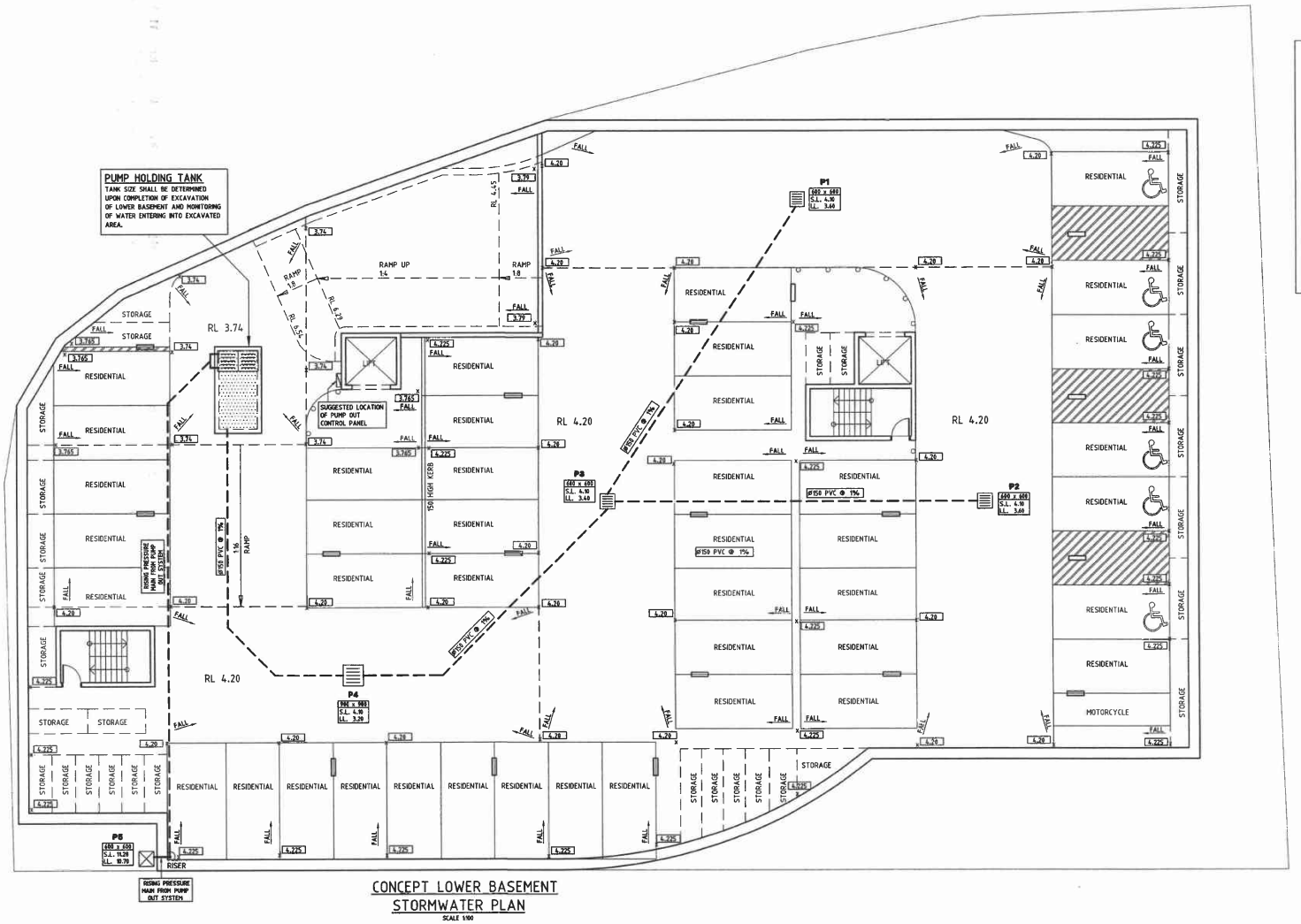
PROJECT
PROPOSED MIXED USE DEVELOPMENT
5 PARKES STREET
PARRAMATTA

DRAWING TITLE
CONCEPT SITE STORMWATER DRAINAGE DRAWING

DESIGNED	DRAWING NUMBER	ISSUE
CE	6273-C DA03	C
CHECKED SA		
DATUM AHD		
SCALE 1:100	SHEET 3 OF 4	



CONCEPT LOWER BASEMENT STORMWATER PLAN

SCALE 1:100

STANDARD PUMP OUT DESIGN NOTES

The pump out system shall be designed to be operated in the following manner:-

- The pumps shall be programmed to work alternately so as to allow both pumps to have an equal operation load and pump life.
- A low level float shall be provided to ensure that the minimum required water level is maintained within the sump area of the below ground tank. In this regard this float will function as an off switch for the pumps.
- A second float shall be provided at a higher level, approximately 300mm above the minimum water level, whereby one of the pumps will operate and drain the tank to the level of the low-level float.
- A third float shall be provided at a high level, which is approximately the roof level of the below ground tank. This float should start the other pump that is not operating and activate the alarm.
- An alarm system shall be provided with a flashing strobe light and a pump failure warning sign which are to be located at the driveway entrance to the basement level. The alarm system shall be provided with a battery back-up in case of power failure.

CONFINED SPACE DANGER SIGN

COLOURS - 'DANGER' AND BACKGROUND - WHITE
ELLIPTICAL AREA - RED
RECTANGLE CONTAINING ELLIPSE - BLACK
OTHER LETTERING AND BORDER - BLACK

A) A CONFINED SPACE DANGER SIGN SHALL BE POSITIONED IN A LOCATION AT ALL ACCESS POINTS, SUCH THAT IT IS CLEARLY VISIBLE TO PERSONS PROPOSING TO ENTER THE BELOW GROUND TANK/S CONFINED SPACE.

B) MINIMUM DIMENSIONS OF THE SIGN - 300mm x 450mm (LARGE ENTRIES, SUCH AS DOORS)
- 250mm x 180mm (SMALL ENTRIES SUCH AS GRATES & MANHOLES)

C) THE SIGN SHALL BE MANUFACTURED FROM COLOUR BONDED ALUMINIUM OR POLYPROPELENE.

D) SIGN SHALL BE AFFIXED USING SCREWS AT EACH CORNER OF THE SIGN.

ISSUE	DESCRIPTION	BY	DATE
A	ISSUE FOR DEVELOPMENT APPLICATION	CE	26/07/11

FOR COUNCIL ISSUE
CHECKED BY: Name/s: STEVE ARRU B.E.(Civil) Date: 26/7/11

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS ENDORSED BELOW
Responsible Principal's Signature: Date:
RAYMOND HADDAD B.E. ME AUST. C.P.ENG. NPER

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PROJECT
PROPOSED MIXED USE DEVELOPMENT
5 PARKES STREET
PARRAMATTA

DRAWING TITLE
CONCEPT SITE STORMWATER DRAINAGE DRAWING

DESIGNED	DRAWING NUMBER	ISSUE
CE	6273-C DA04	A
CHECKED SA		
DATUM AHD		
SCALE 1:100	SHEET 4 OF 4	