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2nd July 2014

South Village Pty Ltd
Level 37, Chifley Tower
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Sydney NSW 2000

c/- email: *Ionic Management (Development Manager - Adrian Kilburn)*
akilburn@imanage.net.au

Dear Adrian,

RE: MP 10_0076 S75W (MOD 3) – Mixed-use Development [Kirrawee (South Village)]

Overview Report - Drainage and Stormwater & Water Management

We refer to the proposed mixed-use development at 566-594 Princes Highway, Kirrawee – otherwise known as Kirrawee (South Village). This Report has been prepared to support the Application for Modification of the Concept Plan [Reference MP 10_0076 S75W (MOD 3)]. It has been prepared to provide an overview of the renewed principles for integrating stormwater drainage, stormwater management and water management into the development.

The Overview Report has been structured to address the key items that were raised in the original Director-General's Requirements (DGR's) – as part of the Approval process for the Current Concept Plan. This is intended to offer a consistent frame of reference for the Agencies assessing the Application for Modification.

1. Drainage and Stormwater Management

A Concept Stormwater Management Plan has been prepared by Northrop to demonstrate key considerations for site stormwater management and stormwater discharge from the proposed development. The Plan is attached in Appendix A. The following stormwater drainage provisions form the principles for managing site runoff, with respect to:

Drainage and Infrastructure

- Stormwater drainage pits, pipes and roof drainage systems to collect / convey site runoff and control discharge to specific points of connection to the street drainage system.
- On-site Stormwater Detention (OSD) facilities to control the rate of discharge from the development site.
- A dedicated on-site stormwater detention (OSD) facility to control the rate of discharge from the proposed Public Park.
- Pollution control devices to treat stormwater prior to discharging to the public drainage system and downstream watercourses.
- Rainwater harvesting facilities to collect rainwater and treated stormwater for re-use opportunities on the development site.

- A dedicated rainwater harvesting facility to collect and treat stormwater for re-use in topping up the compensatory habitat water body – all to be located within the proposed Public Park.

Flooding

- Defined routes for overland flow-paths that (a) support the safe passage of excessive runoff within the site; (b) direct runoff away from habitable areas, basement car parking and other active building areas; and (c) are collected and disposed via OSD facilities (up to the 100-year ARI design storm event).

Water Sensitive Urban Design (WSUD)

- Promoting permeable / soft landscaped surfaces throughout the site
- Stormwater pollution control - including the integration of treatment initiatives into landscaping (e.g. bio-retention systems / rain gardens)
- Collecting site rainwater (and treated stormwater) for re-use on-site for potential uses in toilet flushing, laundry-washing, car-washing, irrigation
- Collecting runoff from within the Public Park (and storing) for replenishing the compensatory habitat water body.

Groundwater

The 'Dewatering and Groundwater Management Plan', prepared by DLA Environmental, January 2014 has been prepared to provide *"initiatives for the management of dewatering and groundwater issues that may occur during the dewatering exercise from an environmental perspective."*

The DLA Environmental Report identifies potential to discharge the water southwards (into the stormwater system draining to Dents Creek), and northwards (into the system discharging to Oyster Gully).

The total volumes of water that require dewatering are dependent on the initial water levels. The DLA Environmental Report estimates approx. 42ML of water to be discharged.

The DLA Environmental Report also provides a protocol for management of the brick pit dewatering. This outlines a procedure, remedial actions and contingency plans for controlling water quality and the potential effects of erosion at outlets to the watercourses.

2. Urban Design Integrating 'Best Practice' Stormwater Management Principles

The urban design exhibits key principles for integrating stormwater management to promote the existing stormwater values of the site, within the context of urban development.

The proposed water body provides an opportunity to maintain general principles of the existing water cycle. The scheme proposes to replenish the water body using collected / treated rainfall runoff from the Public Park, with back-up to supplement this using mains water.

Landscaping

The Concept Plan proposes substantial areas of grassed and soft landscaping surfaces – including the proposed Public Park. This reduces the amount (and rate) of site stormwater runoff by (a) absorption into soils over structure; (b) infiltration for areas over natural ground; and (c) reducing the area of paved surfaces (from which faster flow-rates would otherwise occur). Vegetated surfaces also have the effect of treating runoff by reducing the flow-rate and encouraging the settlement / capture of debris and sediments.

Rainwater Harvesting and On-site Re-use

Rainwater harvesting initiatives will minimise the generation of stormwater from the development. In this regard, the Concept Plan is considering numerous opportunities for rainwater collection and re-use on-site, including:

- Toilet flushing – using collected building roof runoff
- Laundry-washing – using collected building runoff
- Car-washing – using collected building runoff
- Irrigation – using collected building runoff and / or treated stormwater runoff
- Water Body Replenishment – using treated stormwater runoff from the Public Park land

Our preliminary assessment of rainwater harvesting provisions for BASIX (buildings) indicate a substantial portion of the site area will be utilised for capturing stormwater on the site for re-use. There is a separate / similar opportunity for collecting runoff from the Public Park to maximise the potential for re-use in on-going replenishment of the water body.

3. Water Quality in the Compensatory Habitat Water Body

Source of Water Supply to the Water Bodies

Water supply to the compensatory habitat water body will be provided using stored rainfall runoff from within the Public Park site. This will be supplemented by provisions for mains water ‘top-up’.

Treatment of the Surface Water Source

The Concept Plan will integrate landscaping with bio-retention systems for treating rainfall runoff.

Treatment of the Stored Water

The on-going quality of the stored water will be achieved by incorporating a system that promotes recirculation and movement of water within the water body through perimeter planting.

It is noted that the ‘compensatory habitat water body’ will also require deep water zones (at least 1.5m deep) to deter aquatic plant / weed growth, thereby maintaining the clear water area required for habitat drinking activities (e.g. minimum 40m length for flight paths of the Grey-headed Flying Fox, etc.).

Public Safety / Human Interaction

The water bodies are not intended to encourage human contact with the stored water. This is as much in the interest of maintaining acceptable water quality levels for habitat drinking and amenity (i.e. by deterring refuse disposal / contamination); as it is for public safety and any environmental / health concerns. Edge treatments will deter public access direct to the water bodies (e.g. through raised boardwalks / path edges; perimeter planting; fencing; etc.).

In the case of inadvertent contact with the pond water, it is anticipated the water treatment / management systems (outlined above), in conjunction with on-going park / facility maintenance and water quality monitoring by Council, will address any risk of health concerns for habitat or persons coming into contact with the water in the water bodies.

In general, public safety is intended to be commensurate with existing examples of similar water bodies (e.g. Botanical Gardens; Victoria Park; etc.).

For more details on water quality in the compensatory habitat water body, refer to the 'Compensatory Habitat Water Body – Water Supply and Water Quality Statement', prepared by Northrop, 9 May 2014.

4. Control and Treatment of Stormwater Flows from the Site

Stormwater flows will be managed in order to satisfy principles for controlling flow-rates and quality of post-development runoff. This has been considered with respect to the two (2) discrete catchment areas that are dictated by the natural topography of the site – the 'northern one-third' catchment and 'southern two-thirds' catchment.

Control of Site Discharge Rate

'Northern One-Third Site Catchment'

In general, the 'northern one-third catchment' represents the area of the east-west internal road and buildings to the north. Runoff from this catchment will be discharged according to current site conditions – whereby on-site stormwater detention (OSD) provisions will be made to control post-development flow-rates to less than or equal to pre-development flows, and be piped to connect to the existing stormwater drainage system along the Princes Highway road frontage.

'Southern Two-Thirds Site Catchment'

The 'southern two-thirds catchment' represents the remaining area south of the east-west internal road, and includes the proposed public park site and compensatory habitat water body. The current site catchment conditions are dominated by the Brick Pit – from which no site discharge occurs. This pre-development 'zero flow' condition is considered to be a unique case that should not dictate the post-development discharge criteria for this portion of the site.

Northrop has investigated options for determining a reasonable site discharge rate to apply for development. Two (2) conditions have been identified as precedents for flows that have occurred from the subject site (at some time in its history).

- 'Greenfield Site Conditions' – this relates to the site in its natural state (prior to establishment of the Brick Pit). In this case it could be reasonable to expect that the downstream drainage

system should accommodate runoff under this condition – because it has always formed part of the (original) ‘natural’ catchment.

Northrop has calculated the 100-year ARI design flow for Greenfield Site Conditions = 1.00m^3/s (approx.).

- ‘450mm-diameter Site Discharge Pipe’ – reports by Sutherland Shire Council and Sydney Water indicate a 450mm-diameter stormwater drainage pipe once discharged from the south-eastern corner of the site (during operation of the Brick Pit). This is confirmed by visual inspection of the next downstream pit in Flora Street – indicating a 450mm-diameter pipe stub on the upstream side. In this case, it is likely the downstream drainage system once operated with this pipe in place.

  Northrop has calculated the hydraulic capacity of a ‘450mm-diameter Site Discharge Pipe’ = 0.52m^3/s.

On this basis, the discharge criteria for controlling post-development site runoff for the ‘southern two-thirds catchment’ is proposed to be equal to the hydraulic capacity of the ‘450mm-diameter Site Discharge Pipe’. This is based on:

(a) The flow being the lesser of those calculated for the two (2) precedent flow conditions. In this regard it is noted our on-going consultation with Sutherland Shire Council, and own hydraulic assessment of the receiving drainage system, indicates there is inadequate capacity throughout the current downstream network.

(b) Records and on-site inspection indicating that it is likely this pipe once discharged to the receiving stormwater drainage system – therefore this controlled flow would minimise any detrimental effects from excessive flows on the receiving natural waters / environment (based on the 450mm-diameter pipe-flow being what was once encountered).

The Concept Plan proposes two (2) on-site stormwater detention systems to service the ‘southern two-thirds catchment’ – one (1) for the relevant portion of the private development site, and one (1) for the Public Park. These would be conveyed via extension of the existing street drainage system in Flora Street (approx. 100m east of the site). The combined outflow from these facilities would be designed to limit post-development flow-rates (up to the design 100-year ARI storm event) to the hydraulic capacity of the 450mm-diameter site discharge pipe.

The OSD and rainwater harvesting / storage facilities for the private development and Public Park have been separated to avoid public infrastructure traversing private land, and promote the effective on-going operation of public facilities (i.e. water body replenishment, OSD, etc.) – so as not to rely on the performance of infrastructure that would otherwise be located, managed and owned within private land.

<u>Control of Site Discharge Quality</u>

The following train of stormwater treatment measures apply to each of the respective runoff areas, prior to discharging to the public drainage system:

- Building Runoff – via first-flush devices; to rainwater harvesting tanks; to OSD (trash screen); to fine sediment, oil and grease separator (e.g. Humeceptor)

- Development Surface Runoff – via OSD (w/ trash screen); to fine sediment, oil and grease separator (e.g. Humeceptor)

- Public Park Surface Runoff – via water body wetland; to water body overflow pit (w/ in-pit pollution control device); to OSD (w/ trash screen).

Overflow from the compensatory habitat water body is proposed to pass through an in-pit pollution control device, prior to controlled discharge (via the OSD trash screen and fine sediment, oil and grease separator), to the street system. This direct treatment of overflow water, combined with the regular re-circulation and maintenance of water quality in the water body, will minimise any potential for detrimental impacts to the receiving waters or environment, arising from overflows from the compensatory habitat water body.

Maintaining the Compensatory Water Body during the Development Stages

Development of the site will necessitate de-watering the existing Brick Pit pond. Establishment of an (interim) 'temporary water body' will be required to support habitat, until the final compensatory water body is provided as part of the public park works.

The proposed location for the 'temporary water body' is the north-western corner of the site. This provides convenience for the Grey-headed Flying Foxes to roost in the existing (adjoining) trees, and is situated within a part of the site to be least likely affected by construction works.

The Concept Plan is considering the following principles for maintaining storage depths, surface area and water quality within the 'temporary water body'. It is noted the 'temporary water body' will require minimum plan dimensions of 40m x 20m (for habitat drinking), and depths of at least 1.5m to maintain open water (by deterring aquatic plant / weed growth).

Water Storage / Supply

- Use of the existing pond water to establish the 'temporary water body'.
- Optimise opportunities to use clean rainfall runoff for supplementing the 'temporary water body'. In this regard, we recommend shaping (then re-planting) the area surrounding the water body as far as practical - to encourage clean rainfall inflow.
- Line the water body with impermeable material to deter losses from seepage.
- Consult with Sydney Water to utilise mains water for topping-up the 'temporary water body' in the event of rainwater shortfall. Alternatively, water carts may be required.

Water Quality

- Direct only clean surface runoff to the 'temporary water body'.
- Incorporate wetland planting as part of the 'temporary water body' construction to provide a natural means for on-going 'polishing' of the stored pond water.
- Undertake regular flushing / circulation of the stored water through topping-up and aeration (as required), to deter stagnation.
- Monitor the quality of stored water to guard against potential environmental / habitat health risks.
- Secure the 'temporary water body' to restrict public access and potential contamination risks.

- Implement mains water, only to supplement rainfall inflow, and use in quantities that allow mixing with the stored water.

It is noted any act of flushing (or emptying) the ‘temporary water body’ will need to comply with Council and / or EPA requirements. This typically requires slow release of the water to the stormwater drainage system, after confirming water quality is acceptable (or treating the water to acceptable levels).

These responses have been made in direct relation to the subject application for Modification of the Concept Plan, specifically the previous key issues relating to drainage, stormwater and the compensatory water body. We trust this is sufficient to support Approval.

Yours faithfully,

NORTHROP
Mathew Richards
Principal - Civil Engineer

APPENDIX A – CONCEPT STORMWATER MANAGEMENT PLAN

NOTE

— DENOTES NOMINAL DIRECTION OF SURFACE RUNOFF/OVERLAND FLOW.

□— MAIN STORMWATER DRAINAGE NODES/ PIPES

Ⓞ DENOTES FINE SEDIMENT & OIL/GREASE SEPARATOR

POND OVERFLOWS TO 'PUBLIC PARK' OSD TANK VIA OVERFLOW PIT W/ IN-PIT POLLUTION CONTROL DEVICE

RAINWATER HARVESTING TANK SERVES TO 'TOP-UP' POND. BACK-UP SUPPLY FROM MAINS WATER

RAINWATER HARVESTING TANK FOR PUBLIC PARK
- VOLUME = 500m³ (APPROX)
- OVERFLOWS/SURCHARGES TO OSD.

ON-SITE STORMWATER DETENTION TANK FOR PUBLIC PARK
- VOLUME = 500m³ (APPROX)
- TOP WATER RL = 99.00
- BASE LEVEL = 97.30
- PLAN AREA = 360 m²

PRINCES HIGHWAY

PRINCESS HIGHWAY ENTRY

SHOWROOM GFA 2927.10 m²

LOBBY

OAK RD ENTRY

OAK RD EXIT

PARKING 34 SPACES

PARKING 32 SPACES

RETAIL 2 GFA 1450.98 m²

RETAIL 2 LOADING

INDICATIVE LANDSCAPE CONCEPT

OSD TANKS

OAK ROAD NORTH

BASEMENT

RETAIL LOBBY

TROLLEY LIFT

RETAIL 3 GFA 543.06 m²

RETAIL 4 GFA 69.85 m²

RETAIL 5 GFA 1343.66 m²

RETAIL 6 GFA 374.27 m²

RETAIL 7 GFA 205.22 m²

RETAIL 8 GFA 204.92 m²

RETAIL 9 GFA 105.84 m²

RETAIL 10 GFA 502.29 m²

SUPERMARKET GFA 4740.03 m²

RESIDENTIAL PARKING 26 SPACES RL 98.00

PARKING 12 SPACES

AIRLOCK A 97.51 m²

AIRLOCK B 104.09 m²

RAMP DOWN TO B2

RAMP UP TO L1

SPECIALTY LOADING

FLORA ST RETAIL ENTRY / EXIT

FLORA ST RESIDENTIAL ENTRY / EXIT

FLORA ST LOADING ENTRY / EXIT

FLORA STREET

PARKING NUMBERS	
RETAIL	513
RESIDENTIAL	959
RESIDENTIAL VISITORS	94
TOTAL	1,56

NEW STREET DRAINAGE SYSTEM EXTENDS FROM EXISTING 450 ϕ PIPE (100m DOWNSTREAM)

CONCEPT STORMWATER MANAGEMENT PLAN (GROUND LEVEL)

'PUBLIC PARK' OSD TANK CONNECTS TO EXTENDED FLORA STREET DRAINAGE SYSTEM.

MARKED-UP BY NORTHROP (02.07.14)

LEGEND
- RESIDENTIAL LIFT
- RETAIL LIFT

CLIENT
PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Ground Level Plan

PLANNING DETAIL INDICATIVE ONLY

Rev	Date	Approved by	Revision Notes
H	27.06.14	SC	S75W Amendment B - Preliminary Issue

Scale: 1:500 @A1, 50%@A3
Project No: 13040
Drawn by: CH
Status: For Information
Dwg No: A-SK-110-000
Rev: H
North

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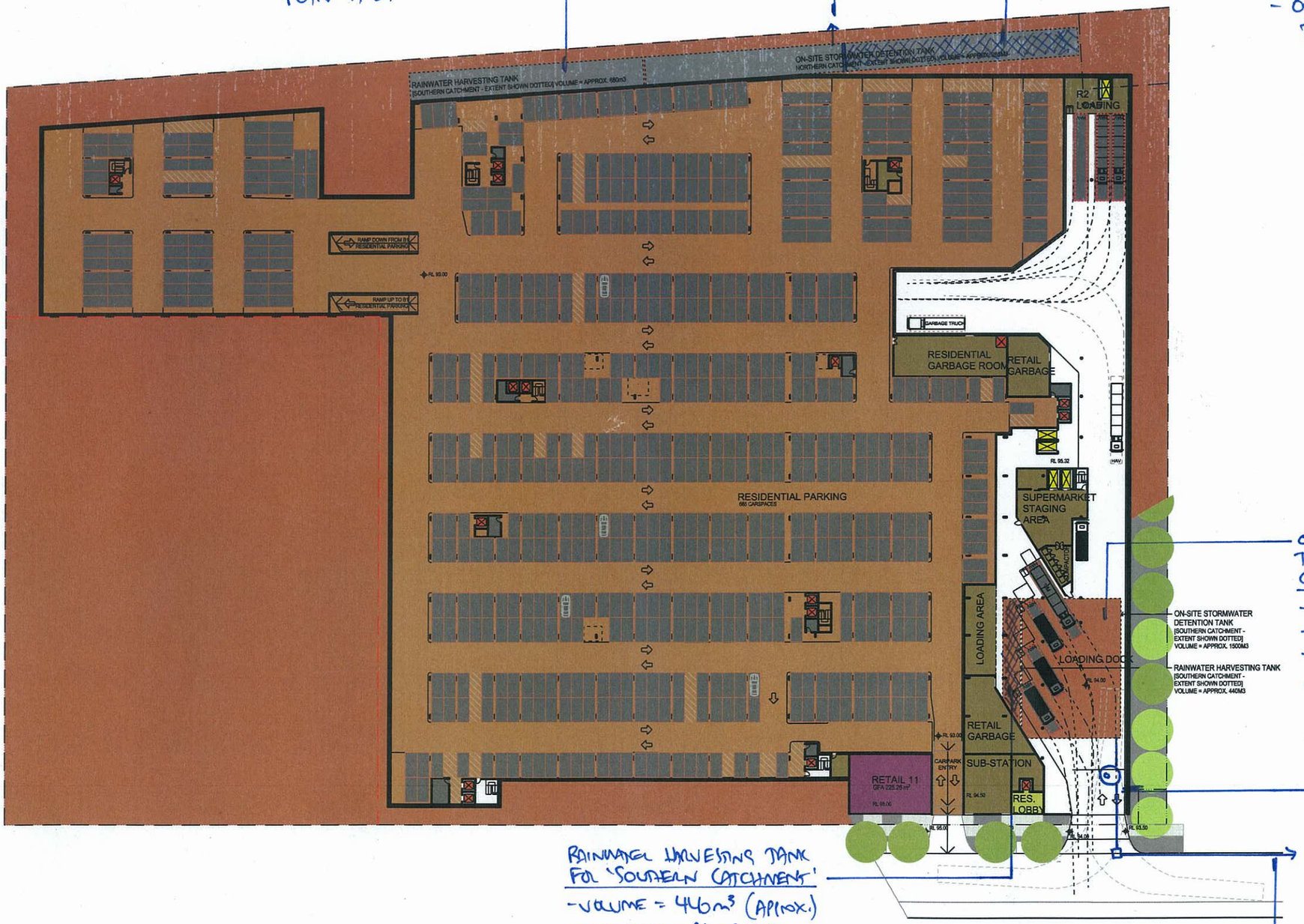
NOTE

(O) DENOTES FINE SEDIMENT TOIL/GREASE SEPARATOR

ON-SITE STORMWATER DETENTION TANK FOR NORTHERN CATCHMENT
- VOLUME = 680m³ (APPROX)
- TOP WATER RL = 95.90
- BASE LEVEL RL = 94.40
- PLAN AREA = 570m²

'NORTHERN' OSD CONNECTS TO PRINCES HIGHWAY STREET DRAINAGE SYSTEM

RAINWATER HARVESTING TANK FOR 'NORTHERN CATCHMENT'
- VOLUME = 265 m³ (APPROX)
- TOP WATER RL = 94.00
- BASE LEVEL = 93.00
- PLAN AREA = 265 m²
- OVERFLOWS / SURCHARGES TO OSD / OUTLET



ON-SITE STORMWATER DETENTION TANK FOR 'SOUTHERN CATCHMENT'
- VOLUME = 1500 m³ (APPROX.)
- TOP WATER RL = 93.50
- BASE LEVEL = 90.00
- PLAN AREA = 500 m²

'SOUTHERN' OSD TANK CONNECTS TO NEW FLORA STREET DRAINAGE SYSTEM

RAINWATER HARVESTING TANK FOR 'SOUTHERN CATCHMENT'
- VOLUME = 440m³ (APPROX.)
- TOP WATER RL = 93.50
- BASE LEVEL = 90.00
- PLAN AREA = 140 m²
- OVERFLOWS / SURCHARGES TO OSD

NEW STREET DRAINAGE SYSTEM EXTENDS FROM EXISTING 450 ϕ PIPE (APPROX. 100m DOWNSTREAM)

CONCEPT STORMWATER MANAGEMENT PLAN (BASEMENT 2 PLAN)

MARKED-UP BY NORTHROP (02.07.14)

* INDICATIVE RET TO FURTHER RES THE PARTIES

PLANNING DETAIL INDICATIVE ONLY

Rev.	Date	Approved by	Revision Notes
H	27.06.14	SC	S75W Amendment B - Preliminary Issue

Number 4108
4 911

CLIENT
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Level 37, Chifley Tower 2 Chifley Square
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LEGEND
RESIDENTIAL LIFT
RETAIL LIFT

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Basement 2 Plan

Scale: 1:500 @A1, 50%@A3
Project No.: 13040
Drawn by: CH
Status: For Information
Dwg No.: A-SK-110-B02
Rev: H
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