



Steel River East BESS

Water Impact Assessment

Ausgrid

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Terms and abbreviations

Term/Abbreviation	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council Water Quality Guidelines
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARI	Average Recurrence Interval
ASS	Acid Sulfate Soils
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
CEMP	Construction Environmental Management Plan
CN Council	City of Newcastle Council
DCP	Development Control Plan
DPE	Department of Planning and Environment
EC	Electrical conductivity
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EP&A	Environmental Planning and Assessment Act 1979
EY	A design event expressed in X Exceedances per Year, e.g. 2 Exceedances per Year (2EY)
GDE	Groundwater Dependent Ecosystem
GPT	Gross Pollutant Trap
IPCC	Intergovernmental Panel on Climate Change
LGA	Local Government Area
LEP	Local Environmental Plan
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NEM	National Energy Market
NWQMS	National Water Quality Management Strategy
PIRMP	Pollution Incidence Response Management Plan
PMF	Probable Maximum Flood
POEO Act	Protection of the Environment Operations Act 1997
RCP	Representative Concentration Pathway
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
SWMP	Soil and Water Management Plan
The Blue Book	Managing Urban Stormwater, Soils and Construction, Volume 1 (Landcom, 2004)
TSS	Total Suspended Solids
WM Act	Water Management Act 2000
WMP	Water Management Plan
WSP	Water Sharing Plan

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1. Introduction

1.1 The project

The Project involves the construction and operation of a 200 MW battery energy storage system (BESS) at 1 McIntosh Drive, Mayfield West, NSW. The site is located approximately 7 km north-west of Newcastle CBD, and 2 km north-west of the town of Mayfield.

The Project will include the development of the following infrastructure:

- Construction, operation, and maintenance of a BESS with a 200 MW maximum power output capacity with 2- hour duration (i.e. 400 MWh).
- Containerised battery units (112 Megapacks) and associated infrastructure, including inverters and 56 medium voltage transformers.
- 33 kV underground cable connection from the battery units to Mayfield West zone substation infrastructure.
- Combined switch room and control room building.
- Eight Ring Main Units (RMU).
- Onsite workshop facility.
- Two auxiliary transformers.
- Backup diesel generator.
- Two spaces for onsite car parking.
- Other ancillary infrastructure including fire suppression, stormwater management, 2.4 m high boundary security chain wire fencing, lighting and CCTV.

The operational lifetime of the BESS is expected to be approximately 50 years. Figure 1.1 provides the Project layout.

1.2 Study area

The site is located at 1 McIntosh Drive, Mayfield West, NSW 2340, within the City of Newcastle Council local government area (LGA). The site includes the Project as well as an existing 132 kV/11 kV substation. The study area includes the site as well as the downstream environment extending to the Hunter River.

1.3 Secretary's environmental assessment requirements

This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) that were issued for the Project (SSD-77450458) on 20 November 2024. The SEARs relevant to this assessment are summarised in Table 1.1.

Table 1.1 Secretary's environmental assessment requirements

Issue	SEARs	Where addressed
Water	An assessment of the likely impacts of the development (including flooding and flood modelling) on surrounding watercourses (including their Strahler Stream Order), groundwater resources and surface water movements, and measures proposed to monitor, reduce and mitigate these impacts including water management.	Section 5 Section 6
	A site water balance for the development.	Section 5.4.3
	Details of water requirements and supply arrangements for construction and operation (including consultation with suppliers).	Section 5.4

Issue	SEARs	Where addressed
	A description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with <i>Managing Urban Stormwater: Soils & Construction</i> (Landcom, 2004) and <i>Managing Urban Stormwater: Soils and construction – Volume 2A manual</i> (Landcom, 2008).	Section 6
	Assessing the impacts of the development, including any changes to flood risk and overland flows on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	Section 5.1
	Where the project involves works within 40 m of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the <i>DPI Guidelines for Controlled Activities on Waterfront Land</i> (2018) and (if necessary) <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (DPI 2003), and <i>Policy & Guidelines for Fish Habitat Conservation & Management</i> (DPE, 2013).	Section 3.2.6
	Flood Risk: – Identification of any flood risk on site having regard to adopted flood studies, the potential effects of climate change and any relevant provisions of the NSW Flood Risk Management Manual. – Where the development could alter flood behaviour, affect flood risk to the existing community or expose its users to flood risk, provide a flood impact and risk assessment (FIRA) prepared in accordance with the <i>Flood Impact and Risk Assessment – Flood Risk Management Guide LU01</i>. – Detailed design solutions and operational procedures to mitigate flood risk where required.	Section 5.1

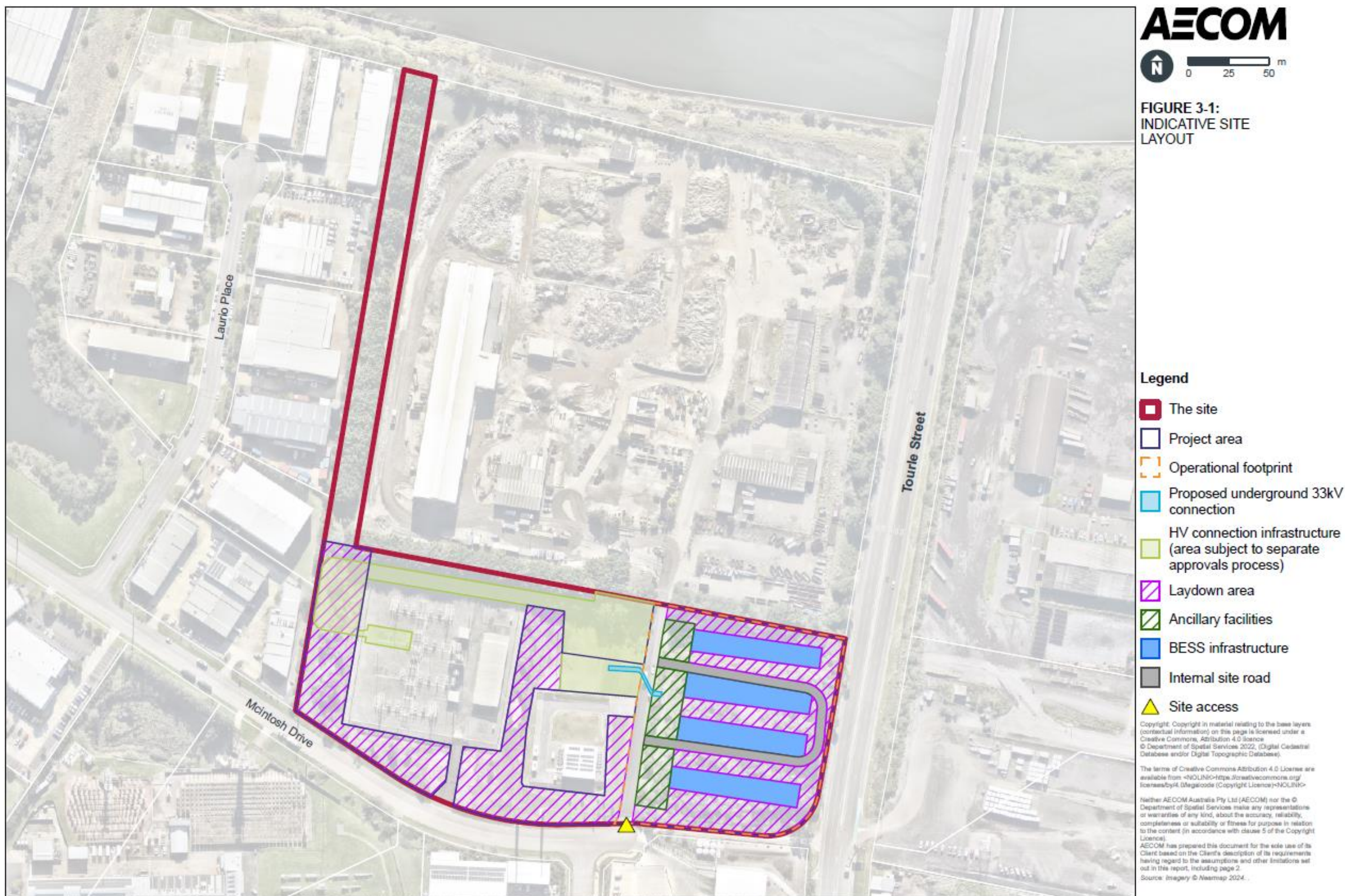


Figure 1.1 Locality and site (reproduced AECOM, 2025)

1.4 Purpose of this report

The purpose of this report is to assess the potential soil and water impacts arising from the construction and operation of the Project. The report:

- Addresses the SEARs and agency requirements listed in Section 1.3 and Appendix A.
- Describes the existing environment with respect to surface water.
- Assesses the impacts of constructing and operating the Project on surface water.
- Recommends measures to mitigate and manage any impacts identified.

1.5 Structure of this report

The structure of the report is outlined below:

- Chapter 1 – Provides an introduction to the report.
- Chapter 2 – Outlines the assessment methodology.
- Chapter 3 – Describes the legislation, policy and guidelines as relevant to this assessment.
- Chapter 4 – Describes the existing environment regionally and within the site.
- Chapter 5 – Provides an assessment of impact, including consideration of the proposed soil and water management strategy.
- Chapter 6 – Specifies required mitigation measures based on the impact assessment.
- Chapter 7 – Provides a summary of the impacts and mitigation measures.

2. Assessment methodology

The methodology for the Project comprised four key components:

- A review of relevant legislation, policy, and guidelines.
- Identification of the existing environmental baseline.
- Impact assessment based on the Project.
- Specification of mitigation measures for identified impacts (if any), with residual risks assessed.

The activities involved in each of these components is described below.

2.1 Review of relevant legislation, policy and guidelines

A review of relevant legislation, policies, and guidelines was conducted to establish the regulatory context for the assessment. This included, but was not limited to, key statutory documents:

- *Environmental Planning and Assessment Act 1979 (EP&A Act)*
- *Protection of the Environment Operations Act 1997 (POEO Act)*
- *Water Management Act 2000 (WM Act)*
- *Managing Urban Stormwater: Soils and Construction (Landcom, 2004)*
- *NSW Flood Risk Management Manual (2023)*
- *Australian Rainfall and Runoff (2019, updated 2024)*

These documents provided the regulatory framework for assessing water-related impacts, including flood risk and surface and groundwater quality. Further details of these documents and requirements relevant to the Project are provided in Section 3.

2.2 Existing environment

A baseline assessment of existing environmental conditions was undertaken to characterise site-specific hydrology, water quality, and flood risks. This included:

- Hydrology and drainage: Reviewing regional and local watercourses, drainage patterns, and nearby waterbodies.
- Surface water quality: Reviewing existing water quality information as it relates to potential interactions of the Project with the surrounding environment.
- Groundwater: Evaluating groundwater conditions based on nearby monitoring bores, including depth, flow direction, and potential groundwater-dependent ecosystems.
- Flood risk assessment: Identifying existing flood behaviour, including site inundation risks under various design storm events, using available flood studies and newly developed site-specific flood modelling.

These and other baseline conditions are described in detail in Section 4.

2.3 Impact assessment

A structured impact assessment was conducted to evaluate potential effects on hydrology, flooding, surface water, and groundwater based on the Project design. This included:

- Hydrology and flooding: Assessing potential changes to local drainage patterns and flood behaviour.
- Surface water quality: Evaluating the risk of erosion, sedimentation, and pollutant discharge during both construction and operational phases.
- Groundwater: Identifying any potential impacts on groundwater quality and flow.
- Cumulative impacts: Reviewing potential interactions with other projects in the region to assess broader water-related implications.

2.4 Identification of mitigation measures

Where risks were identified as part of the impact assessment, mitigation measures were specified to manage potential impacts from the Project relevant to water. Residual risks following implementation of recommended mitigation measures are also provided.

3. Relevant legislation, policy and guidelines

3.1 NSW legislation

3.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the core legislation relating to planning and development activities in NSW and provides the statutory framework under which developments are assessed. The EP&A Act aims to encourage the proper management, development and conservation of resources, environmental protection and ecologically sustainable development. The Project is deemed to be SSD (SSD - 77450458) under the EP&A Act and is subject to the preparation of an EIS. As part of the project EIS, the SEARs issued for the Project (refer Section 1.3) have identified the requirement to undertake this Water Impact Assessment (WIA).

3.1.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA), which is an independent statutory authority and the primary environmental regulator for NSW. The objectives of the POEO Act are to protect, restore and enhance the quality of the environment. Some of the mechanisms that can be applied under the POEO Act to achieve these objectives include programs to reduce pollution at the source and monitoring and reporting on environmental quality. The POEO Act regulates and requires licensing for environmental protection, including for water pollution and water resource impacts.

Under the POEO Act, an Environment Protection Licence (EPL) is required for premises at which a 'scheduled activity' is conducted. Schedule 1 of the POEO Act lists activities that are scheduled activities for the purpose of the Act. Licence conditions relate to pollution prevention and monitoring and can control the air, noise, water and waste impacts of an activity. An EPL is not required for the Project.

3.1.3 Water Management Act 2000

The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use benefiting both present and future generations. It is also intended to provide formal means for the protection and enhancement of the environmental qualities of waterways and in-stream uses as well as to provide for protection of catchment conditions.

Water sources in NSW are managed via Water Sharing Plans (WSPs). Provisions outlined within WSPs exist to ensure water is provided to support the ecological processes and environmental needs of groundwater dependent ecosystems and waterways. WSPs also regulate how the water available for extraction is shared between the environment, basic landholder rights, town water supplies and commercial uses. WALs entitle licence holders to specify share components in the available water that may be sustainably extracted from a particular water source. The actual volume of water available to be extracted may vary, dependent on available water determinations made under the WM Act. Available water determinations are made for each WAL category in each water source and are generally made at the start of a water year, although may be altered at any time.

The Project is located within the Newcastle Water Source which is regulated by the WSP for the Hunter Unregulated and Alluvial Water Sources 2022. Ausgrid do not seek to obtain water from the surface water or groundwater as part of the Project. Water sourcing arrangements are described in Section 5.4.

3.1.4 State Environmental Planning Policy (Resilience and Hazards) 2021

The State Environmental Planning Policy (Resilience and Hazards) 2021 prescribes a coastal zone and within that zone identifies additional development controls that should be considered for developments. The Coastal Management SEPP breaks down the coastal zone into different zones with different restrictions.

The proposed development is not located or in proximity to a coastal wetland or littoral rainforest, and is not within a coastal vulnerability and environment area. As a result of the proximity to the Southern Channel of the Hunter River, the site is within the “coastal environment area”. Consideration of ‘urban design’ issues are presented and addressed within in this report.

3.1.5 Local environmental plans

Local environmental plans (LEPs) are the principal planning controls for local councils, summarising permissible land uses throughout the local government area (LGA). LEPs are not applicable to SSD projects however, provide a reference point for the expectations of flooding controls. The Newcastle LEP includes a clause on flood planning with the following objectives in relation to development:

- Minimise the flood risk to life and property associated with the use of land.
- Allow development on land that is compatible with the land’s flood hazard, taking into account projected changes as a result of climate change.
- Avoid significant adverse impacts on flood behaviour and the environment.
- Enable the safe occupation and efficient evacuation of people in the event of a flood.

The flood planning clause applies to land identified as “flood planning area” on the Flood Planning Map. The flood planning clause identifies that development consent must not be granted to development on land to which this clause applies, unless the consent authority is satisfied that the development:

- Is compatible with the flood function and behaviour on the land.
- Will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties.
- Will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.
- Incorporates appropriate measures to manage risk to life in the event of a flood.
- Will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.

The existing flood condition of the site is discussed in Section 4.9. An assessment of the proposed flood conditions arising from the Project have been assessed in Section 5.1.

3.1.6 Development Control Plans

Development Control Plans (DCPs) specify detailed planning and design guidelines to support the provisions in the LEP. DCPs are not applicable to SSD projects however, provide a reference point for the expectations of water quality controls. Part C of the City of Newcastle (CN) Council DCP (2023) describes the general development controls and targets applicable to stormwater management within the LGA.

The pollutant reduction targets for mitigated and unmitigated development are included in Table 3.1 and implemented in this assessment (refer to Section 5.2.2).

Table 3.1 City of Newcastle Council Pollutant Reduction Targets (CN Council 2023)

Pollutant	Reduction target (%)
Total Suspended Solids	85
Total Phosphorus	65
Total Nitrogen	45
Gross Pollutants	90
Hydrocarbons	100

3.2 Policies and guidelines

3.2.1 NSW Government Water Quality and River Flow Objectives

The NSW Water Quality and River Flow Objectives (DECCW 2006) are the agreed environmental values and long-term goals for each catchment in NSW. The objectives are intended to be considered in assessing and managing the potential impacts of activities on waterways.

The Project is mapped in the catchment of the Hunter River (South Channel), a waterway within the broader Hunter River catchment. The South Channel of the Hunter River is characterised by DCCEEW (2006) as a waterway affected by urban development. The NSW Water Quality and River Flow Objectives relevant to the Project are described in Section 4.1.

3.2.2 Australian and New Zealand water quality guidelines

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000 and ANZG 2018), are the benchmark documents of the NWQMS which provide a guide for assessing and managing ambient water quality in a wide range of water resource types and according to specified environmental values, such as aquatic ecosystems, primary industries, recreation and drinking water. The ANZECC (2000) guidelines present numerical guidelines which can be used as a basis to assess the impact of the Project against defined objectives or values for the receiving waters. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) provide guidance for assessing and managing ambient water quality according to specified environmental values, published following scientific review of the ANZECC (2000) guidelines. The Water Quality Management Framework (ANZG 2018) provides the key requirements for determining appropriate guideline values or performance criteria to evaluate the results of water quality monitoring programs. The application of ANZG (2018) and ANZECC (2000) in the NSW Water Quality is discussed in Section 4 and 5.

3.2.3 NSW Flood Risk Management Manual 2023 and NSW Flood Prone Land Policy

The NSW Flood Risk Management Manual 2023 and NSW Flood Prone Land policy provide for the management of flood-prone land within NSW. The manual “promotes the use of a merit approach which balances social, economic, environmental and flood risk parameters to determine whether particular development or use of the floodplain is appropriate and sustainable”. The NSW Flood Risk Management Manual 2023 is supported by several compendium guidelines. These guidelines are provided in relation to the management of flood liable lands, including any development that has the potential to influence flooding, particularly in relation to increasing the flood risk to people and infrastructure. The Project has the potential to increase flood risk through, for example, increasing stormwater runoff would be subject to consideration under the Floodplain Development Manual.

Flood risk management in accordance with these policies is discussed in Section 5.1.

3.2.4 Australian Rainfall and Runoff

Australian Rainfall and Runoff (ARR) (Babister et al. 2019) is a national guideline document, data (including design rainfalls and other hydrologic data) and software suite that is used for the estimation of design flood characteristics in Australia. The approaches presented in ARR 2019 are essential for policy decisions and projects including infrastructure, town planning, mining, development of rural and urban floodplain management plans, operation of river systems, and estimation of extreme flood levels.

The flood assessment of the Project has been undertaken in accordance with the methodology and data provided by ARR (2019), including recent 2024 revisions, as described in Section 5.1.

3.2.5 Managing Urban Stormwater – Soils and Construction

Managing Urban Stormwater, Soils and Construction, Volume 1 (Landcom 2004) more commonly referred to as 'The Blue Book' provides guidance and performance standards with relation to the control of erosion and sediment. Throughout NSW the performance standards of Landcom (2004) are commonly used to assess the suitability of proposed controls and residual risk and are commonly included by the EPA in relevant regulatory requirements. The guidelines are supported by the NSW Environment Protection Authority (EPA), as well as throughout other NSW government agencies, local government and industry.

The guidelines are referenced and implemented through the development of recommended mitigation measures for soil and water management for the Project, as described in Section 6.

3.2.6 Guidelines for controlled activity approvals

Section 91 of the WM Act details the requirements for obtaining a controlled activity approval to permit work to be carried out on waterfront land. This includes the bed of any river, lake or estuary and any land within 40 m of its highest bank. SSDs do not require controlled activity approvals, by virtue of Section 4.41 of the EP&A Act. However, it remains an offence to harm waterfront land when carrying out an exempt controlled activity.

The former NSW DPE has published a number of guidelines on types of controlled activities and the protection of waterfront land. The guidelines provide recommendations for the design and construction of instream works and an indication of the width of riparian zones to be considered. Whilst the SEARs request this assessment, as described in Section 4, the Project does not propose to undertake works within 40 m of a waterway that would trigger the controlled activities guidelines.

4. Existing environment

This section summarises the key features of the existing environment with respect to water.

4.1 Regional context

The site is located on the eastern coastline of NSW, at the end of the wider Hunter River catchment, shown in Figure 4.1. The Hunter River catchment is the largest coastal catchment in NSW, covering an area of approximately 21,500 square kilometres (km) (DPIE 2024). The catchment includes the major city of Newcastle, approximately 7 km north-west of the site and located at the mouth of the Hunter River. Major towns in the catchment include Maitland, Singleton, Cessnock, Muswellbrook and Raymond Terrace. Water use within the catchment supports a large population and diverse range of users, including Hunter Water Corporation, local councils, power generation, coal mines, heavy industry, dryland agriculture, grazing and irrigated agriculture including use for Hunter Valley wineries.

Elevations within the catchment range from less than 50 mAHD supporting floodplains and estuarine areas to peaks of 1,500 mAHD in the mountain ranges in Barrington Tops. The western area of the catchment contains large areas of wilderness and national park areas.

The catchment consists of major regulated rivers, controlled streams and uncontrolled streams. The catchment is bounded by the Manning and Karuah catchments to the north, and Lake Macquarie and Hawkesbury-Nepean catchments to the south. The Hunter River begins in the Mount Royal Range, on the west of the Barrington Tops, flowing for 460 km before entering the sea at Newcastle. The largest tributary of the Hunter is Goulburn River, beginning at Ulan and flowing east to join Hunter River near Denman. Other major tributaries of the upper Hunter River include the Pages and Isis rivers, and Middle, Dart, Stewart, Moonan and Ormadale brooks. The Paterson and Williams rivers flow south into the Hunter estuary, draining the higher rainfall area in the north-east of the catchment. Several streams drain the southern portion of the Hunter with Wollombi Brook being the largest, rising to an elevation of 440 mAHD in the Hunter Range and entering the Hunter River near Singleton.

Major water storages within the catchment include Glenbawn Dam on the upper Hunter River near Scone, and Glennies Creek Dam on Glennies Creek near Singleton, with a capacity of 749,000 megalitres (ML) and 282,000 ML respectively. These two major water storages supply water for irrigation, town water, stock and domestic supplies as far downstream as Maitland. Several smaller in the catchment include Lostock Dam, Chichester Dam and Grahamstown Dam.

Within the catchment, several large wetland complexes are listed as nationally or internationally important for their waterbird habitat. These areas located in the downstream portion of the catchment include Kooragang Nature Reserve in the Hunter Wetlands National Park, Hexham Swamp and Hunter Wetlands Centre and in the upland swamps of Barrington Tops located in the upstream region. Other notable environmental value in the catchment is Wollemi National Park located south of the catchment between Wollombi and Bylong which forms part of the Greater Blue Mountains World Heritage Area and Goulburn River National Park which extends along 90 km of the Goulburn River and contains over 300 sites of Aboriginal significance.

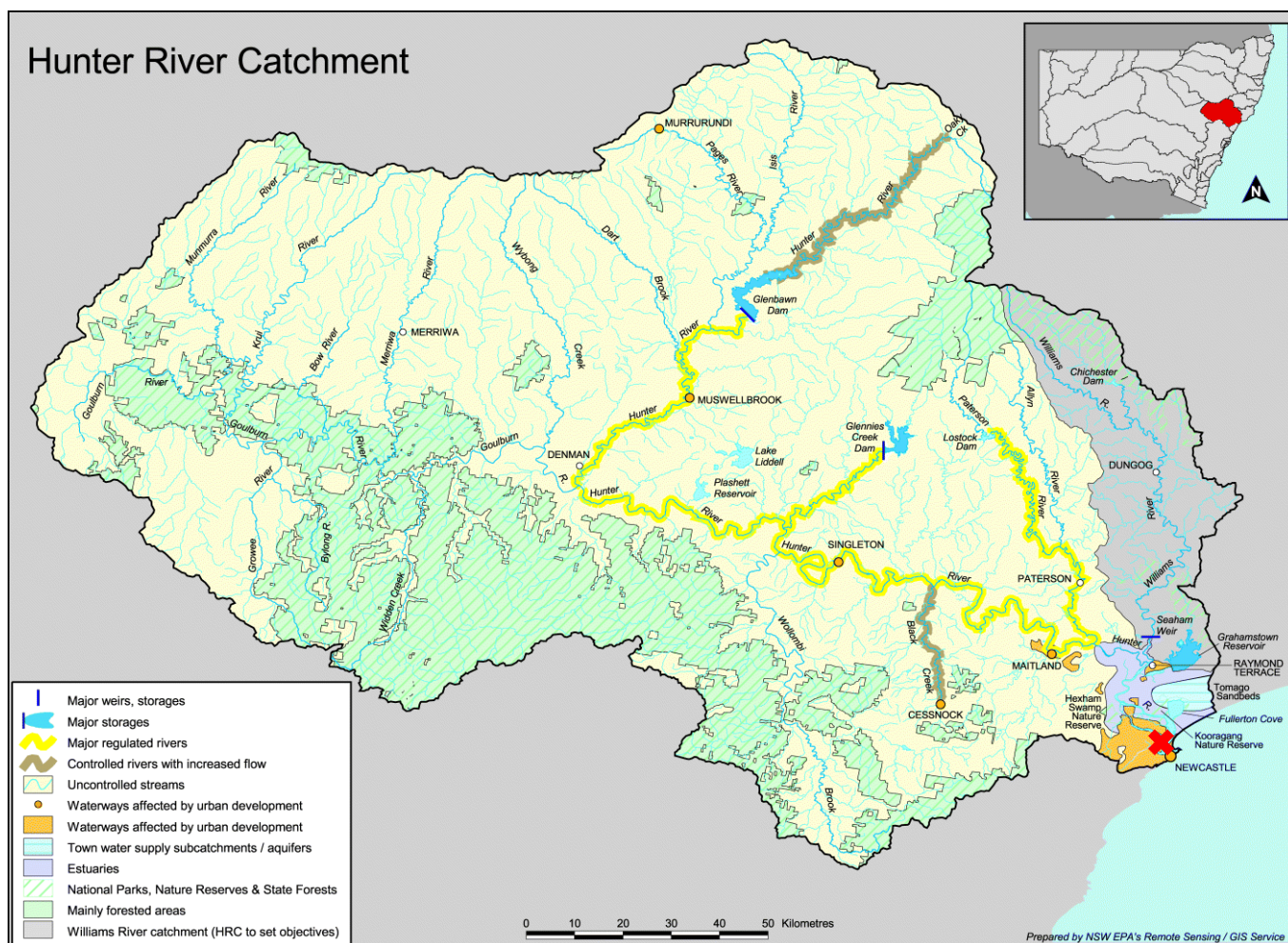


Figure 4.1 Hunter River Catchment map (NSW DCCEW 2024) with the approximate site marked with red cross

The site is located near the Hunter River system, at the end of the wider regional catchment. The site falls within the area of waterways affected by urban development. The water quality and river flow objectives relevant to the site (waterways affected by urban development) are listed in Table 4.1 and Table 4.2 respectively. Any water access licences and works approvals held for the Project will be subject to the rules of the relevant WSP.

The water quality objectives are consistent with the national framework for assessing water quality provided by Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) and have been considered in the assessment of surface water quality, discussed in Section 4.8. The river flow objectives have been considered in the assessment of hydrology and flooding, as discussed in Section 5.1.

Table 4.1 NSW Water Quality Objectives (waterways affected by urban development)

Water quality objective	Detail
Aquatic ecosystems	Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term.
Visual amenity	Aesthetic qualities of waters.
Secondary contact recreation	Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed.
Primary contact recreation	Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed.

Table 4.2 *NSW River Flow Objectives (waterways affected by urban development)*

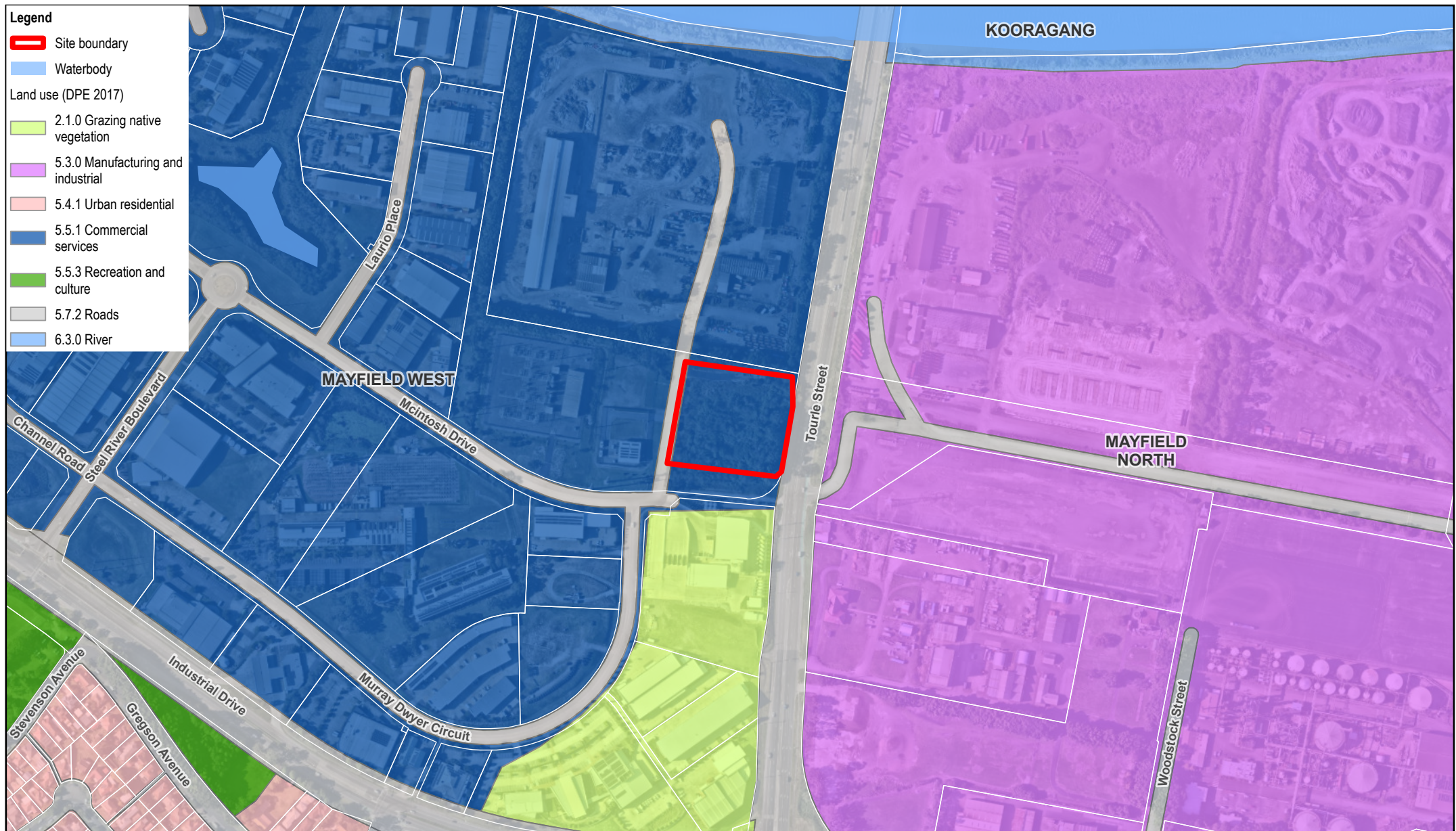
River flow objective	Detail
Maintain wetland and floodplain inundation	Maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems.
Mimic natural drying in temporary waterways	Mimic the natural frequency, duration and seasonal nature of drying periods in naturally temporary waterways.
Maintain natural flow variability	Maintain or mimic natural flow variability in all streams.
Maintain natural rates of change in water levels	Maintain rates of rise and fall of river heights within natural bounds.
Minimise effects of weirs and other structures	Minimise the impact of instream structures.

4.2 Site description and land use

The site is located at 1 McIntosh Drive, Mayfield West, NSW 2340, within the City of Newcastle Council local government area (LGA). The proposed site and the surrounding study area consists of the existing Mayfield West 132 kV/11 kV zone substation owned by Ausgrid, as well as native and exotic vegetation. The land itself is zoned as E4 General Industrial under the Newcastle LEP, with surrounding land uses including industrial and commercial uses. Approximately 300 m north of the site is the South Channel of the Hunter River, which flows north-west to south-east.

Review of the 2017 NSW land use spatial dataset (DPE 2017) was undertaken to identify the nearby land uses to the site. This spatial dataset is presented in Figure 4.2. The direct land use of the site is classified as Services. The land uses immediately surrounding the site include River (South Channel of the Hunter River) to the north, Grazing Native Vegetation to the south (which appears to be incorrect), Manufacturing and Industrial to the west. The land uses surrounding the site are consistent with urban and industrial areas.

The site has historically been shaped and affected by heavy industrial activities. The area defined as the Steel River Industrial Estate was historically reclaimed in the 1950s, in 1960s and 1980s the area was used for the storage of steel and metal spare parts and in the 1980s was operated as an electrolytic manganese dioxide plant until its closure in 2008.



Data Disclaimer

Whilst every care has been taken to generate this map, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of this map being inaccurate, incomplete or unsuitable in any way and for any reason.

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Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56



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Land use

FIGURE 3.2

4.3 Climate

Patched point climate data was obtained from the Scientific Information for Landowners (SILO) database operated by Queensland Government's Department of Environment and Science (DES 2024). SILO point data consists of interpolated estimates based on historically observed data from BOM climate stations. For this assessment, SILO data was obtained for the grid point -32.90, 151.75, which is located over the site. Climate statistics for the site between 1970 and 2023 are presented in Figure 4.3.

Review of Bureau of Meteorology (BOM) climate Köppen classification mapping indicates the site is located in a temperate climate zone and is characterised by hot summers, with no dry season. As shown in Figure 4.3, strong seasonality is observed in temperature, with temperature maximums typically exceeding 30 degrees Celsius (°C) in summer months and 15°C in winter months.

Monthly rainfall is relatively uniform throughout the year, with slightly increased median rainfall occurring in February through June, compared with other months. The annual average rainfall is 1,108.55 mm, with a maximum of 1,765.7 mm recorded in 1990 and minimum of 666.6 mm recorded in 2019.

Strong seasonality in evapotranspiration is observed throughout the year, with the highest monthly totals observed in December through March. The annual average evapotranspiration is approximately 1,500 mm.

A moisture deficit (annual evapotranspiration less annual rainfall) is observed in all months excluding June, with an average annual moisture deficit of 391.43 mm per year, indicating the presence of moisture in environmental conditions are more strongly dominated by evapotranspiration throughout the year.

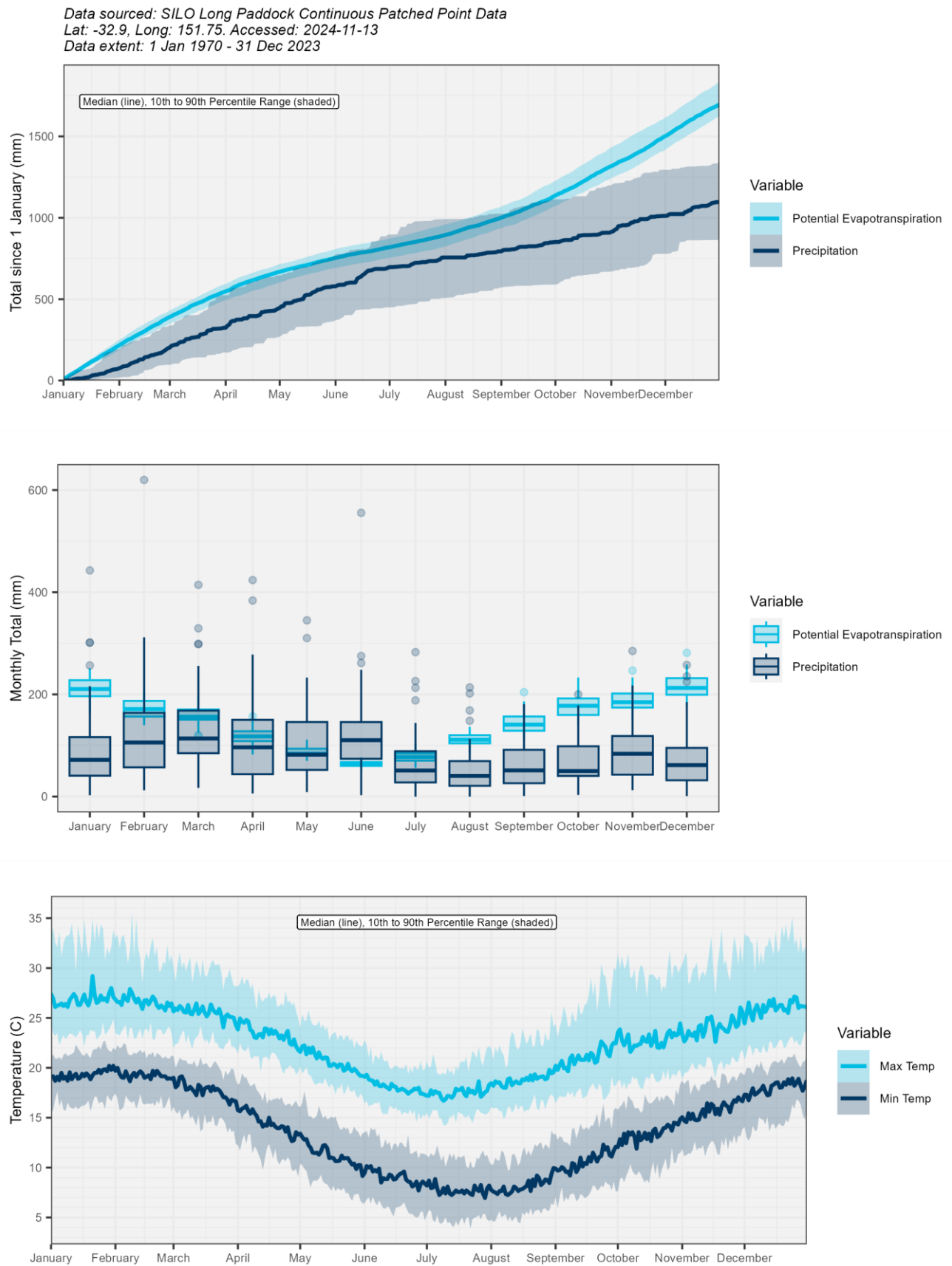


Figure 4.3 Climate statistics - SILO grid point -32.90, 151.75

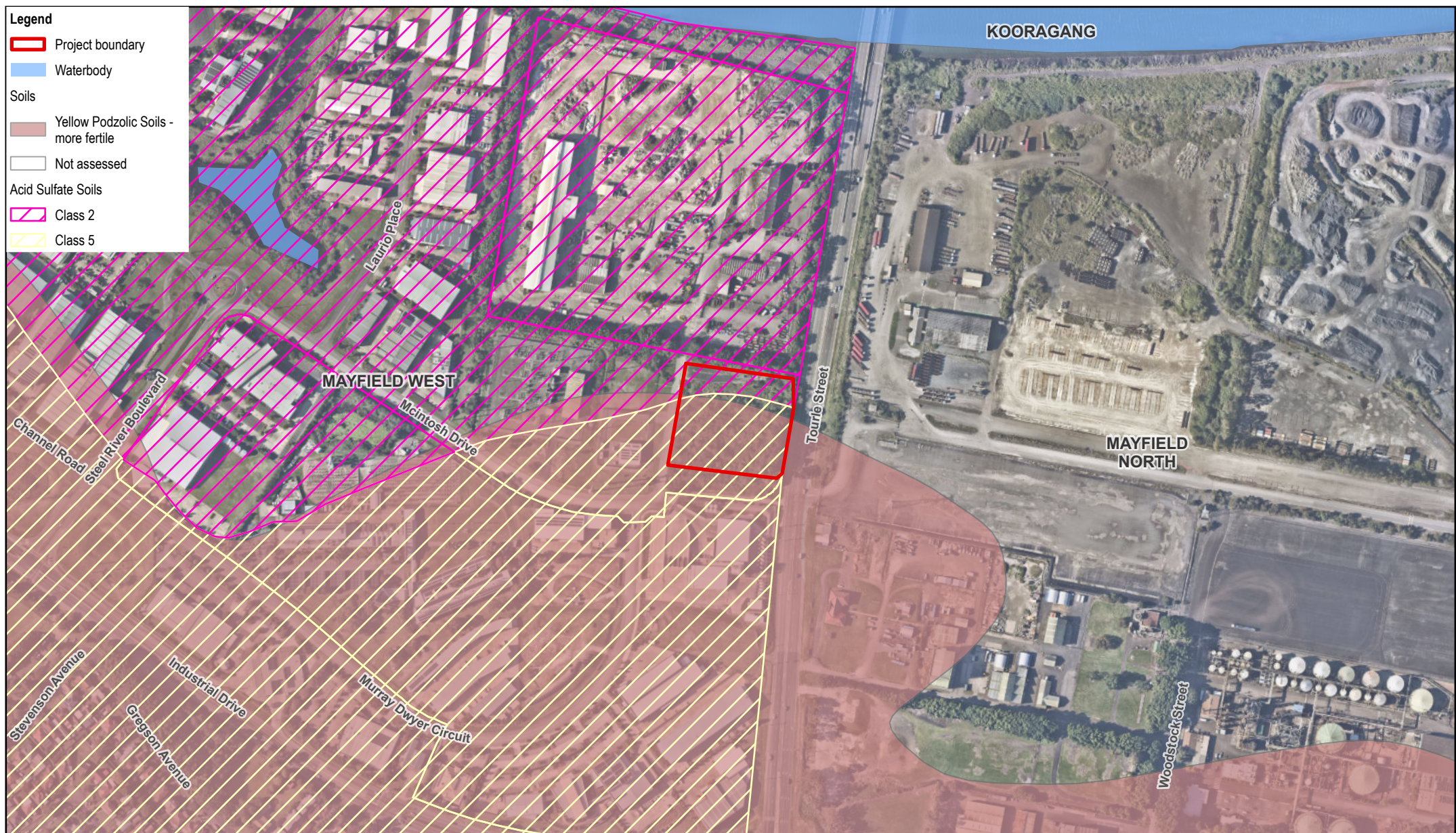
4.4 Soils

The site is located across two different soil landscapes (Disturbed Terrain in the north-west portion of the site and the Beresfield soil landscape in the south-east portion). Disturbed Terrain soil landscapes are identified where soil has been heavily disturbed by human influence such as landfill, mining and heavy industrial complexes. As is the case at the existing substation located on a portion of the site, some areas of Disturbed Terrain have been covered with concrete. The Beresfield soil landscape is characterised by the presence of brownish black loams, sandy loams, and clays. Shallow soils may contain silty sand, gravel and slag material (RCA Australia, 2020).

The soil also potentially contains Acid Sulfate Soils according to the Newcastle LEP; the north-western portion of the site potentially containing Class 2 Acid Sulfate Soils, and the southeastern portion Class 5 Soils. The Acid Sulfate Soil classification identifies the likelihood of acid sulfate soils being present in certain areas and at certain depths with lower class numbers generally identifying a higher risk. The presence of Acid Sulfate Soils in the vicinity of the Project location is depicted in Figure 4.4.

A search of the EPA's List of Notified Sites returned the adjacent Tourle Street Bridge as containing landfill contamination but not requiring regulation under the CLM Act.

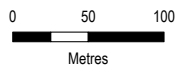
A site management plan (SMP) was previously developed in 2020 for the construction of the Leading-Edge Data Centre, an existing development located in the central portion of Lot 16, DP 270249. The SMP (RCA Australia 2020) was developed as the site was formerly used by BHP. Further discussion of the in-situ soils and materials are discussed in the contamination report and site investigations undertaken as part of the EIS.



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Soils

FIGURE 3.4

4.5 Topography

The site is generally flat on the western edge, with a small mound located centrally where the BESS is proposed to be constructed. The site generally drains to the north towards the Hunter River.

North of Leading-Edge Data Centres, the topography is generally flat with an elevation of approximately 10-10.2 mAHD. In the vegetated area east of this building and adjacent to Tourle Street, there is a grassy hill which reaches 13.3 mAHD, sloping to approximately 10.7 mAHD on the western side and 9.4 mAHD on the eastern side. Site slopes in this area generally range between 4% on the western side of the hill and 8% on the eastern side. From the eastern edge of the site down to Tourle Street, there is a steep drop in elevation from approximately 10 mAHD to 3.7 mAHD. North of the site, the topography gently slopes from south to north until it reaches the South Channel of the Hunter River. The topography of the site is shown on Figure 4.5.

4.6 Hydrology and drainage

Regionally, the site is located within the Hunter River catchment, the river itself being a ninth order watercourse which discharges to the Tasman Sea some 8 km downstream. The South Channel of the Hunter River flows from west to east, north of the site. Approximately 5.3 km downstream of the site, the South Channel of the Hunter River joins the Northern Channel. The contributing catchment upstream of the site is largely comprised of a mix of industrial, urban and agricultural uses, with the Williams and Paterson Rivers as tributaries.

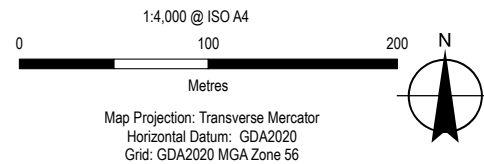
The Hunter Estuary Wetlands are located 2.5 km north of the site and are Ramsar Wetlands (wetlands of international importance). Coastal Wetlands, as mapped under the Resilience and Hazards SEPP, are located 500 m to the north of the site on the northern bank of the South Channel of the Hunter River. A review of the NSW Riverstyles mapping (DPSI 2024) was undertaken to identify the geomorphic condition of the nearby watercourse. It was noted that the South Channel of the Hunter River has poor geomorphic condition but moderate potential to recover from its current condition. It has medium priority for river management near the location of the site.

A site visit was undertaken by GHD in November 2024 to review the stormwater drainage configuration in the vicinity of the site. Runoff from the site currently sheets in the direction of fall and is collected by stormwater structures adjacent to the site. Runoff from the site currently discharges either to the east through informal flow pathways (towards Tourle Street), or towards the west towards the existing substation. Flows towards the west are conveyed through a series of vegetated drainage swales and minor culvert structures before entering the local stormwater system, where it is captured and contained within locally known retention basin 'PopPop Lake'. Overflows from the basin enter the Hunter River. The primary collection pit west of the existing substation is heavily vegetated, likely blocked and is understood to be cleared as part of Ausgrid's maintenance activities.



Legend

- ▬ Site boundary
- ▬ Watercourse
- ▬ Contour (m)
- Waterbody
- ▬ Culverts



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Topography and hydrology

FIGURE 3.5

4.7 Groundwater

Groundwater in the vicinity of the site is likely to flow towards the South Channel of the Hunter River. The Newcastle City-wide Floodplain Risk Management Study and Plan (BMT 2012) notes that the groundwater table is located close to the surface particularly for the downstream areas of the catchment such as the nearby suburbs of Carrington. This is expected to become more problematic with greater sea level rise. However, in the vicinity of the site, a Soil Management Plan (RCA Australia, 2020) estimates groundwater to be >5.0 m below the surface.

A review of the High Ecological Value Aquatic Ecosystems (HEVAE) dataset (DCCEEW 2018) was undertaken to identify potential groundwater dependent ecosystems near the site. Areas of HEVAE vegetation that have a high probability of being groundwater dependent were identified to the north-west of the site along the southern bank of the Southern Channel (Grey Mangrove-River Mangrove Forest), the closest of which is approximately 380 m from the site. HEVAE vegetation is also found widely along the northern bank (Samphire Saltmarsh), the closest of which is approximately 540 m from the site (DCCEEW 2018).

A search of the WaterNSW Water Information Hub (Real time data) was also undertaken to identify groundwater bores within 1 km of the site for the purpose of reviewing historical groundwater levels. The identified bores are detailed in Table 4.3. In the absence of groundwater elevation information, the approximate groundwater elevations presented in Table 4.3 were calculated using elevations taken from a Digital Elevation Model (NSW SS 2014) and standing groundwater water levels.

Table 4.3 Groundwater monitoring bores (WaterNSW 2024)

ID	Bore depth	Lithology (m)	Groundwater standing water level	Approximate groundwater elevation	Approx. distance to site
BHW2/1	15.31 m	N/A	8.3 m	1.6 mAHD*	0 m (onsite)
GW201305	21 m	Fill 0 to 13.4 Clayey Sand 13.4 to 21	-	-	900 m
GW201306	21 m	Fill 0 to 14 Clayey Sand 14 to 21	-	-	120 m
GW201307	15.8 m	Fill 0 to 2 Shale 2 to 3.2 Sandstone 3.2 to 12.05 Coal 12.05 to 13.05 Sand siltstone 13.05 to 20.15	-	-	250 m
GW201311	17 m	Fill 0 to 6 Clay 6 to 18 Shale 18.6 to 18.65	-	-	890 m
GW202794	9.7 m	Fill 0 to 10	-	-	960 m
GW202797	2.1 m	Fill 0 to 1.95 Clay 1.95 to 6.7 Sand 6.7 to 7.45	-	-	700 m
GW203045	2.5 m	Topsoil 0 to 0.15 Fill with PAH odour, phase separated hydrocarbon 0.15 to 1.5 Fill, with phase separated hydrocarbon in groundwater and soil 1.5 to 2.5. Works abandoned	-	-	440 m
GW203046	16 m	Fill 0 to 6.8 Clay 6.8 to 11.0 Sand 11.0 to 11.2 Clay 11.20 to 16.00	7.95 m	-0.05 mAHD	560 m

* = estimated

As shown in Table 4.3, there are limited groundwater level data available within proximity to the site. The lithology logs of all the wells indicate varying levels of fill were placed in the area, consistent with the available previous land use and soils information (refer to Section 4.2 and Section 4.4).

The nearest groundwater monitoring well with groundwater level information is located in the north-eastern corner of the site (BHW2/1), with groundwater identified 8.3 m below the ground surface on 14 January 2025. This groundwater monitoring well was installed as part of the remediation validation of the Steel River site (URS Australia Pty Ltd, 2004).

GW203045 is located approximately 440 m east of the site. This work was abandoned seemingly due to the presence of hydrocarbons in the subsoils and groundwater intercepted during drilling. All groundwater bores in the vicinity of the site are mapped in Figure 4.6.

4.8 Water quality

Whilst there is water quality data available for the Hunter River, water quality sampling sites are not located in the vicinity of the site. The closest routine water quality monitoring site (Station number 210009) is located much further upstream at Luskintyre (approximately 36 km away from the site) according to the Hunter Valley Annual Surface Water Quality Report: 2022-2023 (DCCEEW, 2024). Using the Water Quality Index (WaqI) tool, the Hunter River at Luskintyre is of poor quality. The report also notes that flooding is the main driver of water quality in the broader Hunter catchment.

It should also be noted that for the Benedict Recycling Mayfield West facility (immediately north of the site, at 1a McIntosh Street, Mayfield West), there is daily water quality monitoring of discharge from a sediment basin outlet pipe in the site's north-west corner, when the basin is discharging into the South Channel of the Hunter River. Specifically, monitoring of oil and grease, pH and total suspended solids (TSS) is undertaken on an ongoing basis for compliance with Benedict Recycling Pty Limited's Environmental Protection Licence (EPL 20771) (EMM 2016). Water quality data from this monitoring was not readily available. Regardless, this information is unlikely to be representative of existing conditions at the site given the developed nature of the Benedict Recycling Mayfield West site and the undeveloped nature of the site.



4.9 Existing flood conditions

The Newcastle City-wide Floodplain Risk Management Study and Plan was developed by BMT (2012) on behalf of Newcastle City Council and was reviewed for this study. GHD also developed a flood model to assess local flood conditions and potential changes associated with the Project. This model was simulated using rain-on-grid with reference to ARR (v4.2) and results are mapped in Appendix A. The modelling methodology to produce the existing flood condition results is described in this section.

4.9.1 Regional flooding and flood prone land

According to the Newcastle City-wide Floodplain Risk Management Study and Plan, the site is largely unaffected by flooding, given that the southern bank of the South Channel of the Hunter River has a higher elevation than the northern bank (on Kooragang Island).

The NSW Flood Risk Management Manual (2023) defines flood prone land as all land susceptible to flooding in a PMF event. In the PMF event, the adjacent Tourle Street was predicted to experience up to 2 m of inundation, but this inundation would not affect the site. The extent of flooding in the PMF is provided in Figure 4.7.

A Flood Information Certificate was provided by CN Council to understand the susceptibility of the site to local flooding. The Flood Information Certificate is provided in Appendix C. As outlined in the Flood Information Certificate, the site is not located within a floodway, nor a flood storage area and is not affected by the 1% AEP event level. The estimated PMF level for the site is 5.4 mAHD with the highest risk category being L1, defined as “riverine flooding where there is sufficient time to remove people from the risk to their lives by means of formal community evacuation plans”.

4.9.2 Local flooding

As described above, the site is unlikely to be affected by riverine flooding. Therefore, a two-dimensional flood model was developed in TUFLOW for the purpose of determining the flood inundation at the site arising from rainfall derived local flooding. The modelling was undertaken in accordance with ARR (2019) with consideration of the updated guidance (2024 release) for climate change.

The extent of the TUFLOW model is shown in Appendix A. Topographic data input was sourced from 1 m resolution LiDAR data obtained from the ELVIS data portal and a 1 m cell size was adopted for the TUFLOW model. Hydraulic controls (such as culverts) relevant to the site were represented using topography modifiers. The tailwater levels were set to consider both tidal boundaries and sea level rise and was either consistent or conservative with respect to previous studies. Tailwater was not expected to affect the site and were based on the PMF flood levels provided in the Flood Information Certificate.

The following flooding events were assessed under existing conditions:

- 5% AEP for 2030 using Shared Socio-economic Pathways scenario (SSP) SSP2-4.5. This event was used as an indication of the ‘current’ 1 in 20 AEP event.
- 1% AEP for 2030 using SSP2-4.5. This event was used as an indication of the ‘current’ 1 in 100 AEP event.
- 1% AEP for 2050 using SSP5-8.5. This event was used as an indication of future 1 in 100 AEP event for a conservative climate future in 2050.
- 1% AEP for 2080 using SSP5-8.5. This event was used as an indication of worst 1 in 100 AEP event anticipated during the site’s operation.
- PMF for 2080 using SSP5-8.5. This event was used as an indication of probable maximum flood event anticipated during the site’s operation.

For these events, flood mapping indicating flood depths, elevation contours, extent and velocity is presented in Appendix A. It is acknowledged that the BCS agency advice (refer to Appendix B) requests the use of rarer flood modelling events (0.5% AEP and 0.2% AEP) as proxies for future climate change on the 1% AEP flood events. However, as noted above, recent updates to ARR in 2024 regarding the assessment of climate change have been made and implemented as predictions of climate change, rather than utilising less-frequent events as ‘proxies’ for climate change. Use of recent ARR revisions is considered the most representative modelling of climate change for the design life of the Project.

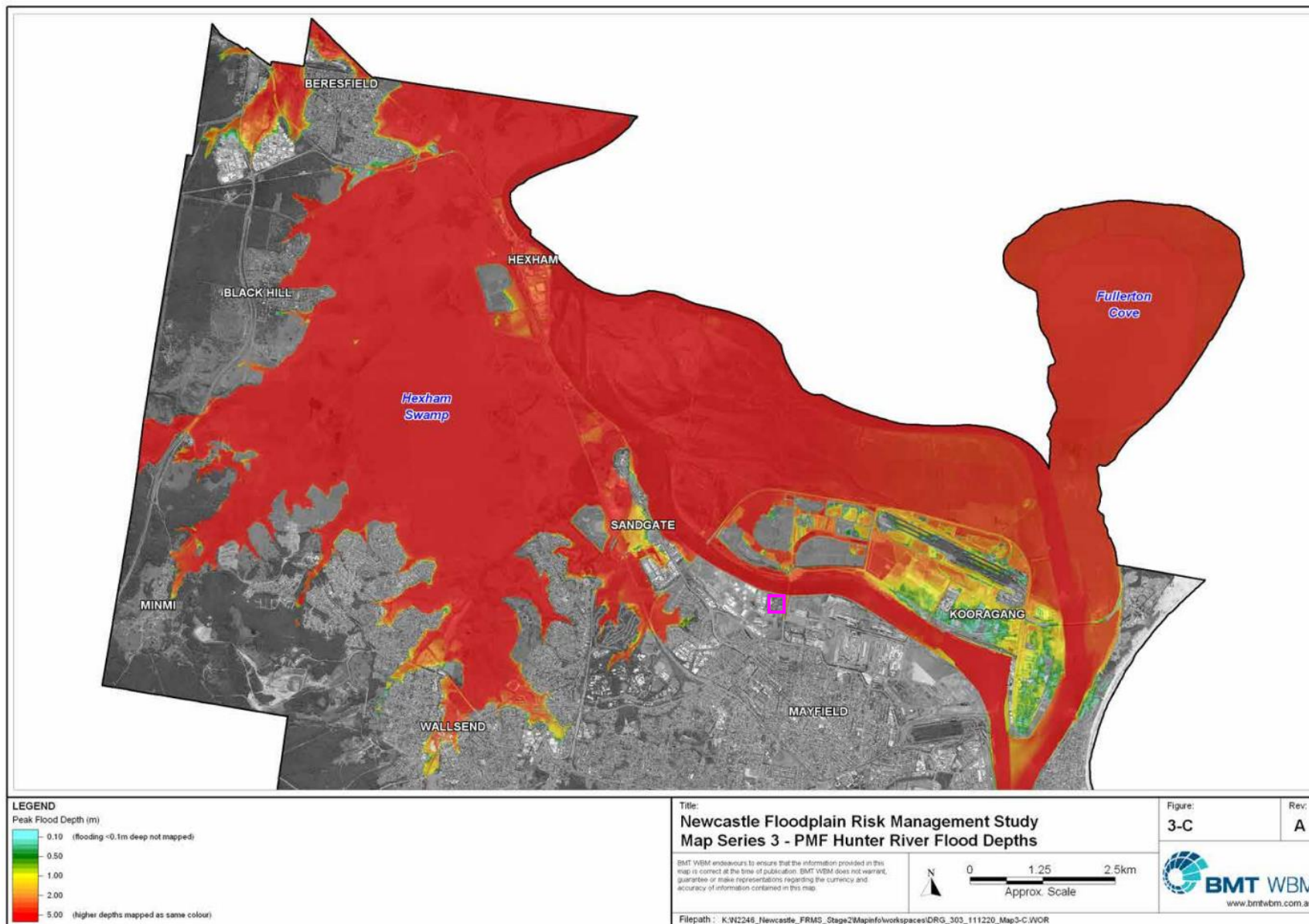


Figure 4.7 PMF with approximate site location outlined in pink (BMT, 2012)

4.9.2.1 Flood depth and level

As shown in Appendix A, the site is at risk of low hazard flood conditions as a result of overland flow pathways along the northern boundary of the lot and across the existing drainage swale north of the existing substation.

In current conditions (adopted as climate change anticipated in 2030 per SSP2-4.5), flooding depths up to 300 mm in the 1% AEP event are modelled, with depths in the same location up to 500 mm in the PMF. Similar depths and extents are anticipated in 2050 under SSP5-8.5, with minor increases in extent but negligible increases in depth under both the 1% AEP event and PMF event (relative to 2030). In the design life planning horizon to 2080, depths of up to approximately 300 mm in the 1% AEP event, increasing to around 500 mm in the conservative PMF event. Flood levels in this area are anticipated to be approximately 10-11 mAHD along the northern site boundary. Under existing conditions, the remainder of the site may experience flooding up to depths of 150 mm in the conservative PMF event.

As described in Section 4.6, flows from the site are generally conveyed towards the west, flowing north of the existing substation through a series of culverts. Under existing conditions, in the 5% AEP the local drainage network is shown to adequately convey flow from the site through to PopPop Lake. Some minor breakthrough flooding of depths up to 150 mm is modelled from the northern end of the site along the shared driveway, though culvert function along the local drainage network appears to convey the majority of flows. Depths along the local drainage network behind the existing substation reach 1 m. Similar results are modelled under the existing condition 1% AEP. However, in the PMF under existing conditions, the culverts along the local drainage network are at capacity, with greater depths (up to 750 mm) resulting in some inundation of the Benedict Recycling Mayfield West facility via the shared driveway. In the design life planning horizon to 2080, in the 1% AEP similar outcomes are observed albeit with slight increases in depth/extent.

4.9.2.2 Flood velocity

The mapping presented in Appendix A shows slow flowing flood waters within the Project, generally along the northern boundary of the site and in the vicinity of the drainage swale across the site and flowing south to north in the western portion of the site. Velocities are relatively low at the site over all events, even during the PMF event velocities only up to 1.25 m/s are anticipated.

4.9.2.3 Flood hazard

Flood mapping of flood hazard is provided in Appendix A. The hydraulic hazard has been categorized in accordance with the NSW Flood Risk Management Manual FB03 as shown in Figure 4.8 (H1-H6).

In all modelled flood events under the 1% AEP event, the results shows that the flood hazard is generally around H1 (generally safe for vehicles, people and buildings) across the Project, anticipated as a result of the low velocities. In the 2030 and 2050 PMF events, there are localised areas of H2 (unsafe for small vehicles) along the drainage swale located in the north of the site and near the northern site boundary, increasing in the PMF to H3 (unsafe for vehicles, children and the elderly) along the drainage swale north of the existing substation.

4.9.2.4 Summary

The site is subject to flood events associated with runoff from the local catchment flowing towards with the Hunter River. No impacts from the Hunter River inundating the site are anticipated. As a result of the low relief at the site, flow velocity is low. While there are locations where some ponding is anticipated, generally flood hazard is low. Key flow pathways include flow towards Benedict Recycling Mayfield West through the existing shared driveway and to the west towards PopPop Lake.

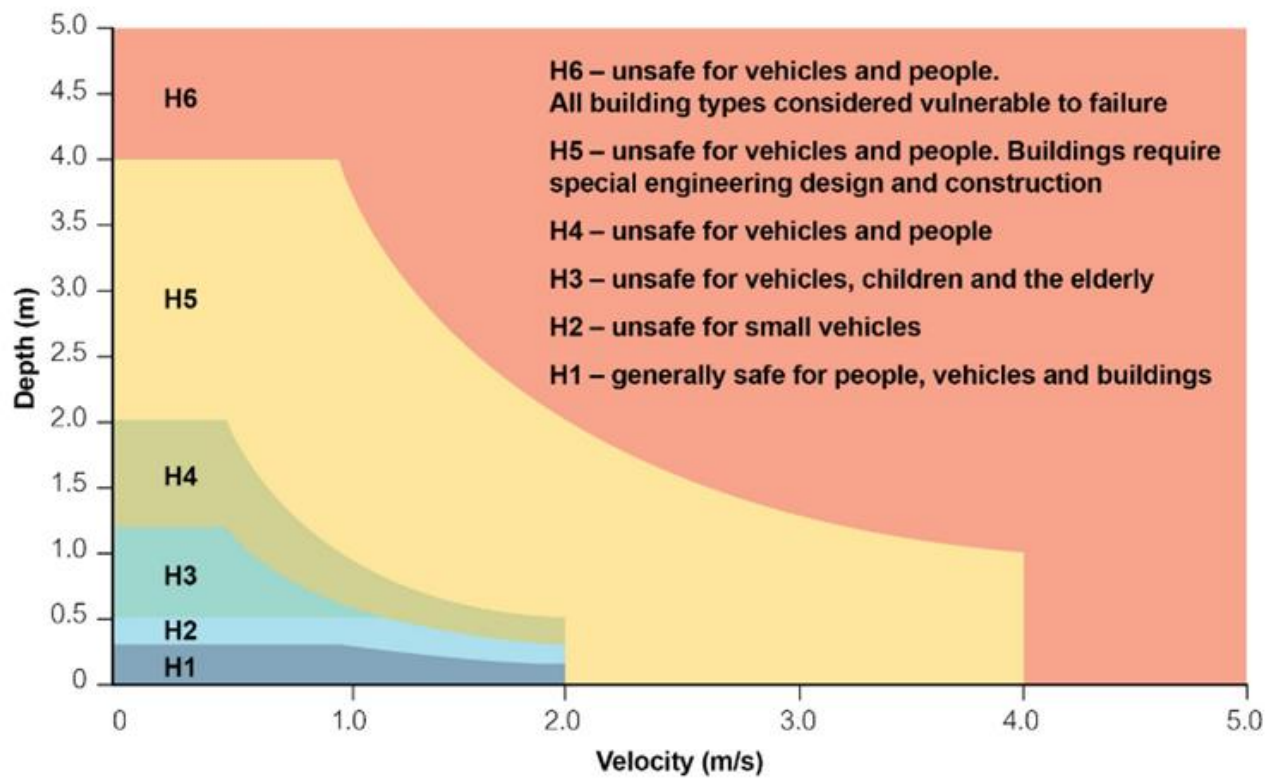


Figure 4.8 NSW Flood Risk Management Manual FB03 Flood Risk Categories

5. Impact assessment

An assessment of water related impacts is provided in the following sections, considering the existing environment and proposed soil and water management for the site. Where it is identified that risks to water resources near the Project are not acceptable, mitigation and management measures are recommended (refer to Section 6).

5.1 Hydrology and flooding

5.1.1 Construction phase flood impacts

Construction activities may result in minor impacts to local runoff patterns, however, as the proposed construction period is relatively short duration (21 months), assessment of the operation phase flood impacts are suitable to identify the potential changes that may occur as the Project is constructed. Given this short duration of construction, quantitative assessment of flooding has not been undertaken. The operational phase flood impacts can be used to estimate the potential magnitude and changes in flood extent during the construction stage; however, the short duration of the construction phase should be considered when interpreting risk. Without the implementation of appropriate flood management measures, inundation of the site by floodwater has the potential to:

- Detrimentially impact downstream waterways through the transport of sediments and construction materials by floodwaters.
- Obstruct the passage of floodwater and overland flow through the provision of temporary measures such as construction compounds and stockpiles.
- Result in restricted accessibility to work areas due to ponded water or soft ground conditions.

Direct construction phase flood impacts are anticipated to be negligible, however may pose an indirect impact associated with construction phase water quality.

5.1.2 Operation phase flood impacts

Based upon on the existing local flood conditions in the vicinity of the site (refer to Section 4.9.2) and the relative increase in hardstand area associated with the Project, flood measures to minimise operational phase flood were included as part of the design. The measures intend to manage increased runoff quantities generated from the increase in impervious area associated with the development, and include:

- Provision of increased flow conveyance capacity by expansion of the drainage swale (approximately 1 m increase in top-width) located west of the site and removal of the existing culvert to the north of the substation.
- Inclusion of two outlets from the hardstand, which would include bunds or similar (with a depth of 150 mm) to provide informal detention and to control runoff into the specified outlets. Outlets would be located on the north-west corner of the site (discharging west) and on the south-east corner of the site (discharging south).

Flood modelling was conducted, through alteration of the flood model topography, inclusion of proposed drainage outlets, and modification of land-use/roughness. Flood mapping of both proposed conditions and flood impact (afflux – difference between proposed and existing conditions) is provided in Appendix A, and indicates that flood waters are mapped to disperse from the site to the local drainage network.

In current climate conditions (adopted as 2030, SSP2-4.5), no significant changes are anticipated to off-site flood conditions (excluding a minor increase in depths in PopPop Lake) during the 5% and 1% AEP event. This is achieved through the expansion of the western drainage swale and removal of the existing culvert to reduce flood levels and minimise potential breakout or overtopping to nearby lots. During the larger PMF event, some minor flood increases (generally <50 mm) are observed to the west and east of the site. For the PMF, this results in slight changes to flood hazard which are anticipated to be predominantly associated with changes to depth.

Potential sensitivity to climate change in 2050 and 2080 were assessed for flood risk. Simulation of these events identified negligible changes to flood risk during the 1% AEP event and minor increases to depth and hazard during the PMF event.

Overall, notable changes are limited to the PMF event, however these are considered relatively minor and are not anticipated to result material changes in flood risk. It is considered unlikely that any social or economic impacts relating to flooding would occur as a result of the Project.

Based on both the existing and proposed future flood hazard associated with the Project, while changes to flood hazard are not anticipated to significant, portions of the site are susceptible to localised flooding, and this should be considered as part of the construction and operational phases of the Project.

5.2 Surface water quality

5.2.1 Construction phase surface water quality

Various activities associated with the Project have the potential to impact surface water quality. These include:

- Earthworks, excavation and disturbance of soils. These have the potential to mobilise surface sediments resulting in erosion and sedimentation.
- Handling and operation of equipment containing hazardous materials such as fuels, batteries, and oils which may contaminate surface runoff and enter local watercourses.

The potential for each of these activities to impact on watercourses is outlined below.

Erosion and sedimentation

Disturbance of in-situ and stockpiled soils has the potential to result in erosion and sedimentation. This may arise from earthworks, excavation, clearing and grubbing, and any activities where the existing surface is disturbed. Once disturbed, these materials are prone to being mobilised into downstream waterways primarily from rainfall derived runoff, resulting a potential risk to downstream water quality. As a result, the primary contaminant of concern would be suspended solids (i.e. turbidity).

The scale of disturbance proposed is relatively small based upon the site area and required cutting of materials. A soil loss hazard assessment was undertaken (see Appendix D for more information) and identified the soil loss hazard is anticipated to be very low. Impacts are therefore anticipated to be minor and can be suitably managed through the implementation of standard sediment and drainage controls. Sedimentation basins are not anticipated to be required.

Hazardous materials

The handling of materials hazardous to downstream waterways is required to permit construction of the Project. Potential activities where handling of hazardous materials could occur may include:

- Interactions with Acid Sulfate Soils
- Maintenance and refuelling of plant (e.g., hydrocarbons)
- Installation of concrete slabs (e.g., alkalinity)
- Handling of battery components (e.g., metals)
- Accidental spills of stored materials (e.g., fuels, oils)
- Accidental spills during the installation of transformers or similar infrastructure (e.g., mineral oils)
- Unexpected contamination that poses a risk to water quality

The potential impact associated with handling of these components includes mobilisation into downstream waterways either via direct flow of the material or washing from rainfall derived runoff or applied water (e.g., during dust suppression). With no mitigation applied, this material may become mobilised into downstream waterways, where impacts to both flora and fauna may occur, and would vary in terms of persistence and severity. Generally, this impact is anticipated to be minor.

5.2.2 Operational phase surface water quality

Potential water quality impacts during operation of the Project were assessed and identified in the following two categories:

- General risks associated with the addition of relatively large impervious areas that apply to most activities and are typically associated with increasing urbanisation.
- Specific risks associated with the nature of the proposed works (e.g., transformer oil, battery metals) that are not necessarily applicable to typical urbanisation activities.

General risk

Developments where the land-use is changed, such as increasing the fraction of impervious areas, can result in changes to water quantity and water quality (specifically nutrient and gross pollutant loads in downstream stormwater networks and receiving waterways). The Project proposes to construct new impervious areas to house the battery pad. This would increase the impervious area of the local catchment by approximately 1.1 ha.

To address these water quality impacts carried by changes in pollutant loads, a conceptual stormwater quality treatment train was developed as part of the design in accordance with the requirements of the CN Council DCP. The conceptual stormwater quality treatment train considers the implementation of multiple drainage pit insert baskets and an end of system gross pollutant trap (GPT). The conceptual stormwater quality treatment train was assessed in the E-Water software package, MUSIC, considering the proposed hardstand area of approximately 1.1 ha. Climatic inputs to the MUSIC modelling were obtained from MUSIC-Link for City of Newcastle Council.

Two outlets are proposed, located in the south-east and north-west corner of the BESS, each conveying approximately 50% of the proposed hardstand. The south-east outlet would outflow to the east (under Tourle Street), and the north-west outlet would outflow towards the west (towards PopPop Lake), both of which discharge directly to the Hunter River. The stormwater quality treatment train was developed and assessed to treat the four-exceedances per year (4-EY), 5-minute design storm (equating to approximately 130 L/s). The conceptual treatment train consists of:

- A set of 8 x 'OceanGuard' stormwater pit insert baskets of capacity with a combined capacity to manage inflows > 130L/s (or an equivalent product).
- Two end of system GPT Ecoceptors with a capacity to manage total inflows > 130 L/s (or an equivalent product).

Results of the modelling are shown in Table 5.1 identifying that the conceptual stormwater treatment train is expected to achieve the CN Council pollutant load reduction targets. On this basis, the Project is not anticipated to impact surface water quality associated with this general risk.

Table 5.1 Water quality treatment train effectiveness

Pollutant	Pre-treatment	Post-treatment	CN Reduction target ¹ (%)	Modelled reduction (%)
Total Suspended Solids	2,018 kg/yr	144.8 kg/yr	85%	93%
Total Phosphorus	3.221 kg/yr	0.742 kg/yr	65%	77%
Total Nitrogen	23.8 kg/yr	10.21 kg/yr	45%	57%
Gross Pollutants	291.2 kg/yr	1.311 kg/yr	90%	99%

¹ Table C4.04 of PART C: General development controls, Section C4 Stormwater. City of Newcastle, 2023
<https://dcp.newcastle.nsw.gov.au/getattachment/3b5df43e-9e6b-41f8-a8e8-b0f9aa3fb0cb/Section-C4-Stormwater.pdf>

Specific risks

Specific activities associated with the operation of the Project that may cause impacts to downstream waterways include the release of potential hazardous materials into downstream waterways. Potential mobilisation of materials into downstream waterways may occur either via direct flow of the material itself, or through washing from rainfall derived runoff. Once mobilised into downstream waterways, impacts to both flora and fauna are likely and would vary in terms of persistence and severity. These are assessed below.

- Handling of materials that pose enhanced water quality risks is anticipated to occur from time to time (i.e. hydrocarbons, fuel), as part of maintenance during the site's operation. These are anticipated to pose a moderate risk to local water quality.
- As the battery and transformer units would be fully enclosed without the generation of leachate or other process wastewaters, the battery and transformer units are anticipated to pose a negligible risk to water quality. During any system failures, including fire, water would not be applied to the units and contaminated water would not be generated.

Potential operational phase water quality impacts associated with material handling may result in moderate localised impacts to nearby waterways, but is not anticipated to result in changes to the Hunter River. Mitigation measures are recommended to manage this impact.

5.3 Groundwater

The primary mechanism for groundwater impacts at the site include excavation and potential exposure of groundwater requiring contaminated water management during construction. As identified in Section 4.7, based upon a review of nearby bores, groundwater levels are anticipated to be below the depth of excavation proposed for the site leveling activities undertaken during construction. It is therefore anticipated that groundwater would not be encountered during the construction phase and dewatering would not be required.

No impacts to groundwater are anticipated during the operational phase as no ongoing interaction with the subsurface is proposed once the hardstand is constructed. Groundwater impacts from the Project are anticipated to be negligible.

5.4 Water supply

5.4.1 Construction

The site would require water (for dust suppression, earthworks, and landscaping) during the construction phase. An upper limit construction demand estimate was developed based on the daily average potential evapotranspiration excess at the site. The construction demand for the purpose of dust suppression and landscaping is in the order of 4.8 megalitres (ML) over the 21-month construction period. Construction water would be sourced externally through a commercial supplier that would be confirmed following detailed design and once construction staging is confirmed. Water would be imported to site via water tanker. Extraction from surface water or groundwater sources under WAL entitlement is not proposed.

Approximately 0.2 ML of drinking water will be required for the construction workforce (approximately 100 people for the 21-month duration). This will be supplied through mains connection or bottled water.

During detailed design and construction planning, construction water demands will be refined in accordance with the staging plan for the site. No impacts to surface or groundwater resources arising from supply are anticipated given the relatively minor quantities of water required during construction that would be sourced externally.

5.4.2 Operation

During operation, water will not be used for fire suppression and emergency management purposes. Any other water will be sourced from the existing/proposed mains connection. As connection to and use of mains water is proposed, no WALs or take from other on-site water resources will be required. Therefore, during operation, no impacts to surface or groundwater resources arising from water take would occur.

5.4.3 Water balance

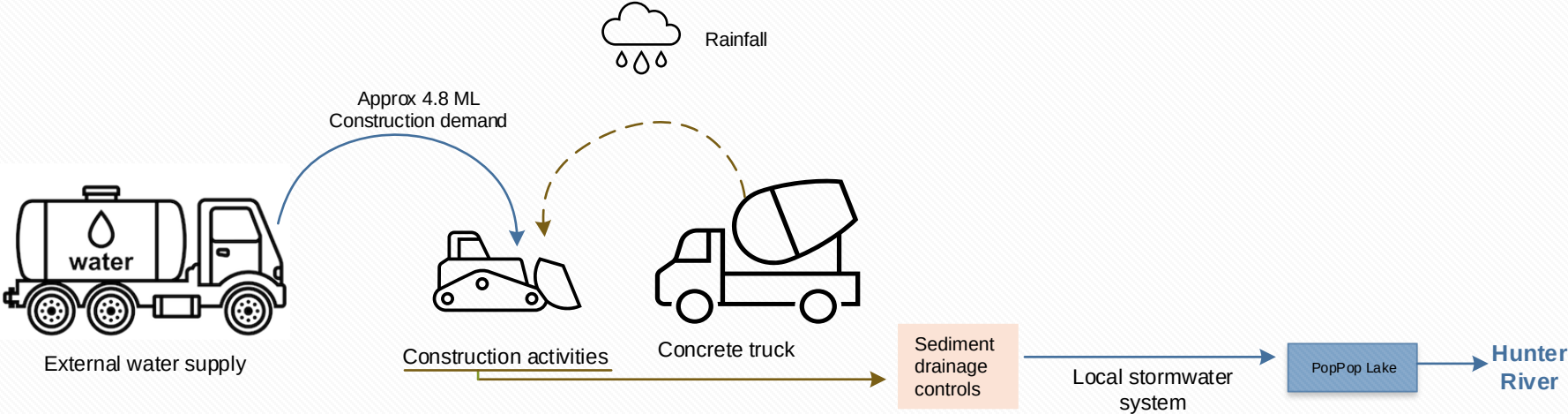
A conceptual site water balance identifies the demands, water uses and outflows of the different water types is presented in Figure 5.1.

5.5 Cumulative impacts

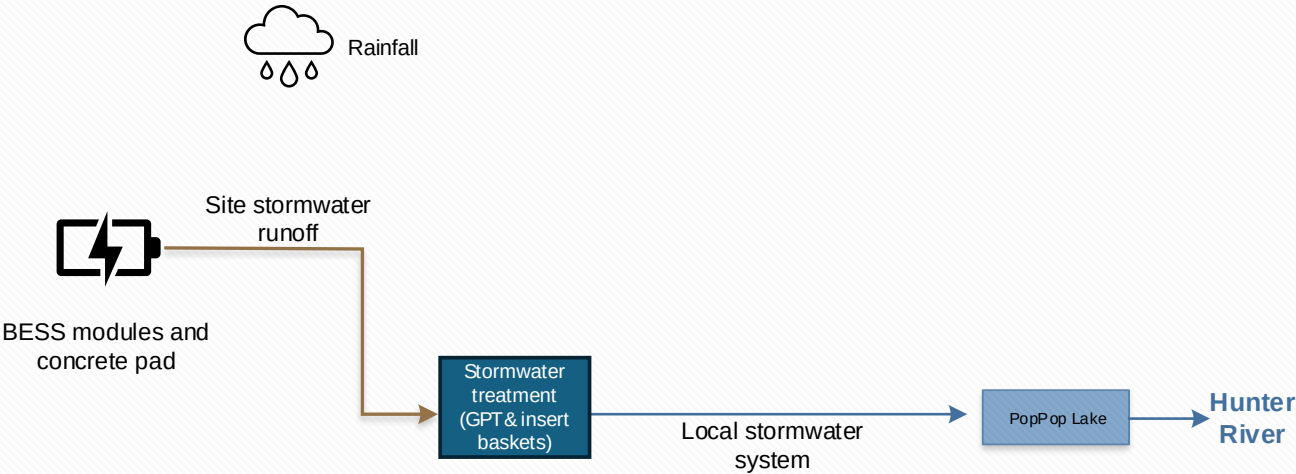
An issue-specific cumulative impact assessment has been undertaken, considering future projects located within the catchment of the South Channel of the Hunter River. While the individual impacts of these projects may be minor, when they occur at the same time as the Project, they may result in material impacts on the receiving environment. A summary of identified future projects is included in Table 5.2 and discussed in the following subsections.

Construction phase

(Approximately 21 months)



Operational Phase



Legend

- Clean water flow
- Dirty water flow
- Water entrained in material
- Retention basin



Ausgrid Operator Partnership
Steel River East BESS
Water Impact Assessment

Site Water Balance

Project No. 12651400
Revision No. 1
Date 05/02/2025

Figure 5.1

Table 5.2 *Projects located within the South Channel Hunter River catchment*

Project	Status	Location	Distance from site	Key element	Summary of assessment	Relevance to Project	Impact assessment
Mayfield West Waste Facility (SSD-7698)	Modification 3 - under assessment	1a McIntosh Drive, Mayfield West, NSW	<1 km	Water quality – handling of acid sulfate soils	– Approved to process 30,000 tonnes per annum of low-level Acid Sulfate Soils (ASS). – Submitted Modification Assessment (Modification 3) to relocate ASS to another facility on same site, requiring an additional 16 ha within the approval boundary. – No interactions with groundwater are expected since all processing will be indoors, with suppression of fines. – Additional area to be managed by existing surface water system. – Leachate runoff to be captured in a 30 kL tank and sediment laden runoff captured in an existing sediment basin. – No changes to EPL or monitoring network are proposed.	– Located directly north of site. – Located directly south of South Channel of Hunter River.	No cumulative impact anticipated.
Hexam Metal Recycling (DA345-7-2003-I)	Modification 6 – more information required	8 Sparke Street, Hexham, NSW	4.4 km	Water quality - stormwater	– Existing recycling centre subject to conditions of EPL 5343. – Stormwater Management Report (Torque Projects Pty Limited 2020) notes site drains east to the South Channel of the Hunter River. – No impact expected as discharges are through a separate drainage stormwater network.	– Located upstream of the site on an adjacent lot. – Drains towards the South Channel of the Hunter River.	No cumulative impact anticipated.

Project	Status	Location	Distance from site	Key element	Summary of assessment	Relevance to Project	Impact assessment
M1 Pacific Motorway extension to Raymond Terrace (SSI-7319)	Modification 1 – approved	Black Hill to Raymond Terrace NSW	8 km	Water quality – construction Flooding	– Project seeks to bypass Hexham through construction of a 2.6 km viaduct bridge over Hunter River. – EIS (Chapter 10) (Transport for NSW 2021) states works would induce minor/moderate increases in stormwater discharge, but these will not materially affect flows in Hunter River. – Flood impacts in the vicinity of Hunter River include: • Increase in flood level by 20 mm in 1% AEP event during construction. • Decrease in flood level towards site by 30 mm in PMF event during construction. – No notable changes to water quality are expected.	– Currently being constructed upstream of the Project. – Construction is also upstream of the distribution of the Hunter River into the southern and northern channels. – No cumulative impact to the flood conditions at the site are expected given modelled impact to the 1% AEP extent outlined in Section 5.1.2 and mapped in Appendix A.	No cumulative impact anticipated.

6. Mitigation measures

6.1 Construction

As outlined in Section 5.2.1, disturbance of soils and handling of hazardous materials is required during construction. Complete elimination of these risks is not feasible and disturbance of soils for the Project is unavoidable and inherent to the proposed activities. A detailed Construction Environmental Management Plan (CEMP) would be prepared and implemented for the Project. The CEMP would contain environmental control measures and a detailed Soil and Water Management Plan (SWMP).

The SWMP would outline the implementation of erosion and sediment control measures in accordance with Blue Book (Landcom 2004), a key resource for the design and construction of stormwater management. It is expected that erosion and sediment controls would be installed in accordance with *Managing Urban Stormwater: Soils and construction – Volume 2A manual* (DECC 2008). Specific controls from that are applicable to the Project would be included in the SWMP, including:

- Minimising the risk of erosion and sedimentation, with a priority on minimising the extent and duration of disturbance. Disturbed areas should be vegetated and stabilised as soon as practicable to do so.
- Handling of soils, including the management of unexpected finds of contaminated materials.
- Handling of hazardous materials and procedures to manage spills to reduce and address soil and water contamination, including fuel storage and management of transformer oils.
- Handling and interactions with potential Acid Sulfate Soils.
- Emergency response procedures during flood conditions.

Prior to any soil disturbance or activities that pose a water quality risk during construction, drainage and other erosion sediment and environmental controls would first be implemented, in accordance with the SWMP.

6.2 Operation

Operational phase impacts associated with water should be managed as part of the detailed design of the Project as well as considered within Ausgrid's existing environmental procedures for the site.

6.2.1 Detailed design

The management of stormwater quantity and quality should be considered as part of the detailed design of the Project. The detailed design of the stormwater management system would be undertaken following project approval and should include the following:

- Confirmation through water quality modelling that the CN Council requirements specified in this report can be met. As part of this the stormwater treatment train should be sized to manage the 4 EY, 5-minute design storm.
- Confirmation that the proposed stormwater drainage layout and external bunding of the facility would manage flood waters appropriately and confirm that the outcomes of the flood assessment presented in this report continue to be met. This should include quantitative re-simulation of flood models (if needed).

6.2.2 Environmental procedures

It is recommended that operational controls relevant to water are included in Ausgrid's existing environmental procedures for the site, or within a site-specific Operational Environment Management Plan (OEMP). The relevant document should include the following measures relevant to water:

- Procedures to maintain drainage features at the site, including open channels, culverts, water quality controls (GPTs and pit inserts) and all pits and outlets. These should be maintained in accordance with the manufacturer's specifications and kept free-draining.

- Identifying procedures to appropriately handle hazardous materials such that they can be contained within the site. Specified responses to a pollution incident should be documented for the unlikely event that hazardous materials are conveyed outside of the site boundary.
- Outlining responses for personnel that may be onsite during flood events. This should consider the Australian Government Business emergency management plan template (business.gov.au) to help protect operations before, during and after an emergency.

With implementation of the mitigation measures as described above, no residual impacts from the Project during the operational phase are anticipated.

7. Conclusion

A Water Impact Assessment has been prepared to address the impacts associated with the Project, as required by the SEARs. The report outlines the existing environment and assesses potential impacts related to water quality, flooding, groundwater and water supply. The assessment identified potential impacts requiring mitigation measures include:

- Minor impacts associated with changes to water quality during the construction phase associated with erosion and sedimentation as well as the handling of hazardous materials. This risk may be exacerbated during times of flood. Recommended mitigation measures include developing a Soil and Water Management Plan in accordance with the Blue Book, and with consideration for emergency response during times of flooding for the construction phase, as well as documenting environmental procedures for the operation of the facility relevant to handling of hazardous materials.
- Potential minor impacts during the operational phase of the Project associated with changes to water quality arising from a change in land-use and additional impervious areas required for the Project. Water quality modelling undertaken indicated that CN Council guidelines for urban water quality could be achieved as part of the design of the facility and no resulting impacts were anticipated. No additional mitigation measures were identified as being required. During operation, environmental procedures should be documented to maintain relevant water quality infrastructure.
- Potential changes to flood conditions outside of the site were identified to be minor and limited to extreme events. The design measures included in the modelling, expanding existing drainage infrastructure and inclusion of bunds around the perimeter of the hardstand indicated that impacts could be managed. Detailed design of the facility should confirm these outcomes. During operation, environmental procedures should be documented to maintain relevant stormwater infrastructure and identify responses during flood events.

Impacts associated with groundwater and water supply were not anticipated and accordingly no mitigation measures were identified. A search of nearby projects was reviewed and identified that cumulative impacts were not anticipated to arise from the Project.

With the implementation of these measures, the Project is not anticipated to result in material impacts to water resources.

8. References

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Appendices

Appendix A

Flood mapping

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
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Legend

- Project Footprint
- Model Boundary
- Lot Boundary
- Flood Level Contours (mAHD)

Flood Depth (m)

<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 - 0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00

Paper Size ISO A3

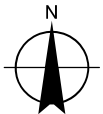
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Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate - Existing Conditions

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-001

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

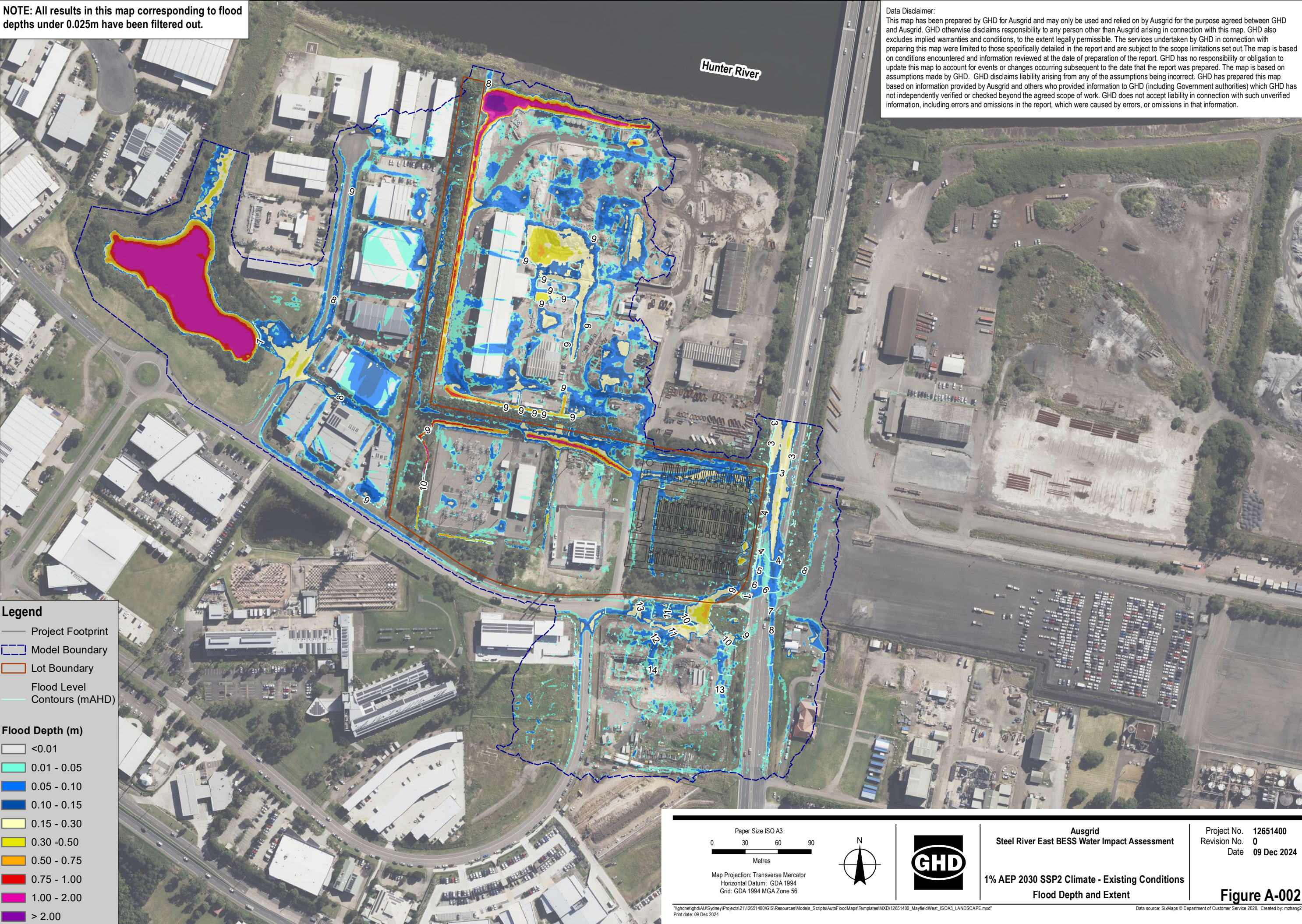
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Legend

- Project Footprint
- Model Boundary
- Lot Boundary
- Flood Level Contours (mAHD)

Flood Depth (m)

<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 - 0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Ausgrid
Steel River East BESS Water Impact Assessment

1% AEP 2030 SSP2 Climate - Existing Conditions
Flood Depth and Extent

Project No. **12651400**
Revision No. **0**
Date **09 Dec 2024**

Figure A-002

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

<0.01

0.01 - 0.05

0.05 - 0.10

0.10 - 0.15

0.15 - 0.30

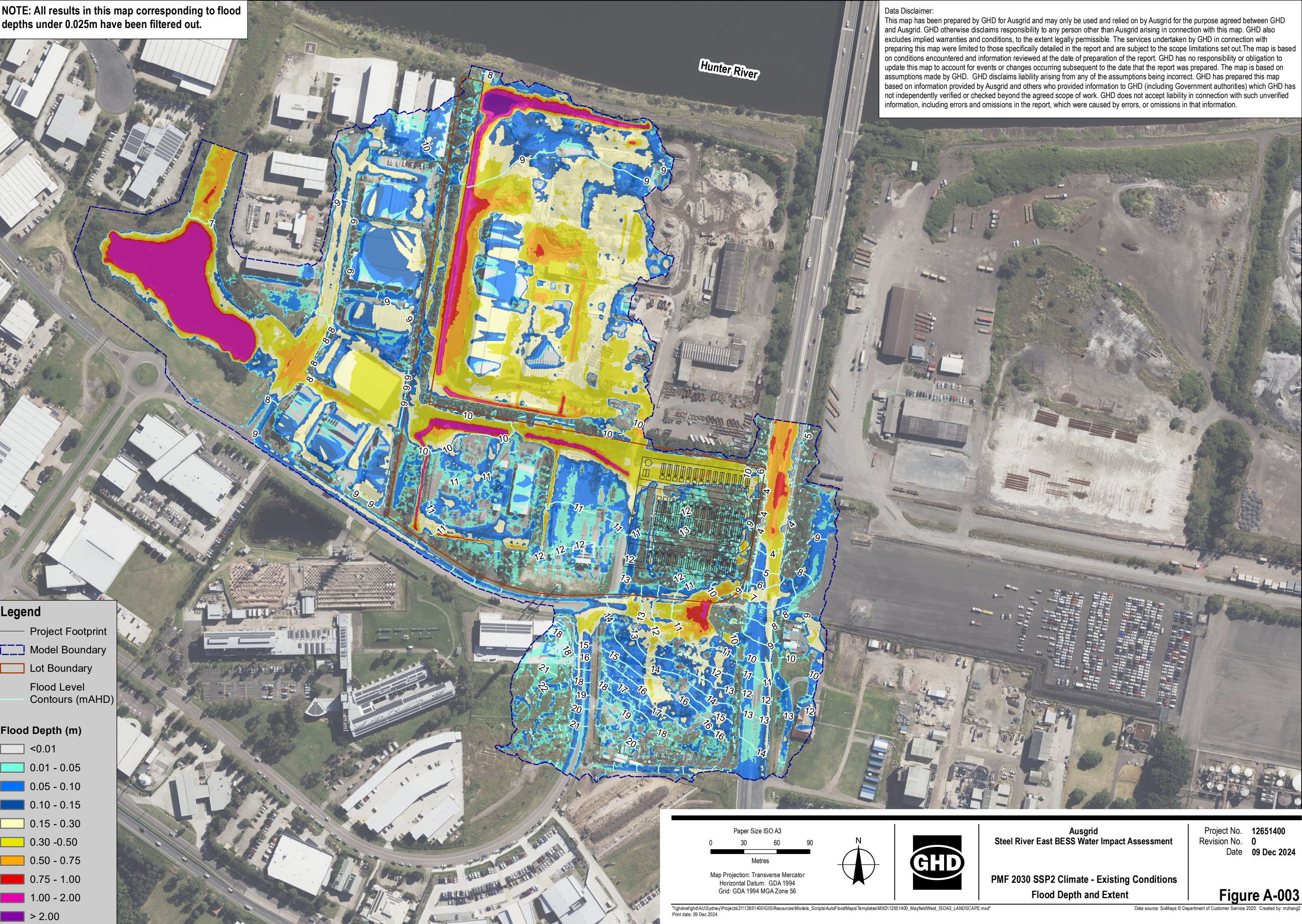
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0.50 - 0.75

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1.00 - 2.00

> 2.00



Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2030 SSP2 Climate - Existing Conditions

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-003

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

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0.01 - 0.05

0.05 - 0.10

0.10 - 0.15

0.15 - 0.30

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0.50 - 0.75

0.75 - 1.00

1.00 - 2.00

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Paper Size ISO A3

0

30

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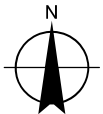
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Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate - Existing Conditions

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-004

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

<0.01

0.01 - 0.05

0.05 - 0.10

0.10 - 0.15

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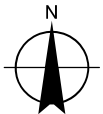
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Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate - Existing Conditions

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-005

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

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0.05 - 0.10

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0.15 - 0.30

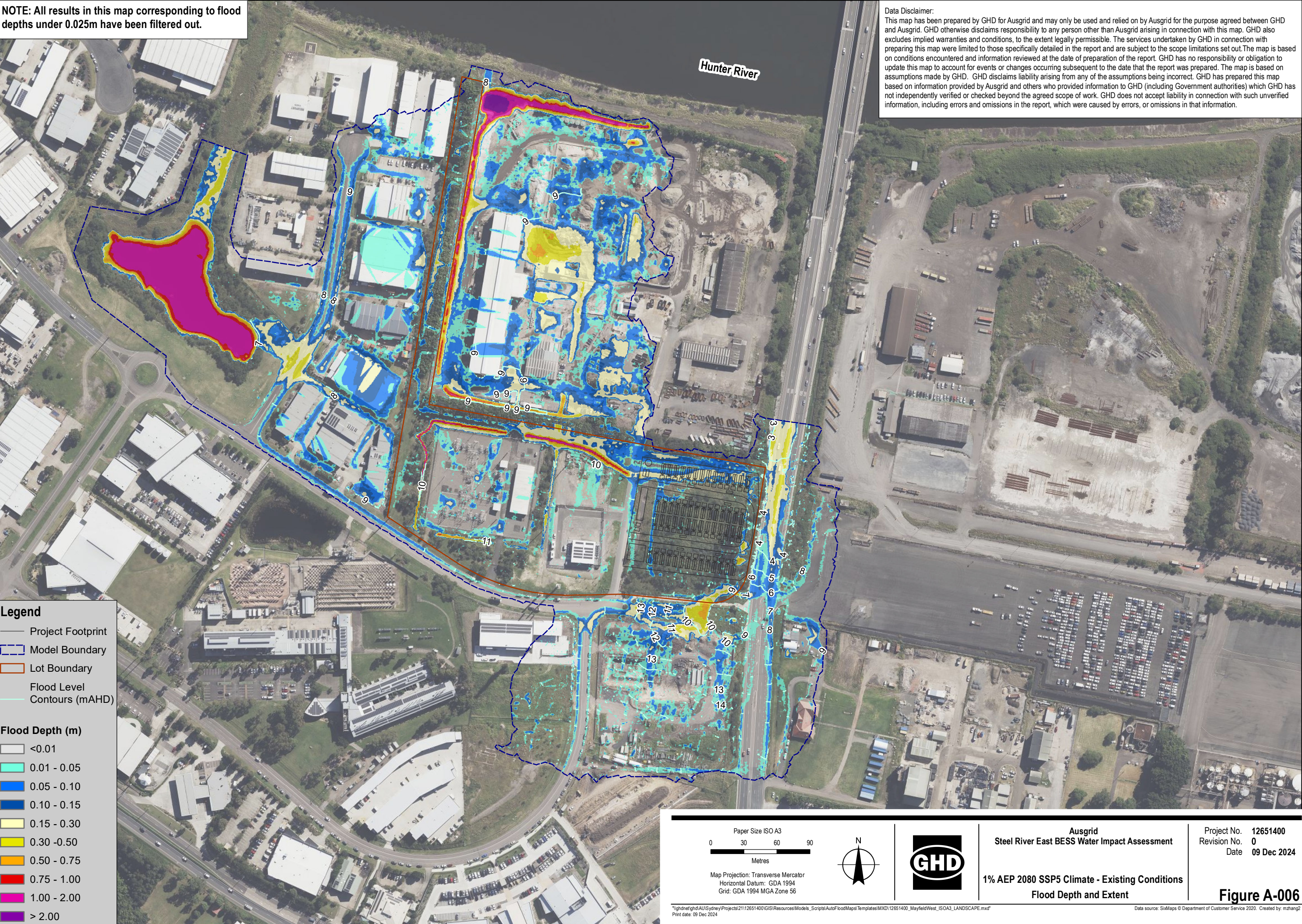
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Paper Size ISO A3
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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid
Steel River East BESS Water Impact Assessment

1% AEP 2080 SSP5 Climate - Existing Conditions
Flood Depth and Extent

Project No. 12651400
Revision No. 0
Date 09 Dec 2024

Figure A-006

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

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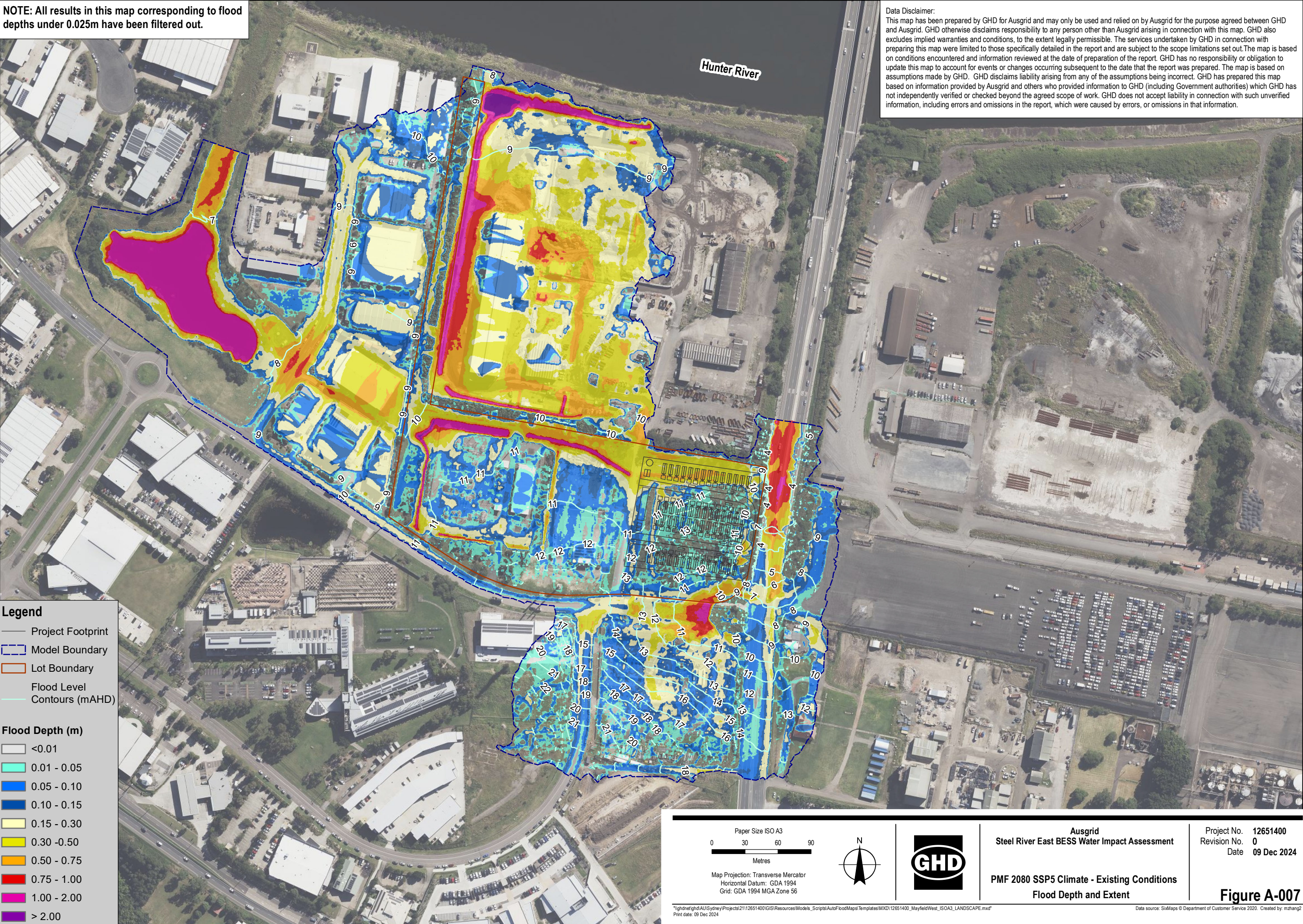
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> 2.00



Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate - Existing Conditions

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-007

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate - Existing Conditions

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-008

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE.mxd"

Print date: 09 Dec 2024

Data source: SixMaps © Department of Customer Service 2020. Created by: mzhang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

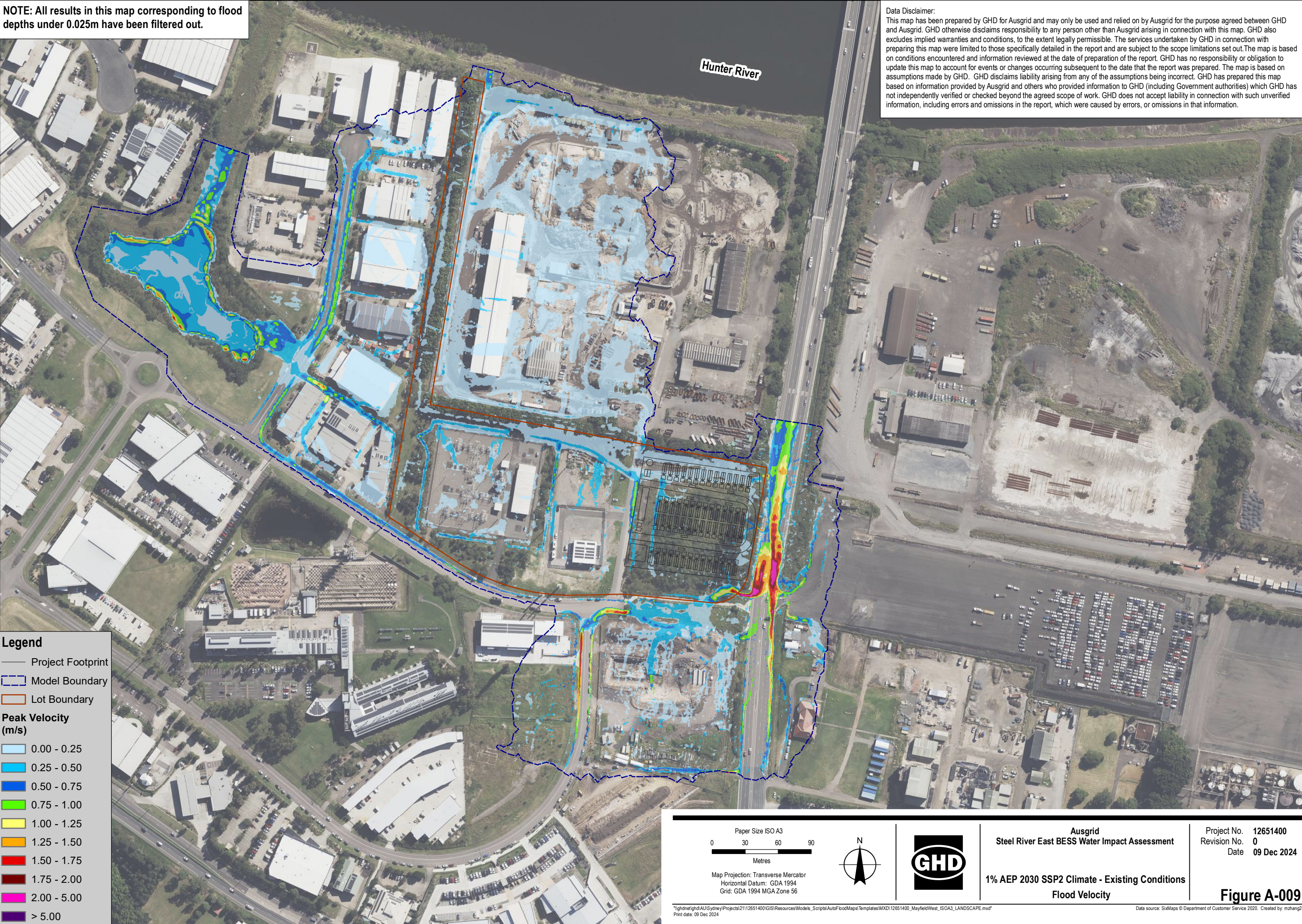
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

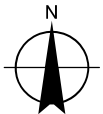


Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

1% AEP 2030 SSP2 Climate - Existing Conditions
Flood Velocity

Project No. 12651400
Revision No. 0
Date 09 Dec 2024

Figure A-009

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

— Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

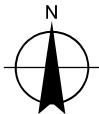
> 5.00

Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

PMF 2030 SSP2 Climate - Existing Conditions
Flood Velocity

Project No. 12651400
Revision No. 0
Date 09 Dec 2024

Figure A-010

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate - Existing Conditions

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-011

\\ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE.mxd

Print date: 09 Dec 2024

Data source: SixMaps © Department of Customer Service 2020. Created by: mzhang2

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate - Existing Conditions

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-012

\\ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE.mxd

Print date: 09 Dec 2024

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

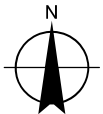
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Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2080 SSP5 Climate - Existing Conditions
Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-013

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

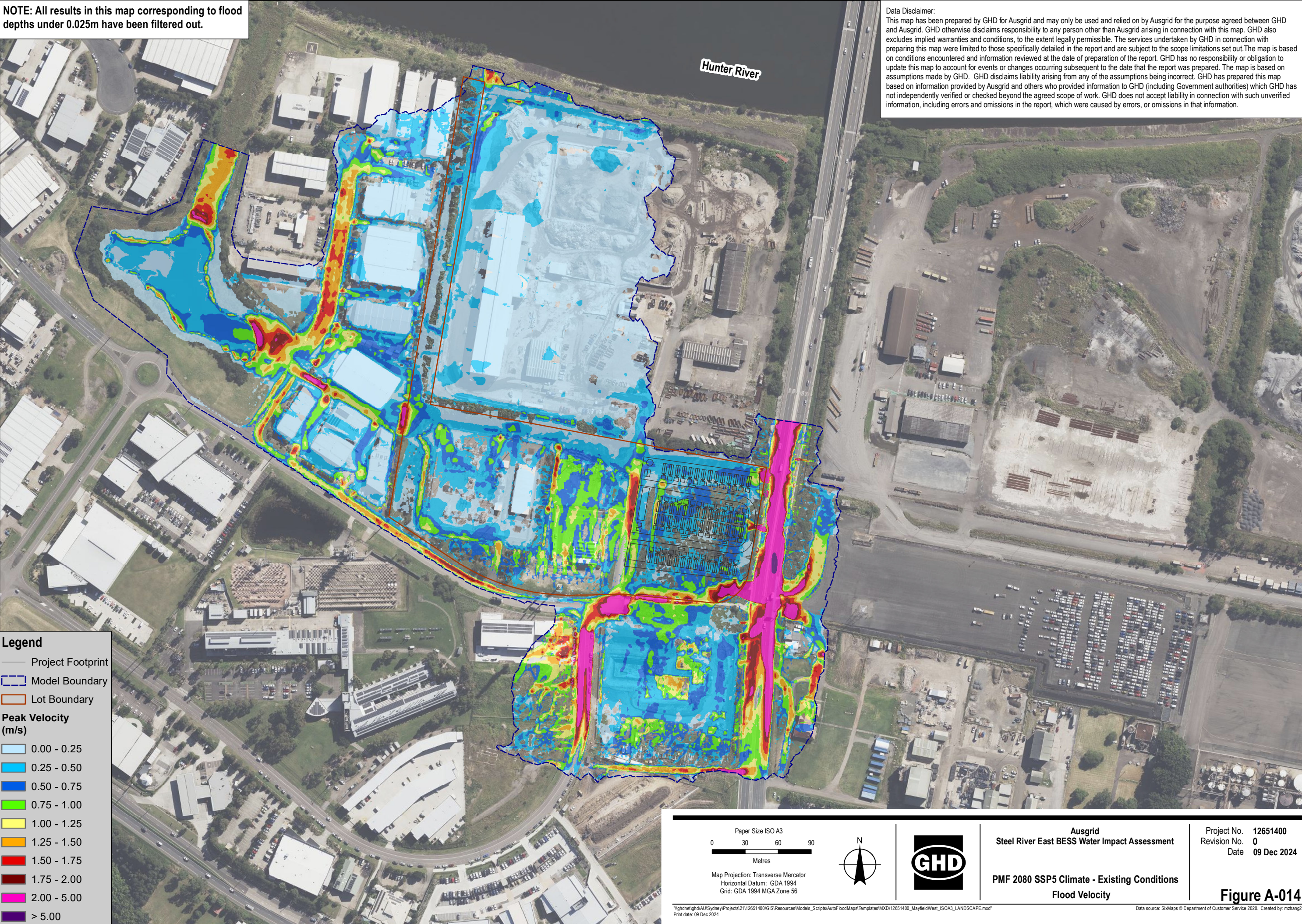
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00



Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate - Existing Conditions

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-014

*ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO A3_LANDSCAPE.mxd

Print date: 09 Dec 2024

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

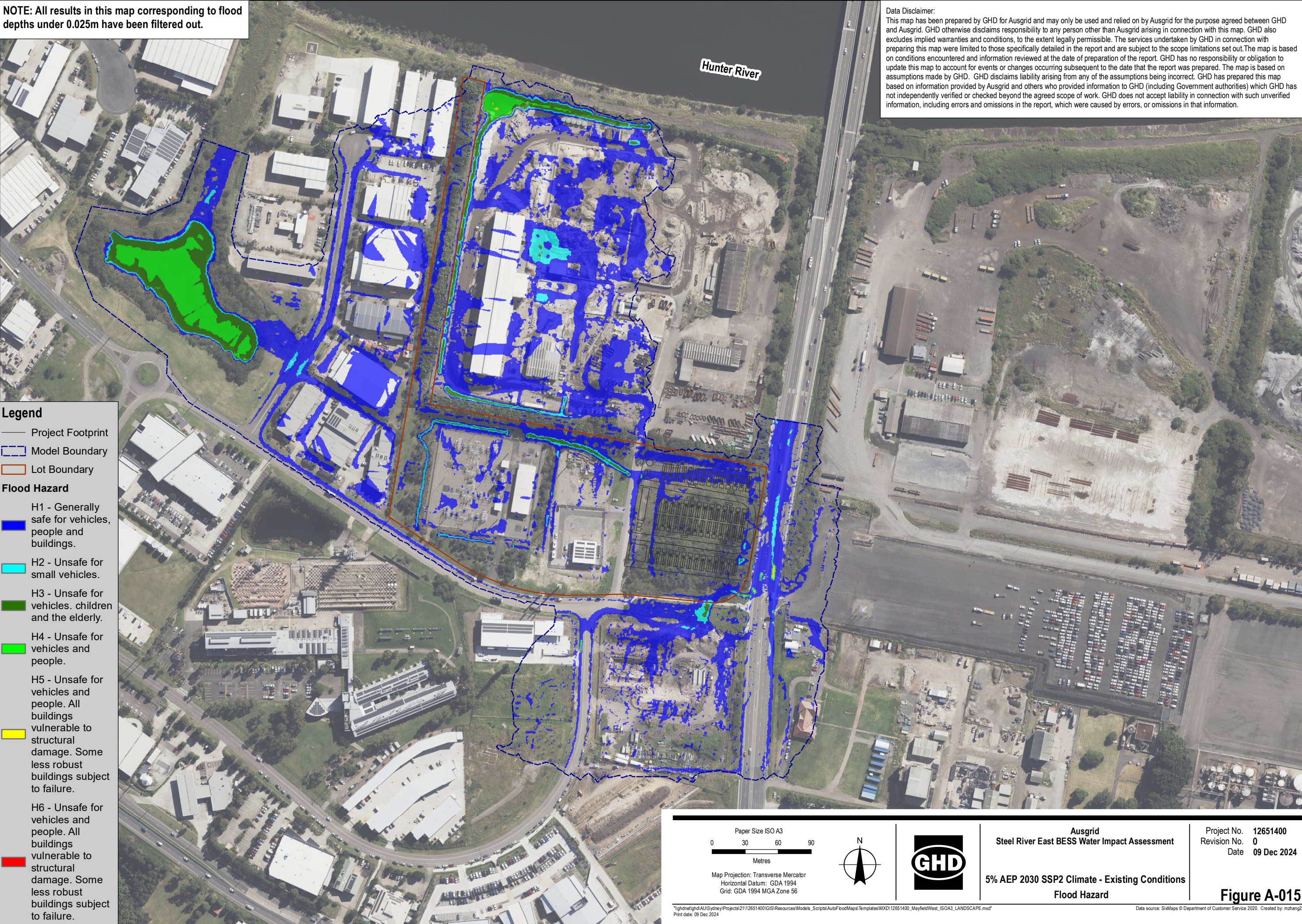
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

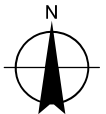
0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-015

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

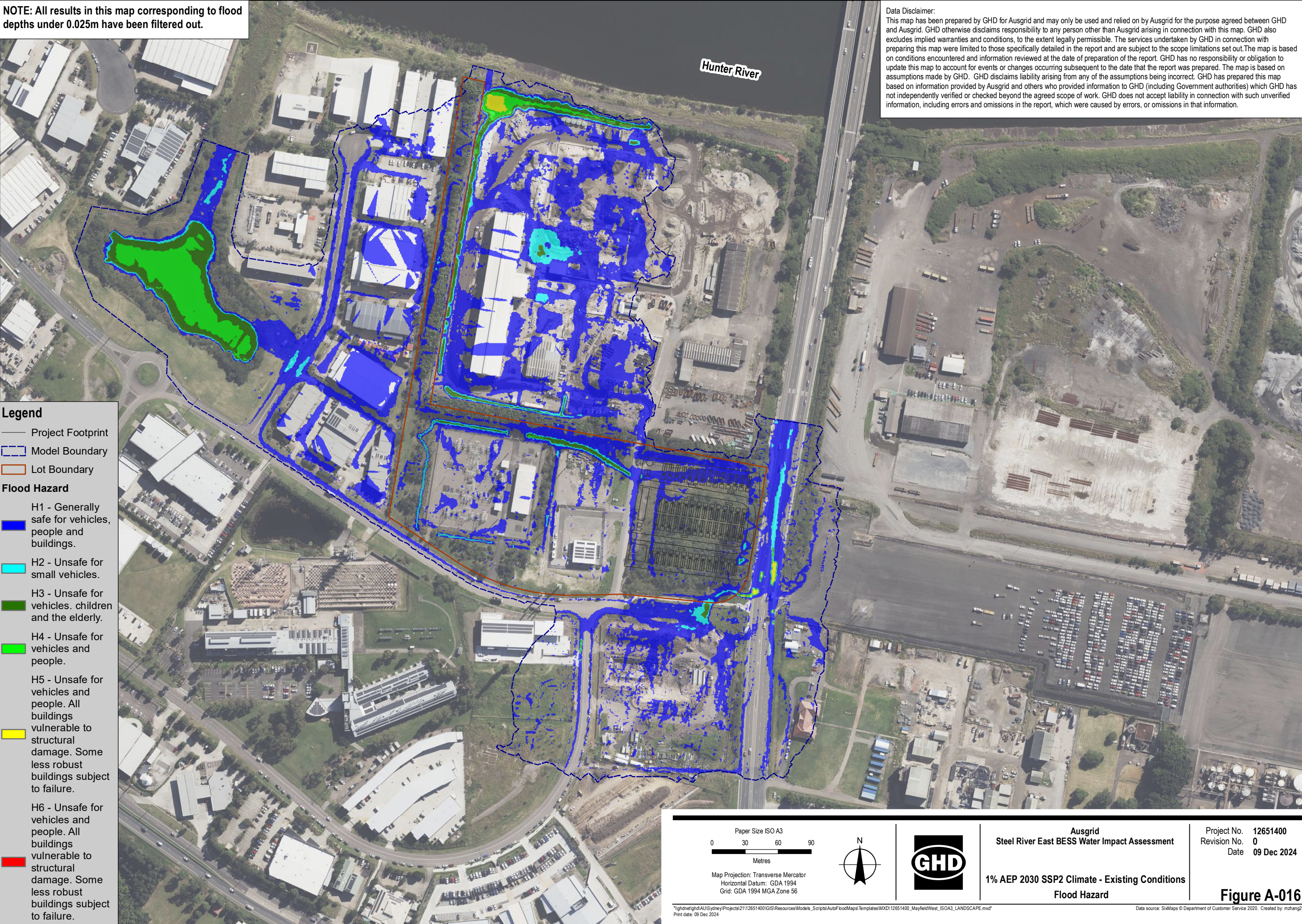
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0

30

60

90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2030 SSP2 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-016

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

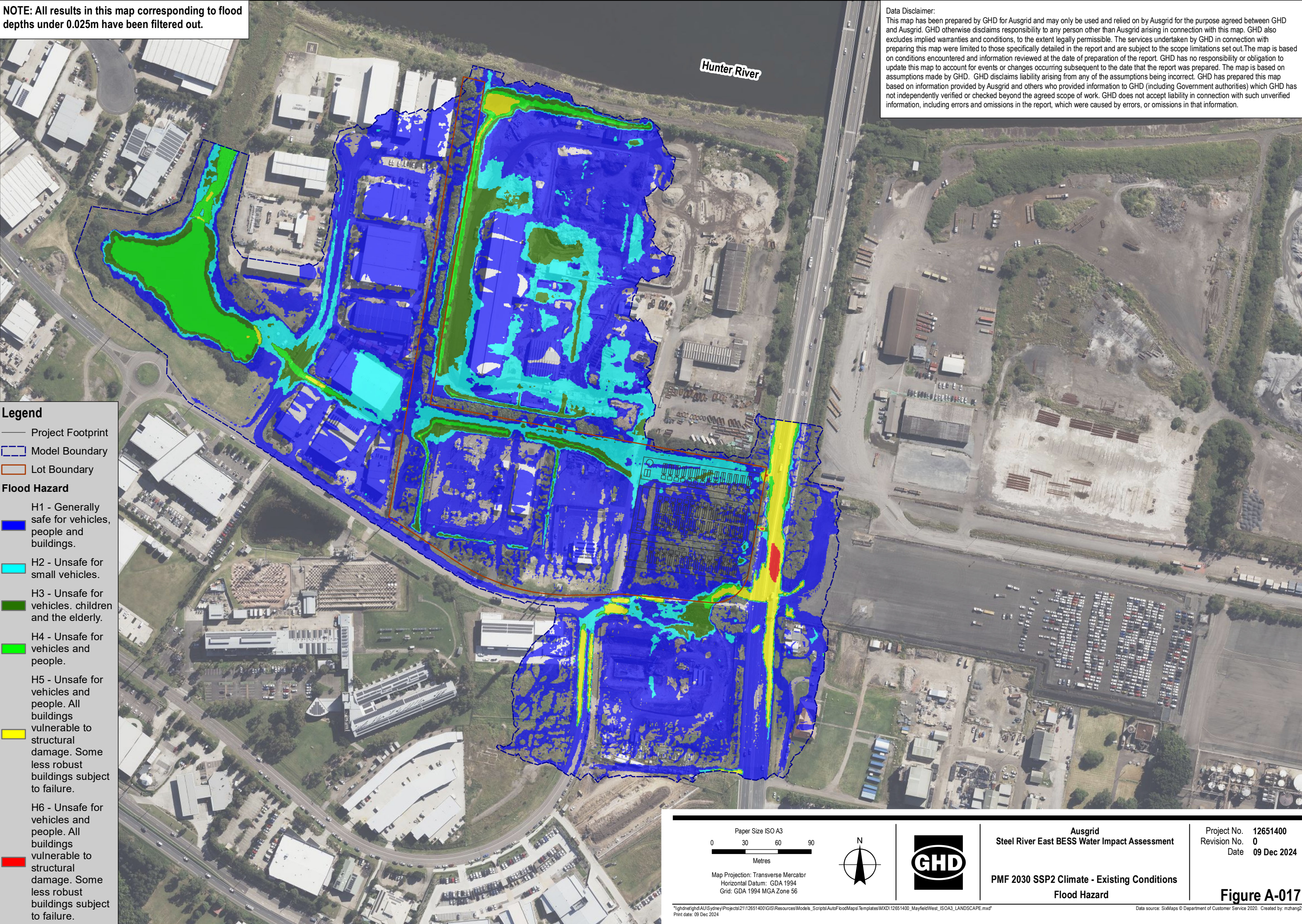
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2030 SSP2 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-017

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

Paper Size ISO A3

0

30

60

90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-018

"lightnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models\Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO A3_LANDSCAPE.mxd"
Print date: 09 Dec 2024

Data source: SixMaps © Department of Customer Service 2020. Created by: mhang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

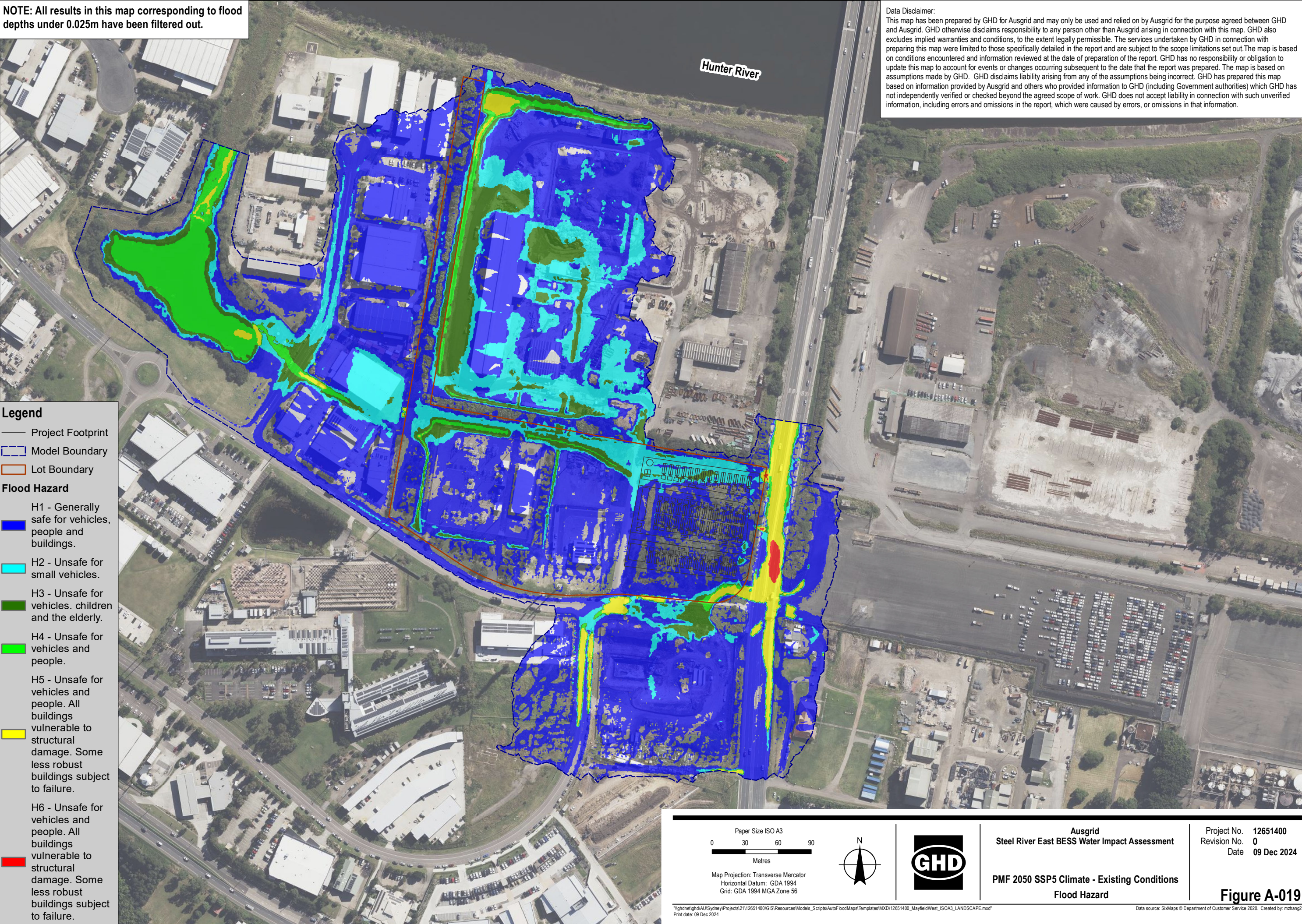
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-019

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2080 SSP5 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Dec 2024

Figure A-020

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO A3_LANDSCAPE.mxd"
Print date: 09 Dec 2024

Data source: SixMaps © Department of Customer Service 2020. Created by: mhang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

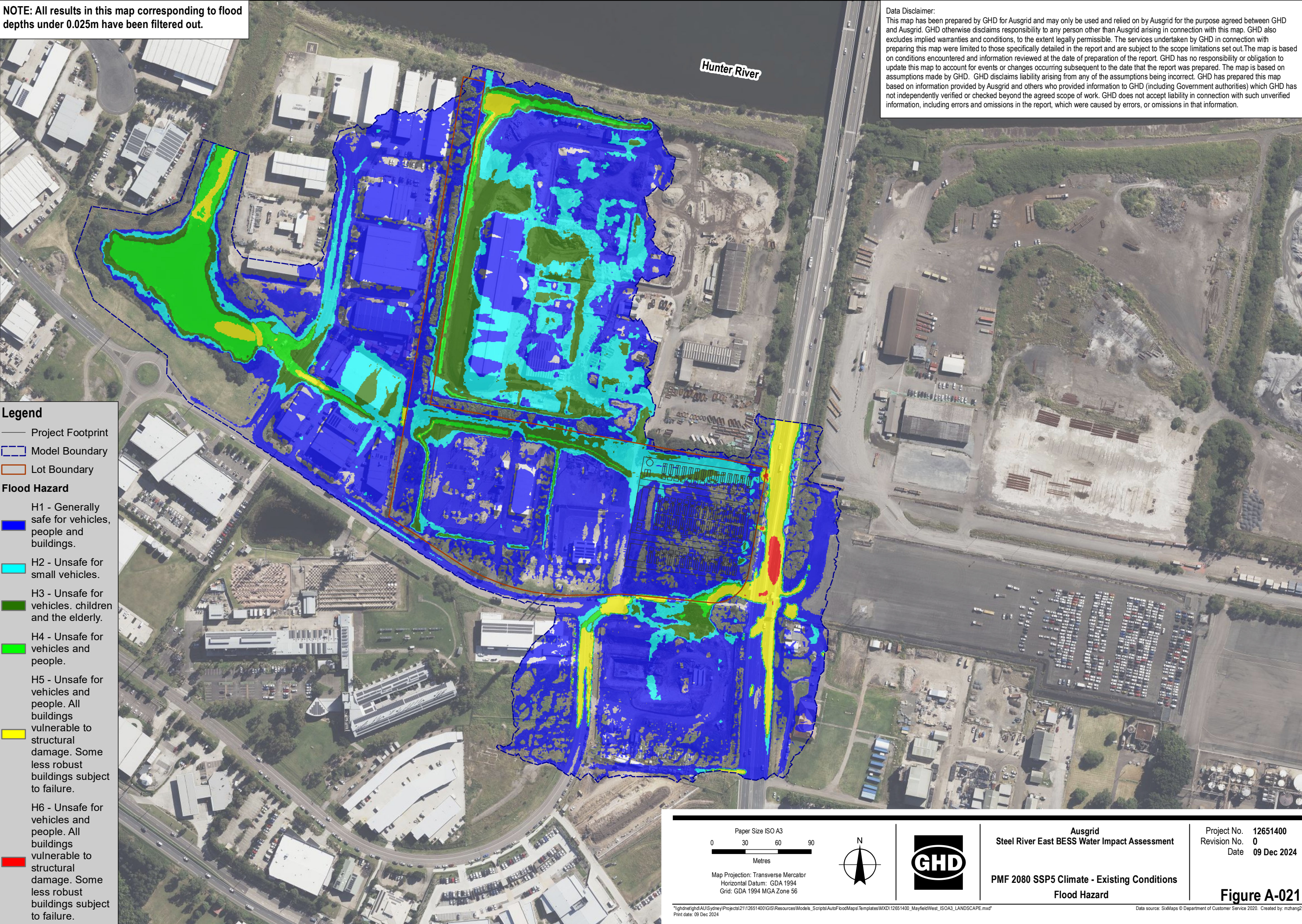
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate - Existing Conditions

Flood Hazard

Project No. 12651400

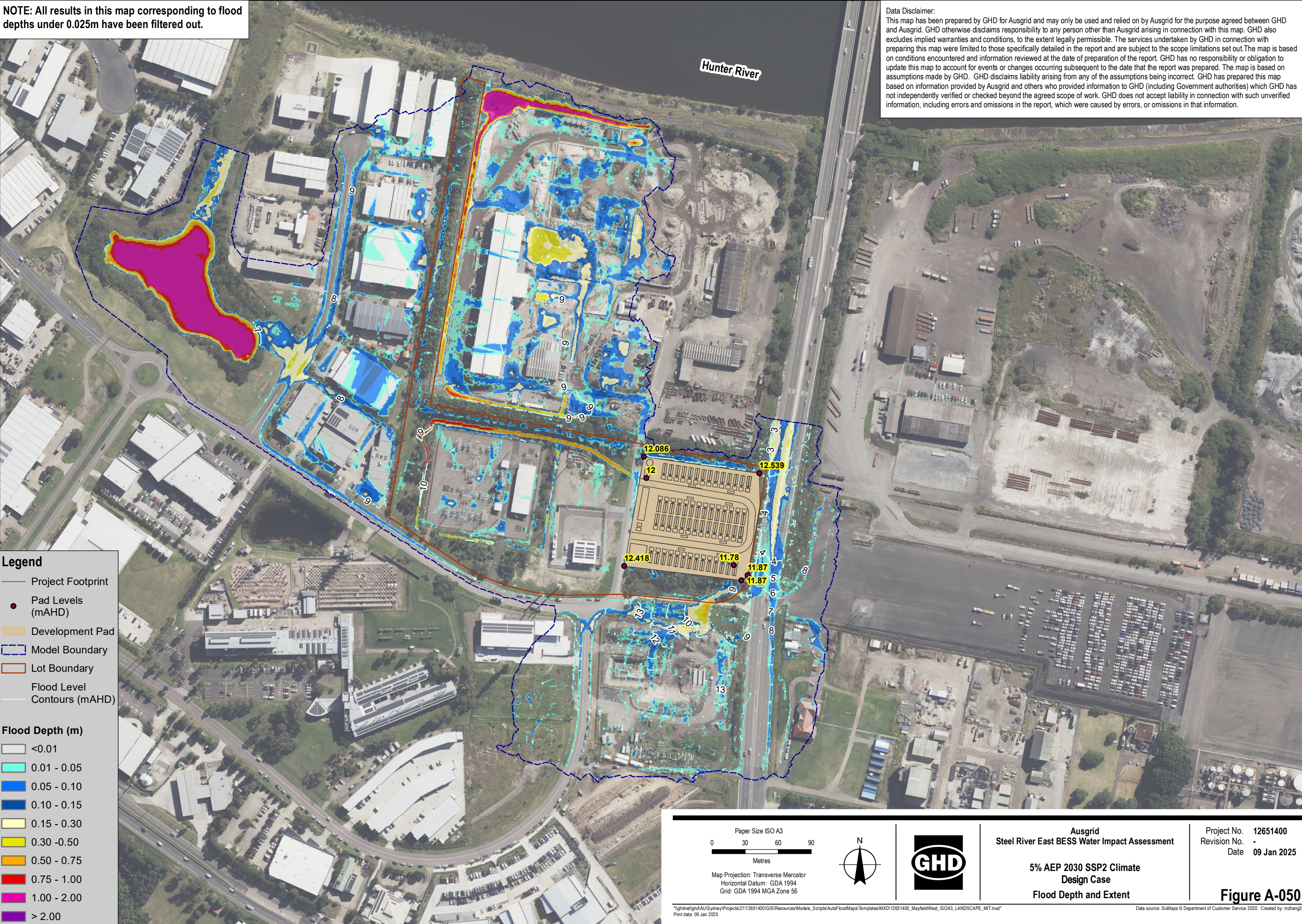
Revision No. 0

Date 09 Dec 2024

Figure A-021

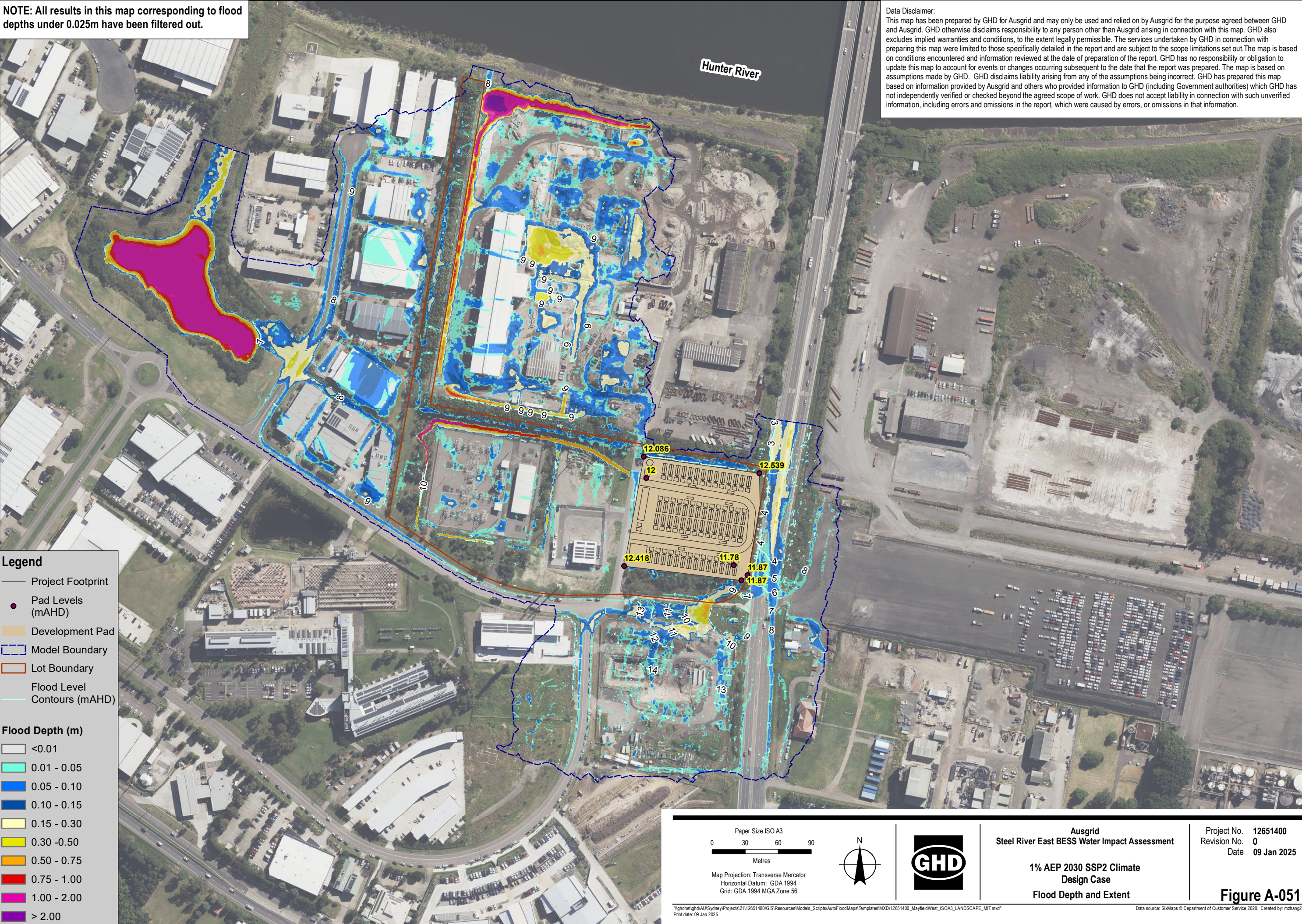
NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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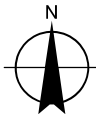


- Legend**
- Project Footprint
 - Pad Levels (mAHD)
 - Development Pad
 - Model Boundary
 - Lot Boundary
 - Flood Level Contours (mAHD)

Flood Depth (m)

- <0.01
- 0.01 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.30
- 0.30 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 2.00
- > 2.00

Paper Size ISO A3
0 30 60 90
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



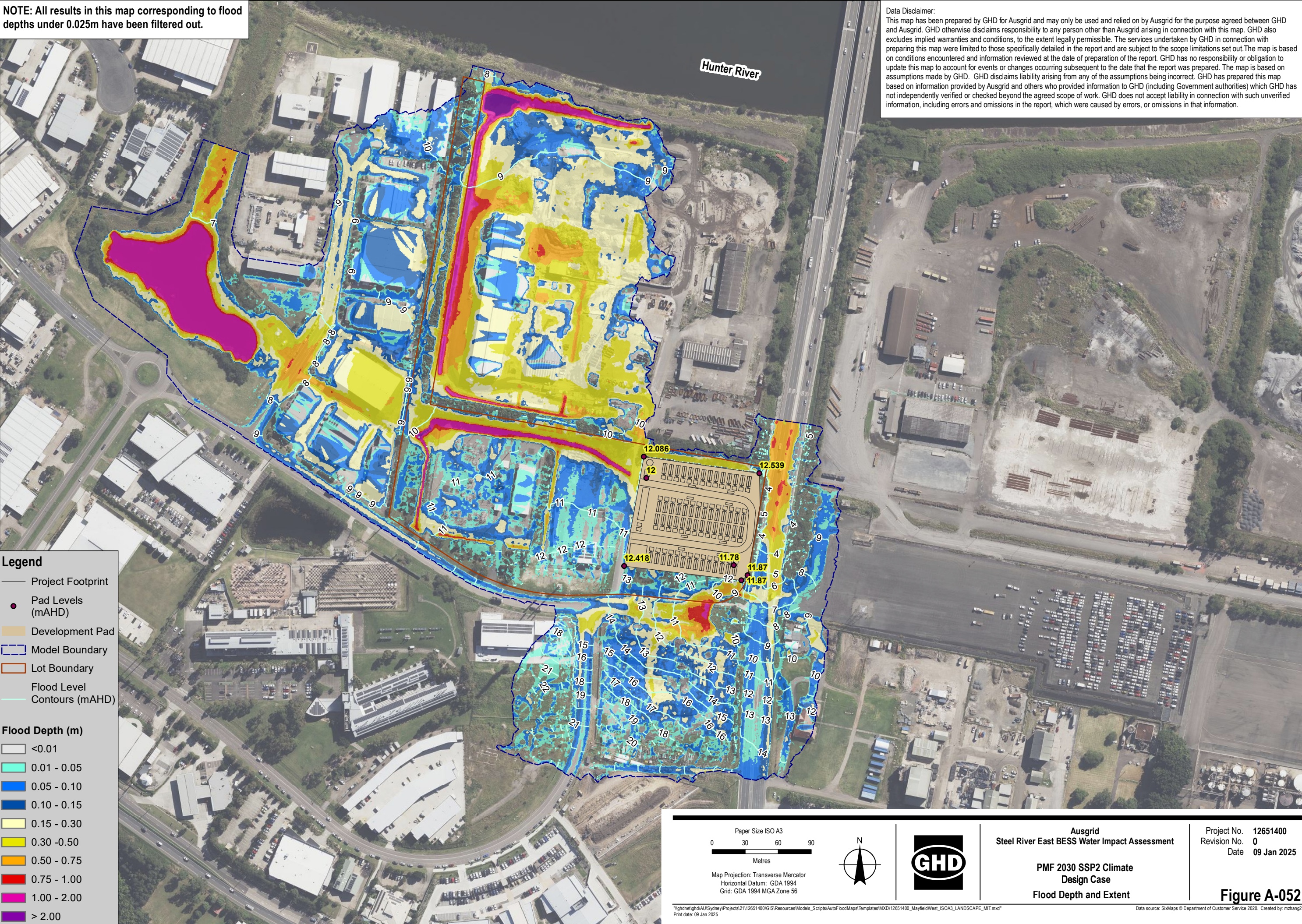
Ausgrid
Steel River East BESS Water Impact Assessment
1% AEP 2030 SSP2 Climate
Design Case
Flood Depth and Extent

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

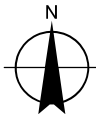
Figure A-051

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Paper Size ISO A3
0 30 60 90
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



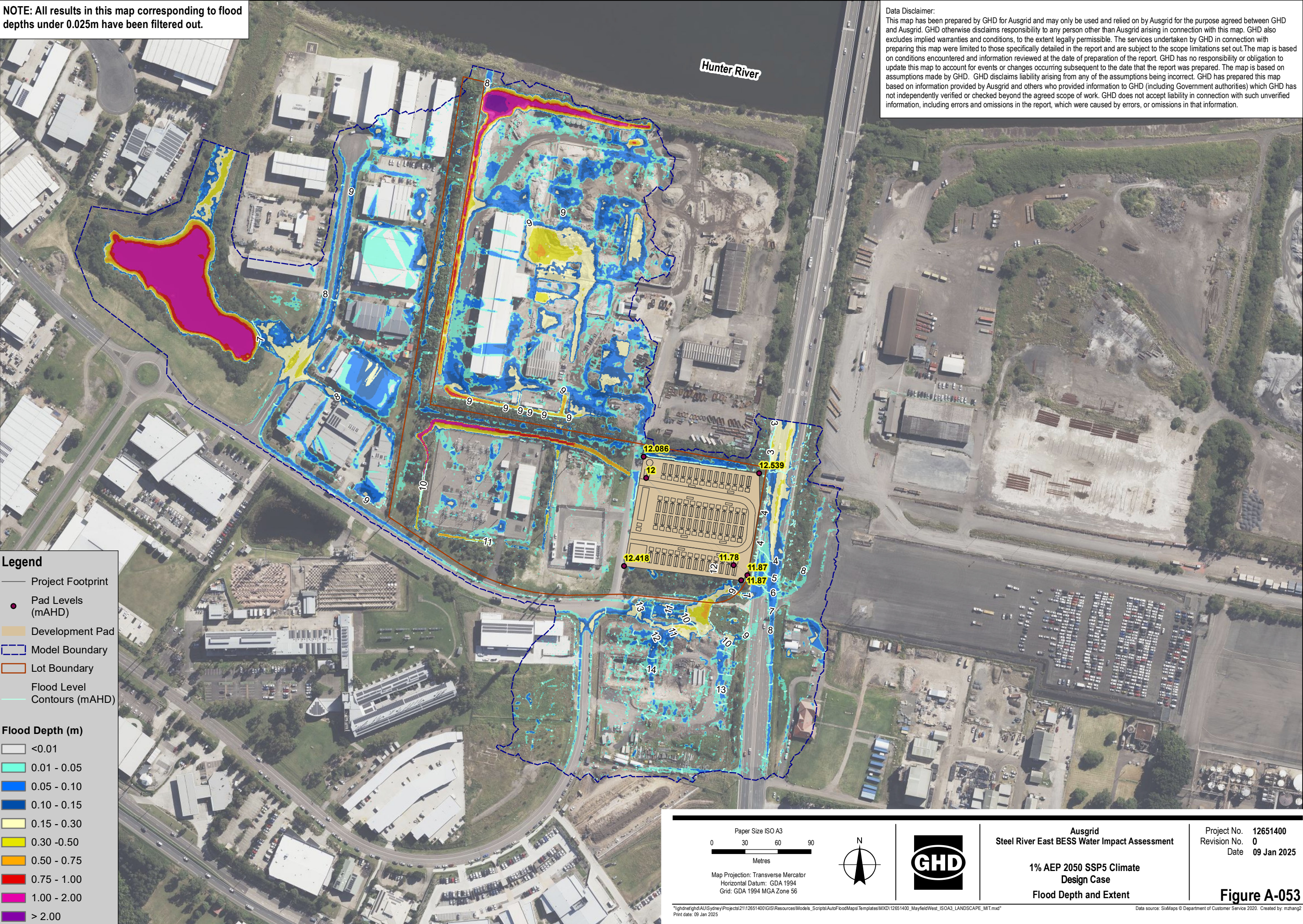
Ausgrid
Steel River East BESS Water Impact Assessment
PMF 2030 SSP2 Climate
Design Case
Flood Depth and Extent

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-052

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

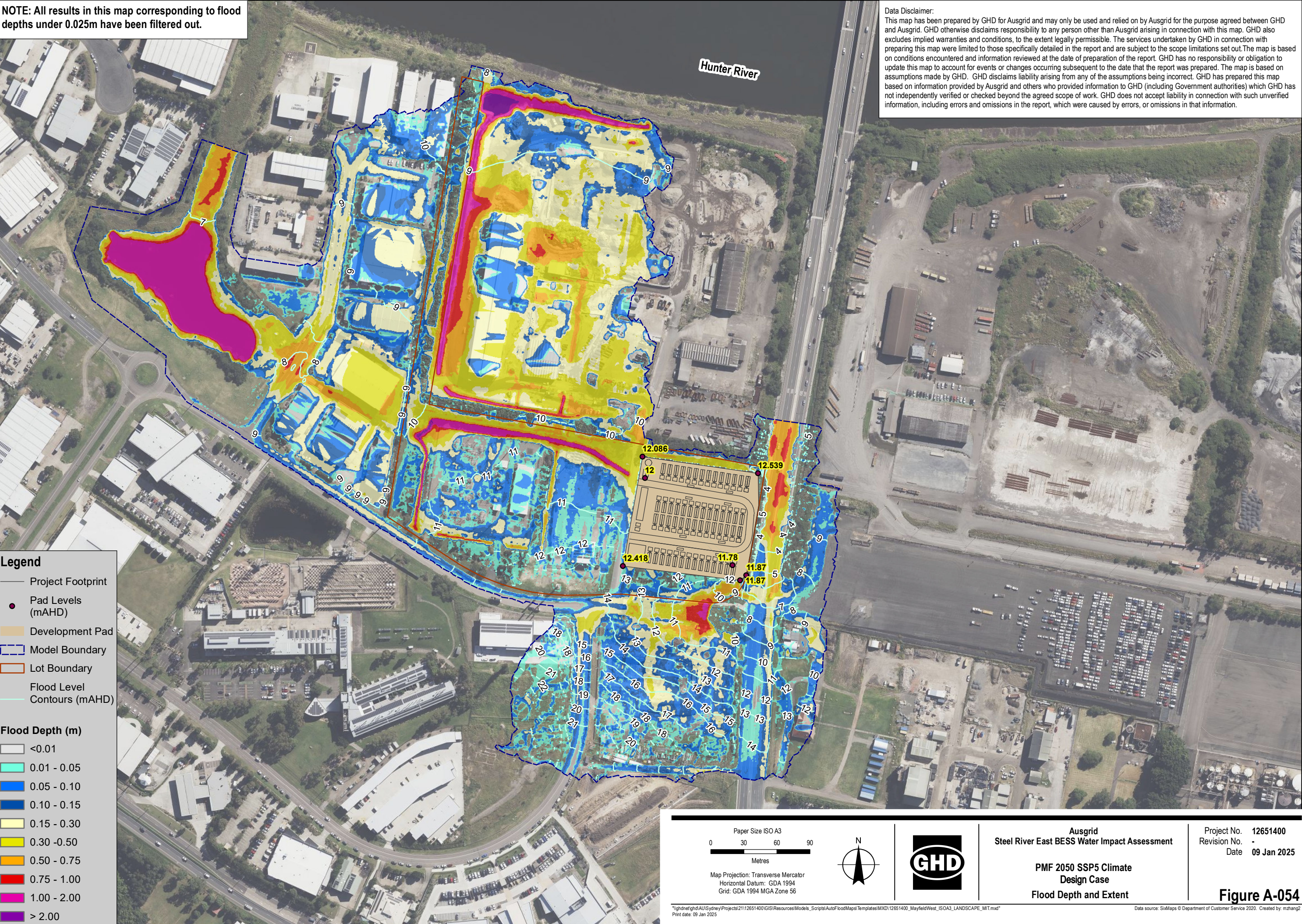
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Legend

- Project Footprint
- Pad Levels (mAHD)
- Development Pad
- Model Boundary
- Lot Boundary
- Flood Level Contours (mAHD)

Flood Depth (m)

<0.01
0.01 - 0.05
0.05 - 0.10
0.10 - 0.15
0.15 - 0.30
0.30 - 0.50
0.50 - 0.75
0.75 - 1.00
1.00 - 2.00
> 2.00



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Ausgrid
Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate
Design Case

Flood Depth and Extent

Project No. 12651400
Revision No. -
Date 09 Jan 2025

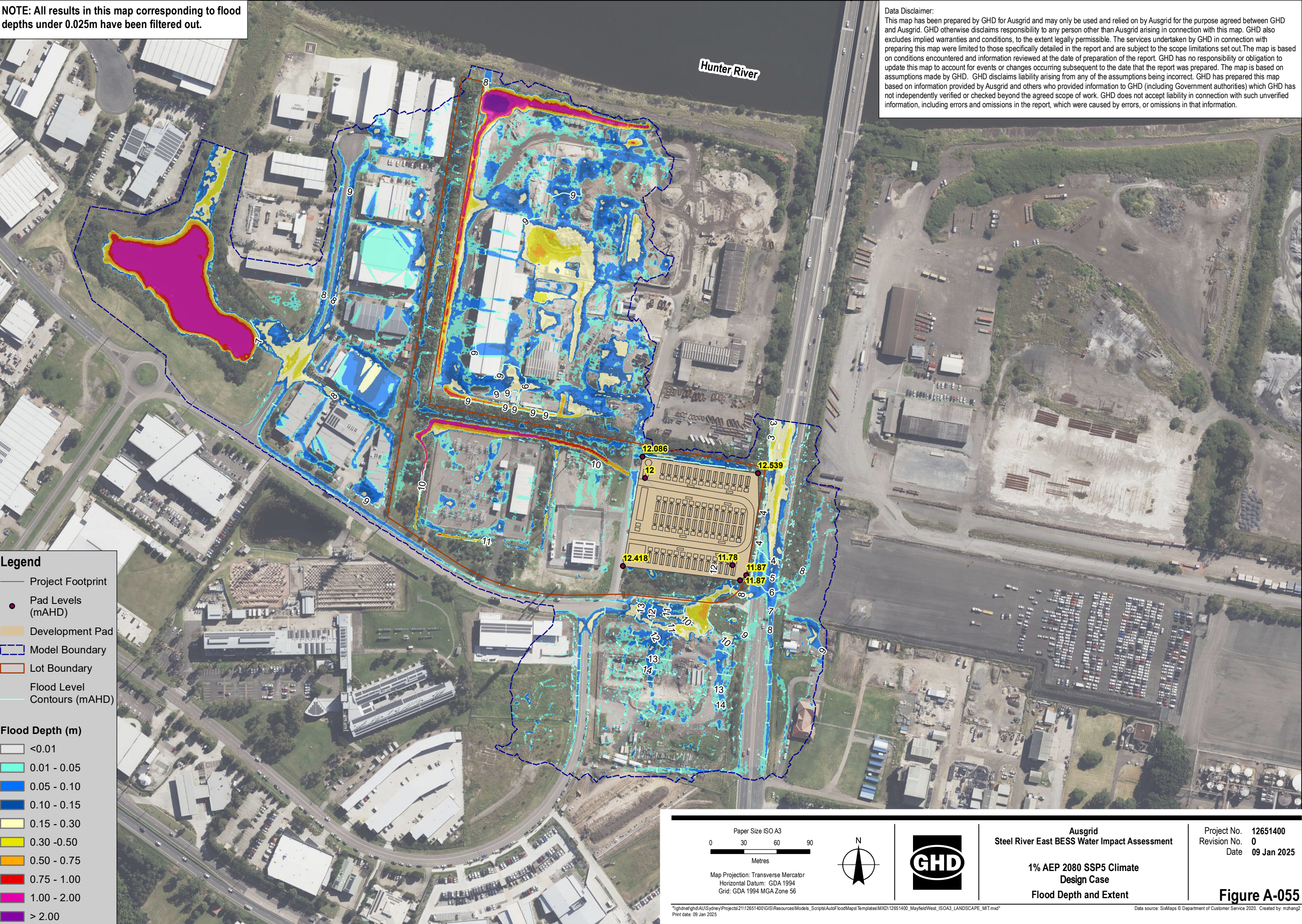
Figure A-054

ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO_A3_LANDSCAPE_MIT.mxd
Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mchang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Level Contours (mAHD)

Flood Depth (m)

<0.01

0.01 - 0.05

0.05 - 0.10

0.10 - 0.15

0.15 - 0.30

0.30 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 2.00

> 2.00

Paper Size ISO A3

0

30

60

90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate Design Case

Flood Depth and Extent

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-056

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO_A3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mzhang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

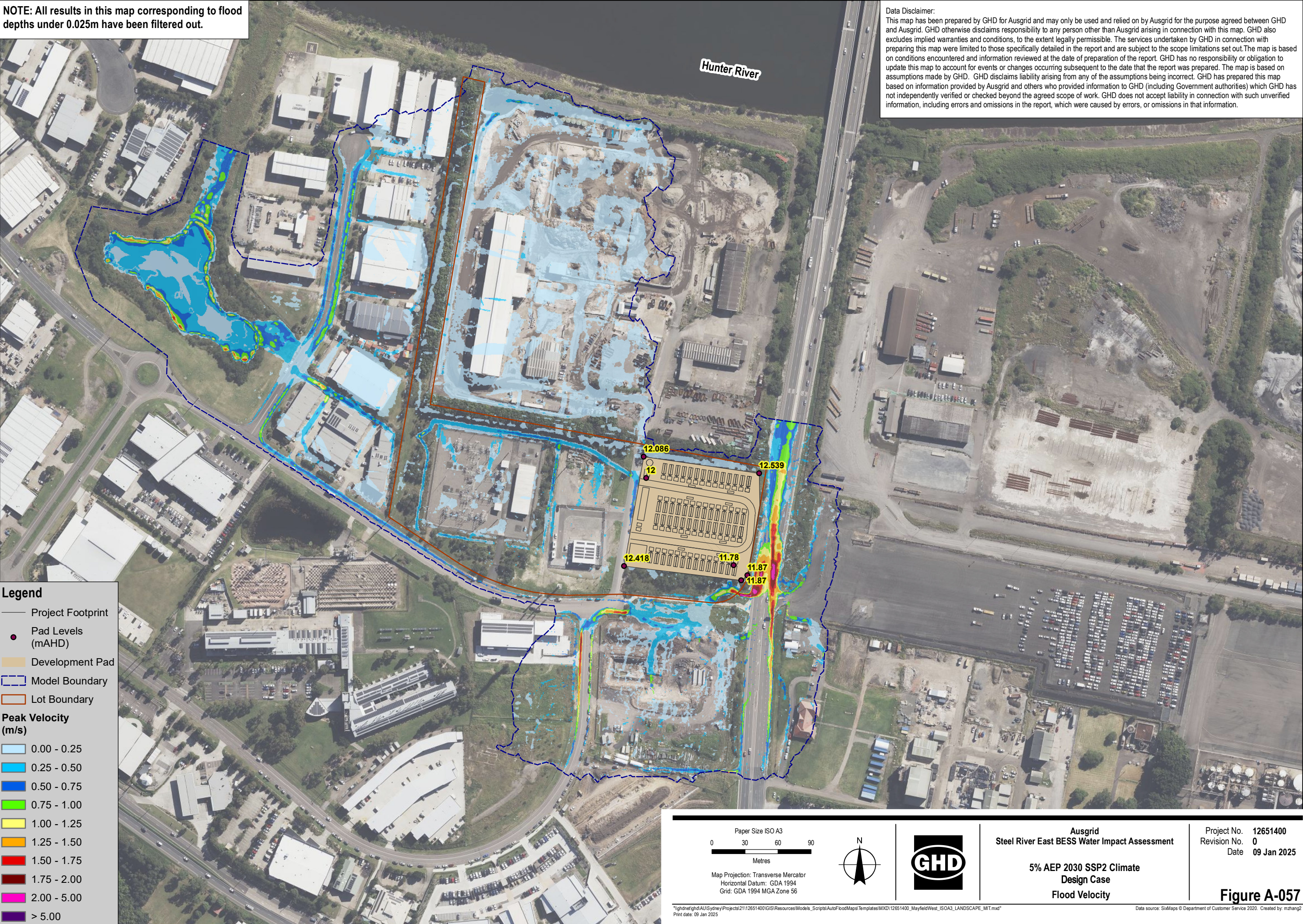
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00



Paper Size ISO A3

0

30

60

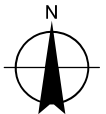
90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate

Design Case

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-057

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

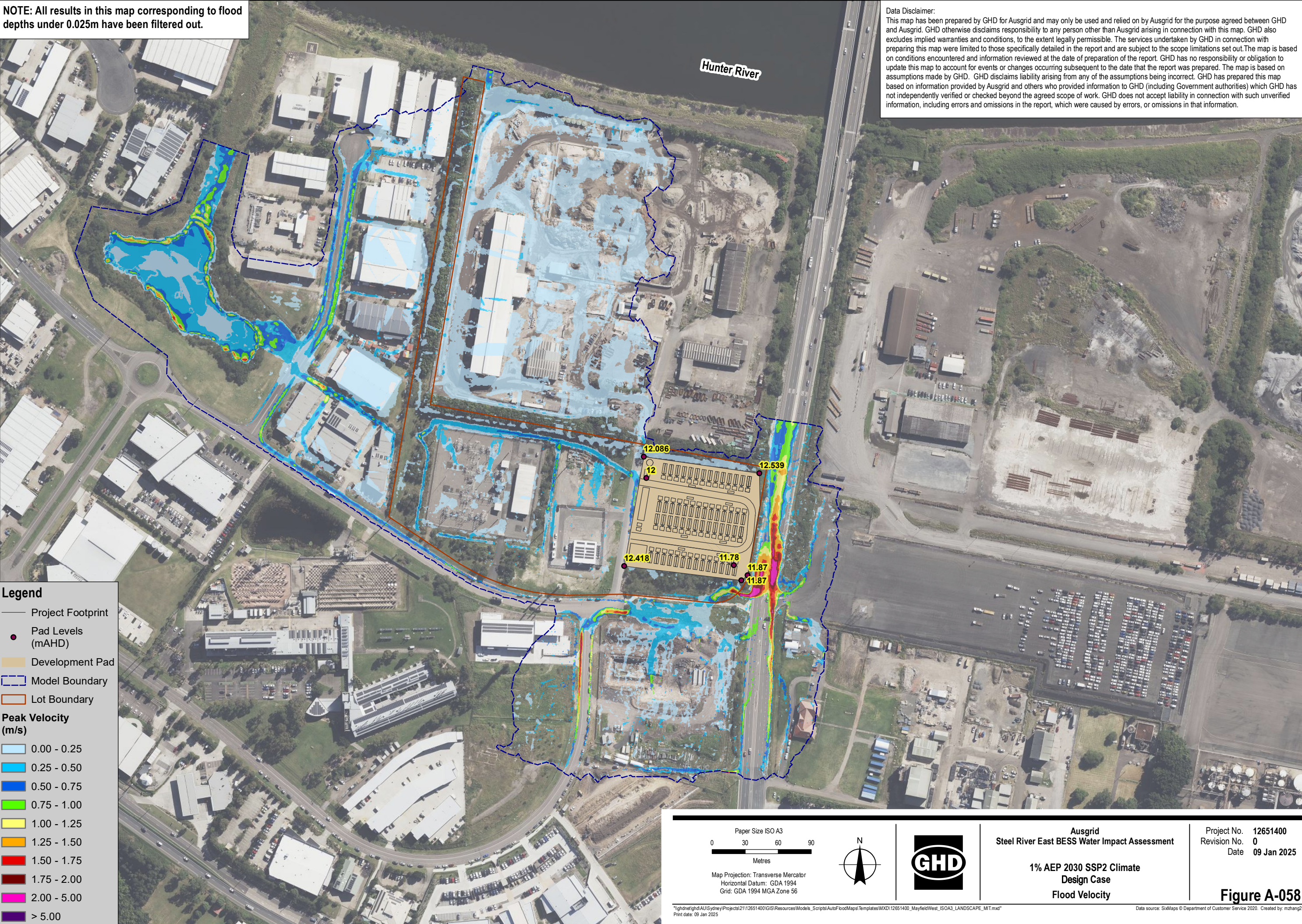
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2030 SSP2 Climate

Design Case

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-058

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

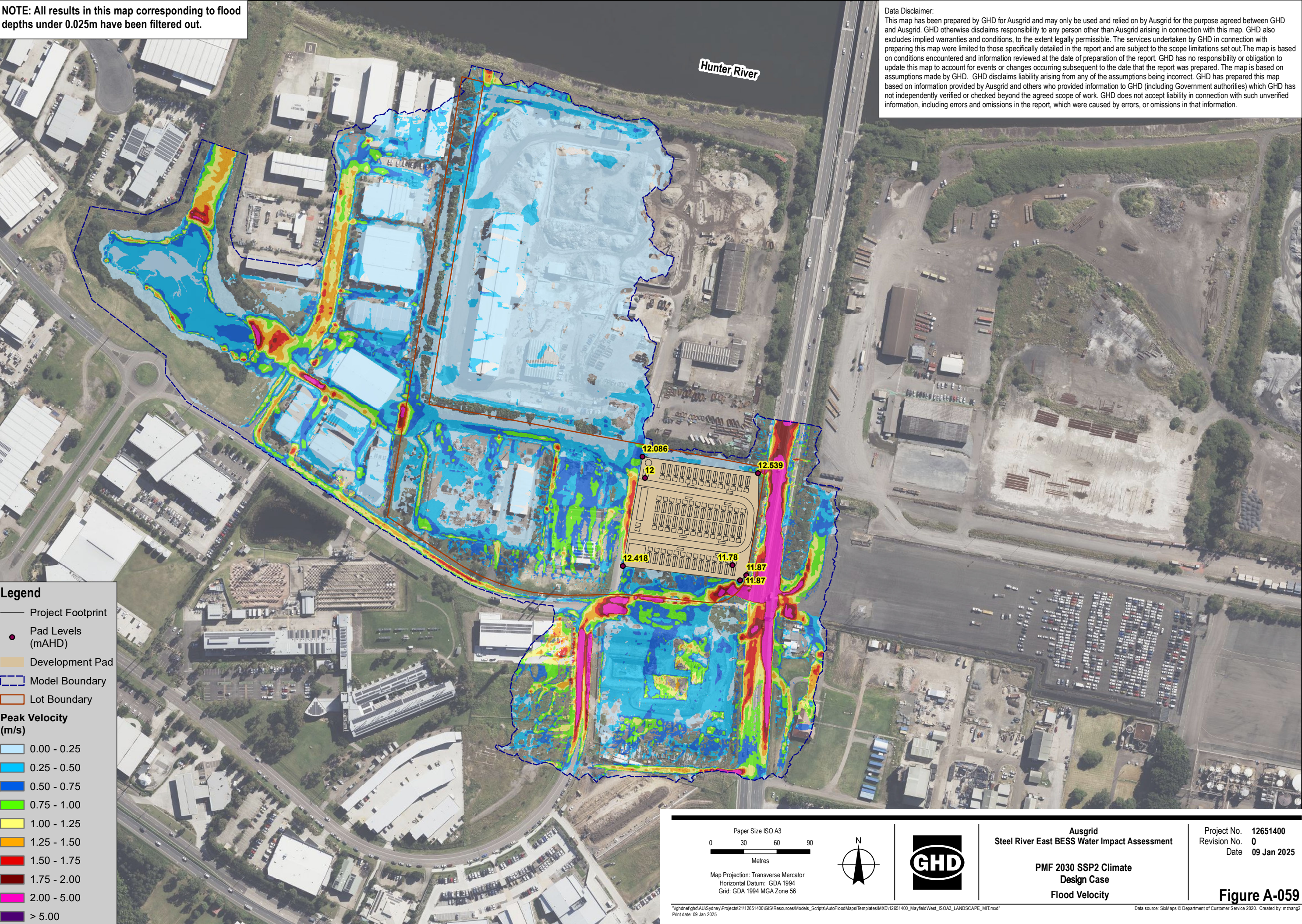
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00



Paper Size ISO A3

0

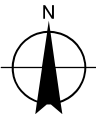
30

60

90

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

PMF 2030 SSP2 Climate
Design Case
Flood Velocity

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-059

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0

30

60

90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate

Design Case

Flood Velocity

Project No.

12651400

Revision No.

0

Date

09 Jan 2025

Figure A-060

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO_A3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: m.hang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

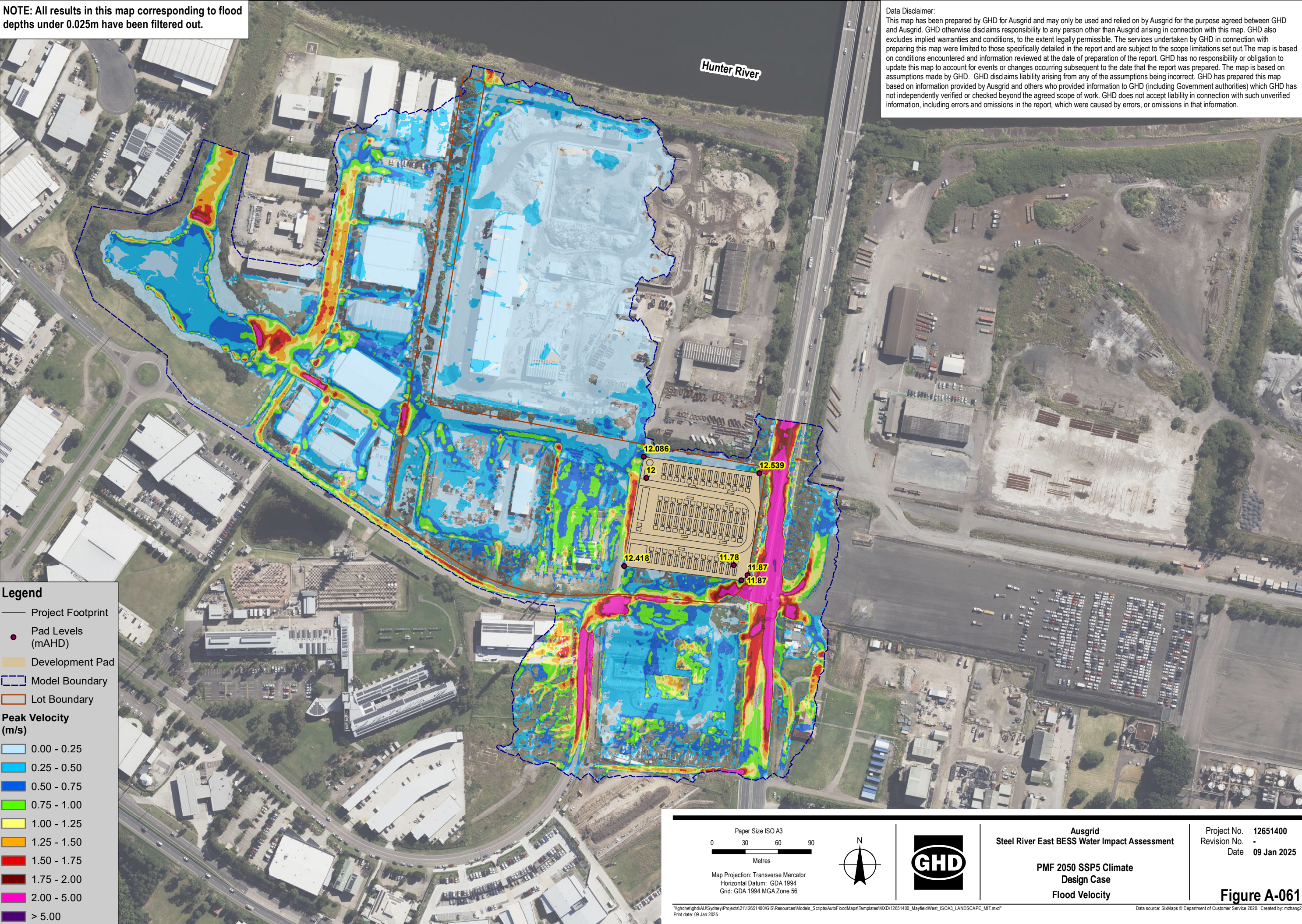
1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00



Paper Size ISO A3

0

30

60

90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate

Design Case

Flood Velocity

Project No. 12651400

Revision No. -

Date 09 Jan 2025

Figure A-061

*ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO A3_LANDSCAPE_MIT.mxd

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: m.hang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0

30

60

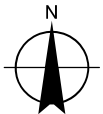
90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2080 SSP5 Climate

Design Case

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-062

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Peak Velocity (m/s)

0.00 - 0.25

0.25 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 1.25

1.25 - 1.50

1.50 - 1.75

1.75 - 2.00

2.00 - 5.00

> 5.00

Paper Size ISO A3

0

30

60

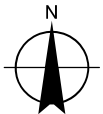
90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate

Design Case

Flood Velocity

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-063

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

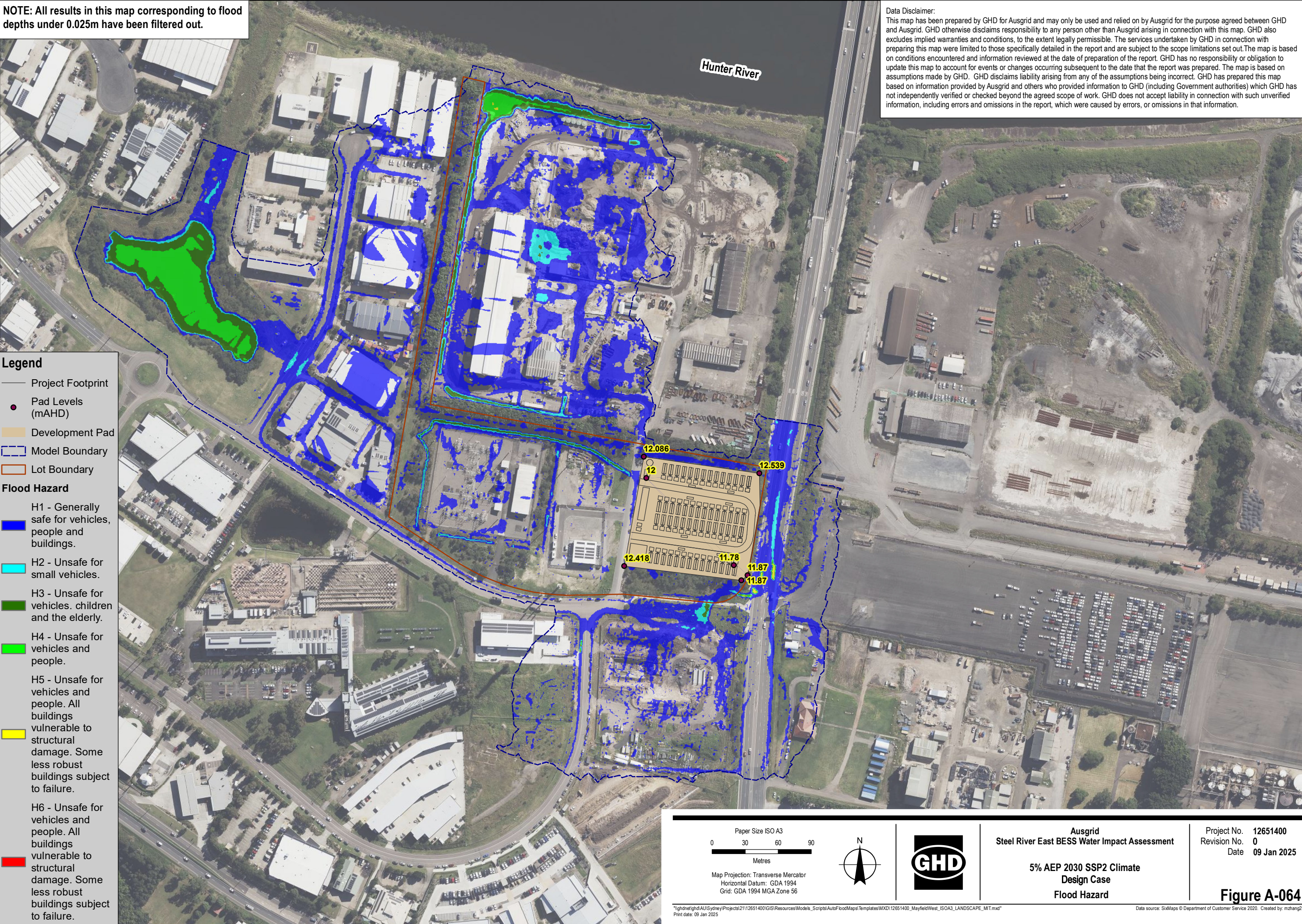
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate Design Case

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-064

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models\Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO A3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mchang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2030 SSP2 Climate Design Case

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-065

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models\Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mhang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

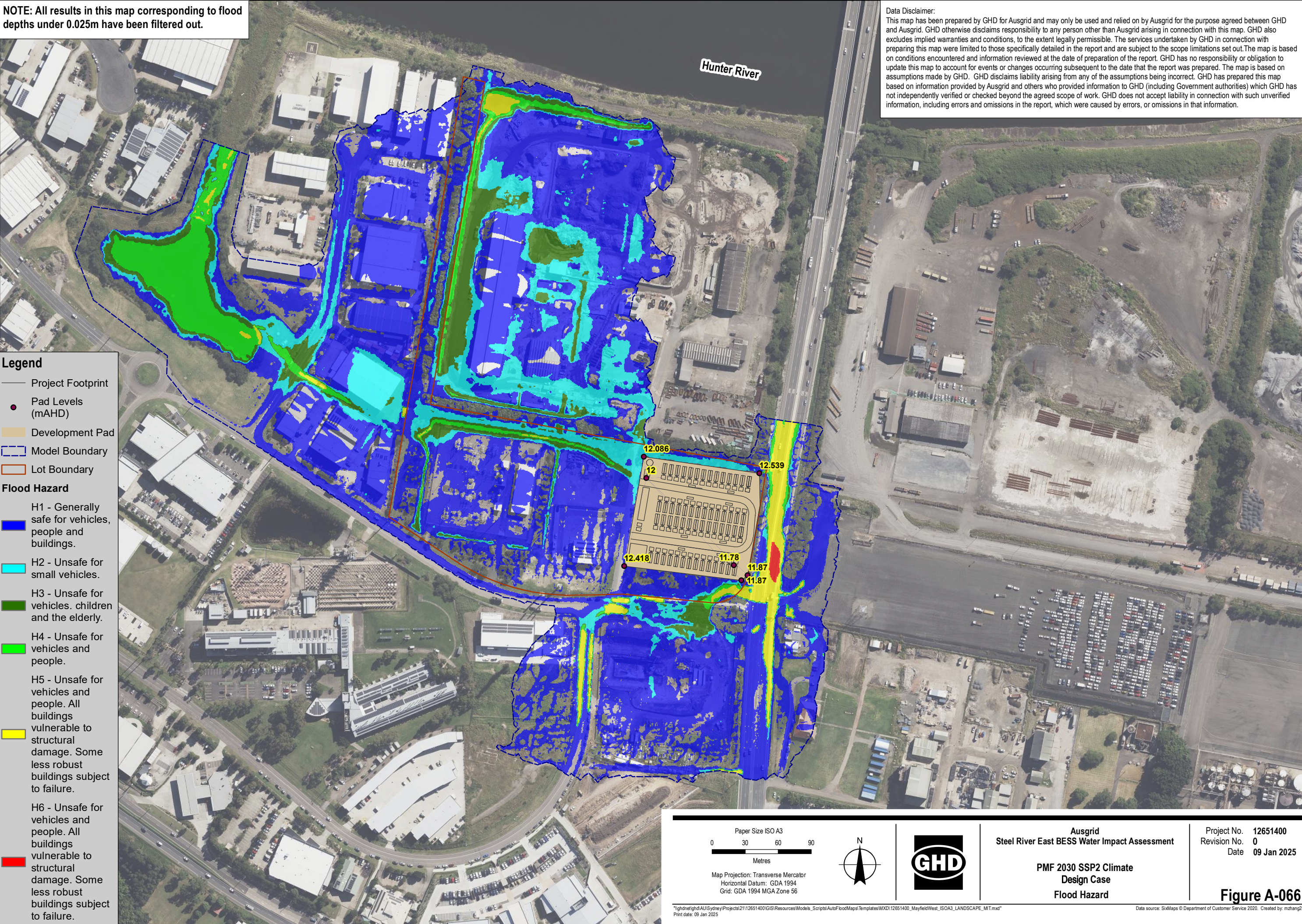
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2030 SSP2 Climate

Design Case

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-066

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mchang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

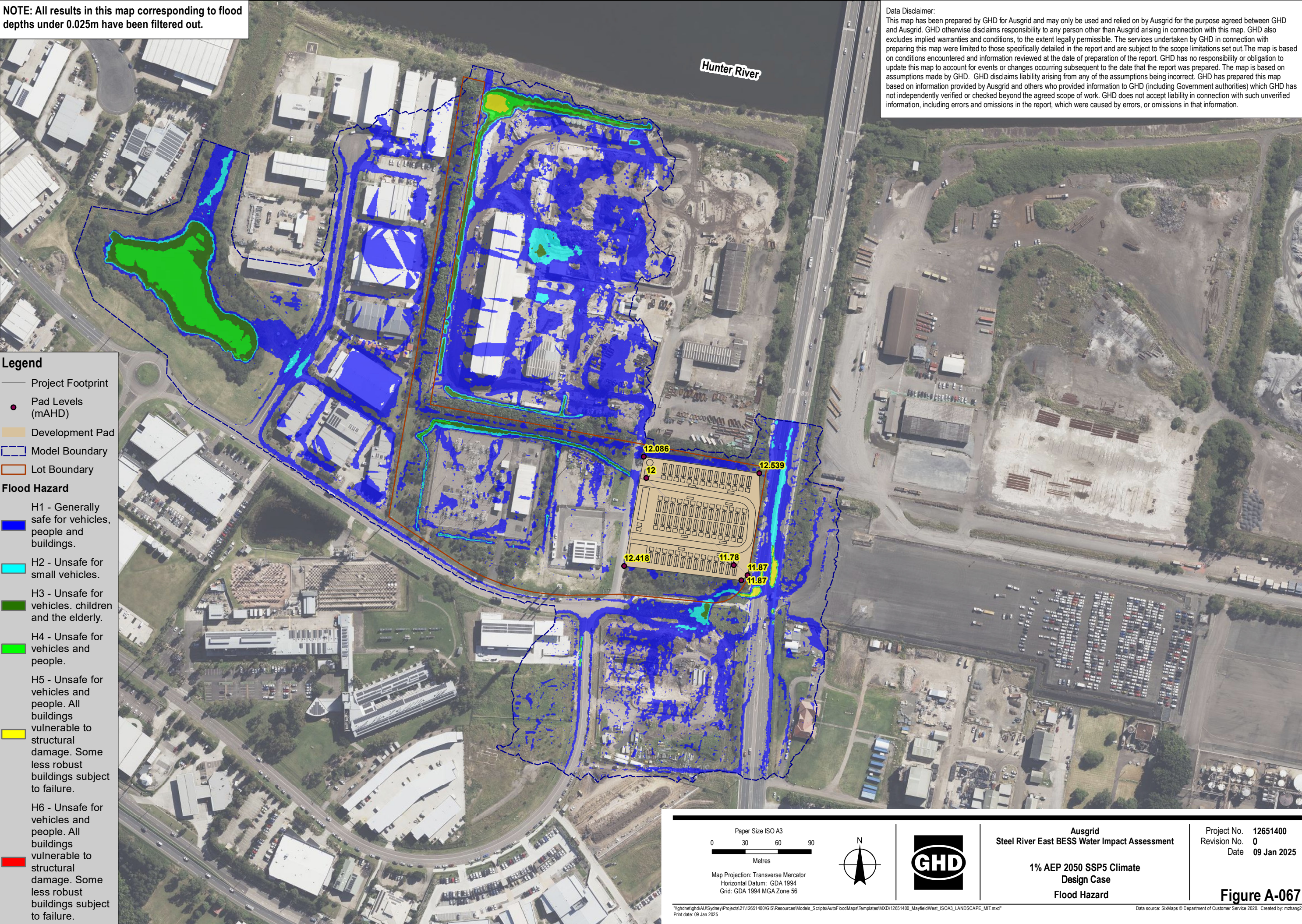
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate Design Case

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-067

"ghdnet\ghd\AU\Sydney\Projects\21112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO_A3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mchang2

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

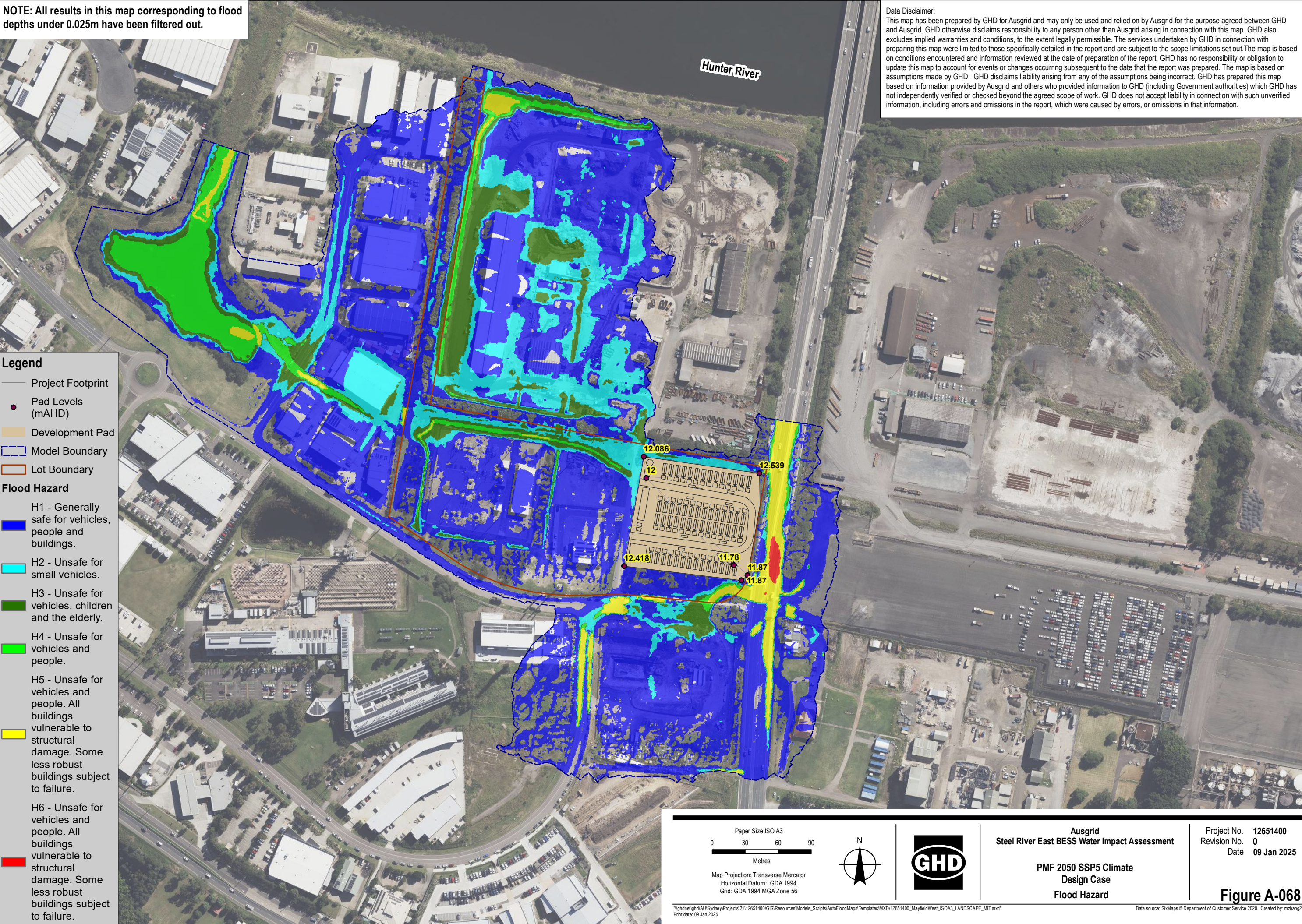
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

GHD

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate Design Case

Flood Hazard

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-068

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

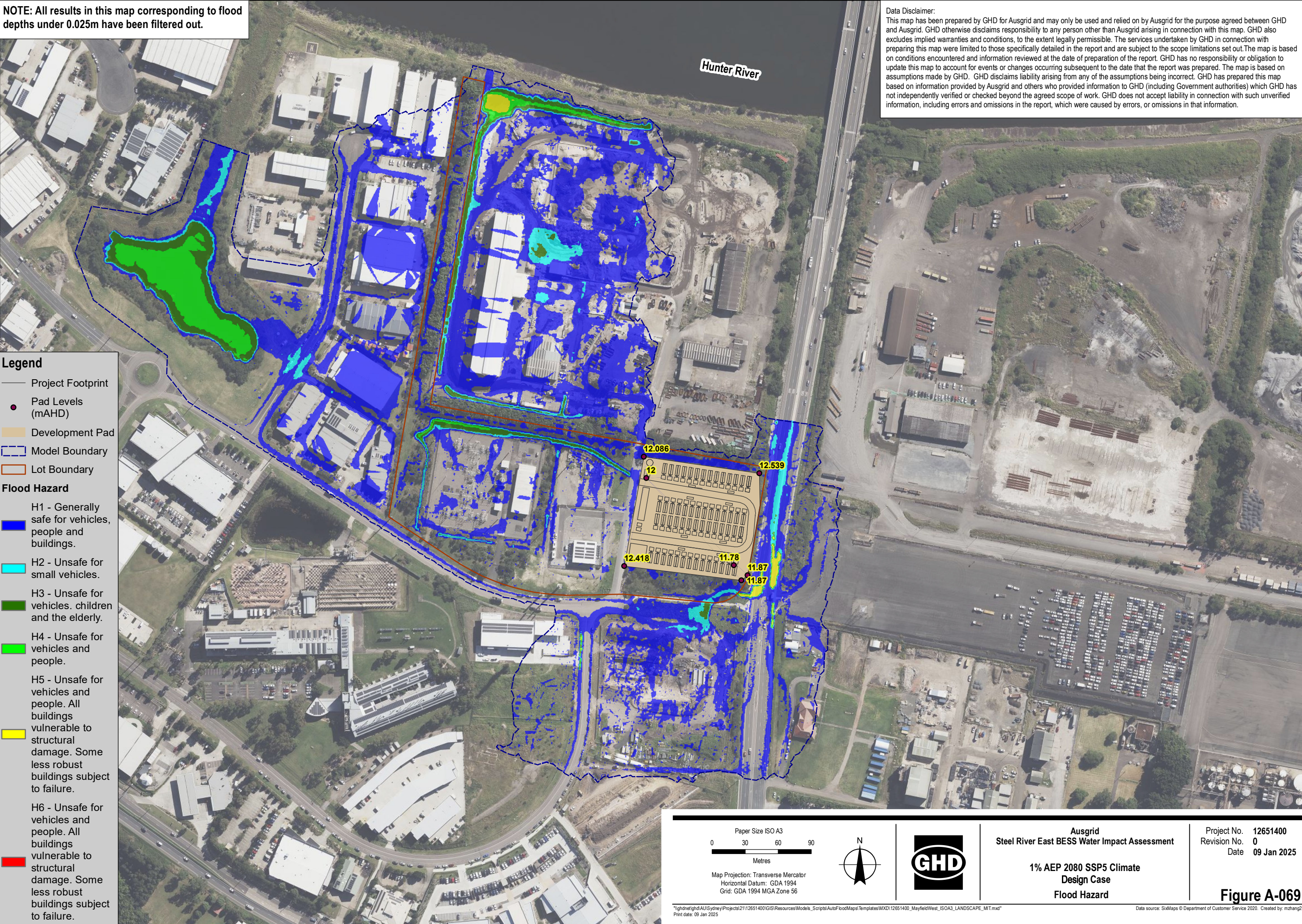
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

0

30

60

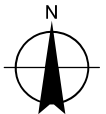
90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

1% AEP 2080 SSP5 Climate
Design Case
Flood Hazard

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-069

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Hazard

H1 - Generally safe for vehicles, people and buildings.

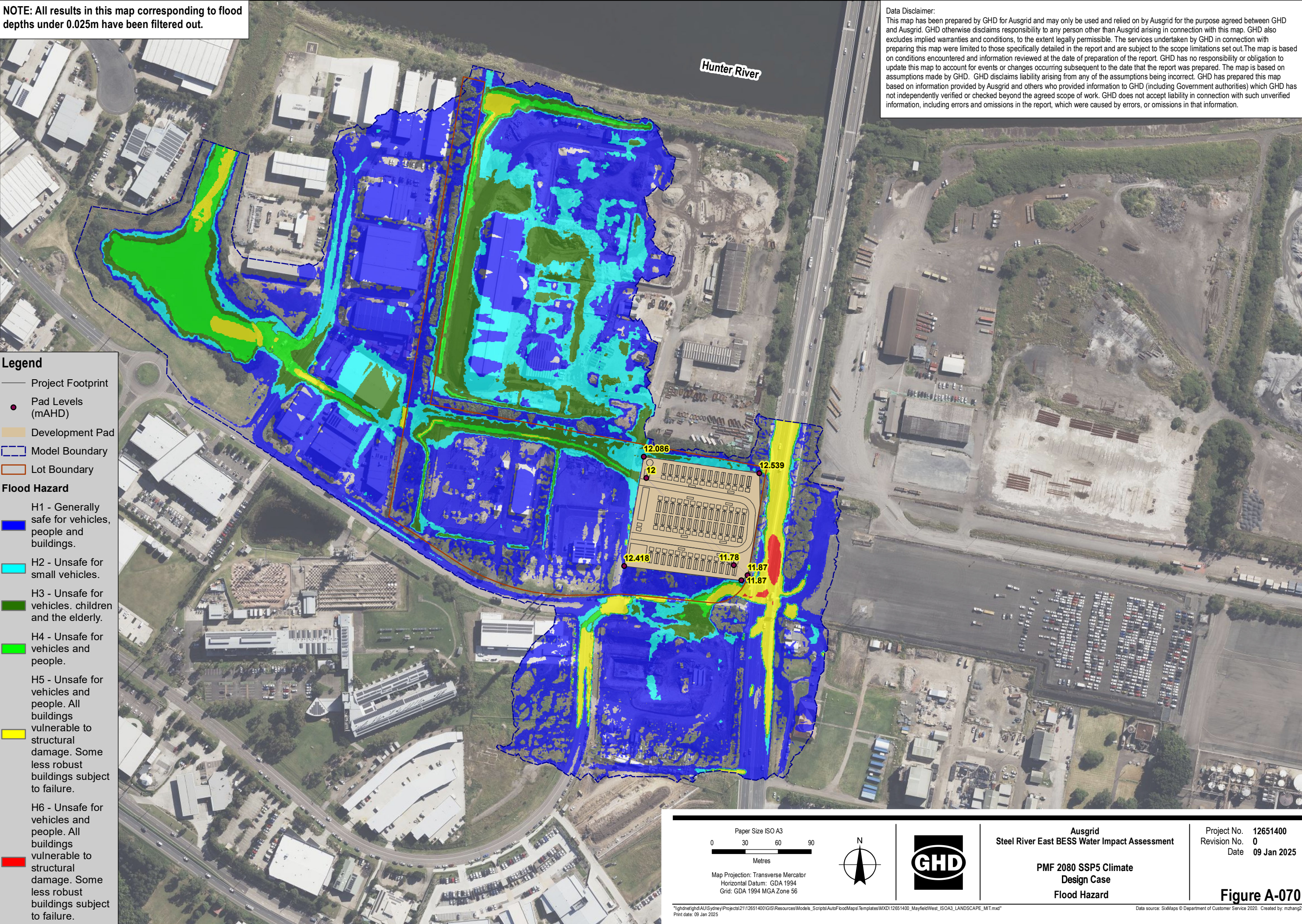
H2 - Unsafe for small vehicles.

H3 - Unsafe for vehicles, children and the elderly.

H4 - Unsafe for vehicles and people.

H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.

H6 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.



Paper Size ISO A3

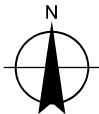
0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate
Design Case
Flood Hazard

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-070

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

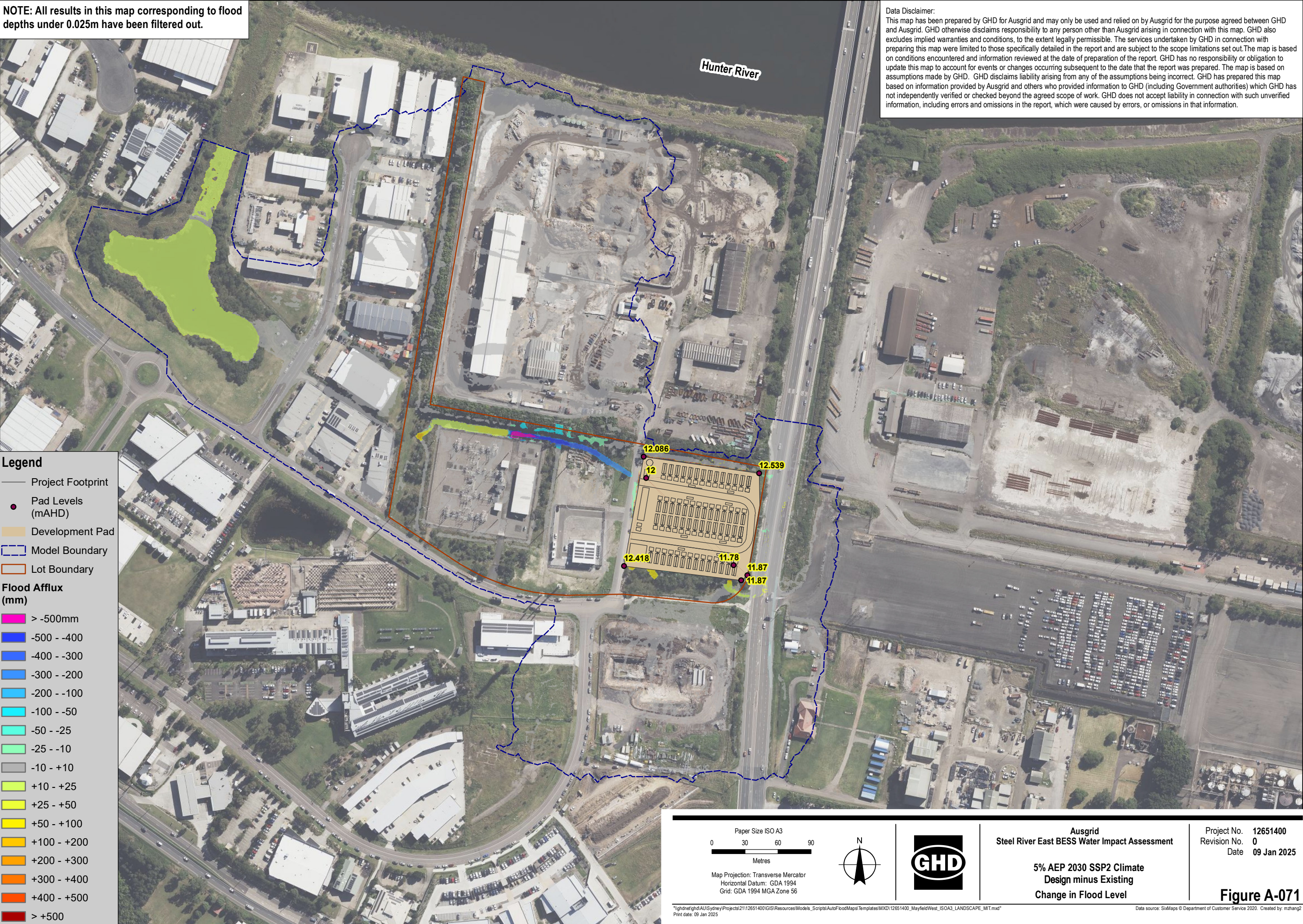
+100 - +200

+200 - +300

+300 - +400

+400 - +500

> +500



Paper Size ISO A3

0306090

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N



Ausgrid

Steel River East BESS Water Impact Assessment

5% AEP 2030 SSP2 Climate

Design minus Existing

Change in Flood Level

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-071

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

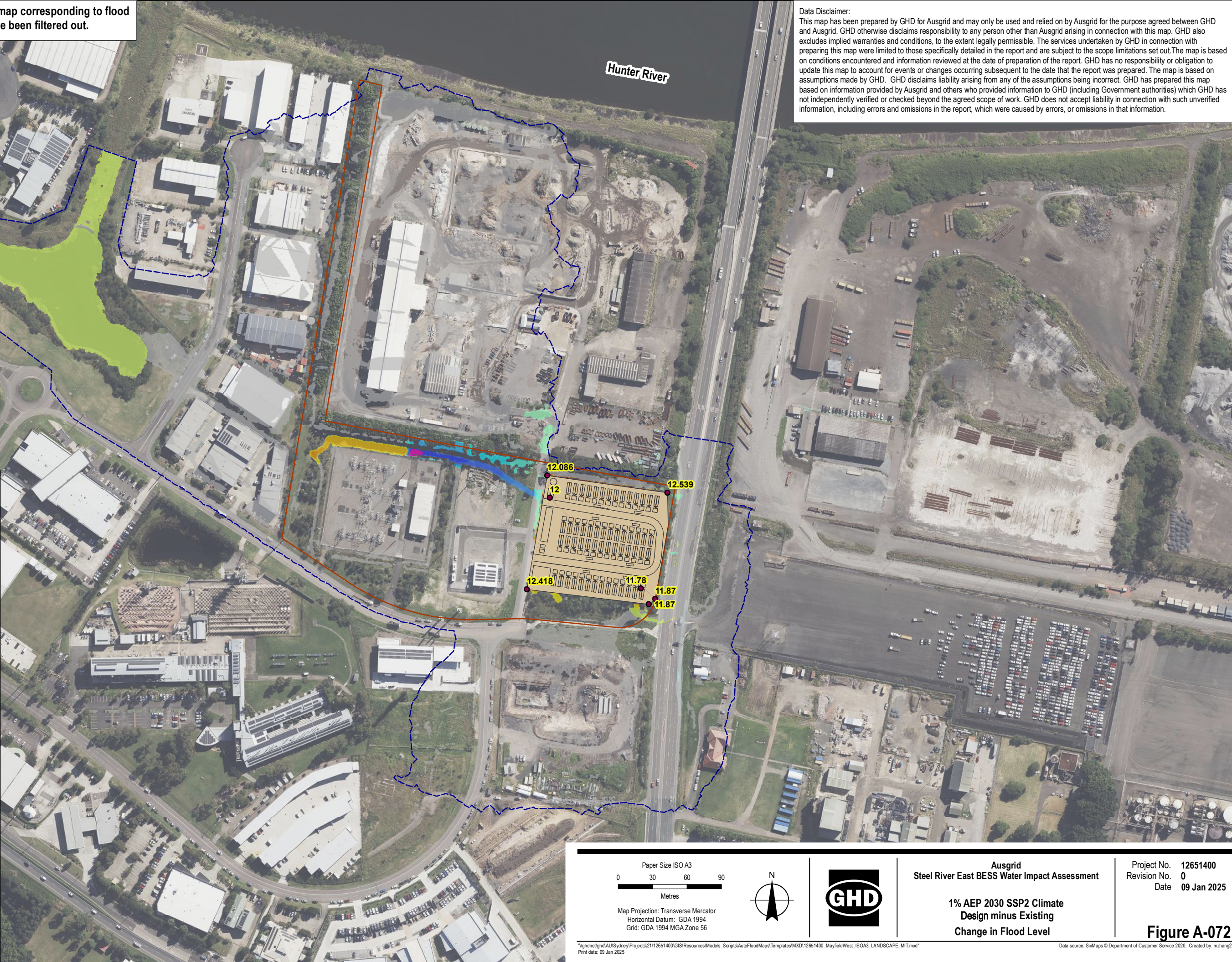
+100 - +200

+200 - +300

+300 - +400

+400 - +500

> +500



Paper Size ISO A3

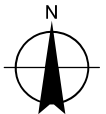
0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

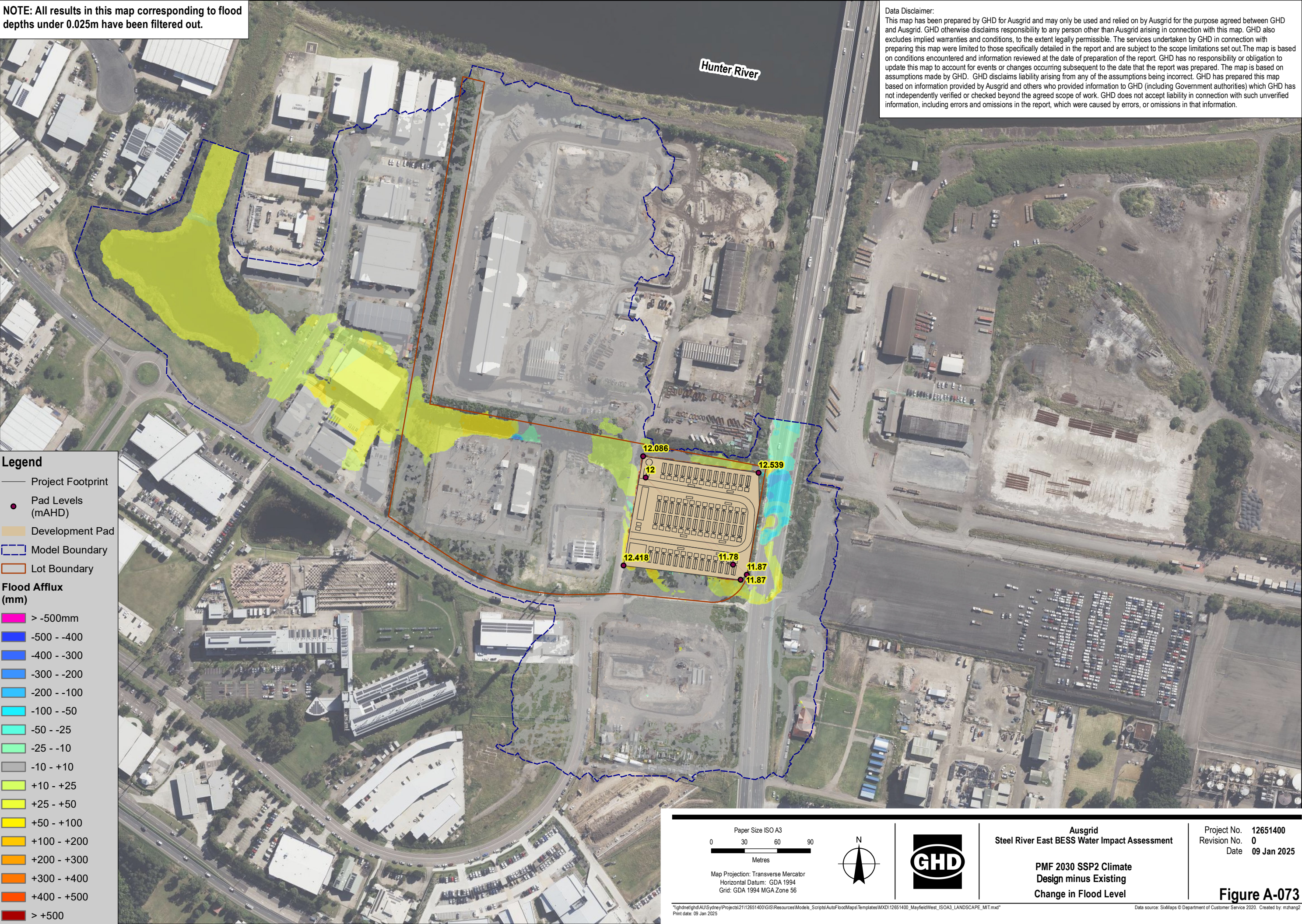
1% AEP 2030 SSP2 Climate
Design minus Existing
Change in Flood Level

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-072

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

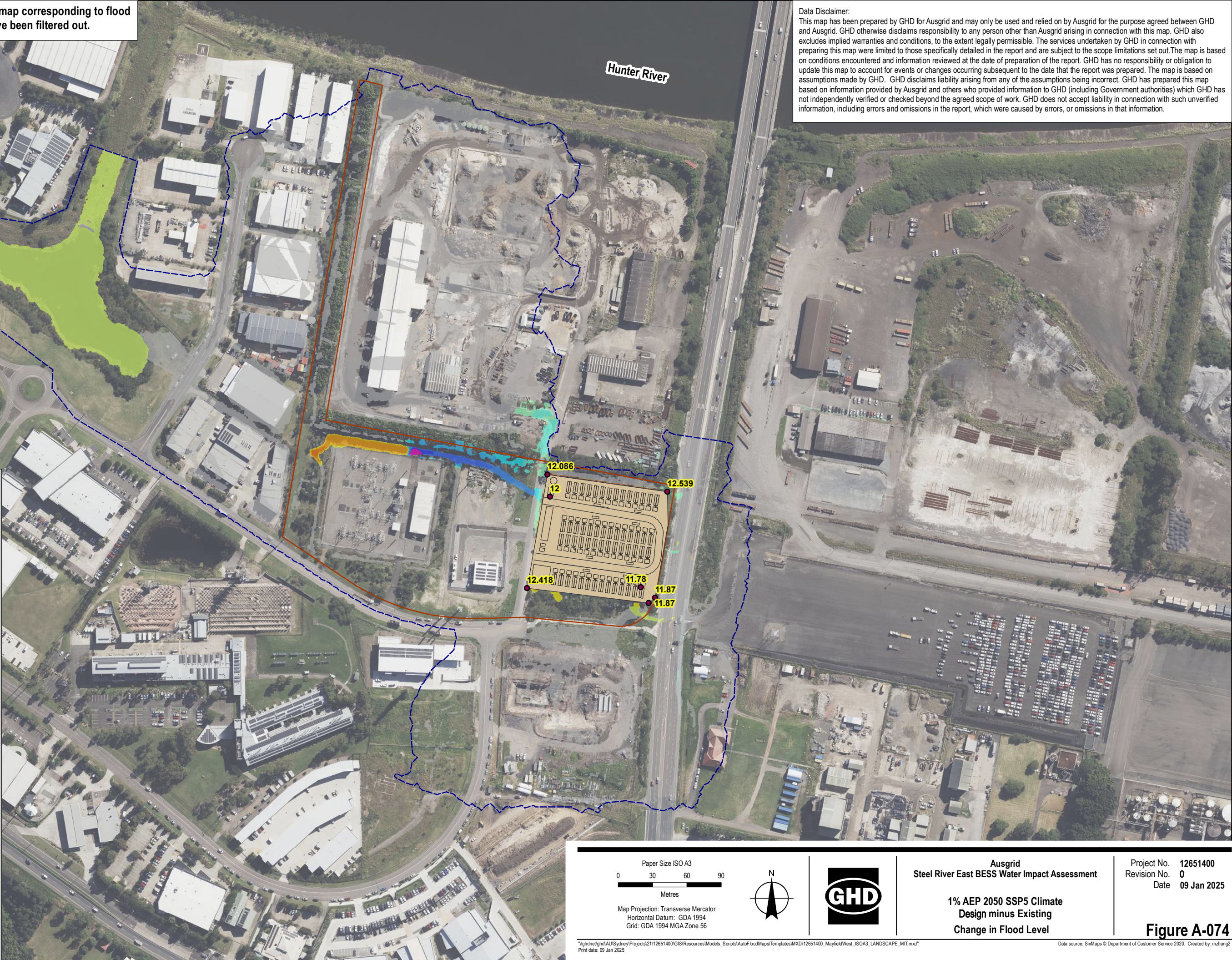
+100 - +200

+200 - +300

+300 - +400

+400 - +500

> +500



Paper Size ISO A3

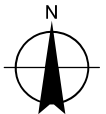
0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Ausgrid

Steel River East BESS Water Impact Assessment

1% AEP 2050 SSP5 Climate

Design minus Existing

Change in Flood Level

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-074

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
This map has been prepared by GHD for Ausgrid and may only be used and relied on by Ausgrid for the purpose agreed between GHD and Ausgrid. GHD otherwise disclaims responsibility to any person other than Ausgrid arising in connection with this map. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this map were limited to those specifically detailed in the report and are subject to the scope limitations set out. The map is based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this map to account for events or changes occurring subsequent to the date that the report was prepared. The map is based on assumptions made by GHD. GHD disclaims liability arising from any of the assumptions being incorrect. GHD has prepared this map based on information provided by Ausgrid and others who provided information to GHD (including Government authorities) which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report, which were caused by errors, or omissions in that information.

Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

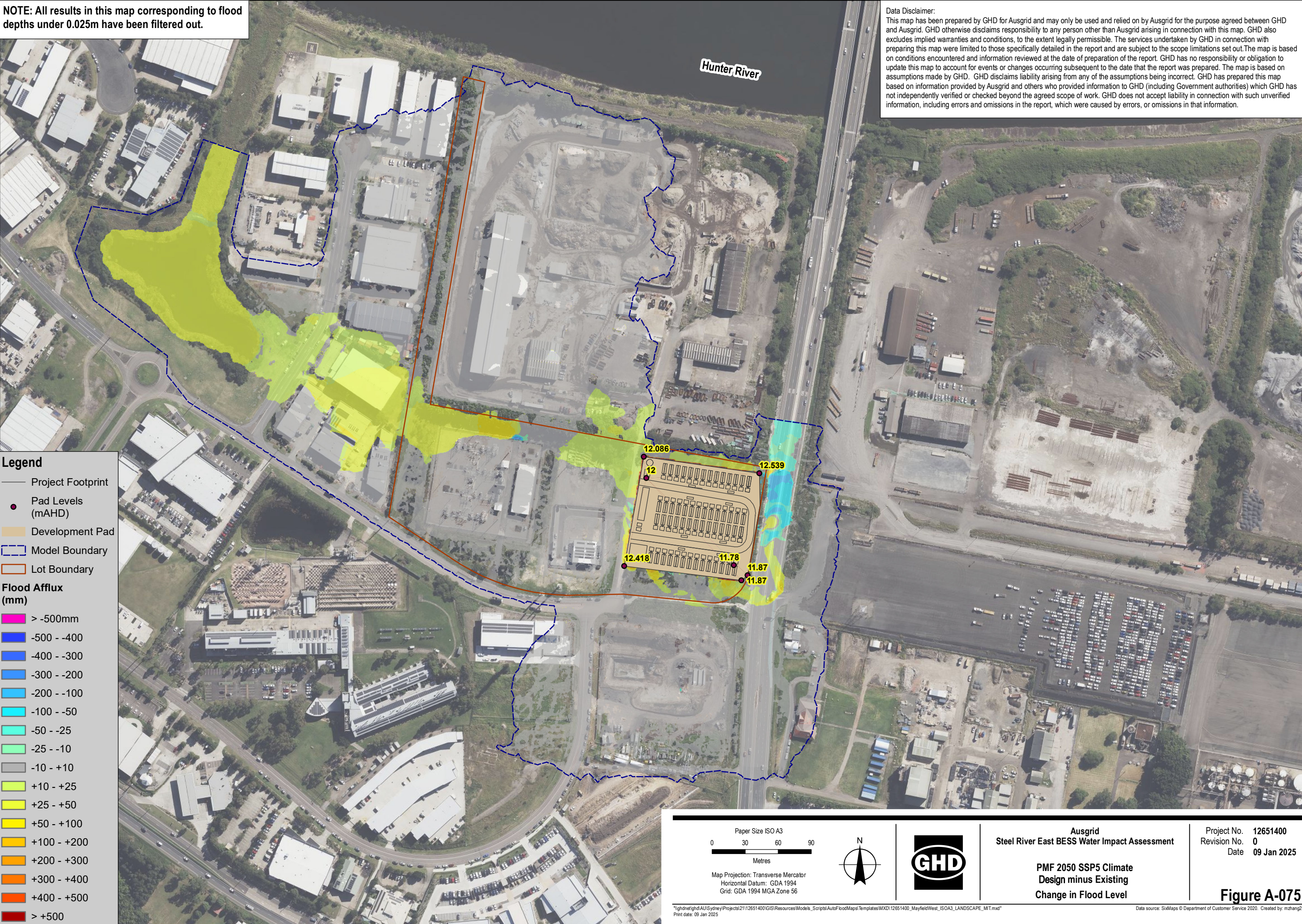
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+400 - +500

> +500

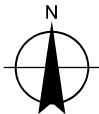


Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment

PMF 2050 SSP5 Climate
Design minus Existing
Change in Flood Level

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-075

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

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Legend

— Project Footprint

● Pad Levels (mAHD)

■ Development Pad

▭ Model Boundary

▭ Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

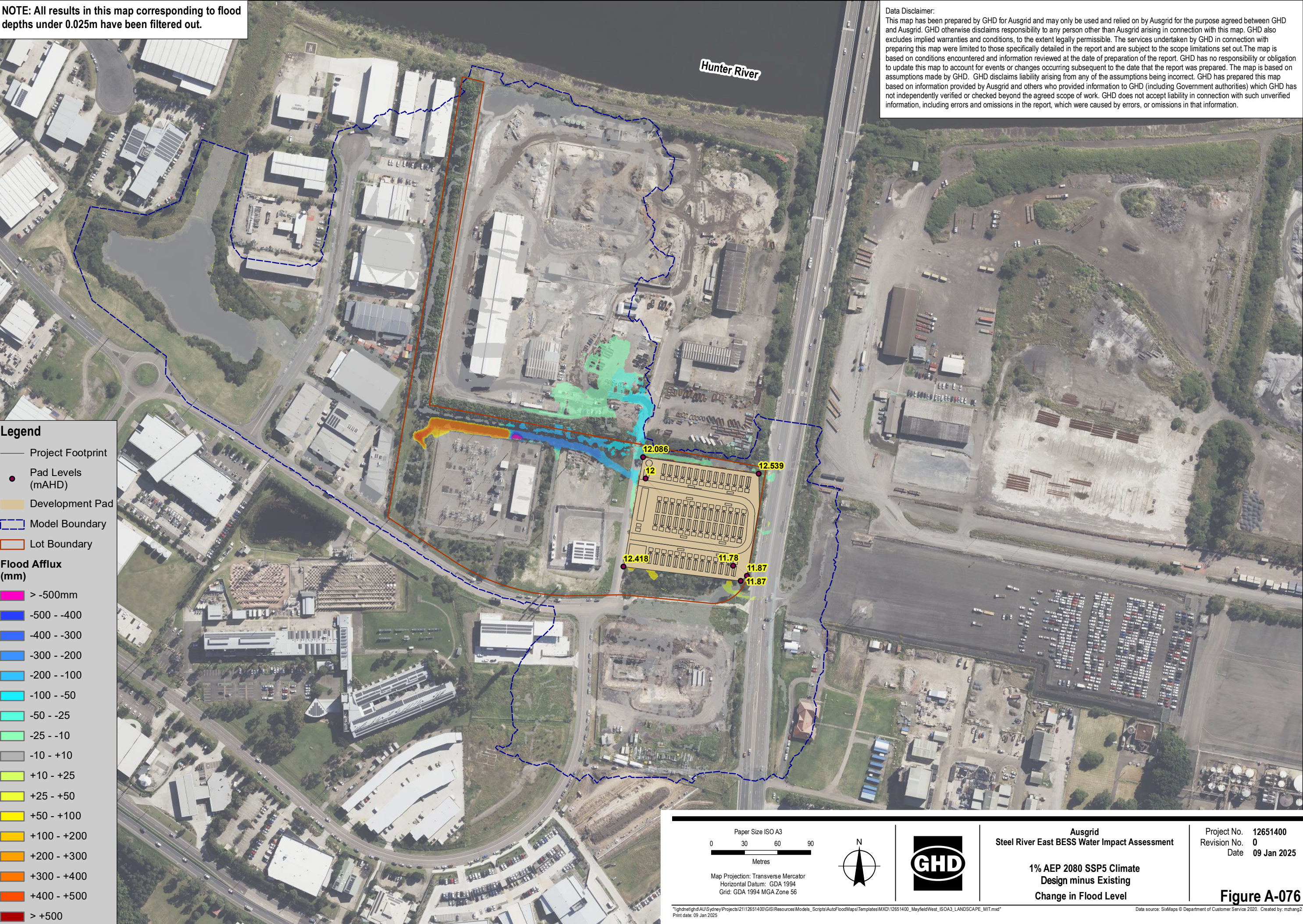
+100 - +200

+200 - +300

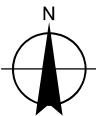
+300 - +400

+400 - +500

> +500



Paper Size ISO A3
0 30 60 90
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Ausgrid
Steel River East BESS Water Impact Assessment
1% AEP 2080 SSP5 Climate
Design minus Existing
Change in Flood Level

Project No. 12651400
Revision No. 0
Date 09 Jan 2025

Figure A-076

NOTE: All results in this map corresponding to flood depths under 0.025m have been filtered out.

Data Disclaimer:
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Legend

Project Footprint

Pad Levels (mAHD)

Development Pad

Model Boundary

Lot Boundary

Flood Afflux (mm)

> -500mm

-500 - -400

-400 - -300

-300 - -200

-200 - -100

-100 - -50

-50 - -25

-25 - -10

-10 - +10

+10 - +25

+25 - +50

+50 - +100

+100 - +200

+200 - +300

+300 - +400

+400 - +500

> +500



Paper Size ISO A3

0 30 60 90

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56

N

Ausgrid

Steel River East BESS Water Impact Assessment

PMF 2080 SSP5 Climate

Design minus Existing

Change in Flood Level

Project No. 12651400

Revision No. 0

Date 09 Jan 2025

Figure A-077

"ghdnet\ghd\AUS\sydney\Projects\12\112651400\GIS\Resources\Models_Scripts\AutoFloodMaps\Templates\MXD\12651400_MayfieldWest_ISO3_LANDSCAPE_MIT.mxd"

Print date: 09 Jan 2025

Data source: SixMaps © Department of Customer Service 2020. Created by: mzhang2

Appendix B

Other agency requirements

Table B.1 *Other agency requirements*

Agency	Requirements	Section
DPIRD Fisheries	The EIS will also quantify and identify sources of water required for construction and operation of the project. The project will engage with appropriate stakeholders to determine the most appropriate options while minimising impacts on local water users.	5.4
DCCEEW Water Group	A detailed and consolidated site water balance.	5.4.3
	Description of all works/activities that may intercept, extract, use, divert or receive surface water and/or groundwater. This includes the description of any development, activities or structures that will intercept, interfere with or remove groundwater, both temporary and permanent.	5.2, 5.3
	Details of all water take for the life of the project and post closure where applicable. This is to include water taken directly and indirectly, and the relevant water source where water entitlements are required to account for the water take. If the water is to be taken from an alternative source confirmation should be provided by the supplier that the appropriate volumes can be obtained.	5.4
	Details of Water Access Licences (WALs) held to account for any take of water where required, or demonstration that WALs can be obtained prior to take of water occurring. This should include an assessment of the current market depth where water entitlement is required to be purchased. Any exemptions or exclusions to requiring approvals or licenses under the Water Management Act 2000 should be detailed by the proponent.	5.4
	A description of groundwater conditions that provides an understanding of groundwater level across the site under a range of wet and dry conditions.	4.7
	Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, groundwater dependent ecosystems, and ground water levels; including measures proposed to reduce and mitigate these impacts.	5
	Proposed surface and groundwater monitoring activities and methodologies.	6
	Identification and impact assessment of all works/activities located on waterfront land including an assessment against Guidelines for Controlled Activities on Waterfront Land (NRAR 2018).	3.2.6
	Assessment of project against relevant policies and guidelines.	3
City of Newcastle (CN) Council	The SR identifies that a Surface Water and Flooding Assessment will be completed as part of the Environmental Impact Statement (EIS) for the development. CN Council recommends the assessment has regard to Sections B1(b) Flood Management (post 2019) studies, C4 Stormwater, C5 Soil Management, and associated technical manuals of the NDCP 2023.	5.1, 5.2
DCCEEW Biodiversity, Conservation and Science Group (BCS)	The EIS must map the following features relevant to water and soils including: – Acid Sulfate Soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map). – Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method). – Wetlands as described in s4.2 of the Biodiversity Assessment Method. – Groundwater. – Groundwater dependent ecosystems. – Proposed intake and discharge locations.	4
	The EIS must describe background conditions for any water resource likely to be affected by the project, including: – Existing surface and groundwater. – Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations. – Water Quality Objectives (as endorsed by the NSW Government) including groundwater as appropriate that represent the community's uses and values for the receiving waters.	4

Agency	Requirements	Section
	Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.	
	The EIS must assess the impacts of the project on water quality, including: - The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the project protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction. - Identification of proposed monitoring of water quality.	5
	The EIS must assess the impact of the project on hydrology, including: - Water balance including quantity, quality and source. - Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas. - Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems. - Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches). - Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water. - Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options. - Identification of proposed monitoring of hydrological attributes.	5
	The EIS must map the following features relevant to flooding as described in the NSW 2023 Flood Risk Management Manual including: - Flood prone land. - Flood planning area, the area below the flood planning level. - Hydraulic categorisation (floodways and flood storage areas).	4.9.1, 4.9.2
	The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100-year flood levels and the probable maximum flood, or an equivalent extreme event.	5.1
	The EIS must model the effect of the proposed project (including fill) on the flood behaviour under the following scenarios: Current flood behaviour for a range of design events as identified in 11 above. This includes the 1 in 200 and 1 in 500-year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.	5.1
	Modelling in the EIS must consider and document: - The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood. - Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories. - Relevant provisions of the NSW 2023 Flood Risk Management Manual.	5.1
	The EIS must assess the impacts on the proposed development on flood behaviour, including: - Whether there will be detrimental increases in the potential flood affection of other properties, assets and infrastructure. - Consistency with Council floodplain risk management plans. - Compatibility with the flood hazard of the land.	5.1

Agency	Requirements	Section
	– Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land. – Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site. – Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses. – Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council. – Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council. – Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES. – Any impacts the development may have on the social and economic costs to the community as consequence of flooding.	
	The EIS must describe the potential effects of coastal processes and hazards (within the meaning of the Coastal Management Act 2016), including sea level rise and climate change: – On the proposed development. – Arising from the proposed development.	5.1
	The EIS must consider have regard to any certified Coastal Management Program (or Coastal Zone Management Plan) and be consistent with the management objectives described in the Coastal Management Act 2016 and development controls for coastal management areas mapped under the State Environmental Planning Policy (Resilience and Hazards) 2021.	5.1

Appendix C

Flood Information Certificate

Additional information for the holders of Flood Information Certificates

This information explains the terms used in City of Newcastle's (CN) Flood Information Certificates and provides some basic information on CN's requirements for future development of flood prone land.

Compliance with these requirements in the Development Control Plan does not guarantee approval, however, in most cases, the flood issues can be resolved by adhering to these guidelines.

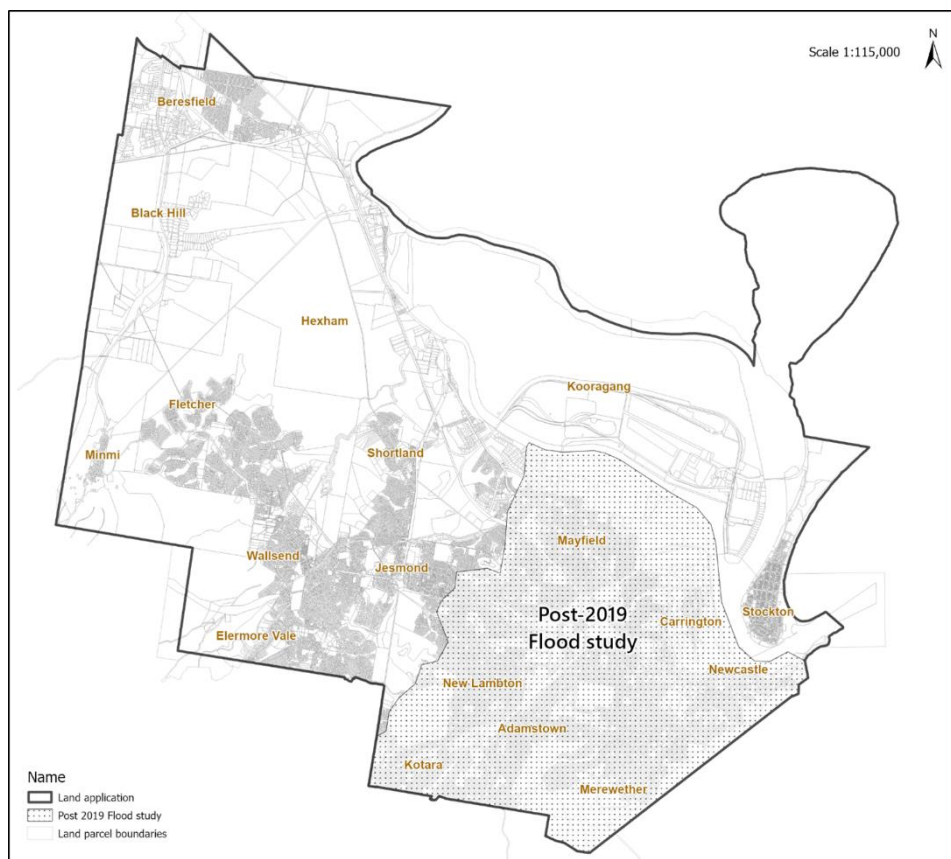
The following information applies to local catchment (flash) flooding only. This is expected to be the critical flood for most areas studied in the 2023 Throsby, Styx and Cottage Creek flood study. For information relating to ocean and riverine flooding please refer to Section B1(a) of the Newcastle Development Control Plan 2023.

FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS

FLOOD CERTIFICATE NOTES

GENERAL:

- The information presented in this Flood Information Certificate ("the Certificate") relates to the Newcastle City-wide Floodplain Risk Management Plan and the Newcastle Development Control Plan, which have been developed in accordance with the principles of the NSW Government's Flood Prone Land Policy.
- CN's flood information is compiled from a composite of data. The variability of rainfall itself is a major factor in the uncertainty of flood information and accordingly, this certificate is only an estimate of real flood characteristics. Any particular flood is likely to be different to the conditions described in this certificate.
- CN acknowledges that its flood information is incomplete and varies in accuracy, however it is the best available to CN at the time of issue.
- Where information is presently not known, it is denoted by "unknown".
- From time to time, on-going research and studies will replace or add to CN's flood information. Accordingly, the information in the Certificate is not warranted after the day of issue.
- Should you disagree with CN's assessment of the flood behaviour, you may conduct your own investigations or enquiries and submit them to CN for consideration. Where revision of this assessment is warranted, CN is committed to making such amendments to its information.
- This document applies to properties within the Post-2019 Flood Study area (see below).



FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS



EXPLANATIONS FOR TERMS USED IN THE FLOOD INFORMATION CERTIFICATE

Is any part of the site affected by a Floodway?

Generally, where a property is affected by a floodway, we will provide you with additional information on where we believe the floodway to be by way of a map. In rare circumstances it may be possible to redirect a floodway subject to appropriate engineering advice. You should start by discussing the matter with a Development Officer from CN.

A **Floodway** is a pathway taken by major discharges of floodwaters, the obstruction or partial obstruction of which would cause a significant redistribution of floodwaters, or a significant increase in flood levels. Floodways are often aligned with existing or historic natural channels or watercourses but can form elsewhere in the floodplain.

Section B1(b) of Newcastle DCP 2023 states:

"No building or structure can be built, and no land can be filled with any materials in areas identified as floodways, except for small changes to ground levels that do not significantly change the flow patterns for:

- a) roads*
- b) parking*
- c) below ground structures*
- d) landscaping.*

Where dividing fences across floodways are unavoidable, they are constructed only of open type fencing that does not restrict the flow of flood waters and are resistant to blockage. New development is designed to avoid fences in floodways."

Is any part of the site affected by a Flood Storage Area?

Where a property is wholly affected by a Flood Storage Area, we will answer "yes" to this question on the Certificate. Where a property is partly affected, we will provide additional information by way of a map.

Flood Storage Area is an area where flood water accumulates and the displacement of that floodwater will cause a significant redistribution of floodwaters, or a significant increase in flood levels, or a significant increase in downstream flood frequency. Flood storage areas are often aligned with floodplains and are usually characterised by deep and slow-moving floodwater.

Section B1(b) of Newcastle DCP 2023 states:

"Not more than 20% of the area of any development site in a flood storage area is filled. The remaining 80% is generally developed allowing for underfloor storage of floodwater by the use of suspended floor techniques such as pier and beam construction.

Where a development is proposing to build over more than 20% of the site area, the portion of the structure being suspended is to have a floor level at the FPL as a minimum. As part of the structure's design, it must allow water to flow freely into and out of the underfloor area and must not be restricted by solid cladding or similar around the perimeter of the structure below the floor level."*

* FPL is the Flood Planning Level which is explained further below.

FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS



1% Annual Exceedance Probability (AEP) event level:

The 1% AEP event is a flood event that has a 1 in 100 chance of being exceeded in any one year. Conceptually, it is similar to a "1 in 100 year" event, except that the term "1 in 100 years" conveys the notion that the event is definitely going to happen in a 100-year time frame, and will only occur once in that time frame. In fact, a "1 in 100 year" event has a 67% probability of occurring once in any nominate hundred-year period.

1% AEP in 2050 event level:

The 1% AEP in 2050 event is a modelled flood event in the Throsby, Styx and Cottage Creek Flood Study (Rhelm 2023) simulating a 1% AEP event as it would occur in 2050 within a RCP8.5 climate scenario. The model uses a 0.5% AEP rainfall event as a proxy for rainfall intensification due to climate change and a 0.4 metre sea level rise.

In 2023, CN adopted the 1% Annual Exceedance Probability event in 2050 as the Defined Flood Event for flood planning purposes to improve community resilience to climate change impacts. The Defined Flood Event is the flood event selected as the general standard for the management of flooding to development.

Levels are reduced to the Australian Height Datum. This means that the quoted levels are heights above sea level. They can be compared to ground levels determined by a surveyor using the same datum to ascertain the likely flood depth.

In general, the minimum requirement for development of flood prone land is to set floor levels of all occupiable rooms of all buildings not lower than above the **Flood Planning Level (FPL)**. The Flood Planning Level is the peak flood level for the Defined Flood Event **plus** the appropriate freeboard (usually, but not always 500mm, depending on the circumstances) to account for uncertainty, wave action, and model error.

Section B1(b) of Newcastle DCP 2023 states:

"Floor levels of all occupiable rooms of all buildings are not set lower than the FPL."

"Garage floor levels are no lower than the 1% 2050 AEP event. However, it is recognised that in some circumstances this may be impractical due to vehicular access constraints. In these cases, garage floor levels are as high as practicable."

"Basement garages may be acceptable where all potential water entry points are at or above the probable maximum flood (PMF), excepting that vehicular entry points can be at the FPL. In these cases, explicit points of refuge are accessible from the carpark in accordance with the controls for risk to life set out below."

"Electrical fixtures such as power points, light fittings and switches are sited above the FPL unless they are on a separate circuit (with earth leakage protection) to the rest of the building."

"Swimming pools are to be located to ensure they are not inundated from minor flooding events. Electrical connections and fixtures around swimming pools are to be sited at the FPL."

"Where parts of the building are proposed below the FPL, they are constructed of water-resistant materials."

FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS

Flood Hazard Thresholds

Flood Hazard Thresholds provide generalised qualitative measures of the relative vulnerability of people, vehicles, and buildings based on the velocity and depth of floodwaters. These thresholds and their effects on people and property are derived from research (Smith, Davey & Cox 2014*) and have been adopted for use in Department of Planning and Environment's *Flood risk management manual* and Geoscience Australia's *Australian Rainfall and Runoff 2019*.

These Flood Hazard Thresholds are used in NDCP 2023 to apply appropriate development controls to manage flood risks arising from development in flood affected areas.

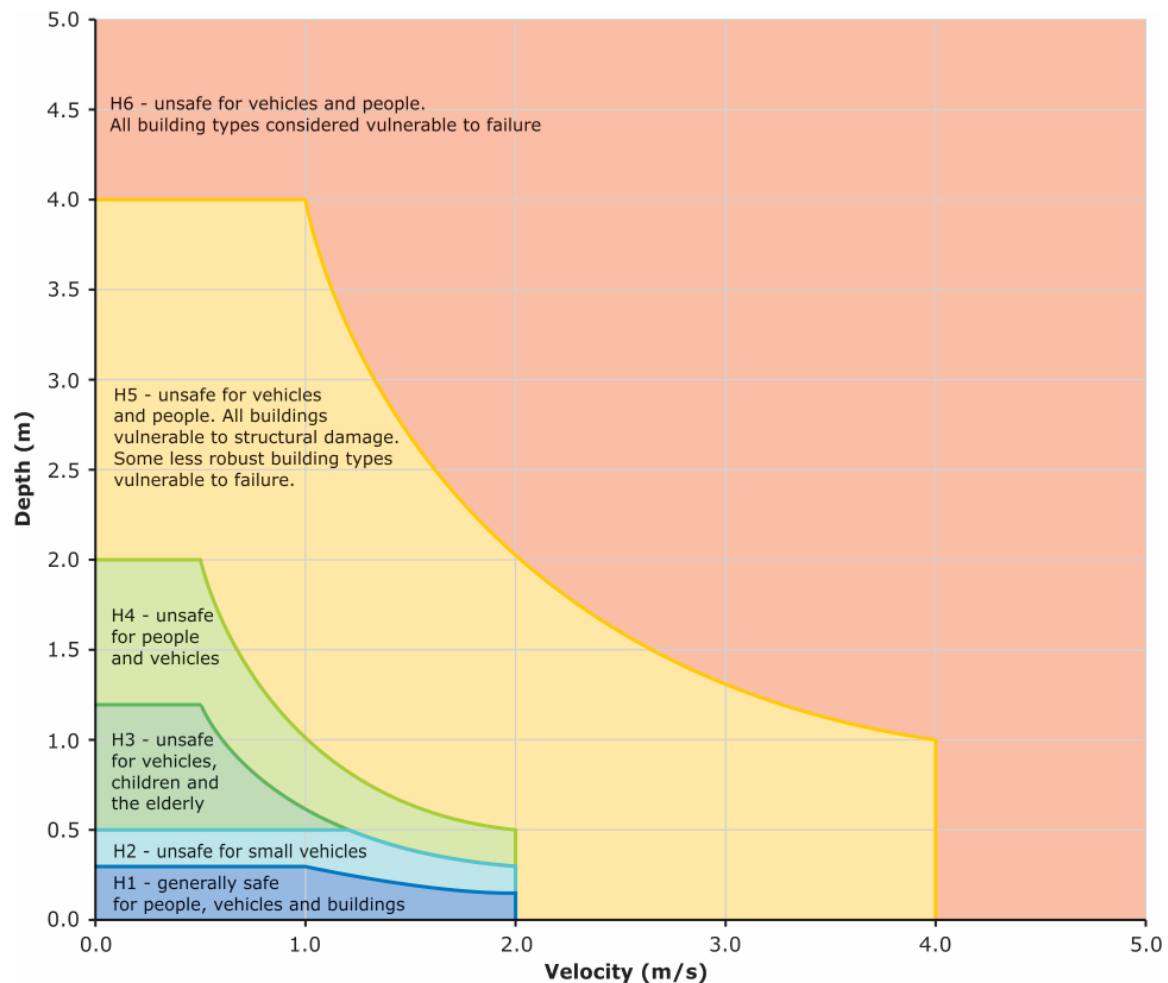


Figure 1 - Flood Hazard Thresholds and their descriptive effects on the stability of people and property (Smith, Davey & Cox 2014*)

*Smith, G.P., Davey, E.K. & Cox R.J. 2014, *Flood Hazard*, WRL Technical Report 2014/07, UNSW Water Research Laboratory, Sydney

Highest Property Risk Category:

Property risks describe the danger that flood waters might pose to the property of persons affected by flooding. Generally, the descriptions are:

- P1** Parked or moving cars remain stable
- P2** Unsafe for small vehicles

FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS

- P3** Suitable for light construction (e.g. timber frame, masonry and brick veneer). Unsafe for vehicles, children and the elderly.
- P4** Suitable for light construction (e.g. timber frame, masonry and brick veneer). Unsafe for vehicles and people.
- P5** Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
- P6** Unsafe for vehicles and people. All building types considered vulnerable to failure.

They are determined by direct correlation to the Flood Hazard Threshold (P1 relates to a Flood Hazard Threshold of H1) as determined at the Defined Flood Event, usually the 1% AEP in 2050 flood. The Flood Hazard Thresholds used in the determination of these risks are shown in Figure 1 below.

For the purposes of the flood information quoted here, the property hazard relates to the ground level as understood by CN at the time the information was collected. The property risk cannot be used to determine the ground level of the site.

Property risks can be reduced by filling a site, or raising floor levels as appropriate provided that the work is compatible with the applicable (if any) floodway or flood storage area.

In general, the minimum requirement for managing property risk is to set floor levels to the Flood Planning Level (usually expressed as a reduced level above the Australian Height Datum, or AHD).

The Newcastle DCP 2023 states:

"Areas where cars, vans and trailers are parked, displayed or stored are only located in areas subject to property risk of P1. Containers, bins, hoppers and other large floatable objects are not to be stored in these areas. Heavy vehicle parking areas can only be located in locations subject to P1 or P2 categories."

"Timber framed, light steel construction, cavity brickwork and other conventional domestic building materials are generally suitable forms of construction where the property risk is P1 to P4."

"Property risk of P5 is generally unsuitable for building construction and building is discouraged from these areas. Where building is necessary, the structure is certified by a practising structural engineer to withstand the hydraulic loads (including debris) induced by the flood waters."

"Property risk of P6 is unsuitable for any type of building construction."

Highest Life Risk Category:

Life risks describe the danger that flood waters might pose to the lives of persons affected by flooding. Generally, the descriptions are:

- L1** Flood event (typically ocean and riverine flooding) too long for a refuge enclosed by floodwaters to be appropriate. Refuge must be sought outside of the entire flood via formal community evacuation plans. Sufficient warning is generally available for such events.
- L2** Generally safe for people.
- L3** Unsafe for children and the elderly. On-site refuge is to be provided in development other than commercial premises or industry.
- L4** Unsafe for all people. On-site refuge is required.

FOR PROPERTIES IN THE THROSBY, STYX AND COTTAGE CREEK CATCHMENTS

L5 Unsafe for all people. On-site refuge is required. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.

L6 Unsafe for all people. All building types considered vulnerable to failure.

Life risks are determined by considering the Flood Hazard Threshold (see below) at the Probable Maximum Flood (PMF).

		Flood Hazard Threshold					
		H1	H2	H3	H4	H5	H6
Catchment Response time	Riverine and Ocean	L1					
	Flash	L2	L3	L4	L5	L6	

Figure 2 - Life Risk determination

The Newcastle DCP 2023 states:

"On-site refuge is to be provided for all development where the risk to life category is L3 or higher unless:

- the proposed development is less than 40m from the perimeter of the PMF extent and the higher ground is accessible, or*
- the proposed use is defined as commercial premises or industry in which case onsite refuge is only required where the risk category is L4 or higher."*

"Where on-site refuge is required for a development, it should comply with the following minimum standards:

- The minimum on-site refuge is the level of the PMF. On-site refuges are designed to cater for the number of people reasonably expected on the development site and are provided with emergency lighting.*
- On-site refuges are of a construction type able to withstand the effects of flooding. Design certification by a practising structural engineer that the building is able to withstand the hydraulic loading due to flooding (at the PMF)."*

The requirement for on-site refuge (where applicable) will generally be satisfied by a two-storey building form. However, for residential properties, attic access stairs and suitable small platform will usually also suffice.

In most cases where on site refuge is required, the duration of the peak flood event is short and accordingly, it is not expected to have to utilise flood refuge areas for long periods of time, especially when the chance of them being used is generally less than 1% in any given year. Accordingly, comfort factors are not of large concern to owners, occupiers or CN in determining the suitability of flood refuges.

FLOOD INFORMATION CERTIFICATE



02 December 2024

Ausgrid
24-28 Campbell Street
Haymarket NSW 2000

Flood Information Certificate No: FL2024/00250

Land: Lot 16 DP 270249

Property Address: 1 McIntosh Drive Mayfield West NSW 2304

Thank you for your recent enquiry regarding flood behaviour at the above property. This letter confirms the property is located in a flood prone area.

The pertinent features of the flood behaviour are estimated as follows:

Hunter River Flooding

Is any part of the site affected by a floodway?	No
Is any part of the site affected by a flood storage area?	No
Estimated 1% Annual Exceedance Probability event level: (equivalent to the "Defined Flood Level" in the Building Code of Australia)	Not affected
Estimated Maximum Flow Velocity of floodwaters (in the "Defined Flood Event" as per the Building Code of Australia)	Not affected
Highest Property Risk Category*	Not applicable
Estimated Probable Maximum Flood Level	5.4m AHD
Highest Life Risk Category*	L1

**Based on flood hazard and risk categories in the 2012 Newcastle City-wide Floodplain Risk Management Study (BMT WBM 2012). Refer to Section B1(a) of Newcastle Development Control Plan 2023.*

The flood study from which ocean and Hunter River flooding information is derived is part of a Newcastle City Wide Floodplain Management Plan. The above advice may change in the future, however the advice is based on the best information held by Council at the time of issue of this certificate.

The Newcastle Development Control Plan 2023 addresses the issues of flood management for new development. You can view the Development Control Plan at www.newcastle.nsw.gov.au. In summary, the following requirements apply for all future development applications on the site.

Development in a floodway is not generally allowable due to likely redistribution of flood water.	Not Applicable
Filling of a flood storage area by more than 20% is not generally allowable due to redistribution of flood water.	Not Applicable
Minimum floor level for occupiable rooms in a new development on this site is: (equivalent to the "Flood Hazard Level" in the Building Code of Australia)	Not applicable
Is onsite flood refuge required?	No

The Newcastle Local Environmental Plan 2012 includes provisions that apply to development within flood prone areas. You can view the Local Environmental Plan at www.newcastle.nsw.gov.au. In summary, the following provisions apply for all future development applications on the site.

Is clause 5.21 <i>Flood Planning</i> applicable to a development on this site?	Not applicable
Is clause 5.22(2)(a) <i>Special Flood Considerations</i> applicable to a development on this site?	Not applicable
Is clause 5.22(2)(b) <i>Special Flood Considerations</i> applicable to a development on this site?	Not applicable

Council holds no information concerning floor levels of existing structures on the site. Site levels and floor levels should be verified by survey based on the Australian Height Datum.

Please note that:

1. No assessment of the lot's suitability for the purposes of making an application for a complying development certificate under the Housing Code or Rural Housing Code of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*, or for a Secondary Dwelling under *State Environmental Planning Policy (Affordable Rental Housing) 2009*, has been made. This type of flood information can also be obtained from Council via a Flood Information Application as follows:
 - a) Identification of lots affected by any of the flood control lot exclusions identified in subclause 3.5(1) or 3A.38(1) of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*. If this information is required, select Box 4. b) (i) on the Flood Information Application form and pay the required fee.

2. The information contained in this certificate may alter in the future. The applicant should at all times ensure the currency of this information.

Should you require any further clarification please contact Robert Currie on 4974 2000 or at rcurrie@ncc.nsw.gov.au.

Yours faithfully

Robert Currie
DEVELOPMENT OFFICER

Appendix D

Soil Loss Hazard

The soil loss hazard was quantified using the Revised Universal Soil Loss Equation (RUSLE):

$$A = R \times K \times LS \times P \times C$$

Where, A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor

Table D.1 Revised Universal Soil Loss Equation Parameters

Parameter	Value	Justification
Soil erodibility (K) factor	0.06	Espade (2024) – taken as the most conservative value, the maximum K values at the site range from 0.03-0.06
Practice (P)	1.3	Landcom (2004), representing compacted/smooth surfaces
Cover (C)	1.0	Landcom (2004), representing completely stripped surfaces during construction
Rainfall erosivity (R)	3,132	Espade (2024)
Slope length/gradient factor (LS)	0.37	Espade (2024)
Total area (ha)	1.1	Maximum potential site disturbance area
Total soil loss (t/year)	99.4 yr	Calculation
Total soil loss (m ³ / year)	76.5 m ³ /yr	Assumes 1.3 t/m ³

To inform the staging of the proposed works, the annual soil loss results were extrapolated to a monthly soil loss risk, based on monthly average rainfall. The monthly soil loss hazards are shown in Table D.2.

Table D.2 Monthly soil loss risk hazard

Month	% of R	Soil loss (t/ha/month)	Soil loss (m ³ /month)	Hazard
Jan	9%	7.9	6.7	very low
Feb	11%	9.7	8.2	very low
Mar	12%	10.8	9.2	very low
Apr	10%	9.3	7.8	very low
May	9%	8.4	7.1	very low
Jun	11%	10.0	8.4	very low
Jul	6%	5.4	4.6	very low
Aug	5%	4.3	3.6	very low
Sep	6%	5.1	4.3	very low
Oct	7%	6.0	5.1	very low
Nov	8%	7.4	6.3	very low
Dec	7%	6.1	5.2	very low

