# STORMWATER, SERVICING AND CIVIL INFRASTRUCTURE ASSESSMENT

## PROPOSED MIXED USE DEVELOPMENT

## 310 TERRIGAL DRIVE, TERRIGAL

**REVISION 03**
**MAY 2023**


## Tagro Engineering Consultants

Level 35 Tower One,
100 Barangaroo Avenue, Sydney, NSW 2000

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## 1.0 INTRODUCTION

This stormwater, servicing and civil infrastructure assessment report has been prepared on behalf of LoftusLane Capital Partners (**the applicant**), in support of a Planning Proposal relating to land identified as 310 Terrigal Drive, Terrigal, which is legally described as Lot 27 in DP 1223375 (**the site**). The Planning Proposal seeks to amend the Central Coast LEP 2022 by increasing the maximum permissible height of buildings to 30m, and the maximum floor space ratio to **1.4**:1. The Planning Proposal will enable the site to be redeveloped from a vacant land parcel to a **eight**-storey residential flat building, with a café activating the corner of Charles Kay Drive and Terrigal Drive at the ground level. The concept drawings prepared by CKDS Architects demonstrate the potential for the site to accommodate 42 residential apartments and 75 car parking spaces across three basement levels.

This report documents the methodology involved in determining the design of the proposed stormwater drainage system for the proposed development and how Central Coast Development Control Plan (2022) requirements are satisfied, including the stormwater quantity and quality management, and stormwater disposal.

This report also outlines the proposed servicing strategy for sewer, potable water, and gas services from the available authority infrastructure.

## 2.0 REFERENCE DOCUMENTS

a) Bureau of Meteorology IFD data – sourced from http://www.bom.gov.au/

b) Australian Rainfall and Runoff (2016)

c) Central Coast Council Civil Works Specification – Design Guideline

d) Central Coast Development Control Plan (2022)

e) Central Coast Council Stormwater Detention Policy (2022)

f) AS/NZS 3500.3-2021

g) Before You Dig Australia – Authority Services & Infrastructure Maps

## 3.0 EXISTING SITE CONDITIONS

The subject site (Lot 27 of DP 1223375) is located at 310 Terrigal Drive, Terrigal. The existing site is an irregular shaped lot that consists of a greenfield site of moderate to dense vegetation, with the north-western portion of the site previously cleared.

The site is bounded by Terrigal Drive to the north, Charles Key Drive to the west, and an unnamed creek to the south and east. The unnamed creek forms the upstream tributary to Terrigal Lagoon.

The subject site occupies a total site area of 4262 square metres (by survey). The generally grades from the west to the east, towards the unnamed creek.

**Figure 1. Existing Site Aerial Photograph and Locality Map**

# 4.0 STORMWATER DRAINAGE SYSTEM

## 4.1 Existing Council Stormwater Infrastructure

An existing Council stormwater system is located within Terrigal Drive and Charles Key Drive based on available Dial Before You Dig data. The exact sizes of the stormwater pipeline infrastructure have not been nominated.

The Council stormwater pipeline system drains from the existing road network into the unnamed creek to the east of the subject site.

Refer to Appendix F for the Council Dial Stormwater Infrastructure Dial Before You Dig map.

## 4.2 Minor and Major Drainage System

Stormwater runoff from all pervious and impervious surfaces within the proposed development will generally be collected by an in-ground pit and gravity pipe system.

It is proposed to size the roof drainage system, as well as the in-ground pit and pipe system, to accommodate the 1% AEP storm event for the site, to ensure runoff can be collected and conveyed to the on-site detention (OSD) system, and to incorporate redundancy in the system should blockage occur.

Roof water will generally be collected via rainwater outlets from the flat roof areas and exposed balcony decks by a combination of eaves gutters and downpipes to pitched roofs, before connecting into the OSD system.

A small portion of the site, being the low-lying areas (i.e. below the ground floor level) along the retail frontage to the north, and the portion of the driveway below the driveway crest level to the south, will bypass the OSD system and will drain towards Terrigal Drive and Charles Key Drive, respectively. This has been accounted for in the OSD design and catchment calculations.

Refer to Appendix A for the site drainage catchment plan.

| | Annual Exceedance Probability (AEP) | | | | | | |
|---|---|---|---|---|---|---|---|
| Duration | 63.2% | 50%# | 20%* | 10% | 5% | 2% | 1% |
| 1 min | 136 | 156 | 222 | 271 | 324 | 400 | 463 |
| 2 min | 115 | 132 | 190 | 233 | 279 | 344 | 398 |
| 3 min | 106 | 122 | 174 | 214 | 255 | 315 | 364 |
| 4 min | 99.6 | 114 | 162 | 199 | 238 | 293 | 339 |
| 5 min | 94.0 | 107 | 153 | 187 | 223 | 275 | 318 |
| 10 min | 74.0 | 84.4 | 120 | 146 | 175 | 216 | 250 |
| 15 min | 61.6 | 70.3 | 100 | 122 | 146 | 180 | 209 |
| 20 min | 53.2 | 60.8 | 86.6 | 106 | 127 | 157 | 182 |
| 25 min | 47.0 | 53.8 | 76.8 | 94.1 | 113 | 139 | 162 |
| 30 min | 42.4 | 48.5 | 69.3 | 85.0 | 102 | 126 | 146 |
| 45 min | 33.2 | 38.0 | 54.5 | 66.9 | 80.1 | 99.1 | 115 |
| 1 hour | 27.8 | 31.8 | 45.6 | 56.0 | 67.0 | 82.9 | 96.2 |
| 1.5 hour | 21.5 | 24.6 | 35.2 | 43.2 | 51.7 | 63.9 | 74.0 |
| 2 hour | 17.9 | 20.5 | 29.3 | 35.9 | 42.9 | 52.9 | 61.3 |
| 3 hour | 13.9 | 15.9 | 22.6 | 27.6 | 32.9 | 40.5 | 46.8 |
| 4.5 hour | 10.9 | 12.4 | 17.5 | 21.3 | 25.3 | 31.1 | 35.9 |
| 6 hour | 9.21 | 10.5 | 14.7 | 17.8 | 21.1 | 25.9 | 29.8 |
| 9 hour | 7.28 | 8.25 | 11.5 | 13.9 | 16.5 | 20.1 | 23.1 |
| 12 hour | 6.17 | 6.98 | 9.71 | 11.7 | 13.9 | 16.9 | 19.4 |

**Figure 2. Rainfall Data. Source: Bureau of Meteorology**

## 4.3 Stormwater Disposal

Disposal of stormwater from the site's OSD system will be towards the existing unnamed creek to the east of the building via a headwall outlet with scour protection. This is the recommended method of discharge, as the Council stormwater system within Terrigal Drive and Charles Key Drive likely has insufficient capacity to accept additional discharge flows during major storm events, based on the 1% AEP flood maps prepared by Rienco Consulting (ref: 23008 Letter 002).

## 4.4 Basement pump out sizing

The three basement levels below the ground floor level will be located to a depth that will preclude gravity drainage to the Council stormwater system and the adjacent unnamed creek.

As such, a basement stormwater pump out system will be required to drain flows generated from the following sources:

- Surface runoff or wind-driven rain from any exposed or undercroft driveways or loading areas.
- Groundwater seepage through basement retention systems.

The site drainage catchment plan in Appendix A shows that the flat concrete roof provides coverage to the basement driveway ramp that grades into the basement.

Notwithstanding, to account for wind driven rain, a nominal 50m$^2$ of driveway area has been assumed to drain towards the basement pump out system.

The sizing of the basement pump out system is in accordance with AS/NZS3500.3 Section 8 based on the following:

- 1% AEP, 120-minute rainfall intensity = 61.3mm/hr
- Nominal surface area draining to the basement = 50m$^2$
- $Q_{100}$ flow rate for surface runoff = 0.85L/s

- Basement wet well storage for surface runoff = 6,200L (rounded up)
- Groundwater seepage wet well storage volume = 3,000L (nominal)
- Total minimum volume of basement wet well storage volume = 9,200L
- Minimum pump duty flow = 10L/s
- Minimum pump duty pressure = 15m head

A nominal 10,000L effective capacity packaged stormwater pumping station is proposed for the development at the lowest basement level, which will include the following:

- Dual alternating submersible pumps with each pump capable of pumping the calculated duty flow and pressure.
- Low-level audible and visible alarm
- High-level audible and visible alarm set not higher than 100mm above the invert level of the inlet pipe.
- High-level float switch set 300mm below the pump station grate level that will trigger operation of both pumps
- A rising main connected to the proposed OSD tank with a non-return valve.

## 5.0 POST-DEVELOPMENT FLOWS AND ON-SITE DETENTION (OSD)

The proposed stormwater system is to store and release stormwater so that the post-developed flows leaving the site achieves the following requirements nominated within the Central Coast Council Stormwater Detention Policy:

- Limit the peak rate of piped stormwater discharge from the development to that generated for the lot developed to a level of **40% impervious for a 5% AEP event**
- Accommodate the maximum volume generated for the **actual percentage impervious for the fully developed site for a 5% AEP event.**
- Accommodate the maximum volume generated for the **actual percentage impervious for the fully developed site up to the 1% AEP event**
- Provide sufficient storage to ensure peak flow rates at any point within the downstream drainage system do not increase as a result of the development during the design storm event [up to and including the 100-year ARI (1% AEP) event], unless the downstream drainage system has been designed to accommodate an increase in stormwater discharge from the site.

A DRAINS ILSAX Model has been created for the development to model the pre-development and post-development catchments for the developable footprint. The undeveloped areas beyond the building footprint (i.e. the vegetated riparian zone) has not been considered in OSD calculations.

The key input parameters for the DRAINS model are as follows:

**Pre-Development Parameters**

- Development footprint = 1,485 m2
- Impervious percentage of Pre-Development Catchment = 40%
- Catchment Time of Concentration = 5 minutes

**Post Development Parameters**

- Development footprint = 1,485 m2
- Area draining to OSD = 1,200 m2 (80.8%)
- Impervious percentage of Area Draining to OSD = 100%
- Area bypassing OSD = 285 m2 (19.2%)
- Impervious percentage of Area Bypassing OSD = 80%
- Catchment Time of Concentrations = 5 minutes

The proposed OSD system will consist of a below ground storage tank located under the loading area slab, above the Basement 01 level carpark (structural slab level in the basement carpark is RL1.30m AHD) The OSD tank will incorporate separate chambers for stormwater quality improvement and rainwater reuse (detailed in subsequent sections of this report).

The following OSD design requirements have been determined from the DRAINS model:

- Pre-Development 5% AEP Peak Flow Rate (Permissible Site Discharge) = 74 L/s
- Post-Development 5% AEP Peak Flow Rate from OSD = 39 L/s
- Post-Development 5% AEP Peak Flow Rate bypassing OSD = 16 L/s
- Post-Development 1% AEP Peak Flow Rate from OSD = 50 L/s
- Post-Development 1% AEP Peak Flow Rate bypassing OSD = 23 L/s
- Total Post-Development 1% AEP Flow Rate (OSD + Bypass) = 73 L/s
- Minimum OSD internal surface area = $30m^2$
- OSD average depth = 1.2m
- Minimum OSD storage volume = $36m^3$
- Orifice Plate Size = 160mm

An emergency overflow strategy has been designed for the OSD system whereby water will surcharge through the OSD grate through a slot in the loading area kerb line at RL 5.50m AHD. Emergency overflows will drain eastward towards the unnamed creek.

Refer to Appendix B for the proposed OSD system location.

Refer to Appendix C for DRAINS model results.

## 6.0 STORMWATER QUALITY MANAGEMENT

Central Coast Council's Civil Works Specification – Design Guidelines (2020) Section 11 requires that stormwater discharge leaving the site is treated to meet percentage reduction targets for pollutants.

A MUSIC model has been created using the Central Coast Council MUSIC-Link rainfall, PET and node parameters, as well as proprietary data and parameters for treatment products from Ocean Protect.

It has been determined that the subject site is classified as Lowland Area due to the following:

- The proposed development area located on a previously cleared, flat portion of the site with gradients less than 5%
- The close proximity of the receiving watercourse, which border's the eastern and southern property boundaries.

Due to the close proximity of downstream watercourse receiving stormwater discharge from the proposed development, coupled with the proposal to dispose stormwater directly to the unnamed creek via a headwall outlet, a more stringent pollutant reduction requirement is proposed, shown in the below Table.

**Table 1 – Central Coast Council Percentage Reduction Targets – Coastal Catchments**

| Pollutant | Percentage Reduction – Civil Works Specification Minimum Requirements | Percentage Reduction – Proposed Requirements |
|---|---|---|
| Gross Pollutants | 90% | 90% |
| Total Suspended Solids (TSS) | 80% | 85% |
| Total Phosphorus (TP) | 45% | 70% |
| Total Nitrogen (TN) | 45% | 55% |

The proposed stormwater quality treatment train can be summarised as follows:

- A 10m$^3$ effective volume rainwater tank will be provided for rainwater reuse in toilets and irrigation.
    - Minimum toilets connected to reuse system = 40 toilets
    - Minimum landscape area irrigated from reuse system = 100m2
    - Daily reuse demand for toilets = 1kL per day (0.025kL per day per toilet)
    - Annual reuse demand for toilets = 365kL per year
    - Annual reuse demand for irrigation = 40kL per year (0.4kL per square metre)
    - Total annual reuse demand = 405kL per year
- OceanGuard gross pollutant traps at the following locations:
    - 1x OceanGuard at the low point of the driveway
    - 2x OceanGuards to treat roof water prior to storage in the rainwater reuse chamber. The OceanGuards can either be located within a stormwater pit upstream of the reuse chamber, or within the reuse chamber itself to treat discharge prior to storage.
- A filtration chamber will be provided within the OSD tank to house six StormFilter 690mm head-loss PSORB filtration cartridges by Ocean protect. Generally all open courtyards, roof runoff and external landscaped areas will be treated by the filtration cartridges. The bypass areas nominated in the catchment plan will be excluded from stormwater treatment.

The above treatment train configuration satisfies Central Coast Council Water Cycle Management Guideline requirements. The MUSIC-Link summary report has been enclosed as Appendix D to this report.

**Table 2 – MUSIC Model Results**

| Pollutant | Percentage Reduction – Proposed Requirements | MUSIC Model Results |
|---|---|---|
| Gross Pollutants | 90% | 92.0% |
| Total Suspended Solids (TSS) | 85% | 88.6% |
| Total Phosphorus (TP) | 70% | 71.7% |
| Total Nitrogen (TN) | 55% | 58.8% |

## 7.0 SEWER SERVICING STRATEGY

Central Coast Council's Dial Before You Dig map indicates that an existing DN150 diameter gravity sewer main is located along the western side of Charles Key Drive.

In addition, an existing sewer connection to the DN150 diameter authority sewer main is located at the subject site's western boundary. It is proposed to retain and utilise this existing connection for the proposed development's site sewer connection.

The existing sewer connection depth to invert at the property boundary is not available from Council's Dial Before You Dig maps. A site sewer diagram, and/or CCTV investigations (as necessary depending on the availability of as-constructed documentation of the asset) will be obtained prior to application to Council for connection to the sewer system.

Refer to Appendix G for the site sewer servicing strategy.

## 8.0 POTABLE WATER SERVICING STRATEGY

Central Coast Council's Dial Before You Dig map indicates that an existing water main is located within the centre of both Charles Key Drive and Terrigal Drive. The DBYD map does not nominate the water main diameter, however it is assumed that this asset will have sufficient capacity to service the development.

It is recommended that a connection to the existing watermain within Charles Key Drive is undertaken, either adjacent to the existing sewer property connection, or reusing an existing potable water connection servicing the site, if available. Additional investigations determining the location of any existing potable water connection(s) servicing the subject site will be undertaken prior to obtaining CC, as part of the Application for Water Authority Works Approval with Central Coast Council.

Finalisation of any storage buffer tanks and/or pressure boosting systems required for the site potable water and fire services will be determined upon confirmation of this data from the Authority.

Refer to Appendix G for the site potable water servicing strategy.

## 9.0 GAS SERVICING STRATEGY

Jemena Gas' Dial Before You Dig map indicates that an existing DN160 PE 210kPa (medium pressure) gas main is located within Charles Key Drive and Terrigal Drive.

It is recommended that a connection to the existing Jemena Gas main within Charles Key Drive is undertaken. The Jemena Gas main has been documented as approximately 1.0 metres from the north-west property boundary line. As such, it is preferrable to connect to the gas main at this location to minimise connection works within the road reserve.

Refer to Appendix H for the site gas servicing strategy.

## 10.0 SOIL EROSION AND SEDIMENTATION CONTROL

A soil erosion and sedimentation control plan sketch has been prepared for the development, enclosed as Appendix E to this report.

The following general principles of soil and water management have been applied to the SWMP:

- Minimise the area of soil disturbed and exposed to erosion
- Conserve topsoil for later site rehabilitation/revegetation
- Control water flow from the top of, and through the development area
- Rehabilitate disturbed lands quickly

- Maintain soil and water management measures appropriately during the construction phase

Based on the proposed development activities, the following sources of pollution during construction that could lead to earthworks erosion, sediment and silt transportation and contamination of downstream stormwater systems have been considered:

- Earthworks undertaken prior to rainfall events without sufficient auxiliary measures to manage drainage
- Earthworks areas that have not been stabilised or are exposed prior to temporary or permanent ground cover
- Establishment time for rehabilitation / revegetation of exposed earthworks
- Localised groundwater dewatering activities during earthworks excavations
- Vehicle entry and exit to the construction site and associated tracking of debris out of the site
- Clearing and grubbing of vegetation / organic matter and stripping of topsoil
- Stockpiling of excavated materials or construction materials (e.g. earthworks, ordinary and select fill, etc)
- Re-fuelling and general maintenance of construction plant and equipment
- Ineffective / incorrect installation or maintenance of soil erosion and sedimentation control measures

The following construction management methodology has been nominated for the development:

- Establish sediment fencing to the downstream perimeter of the zone of disturbed works to protect downstream assets and properties
- Installation of stabilised construction entry and exit grids to prevent construction vehicles tracking debris into adjacent Authority roadways and stormwater systems
- Construction of appropriately sized and maintained sedimentation sumps with the ability to connect to a mobile sediment filter (e.g. sand filter) within the excavation zone to promote settling of gross pollutants and suspended solids prior to discharge of stormwater to the approved receiving network.
- Protection of materials stockpiles by suitable wind protection fencing and / or temporary covering of stockpiles
- Protection of existing and recently constructed surface inlet pits with temporary sediment traps using geotextile filter fabric and sandbags
- General expedited revegetation and stabilisation of exposed earthworks to prevent sedimentation of stormwater runoff

## 11.0 CONCLUSION

The proposed mixed use development at 310 Terrigal Drive, Terrigal incorporates measures to address both stormwater quality and quantity requirements set out in Central Coast DCP (2022).

On-site detention will be provided to achieve the storage and discharge requirements of the Central Coast Council Stormwater Detention Policy.

Stormwater Quality initiatives will be implemented by proprietary stormwater quality improvement devices (gross pollutant pit inserts, filter cartridges and rainwater reuse) to achieve the stormwater quality requirements of Central Coast DCP (2022).

It can be demonstrated that there is availability of connections to Authority stormwater, potable water, sewer and gas services for the proposed development, based on available site survey and Dial Before You Dig maps.

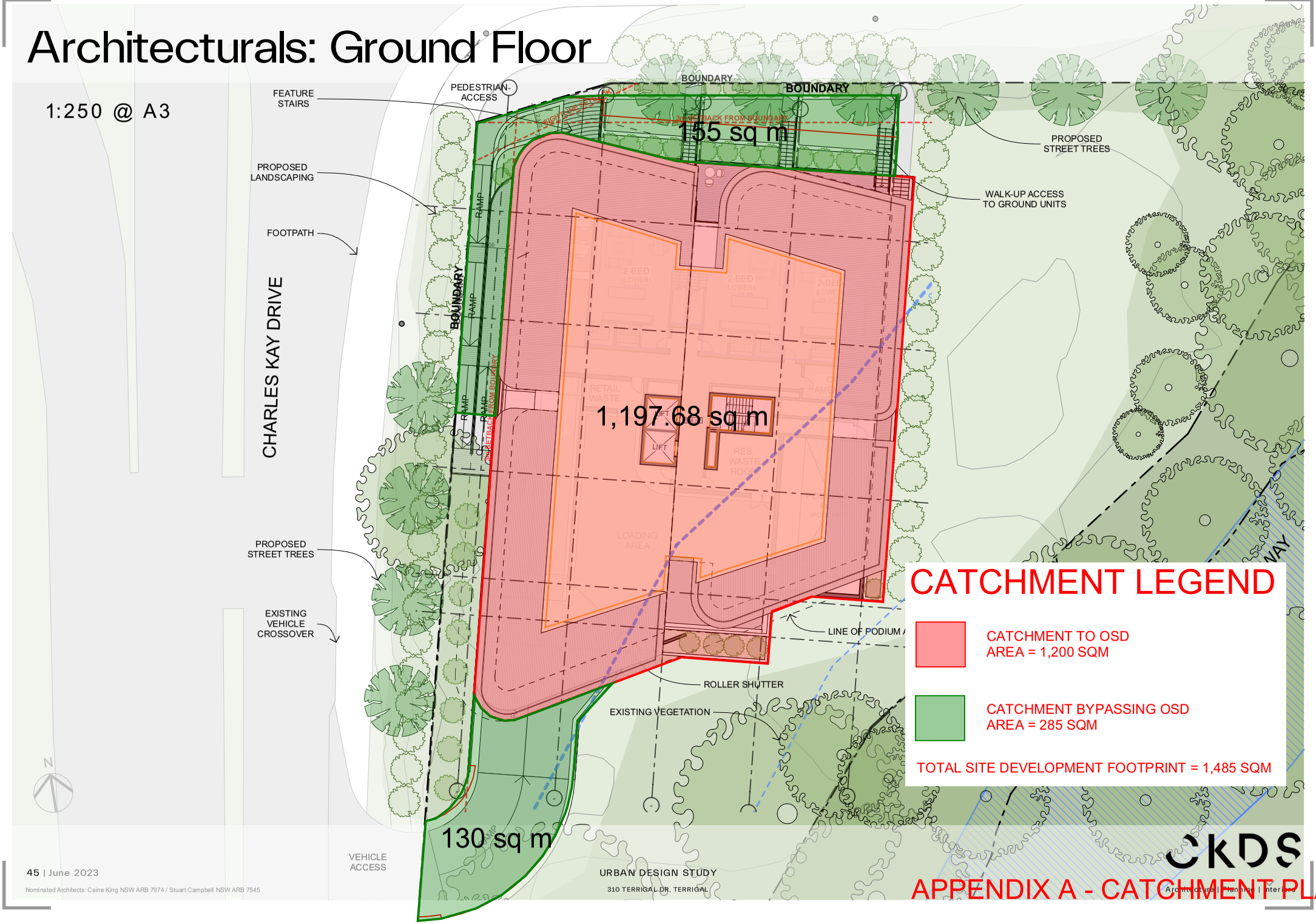
The above measures achieve the requirements set out by the following documents:

- Bureau of Meteorology IFD data – sourced from http://www.bom.gov.au/
- Australian Rainfall and Runoff (2016)
- Central Coast Council Civil Works Specification – Design Guideline
- Central Coast Development Control Plan (2022)
- Central Coast Council Stormwater Detention Policy (2022)
- AS/NZS 3500.3-2021
- Before You Dig Australia – Authority Services & Infrastructure Maps

# Appendix A – Catchment Plan

# Architecturals: Ground Floor

1:250 @ A3




## CATCHMENT LEGEND

CATCHMENT TO OSD
AREA = 1,200 SQM

CATCHMENT BYPASSING OSD
AREA = 285 SQM

TOTAL SITE DEVELOPMENT FOOTPRINT = 1,485 SQM

CKDS
Architecture | Planning | Interiors

APPENDIX A - CATCHMENT PLAN

# Appendix B – OSD Location and Sizing Sketch

# Architecturals: Ground Floor

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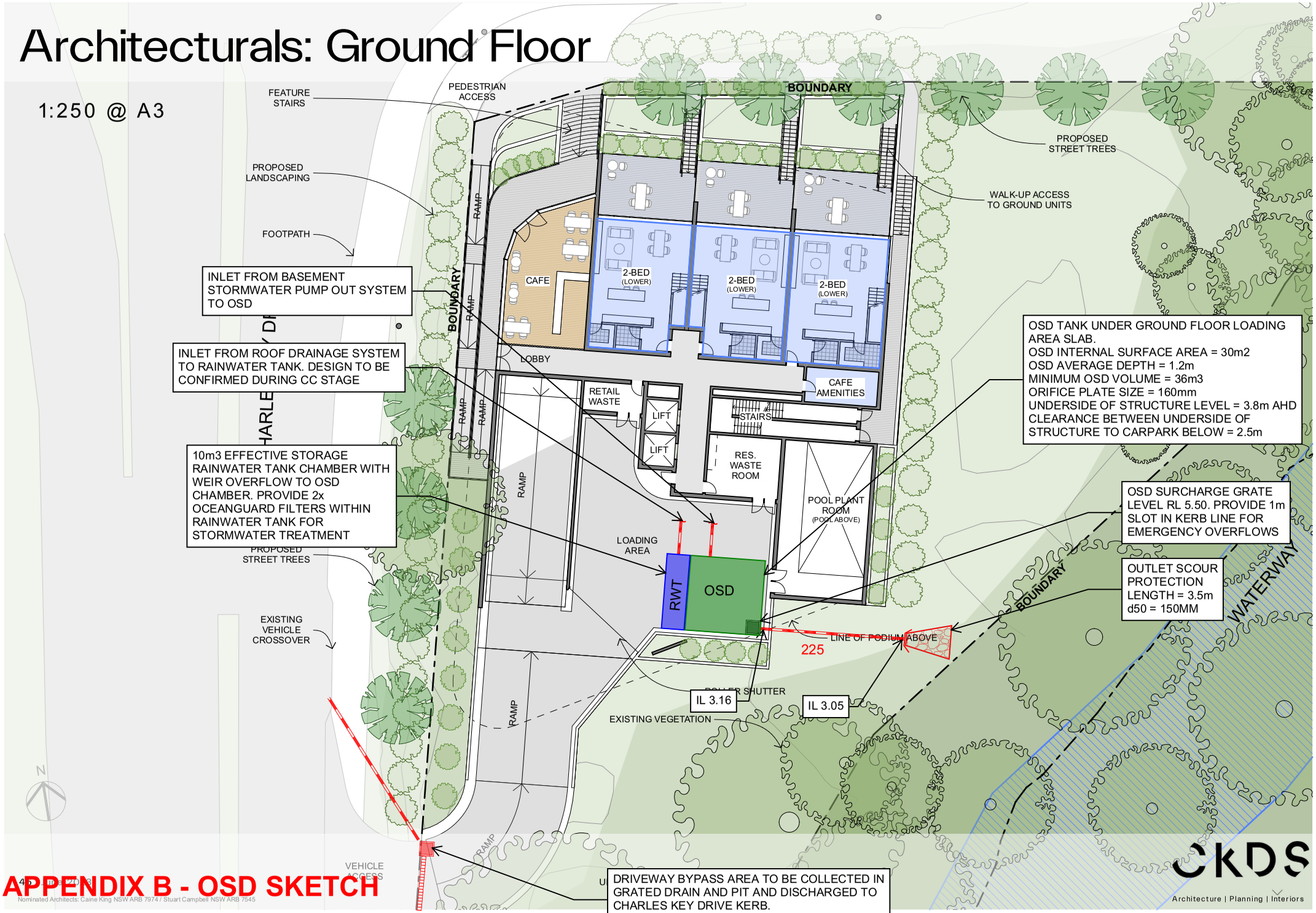
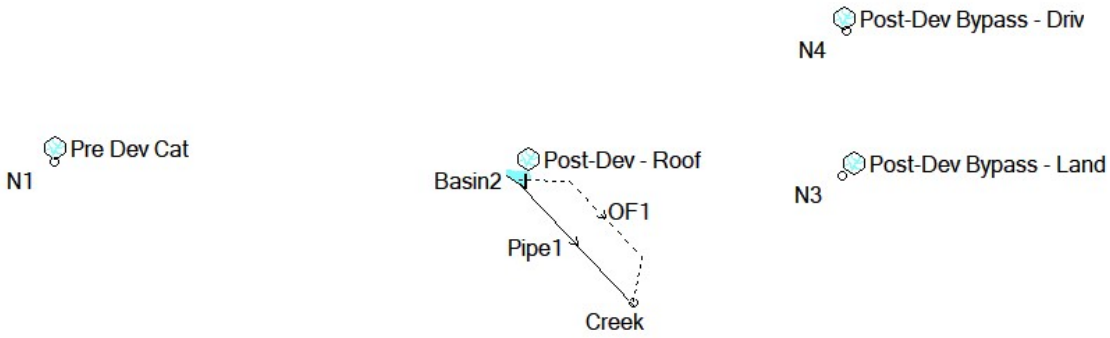


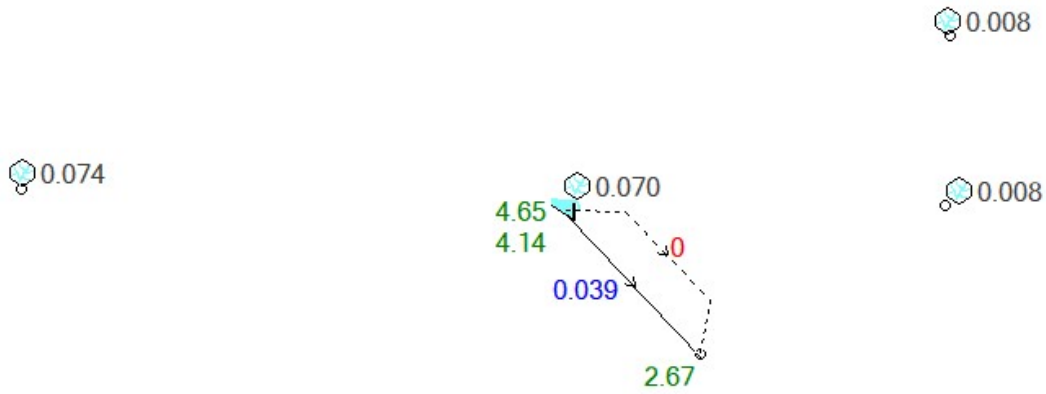

**APPENDIX B - OSD SKETCH**

# Appendix C – DRAINS Model Results

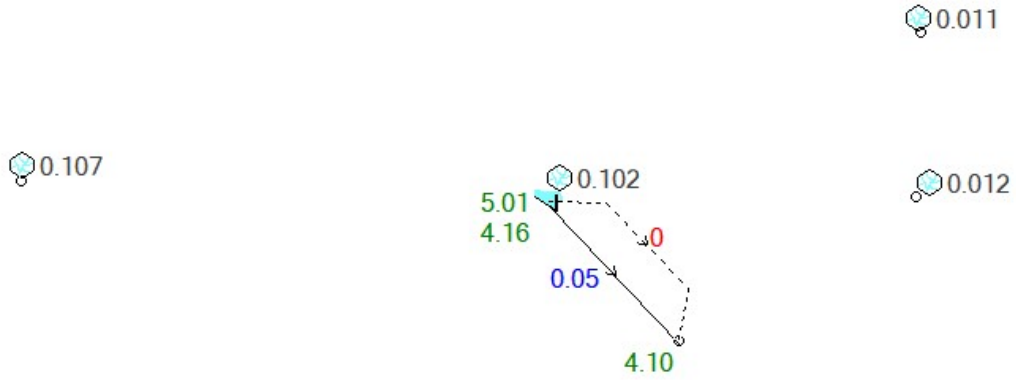
## DRAINS Model Set-Up




## DRAINS Results – 5% AEP Storm Event



## DRAINS Results - 1% AEP



# Appendix D – MUSIC Link Summary

# MUSIC-*link* Report

| Project Details | | Company Details | |
|---|---|---|---|
| **Project:** | 310 Terrigal Drive, Terrigal | **Company:** | Tagro Engineering Consultants |
| **Report Export Date:** | 20/04/2023 | **Contact:** | Michael Labib |
| **Catchment Name:** | 310 Terrigal Drive | **Address:** | |
| **Catchment Area:** | 0.15ha | **Phone:** | |
| **Impervious Area*:** | 96.05% | **Email:** | michael@tagro.com.au |
| **Rainfall Station:** | 66062 SYDNEY | | |
| **Modelling Time-step:** | 6 Minutes | | |
| **Modelling Period:** | 1/01/1974 - 31/12/1993 11:54:00 PM | | |
| **Mean Annual Rainfall:** | 1297mm | | |
| **Evapotranspiration:** | 1261mm | | |
| **MUSIC Version:** | 6.3.0 | | |
| **MUSIC-link data Version:** | 6.34 | | |
| **Study Area:** | Lowland | | |
| **Scenario:** | Central Coast Development | | |

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

| Treatment Train Effectiveness | | Treatment Nodes | | Source Nodes | |
|---|---|---|---|---|---|
| **Node: Receiving Node** | **Reduction** | **Node Type** | **Number** | **Node Type** | **Number** |
| **Flow** | 16.8% | Rain Water Tank Node | 1 | Urban Source Node | 3 |
| **TSS** | 88.7% | Sedimentation Basin Node | 1 | | |
| **TP** | 71.5% | Generic Node | 1 | | |
| **TN** | 58.8% | GPT Node | 2 | | |
| **GP** | 92% | | | | |

## Comments

Sedimentation basin (Stormfilter chamber) parameters are in accordance with the manufacturer's specifications

## Passing Parameters

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| GPT | 1 x OceanGuard | Hi-flow bypass rate (cum/sec) | None | 99 | 0.02 |
| GPT | 2 x OceanGuard | Hi-flow bypass rate (cum/sec) | None | 99 | 0.04 |
| Receiving | Receiving Node | % Load Reduction | None | None | 16.8 |
| Receiving | Receiving Node | GP % Load Reduction | 90 | None | 92 |
| Receiving | Receiving Node | TN % Load Reduction | 45 | None | 58.8 |
| Receiving | Receiving Node | TP % Load Reduction | 45 | None | 71.5 |
| Receiving | Receiving Node | TSS % Load Reduction | 80 | None | 88.7 |
| Sedimentation | SF Chamber | Exfiltration Rate (mm/hr) | 0 | 0 | 0 |
| Sedimentation | SF Chamber | Extended detention depth (m) | 0.25 | 1 | 0.77 |
| Sedimentation | SF Chamber | High Flow Bypass Out (ML/yr) | None | None | 0 |
| Urban | Driveway - Bypass | Baseflow Total Nitrogen Mean (log mg/L) | 0.11 | 0.11 | 0.11 |
| Urban | Driveway - Bypass | Baseflow Total Phosphorus Mean (log mg/L) | -0.85 | -0.85 | -0.85 |
| Urban | Driveway - Bypass | Baseflow Total Suspended Solids Mean (log mg/L) | 1.2 | 1.2 | 1.2 |
| Urban | Driveway - Bypass | Stormflow Total Nitrogen Mean (log mg/L) | 0.34 | 0.34 | 0.34 |
| Urban | Driveway - Bypass | Stormflow Total Phosphorus Mean (log mg/L) | -0.3 | -0.3 | -0.3 |
| Urban | Driveway - Bypass | Stormflow Total Suspended Solids Mean (log mg/L) | 2.43 | 2.43 | 2.43 |
| Urban | Landscape & Entry - Bypass | Baseflow Total Nitrogen Mean (log mg/L) | 0.11 | 0.11 | 0.11 |
| Urban | Landscape & Entry - Bypass | Baseflow Total Phosphorus Mean (log mg/L) | -0.85 | -0.85 | -0.85 |
| Urban | Landscape & Entry - Bypass | Baseflow Total Suspended Solids Mean (log mg/L) | 1.2 | 1.2 | 1.2 |
| Urban | Landscape & Entry - Bypass | Stormflow Total Nitrogen Mean (log mg/L) | 0.3 | 0.3 | 0.3 |
| Urban | Landscape & Entry - Bypass | Stormflow Total Phosphorus Mean (log mg/L) | -0.6 | -0.6 | -0.6 |
| Urban | Landscape & Entry - Bypass | Stormflow Total Suspended Solids Mean (log mg/L) | 2.15 | 2.15 | 2.15 |
| Urban | Roof | Baseflow Total Nitrogen Mean (log mg/L) | 0.11 | 0.11 | 0.11 |
| Urban | Roof | Baseflow Total Phosphorus Mean (log mg/L) | -0.85 | -0.85 | -0.85 |
| Urban | Roof | Baseflow Total Suspended Solids Mean (log mg/L) | 1.2 | 1.2 | 1.2 |
| Urban | Roof | Stormflow Total Nitrogen Mean (log mg/L) | 0.3 | 0.3 | 0.3 |
| Urban | Roof | Stormflow Total Phosphorus Mean (log mg/L) | -0.6 | -0.6 | -0.6 |
| Urban | Roof | Stormflow Total Suspended Solids Mean (log mg/L) | 2.15 | 2.15 | 2.15 |

Only certain parameters are reported when they pass validation

## Failing Parameters

| Node Type | Node Name | Parameter | Min | Max | Actual |
|---|---|---|---|---|---|
| Sedimentation | SF Chamber | Notional Detention Time (hrs) | 8 | 12 | 0.1 |
| Sedimentation | SF Chamber | Total Nitrogen - k (m/yr) | 500 | 500 | 1 |
| Sedimentation | SF Chamber | Total Phosphorus - k (m/yr) | 6000 | 6000 | 1 |
| Sedimentation | SF Chamber | Total Suspended Solids - k (m/yr) | 8000 | 8000 | 1 |

Only certain parameters are reported when they pass validation

# Appendix E – Soil Erosion and Sedimentation Control Plan

# Architecturals: Ground Floor

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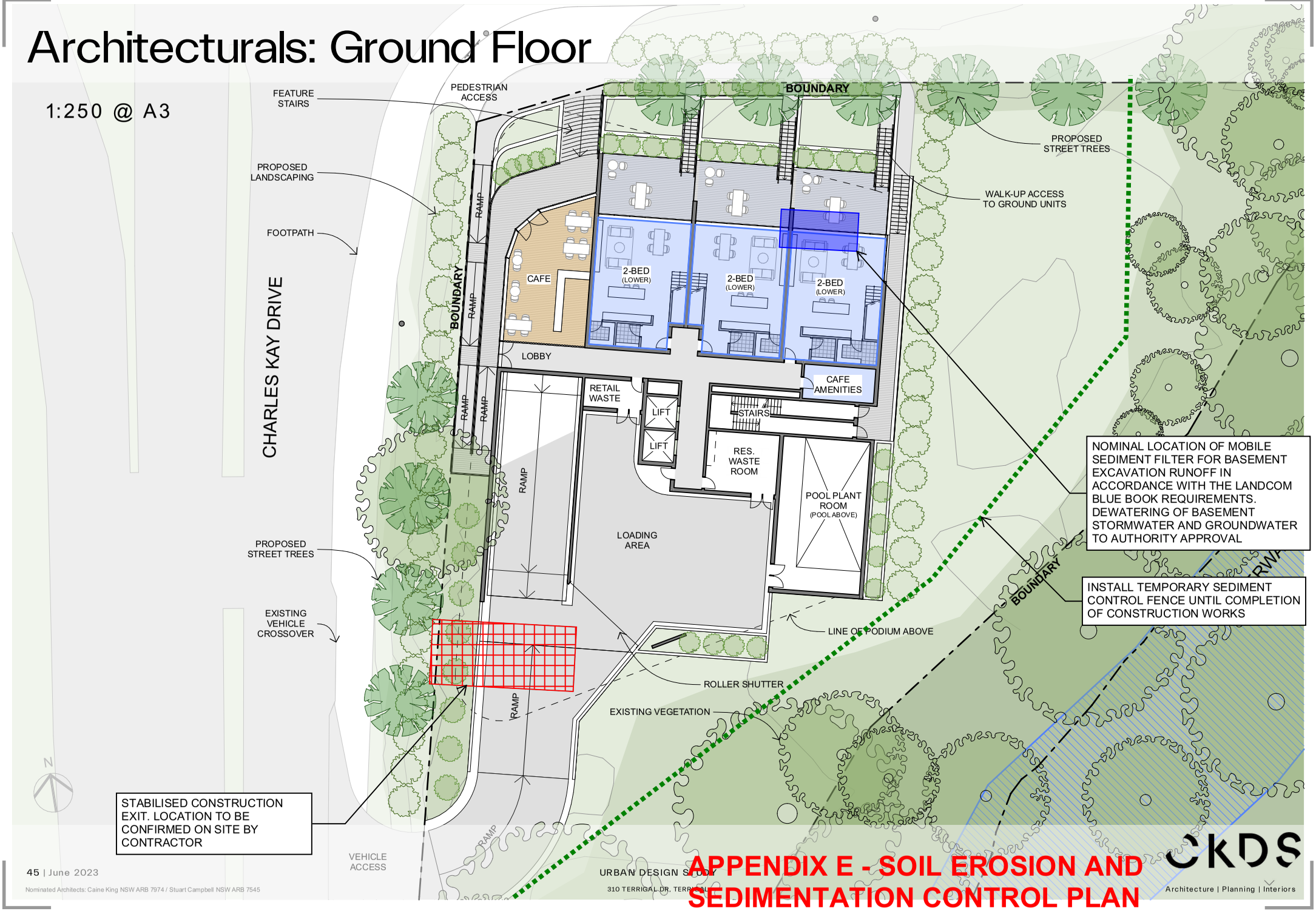



**APPENDIX E - SOIL EROSION AND SEDIMENTATION CONTROL PLAN**



Nominated Architects: Caine King NSW ARB 7974 / Stuart Campbell NSW ARB 7545

URBAN DESIGN STUDY

310 TERRIGAL DR, TERRIGAL

CKDS

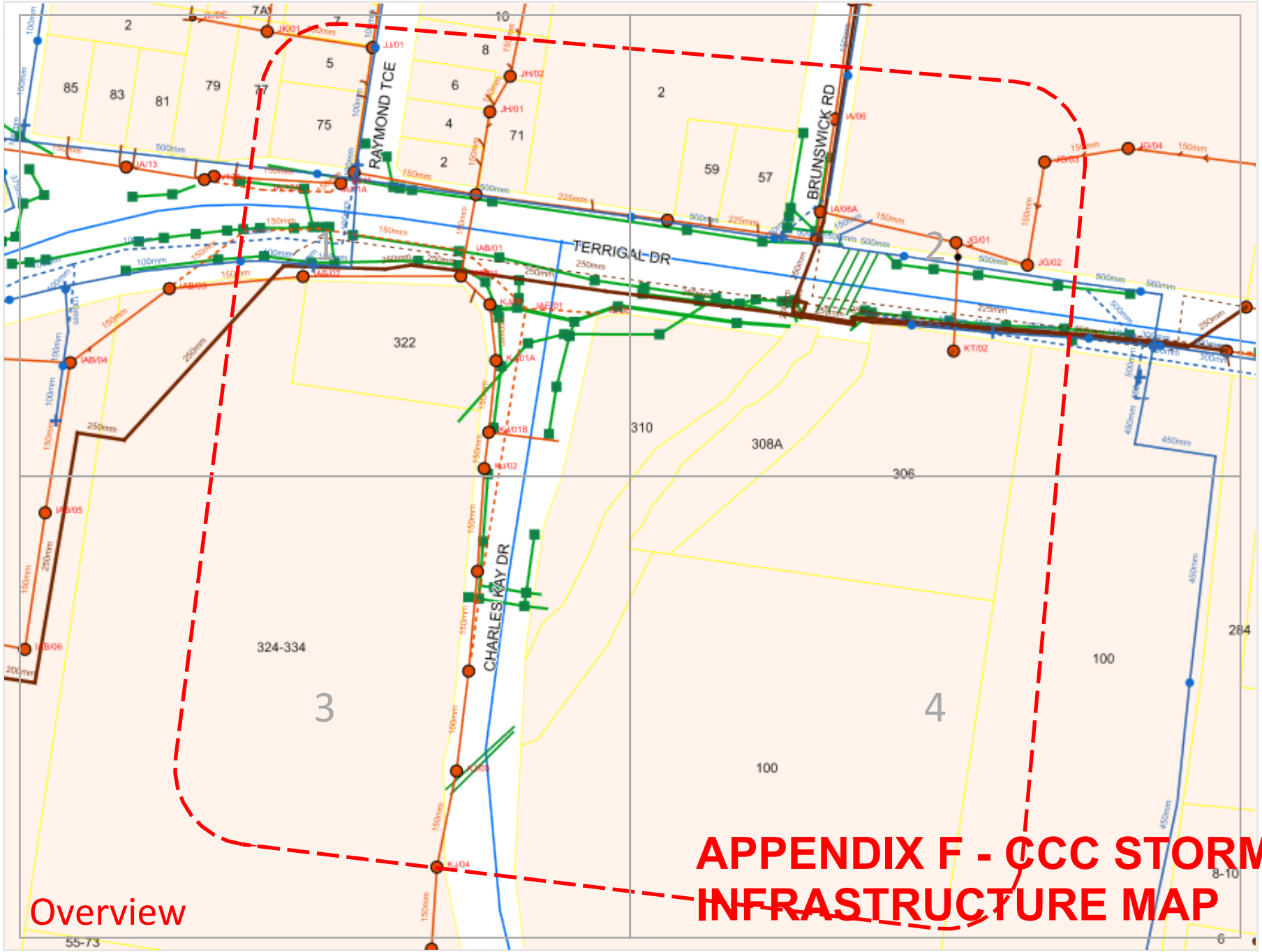
Architecture | Planning | Interiors

# Appendix F – Central Coast Council Stormwater Infrastructure Map

Central Coast Council

**Sequence No:** 223549575
**Job No:** 34022209
**Location:** 308b Terrigal Drive, Terrigal, NSW 2260

DIAL BEFORE YOU DIG www.1100.com.au
*The Essential First Step.*




# APPENDIX F - CCC STORMWATER INFRASTRUCTURE MAP

## Legend

- Watermain
- Watermain (Asbestos)
- Watermain - Expired
- Watermain - Expired (Asbestos)
- Water Valve
- Watermain - Recycled
- Water Hydrant
- Sewer Service Connection
- Sewer Pressure Main
- Sewer Pressure Main- Expired
- Sewer Network Structures
- Sewer Maintenance Hole
- Sewer Dead End
- Sewer Lamphole
- Sewer Gravity Main
- Sewer Gravity Main (Asbestos)
- Sewer Gravity Main - Expired
- Drainage Pit
- Drainage Pipe
- Drainage Pipe - Expired
- Drainage Culverts
- Drainage Culverts - Expired

N

Scale: 1:2050
Expires: 15 May 2023

# Appendix G –Sewer & Potable Water Servicing Strategy

Central Coast Council

**Sequence No:** 223549575
**Job No:** 34022209
**Location:** 308b Terrigal Drive, Terrigal, NSW 2260

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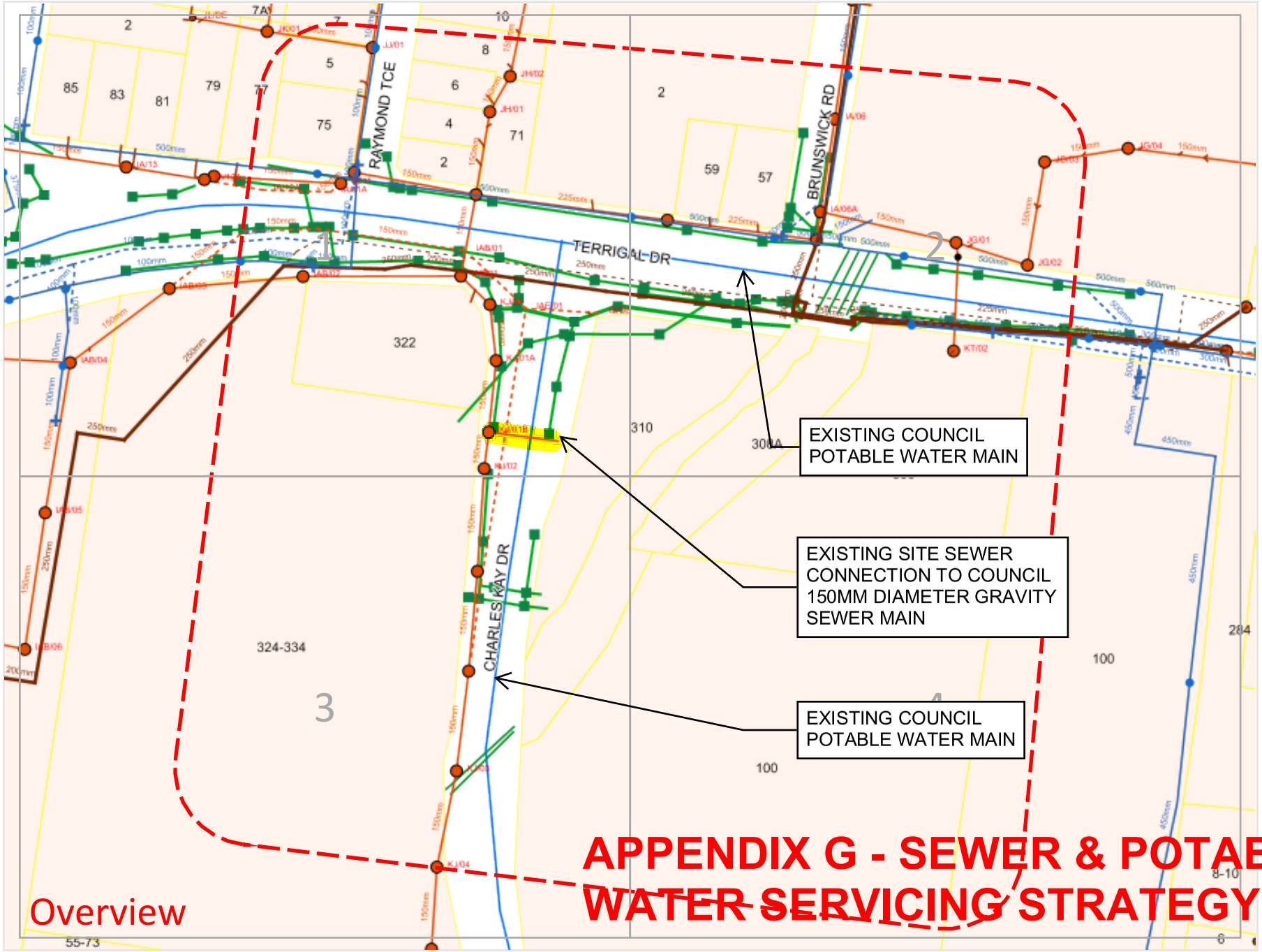



# APPENDIX G - SEWER & POTABLE WATER SERVICING STRATEGY

Legend

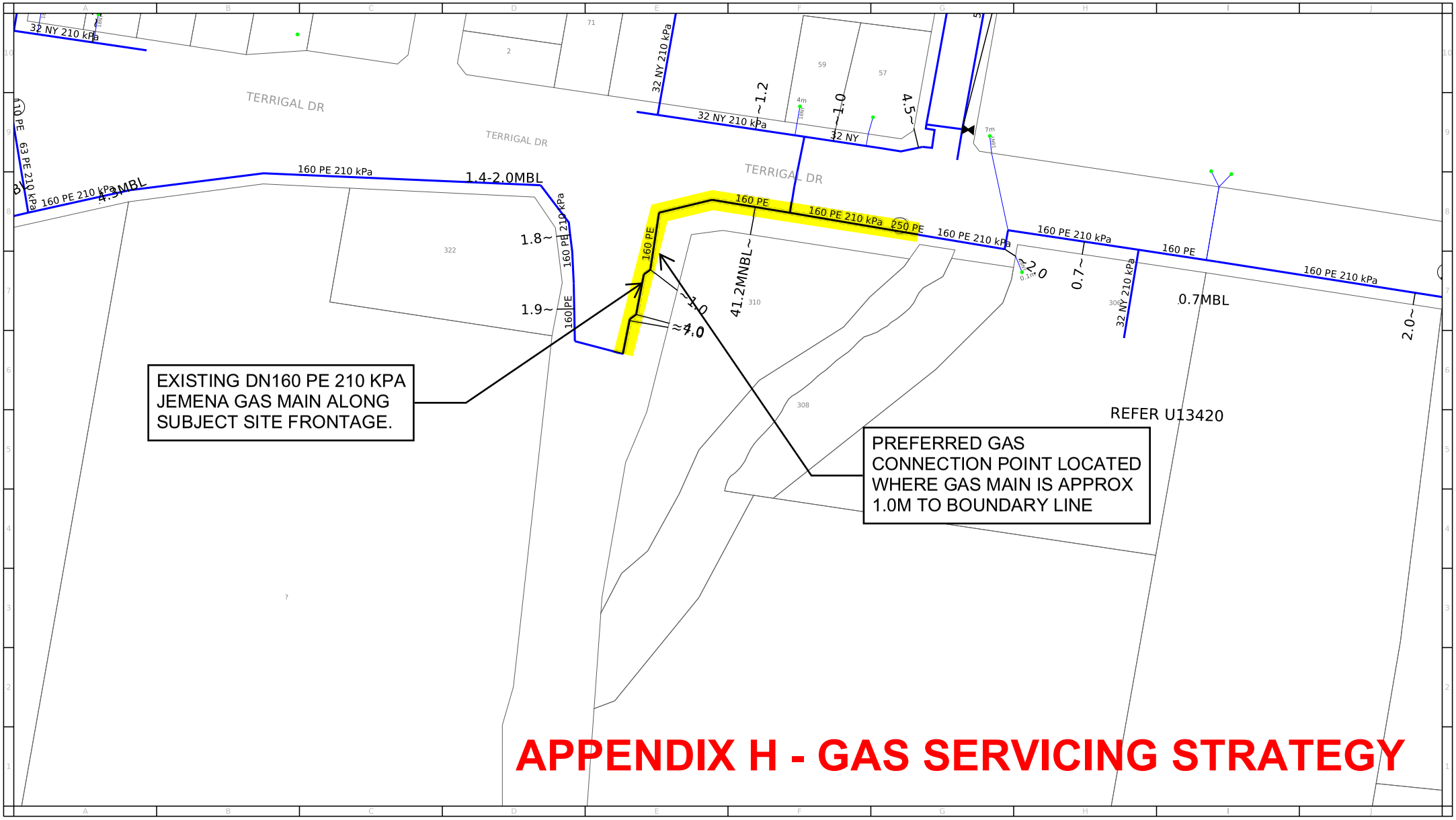
- Watermain
- Watermain (Asbestos)
- Watermain - Expired
- Watermain - Expired (Asbestos)
- Water Valve
- Watermain - Recycled
- Water Hydrant
- Sewer Service Connection
- Sewer Pressure Main
- Sewer Pressure Main- Expired
- Sewer Network Structures
- Sewer Maintenance Hole
- Sewer Dead End
- Sewer Lamphole
- Sewer Gravity Main
- Sewer Gravity Main (Asbestos)
- Sewer Gravity Main - Expired
- Drainage Pit
- Drainage Pipe
- Drainage Pipe - Expired
- Drainage Culverts
- Drainage Culverts - Expired

N

Scale: 1:2050
Expires: 15 May 2023

# Appendix H – Jemena Gas Servicing Strategy

DBYD Authority: Jemena Gas Networks (NSW)  DBYD Location: 308b Terrigal Drive Terrigal NSW, 2260




# APPENDIX H - GAS SERVICING STRATEGY

Jemena
ABN 87 003 004 322

For legend details, please refer to the Coversheet attachment provided as part of this DBYD response.

Issue Date: 17/04/2023
DBYD Seq No: 223549576
DBYD Job No: 34022209
Scale: 1:2000
0m 10m 20m 30m 40m 50m 60m 70m 80m