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CREATIVE VISION

Acid Sulfate Soil Assessment

135 Badgerys Creek Road, Bradfield, NSW

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1. INTRODUCTION

1.1 Overview

EI Australia (EI) was engaged by Creative vision (the client) to prepare an Acid Sulfate Soil Assessment (ASSA) for the property located at 135 Badgerys Creek Road, Bradfield, NSW (henceforth referred to as 'the site').

The site is located within the local government area (LGA) of Liverpool City Council (**Figure 1**, **Appendix A**). It comprises a rectangle-shaped section of land, covering an area of approximately 2.02 hectares (ha). At the time of the preparation of this plan, the site was vacant land with no standing structures (**Figure 2**, **Appendix A**).

1.2 Background

The site was designated for redevelopment and this ASSA was prepared in support of the corresponding NSW Government Planning Secretary's Environmental Assessment Requirements (SEARs, application number SSD-77458970) for the project. Condition 13 (Ground and Water Conditions) of the SEARs requires that potential impacts on soil resources and related infrastructure and riparian lands on and near the site, including soil erosion, salinity and Acid Sulfate Soils (ASS) are assessed. The findings of the assessment would be used to inform whether ASSs are present at the site, whether proposed redevelopment works are likely to disturb those soils and establish whether an Acid Sulfate Management Plan (ASSMP) should be prepared. An ASSMP would document procedures to be implemented during construction works in order to manage the potential environmental risk associated with disturbance of actual or potential acid sulfate soils (AASS/PASS).

1.3 Objective

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), Secretary's Environmental Assessment Requirements (SEARs) for SSD-77458970 were issued on 30 January 2025. This ASSs report has been prepared to respond to the relevant issued Secretary's Environmental Assessment Requirements (SEARS) and provide the framework for the on-going management and monitoring of the impacts of ASSs (if present at the site) throughout the construction and operation phases of the project in lieu of an Acid Sulfate Soil Assessment, specifically the requirements set out in **Table 1-1** below.

Table 1-1 Summary of SEARs addressed

SEARs Request	Response / Location in report
13 Ground and Groundwater Conditions (partial) ▪ Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion. ▪ Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.	▪ Sections 2, 3 and 4 of this report ▪ Further details provided in separate reports: ‣ Groundwater assessment in E26733.E01; ‣ Salinity assessment in E26733.G17; ▪ Acid sulfate soils assessment in Sections 2, 3 and 4 of this report

1.4 Scope of Works

In order to achieve the project objective, the scope of works is as follows:

- Identification of the site investigation requirements, to establish if and where ASSs are present;
- Description of the soil management procedures to be undertaken on-site, which when implemented will prevent, or control, the generation of acid leachate; and
- Description of the contingency measures to be implemented in the case of failure of management procedures.

1.5 Proposed Development

The following relevant documents, supplied by the Client, were used to assist with the preparation of this report:

- Architectural plans prepared by Plus Architecture – Job No. 20799, Drawing Nos. DA-10B1 to 10B3, and DA-1000 to 1012, 110, 120, 200 to 204, dated on 6 March 2025; and
- Site survey plan prepared by SDG – Referenced 9165, revision B 94, dated on 8 August 2024.

The proposed development will seek consent for the redevelopment of the site, comprising:

- Enabling works including vegetation removal and earthworks;
- The construction of three buildings, comprising:
  - Residential use, including approximately 400 apartment units;
  - Hotel use, including approximately 450 hotel rooms;
  - Commercial use, including supermarket, food and drink and other commercial uses;
  - Medical centre use;
  - Childcare centre use;
- Construction of two basement structures, including approximately 800 carparking spaces;
- Public domain upgrades, including:
  - Construction of an internal road;
  - A public plaza;
- Rehabilitation and augmentation of the existing riparian corridor;
- Landscaping embellishments on the ground level and within the built form; and
- Services augmentation as required.

Refer to the Environmental Impact Statement for a detailed summary of the proposed development.

Based on the provided documents, EI understands that the proposed development involves:

- Excavation is planned for three detached two-level basements, comprising:
  - Stage 1 basement underlying the hotel and childcare towards the eastern boundary;
  - Stage 2 basement underlying commercial and residential buildings towards the centre of the site; and

  - Stage 3 underlying further commercial and residential buildings towards the western boundary.
  - Stage 1 and Stage 2 basements are shown to have a shared wall with Stage 2 and Stage 3 separated by a riparian corridor with water course and a proposed local street.
- The lowest basement levels of each stage are proposed to have a Finished Floor Level (FFL) of between RL 68.8m and 70.0m Australian Height Datum (AHD).
- A Bulk Excavation Level (BEL) ranging between RL 69.7 m and 70.7 m is assumed, which includes allowance for the construction of the basement slab.
- To achieve the BEL, excavation depths from 5.5m to 11.5m Below Existing Ground Level (BEGL) have been estimated. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.
- The basement extends up to the northern and eastern site boundaries for the Stage 1 and Stage 2 basements, and is set back from the southern boundary by about 3 m.
- The Stage 3 basement is set back also about 3 m from the southern site boundary, and about 10 m from the western boundary, and a minimum of 6 m from the northern site boundary.

1.6 Regulatory Framework

This plan was completed with reference to the following key guidelines:

- NSW EPA (1995) *Assessing and Managing Acid Sulfate Soils - Guidelines for Land Management in NSW Coastal Areas*, NSW Environment Protection Authority;
- Ahern, C. R., Stone, Y. and Blunden, B. (1998) *Acid Sulfate Soil Manual*. Acid Sulfate Soil Management Advisory Committee (ASSMAC);
- DAWR (2018) *National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual,* Department of Agriculture and Water Resources;
- NSW EPA (2020) *Consultants Reporting on Contaminated Land: Contaminated Land Guidelines*, Environment Protection Authority of New South Wales.
- NSW Government (2021) *State Environmental Planning Policy (Precincts – Western Parkland City) 2021*; and
- NSW Government (2025) Request for Secretary's Environmental Assessment Requirements SEARS) – Mixed-use residential and commercial development – SSD-77458970.

2. SITE DESCRIPTION

2.1 Property Identification, Location and Physical Setting

The site identification details and associated information are presented in **Table 2-1**. Refer to **Appendices A** and **B** for site plans.

Table 2-1 Site Identification and Zoning

Information	Detail
Street Address	135 Badgerys Creek Road, Bradfield, NSW
Lot and DP	Lot 7 in Deposited Plan 243457
LGA	Liverpool City Council (Council)
Current Zoning	State Environmental Planning Policy (Precincts—Western Parkland City) 2021 MU1: Mixed Use (Liverpool Local Environmental Plan 2008)
Land Use	At the time of our investigation, the site comprised cleared agricultural land with some large trees particular near the eastern and south-western site boundaries. A farm dam is located near the centre of the site, filling from runoff typically from the north and north-west.
Brief Site Description	The site is located approximately 250m to the future Bradfield Metro Station and 4km to the Western Sydney Airport. It shares a western frontage with Badgerys Creek Road. The eastern boundary of the site adjoins the State government-led Bradfield City Centre which is set to be a vibrant 24/7 global city, driving advancements in industry and will support 10,000 more homes and 20,000 new jobs in Western Sydney. As defined by the Aerotropolis Precinct Plan, the site is located within the Aerotropolis Core Precinct which is envisioned as an attractive place for workers, residents, and visitors. The Aerotropolis Core Precinct will leverage the positive economic impact of the adjacent Western Sydney Airport and Bradfield City Centre. It will attract business hubs, research and development, professional services, and creative industries in addition to providing residential development within walking distance of the Bradfield Metro station and proximity to blue and green infrastructure.
Site Area	2.02 ha

2.2 Regional Setting

Local topography, (hydro)geology and soil landscape information is summarised in **Table 2-2**.

Table 2-2 Regional Setting Information

Attribute	Description
Topography	The site gently downslopes from the west and east boundaries to the centre of the site, with elevations ranging from 80 to 76 metre Australian Height Datum (m AHD). (Source: Mecone Mosaic).
Drainage	Surface water is expected to directly infiltrate on exposed surfaces. Any runoff is likely to drain into the municipal stormwater system.
Geology	According to the *Geological Series Penrith Sheet 9030* (DMR, 1991), the site is underlain by *Rwb: Bringelly Shale*, characterised by shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal and tuff.

Attribute	Description
Soil Landscape	The NSW Government Department of Planning, Industry and Environment *eSPADE v2.2* website indicates that the site overlies a Blacktown (*bt*) residual landscape, which consists of gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes.
Nearest Surface Water Feature	Private: Dam located approximately 20 m north of the northern site boundary. Public: Moore Gully approximately 500 m south of the site.

3. DESKTOP REVIEW

3.1 Definition of Acid Sulfate Soils

Acid sulfate soils are naturally occurring sediments containing iron sulphides, usually deposited in estuarine environments. As ASSs comprise natural geological materials, their occurrence is not related to site boundaries or anthropogenic contamination; rather, they extend across regions suitable for their deposition.

When ASSs are exposed to air (e.g. due to bulk excavation or dewatering), oxygen reacts with the iron sulphides, producing sulphuric acid (and iron oxides). The acid can be produced in large quantities and drain into waterways causing severe short and long term socio-economic and environmental impacts, including damage to manmade structures and natural ecosystems.

ASS can be classified as either:

- Actual acid sulphate soil (AASS), within which are materials that have already reacted with oxygen to produce acid; or
- Potential acid sulfate soil (PASS), within which are materials that contain iron sulphides, but have not been exposed to oxygen (e.g. soils below the water table) and therefore have not produced sulphuric acid (though they have the capacity to do so).

Aquatic organisms are very sensitive to acid drainage. Impacts from ASS leachates include:

- Dissolved metals (aluminium in particular) can be toxic to aquatic life forms;
- Dissolved sulfate salts can increase the salinity of freshwater; and
- Acidic sediment may “fix” phosphates and other nutrients, preventing their uptake by plants.

3.2 Acid Sulfate Soil Planning and Risk Maps

ASS mapping provided on the NSW Department of Customer Service *NSW Planning Portal: Spatial Viewer* (https://www.planningportal.nsw.gov.au/spatial-viewer) shows that site is located in an area classified as being of *No Known Occurrence*, whereby ASSs are not known or expected to occur (as shown on **Figure 3-1** below).

Figure 3-1 - Acid Sulfate Soil Zones

3.3 Geomorphic Characteristics of Acid Sulfate Soils

The likelihood of ASS occurrence on-site should be considered against various geomorphic indicators given in Ahern *et al.* (1998) *Acid Sulfate Soil Manual*. These considerations are presented in **Table 3-1**.

Table 3-1 Consideration of Geomorphic Indicators

Geomorphic Feature	Site Presence of Feature
Holocene sediments	Not present, based on the available maps
Soil horizons less than 5m AHD	Not Present, site elevations are 88-82m AHD (Source: Mecone Mosaic).
Marine / estuarine sediments or tidal lakes	Not present, based on the available maps
Coastal wetland; backwater swamps; waterlogged or scaled areas; inter-dune swales or coastal sand dunes.	Not present, based on the available maps and site inspection
Dominant vegetation is mangroves, reeds, rushes and other swamp or marine tolerant species	Not present, based on site inspection
Geologies containing sulphide bearing material	Unlikely, based on the available maps
Deep older (Pleistocene) estuarine sediments	Not present, based on the available maps

3.4 Likelihood of ASS Occurrence

The site is situated within a relatively sloped, 80-76 m AHD, shale environment. Additionally, with reference to the Liverpool Local Environmental Plan (2008) ASS map, the site lies in an area of “no

known occurrence" and is not situated within 500m of a class 1, 2, 3 or 4 land. It displayed none of the geomorphic indicators of ASS presence, suggesting that the occurrence of ASS was unlikely.

The proposed development involvess bulk soil excavations to depths of 6m BGL. Based off the location of the site and proximity to any class 1, 2, 3 or 4 land, intrusive investigation involving soil sampling and laboratory analysis is not required prior to excavation to confirm the presence or absence of ASS. This requirement was consistent with the *Liverpool Local Environmental Plan 2008,* as well as Schedule 3 of the NSW *Environmental Planning and Assessment Regulation 1994*.

From the above the potential for ASS to be present on-site was low and further related assessment was unwarranted and as such an Acid Sulfate Management Plan (ASSMP) is not required to be prepared.

4. ACID SULFATE SOIL MANAGEMENT

4.1 Mitigation measures

As mentioned in **Section 3** the potential of ASS to be present on-site was low and further related assessment was unwarranted. Nevertheless, a summary of the mitigation measures described in this report is presented in **Table 4-1** below.

Table 4-1 Summary of Mitigation Measures

ID	Mitigation Measure
Construction Phase	
C1	An Acid Sulfate Management Plan (ASSMP) is **not required** for this site as discussed in **Section 2** and **3**. Section 4 of this report provides contingency and acts as a guide should the occurrence of ASS was found to be likely for this site.

4.2 Intrusive Investigation

An Acid Sulfate Management Plan (ASSMP) is not required for this site. This section of the report is presented as a guide only should the occurrence of ASS was found to be likely.

Based on the site area (2.02 ha) and predicted total volume of soils to be disturbed during bulk excavation (maximum of 121,200m^3), then in accordance with Ahern *et al.* (1998) and Sullivan *et al*. (2018), the investigation would comprise:

- Soil profiling at a minimum of eight boreholes / test pits, each extended to at least 7m BGL;
- The collection of soil samples from each distinguishable layer and/or at 1m increments, ensuring each horizon is represented by the sampling program;
- The collection of a groundwater sample from at least one of the bores / pits, should sufficient inflow be encountered;
- Laboratory analysis of selected soil and groundwater samples for ASS parameters; and
- Data interpretation against the adopted assessment criteria.

Soil Description

Examined soils are to be described in-field with respect to lithological characteristics, based on the Unified Soil Classification System (USCS) and Australian Standard AS1726:2017 *Geotechnical Site Investigations* (Standards Australia, 2017). They are to be evaluated on a qualitative basis for odour (hydrogen sulfide) and visual signs of ASS (pale yellow deposits / coatings of jarosite, dark (blue/green) grey to black soils and/or marine shell grit).

Sample Handling Procedures

A stainless steel trowel should be used to transfer soil aliquots from the auger drill flights / excavator bucket into laboratory-supplied, zip-lock bags (the sampler wearing dedicated nitrile gloves). The headspace air is to be expelled before sealing the bag.

Groundwater samples are to be collected in high-density, polyethylene bottles.

Upon sealing the bag / bottle, the sample shall be immediately stored in an insulated chest (containing ice packs), before transportation to the designated NATA-accredited analytical laboratory under strict chain-of-custody (COC) procedures.

Laboratory Analysis

To confirm the presence/absence of ASSs, representative samples would be assigned for analysis of the parameters recommended in Section 2 *ASSs Assessment Guidelines* of Ahern *et al.* (1998) *Acid Sulfate Soil Manual*, Australian Standard AS4969:2009 *Analysis of Acid Sulfate Soil* (Standards Australia, 2009) and Section 6 *Chemical Analysis for Acidity Hazards* of Sullivan *et al*. (2018) *National Acid Sulfate Soils Guidance - National Acid Sulfate Soils Identification and Laboratory Methods Manual*:

- field pH (pH_f);
- field peroxide oxidation pH (pH_{fox});
- electrical conductivity (EC);
- suspension peroxide oxidation combined acidity and sulphate (SPOCAS) suite, for estimation of peroxide oxidisable sulfur (S_{pos}); and
- Chromium suite, for estimation of chromium reducible sulfur (S_{Cr}), which reflects the inorganic sulfide content of a sample, that being more closely correlated with potential acid sulfates compared with S_{pos}.

All laboratory analyses would be conducted on discrete (un-composited) samples using NATA-registered methods. They shall determine the ASS risk and establish required rates of liming for neutralisation purpose (if ASS are confirmed).

Assessment Criteria

The soil analytical results to be interpreted with respect to the indicators (screening and action criteria) for ASS presented in Tables 2.3 and 4.4 from Section 2 *ASSs Assessment Guidelines* of Ahern *et al*. (1998) *Acid Sulfate Soil Manual*. Since more than 1000m^3 / 1000 tonnes of soils will be disturbed, the corresponding criteria are:

- field pH (pH_f): 4
- field peroxide oxidation pH (pH_{fox}): 3

SPOCAS / Chromium Suite Sulfur Trail

- peroxide oxidisable sulfur (S_{pos}): 0.03% w/w as sulphur
- chromium reducible sulfur (S_{Cr}): 0.03% w/w as sulphur

SPOCAS Acid Trail

- total potential acidity (TPA): 18 moles H^+ / tonne
- total sulfidic acidity (TSA): 18 moles H^+ / tonne.

4.3 Preliminary Management Considerations

Assuming ASSs are present on-site, the following activities may intercept and disturb them, thus creating associated environmental impacts via acid leachates:

- Excavation for the basement;
- Piling;
- Excavations for crane pads, lift overrun pits, building footings and service trenches; and
- Dewatering for basement construction (if groundwater inflow and/or heavy rains occur).

The extent of any adverse impacts associated with ASS will depend on the following factors:

- Volume of disturbed / exposed soil identified as being ASS;
- Physical characteristics of the ASS, such as grain size and natural buffering capacity;
- Time that ASS are exposed to air; and
- Rate of oxidation and transport of the oxidation products.

In order to minimise environmental impacts associated with oxidised ASSs, the management options commonly adopted are (WA DER, 2015):

- Avoidance, or minimisation of ASS disturbance;
- Soil neutralisation (typically with lime);
- Strategic reburial under water; and/or
- Off-site treatment and disposal.

Effective identification and monitoring, combined with a planned treatment program that includes appropriate contingencies, will ensure there is no incremental contribution of acid leachates during basement excavation and building construction.

It is understood that all excavated materials will be disposed off-site to landfill. It is recommended that all ASSs be assessed and/or treated (limed) on-site immediately upon disturbance. No such soil should be used for structural or general filling above the groundwater table.

The shortest possible time of air exposure will be permitted, to minimise the extent of oxidation and transport of reaction products. Ideally, stockpiled ASSs will be treated on the same day that they are excavated (and covered by sheets of builder's plastic), while remaining surface soils will be exposed for less than thirty days.

4.4 Management of Disturbed Acid Sulfate Soils

It is proposed that excavated ASSs will be stockpiled separately within a designated (bunded) area, in preparation for lime treatment. More specifically, the management procedures are:

1) Prior to work commencement, the proposed excavation area will be isolated and appropriate bunding put in place.

2) ASS will be stockpiled on-site, with temporary bunding placed around each mound. Alternatively, it can be deposited into a skip bin. Lime will be spread evenly throughout the excavated material.

3) For every day a stockpile / skip bin remains on-site, representative samples will be monitored for pH. Where pH is below 5.5, (additional) lime will be applied for neutralisation.

4) On-site neutralisation of potential ASS will be carried out with granulated, agricultural lime.

It is recommended that stockpile(s) containing ASSs be formed on an area where no development works are proposed. The designated treatment area may be subject to change, depending on (modified) plans of the proposed development and access needs. If lime treatment on freshly excavated ASS cannot be performed immediately, plastic sheeting shall be placed over the stockpile to reduce the oxidation rate.

Determination of Lime Requirement

The liming rate of identified ASS shall be determined by the investigation (SPOCAS / chromium suite) data. Given the large-scale excavation proposed (at least 35,000m^3 site soils), a *Very High Treatment* category is predicted, should ASS be identified (Ahern *et al.*, 1998).

Method of Neutralisation

In order to facilitate mixing, the soil should be thinly spread (<0.5m thickness) within the bunded, stockpiling area, or skip bin. Lime should be added by hand and/or excavator bucket, followed by mixing using light-weight rotavators and/or shovels.

Field pH testing on representative samples should be performed to ensure that sufficient neutralisation has occurred (i.e. pH>5.5), prior to disposal.

Alternative Procedure (Lime Treatment Not Required for PASS)

In accordance with the EPA (2014) *Waste Classification Guidelines - Part 4: Acid Sulfate Soils*, PASS may be disposed at a licensed landfill without prior treatment, provided the following conditions are met:

- The landfill facility is licensed by the EPA to accept untreated PASS;

- Disposal occurs within 24 hours of excavation (disturbance);
- The PASS is buried at least 2m below the lowest historical level of the permanent water table (at the designated landfill facility); and
- The PASS otherwise meets the definition of *virgin excavated natural material* (VENM) under the *Protection of the Environment Operations Act 1997*, even though it has sulfidic ores / soils.

Methodology

When clearance is granted for PASS disposal without treatment, PASS shall be excavated to the required depth and stockpiled in a suitable (bunded) location. Alternatively (preferably), it can be loaded directly onto waiting trucks. Each stockpile / truckload shall be inspected and verification testing for pH shall be carried out to confirm soil pH_f does not fall below 5.5 prior to leaving the site.

Verification testing is required to demonstrate that materials with existing acidity are not being reburied. Should field pH_f fall below pH 5.5, the materials from that stockpile / truck are to remain on-site and lime neutralisation techniques are to be implemented, as described previously.

Stockpiled, non-treated PASS shall be covered if immediate disposal is not possible. Such soil must leave the site within 16 hours of excavation, otherwise lime neutralisation techniques shall proceed as described previously. The PASS must be kept wet at all times and buried below the permanent water table within 8 hours of their receipt at the designated landfill.

Notes:
The large basement excavation area and depth may preclude the ability to stockpile PASS on-site and/or create a suitable treatment pad. Hence, it may be prudent to adopt the *Alternative Procedure* described above (without stockpiling), in which case an agreement (approval) with the designated landfill facility should be sought prior to works commencement.
The designated landfill facility must be licensed for the certified waste category. Documentation (tipping dockets) must be collated, accounting for each truck load of soil disposed off-site.

4.5 Management of *In Situ* Acid Sulfate Soils

Potential ASSs which become exposed on an excavated pit surface may produce acid. This will apply to any wall and base surfaces of the basement shell containing ASS.

For every day that an excavated pit surface comprised of *in situ* ASS is in an exposed state, representative samples will be monitored for pH; where soil pH falls below 5.5, lime will be applied to the potential ASS horizon(s). Plastic sheeting can be placed over the corresponding surface (where possible) to reduce the oxidation rate.

4.6 Dewatering (Groundwater) Issues

If groundwater is encountered during the bulk excavation phase, the removal (pumping) of seepage water from the basement excavation area may be necessary. The proposed excavation work and/or pumping is unlikely to cause significant alterations to the existing (local) groundwater table, at least in the long term. Nevertheless, any required dewatering must be performed in accordance with Sullivan *et al*. (2018) *National Acid Sulfate Soils Guidance: Guidance for the Dewatering of Acid Sulfate Soils in Shallow Groundwater Environments*.

Specific measures that must be implemented are as follows:

1) The civil and dewatering works program will be undertaken in a staged manner, to minimise their duration and the magnitude of water volume.
2) Active management of civil works and dewatering operations is required to minimise potential impacts on the environment and other groundwater users. The use of shoring to physically confine the cone of depression (in the pit), or temporarily slow down groundwater flow, should be considered. Specifications for shoring are to be determined by the appointed structural engineer.
3) Excavation areas will be left open for the shortest possible time.

4) Water to be discharged to Council's stormwater system must:
   - be pumped to an agreed discharge point;
   - not contain a concentration of suspended sediment exceeding 50 mg/L;
   - have a pH of between 6-8; and
   - comply with the ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018 - (specifically the criteria for the protection of 95% of species in freshwater ecosystems), as well as the criteria included in Landcom (2004) *Managing Urban Stormwater: Soils and Construction*.
5) Should acidic water (pH<6) be encountered during the works, it will be treated with lime to display a pH level of 6-8. The treatment system should include a settlement tank of suitable capacity, with dosing pump to neutralise any acidic water, prior to controlled off-site release. A flow meter is to be located on the discharge line, to record volumes of treated effluent.
6) Granulated lime should be added to the water by hand and/or excavator bucket, then mixed. Field pH testing on representative samples should be performed to ensure that sufficient neutralisation has occurred, prior to disposal.
7) Water testing shall be carried out to ensure groundwater is appropriate for discharge. This testing must be undertaken by a suitably qualified environmental consultant and results provided to Council upon request.
8) Results of water testing must be provided in a certification report. Water that does not comply with the above standards must not be discharged off-site. A permit may be required to discharge such water. It is recommended that consultation with Council be undertaken prior to discharge into the stormwater network.
9) No water containing any suspended matter or contaminants is to leave the site in a manner which could significantly pollute a receiving waterway. Sediment retention traps will be used to control any runoff water.

4.7 Risk Management

This management plan is based on the assumption that more than 1000m^3 / 1000 tonnes of potential ASSs from within the proposed basement area will be disturbed and exposed (on wall and base surfaces) as a consequence of the corresponding excavation. Should the actual amounts of ASSs significantly differ from those in this report, management techniques may need to be revised. Indeed, management may not necessarily be required at all, depending on investigation findings.

Prior to the commencement of any excavation works, the applicant shall nominate an appropriately qualified environmental scientist to complete the investigation phase and supervise the management of ASSs (if necessary). The scientist shall:

a) Provide an acceptance in writing to supervise the aforementioned works and ensure compliance with this management plan and conditions of consent. This must be provided to the *Director - Environmental Services* of Liverpool City Council prior to works commencing.
b) On completion of all ASS management, certify that the aforementioned works were conducted in compliance with the approved plan(s), specifications and conditions of consent. This certification shall be submitted to the *Director - Environmental Services* of Liverpool City Council within 30 days of the completion of works.

During the proposed basement excavation, site inspection is to be conducted by the appointed environmental consultant, in order to check that the assumptions made in this plan are consistent with field evidence and practices. The consultant will be responsible for ensuring that:

- actual and/or potential ASSs are kept separate from other soils; and

- testing of excavated and exposed ASSs is performed.

All contractors must employ best practices in managing any off-site water and soil quality impacts during site redevelopment. All waste materials must be contained and disposed at appropriate landfill facilities, in accordance with the EPA (2014) *Waste Classification Guidelines*. Any soils to be imported onto the site for the purpose of back-filling or landscaping will require some form of validation, to confirm their suitability for the proposed land use.

If parts of the basement are to be set on ASS horizons, it is suggested that acid-resistant concrete be considered for the concrete shell. The specifications for acid-resistant concrete will be determined by the appointed structural engineer.

Notes:
All demolition activities must be managed in accordance with Australian Standard AS 2601 *The Demolition of Structures* (Standards Australia, 2001). The overriding objective will be the minimization of soil disturbance. During demolition, each structure is to be maintained in a stable and safe condition. Best practices must be employed in managing any off-site water and soil quality impacts. No water containing any suspended matter is to leave the site in a manner which could significantly pollute a receiving waterbody.

4.8 Contingency Measures

A list of potential events that may arise during the development and the corresponding contingency actions to be undertaken is provided in **Table 4-1**.

Table 4-2 Contingency Plan

Condition	Action
Potential ASS identified at unexpected depths	Stop excavation. Have material assessed by an environmental consultant for the presence of ASS. Follow management procedures adopted in the ASSMP.
Neutralisation of ASS was not effective	Re-assess liming rates and add additional lime to material. Re-test material to check neutralisation.
Neutralisation of ASS indicates that too much lime has been added and soils are alkaline	Remediate soils before use. Remediation comprises mixing additional ASS with the material (i.e. use excess lime to neutralise more ASS). Re-test material to check neutralisation.
Bunded ASS treatment area is damaged	Repair bund as soon as practicable. Clean-up any ASS that escaped the treatment area and place back into the treatment area. Check surrounding area for impact from the ASS or leachate, and undertake remedial action as required.
Groundwater level falls below the upper limit of soil horizon identified as containing PASS	Pause / adjust the rate of dewatering to restore groundwater level to above soil horizon defined as containing PASS. Review PASS exposure by checking the ASS and non-ASS interface in the affected area. Determine potential causes by reviewing construction practises, weather, baseline groundwater monitoring data, and performing additional groundwater monitoring as necessary on groundwater monitoring present at the site. Review and confirm mitigation measures to be implemented, including: Maintaining PASS soil moisture levels through targeted groundwater recharge; Adjusting the construction activities or schedule; and Treatment of additional PASS in treatment area. The pH of water should be monitored.
Extended rainfall generating excessive	The control procedures detailed in the plan will accommodate this

Condition	Action
water	contingency. The timeframe needed to recover the excessive water may extend the period during which the trench or excavation is open increasing the potential for acid generation and therefore requiring management.
Extended delays due to equipment failure, leaving excavated materials open to oxidation	Addition of lime sufficient to neutralise the total potential acidity of the excavated waste. A safety factor of 1.5 is included in the calculation of lime required which should ensure sufficient neutralising capacity should the excavation be open for greater than the planned period. The oxidation of the walls and base of the excavation should also be considered in regards to engineering design.
Spillage of ASS	Spillage of ASS should be collected and transferred to the acid soil storage facility as soon as practicable to ensure that surface soil or groundwater is not adversely impacted.

5. CONSULTATION AND RECORDS

During the development and any ASS management, the following authorities may require consultation:

- New South Wales Environment Protection Authority (EPA), concerning pollution incident and response issues, including off-site migration of acid leachates from ASS;
- WaterNSW, for a dewatering permit and associated conditions; and
- Liverpool City Council, regarding development compliance and environmental issues.

The party responsible for the implementation of this ASSMP should maintain a portfolio documenting all records associated with on-site ASS management. Such records will comprise, though not necessarily be limited to:

- ASS investigation results;
- Field records of ASS monitoring, such as daily field pH screening results on stockpiled materials, excavation surfaces, application of lime, groundwater level and pH level monitoring;
- Records of ASS transportation, including truck registers and waste (tipping) dockets issued by the receiving land fill facility; and
- Environmental incident reports, in cases of non-conformance and subsequent mitigation measures adopted.

All analysis and monitoring information will be stored electronically to permit ease of access and data interpretation.

6. STATEMENT OF LIMITATIONS

This plan has been prepared for the exclusive use of Creative vision, whom is the only intended beneficiary of EI's work. The scope of this plan was limited to that agreed with the client.

No warranties are made as to the information provided in this plan. All recommendations and procedures are of the professional opinions of EI personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to EI personnel and which may impact on those opinions are not the responsibilities of EI.

This plan was prepared for the above named client and no responsibility is accepted for use of any part of this report in any other context or for any other purpose or by other third parties. This report does not purport to provide legal advice.

This plan and associated documents remain the property of EI subject to payment of all fees due for the corresponding reporting. The report shall not be reproduced except in full and with prior written permission by EI.

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Appendix A – Figures

LEGEND **Note: All locations are approximate**

Site Boundary

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Drawn:	A.L.
Approved:	S.R.
Date:	22/09/2025

Creative Vision

Acid Sulfate Soils Assessment

135 Badgerys Creek road, Bradfield, NSW

Site Locality Plan

Figure: 1

Project: E26733.E14

Map Source: NSW SIXMaps, accessed 17/04/2025

LEGEND Note: Areas are approximate

Site Boundary | Proposed Basement Boundary

eiaustralia
Practical Solutions for Built Environments
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Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	A.L.
Approved:	S.R.
Date:	22/09/2025

Creative Vision

Acid Sulfate Soils Assessment

135 Badgerys Creek Road, Bradfield, NSW

Site Layout Plan

Figure: 2

Project: E26733.E14

Appendix B – Proposed Development Plans

FOR INFORMATION

REV	CKD	APP	Status	DATE
01	HN	AJ	FOR INFORMATION	9/5/2025
02	HN	AJ	FOR INFORMATION	9/11/2025
03	DC	AS	FOR INFORMATION	9/17/2025
04	DC	AS	FOR INFORMATION	9/19/2025

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PROJECT TITLE
135 Badgerys Creeks, Bradfield
DEVELOPMENT APPLICATION

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AS	DC	

DRAWING TITLE
GENERAL FLOOR PLAN - GROUND 00

PROJECT NUMBER
20799

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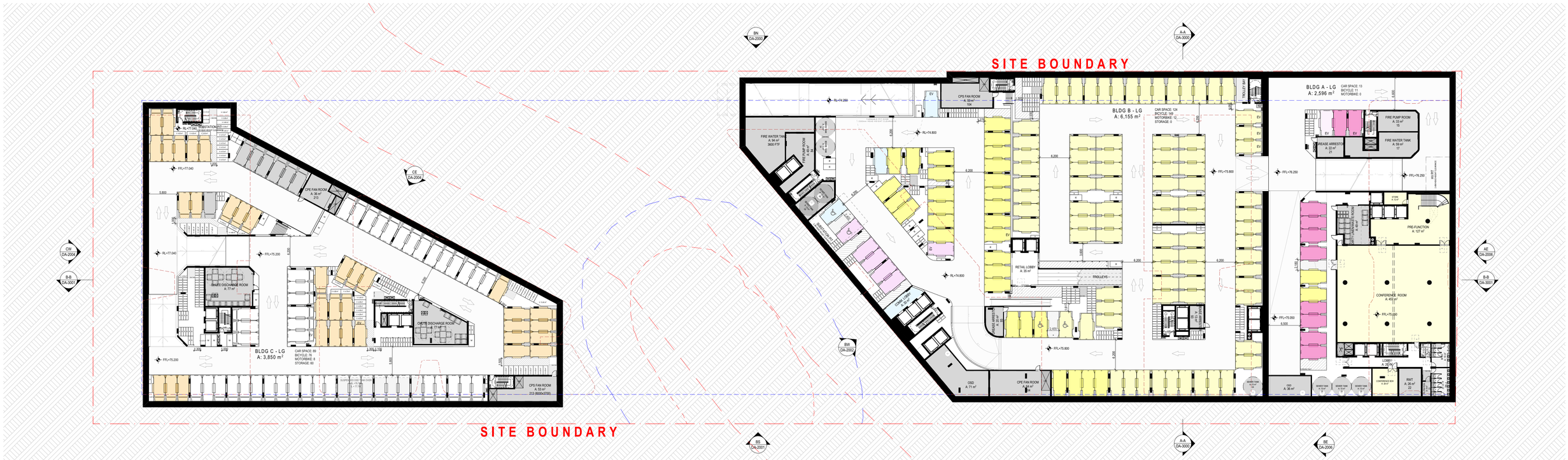
DA

DRAWING NUMBER
DA-1000

REVISION
04



CAR PARKING LEGEND

		BLDG A	BLDG B	BLDG C
	RETAIL PREMISES CAR SPACE	2	31 (1 ACC.)	0
	RETAIL PREMISES CAR SPACE	0	84 (1 ACC.)	0
	HOTEL / CONFERENCE CAR SPACE	1	0	0
	GYM CAR SPACE	0	0	0
	MEDICIAL CAR SPACE	0	0	0
	COMMERCIAL CAR SPACE	0	3 (1 ACC.)	0
	CHILCARE CAR SPACE	0	6 (1 ACC.)	0
	RESIDENTIAL CAR SPACE	0	0	35
	RESI. VISITOR CAR SPACE	0	0	47
	TAVERN CAR SPACE	10	0	0
	CAR SHARE	0	0	7
	TOTAL	13	125 (4 ACC.)	89

NOTES:

ACCESSIBLE PARKING SPACES WITH THEIR SHARED
AREAS TO ACHIEVE A MIN. CLEAR HEAD HEIGHT OF 2.5M

FOR INFORMATION

REV	CKD	APP	Status	DATE
01	HN	AJ	FOR INFORMATION	9/5/2025
02	HN	AJ	FOR INFORMATION	9/11/2025
03	DC	AS	FOR INFORMATION	9/17/2025
04	DC	AS	FOR INFORMATION	9/19/2025

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135 Badgerys Creeks, Bradfield
DEVELOPMENT APPLICATION

DRAWING TITLE
GENERAL FLOOR PLAN - LOWER GROUND

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PROJECT NUMBER
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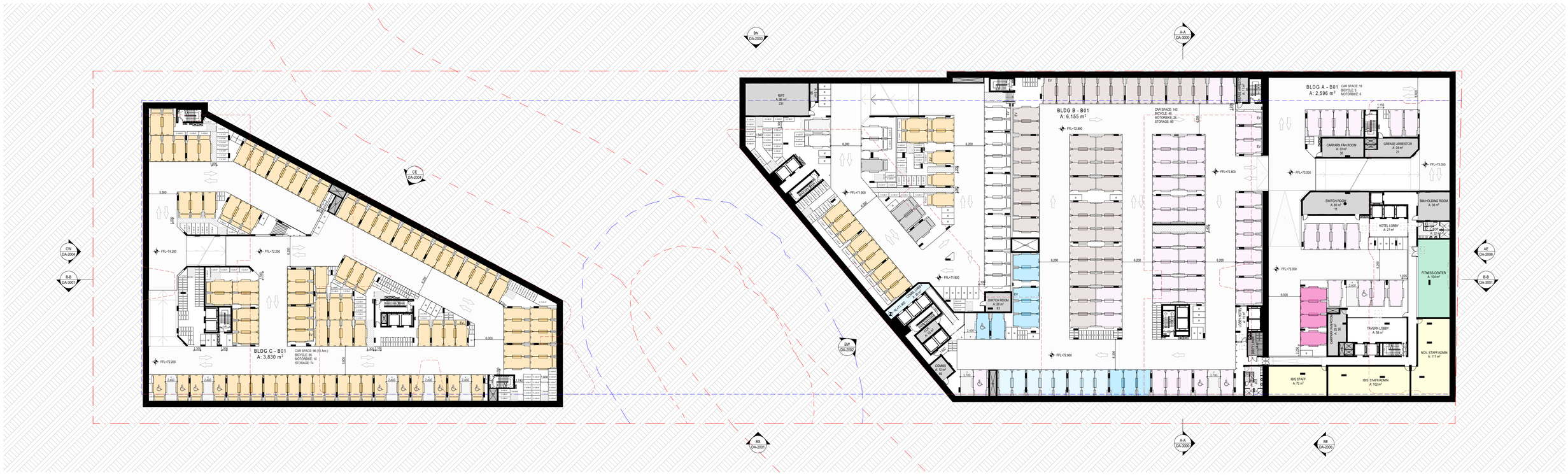
DRAWING NUMBER
DA-10B1

REVISION
04



CAR PARKING LEGEND

		BLDG A	BLDG B	BLDG C
	RETAIL PREMISES CAR SPACE	0	0	0
	RETAIL PREMISES CAR SPACE	0	0	0
	HOTEL / CONFERENCE CAR SPACE	14 (1 ACC.)	44 (3 ACC.)	0
	GYM CAR SPACE	0	44	0
	MEDICIAL CAR SPACE	0	10 (1 ACC.)	0
	COMMERCIAL CAR SPACE	0	8	0
	CHILCARE CAR SPACE	0	0	0
	RESIDENTIAL CAR SPACE	0	16	96 (10ACC.)
	RESI. VISITOR CAR SPACE	0	17	0
	TAVERN CAR SPACE	4	0	0
	CAR SHARE	0	4	0
	TOTAL	18 (1 ACC.)	143 (4 ACC.)	96 (10ACC.)

NOTES:

ACCESSIBLE PARKING SPACES WITH THEIR SHARED
AREAS TO ACHIEVE A MIN. CLEAR HEAD HEIGHT OF 2.5M

FOR INFORMATION

REV	CKD	APP	Status	DATE
01	HN	AJ	FOR INFORMATION	9/5/2025
02	HN	AJ	FOR INFORMATION	9/11/2025
03	DC	AS	FOR INFORMATION	9/19/2025

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PROJECT TITLE
135 Badgerys Creeks, Bradfield
DEVELOPMENT APPLICATION

DRAWING TITLE
GENERAL FLOOR PLAN - BASEMENT 01

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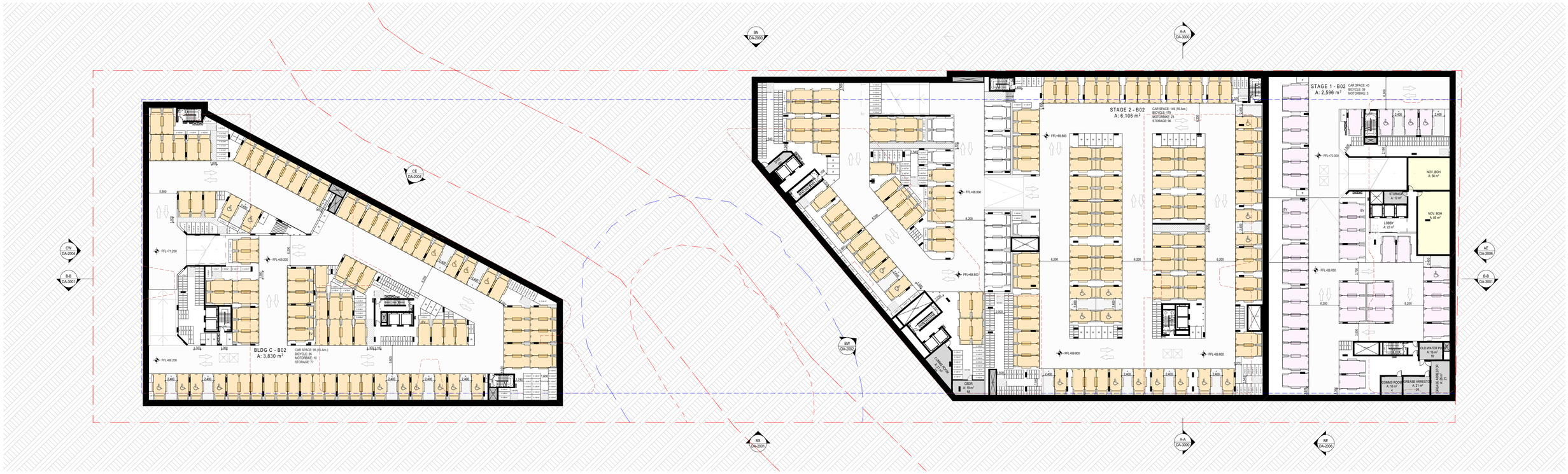
DA-10B2

REVISION
03



CAR PARKING LEGEND

		BLDG A	BLDG B	BLDG C
	RETAIL PREMISES CAR SPACE	0	0	0
	RETAIL PREMISES CAR SPACE	0	0	0
	HOTEL / CONFERENCE CAR SPACE	43 (4 ACC.)	0	0
	GYM CAR SPACE	0	0	0
	MEDICIAL CAR SPACE	0	0	0
	COMMERCIAL CAR SPACE	0	0	0
	CHILCARE CAR SPACE	0	0	0
	RESIDENTIAL CAR SPACE	0	134 (16 ACC.)	95 (16 ACC.)
	RESI. VISITOR CAR SPACE	0	15	0
	TAVERN CAR SPACE	0	0	0
	CAR SHARE	0	0	0
	TOTAL	43 (4 ACC.)	149 (16 ACC.)	95 (16 ACC.)

NOTES:

ACCESSIBLE PARKING SPACES WITH THEIR SHARED
AREAS TO ACHIEVE A MIN. CLEAR HEAD HEIGHT OF 2.5M

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135 Badgerys Creeks, Bradfield
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DRAWING TITLE
GENERAL FLOOR PLAN - BASEMENT 02

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