Appendix F Traffic Impact Assessment

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SA Water Corporation

Eyre Peninsula Desalination Plant Project

Traffic Impact Assessment Report

May 2024

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Eyre Peninsula Desalination Plant Project
Traffic Impact Assessment Report

SA Water Corporation

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Approved by:	Bronte Nixon	29/05/2024	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

Table of contents

List of tables

List of figures

Abbreviations

AADT	Annual Average Daily Traffic
Acciona	Acciona Construction Australia
CV	Commercial vehicle
DIDO	Drive-in drive-out: relates to construction workers
DIT	Department for Infrastructure and Transport
ECI	Early Contractor Involvement
FIFO	Fly-in fly-out: relates to construction workers
GAV	General Access Vehicle
GML	General Mass Limit
GL	Gigalitre
HML	Higher Mass Limit
km	Kilometre
m	Metre
OSOM	Over Size Over Mass
PBS	Performance Based Standards
PDO	Property damage only (crashes)
Project	Eyre Peninsula Desalination Plant Project
RAV	Restricted Access Vehicle
SAW	SA Water (Corporation)
Site	Area within the Desalination Plant Boundary and Intake Pump Station location
SWRO	Seawater reverse osmosis
TBM	Tunnel Boring Machine
TIA	Traffic Impact Assessment
WWTP	Waste Water Treatment Plant

1 Introduction

1.1 Project description

SA Water (SAW) has been working to ensure that the Eyre Peninsula's water supply and supporting infrastructure can meet the current and identified future demands of the local community. Approximately 75% of the Eyre Peninsula's water is sourced from the Uley South Basin, with most of the remainder coming from a pipeline from the River Murray. The health of the Uley South Basin is critical to the water security of the Eyre Peninsula as there is no alternate local drinking water supply. In recent years, the basin has been experiencing a long-term recharge decline and drawing water at current rates risks irreversible damage to the basin.

In consultation with businesses, landholders, local communities, and Councils, SAW determined that a new seawater reverse osmosis (SWRO) desalination plant near the town of Port Lincoln was the preferred option to ensure a continued drinking water supply for the region. The new plant will reduce reliance on the Uley South Basin, groundwater resources, and River Murray and supports both the existing and anticipated future water demand.

The Eyre Peninsula Desalination Plant Project (the Project) will be located at Billy Lights Point and will involve the construction and commissioning of a new 5.3 gigalitre (GL, Stage 1, ultimate capacity 8 GL)/annum capacity SWRO desalination plant, a seawater intake pump station/ marine infrastructure with connecting pipeline and seven (7) kilometres (km) of pipeline located to transfer the treated desalinated water to the existing Northside Hill Tanks.

At the time of preparing this Traffic Impact Assessment (TIA) report, SAW had contracted Acciona Construction Australia (Acciona) to deliver the plant and intake pump station but had yet to appoint a contractor to deliver the transfer pipeline.

1.2 Project site and surrounds

The site of the proposed desalination plant site boundary (the Site – shown in Figure 1.1) is approximately 3 km southeast of the town of Port Lincoln at Billy Lights Point, South Australia. The Site is a subdivided portion of land formerly utilised by BHP as a sand mine which will be accessible via a new access road from St Andrews Drive. The remaining portion of the subdivided land has no current commercial use. Apart from the abandoned mine infrastructure (including a disused railway line) and internal tracks, the surrounding land is undeveloped and largely vegetated.

The intake pump station will be constructed in a disused lagoon at the northern end of the Eyre Peninsula Wastewater Treatment Plant (WWTP) a further 500 metres (m) east of the Site and adjacent to the Billy Lights Point public boat ramp, carpark, BBQ and picnic area and walking trails.

The two sites (both owned by SAW) and the public recreational area are accessible by road via St Andrews Drive.

A buried terrestrial seawater pipeline will run between the intake pump station and the desalination plant via an easement through land owned by the Sarins Group. The nearest residence to the proposed new access road to the Site is about 370 m away.

The full extent of development along St Andrews Drive is shown in Figure 1.2. At the eastern end (adjacent to the WWTP and the recreational facilities) it includes commercial fishing (Australian Fishing Enterprises) and ship repairs and maintenance (Port Lincoln Slipway). These developments share a road access with the WWTP to St Andrews Drive. Residential dwellings predominate along the central and western end of the road (albeit few having direct access).

Throughout this report the reference to Site generally means the location of the desalination plant but may also include the WWTP where the seawater intake pump station is to be constructed. Both sites are accessible via St Andrews Drive just 175 m apart.

Eyre Peninsula Desalination Plant Project

Figure 1.1
Project Location

Legend

- Substation
- Local Government Area
- Desalination Plant Site Boundary
- Easement
- New Site Access
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 500 1,000
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 22/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

Figure 1.2 St Andrews Drive – existing land uses

1.3 Scope of report

This TIA Report assesses the potential physical and operational impacts on, and users of the local road network that may be caused by traffic movements generated by the onshore construction activities of the Project and suggests measures to mitigate these.

The assessment is limited to the study area shown in Figure 1.3 bounded by roads east of Pine Freezers Road, south of and including Western Approach Road, Yandra Terrace, Mortlock Terrace and Porter Street, and Hallett Place and Liverpool Street (intersection with Porter Street).

Figure 1.3 Study area extents

1.4 Legislative

The following legislation is relevant to traffic aspects of the Project:

- *Road Traffic Act 1961*
- *Environment Protection Act 1993*
- *Heavy Vehicle National Law Act 2013.*

1.5 Assessment methodology

The assessment considers the baseline (existing) physical and operational conditions of the road network in the study area, forecasts the type, frequency and trip patterns of traffic generated by the construction activities for the Project, and determines the impacts of the imposed traffic on the road network. Measures are identified to mitigate these impacts commensurate with the scale of the Project and the duration of the construction activities.

The baseline conditions of the road and transport network pertinent to the development proposal were assessed through desk-top reviews of publicly available data, discussions with the Department for Infrastructure and Transport (DIT), communications with the City of Port Lincoln (directly and via SAW) and an inspection of the wider study area undertaken with the SAW project team.

Estimates of construction traffic (refer Section 4) were determined from information provided by Acciona in its "Draft Construction Strategy (Rev B – April 2024)" and supplemented with assumptions regarding the construction of the transfer pipeline (which is not part of Acciona's scope).

2 Existing (baseline) conditions

2.1 Land use and economy

The predominant land uses in proximity to the Project site comprises residential, commercial and industrial.

The city's economy is dominated by commercial fishing and the export of regionally produced wheat, barley, and oil seeds. The seaport is the second most important and busiest port in South Australia.

This movement of grain and commercial fishing places a reliance on the port and access the waterfront and hence significant movements of trucks using the main roads through the city. The local community appears tolerant of the apparent conflicts between truck movements and their general amenity (particularly during the harvest season) because of the importance of freight movement through the city to the local economy.

2.2 Regional transport

Port Lincoln is remotely located on the southern tip of the Eyre Peninsula and is accessible via road (686 km from Adelaide), sea, and air. The sea port is vital to the export and import of bulk commodities and the airport plays a key role in the movement of people into and out of the region. The road network provides for the significant movement of intra and inter regional freight. The seaport and the regional transport network are critical to the viability of the economies of the city, the region and the State.

The following sections provide an overview of the regional transport networks serving Port Lincoln.

2.2.1 Arterial roads and freight routes

2.2.1.1 Road access

The primary road access into Port Lincoln is via the Flinders Highway, Western Approach Road and the Lincoln Highway (Route B100). These roads are national highways maintained under the care and control of the DIT, and are shown in Figure 2.1.

The Lincoln Highway connects Port Lincoln with Port Augusta via Cowell and Whyalla (via the Eyre Highway) and then Adelaide (via the Augusta Highway and the Princes Highway). The highway extends along the east coast of the Spencer Gulf from the north and passes through Port Lincoln via Hallett Place, Liverpool Street, Porter Street, Mortlock Terrace, and Yandra Terrace.

The Flinders Highway connects Port Lincoln with Ceduna via Elliston and Streaky Bay (also via the Eyre Highway). It passes through the northern part of Port Lincoln and connects with the Lincoln Highway at Hallet Place. The section of Flinders Highway between its junctions with Western Approach Road and Lincoln Highway does not form part of the B100 route.

The Western Approach Road extends southeast towards the city about 11 km from its junction with the Flinders Highway and connects with Yandra Terrace.

The major portions of these roads comprise 2-lane undivided carriageways. At junctions with some local roads, dedicated right turn lanes allow right turning vehicles to stand and give way to oncoming traffic without impeding the following through traffic.

The B100 route through the city runs parallel to, and to the west of the railway line (refer Section 2.3). The route provides direct access to the northern parts of the city, the grain terminal and the wharves. Road access to the eastern side of the rail line is limited to:

- At-grade rail level crossings located at:
  - Pine Freezers Road (Western Approach Road)
  - Anne Street (Mortlock Terrace)
  - Le Brun Street (Mortlock Terrace), and
- Bridge crossings at:
  - Dublin Street (Porter Street) and
  - London Street.

The rail line and the level crossings are no longer in operation and vehicles are not required to stop before crossing the rail line.

Figure 2.1 Road access to Port Lincoln: primary arterial and national highway roads

2.2.1.2 Gazetted freight routes

The B100 route segments are gazetted to carry several classifications of Restricted Access Vehicles (RAVs) including for example:

- General Mass Limit (GML) and Higher Mass Limit (HML) up to 36.5 m road train
- Over Size/Over Mass Limits (OSOM) – 25 m/59 tonne low loader, 4 m wide-load carrying vehicle, 40 tonne special purpose vehicles
- Performance Based Standard (PBS) Level 3A
- Commodity routes B-doubles and Road Trains.

These routes permit long, wide and over-mass vehicles to move through the city and to access the port and the grain terminal. Other lower-order roads on the eastern side of the rail line are also gazetted to provide access to specific locations including several transport companies (refer Figure 2.2 showing gazette routes for PBS Level 3A). There is a 32-m length restriction on vehicles crossing the Dublin Street bridge.

The gazette routes however only allow some classifications of RAV's to travel on Verran Terrace, Ravendale Road, part of Bel Air Drive and to the northwest of the city on the east side of the rail line. The Project Site on St Andrews Drive is about 2 km from the nearest gazetted RAV route.

Figure 2.2 Gazetted routes for PBS Level 3A/30 metre road trains

2.2.2 Rail

The Eyre Peninsula Railway comprises a narrow-gauge track that is isolated from the rest of the SA rail network. The main lines radiate out from Port Lincoln and Thevenard and originally connected small ports on the Eyre Peninsula to the inland and allowed for exports of grain grown in the region. Until 2019, trains were used to transport grain into the silos at the grain terminal in the port in Port Lincoln. The line is no longer operational, although it has not been officially closed. Grain (and other exports and imports) is transported into and out of the port via road. Resumption of rail services to transport bulk commodities will require a significant investment in upgrading of the track and a recent submission for funding was not successful. The rail level crossing infrastructure remains but signs have been erected on the road approaches indicating that the line is no longer in operation.

2.2.3 Sea transport

Port Lincoln is a natural deep-water harbour which makes the port attractive to large bulk grain carriers for topping up loads from other ports in South Australia and Victoria. The Port Lincoln Grain Terminal is located immediately adjacent to the wharves. Grains and seeds are the principal exports and major imports are petroleum products and fertiliser. Approximately 90 vessels and 1,214,000 tonnes of cargo are handled annually. The port is operated by Flinders Ports.

Road access to the port is via King Street/London Road. Several rail lines access the port but these are no longer in operation.

2.2.4 Airport

Port Lincoln airport is located about 13 km north of the city accessible via the Lincoln Highway. It is owned by the District Council of the Lower Eyre Peninsula. It has one sealed and two gravel runways. Qantas and Rex operate passenger and small freight services through the airport. It is the largest and busiest regional airport in South Australia.

2.2.5 Summary regional transport

The transport network in Port Lincoln supports the economy of the city and the region which is based predominantly on agricultural exports and industrial activities. These economic activities generate and attract significant demands for movement of freight.

Transportation of people and freight to and from Port Lincoln is provided by road, sea and air. The remote location of the city means there is a heavy reliance on the airport to cater for demands for inter-regional people movements. The airport though only has limited capacity to transport small items of freight and so movement of larger and heavier freight takes place by road. Bulk exports of grain and imports of petroleum and fertilizer are managed at the seaport but with the closure of rail services, movements to and from the port on the land side are via road.

The gazetted restricted access vehicle routes into and through the town (the national highways and primary arterial roads) supplemented by gazetted lower order routes provide good connectivity between the road network, transport operators and the seaport. These gazetted routes are about 2 km from the desalination Project Site.

General Access Vehicles (GAV's – including semi-trailers) are permitted to use any of the arterial and local roads in Port Lincoln (unless explicitly prevented due to overall length or mass on selective roads). This includes roads connecting the city with the Project Site. Restricted Access Vehicles (RAV's – including over-dimensional and over-mass loads) requiring access to the Project Site will require special permits to access the local roads if not already gazetted for over-size and over-mass vehicle use.

2.3 Roads and junctions

This section describes the characteristics of those roads in the road network that may be impacted by the Project proposal. It is limited to those roads on the eastern side of the railway line and junctions with the B100 route that may be used to transport people, construction materials and components and plant and equipment to the Project Site particularly during the construction period. Heavy vehicle access (both GAV's and RAV's) to the eastern side of the railway line is via the B100 route and roads that cross the railway line via at-grade level crossings or bridges.

2.3.1 Rail level crossings

2.3.1.1 At-grade rail level crossings

At-grade rail level crossings are located at:

- Pine Freezers Road (Western Approach Road)
- Anne Street (Mortlock Terrace)
- Le Brun Street (Mortlock Terrace).

The rail line and rail level crossings are no longer operational (but not formally closed). The rail could be used again at some time in the future but this is unlikely at this stage.

The rail crossings when operational are active level crossings; that is vehicles are required to stop at the rail crossing when the warning signals are activated by approaching trains. There are no barriers to prevent vehicles crossing the track.

Pine Freezers Road

Pine Freezers Road crosses the rail line about 2 km west of the city centre and about 400 m south of its junction with Western Approach Road. It provides access to several transport companies, commercial fishing enterprises and various plant hire companies. Pine Freezers Drive then connects with Proper Bay Road/Verran Terrace that run parallel with and on the eastern side of the rail line providing access to commercial and residential land uses as well as the Project Site via Stamford Terrace/Marina Drive/St Andrews Drive.

This route across the railway line is convenient for traffic travelling to and from the west of the region (via Flinders Highway).

Anne Street

Anne Street crosses the rail line between Yandra Terrace/Mortlock Terrace and Verran Terrace which are about 30 m apart. This distance provides little road space for vehicles to queue on Anne Street on its approaches to the junctions with Yandra Terrace and Verran Terrace. There is a risk that vehicles (and particularly long vehicles) could queue back onto the main carriageways and impede through traffic movements. No such queueing was observed during the site inspection however, traffic conditions were moderate at the time.

Anne Street provides access to various commercial and residential land uses. The rail crossing also provides access to the Project Site via Verran Terrace, Windsor Avenue or Follet Street and Stamford Terrace/Marina Drive/St Andrews Drive.

This crossing of the rail line is convenient for trips travelling from one side of the city to the other (between residences and schools for example and for trips travelling between the commercial fishing businesses and the east of the town via B100 and Verran Terrace/Proper Bay Road.

Le Brun Street

Le Brun Street crosses the rail line 300 m from Mortlock Terrace/Porter Street. The rail crossing also provides access to the Project Site via St Andrews Terrace, Ravendale Road and Marina Drive/St Andrews Drive. This crossing is the most centrally located in the city and connects residences with schools (St Josephs, Port Lincoln Primary and High Schools and Kirton Point Primary School) on both sides of the rail line.

There is a 10 m length limit on vehicles travelling on Le Brun Street south of Simmonds Street. This restriction may be associated with the proximity of the rail level crossing to the intersection with Verran Terrace.

2.3.1.2 Bridge crossings

There are two bridge crossings of the rail line at Dublin Street and London Street. These support two-lane divided roads over the tracks 60 m and 240 m east of Porter Street respectively. The crossings provide access to the developed residential neighbourhoods on the eastern side of the city. Dublin Street connects with Luke Street/Verran Terrace which provides access to other areas of the city. Both crossings provide access to Stevenson Street.

2.3.2 Routes connecting the project Site

The desalination Project Site is remotely located about 3 km east of the national B100 route. With the exception of trips travelling to the Site from the coastal road (Proper Bay Road), it is expected that heavy vehicle trips to the Project Site will travel via the national route (B100) and the road crossings of the railway line and make best use of existing gazetted routes. Restricted Access Vehicles cannot presently access the Project Site.

The routes linking the national highway with the Marina Drive, St Andrews Drive and the Project Site that may be convenient for heavy (general access) vehicles include:

- **Western Approach Road, Pine Freezer Road, Proper Bay Road/Verran Terrace**, Windsor Avenue, Stamford Terrace
- **Mortlock Terrace,** Anne Street, **Verran Terrace**, Windsor Avenue, Stamford Terrace
- **Mortlock Terrace**, Anne Street, **Verran Terrace,** Bel Air Drive, Ravendale Roade, Stamford Terrace
- **Dublin Street, Luke Street**, **Matthew Place**, Stevenson Street, Ravendale Road.

The roads shown in bold (and part of Matthew Place and Bel Air Drive) are gazetted routes for selected categories of RAV's and may be conducive to permitting other heavy vehicle types if required. A permit would be required to allow RAV's to travel on the other nominated roads.

Le Brun Street is the most central of the rail crossings and would provide a convenient route to the Project Site via St Andrews Terrace and Ravendale Road. However, trucks over 10m in length are not currently permitted to use the southern end of the road and it is not a gazetted route.

The characteristics of these roads, including Marina Drive and St Andrews Drive are tabulated in Table 2.1 below.

Table 2.1 Road characteristics

Road section	Cross section and alignment	Land use	Comments
Windsor Avenue (Verran Terrace to Stamford Terrace)	2 lane undivided Wide verges Straight	Sports ovals and facilities, commercial light industrial, driveway access	50 kph 540 m
Stamford Terrace (Windsor Avenue to Marina Drive)	2 lane undivided Wide verges Straight	Residential, Navigator college, undeveloped land Local road junctions	50 kph 760 m School crossing
Bel Air Drive (Thomas Court to Ravendale Road)	2 lane undivided Wide verges Straight	Commercial and light industrial, sports clubs/ovals Driveway access	50 kph 400 m

Road section	Cross section and alignment	Land use	Comments
Stevenson Street (Matthew Place to Ravendale Road)	2 lane undivided Wide verges Straight	Kirton Point Primary school (landscaped buffer) Informal car par parkin on unsealed verge adjacent to tennis courts	50 kph 200 m Pedestrian crossing (25 kph children present)
Ravendale Road (Stevenson Street to Marina Drive)	2 lane undivided Wide verges Straight	Residential Commercial and light industrial Aboriginal Community Council	50 kph 570 m
Le Brun Street (Porter Street to Verran Terrace	2 lane undivided Footpaths and kerbs Straight	Commercial and light industrial	50 kph, 300 m 10 m vehicle length limit south end 2 lane roundabout with Porter Street
Marina Drive	Generally straight, minor curves Landscaped verges on side	Undeveloped, marinas, tuna boat wharf Local junctions, car park driveways	50 kph 700 m
St Andrews Drive	2 lane undivided, curvilinear alignment	New residential development western end Driveway access WWTP	50 kph 1.5 km developed section 0.5 km to site access

2.3.3 St Andrews Drive

St Andrews Drive between Marina Drive and its eastern end (Billy Lights Point) is approximately 2.5 km long. This road is a local road, with a single carriageway divided with centrelines. For the first 1.5 km section, St Andrews Drive provides access to residential areas, it is approximately 7.2 m wide between kerbs. A footpath is provided generally along the southern side of the road with unrestricted kerbside parking permitted along most of this this section.

The vertical alignment is generally flat in the first 1.5 km section with a large horizontal curve around a water body south of Parnakalla Avenue which is followed by a straight section extending past the site access. The curve at the start of St Andrews Drive is tight and advisory signs for reducing speed are installed at either ends of the curve to assist motorists to safely negotiate it. A posted speed limit of 40 km/hr applies in this 1.5 km section of St Andrews Drive.

A total of nine side streets connect to/terminate at St Andrews Drive with all these providing access to residential properties.

The remaining 1 km section provides access to Billy Lights Point (which has two boat ramps and visitor viewing area), the Australian Fishing Enterprises and Port Lincoln Slipway (Sarins Group) located to the east of the proposed development site, the Site (and the adjacent unused land) and the SAW WWTP.

This 1 km section comprises a sealed surface of approximately 6.4 m in width, has no kerbs, formed shoulders of variable width and quality and a vegetated road reserve. The posted speed limit of 60 km/h applies in this section between end of the residential area and Billy Lights Point. There is no street lighting along this section. Stobie poles supporting overhead power lines are located along the northern side of the road and cross over the road at the entrance to the WWTP.

2.3.4 Transfer pipeline route

The proposed transfer pipeline between the desalination plant and the existing North Side Hill tanks will be placed in the road reserves of Greyhound Road, Proper Bay Road and Blue Fin Road. The eastern end of the pipeline will be in private land.

Greyhound Road (approximately 2 km) provides access to Murray Point via some native scrub land. It is a curvilinear and flat unsealed road varying in width and condition with no shoulders and native vegetation predominantly along the northern side. It forms a T-junction with Proper Bay Road.

Proper Bay Road links the township with Sleaford Conservation Park. The 1.2 km section of interest is a wide two-lane undivided and sealed road, is generally straight and follows the coastline. It is marked with centrelines and edge-lines, is delineated at junctions with it and provides access to several light industrial and commercial properties.

Blue Fin Road (approximately 2 km) forms a T-junction with Proper Bay Road. The southern section is 500 m long, is a two-lane undivided road, sealed with kerb and gutter and terminates at the junction with the railway line. There is no road crossing of the rail line. The road resumes on the northern side of the line as an unsealed narrow road and providing access to the North Side Hill water storage tanks.

2.3.5 Key junctions

There are several road junctions in the Port Lincoln road network of which some will be likely be used by traffic travelling to and from the Project Site. The operation of some of these were observed during the site inspection but displayed no congestion or safety issues during a period of moderate traffic flow. Anecdotal comments were sought from both the City of Port Lincoln council and DIT on any operational matters at key junctions. Observations and comments for key junctions are summarised below. Further assessment of these and possibly others not mentioned may be required when details of the Project construction are known.

It is noted that there is a current project to upgrade 4 intersections on the B100 route between Mortlock Terrace and the Flinders Highway. The Port Lincoln Intersection Safety Upgrade Project includes upgrades to:

- Flinders Highway/Lincoln Highway
- New West Road/Hallett Place
- Hallett Place/Liverpool Street/Adelaide Place
- Liverpool Street/Mortlock Terrace.

Le Brun Street – Luke Street – St Andrews Terrace

Council advised that the Le Brun Street/Luke Street/St Andrews Terrace intersection (shown in Figure 2.3). is congested “at times”. It is a four-way priority-controlled intersection controlled by stop signs on Le Brun Street and St Andrews Terrace. It is presumed that the reference to congestion relates to queues and delays to traffic using Le Brun Street and St Andrews Drive attempting to cross or turn on to Luke Street.

Long vehicles over 10 m are prevented from using Le Brun Street at its southern end. The reason for this restriction is not immediately evident but may have been imposed when the rail line was in operation to prevent vehicles stopped at the intersection from queuing over the rail line. Coincidentally the junction stop line on Le Brun Steet is only about 10 m from the rail level crossing.

Figure 2.3 Intersection Le Brun Street-Luke-Street-St Andrews Terrace

Dublin Street – Porter Street

The Dublin Street/Porter Street intersection (shown in Figure 2.4). is a priority-controlled T-junction with a long dedicated right turn lane on Porter Street. Vehicles turning right into Dublin Street must give way to oncoming traffic on Porter Street. This allows potential for queues in the turn lane to extent back into the adjacent through lane. Vehicles turning right from Dublin Street have to give way to all traffic on Porter Street and there is a risk that long vehicles may queue across the westbound through traffic when negotiating gaps in the eastbound through traffic.

Dublin Street – Luke Street

The Dublin Street/Luke Street junction (shown in Figure 2.4) is only 90 m from the junction of Dublin Street with Porter Street. It is a priority-controlled junction. There is a risk that vehicles standing to turn right into Luke Street may queue back into the adjacent through lane and even back to Porter Street.

Figure 2.4 Junctions Dublin Street-Porter Street and Dublin Street -Luke Street

Marina Drive – St Andrews Drive

The Marina Drive/St Andrews Drive junction (shown in Figure 2.5) is a four-way intersection with give way signs on St Andrews Drive and Monterey Drive. Sight distance is generally good on the approaches, but the curve on the Marina Drive approach to the intersection may restrict visibility from St Andrews Drive. There are no turning lanes at the junctions, but there is land in the road corridor that could provide for any future widening or realignment to cater for larger turning vehicles.

Figure 2.5 Intersection Marina Drive-St Andrews Drive

Marina Drive – Stamford Terrace – Ravendale Road

The Marina Drive/Stamford Terrace/Ravendale Road T-junction (shown in Figure 2.6) provides a dedicated right turn lane on Ravendale Road into Stamford Terrace. The Ravendale Road approach to the junction exhibits a moderate left-hand curve which restricts sight and stopping distance at the junction. The movement through the junction from Marina Drive to Ravendale Road is delineated with warning signs to reduce traffic speeds. There is substantial land in the road corridor to improve the junction alignment if required.

Figure 2.6 Intersection Marina Drive – Stamford Terrace – Ravendale Road

St Andrews Drive – desalination plant Site access

The existing access to the desalination plant Site is located on the outside of a large radius curve and sight distance is restricted by native vegetation in the road corridor. St Andrews Drive is 7 m wide, sealed with centre barrier lines, no edge lines, and narrow unsealed shoulders.

The existing access road into the Site also provides access to the adjacent land (the remaining under-utilised section of the subdivision). The road bifurcates about 70 m in from the St Andrews Drive and provides access to the Site. (As part of the proposed development and the subdivision of the land, a new access road to the Site will be provided about 60 m west of the existing to provide dedicated access to the Site (shown in Figure 2.7). The existing access road is to be retained to maintain access to the adjacent property).

Figure 2.7 Existing and proposed desalination plant site access – St Andrews Drive

St Andrews Drive – WWTP access

The access road is to the WWTP (shown in Figure 2.8). is located on the outside of a curve and sight distance is restricted by native vegetation in the road corridor. St Andrews Drive is 7 m wide, sealed with centre barrier lines, no edge lines, and narrow unsealed shoulders. The access road is sealed at the junction and immediately diverges to provide access to the WWTP and the Sarin Group property. Both properties have gated entrances. The junction is located about 25 m away from a cleared patch of land on the opposite side of St Andrews Drive.

Figure 2.8 WWTP access – St Andrews Drive

The access road junction is not visible to motorists when travelling along St Andrews Drive. Visibility is restricted by native roadside vegetation as shown in Figure 2.9.

Figure 2.9 Restricted visibility of the WWTP access road junction

2.4 Traffic

2.4.1 Regional roads

DIT is responsible for the care and control of the arterial road network in the region and the national highway route that passes through Port Lincoln.

DIT monitors traffic volumes on its arterial road network to assess total traffic, proportion of heavy vehicles, and changes in demand arising from general growth of changes in travel patterns. Surveys of traffic in the immediate vicinity of the Project site are shown below (source SA location Viewer 2020/21). These are Annual Average Daily Traffic (AADT) volumes. These traffic volumes are influenced by seasonal factors which in Port Lincoln include significant variances in the harvest season. Neither council nor DIT have been able to quantify the extent of these variations.

- Western Approach Road: 2100 AADT (380, 18% CV)
- Yandra Terrace: 4900 AADT (750, 16% CV)
- Mortlock Terrace: 8500 AADT (770, 9% CV)
- Porter Street: 10,300 AADT (750, 7.5% CV)
- Liverpool Street: 7,700 AADT (430, 5.5% CV)
- Hallett Place: 14,700 AADT (550, 3.5%)
- Lincoln Highway: 12,400 AADT (600, 5%).

The roads are subject to increased heavy vehicle traffic movements during the grain harvesting season. Trucks carrying grain travel on these roads through to the grain terminals adjacent to the port.

2.4.2 Local road network

The City of Port Lincoln is responsible for the care and control of the local road network east of the railway line. Council was approached to provide any information on traffic counts on any of its roads. Council advised it no longer conducts regular surveys of traffic volumes on any of its roads.

Accordingly, SAW arranged for traffic surveys to be undertaken at 10 mid-block locations (Thursday 26 October – Wednesday 1 November 2023) and three intersections (Thursday 26 October 2023) as shown in Figure 2.10.

A complete set of survey results were provided to SAW and City of Port Lincoln and these are summarised in Table 2.2 and Figure 2.11, Figure 2.12, and Figure 2.13.

Eyre Peninsula Desalination Plant Project

Figure 2.10
Traffic Count Locations

Legend

- Intersection Turning Counts
- Mid-Block Tube Locations
- Cadastre
- Desalination Plant

PRELIMINARY

0 370 740
Meters

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:15,000 Date: 16/10/2023

GDA 2020

Data sources: DELWP, Geoscience Australia, DataSA, Metromap

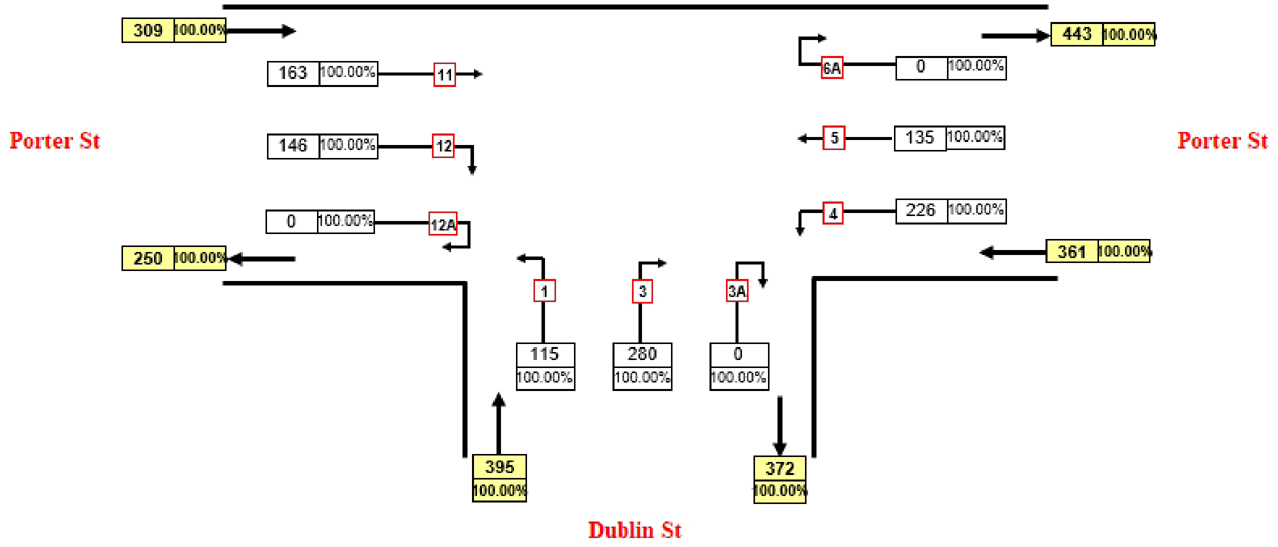
Table 2.2 Summary of Daily 2-way traffic volumes (AWDT) and peak hour 2-way traffic volumes at mid-block locations

Location	Peak hour 2-way traffic	AWDT	Daily traffic Direction 1	Daily traffic Direction 2	85%ile Speed (Kph)	Weekday % CV
Bel-Air Drive South of Thomas	170 (am)	1350	750	600	54	11.6
Dublin Street Bridge	690 (pm)	8100	3920	4180	39	14.1
Marina Drive East of Laguna Dr	606 (pm)	6660	3333	3326	56	13.6
Matthew Place East of Mark St	611 (pm)	700	300	400	62	25.1
Pine Freezers Road South of RLX	127 (am)	1190	545	645	57	26.1
Proper Bay Road West of Windsor	370 (noon)	3690	1900	1790	59	`4.1
Ravendale Road South of Bel-Air	606 (am)	6150	3115	3035	51	7.1
St Andrews Drive South of Marina Dr	300 (pm)	3320	1660	1660	42	12.0
Stamford Terrace East of Martindale	319 (am)	2128	1057	1071	40	10.2
Stevenson St South of Matthew Pl	556 pm)	5380	2600	2780	51	10.9

Volumes displayed in Table 2.2 clearly show that commercial vehicles represent a high proportion of the traffic on many of the local roads. This is indicative of the industrial and commercial land uses prominent in the city east of the railway line.

Also of note is the relatively high traffic volumes on Stevenson Street Marina Drive, and Ravendale Road (5000 to 6600 vehicles per day) and the very high traffic crossing the railway line over the Dublin Street bridge.

AM peak Hour



PM Peak Hour

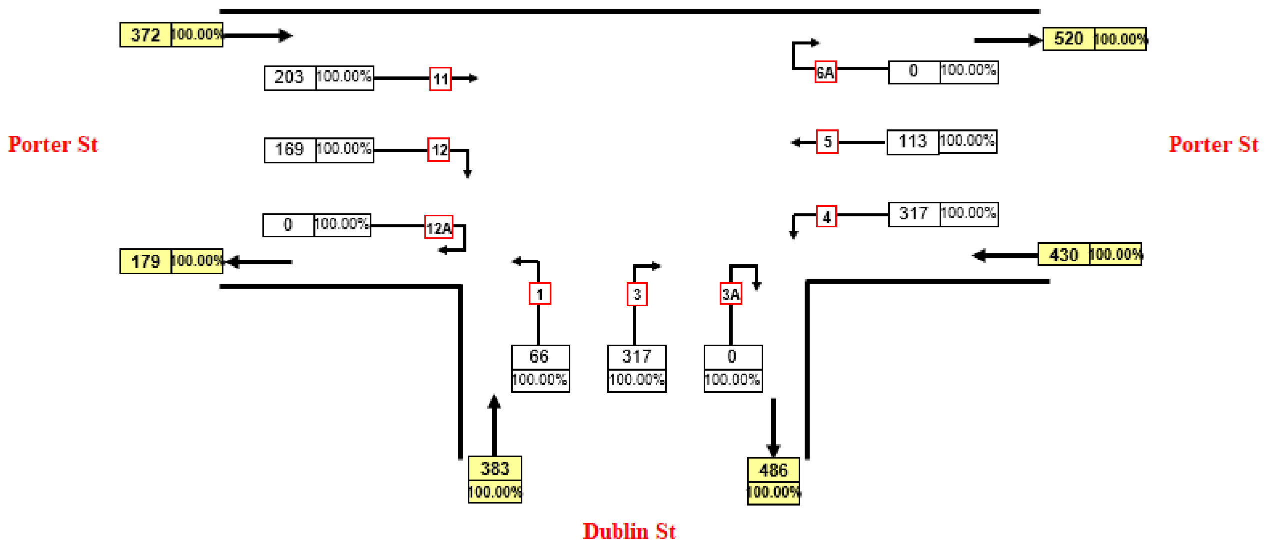
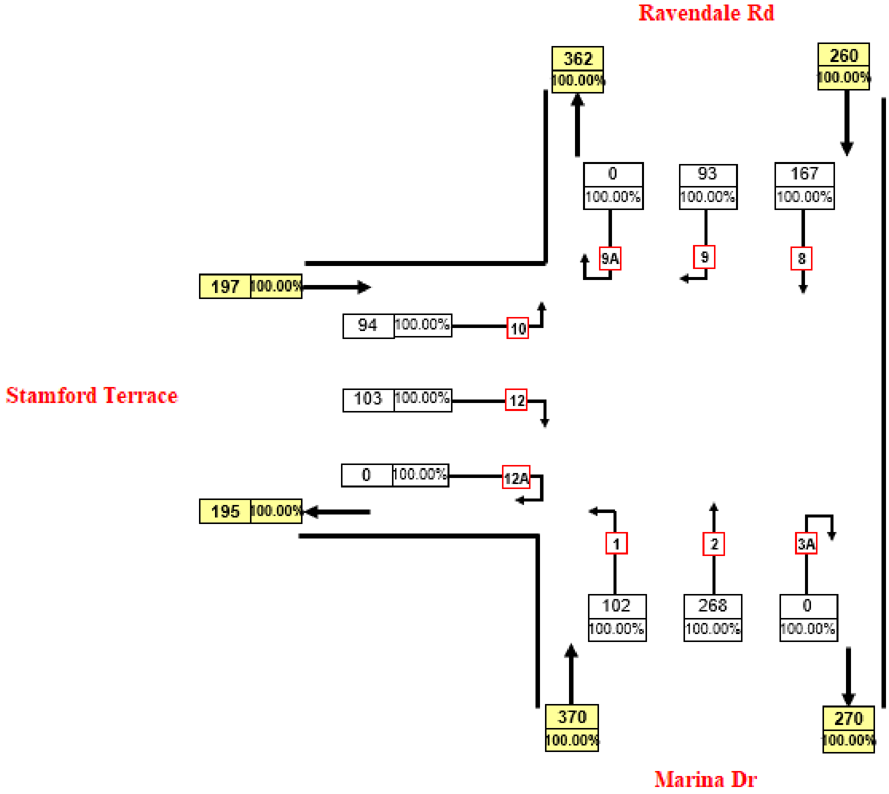
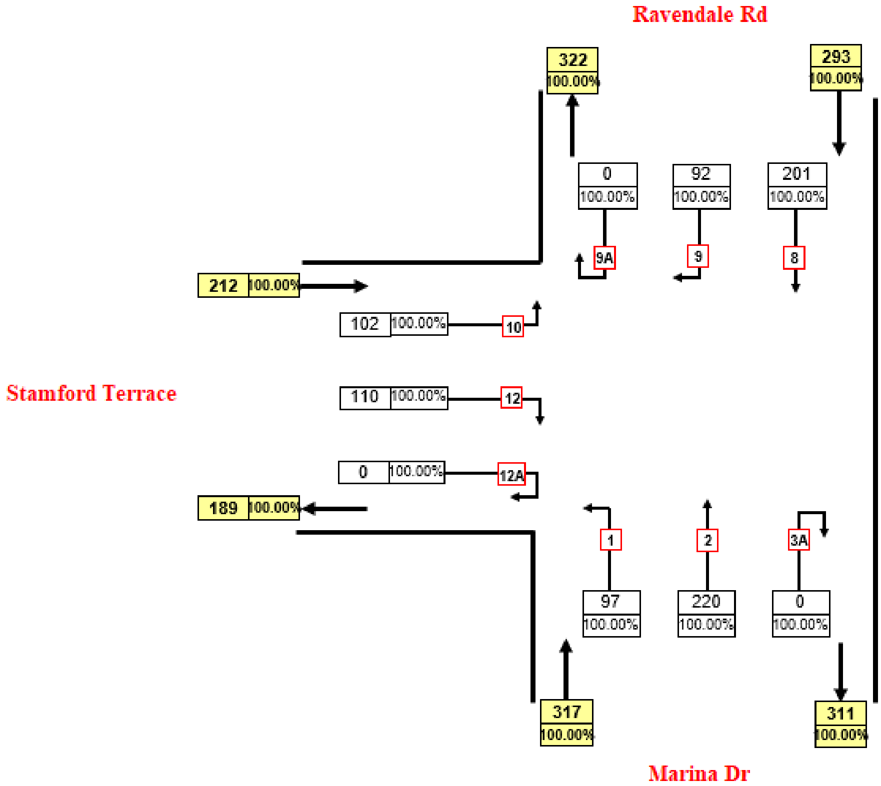


Figure 2.11 Peak-hour turning movements: Intersection Porter Street and Dublin Street

AM Peak Hour



PM Peak Hour



24 hour turning movements

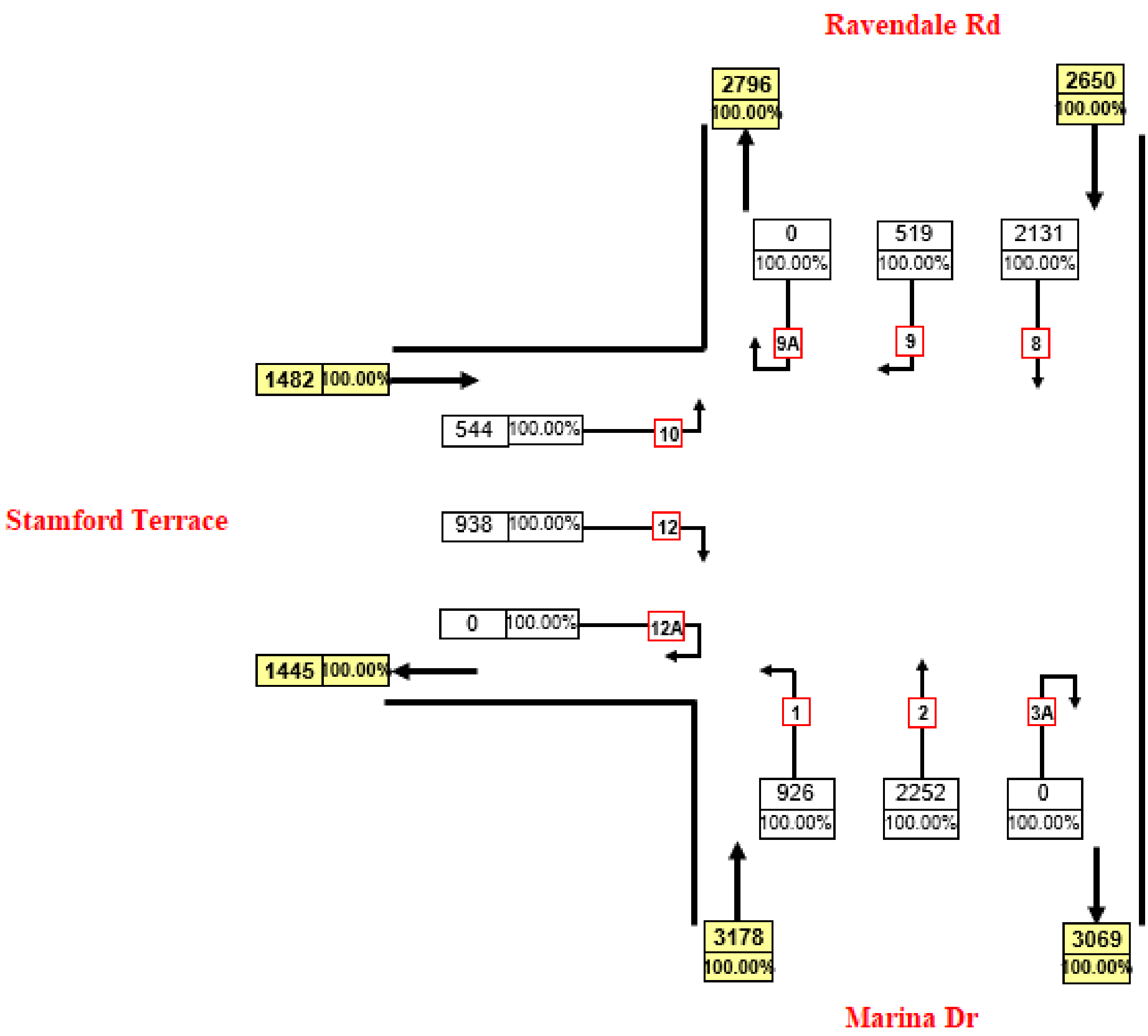
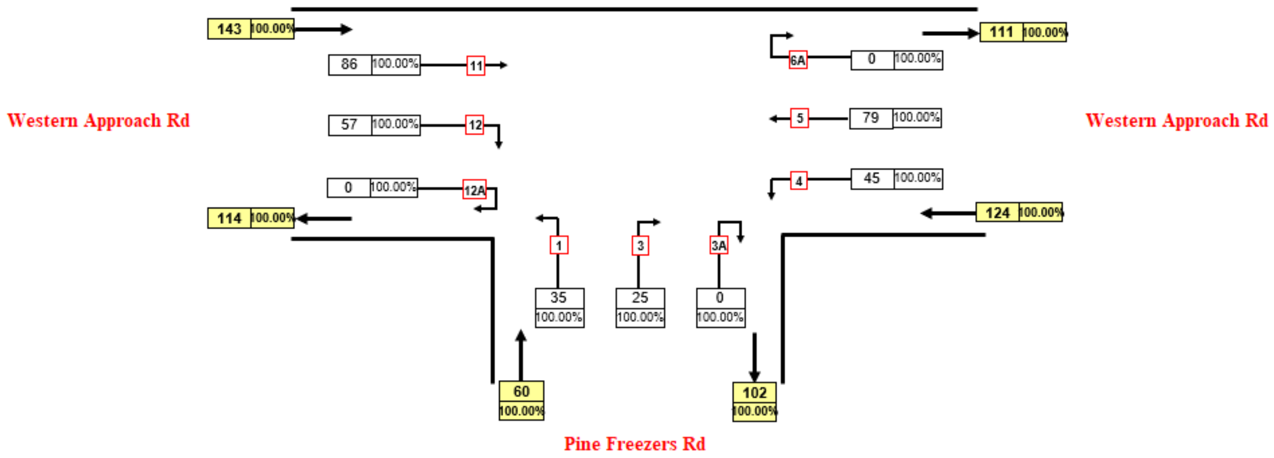


Figure 2.12 Peak-hour and 24-hour turning movements: Intersection Ravendale Road-Stamford Terrace-Marina Drive

AM Peak Hour



PM Peak Hour

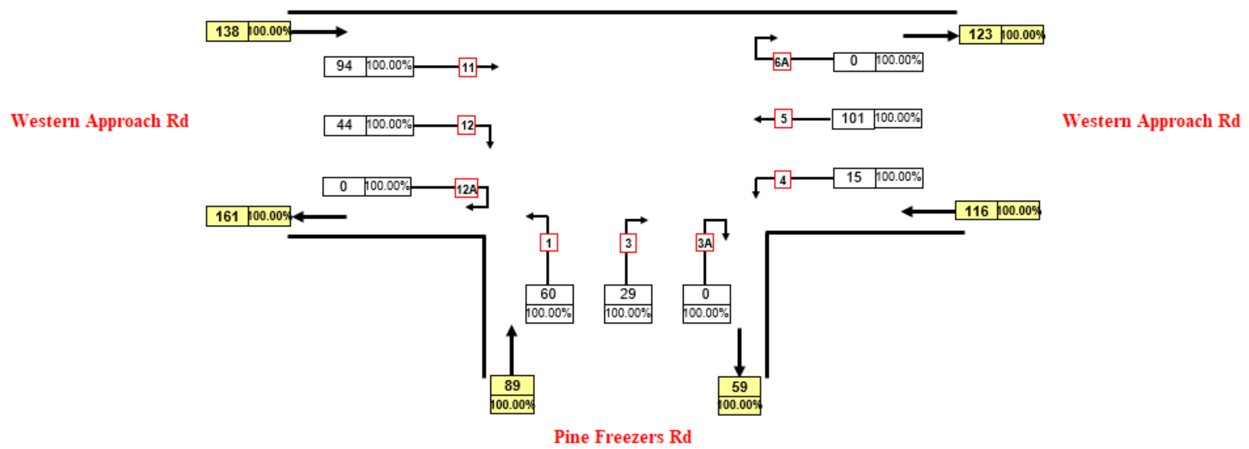


Figure 2.13 Peak-hour turning movements: Intersection Western Approach Road – Pine Freezers Road

2.5 Crashes

Location SA Viewer provides the most recent published records of crash events on roads in Port Lincoln (2018-2022). These provide location, severity of injury and crash type. Summarised below are the crash statistics for the road section and junctions in Port Lincoln discussed above.

Road sections

- Pine Freezers Road: 1 Property Damage Only (PDO)
- Proper Bay Road: 1 PDO
- Windsor Avenue: 1 PDO
- Stamford Terrace: 2 casualty (right angle and head on crashes) and 1 PDO.

No crashes have been recorded on Bel-Air Drive, Stevenson Street, Ravendale Road, Marina Drive or St Andrews Drive.

Junctions

- Pine Freezers Road/Proper Bay Road: 1 PDO
- Proper Bay Road/Windsor Avenue: 1 PDO, 1 casualty (rear end)
- Marina Drive/St Andrews Drive: 1 casualty crash (right angle)

- St Andrews/Stevenson Street: 1 PDO, 2 casualty (2 right angle)
- Luke Street/St Andrews Terrace/Verran Terrace/ Le Brun Street: 15 PDO, 3 casualty (all right-angle crashes).

Discussion

Overall, there has been few crashes recorded in the local road network. Casualty crashes have been recorded on Stamford Terrace and at 4 intersections with right angle crashes being the most prominent crash type. Several (15) PDO crashes have occurred at the intersection at Luke Street/St Andrews Terrace. All 4 intersections are priority-controlled junctions.

2.6 Summary

The national highway runs through the city parallel to and to the west of the disused railway line. It is a gazetted route for over mass and over dimensional vehicles (restricted access vehicles -RAVs) and provides access to the port and the grain terminal. Road access to the east of the city is via 3 at-grade and 2 bridge crossings of the rail line. The gazetted routes for RAV's extends to east side of the railway line running parallel with the railway line and into the northeast of the city road network. These do not extend to the Project Site. There are restrictions on the length of vehicles permitted to use Le Brun Street (10 m) and Dublin Street (32 m).

The road network on the eastern side off the railway line is quite extensive and serves a wide range of land uses including commercial, residential, schools and light industrial. Most of these roads are 2-lane undivided sealed roads and all of the intersections and junctions are priority controlled.

Traffic volumes on the national highway vary between 2100 vehicles per day on Western Approach Road and 14,700 vehicles per day on Hallett Place. The percentage of commercial vehicles ranges from 3.5% (Hallett Place) and 18% on Western Access Road. These roads are subject to increased volumes of commercial vehicles during the grain harvest season.

Traffic surveys were conducted to assess the traffic volume using local roads on the eastern side of the railway line. These indicated that over 5,000 vehicles per day on Stevenson Street, and over 6,000 vehicles per day using Ravendale Road and Marina Drive. The percentage of commercial vehicles using these roads was notably high (7–12%).

No congestion issues were identified during an inspection of the site but Council has indicated that congestion does occur at the intersection of Luke Street and Le Brun Street.

The local road network is considered to be operating safely despite the moderately high traffic volumes and high proportion of commercial traffic. Few crashes have been recorded in the last 5 years, the exception being the 15 PDO and 3 casualty crashes at the intersection of Luke Street/Le Brun Street.

St Andrews Drive is a narrow two-lane undivided road that provides access to residential properties at its western end (primarily via local road junctions), to industrial properties and Billy Lights Point recreational area. The existing junction accesses to the proposed desalination plant site and the WWTP/Sarin Group site exhibit sight and stopping distances restricted by vegetation and road alignment. Traffic volumes along this section of St Andrews Drive have not been surveyed but are likely low as the road terminates at the recreational carpark and boat ramp. The activities of the Sarin Group and the WWTP also appear to generate few traffic movements.

3 Project description

3.1 Overview

As mentioned in Section 1, the proposed development (the Project) will comprise the construction and commissioning of:

- A new 5.3 GL/annum capacity SWRO desalination plant to be accessed from St Andrews Drive via a new access road located about 50 m west of the existing site access.
- Marine infrastructure and intake pumpstation at the SAW WWTP site also to be accessed from St Andrews Drive via the existing combined WWTP/Sarin Group access road and a temporary construction access road immediately west of the recreational area car park.
- Approximately 600 m of terrestrial pipeline (located mainly within WWTP and desalination plant land but including about 200 m within an easement through Sarins Group owned property) connecting the intake pumpstation and the desalination plant

These are shown in Figure 3.1.

Construction of the desalination plant and the intake pumpstation will generate traffic movements to and from the two sites via Marina Drive and St Andrews Drive.

The Project will also include seven (7) km of underground pipeline (5 km located within public road reserves) to transfer the treated desalinated water to the existing Northside Hill Tanks. The pipeline route is shown in Figure 1.1.

The civil works associated with the laying of the transfer pipeline and the pipeline connecting the pump station with the desalination plan works will be undertaken next to live traffic to varying degrees.

At the time of preparing this report, SAW, in conjunction with the City of Port Lincoln, is investigating laydown areas external to the Site to supplement the limited laydown areas within the Site for the temporary storage of material and components. These include an area remote from the Site (for the Tunnel Boring Machine (TBM) segments and pipes and the concrete terrestrial pipes) and a cleared area on the northern side of St Andrews Drive west of the access to the WWTP (this site is subject to flooding). These laydown areas have not been assessed in this report and it has been assumed that all deliveries will be made directly to the Site.

Eyre Peninsula Desalination Plant Project

Figure 3.1
Site Layout

Legend

- Cadastre
- Desalination Plant Site Boundary
- Security Fence
- New Site Access
- Design Desalination Plant
- Pump Intake Station
- Saline Waste Transfer Pipeline
- Sewer Rising Main
- Seawater Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 100 200
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:6,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

3.2 Construction methodology and program

SAW has engaged Acciona under an ECI contract to deliver the Project excepting the transfer pipeline. Acciona has prepared a "Draft Construction Strategy (Rev B-April 2024)". This strategy has been referenced to provide a basis for determining the traffic movements likely to be generated by the construction activities. This information is subject to change but it is not anticipated that this would have any significant impact on the traffic assessment described in this report.

SAW has yet to engage a contractor to lay the transfer pipeline. In the absence of a construction strategy assumptions have been made to determine the traffic related aspects of the works required.

3.2.1 Construction philosophy

The construction strategy includes the remote and offsite prefabrication and modularisation of many of the plant elements (including tanks and buildings) and transporting these to site. The offsite fabrication will occur in workshops across South Australia including in Adelaide, Port Lincoln, and the Upper Spencer Gulf. Some specialist and proprietary components (including TBM segments and pipes) may be fabricated interstate or overseas. These will be transported to Site by trucks including over-size and over-mass vehicles for the larger components. Bulk civil materials (aggregate, concrete, clean fill) will be sourced from the Port Lincoln area and transported to Site by truck.

3.2.2 Workforce

Working hours will generally be between 6 am and 6 pm, 7 days a week. Some activities though will require continuous work and involve multiple continuous shifts outside of these times.

A total workforce peaking at about 150 will be deployed with the contractors' preference for these to reside in Port Lincoln. The local workforce will likely be augmented by fly in/fly out (FIFO) or drive in/drive out (DIDO) workforce. A self-contained construction camp may be constructed locally to accommodate FIFO and DIDO if there is insufficient existing accommodation available. The location of the camp has yet to be determined but it will not be within the desalination plant site. No provision will be made onsite for carparking (other than construction vehicles) and buses will likely be provided to transport workers to and from the two main sites.

3.2.3 Logistics – materials

All materials, plant, components and equipment will be transported to Site via existing roads. Passenger cars, utilities and general access vehicles including 19 m semi-trailers) are legally permitted to travel on any public road except where length or load limits apply (such as the length limits on Le Brun Street and Dublin Street bridge).

OSOM loads will be able to travel on roads currently gazetted for their use and permits will be sought for travel on roads connecting these gazetted routes to the Site. Escorts for over-size and over-mass vehicles may be provided as required. The contractor will be responsible for applying for permits for over-dimensional vehicles and for complying with any special conditions imposed. The application for permits will include an assessment of the nominated route to identify safety and operational risks and will nominate any mitigation measures to be applied.

There are several routes that link the B100 national highway with Marina Drive/St Andrews Drive and access to the project site. Each of these include crossing the railway line via either one of the inactive at-grade railway level crossings or one of the two bridge crossings.

Preferred truck routes would maximise the use of gazetted heavy vehicle route network (including specifically London Street and Dublin Street bridges, Stevenson Street, Luke Street/Verran Terrace, Ravendale Street, and Bel Air Drive) and minimise use of roads that pass by adjacent sensitive land uses such as schools and hospitals).

Acciona has nominated a preferred route (supported by the local council) for legal size and weight deliveries having origins and destinations located north of the rail line and outside of the immediate Port Lincoln area. The preferred route is shown in Figure 3.2. The route makes use of the existing gazetted PBS Level 3 heavy vehicle route B100 (Hallet Place-Liverpool Street-Porter Street)), Dublin Street (bridge over railway line), Luke Street, Verran Terrace and Bel-Air Drive then Ravendale Road, Marina Drive and St Andrews Drive.

Eyre Peninsula Desalination Plant Project

Figure 3.2
Preferred Traffic Route

Legend

- Substation
- Cadastre
- Local Government Area
- Desalination Plant Site Boundary
- Easement
- New Site Access
- Preferred Traffic Route
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 500 1,000
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 23/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

Minimal carparking space will be provided withing the Site. As previously mentioned, a bus service is likely to be provided at the start and end of each shift to transport workers between pick up locations in Port Lincoln and the Site. Materials, plant and components will generally be transported direct to Site. Deliveries to the desalination plant will be via the new permanent access road, as shown in Figure 2.7.

Deliveries to the WWTP will be via a new temporary construction access road immediately adjacent to the location of the marine intake pump station, as shown in Figure 3.3). An internal circulation road will be formed around the marine intake pump station to facilitate efficient movements and deliveries by trucks. Deliveries by smaller trucks to the WWTP may use the existing access.

Vehicles entering and leaving the Sites will be required to give way to traffic travelling along St Andrews Drive.

There will be limited laydown space though for storing components (particularly in the WWTP) and these will likely be unloaded and installed immediately upon delivery.

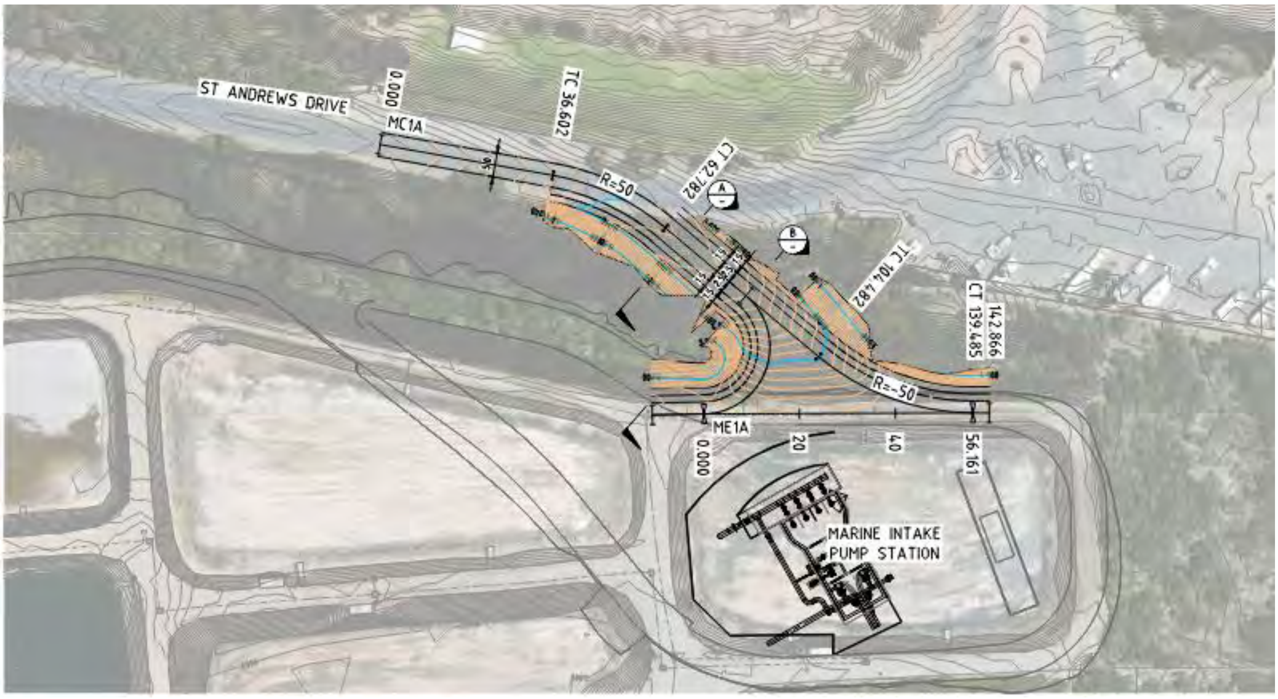


Figure 3.3 Temporary access road to the WWTP site.

12-m long pipes for the terrestrial pipeline will be delivered by semi-trailers directly alongside the pipeline route ready for subsequent installation. The TBM segments and pipes (3-m diameter and 3 m long) will also be delivered straight to the location where these are to be assembled and installed.

The public carpark at Billy Lights Point will not be used for parking of construction traffic or plant nor for temporarily laying down materials.

The transfer pipeline is assumed will be laid in sections concurrently at 2–3 locations along the route. Pipes are assumed will be transported to and unloaded into several laydown areas located along the transfer pipeline route. Details of construction program, numbers of works zones and laydown areas will be determined once SAW has engaged a contractor to undertake the construction of the transfer pipeline. It is assumed that the pipes will be laid in excavated trenches by mobile cranes which will then be backfilled and rehabilitated.

3.2.4 Sequence and program

The construction program is estimated will be 21-24 months duration during which there will be several periods of intense construction activities.

Mobilisation is expected will commence in Q1 of 2025 allowing the construction activities at the intake pump station in the WWTP. Tunnelling, marine pipeline works and fit out of the intake pump station are expected to be completed by mid-2026.

Works on the desalination plant and terrestrial pipelines would commence when long-lead specialist equipment is available in mid-2025 and conclude in late 2026.

The Project works will include:

- site establishment and mobilisation (6 months)
- shore crossing and tunnelling (6-14 months)
- marine works and offshore pipelines (5-6 months)
- marine intake pumpstation (4-6 months)
- terrestrial pipelines (3-4 months)
- desalination plant (civil, below ground services, structural, mechanical, electrical, instrumentation: 18 months).

The laying of the transfer pipeline will take place within the same period.

The intensity of construction activities and volumes of traffic movements associated with these Project phases are expected will vary significantly throughout the Project.

There will be periods of movements of earthmoving plant, components, equipment, and materials to the Site. At other times, activities within the Site will generate more moderate and regular traffic movements.

Traffic activity will reduce to much lower levels post construction during the operational phase of the Project. On site car parking may be provided.

3.2.5 Construction plant and equipment

A range of construction plant and equipment will be required to travel to or be transported to site. A list of heavy plant is included in Appendix A of the Draft Construction Strategy. It includes for example:

- earthmoving plant such as truck and trailers, tandem tippers graders, backhoe excavators, dozers
- piling rigs, concrete trucks and pumps
- generators and air compressors
- finishing plant such as rollers and water trucks
- lifting equipment such as cranes and forklifts.

Specialist items of plant will generally make a single trip to Site and depart when it is no longer required. Trucks delivering materials will make numerous trips to and from the Site. Oversize vehicles will transport components and prefabricated sections to the plant as well as to deliver any large items of plant that cannot legally travel on the roads. Pipes and materials required for the pipeline construction will be delivered directly to the required locations along the public roads.

A TBM is proposed to lay the marine pipelines from the intake pump station. The TBM will be delivered in sections firstly to the laydown area and then as required to the WWTP site as an oversize load and via the current access from St. Andrews Drive. Appropriate traffic control will be required to ensure safe and efficient access so close to the recreational facility. The TBM will be assembled in one of the disused WWTP lagoons.

3.2.6 Terrestrial and transfer pipelines

Terrestrial pipelines

The terrestrial pipes linking the seawater intake pump with the desalination plant will be installed in long continuous sections. Within the desalination plant and WWTP plant sites, Acciona proposes to clear the route of any vegetation, excavate a battered trench for the full length of the pipeline, to weld pipes alongside the trench and then place long lengths of pipe into the trench. The trench will then be back filled and reinstated. Pipes and other materials will be delivered to site via the St Andrews Drive driveway accesses.

Transfer pipeline

The transfer pipes will be placed in trenches in the road reserves of several public roads and about 2 km of undeveloped land between the desalination plant the Northside Hill tanks. The pipeline will pass under the disused railway line at Blue Fin Road via a bored tunnel. Construction of the pipeline could occur at several locations concurrently. The process will involve clearing of vegetation, mechanically excavating the trench, delivery and unloading of pipes and materials, welding of pipes alongside the trench and lowering pipes by crane, backfilling the trench with sand and spoil, compacting the fill and then reinstating area.

Traffic control will be in place to manage one-way traffic movements past the works. Where it will be necessary to close roads to traffic, detours will be put in place. Access to adjacent properties will be maintained. Blue Fin Road and Proper Bay Road are both sealed roads and any disturbance of the road pavements will be reinstated.

Large trucks delivering pipes to the respective sites are expected will unload adjacent to open trenches. Along Blue Fin Road, large vehicles will need to turn around to depart the construction zone.

3.3 Traffic

3.3.1 Construction phase

Acciona has estimated over the course of the project there could be up to approximately 15,000 light vehicle movements to and from the Site predominantly supporting the transport of construction personnel. However, as carparking at the Site is unlikely to be provided because of space limitations then it is probable that a bus service will be deployed and the number of light vehicle movements would reduce significantly. Up to 3 buses would be required to transport workers

both to and from the Site at the start and end of shifts each day.

It is expected there will be about 10,000 heavy vehicle movements over the course of the project (excluding the transfer pipeline) divided approximately between:

- quarry material (3,500)
- concrete (5,000)
- plant mobilisation (100)
- deliveries (1,000)
- bus (600–800).

25 oversized deliveries are expected to transport prefabricated components.

There is expected to be at least 5 major concrete pours during the initial stages of the Project each requiring the regular delivery of concrete over several hours. It may be necessary for concrete trucks to queue at the Site within the internal access road. Any requirement for trucks to queue outside of the construction sites is unlikely but will occur on local roads further away from Marina Drive and St Andrews Drive. Concrete pours will generally commence very early in the morning and generate regular deliveries throughout the period of the pour.

These estimates do not include the vehicle movements generated by the construction of the transfer pipeline. Each pipeline work zone will attract plant for clearing and excavating the trenches, lifting and lowering of pipes, trucks to deliver materials and buses to pick up and drop off workers.

3.3.2 Operations

The ongoing operation of the plant will require daily attendance by staff and occasional visits by maintenance personnel. This will generate mainly passenger car trips with the occasional utility and small truck. The volume of traffic attending the site post-construction will be significantly less that that during the construction period.

There will be at times, a need to deliver hazardous materials (chlorine and calcite for example) to Pite. The contractor will be required to obtain any relevant permits and comply with any applicable directions regarding transporting these materials to site by road.

4 Traffic generation and impacts

The following assessment of traffic generation and impacts is based on the baseline roads and traffic information presented in Section 2 and the "Technical Memo Traffic Impact Assessment (22/12/2023)" (including the "Draft Construction Strategy" in Appendix B) and the "Technical Memo Easements and Services" prepared by Acciona.

This assessment makes no comment on the offshore marine works nor the internal road layout and traffic circulation within the desalination plant. It is understood that all vehicle movements will enter and leave the site in a forward direction and there will be an internal road layout that formalises and minimises conflicts between traffic movements.

Assumptions have been made regarding the traffic generation associated with the construction of the transfer pipeline.

4.1 Daily traffic volumes

4.1.1 Construction workers

The construction activities are expected will generally take place daily (7 days per week) between 6 am and 6 pm although there will be times when these working hours are extended. Accordingly, there will be car and truck traffic movements to and from the site during these periods. The frequency of trips and the time of day in which they occur will vary over the course of the Project depending on the activities being undertaken.

Construction personnel will travel to and from the Site daily at the start and end of each shift. There may be times when additional shifts are required and travel to and from the Site may occur outside of these normal times. It has been estimated that there will be a maximum of 150 construction personnel working at the plant, the intake pump station and the pipelines at the peak of the construction activity. It is assumed that many of the workers will travel to and from the site by bus as there will be very limited car parking provisions for other than construction vehicles.

It is estimated that a maximum of 3 buses and up to 25 cars will travel to the Site in the morning and from the Site in the afternoon. During periods of less intense activity at the Site the numbers could reduce to 1 bus and 10 cars. Buses will travel along a prescribed route to pick up and transport workers to the project Site and to the pipeline work zones. The buses are likely to approach Marina Drive from Ravendale Road

These bus trips will have negligible impact on traffic conditions along Marina Drive or St Andrews Drive.

4.1.2 Truck movements

Trucks will transport quarry materials and concrete to Site and to deliver a wide range of materials and components. Acciona estimate about 9,500 truck movements over the construction period. The number of movements will vary significantly on a daily basis with intense activity during the early phases of the Project when earthworks and civil works are being undertaken and during major concrete pours. Assuming most of these trips will be concentrated in a 9-month period, the average number of truck movements is estimate at 35 per day with a range of possibly 25–45. These truck movements would generally have origins within or in proximity to the township on either side of the railway line.

There are expected to be 5 major concrete pours during the construction period when the maximum number of daily trips is expected. The number of concrete truck movements for a single pour could be as high as 60 which would commence early in the morning and continue for several hours (so 10-12 trucks per hour).

4.1.3 Plant mobilisation

Plant mobilisation includes earthmoving plant and other plant required to prepare the Site. This would include large plant items such as graders, dozers and excavators. Plant items that are permitted to travel on public roads would travel to Site and only return to their trip origin when the task is completed. Acciona has estimated 100 such trips and assuming these occur over a two-week period would represent an average of 7 per day and a possible range of 2–10. These movements would occur before any of the more frequent trips to site by trucks and construction personnel.

4.1.4 Over dimensional and over mass (OSOM) vehicles

Acciona estimates that about 25 over dimensional trucks will transport prefabricated and other components to site. These will be arranged to arrive during low traffic periods in the city. These deliveries would occur at various stages through the construction program and it is assumed that no more than 3 would occur in one day. Some over size truck movements will be escorted including most likely the delivery of the TBM components.

4.1.5 Total traffic

The peak traffic volumes estimated above may not necessarily coincide as each will peak at different times through the construction program. The volume of traffic movements generated by the project will commence at a low rate in the mobilisation phase (comprising a small workforce travelling to and from side, transportation of plant to site and truck deliveries of materials), gradually increasing as the construction activities become more intense (requiring a larger workforce and concentrated deliveries of concrete and materials as well as plant components) and then dropping off again as the construction moves into the commissioning and testing phase. It has been assumed that the most intense activity will be over a 9-month period following the mobilisation phase.

4.2 Route selection

Vehicle trips to the Site will have origins that are either local (within the town and on either side of the railway line), regional and outside of the township or more remote (including Port Augusta and Adelaide).

The significant majority of traffic movements generated by the Project will be general access vehicles (i.e., cars and trucks that are legally permitted to use any local road) and have local origins including workforce and delivery of materials and products. The contractor for the Project may have some influence over the routes that these vehicles take to avoid trucks in particular passing sensitive land uses such as schools and medical centres. Prefabricated plant and building components may have more distant origins and may be transported by over-dimensional vehicles.

All traffic must use Marina Drive and St Andrews Drive to access the Site.

Acciona has nominated route is suitable for general access vehicles and also PBS Level 3A (to the northern end of Bel-Air Drive). Permits will be required to operate over dimensional vehicles from the southern end of Bel-Air Drive, Ravendale Road, Marina Drive and St Andrews Drive.

Traffic movements having origins south of the railway line may take any of the available roads to access Marina Drive.

4.2.1 Workforce trips (up to 3 buses and 25 cars per day)

The workforce is expected to reside permanently or temporarily in Port Lincoln on either side of the railway line. The majority of these will be transported bus from a pickup location or drive to Site. These will have dispersed origins and use many of the local roads to access Marina Drive/St Andrews Drive. Those residing south of the railway will likely travel via Stevensons Street/Ravendale Road or Wingard Terrace. Those residing north of the rail line will likely cross it at either Anne Street or Le Brun Street and then via Follett Street/Stamford Terrace or St Andrews Terrace/Ravendale Street. Buses will have a pre-set route to collect workers and probably approach Marina Drive via Ravendale Road.

4.2.2 Concrete and materials deliveries (30–80 small to medium trucks per day)

The majority of truck traffic will remove materials during major earthworks and deliver concrete and quarry materials to the Site. These materials and products can be sourced locally from businesses located on the eastern side of the rail line. Concrete is likely to be sourced from one of the larger suppliers (north of the rail line). Concrete trucks will cross the rail line at Pine Freezers Road and then access the Site via Proper Bay Road, Windsor Avenue and Stamford Terrace turning right into Marina Drive.

General deliveries will likely have local origins within the township and could use any of the local roads to ultimately access Marina Drive.

4.2.3 Plant (2–10 movements in a day)

Earthmoving and other plant may also be hired locally from suppliers on both sides of the rail line. Trips from the northern side of the city will have to cross the railway line at one of the at-grade or bridge crossings. These may then use any of the local roads and most likely Ravendale Road to access Marina Drive.

Most trips will have origins north of the site and will access it via Ravendale Road. Trips originating from the west are likely to approach via Western Approach Road, cross the railway line on Pine Freezers Road then travel Proper Bay Road, Windsor Avenue, and Stamford Terrace to access Marina Drive.

4.2.4 Restricted access vehicles – oversize and over mass (maximum 3 in a day)

The relatively small number of oversize/over mass (RAV's) over the life of the Project will most likely be long distance trips having remote origins. These will require permits to travel beyond the current gazetted routes to travel through the local road network including Marina Drive and St Andrews Drive.

To maximise the use of the existing gazetted routes (in bold) it is suggested that the preferred routes might be via:

- **Dublin Street, Luke Street, Matthew Place**, Stevenson Street, Ravendale Road (for trips originating from the Adelaide and Port Augusta).
- **Western Approach Road, Pine Freezer Road, Proper Bay Road/Verran Terrace**, **Bel-Air Drive** (part), and Ravendale Road (for trips originating from the west).

These would be subject to a route assessment for the specific vehicle proposed and a permit would be required to allow vehicles to travel on the roads that are not gazetted. Acciona has indicated that these trips would be scheduled to occur at times of low traffic activity on the local road network.

4.3 Impacts

4.3.1 Traffic volumes

Traffic movements generated by the Project construction activities will be distributed across the local road network. These will be concentrated closer to the Project Site along Ravendale Road, Marina Drive, and St Andrews Drive. Passenger car trips and buses and minibuses transporting construction personnel to and from the Site will occur daily but will represent only a small proportional increase in daily traffic volumes on most roads. At Marina Drive and St Andrews Drive the increase may be at most 1% and 2% of existing traffic volumes respectively. These trips though will generally be concentrated in one-hour periods at the start and end of the work shifts. These peak times do not coincide with the peak hours recorded at the intersection of Marina Drive and Ravendale Road. Overall, then, the volume of car and bus trips will have a minor impact on the performance of the road network.

Only 25 RAVs are expected to access the Site over the 12-month construction period. These will be scheduled to travel through the local road network to the Site during low traffic periods (early morning or evening). Slow moving, long and wide vehicles will impede local traffic using the same routes but only for a short time and on infrequent occasions. Where necessary, escorts and traffic control will ensure safe movements through the road network.

Truck movements during major earthworks and deliveries of concrete, materials and other items represent the largest volume of vehicle trips (30-80 per day). These may be distributed over the 12-hour day – 3–7 per hour although concrete deliveries will likely be concentrated over a few hours in the morning during large pours (and commencing early in the mornings before the peak period). Concrete is likely to be sourced locally and access the site via Stamford Road right turn into Marina Drive. At Marina Drive and St Andrews Drive the extra (two-way) trips represent a percentage increase ranging from 1.2% to 2.4%

Overall, the total traffic generation is considered to be moderate and dispersed through the local road network. It may not therefore have any significant impact on traffic operations; not to say that extra truck traffic will not be noticed. This is most definitely the case closer to the Site where the traffic movements will be concentrated on Marina Drive and St Andrews Drive.

Marina Drive and St Andrews Drive provide the only route to both the desalination plant and the intake pump station from the wider road network. At the western end of the route, these roads pass by potentially sensitive receivers including:

- Marina Drive – 680 m long passing on the northern side, a small number of residences on Sailfish Drive (mainly garage frontages set back about 15–20 m), the Lincoln Executive Apartments (one two-storey dwelling set back behind a 2 m high masonry wall) and the marina. The abutting land on the southern side is undeveloped.
- St Andrews Drive – 1.5 km passing several residential properties (the majority of which are set behind fences with no direct access to the road and a smaller number of residences with direct access to the road) and 800 m passing undeveloped land on both sides (including 400 m to the plant site entry and a further 400 m to the location of the intake pump.

Residences not having direct access to these roads but backing on to them may be impacted more by noise levels than passing traffic nuisance. There are 2 residential properties located on St Andrews Drive near the intersection with Marina Drive that have direct driveway access to the road. These residents will experience some disturbance during the Project construction period and some delays when egressing their driveways.

4.3.2 Turning traffic at junctions

Traffic approaching the Site through the local road network will be required to make right and left turns at priority-controlled junctions and intersections most having no turning lanes. Vehicles turning from the non-priority road approach will be required to give way to traffic on the priority route and will incur delays and impose additional delays on other traffic who use the junctions on a regular basis. Generally, the volume of extra traffic making these turns will not be high and the impact on the operation of the junctions will not be significant.

Closer to the Site, the generated traffic movements will converge and the impacts on the operation of junctions and intersections will be more significant. These are discussed below.

The junction of Marina Drive and St Andrews Drive will be subjected to the full extent of project generated traffic movements with all traffic making right or left turns. This increase in turning traffic may place significant stress on the road pavement over the course of the construction period which may break up and require repairs.

Stamford Terrace-Ravendale Road-Marina Drive

The estimated maximum increase in daily and peak hour traffic volumes passing through this junction is only about 3% (daily traffic volumes are estimated at 6,000 on Ravendale and Marina /Drive and 3,000 on Stamford). Importantly though, there will be an increase in the number of right turns from Stamford Terrace which will experience delays as they look for gaps in traffic travelling along Ravendale Road and Marina Drive. The level of delay is not expected to be significant but on days when there are large concrete pours, concrete trucks may increase the volume of right traffic from Stamford Road to Maina Drive and longer delays.

Marina Drive-St Andrews Drive

Traffic approaching the Site will turn right from Marina Drive into St Andrews Drive. This movement will not have priority over westbound traffic and vehicles may be required to stand in the traffic lane while waiting for a gap in oncoming traffic. Whilst standing, these vehicles may prevent eastbound through vehicle movements.

4.3.3 Access to the Site access roads and laydown area

Access to the project Site and the WWTP site will be via right turns from St Andrews Drive.

There is no turning lane at the WWTP access road junction and sight distance is restricted by vegetation. Slow moving and standing right turn vehicles will delay following through traffic. The increase in turning traffic volumes and lack of sight distance will increase the risk of head on and side- swipe crashes.

A new junction to the Site will be constructed from the outset of the Project construction. The Concept Design for the RO desalination plant site location shows that the proposed new junction will be located about 60 metres further away from the curve on St Andrews Drive and along a straighter section of road. This will improve sight and stopping distance compared to the existing junction. It may also be possible (subject to further investigations) to seal the shoulder on the northern side of St Andrews Drive on the approach to the new junction to allow through traffic to pass decelerating and standing right turning traffic. Alternatively, consideration might be given to providing attended traffic management to manage any conflicts between through and turning traffic. The proximity of 2 junctions may raise some safety concerns although the volume of traffic movements to and from the property adjacent to the Site is very low as the land is not being extensively used.

The existing junction access to the WWTP exhibits poor sight and stopping distances approaching from the northeast. Presently it would appear that the number of traffic movements using the junction is low. Increased use of the access by construction traffic will proportionally increase the risk of collisions.

The proposed new construction access road is to be located immediately adjacent to the exit from the recreational area car park. The construction traffic to and from the site (carrying TBM segments, pipes and pump station components on semi-trailers and possibly a wide or heavy load operating under permit) will involve right turns in and left turns out across traffic travelling at low speeds (either entering or leaving the carpark). Vegetation is to be removed to construct the road access and this, combined with slow moving traffic could provide adequate sight and stopping distances.

4.3.4 Access to the terrestrial and transfer pipelines

Access to the terrestrial seawater pipeline routes located within the WWTP and desalination plant sites will be via either of the two accesses to the WWTP and the new plant access road from St Andrews Drive. As the construction of the pipeline progresses, semi-trailers will deliver the pipes to the appropriate location via the most convenient road access.

Vehicle access to the various work zones laying the transfer pipeline will be via the local road network and within the desalination plant. Other than Proper Bay Road, these roads are assumed carry low volumes of traffic. Nonetheless, appropriate management of traffic movements around the work zones by the public will be a high safety priority.

Access to Greyhound Road could be made via either the desalination plant land as a continuation of the pipeline through it, or via Proper Bay Road. Greyhound Road is a mere track and not very highly trafficked.

The section of Proper Bay Road is accessible via Pine Freezer Road. The works will be undertaken next to live traffic. Appropriate traffic control measures will be required during periods of construction activity.

Access to Blue Fin Road (south of rail line) is via Proper Bay Road. Access to the north, is via Stanford Dr/Kaithi Drive.

5 Mitigation measures

The following actions by the construction contractors and SAW will assist in minimizing the actual and perceived impacts of the construction traffic on the local road network and the community.

General

- Keep the local community informed of traffic conditions along Marina Drive and St Andrews Drive by providing advance notice of significant changes or periods of high and concentrated traffic use. Specifically, maintain regular contact and good relations with the residents of the two properties located on St Andrews Drive immediately adjacent to the intersection with Marina Drive, these being the most impacted of the sensitive receivers along the construction traffic route.
- Consult with Council regarding management of impacts on access to and use of the public boat ramp and other recreational facilities at Billy Lights Point for the community. Avoid wherever possible conducting major works at times when demands to use these facilities will be high (such as public holidays and weekends).
- Where it is within the control of the construction contractor, encourage regular truck operators to use the same local roads to access the Site so that the local community becomes familiar with the changed traffic conditions.
- Ensure truck drivers are aware of vehicle length limit on Le Brun Street.
- Minimise (if not avoid) traffic-generating activities at night-time so as to avoid noise nuisance and travel along the unlit sections of roads and junctions.
- Monitor the condition of the road pavement at the intersection of Marina Drive and St Andrews Drive and undertake periodic and ad hoc repairs as required to ensure the integrity of the riding surface.

Intersection improvements

- Investigate implementing right and left turn lanes on Marina Drive (west) and St Andrews Drive (south) respectively to reduce standing vehicle conflicts with vehicles travelling straight through.

WWTP and plant Site access

- Erect truck turning and junction warning signs on the St Andrews Drive road approaches to each of the three site access junctions.
- Deploy manual traffic control as required to manage potential conflicts between traffic travelling on St Andrews Drive and construction traffic turning at access junctions.
- Deploy measures along the site access roads to minimise drag out of mud into St Andrews Drive.
- Subject to a more detailed assessment of the road condition, seal the shoulder on the northern side of St Andrews Drive in immediate proximity to the existing (WWTP) and proposed new (RO site) junctions, long enough to accommodate a standing truck and to allow following vehicles to pass. This may need to be balanced with any native vegetation removal required. Alternatively, consider options for attended traffic management to manage any conflicts between through and turning traffic.
- Clear/trim vegetation (subject to approvals if protected) in the road corridor on both approaches to access junctions improve sight and stopping distances. Maximise sight and stopping distances at the junction of the new access road to the Site.
- Avoid using junctions at night where possible.
- Be aware of the overhead power lines crossing St Andrews Terrace when operating lifting equipment.

Transfer pipeline construction

- Retain traffic flow along public roads wherever possible. Prepare traffic management plans and provide manual or automated traffic control when traffic is to be restricted to one lane. Consult with council and develop agreed detours when roads are to be closed.
- Maintain at least one serviceable traffic lane on Proper Bay Road.
- Provide lighting at nigh time around open excavations and deploy barriers and signage around material stockpiles and plant.

Over dimensional vehicles

- Conduct a heavy vehicle assessment along Stevenson Street, Ravendale Road and Bel-Air Drive as well as Marina Drive and St Andrews Drive and act on the assessment findings prior to submitting an application for permits to operate over dimensional vehicles along these routes.
- Where possible, schedule these vehicles to arrive during periods of low traffic flow (e.g., early mornings) to avoid conflicts with local traffic movements.

6 Limitations

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Appendix G Preliminary Site Investigation Update

Memo

To:	SA Water
From:	Ashlyn Daly
Subject:	Eyre Peninsula Desalination Plant Project | Preliminary Site Investigation Update
Our ref:	PS137455-ADL-CLM-MEM-001 RevB
Date:	**29 May 2024**

1. Introduction

1.1 Project description

SA Water has been working to ensure that the Eyre Peninsula's water supply and supporting infrastructure can meet the current and identified future demands of the local community. Approximately 75% of the Eyre Peninsula's water is sourced from the Uley South Basin, with most of the remainder coming from a pipeline from the River Murray. The health of the Uley South Basin is critical to the water security of the Eyre Peninsula as there is no alternate local drinking water supply. In recent years, the basin has been experiencing a long-term recharge decline and drawing water at current rates risks irreversible damage to the basin.

In consultation with businesses, landholders, local communities and Councils, SA Water determined that a new seawater desalination plant near the town of Port Lincoln was the preferred option to ensure a continued drinking water supply for the region. The new plant will reduce reliance on the Uley South Basin, groundwater resources and River Murray and supports both the existing and anticipated future water demand.

The Eyre Peninsula Desalination Plant Project (the Project) will involve the construction and commissioning of a new 5.3 gigalitre (GL, Stage 1, ultimate capacity 8 GL)/annum (a) capacity seawater reverse osmosis (RO) desalination plant and marine infrastructure at Billy Lights Point in Port Lincoln, South Australia.

The Project will also include a seven (7) kilometre (km) long pipeline to transfer the treated desalination water to the existing North Side Hill tanks in Port Lincoln to supply the town.

1.2 Project area

The proposed Project site (the Site) is approximately 800 m south of the town of Port Lincoln, South Australia. The Site is located approximately 200 m west of the Eyre Peninsula Wastewater Treatment Plant and can be accessed via St Andrews Drive. Land use immediately surrounding the site is currently industrial, as the site was formerly utilised by BHP as a sand mine. The surrounding area is largely vegetated and there is a railway line that is no longer in use (Figure 1, Attachment A).

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A new access road will be constructed with an entry and exit point from St Andrews Drive.

This transfer pipeline to the North Side Hill tanks will be installed within existing road reserves along Greyhound Road, Property Bay Road and Blue Fin Road.

The closest residential properties are located within a new housing development approximately 230 m north of the proposed Site. Currently, the nearest existing dwelling to the Site is approximately 320 m away, while a number of additional dwellings in this housing development are currently under application and are proposed approximately 230 m from the Site.

1.3 Objective

The objective of the Preliminary Site Investigation (PSI) was to identify site contamination issues which may have resulted from past and/or current site use(s) and which may significantly impact the proposed use of the site for commercial/industrial use and/or represent potential public health or environmental risks.

1.4 Limitations

This technical memorandum presents the findings of the PSI which was completed in 2021, with associated database searches conducted in 2021. The report produced by Lotsearch to provide an overview of some of the site history, environmental risk and planning information is dated 27 July 2021, therefore the findings presented herein are based on the 2021 report.

The certificate of title (CT) of the site at the time the PSI was completed in 2021 (Volume 6252 Folio 672) is now cancelled. Therefore, the site extent investigated as part of the PSI corresponds to the following current CTs:

- Allotment 10 Deposited Plan 129500 (CT Volume 6275 Folio 756)
- Allotment 11 Deposited Plan 129500 (CT Volume 6275 Folio 757).

1.4.1 Permitted purpose

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2. Site history investigation

2.1 Methodology

This memo has been prepared in accordance with the guidance provided in the following documents:

— National Environment Protection Council (NEPC 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (ASC NEPM).

— State Planning Commission (SPC, 2021) *Practice Direction 14 – Site Contamination Assessment 2021*

— Standards Australia (2005) *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. AS4482.1-2005 Homebush NSW.

The research components of the report are detailed in Table 2.1.

Table 2.1 Summary of PSI Research Components

Component	Section of memo
Site Setting	**Section 2.2**
Site details	Section 2.2.1
Zoning	Section 2.2.2
Adjacent land uses and sensitive receptors	Section 2.2.3
Site walkover	Section 2.2.4
Topography	Section 2.2.5
Regional geology and soils	Section 2.2.6
Potential acid sulfate soil	Section 2.2.7
Regional hydrogeology	Section 2.2.8
Historical overview	**Section 2.3**
Previous investigations	Section 2.3.1
History of Certificates of Title	Section 2.3.2
Aerial photograph review	Section 2.3.3
EPA Section 7 search	Section 2.3.4
EPA Public Register search	Section 2.3.5
Business Directory search	Section 2.3.6

A report was produced by Lotsearch to provide an overview of some of the site history, environmental risk and planning information. The report referred to herein (provided in Attachment B) is as follows:

— Lotsearch (2021) *Lotsearch Enviro Professional, St Andrews Drive, Port Lincoln, SA 5606*, dated 27 July 2021, reference LS022638_EP.

2.2 Site setting

2.2.1 Site details

Site information details are provided in Table 2.2 below.

Table 2.2 Site information

Site Address	St Andrews Drive, Port Lincoln, SA 5606
Title Reference	CT Volume 6252 Folio 672 (cancelled) CT Volume 6275 Folio 756 (current) CT Volume 6275 Folio 757 (current)
Property Description	Allotment 600 Deposited Plan 126465 (cancelled) Allotment 10 Deposited Plan 129500 (current) Allotment 11 Deposited Plan 129500 (current) In the Area named Port Lincoln Hundred of Lincoln
Property Owner	SA Water Corporation (Allotment 10) Oscar & Simba Pty Ltd (Allotment 11)
Council Zoning	Deferred Urban (DU), General Neighbourhood (GN), Open Space (OS), Strategic Employment (SE)
Current Site Use	Unoccupied (Allotment 11) and metal fabrication (Allotment 10)
Proposed Site Use	Commercial/Industrial
Site Area	Approximately 89 ha

2.2.2 Zoning

According to the South Australian Planning and Design Code (2021), the following zones are applicable to Allotments 10 and 11:

- Deferred Urban (DU)
- General Neighbourhood (GN)
- Open Space (OS)
- Strategic Employment (SE).

2.2.3 Adjacent land uses and sensitive receptors

The site is located immediately south of the southern outskirts of the township of Port Lincoln on the Eyre Peninsula. The southern boundary of the site is bounded by the ocean and the northern boundary is bounded by residential dwellings, with the north-eastern portion bounded by St Andrews Drive. Adjacent land uses are as follows:

- North: residential then Porter Bay.
- East: commercial (aquaculture business and Eyre Peninsula Wastewater Treatment Plant), and Billy Lights Point further north-east.
- South: Jetty and ocean with aquaculture cages/ranching sites evident, the closest being approximately 100 m from the allotment boundary.
- West: vacant, undeveloped land with some internal roads.

A marina is located approximately 300 m north of the site at its closest point as part of the nearby residential development. Extending from the marina to the west is a wetland area, located approximately 300 m west/north-west from the site at its closest point.

2.2.4 Site walkover

Following completion of the PSI a limited site walkover of the area was conducted by a WSP Environmental Engineer on 4 May 2022. The following key features were noted:

- Former sand storage shed and loading dock infrastructure was present in the southern portion of the site, generally of corrugated iron and steel construction. Sand was present inside the shed.
- Numerous piles of tree branches/roots, stockpiles of rock and some small stockpiles of soil (consistent with site soils), were present in the central-southern portion of the site.
- Domestic waste was scattered in various areas across the site surface, predominantly near access roads.
- Redundant rail infrastructure, including train carriages, railway line, traffic signals and ballast was present in the central portion of the site and along the rail corridor (orientated east-west through the site), with railway line and timber sleepers extending down to the jetty in the southern portion of the site.
- A storage shed with concrete floor and corrugated iron construction was present in the south-east portion of the site. It contained various waste materials (predominantly metal), a rusted 205 L drum and metal cables.
- A redundant transformer was located on unsealed ground near the wharf in the southern portion of the site.
- Two 50 mm PVC pipes with caps, approximately 0.2 m above ground level, possibly groundwater monitoring wells, were present in the southern portion of the site near the wharf. Their status and purpose are unknown and there are no registered groundwater bores within the bounds of the site listed on the SA Government *WaterConnect* database.
- A metal fabrication business comprising a corrugated iron shed and adjoining smaller building of brick construction was present in the central-eastern portion of the site. Access was not obtained into the buildings during the site walkover.
- A visual inspection around the south-east corner of the metal fabrication building did not find evidence of staining of the ground surface or product lines associated with a former above ground storage tank (AST) (see Section 2.3.1).
- Native vegetation, mainly shrubs and mallee species, covers much of the site.

A site layout plan showing some of the above site features is presented in Figure 1, Attachment A.

2.2.5 Topography

The south-eastern portion of the site lies at an approximate level of 10 m Australian Height Datum (AHD), falling to approximately 5 mAHD in the western portion. There are also some mounds in the west and south-west portions up to 15 mAHD.

2.2.6 Regional geology and soils

The South Australian Resources Information Gateway (SARIG, 2021) (https://map.sarig.sa.gov.au/) layer: 100K Geology – map unit symbology, indicates that the region is underlain by the following geology:

- Qpcb: BRIDGEWATER FORMATION – coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete.
- T\fe: TERTIARY FERRICRETE – Undifferentiated Tertiary ferricrete.
- Ldw: WANNA MEGAGACRYSTIC GRANITE GNEISS – Granite-gneiss, weakly to strongly foliated, mafic rich, coarse-grained, meagcrystic; granite-granodiorite augen gneiss, ovoid zoned plagioclase and K-fspar to 40 mm diam. Local mafic xenoliths.

The soil type identified at the site is shallow sandy loam on calcrete (Lotsearch, Attachment B).

2.2.7 Potential acid sulfate soil

According to the Australian Soil Resource Information System (ASRIS) website (http://www.asris.csiro.au/mapping/viewer.htm), the area of Port Lincoln which includes the site has an extremely low probability of acid sulfate soils (ASS) occurring. The area near the western/north-western boundary of Allotment 11 has a low probability of occurrence.

2.2.8 Regional hydrogeology

A summary of the Department for Environment and Water (DEW, 2021) WaterConnect bore database for the area (Lotsearch, 2021), based on a search radius of 2 km from the desalination plant site, indicated the following:

- There are no registered groundwater bores identified within the site bounds.
- The closest registered bore to the site is located approximately 50 m west, drilled to 5 m depth for investigation purposes. It has a standing water level (SWL) of 2.7 m below top of casing (BTOC).
- There are 16 registered bores located within 500 m of the site and they were drilled for the purposes of investigation (11 bores) or monitoring (five bores). Of these, SWLs were listed for 13 of the bores ranging from 0.4 to 3.9 m below ground level (BGL).
- Groundwater salinity was recorded for two of the bores within 500 m of the site and ranged from 1,620 to 1,832 mg/L total dissolved solids (TDS).

2.3 Historical overview

2.3.1 Previous investigations

Subsequent to completion of the PSI in 2021, WSP was supplied with the following previous investigation reports relating to the site:

FMG Engineering (2021) *Preliminary site investigation, Former BHP Site*, Draft A, report reference S54636/275827, dated 13 October 2021.

FMG Engineering (FMG) completed a Preliminary Site Investigation (PSI) for the site described as portion of Allotment 600 in Deposited Plan 126465, referred to as the former BHP site, located at St Andrews Drive, Port Lincoln, SA. The area investigated was approximately 14.43 hectares and the scope of works comprised the following:

- Stage 1: Desktop investigation to assess the site history and whether potentially contaminating activities (PCAs) had occurred at the site which may pose a risk to future development or future site users.
- Stage 2: Grid-based soil investigation comprising excavation of 10 test pits to 1 m BGL, advancement of 83 boreholes by hand auger to 0.3 mBGL and analysis of soil samples for potential contaminants of concern.

The Section 7 search conducted by EPA found there was a licence to undertake a prescribed activity of environmental significance under Schedule 1 of the *Environment Protection Act 1993* linked to the site. The licence was issued to Oceancraft for the prescribed activity *abrasive blasting*, relating to their metal fabrication business. The shed where this business operates, located in the central-eastern portion of Allotment 600, was outside the site boundary.

Based on a site inspection cut and fill activities were noted, stockpiles of tree debris and soil were present at several locations, a power transformer (redundant) was located in the southern portion of the site, abundant equipment/infrastructure associated with former BHP sand mining operations were present (predominantly adjacent the western site boundary), a storage shed of corrugated iron construction and concrete floor was located in the southern portion of the site and used to store metal, ropes and other equipment; no asbestos containing material was observed.

The main findings of the soil investigation were as follows:

- Variable fill was present across the site to a depth of approximately 0.7 mBGL.
- Limestone cobbles (>100 mm) were observed within test pits.
- All analyte concentrations in soil were below the adopted human health and ecological criteria for commercial/industrial land use.
- Several samples (predominantly surficial) contained concentrations of metals (hexavalent chromium, copper, zinc) and total polycyclic aromatic hydrocarbons (PAHs) exceeding Waste Fill (WF) criteria. Calculation of the 95% upper confidence limit (UCL) of the arithmetic mean found the concentrations of copper and total PAHs to be below WF criteria. Statistical analysis could not be conducted for the elevated zinc and hexavalent chromium results due to concentrations >250% of the criteria (these sample locations were concentrated in the south-east portion of the site).
- Leachability analysis of selected samples recorded results below the Intermediate Waste (IW) leachability criteria.
- Groundwater was not encountered.

PCAs confirmed to have occurred at the site included cut and fill activities with soil materials of unknown origin. An additional unconfirmed PCA was inferred for the potential application of pesticides and herbicides during maintenance activities at the site.

GHD (2012) *Port Lincoln Development Plan Amendment, Phase 1 Environmental Site Assessment*, report reference 33/16378, dated 12 October 2012

This report was included as an appendix of the FMG Engineering (2021) PSI report.

A Phase 1 ESA was completed by GHD to inform an application for rezoning a parcel of land identified as Allotment 5 in Deposited Plan 17236 for 5 St Andrews Drive, Port Lincoln, SA. The area of investigation was approximately 118.3 hectares, slightly larger than the current Allotment 600 boundary, and comprised identification of PCAs at the site which may present a risk for the proposed development.

The main findings of the investigation were as follows:

- Site features noted during the site inspection included: undeveloped land with native vegetation cover; several unsealed vehicle access tracks; infrastructure from the former BHP sand mining operations (rail corridor running east/west across the site with only ballast remaining, sand loading facility including sand storage shed of corrugated iron construction and wharf, a transformer adjacent the former storage facility, and 13 train carriages); Oceancraft metal fabrication business; and several dump sites (varying from a few square metres to over 100 m^2) comprising wood, concrete, metal (including empty, rusted chemical drums), plastic and domestic waste including a television, fridge and chairs.
- Oceancraft held an EPA licence for metal blasting, but informed GHD they planned to surrender the licence. The building comprised a combination of brick and corrugated iron construction on a concrete slab. A chemical storage area contained paints, solvents, abrasives and acids and there was previously an AST present, containing diesel, used as part of the BHP operations. The report states that whilst the AST had been removed it was unclear if fuel lines were present or had been decommissioned.
- The Section 7 search revealed records for licences (current and no longer in force) to undertake a prescribed activity of environmental significance ('*abrasive blasting'* issued to Oceancraft). No other records were held by EPA pertaining to the site.
- A previous investigation of the contamination status of the ballast on site was undertaken by Amdel in 2001. Twenty samples comprising ballast and ballast fines were analysed for metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene, xylenes (BTEX), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs) and PAHs. Several samples contained concentrations of the metals copper, chromium, nickel, lead and zinc exceeding adopted ecological criteria but below adopted health criteria. Leachate testing indicated the metals were not in leachable form. The report concluded use of the ballast 'would result in environmental concern if used for general construction material or road base'.
- The following PCAs were identified as potentially occurring at the site:
  - abrasive blasting
  - bulk shipping facilities
  - metal coating, finishing or spray painting
  - railway operations
  - scrap metal recovery

- spray painting
- transport depots or loading sites
- fill or soil importation
- liquid organic chemical substances – storage.

— Risk rankings were applied for areas of potential environmental concern and the former AST was assigned a ranking of 'high' (remaining areas were low to medium). The AST was located adjacent the south-east corner of the Oceancraft building.

— Further investigation of the contamination status of soil and groundwater in the vicinity of the AST was recommended, in addition to grid-based and targeted soil sampling across the site.

2.3.2 History of certificates of title

At the time of preparing the PSI, the desalination plant site was described by CT Volume 6252 Folio 672. This CT is now cancelled, and the site is currently described by CT Volume 6275 Folio 756 and CT Volume 6275 Folio 757. Copies of the current CTs are included in Attachment C. A search of historical certificates of title relating to the desalination plant site was undertaken and is summarised as follows:

— The original land grant for the property, described as Section 110, Hundred of Lincoln, County of Flinders, was issued to **The Broken Hill Proprietary Company Limited** on 1 May 1968.

— The site has been owned by **The Broken Hill Proprietary Company Limited** since the original land grant until 12 April 2016. At this time the title was transferred to **Dean Lukin Collection Pty Ltd**.

— On 19 September 2018 the title was transferred to **Port Lincoln Proper Pty Ltd** and then transferred to **Oscar & Simba Pty Ltd** on 6 April 2021.

— On 20 September 2022 two individual titles were issued for the site with CT 6275/757 registered to **Oscar & Simba Pty Ltd** and CT 6275/756 registered to **SA Water Corporation**. These represent the current CTs for the site.

2.3.3 Aerial photograph review

Selected historical aerial imagery in approximate ten-year intervals from 1950 to 2021 was reviewed. A summary of the observed land use changes is described in Table 2.3. Copies of the aerial photographs are presented within the Lotsearch report in Attachment B.

Table 2.3 Aerial photograph review

Year	Description
1950	The site and surrounds were vacant and undeveloped with vegetation spread across the area. North-west of the site an inlet or creek was evident.
1958	The site and surrounds appeared unchanged from the 1950 aerial photograph.
1967	Several internal roads (unsealed) had been constructed through the site and several sheds were present in the eastern portion of the site as per the present-day configuration. A jetty had also been constructed extending from the southern boundary as per the present-day layout. A general east-west orientated cleared corridor coinciding with the railway line which serviced the loading dock for transport of sand from the site was present.

Year	Description
	Numerous small rectangular objects lined the railway corridor just west of the sheds, likely to be train carriages. St Andrews Drive was present immediately north of the site, and some residential dwellings had been constructed north/north-west of the site.
1973	The site and surrounds appeared unchanged from the 1967 aerial photograph.
1986	The site appeared unchanged from the 1973 aerial photograph except there were numerous train carriages north and north-west of the larger shed (associated with the transport of sand). North/north-west of the site land had been cleared, and some roads were constructed as part of residential development; a large and smaller building were evident in this area.
1995	The site appeared relatively unchanged from the 1986 aerial photograph. At the edge of the photograph extent to the east, a building was present, and north/north-west of the site there was significant residential development, with construction of a marina.
2008	The site appeared relatively unchanged from the 1995 aerial photograph. Additional residential dwellings had been constructed in the southern portion of the marina area (south of St Andrews Drive) north/north-west of the site.
2015	The site and surrounds appeared relatively unchanged from the 2008 aerial photograph except for additional construction of residential dwellings north/north-west of the site.
2021	The site and surrounds appeared relatively unchanged from the 2015 aerial photograph except for the clearing of land immediately north of the site (south of St Andrews Drive) and north-west of the site (west of St Andrews Drive) for residential development.

2.3.4 EPA Section 7 search

A Section 7 search was conducted by the South Australian Environment Protection Authority (SA EPA) for the land described in the previous Certificate of Title – Volume 6252 Folio 672.

A copy of the search results is included in Attachment D and indicated the following (as of 27 July 2021):

- There are no mortgages, charges or prescribed encumbrances affecting the site under the relevant sections of the *Environment Protection Act 1993.*
- There is a licence recorded by EPA in the public register issued under the Part 6 of the *Environment Protection Act 1993* to undertake a prescribed activity of environmental significance under Schedule 1 of the Act.
- No licences to operate a waste depot and/or to produce listed waste have been issued or repealed for the site under the *South Australian Waste Management Commission Act 1979*, the *Waste Management Act 1987* or the *Environment Protection Act 1993.*

- The EPA does not hold any of the following information:
  - reports, environmental assessments or site contamination audits of the land or any part of the land
  - details of serious or material harm, or notifications of site contamination, under Section 83A of the *Environment Protection Act 1993*
  - details of an agreement for the exclusion or limitation of liability for site contamination
  - details of any agreements relating to approved voluntary site contamination assessment or remediation proposals
  - details of notification of the commencement or termination of a site contamination audit; or
  - any other relevant information, as listed in the Section 7 search results.

The Section 7 Search results note that historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete.

Following the Section 7 search, details of the records listed on the Public Register were obtained from the EPA and are summarised as follows:

EPA Licence 001370

- Issued to Integrated Steel Division BHP Steel, commencing on 1/12/1997 until 30/11/1999.
- Authorises the licensee/s to undertake the following activity of environmental significance: *Bulk shipping facility* at Proper Bay Shiploading Jetty, Port Lincoln.

EPA Licence 12603

- Issued to Oceancraft Enterprises Pty Ltd, commencing 14/03/2013 until 28/02/2018.
- Authorises the licensee/s to undertake the following activity of environmental significance: *Abrasive blasting* (mobile abrasive blasting, spraying of protective coatings and blasting of structures outside of a blast chamber).

2.3.5 EPA Public Register search

A search of the SA EPA Public Register (https://www.epa.sa.gov.au/our_work/public_register) was undertaken by Lotsearch (Attachment B) to assess whether any Section 83A notifications, environmental authorisations (licences, exemptions and works approvals) or environmental protection orders (EPOs) had been recorded for the site or surrounding area.

The site is not currently registered on the list of sites notified to SA EPA (Site Contamination Index), or currently regulated by the SA EPA as a contaminated site. No current or historic records related to EPA environmental authorisations are listed for the site, and there are no EPOs.

There were 11 records listed on the Site Contamination Index within a 1 km radius of the site (Lotsearch, Attachment B), relating to Audit notifications, Audit reports, Audit terminations, or Section 83A notifications. Where recorded the potentially contaminating activity (PCA) was listed as 'Fill or soil importation'. Three records relate to the immediately adjacent property to the north-west.

There are 23 records relating to EPA environmental authorisations within a 1 km radius of the site (Lotsearch, Attachment B). The closest to the site, immediately adjacent to the south/south-east, is for the activity of 'Fish processing works'. There are four records relating to the properties 102 m to 212 m east and north-east of the site for environmental licences issued for the following activities:

- abrasive blasting; marinas and boating facilities (102 m east)
- bulk shipping facilities (204 m east, two records)
- sewage treatment works or septic tank effluent disposal schemes (discharge to marine waters) (212 m north-east).

2.3.6 Business Directory search

To determine the activities of businesses that may be listed on historical Certificates of Title, the 1991 UBD Business to Business Directory, the 1910, 1920, 1930, 1940, 1955, 1965, 1973 Sands and McDougall's Directory, and the 1950 UBD Business Directory were searched, but no records were recorded for the site or immediate surrounds (150 m buffer).

3. Discussion

3.1 Historical overview

The findings of the PSI assessment indicated that the original land grant for the site was issued in 1968 to **The Broken Hill Proprietary Company Limited**, who owned the site until 2016. Subsequent owners included **Dean Lukin Collection Pty Ltd, Port Lincoln Proper Pty Ltd**, and **Oscar & Simba Pty Ltd**. The site was subdivided into two allotments in 2022 and transferred to the current owners **Oscar & Simba Pty Ltd** and **SA Water Corporation**.

Based on a review of historical aerial photographs, the site was vacant and undeveloped until sometime between 1958 and 1967. By 1967 there were several sheds present in the eastern portion and a jetty extending from the southern boundary. The railway line used for the transport of sand from the site was also evident at this time. There has been very little change at the site since this time to the present day.

3.2 Potentially contaminating activities

3.2.1 Historical and existing on-site contamination sources

Based on the information reviewed as part of this assessment, including government databases and publicly available information for the Port Lincoln area, the site has historically been used for the transport of sand from the site. Sand was mined from the Coffin Bay area, transported via railway to the site (the railway enters the site from the western boundary running to the eastern portion of the site) where there is a loading dock. The sand was then historically transported from the site by ships. A metal fabrication business has historically operated at the site undertaking boat repairs and boat construction. Previous investigations cited a diesel AST (unknown volume) which was historically located adjacent the south-east corner of the metal fabrication building.

PCAs, as defined by the *Environment Protection Regulations 2009*, which have been identified associated with past or current use of this site include:

- railway operations
- bulk shipping facilities
- abrasive blasting

— fill or soil importation
— liquid organic chemical substances – organic.

Previous soil investigations (FMG, 2021) have identified elevated concentrations of metals (hexavalent chromium, copper, zinc) and total PAHs at some locations, however not in excess of human health guidelines for commercial/industrial land use.

A search of the SA EPA Site Contamination Index indicated that the site is not currently registered on the list of sites notified to the SA EPA, or currently regulated by the SA EPA as a contaminated site.

3.2.2 Historical and existing off-site contamination sources

There are several surrounding properties which are listed on the SA EPA Site Contamination Index. The closest contaminated site bounds the site to the north-west, and the PCA was 'Fill or soil importation'. Another property located approximately 100 m north-west contains a record for the same PCA.

Several surrounding properties are listed on the SA EPA Public Register with records of environmental licences. The closest to the site (102 m to 212 m east and north-east) relate to the following PCAs:

— abrasive blasting
— bulk shipping facilities
— wastewater storage, treatment or disposal.

3.3 Potential contaminants and significance

A summary of the possible significance of the identified known and potential contamination is provided below:

— Based on previous investigations (FMG, 2021), surficial soils may not meet Waste Fill classification, in particular in the south-eastern portion of Allotment 10. Vertical delineation of this contamination was not achieved at all impacted locations with a maximum known depth of 0.35 mBGL.

— Further assessment of site soils is required to confirm waste classification of any excavated soil.

— Site soils in the area investigated by FMG (2021) were considered suitable under a commercial/industrial land use setting and are likely suitable to remain on-site in non-environmentally sensitive areas.

— No groundwater data is available for the site. Possible impacts to underlying groundwater from activities such as historical bulk fuel storage (diesel AST) is unknown.

— The removal of all fuel infrastructure associated with the former diesel AST (e.g. product lines) has not been confirmed. Further assessment is required to determine if any contamination is present associated with the former fuel infrastructure.

4. References

- Australian Soil Resource Information System website: http://www.asris.csiro.au/mapping/viewer.htm.
- Department for Environment and Water (DEW, 2021) *WaterConnect Groundwater Data* (https://www.waterconnect.sa.gov.au/Systems/GD/Pages/Default.aspx). Primary Industries and Resources South Australia.
- *Environment Protection Act 1993.*
- *Environment Protection Regulations 2009.*
- FMG Engineering (2021) *Preliminary site investigation, Former BHP Site*, Draft A, report reference S54636/275827, dated 13 October 2021.
- GHD (2012) Port Lincoln Development Plan Amendment, Phase 1 Environmental Site Assessment, report reference 33/16378, dated 12 October 2012.
- Lotsearch (2021) *Lotsearch Enviro Professional, St Andrews Drive, Port Lincoln, SA 5606*, dated 27 July 2021, reference LS022638_EP.
- National Environment Protection Council (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (ASC NEPM).
- South Australian Resources Information Gateway (SARIG, 2021) https://map.sarig.sa.gov.au/, accessed 22 July 2021.
- Standards Australia (2005) *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. AS4482.1-2005 Homebush NSW.
- State Planning Commission (SPC, 2021) *Practice Direction 14 – Site Contamination Assessment 2021.*

Yours sincerely,

Ashlyn Daly

Ashlyn Daly
Senior Associate Environmental Scientist

List of attachments

Attachment A Figure
Attachment B Lotsearch report
Attachment C Certificate of title
Attachment D SA EPA Section 7

Attachment A Figure

Eyre Peninsula Desalination Plant Project

Figure 1
Site Features

Legend

Previous Allotment 600 (2021)

Cadastre

PRELIMINARY

0 190 380
Meters

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:8,000 Date: 1/09/2023

Data sources: DELWP, Geoscience Australia, DataSA, Metromap

Attachment B Lotsearch report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Address: St Andrews Drive, Port Lincoln, SA 5606

Date: 27 Jul 2021 12:23:24

Reference: LS022638 EP

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	PSMA Australia Limited	01/05/2021	01/05/2021	Quarterly	-	-	-	-
EPA Site Contamination Index	EPA South Australia	15/07/2021	15/07/2021	Monthly	1000	0	6	11
EPA Environmental Protection Orders	EPA South Australia	15/07/2021	15/07/2021	Monthly	1000	0	0	0
EPA Environmental Authorisations	EPA South Australia	15/07/2021	15/07/2021	Monthly	1000	0	10	23
EPA Assessment Areas	EPA South Australia	21/06/2021	21/06/2021	Quarterly	1000	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	01/07/2021	01/07/2021	Monthly	2000	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	01/07/2021	01/07/2021	Monthly	2000	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	07/07/2021	07/07/2021	Monthly	2000	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	11/05/2021	11/05/2021	Quarterly	2000	0	0	0
National Waste Management Facilities Database	Geoscience Australia	12/05/2021	07/03/2017	Annually	1000	0	0	0
EPA Collection Depots	EPA South Australia	31/05/2021	31/05/2021	Quarterly	1000	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	15/02/2021	15/03/2012	Annually	1000	0	0	1
Historical Business Directories (Premise & Intersection Matches)	Hardie Grant, Sands & McDougall			Not required	100	0	0	0
Historical Business Directories (Road & Area Matches)	Hardie Grant, Sands & McDougall			Not required	100	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant, Sands & McDougall			Not required	250	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant, Sands & McDougall			Not required	250	-	0	0
Mines and Mineral Deposits	Department for Energy and Mining	22/04/2021	22/04/2021	Quarterly	1000	0	0	1
Groundwater Aquifers	Department for Environment and Water	29/03/2021	01/01/2008	Annually	1000	2	2	2
Drillholes	Department for Environment and Water	16/07/2021	02/07/2021	Quarterly	2000	0	1	54
Surface Geology 1:100,000	Department for Energy and Mining	12/07/2018	01/07/2018	As required	1000	5	9	12
Geological Linear Structures 1:100,000	Department for Energy and Mining	12/07/2018	01/07/2018	As required	1000	0	0	0
Atlas of Australian Soils	ABARES	19/05/2017	17/02/2011	As required	1000	1	1	1
Soil Types	Department for Environment and Water	12/07/2018	01/07/2009	As required	1000	1	1	2
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000	1	2	3
Acid Sulfate Soil Potential	Department for Environment and Water	30/03/2021	03/06/2016	Annually	1000	1	1	3

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Soil Salinity - Watertable Induced	Department for Environment and Water	19/03/2021	01/07/2009	Annually	1000	1	1	3
Soil Salinity - Non-watertable	Department for Environment and Water	19/03/2021	01/07/2009	Annually	1000	1	1	2
Soil Salinity - Non-watertable (magnesia patches)	Department for Environment and Water	19/03/2021	01/07/2009	Annually	1000	1	1	1
Planning and Design Code - Zones	Department of Planning, Transport and Infrastructure	01/07/2021	08/04/2021	Monthly	1000	4	7	13
Planning and Design Code - Subzones	Department of Planning, Transport and Infrastructure	01/07/2021	19/03/2021	Monthly	1000	0	0	0
Land Use Generalised 2019	Department of Planning, Transport and Infrastructure	20/08/2020	12/08/2020	Annually	1000	1	8	12
Commonwealth Heritage List	Australian Government Department of Agriculture, Water and the Environment	18/05/2021	20/11/2019	Annually	1000	0	0	0
National Heritage List	Australian Government Department of Agriculture, Water and the Environment	18/05/2021	20/11/2019	Annually	1000	0	0	0
State Heritage Areas	Department for Environment and Water	30/03/2021	10/11/2004	Annually	1000	0	0	0
SA Heritage Places	Department for Environment and Water	22/04/2021	13/01/2021	Quarterly	1000	0	0	0
Aboriginal Land	Department for Energy and Mining	30/03/2021	08/04/2018	Annually	1000	0	0	0
Bushfire Protection Areas	Department of Planning, Transport and Infrastructure	04/09/2018	20/02/2018	Annually	1000	1	3	6
Bushfires and Prescribed Burns History	Department for Environment and Water	29/03/2021	03/02/2021	Annually	1000	0	0	0
Groundwater Dependent Ecosystems Atlas	Bureau of Meteorology	14/08/2017	15/05/2017	Annually	1000	2	2	22
Ramsar Wetland Areas	Department for Environment and Water	01/03/2021	18/02/2020	Annually	1000	0	0	0

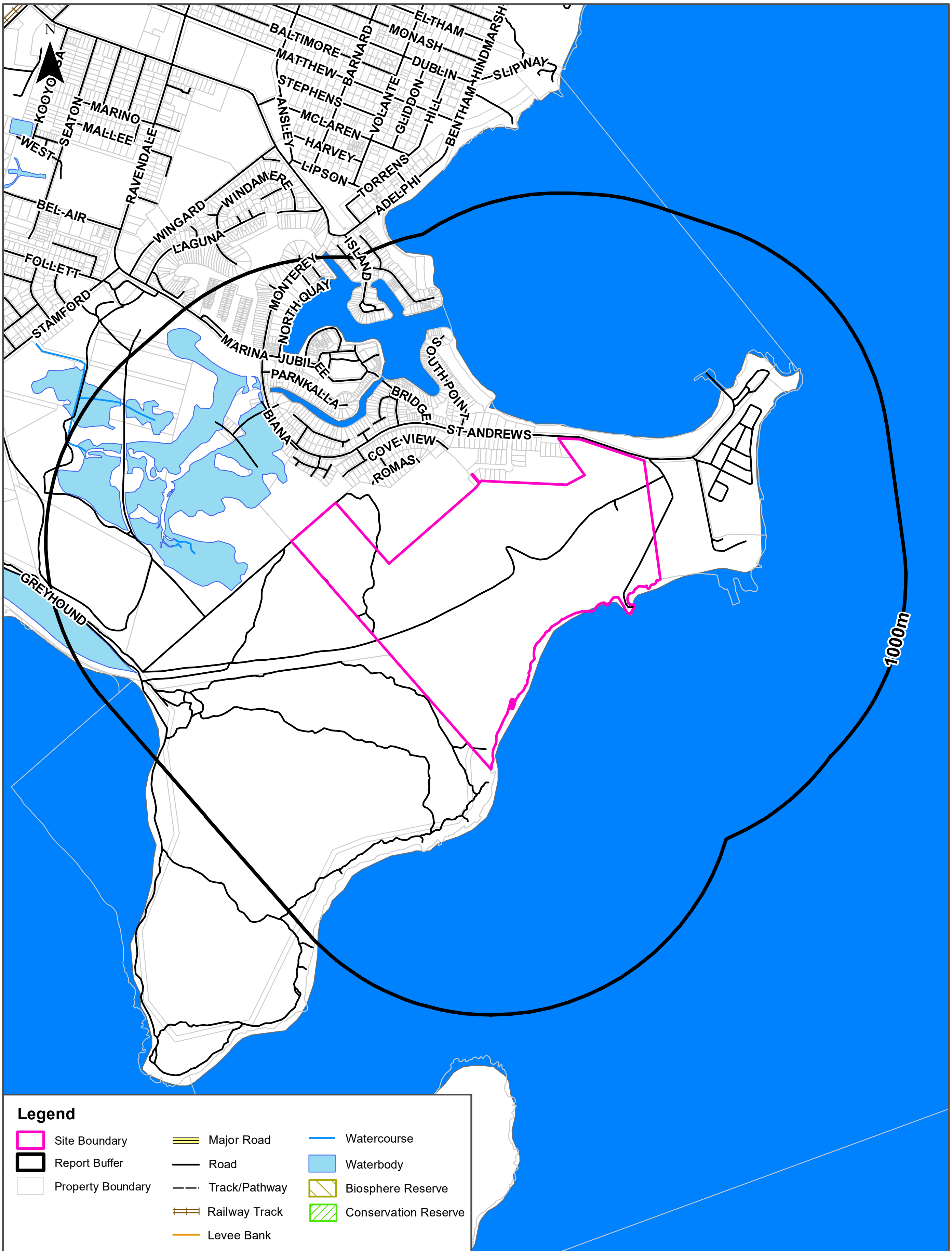
Site Diagram

St Andrews Drive, Port Lincoln, SA 5606

Legend	Total Area: 891349m^2	Scale: 0 25 50 100 150 200 250 Meters
Site Boundary	Total Perimeter: 5298m	Data Sources: Aerial Imagery © Aerometrex Pty Ltd
Internal Parcel Boundaries	Disclaimers: Measurements are approximate only and may have been simplified or smaller lengths removed for readability. Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.	Coordinate System: GDA 1994 MGA Zone 54 / Date: 27 July 2021

Topographic Features

St Andrews Drive, Port Lincoln, SA 5606



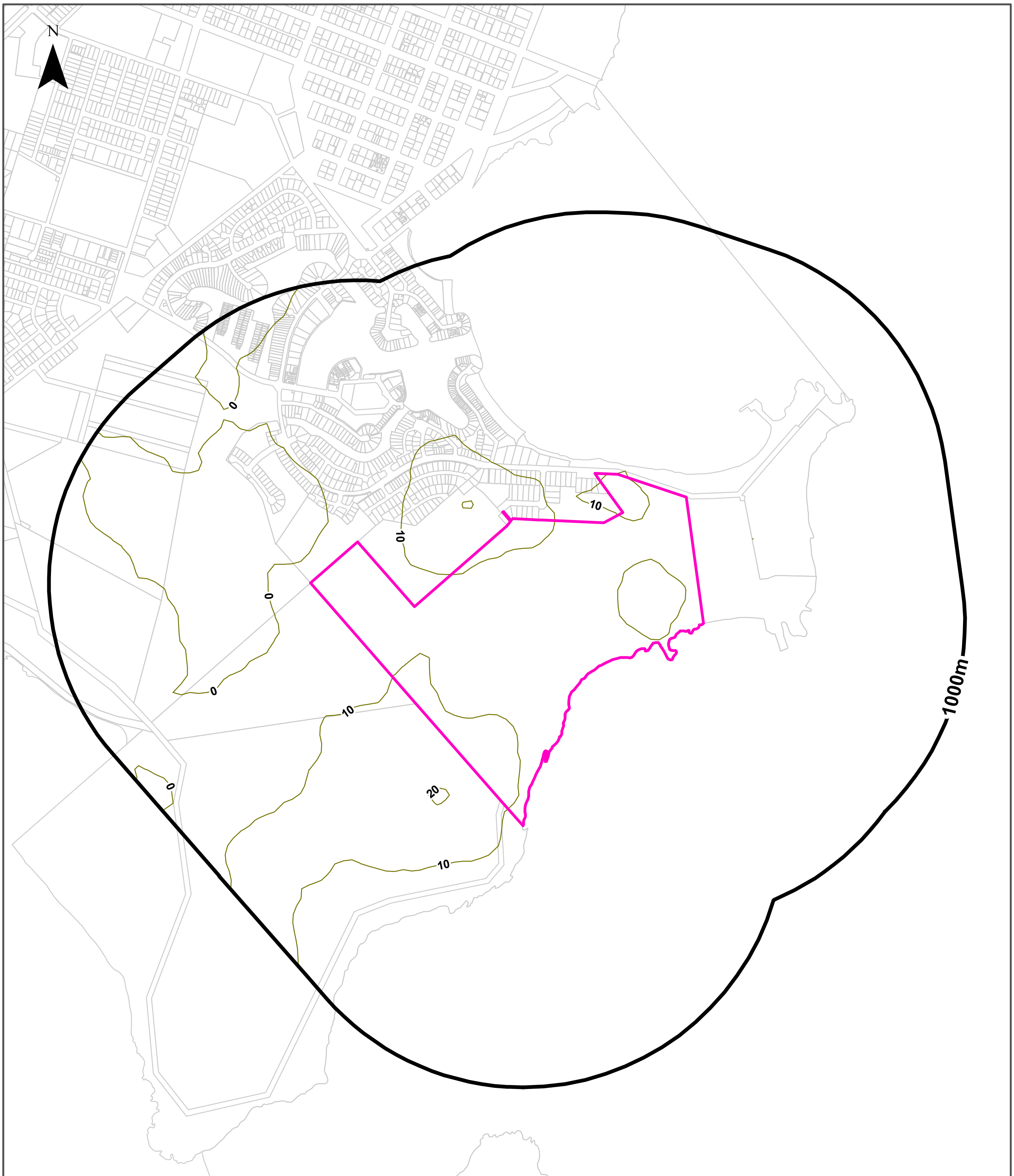
Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Major Road
- Road
- Track/Pathway
- Railway Track
- Levee Bank
- Watercourse
- Waterbody
- Biosphere Reserve
- Conservation Reserve

Scale: 0 100 200 400 600 800 1,000 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Elevation Contours

St Andrews Drive, Port Lincoln, SA 5606



Legend

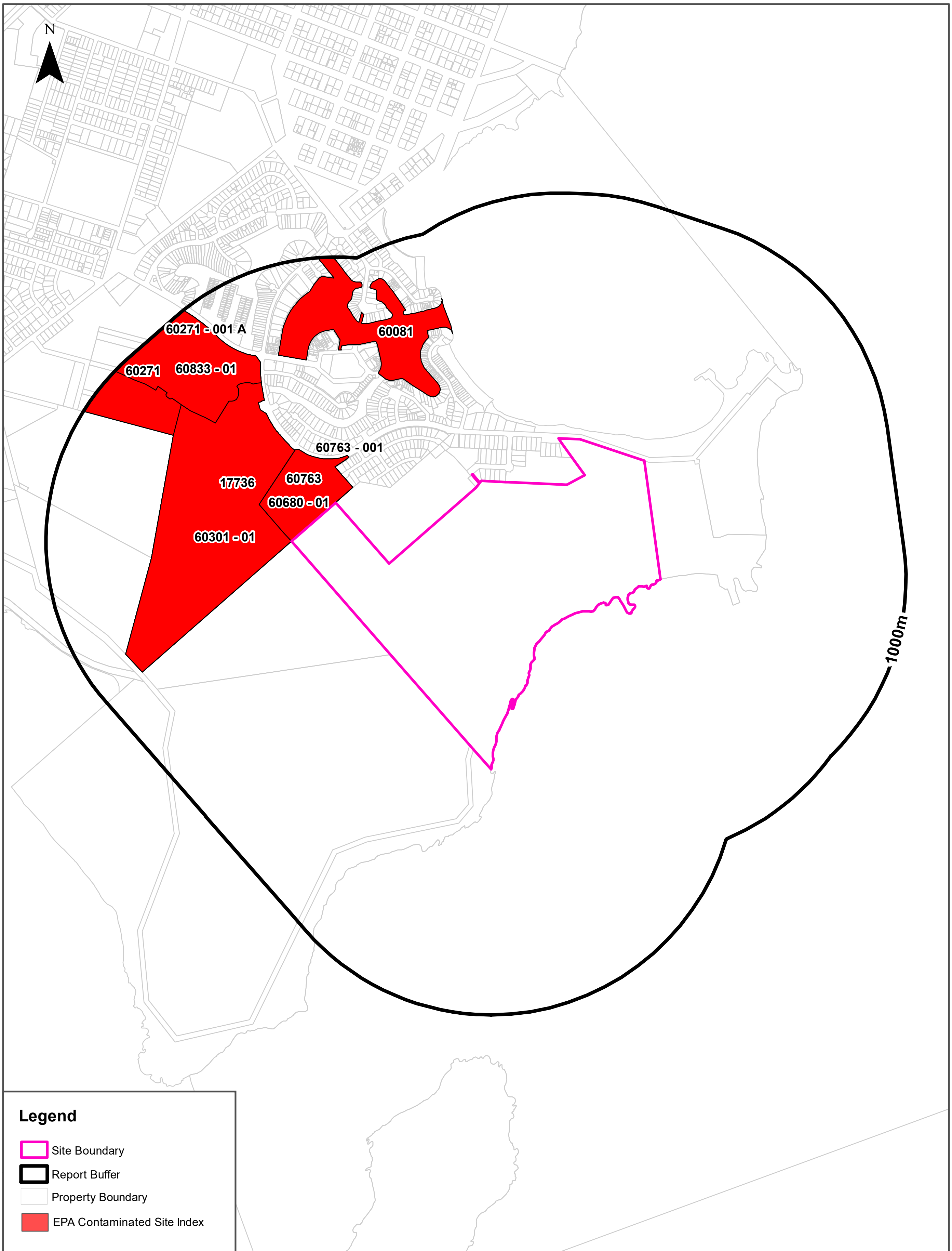
- Site Boundary
- Report Buffer
- Property Boundaries
- Elevation Contour 10m

10m contours derived from SRTM-derived 1 second digital elevation model, supplied by Geoscience Australia. The smoothed digital elevation model (DEM-S) represents ground surface topography, excluding vegetation features, and has been smoothed to reduce noise and improve the representation of surface shape. An adaptive smoothing process applied more smoothing in flatter areas than hilly areas, and more smoothing in noisier areas than in less noisy areas. This DEM-S supports calculation of local terrain shape attributes such as slope, aspect and curvature that could not be reliably derived from the unsmoothed 1 second DEM because of noise.

Scale: 0 100 200 400 600 800 1,000 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

EPA Site Contamination Index

St Andrews Drive, Port Lincoln, SA 5606



Scale: 0 100 200 400 600 800 1,000 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 18 August 2021

EPA Contaminated Land

St Andrews Drive, Port Lincoln, SA 5606

EPA Site Contamination Index

Sites on the EPA Contamination Index within the dataset buffer:

Notification No	Type	Address	Activity	Status	LocConf	Dist	Dir
17736	Pre 1 July 2009 Audit Notification	Lincoln Lakes Marina Stage 2B St Andrews Terrace PORT LINCOLN SA 5606	Not recorded	Current EPA List	Premise Match	0m	West
17736	Pre 1 July 2009 Audit Termination	Lincoln Lakes Marina Stage 2B St Andrews Terrace PORT LINCOLN SA 5606	Not recorded	Current EPA List	Premise Match	0m	West
60301 - 01	S83A Notification	Lot 600 St Andrews Terrace PORT LINCOLN SA 5606	Fill or soil importation	Current EPA List	Premise Match	0m	West
60680 - 01	S83A Notification	Lot 1 Cove View Drive PORT LINCOLN SA 5606	Fill or soil importation	Current EPA List	Premise Match	0m	North West
60763	Audit Notification	Lot 1 Cove View Drive PORT LINCOLN SA 5606	Fill or soil importation	Current EPA List	Premise Match	0m	North West
60763 - 001	Audit Report	Lot 1 Cove View Drive PORT LINCOLN SA 5606	Fill or soil importation	Current EPA List	Premise Match	0m	North West
60081	Audit Notification	Lincoln Lakes Marina PORT LINCOLN SA 5606	Not recorded	Current EPA List	Premise Match	353m	North West
60081	Audit Termination	Lincoln Lakes Marina PORT LINCOLN SA 5606	Not recorded	Current EPA List	Premise Match	353m	North West
60833 - 01	S83A Notification	Various Allotments St Andrews Terrace PORT LINCOLN SA 5606	Not recorded	Current EPA List	Premise Match	567m	North West
60271	Audit Notification	Lot 600 St Andrews Terrace PORT LINCOLN SA 5607	Not recorded	Current EPA List	Premise Match	625m	North West
60271 - 001 A	Audit Report	Lot 600 St Andrews Terrace PORT LINCOLN SA 5607	Not recorded	Current EPA List	Premise Match	625m	North West

Site Contamination Index Data Source: EPA South Australia

EPA Public Register

St Andrews Drive, Port Lincoln, SA 5606

EPA Environment Protection and Clean Up Orders

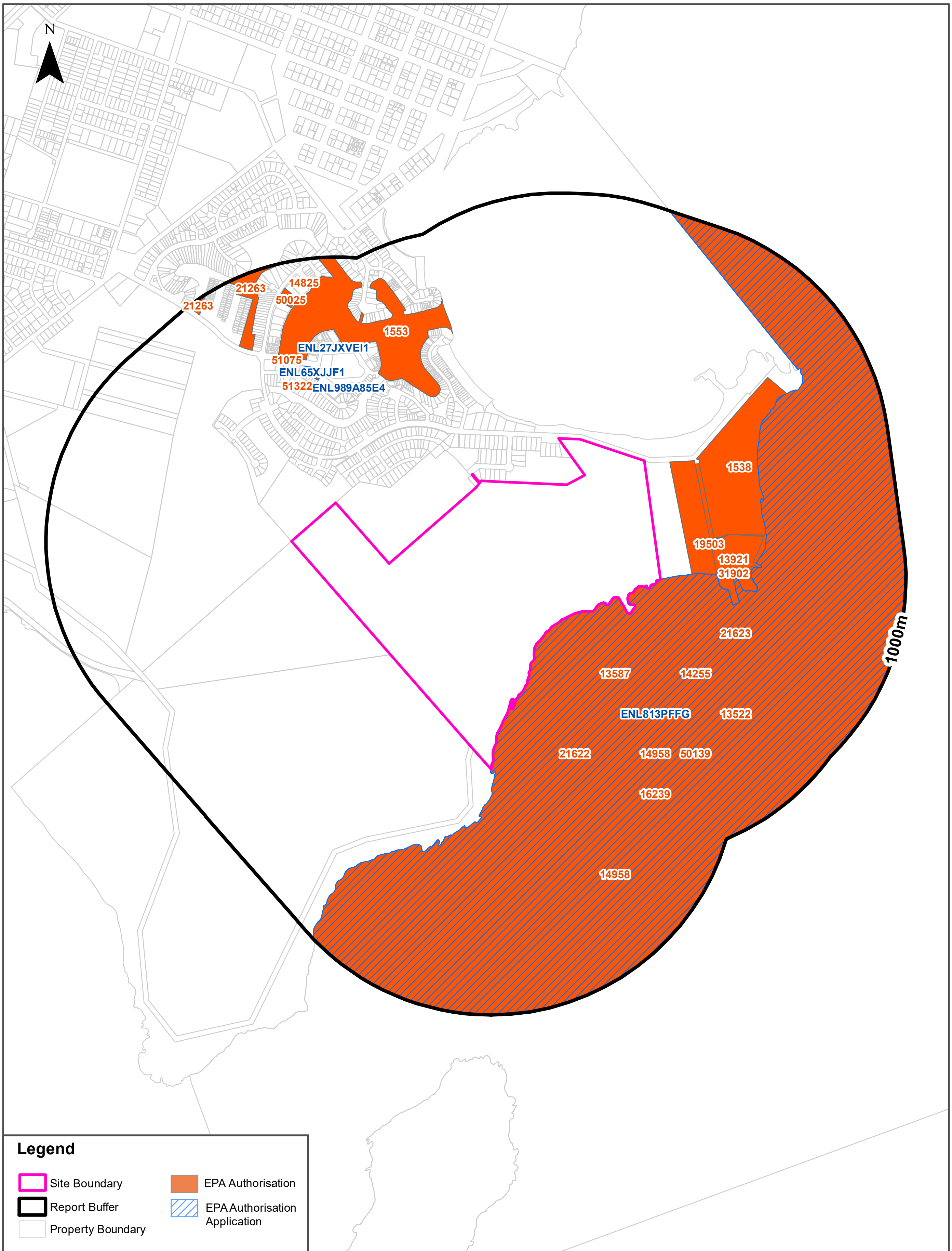
EPA Environment Protection and Clean Up Orders, within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	LocConf	Dist	Dir
N/A	No records in buffer								

Authorisations Data Source: EPA South Australia

EPA Authorisations and Applications

St Andrews Drive, Port Lincoln, SA 5606



Scale: 0 100 200 400 600 800 1,000 Meters

Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

EPA Public Register

St Andrews Drive, Port Lincoln, SA 5606

EPA Authorisations and Applications

EPA Authorisations and Authorisation Applications within the dataset buffer:

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	LocConf	Dist	Dir
13587	LICENCE	Surrendered	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
21622	LICENCE	Issued	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
16239	LICENCE	Issued	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
21623	LICENCE	Surrendered	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
ENL813PFFG	LICENCE APPLICATION	Proceed To Authorisation	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations within Boston Bay, SA waters	Fish processing works	Current EPA Register	General Area Match	0m	North East
14958	LICENCE	Surrendered	WILHELMSEN SHIPS SERVICE PTY LIMITED	M.V. Meita Maru, Tuna Process Vessel At Anchor Boston Bay, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
14255	LICENCE	Surrendered	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
14958	LICENCE	Surrendered	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations Within Boston Bay, SA Waters, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
13522	LICENCE	Surrendered	AUSTRALIAN FISHING ENTERPRISES PTY. LTD.	Sea Princess, Various Locations Within Boston Bay, PORT LINCOLN, SA	Fish processing works	Current EPA Register	General Area Match	0m	North East
50139	LICENCE	Issued	WILHELMSEN SHIPS SERVICE PTY LIMITED	Various Locations within Boston Bay, SA waters	Fish processing works	Current EPA Register	General Area Match	0m	North East
19503	LICENCE	Issued	PORT LINCOLN SLIPWAY PTY LTD	Section 615, St Andrews Drive, PORT LINCOLN SA 5606	Abrasive blasting,Marinas and boating facilities	Current EPA Register	Premise Match	102m	East
31902	LICENCE	Issued	FLINDERS LOGISTICS PTY LTD	Various Wharf Side Facilities Throughout Port Adelaide, Osborne & Outer Harbor, Port Pirie, Wallaroo and Port Lincoln SA	Bulk shipping facilities	Current EPA Register	Premise Match	204m	East
13921	LICENCE	Issued	PERILYA BROKEN HILL LIMITED	Ellen Street, PORT PIRIE SA 5540	Bulk shipping facilities	Current EPA Register	Premise Match	204m	East
1538	LICENCE	Issued	SOUTH AUSTRALIAN WATER CORPORATION	Lot 3, St Andrews Drive, PORT LINCOLN SA 5606	Sewage treatment works or septic tank effluent disposal schemes (discharge to marine waters)	Current EPA Register	Premise Match	212m	North East
1553	LICENCE	Issued	MINISTER FOR TRANSPORT AND INFRASTRUCTURE	Lincoln Cove Marina, PORT LINCOLN, 5606, SA	Marinas and boating facilities	Current EPA Register	Premise Match	353m	North West
ENL989A85E4	LICENCE APPLICATION	Authorisation Updated	A & A SEAFOODS PTY LTD	29 Jublee Drive, PORT LINCOLN SA 5606	Petrol stations	Current EPA Register	Premise Match	504m	North West
ENL65XJJF1	LICENCE APPLICATION	Authorisation Updated	SERENDIPITY BROWN PTY. LTD.	29 Jubilee Drive, PORT LINCOLN SA 5606	Petrol stations	Current EPA Register	Premise Match	504m	North West

Record No.	Record Type	Record Status	Entity	Site Address	Activity	EPA Register Status	LocConf	Dist	Dir
51075	LICENCE	Surrendered	SERENDIPITY BROWN PTY. LTD.	29 Jubilee Drive, PORT LINCOLN SA 5606	Petrol stations	Current EPA Register	Premise Match	504m	North West
51322	LICENCE	Issued	A & A SEAFOODS PTY LTD	29 Jublee Drive, PORT LINCOLN SA 5606	Petrol stations	Current EPA Register	Premise Match	504m	North West
ENL27JXVEI1	LICENCE APPLICATION	Processing	GRAHAM BAILEY PTY LTD	14 South Quay Boulevard, PORT LINCOLN SA 5606	Petrol stations	Current EPA Register	Premise Match	619m	North West
21263	LICENCE	Issued	COMMUNITY CORPORATION 20050 INC	Allotment 146 Marina Drive, PORT LINCOLN, 5606, SA	Marinas and boating facilities	Current EPA Register	Premise Match	707m	North West
50025	LICENCE	Issued	MORI SEAFOOD PTY LTD	26 North Quay Boulevard, PORT LINCOLN SA 5606	Fish processing works	Current EPA Register	Premise Match	815m	North West
14825	LICENCE	Transferred	SOUTHERN WATERS MARINE PRODUCTS PTY LTD	26 North Quay Boulevard, PORT LINCOLN SA	Fish processing works	Current EPA Register	Premise Match	815m	North West

Authorisations Data Source: EPA South Australia

EPA Assessment Areas

St Andrews Drive, Port Lincoln, SA 5606

EPA Assessment Areas

EPA Assessment Areas within the dataset buffer:

Map Id	Supplied Ref	Area Name	Map Link	Status	Location Confidence	Distance	Direction
N/A	No records in buffer						

Assessment Areas Data Source: EPA South Australia

PFAS Investigation and Management Programs

St Andrews Drive, Port Lincoln, SA 5606

Defence PFAS Investigation and Management Program Investigation Sites

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Defence PFAS Investigation and Management Program Management Sites

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Location Confidence	Distance	Direction
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

St Andrews Drive, Port Lincoln, SA 5606

Defence 3 Year Regional Contamination Investigation Program

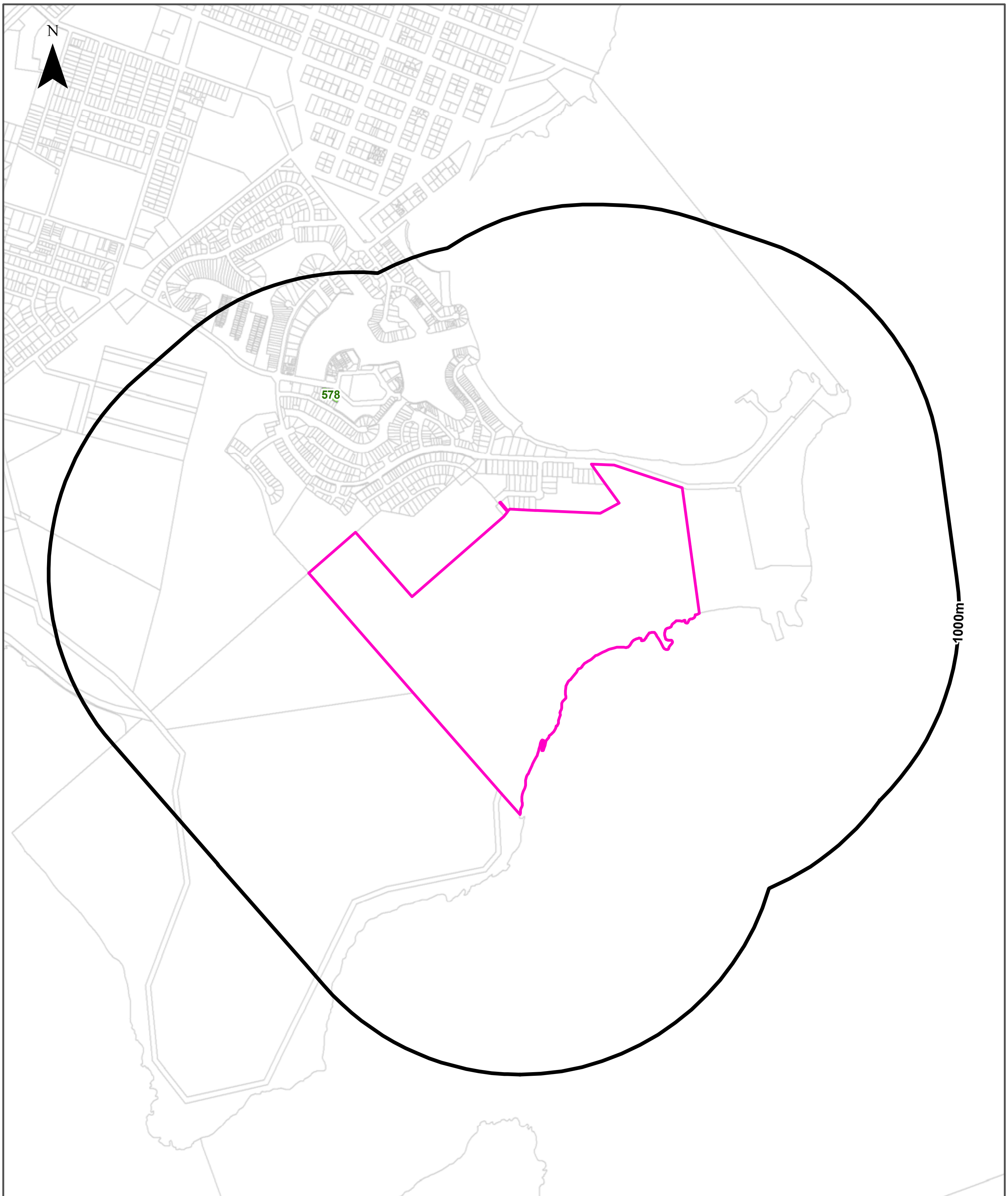
Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

Waste Management & Liquid Fuel Facilities

St Andrews Drive, Port Lincoln, SA 5606



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Waste Management Facility
- Container Collection Depot
- National Liquid Fuel Facility

Scale: 0 – 275 – 550 – 825 – 1,100 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Waste Management and Liquid Fuel Facilities

St Andrews Drive, Port Lincoln, SA 5606

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Revised Date	Location Confidence	Distance	Direction
N/A	No records in buffer								

Waste Management Facilities Data Source: Australian Government Geoscience Australia

EPA Approved Container Collection Depots

EPA approved container collection depots within the dataset buffer:

MapId	Name	Address	Suburb	Loc Conf	Distance	Direction
N/A	No records in buffer					

Collection Depot Data Source: EPA South Australia

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist (m)	Dir
578	7-Eleven Pty Ltd	Port Lincoln	Jubilee Drive	Port Lincoln	Petrol Station	Operational		13/07/2012	Premise Match	504m	North West

National Liquid Fuel Facilities Data Source: Geoscience Australia

Historical Business Directories

St Andrews Drive, Port Lincoln, SA 5606

Business Directory Records 1910-1991 Premise or Road Intersection Matches

Universal Business Directory and Sands & McDougall Directory records, from years 1991, 1973, 1965, 1955, 1950, 1940, 1930, 1920 & 1910, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection (m)	Direction
	No records in buffer						

Business Directory Records 1910-1991 Road or Area Matches

Universal Business Directory and Sands & McDougall Directory records, from years 1991, 1973, 1965, 1955, 1950, 1940, 1930, 1920 & 1910, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area (m)
	No records in buffer					

Historical Business Directories

St Andrews Drive, Port Lincoln, SA 5606

Dry Cleaners, Motor Garages & Service Stations 1930-1991 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories and Sands & McDougall's Directories, from years 1991, 1973, 1965, 1955, 1950, 1940 & 1930, mapped to a premise or road intersection, within the dataset buffer.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection (m)	Direction
	No records in buffer						

Historical Business Directories

St Andrews Drive, Port Lincoln, SA 5606

Dry Cleaners, Motor Garages & Service Stations 1930-1991
Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories and Sands & McDougall's Directories, from years 1991, 1973, 1965, 1955, 1950, 1940 & 1930, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area (m)
	No records in buffer					

Aerial Imagery 2018

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Aerial Imagery 2015

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 23 July 2021

Aerial Imagery 2008

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Source Aerial Imagery: © 2021 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.	Coordinate System: GDA 1994 MGA Zone 54	Date: 23 July 2021

Aerial Imagery 2002

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 28 July 2021

Aerial Imagery 1995

St Andrews Drive, Port Lincoln, SA 5606

Legend

Site Boundary

Buffer 150m

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 23 July 2021

Aerial Imagery 1986

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters

Data Sources Aerial Imagery: © South Australia Department for Environment & Water

Coordinate System: GDA 1994 MGA Zone 54

Date: 28 July 2021

Aerial Imagery 1973

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 23 July 2021

Aerial Imagery 1967

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 28 July 2021

Aerial Imagery 1958

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 23 July 2021

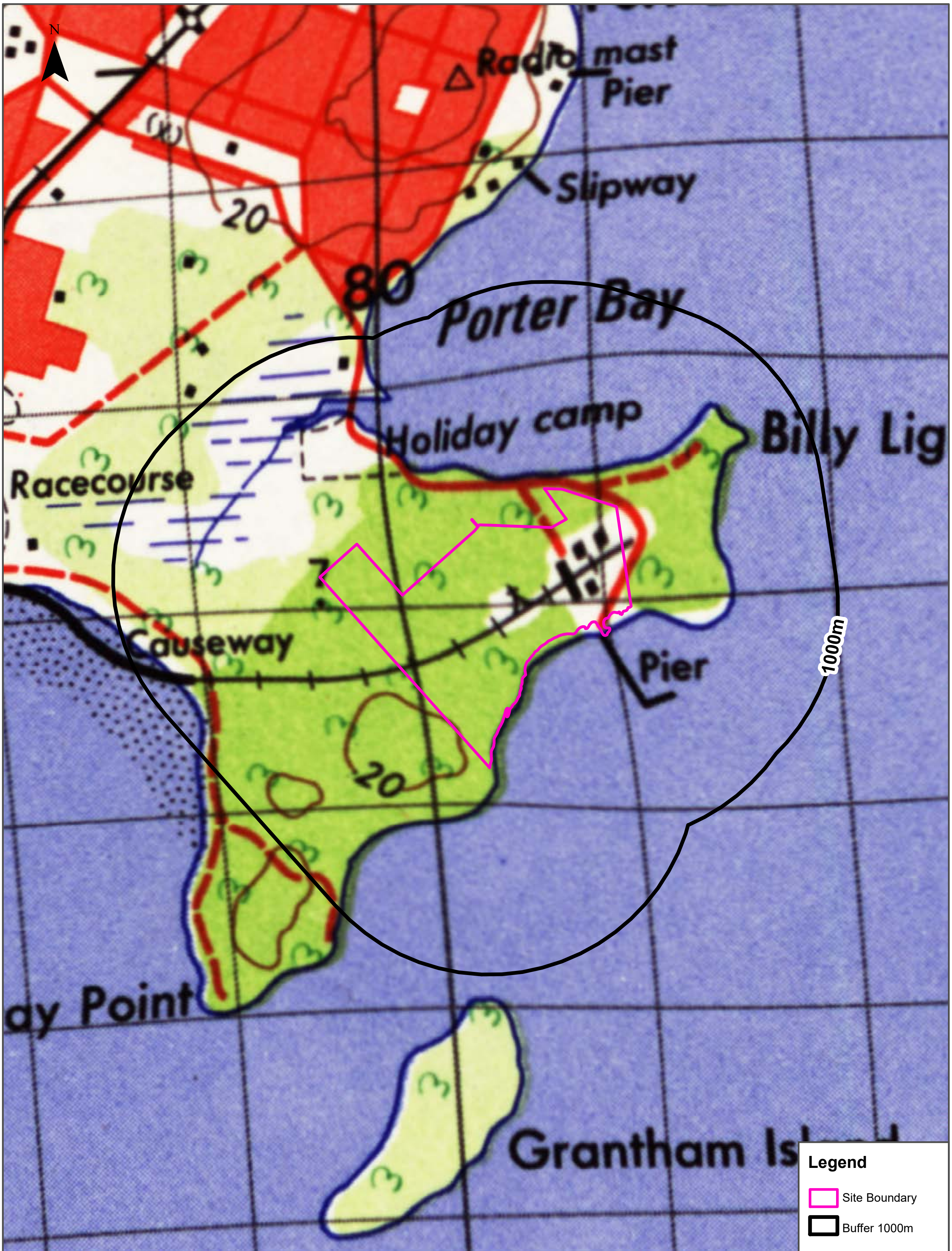
Aerial Imagery 1950

St Andrews Drive, Port Lincoln, SA 5606

Scale: 0 125 250 375 500 Meters	Data Sources Aerial Imagery: © South Australia Department for Environment & Water	Coordinate System: GDA 1994 MGA Zone 54	Date: 28 July 2021

Historical Map 1970

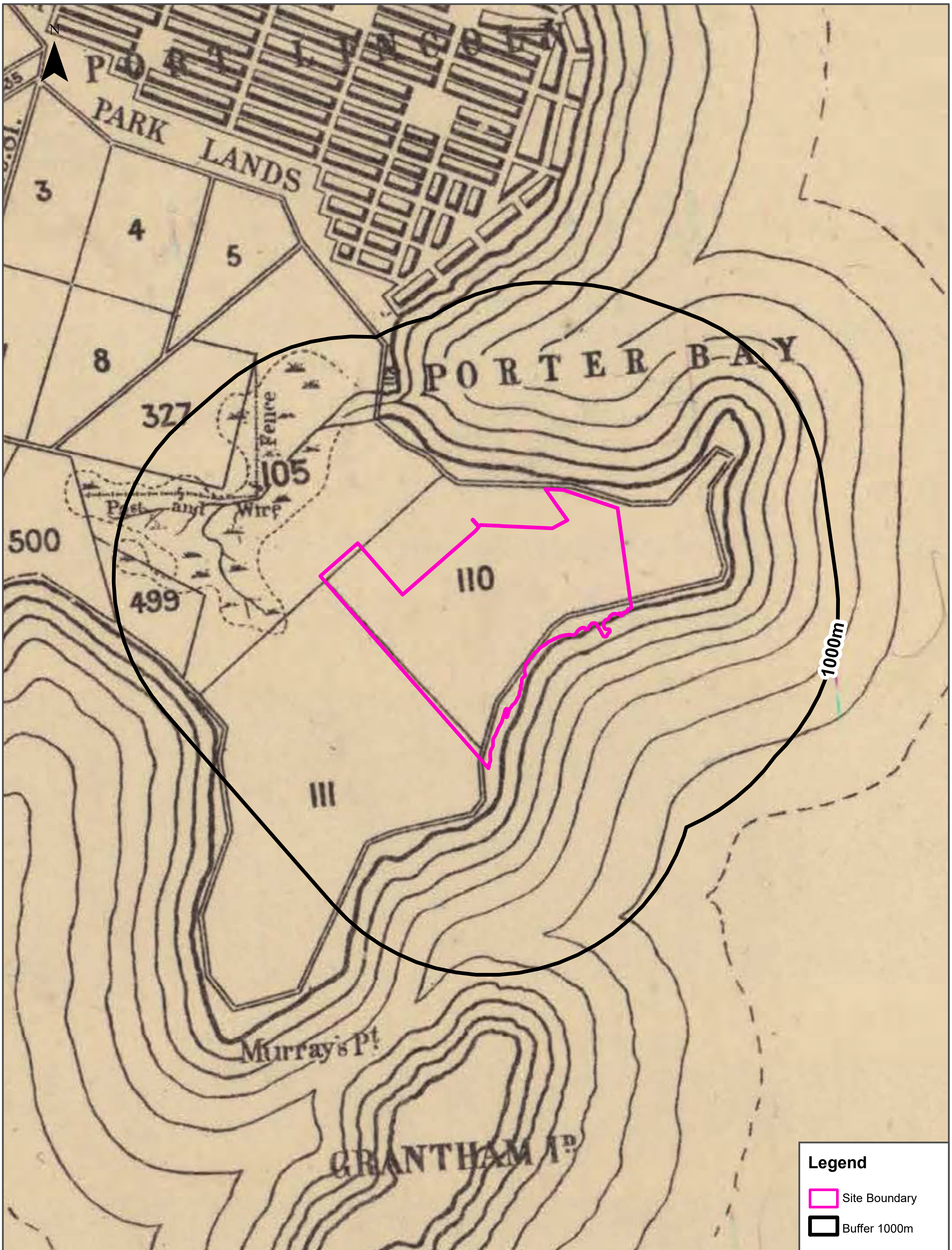
St Andrews Drive, Port Lincoln, SA 5606



Scale: 0 200 400 800 Metres	Data Sources: NATMAP 1:100,000 Topographic Maps Geoscience Australia	Coordinate System: GDA 1994 MGA Zone 54	Date: 26 July 2021

Historical Map 1898

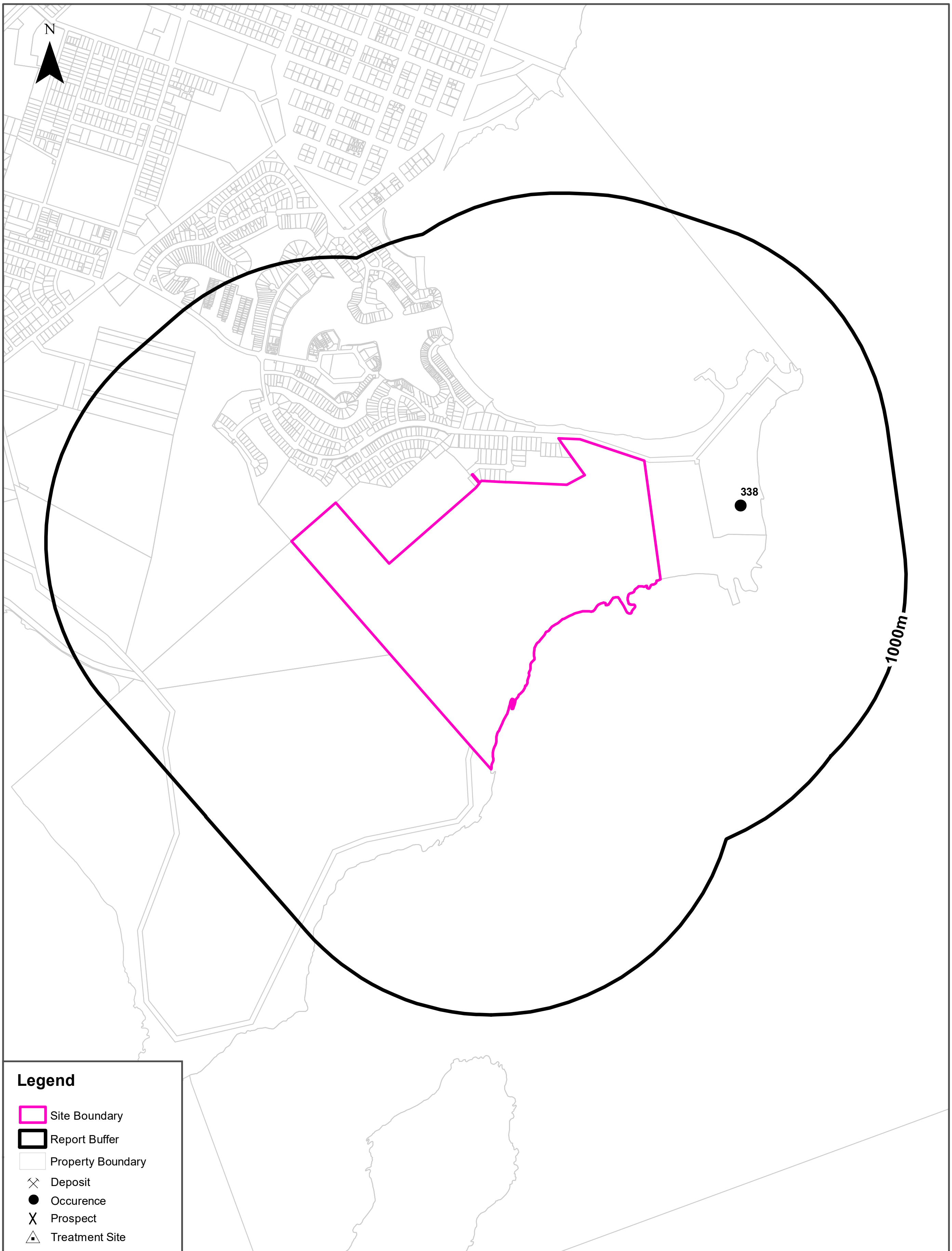
St Andrews Drive, Port Lincoln, SA 5606



Scale: 0 200 400 800 Metres	Data Sources: Hundred Map - Lincoln Surveyor General's Office, Adelaide	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Mines and Mineral Deposits

St Andrews Drive, Port Lincoln, SA 5606



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Deposit
- Occurence
- Prospect
- Treatment Site

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Mining

St Andrews Drive, Port Lincoln, SA 5606

Mines and Mineral Deposits

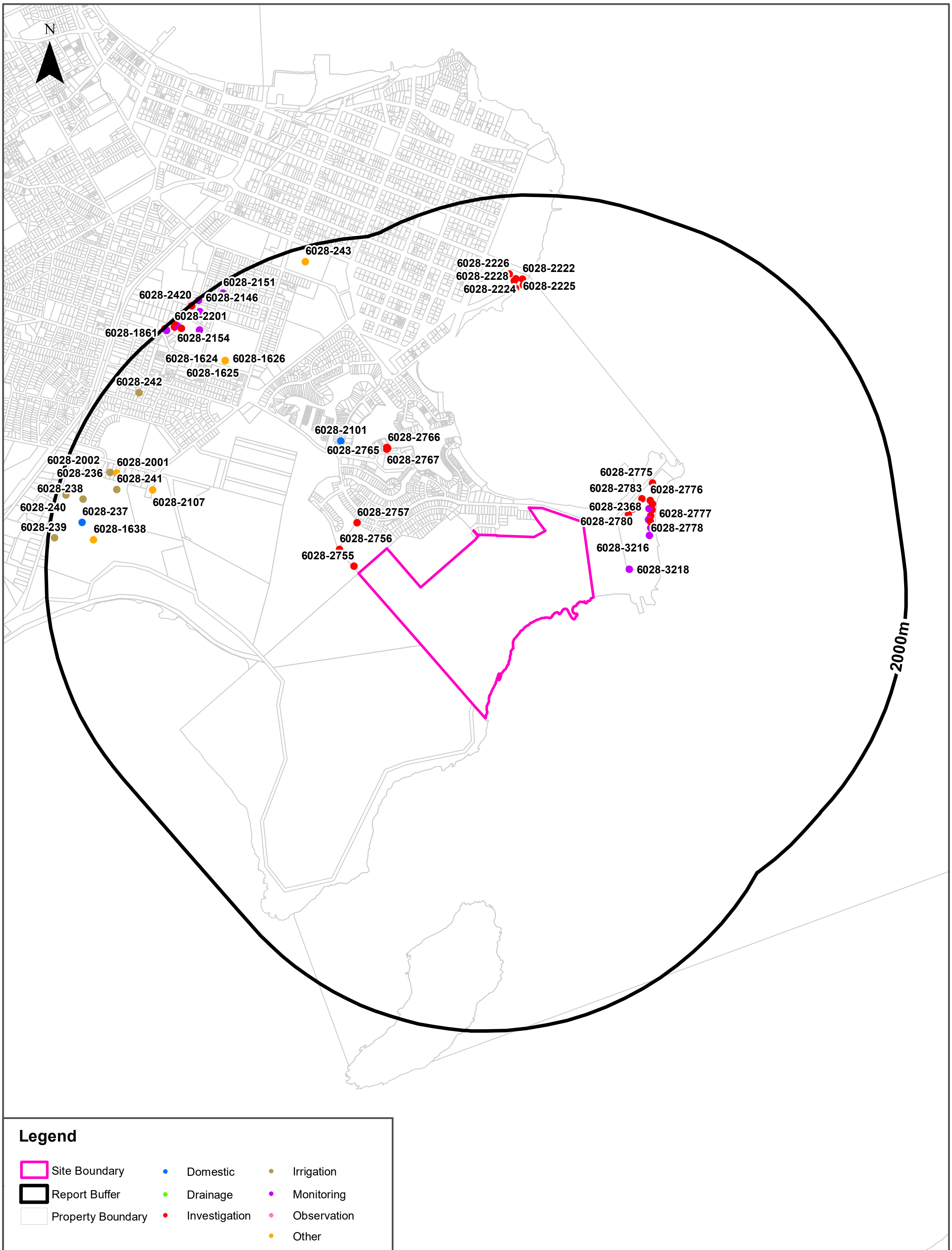
Mines and mineral deposits within the dataset buffer:

Deposit No.	Name	Class	Status	Commodity	Year	Description	Dist	Dir'n
338	BILLY LIGHTS	OCCURRENCE	Abandoned	Sand		abandoned sand pit of <1,000m2 x 1-3m deep on Pleistocene coastal lime sand, and worked by the E&WS for filling sand.	364m	East

All Mines and Mineral Deposits Data Source: Dept. of State Development, Resources and Energy - South Australia

Drillholes

St Andrews Drive, Port Lincoln, SA 5606



Scale:

0 200 400 800 1,200 1,600

Meters

Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Groundwater and Drillholes

St Andrews Drive, Port Lincoln, SA 5606

Groundwater Aquifers

Groundwater aquifers within the dataset buffer:

Aquifer Code	Description	Distance	Direction
30	Fractured Rocks - Cambrian and Precambrian rocks - quartzite, sandstone, limestone, dolomite, slate, marble, siltstone, phyllite, schist and gneiss	0m	Onsite
100	ocean	0m	Onsite

Groundwater Aquifers Data Source: Dept. of Environment, Water and Natural Resources - South Australia

Drillholes

Drillholes within the dataset buffer:

Unit No	Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	EC	Yield	DTW	SWL	RSWL	Dist	Dir'n
6028-2755	266941	MW 1		Investigation	2011-07-27	5.00		2.68					2.70	2.70	-0.02	50m	West
6028-2756	266942	MW 2		Investigation	2011-07-27	2.50		-2.51					0.50	0.50	-3.01	194m	West
6028-2757	266943	MW 3		Investigation	2011-07-27	2.50		-1.83					0.40	0.40	-2.23	246m	North West
6028-3218	350946			Monitoring	2020-10-27	18.00										252m	East
6028-2781	275696			Investigation	2013-10-10	5.40		8.18					2.50	2.50	5.68	296m	North East
6028-2780	275695			Investigation	2013-10-10	5.20		8.65					2.40	2.40	6.25	328m	North East
6028-2783	275978			Investigation	2013-10-10	5.40		4.14					2.00	2.00	2.14	405m	North East
6028-3216	350944			Monitoring	2020-10-27	5.00										408m	East
6028-2367	200394	SITE A		Monitoring	2004-05-06	5.00		4.62		1620	2920		3.90	3.90	0.72	417m	North East
6028-3217	350945			Monitoring	2020-10-27	5.00										424m	North East
6028-2779	275694			Investigation	2013-10-10	5.30		3.06					2.40	2.40	0.66	428m	North East
6028-2368	200395	SITE B		Monitoring	2004-05-06	5.00		4.44		1832	3300		3.00	3.00	1.44	430m	North East
6028-2778	275693			Investigation	2013-10-10	5.00		3.31					2.50	2.50	0.81	434m	North East
6028-2777	275692			Investigation	2013-10-09	5.00		3.80					2.60	2.60	1.20	448m	North East
6028-2776	275691			Investigation	2013-10-10	5.00		6.12					2.80	2.80	3.32	452m	North East
6028-2782	275977			Investigation	2013-10-09	5.00		6.36					2.80	2.80	3.56	458m	North East
6028-2775	275690			Investigation	2013-10-09	5.00		8.24					2.80	2.80	5.44	510m	North East
6028-2765	267624	MW 1		Investigation	2011-10-26	5.00		3.80					2.60	2.60	1.20	633m	North West
6028-2766	267625	MW 2		Investigation	2011-10-26	5.00		3.41					2.50	2.50	0.91	640m	North West

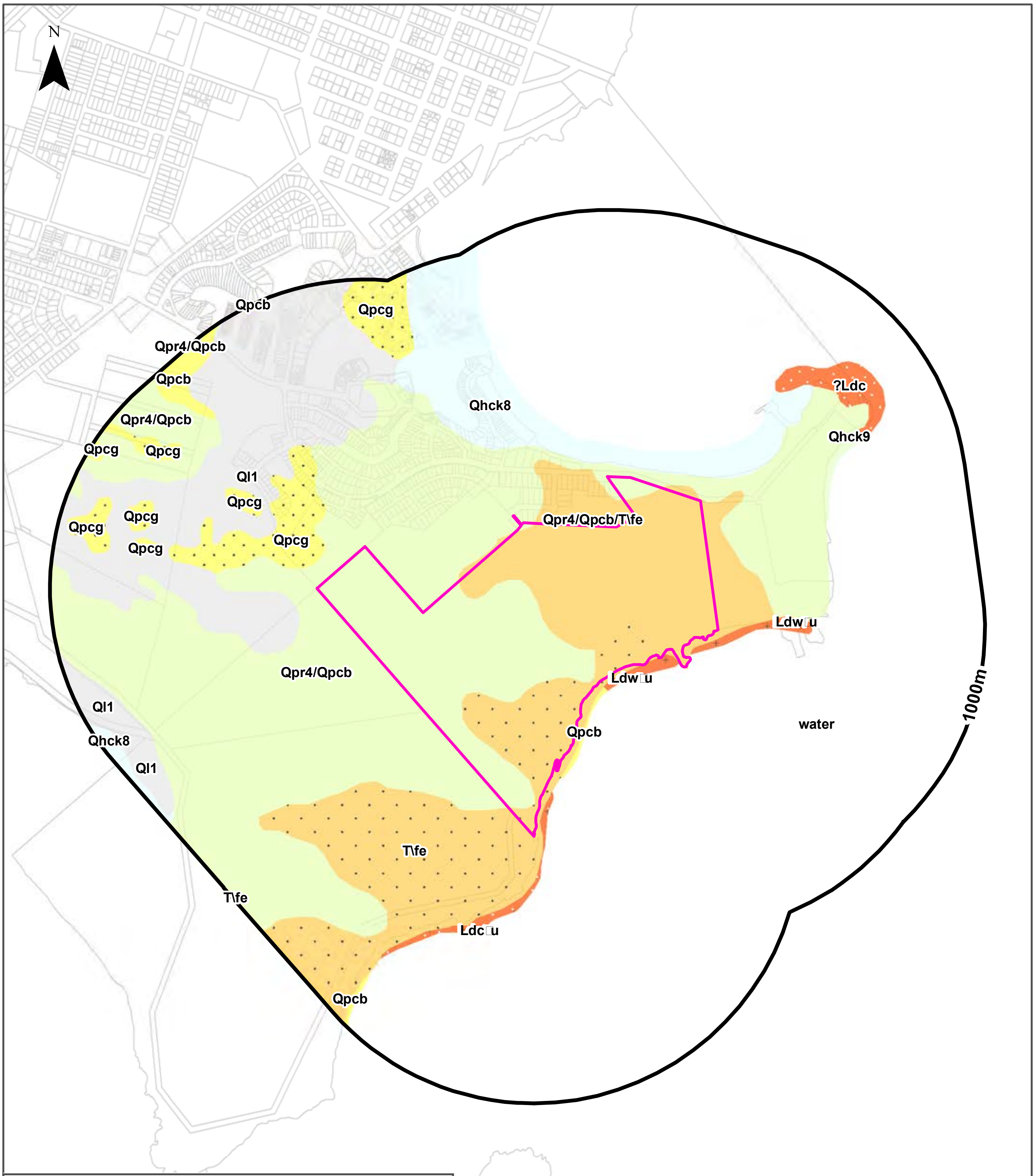
Unit No	Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	EC	Yield	DTW	SWL	RSWL	Dist	Dir'n
6028-2767	267626	MW 3		Investigation	2011-10-26	5.00		3.20					2.60	2.60	0.60	645m	North West
6028-2101	165690			Domestic	1997-02-15	8.75		3.30		32823	50200	1.0000	4.00	4.00	-0.70	747m	North West
6028-2225	182436			Investigation	2000-10-02	5.50		8.96					3.70	3.70	5.26	1405 m	North
6028-2107	166716			Stock	1997-06-28	5.00		4.61		13504	22600	0.5000	2.00	2.00	2.61	1421 m	West
6028-2224	182435			Investigation	2000-10-02	3.50		9.23					3.40	3.40	5.83	1422 m	North
6028-2223	182434			Investigation	2000-10-02	3.80		7.86					3.70	3.70	4.16	1424 m	North
6028-2227	182438			Investigation	2000-10-02	8.70		10.07					6.20	6.20	3.87	1451 m	North
6028-2222	182433			Investigation	2000-10-02	6.30		8.59					5.00	5.00	3.59	1460 m	North
6028-2228	182439			Investigation	2000-10-02	8.60		10.64					6.70	6.70	3.94	1466 m	North
6028-2226	182437			Investigation	2000-10-02	8.70		13.96					7.30	7.30	6.66	1498 m	North
6028-1625	11864		Backfilled		1986-07-20	6.00		10.49								1583 m	North West
6028-1624	11863		Backfilled		1986-07-20	12.00		10.49								1583 m	North West
6028-1626	11865		Operational	Town Water Supply (Public/Municipal)	1986-07-20	6.00		10.49	7.70	10763	18304	2.0000	2.10	2.10	8.39	1583 m	North West
6028-241	10480		Operational	Irrigation	1979-06-06	4.11		6.66	7.50	1625	2930	1.2000	1.80	1.80	4.86	1637 m	West
6028-2001	150971			Environmental; Recreational	1992-03-20	13.00		4.85	8.00	7307	12680	0.5000				1672 m	West
6028-1638	11877		Operational	Town Water Supply (Public/Municipal)	1987-07-29	6.00		3.00					0.00	0.00	3.00	1708 m	West
6028-236	10475		Operational	Irrigation		3.66		5.93		3815	6780		3.05	3.05	2.88	1715 m	West
6028-2002	150972		Backfilled	Environmental; Recreational	1992-05-23	7.50		6.99	7.80	2870	5130	1.2500				1781 m	West
6028-237	10476		Abandoned	Domestic; Irrigation; Stock		9.14		6.68		1942	3495	1.8900	1.83	1.83	4.85	1797 m	West
6028-242	10481		Operational	Irrigation; Stock		4.88		11.36		2901	5188	0.1300	3.66	3.66	7.70	1816 m	North West
6028-238	10477		Operational	Irrigation	1979-06-12	5.40		3.29	7.50	3482	6200	1.3000	2.50	2.50	0.79	1824 m	West
6028-2150	176069			Monitoring	1999-06-11	2.50		8.42					1.45	1.45	6.97	1840 m	North West
6028-243	10482	MALLEE PARK 1	Unknown	Exploration	1962-09-07	24.38				19238	31321		8.84	8.84		1904 m	North West
6028-2735	258786	GW 23A		Investigation	2010-06-30	4.50		6.53					1.60	1.60	4.93	1923 m	North West
6028-2147	176066			Monitoring	1999-06-11	5.50		6.24					2.60	2.60	3.64	1927 m	North West
6028-240	10479		Abandoned	Irrigation	1979-06-04	6.70		9.63	7.40	2909	5200					1937 m	West
6028-2151	176070			Monitoring	1999-06-11	7.00		12.41					3.30	3.30	9.11	1938 m	North West
6028-2154	176073			Monitoring	1999-06-07	6.00		6.17					1.93	1.93	4.24	1954 m	North West
6028-239	10478		Abandoned	Irrigation	1979-05-30	11.20		12.00	7.60	600	1090					1957 m	West
6028-2201	178025			Investigation	1999-12-15	5.00		5.99					1.75	1.75	4.24	1960 m	North West
6028-2155	176074			Monitoring	1999-06-07	6.00		9.42					2.96	2.96	6.46	1977 m	North West

Unit No	Drillhole No	Name	Status	Purpose	Drill Date	Max Depth	Ref Elev	Ground Elev	PH	TDS	EC	Yield	DTW	SWL	RSWL	Dist	Dir'n
6028-2737	259054	GW 27		Investigation	2009-11-10	4.70		6.81					3.10	3.10	3.71	1980 m	North West
6028-1861	147092			Investigation	1994-08-29	6.00		10.92					4.20	4.20	6.72	1991 m	North West
6028-2420	234127			Investigation	2007-02-07	8.00		11.21					6.00	6.00	5.21	1992 m	North West
6028-2146	176065			Monitoring	1999-06-11	5.00		8.12					3.15	3.15	4.97	1992 m	North West

Drillholes Data Source: Dept of Environment, Water and Natural Resources - South Australia

Geology 1:100,000

St Andrews Drive, Port Lincoln, SA 5606



Legend

- Site Boundary
- Report Buffer
- Property Boundary

Linear Feature

Alluvial fan	Joint
Dyke	Lineament
Fault	Open cut quarry
Fold	Shear zone
Gilgai	Other Linear Feature

Scale: 0 100 200 400 600 800 1,000 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Geology

St Andrews Drive, Port Lincoln, SA 5606

Surface Geology 1:100,000

Surface Geology Units within the dataset buffer:

Map Unit Code	Name	Description	Parent Name	Province	Age	Min Age	Max Age	Distance
water								0m
Ldw□u	Wanna Megacrystic Granite Gneiss	Granite-gneiss, weakly to strongly foliated, mafic rich, coarse-grained, meagcrystic; granite-granodiorite augen gneiss, ovoid zoned plagioclase and K-fspar to 40 mm diam. Local mafic xenoliths.	Donington Suite	GAWLER CRATON	PALAEOPROTEROZOIC	Palaeoproterozoic	Palaeoproterozoic	0m
Qpr4/Qpcb	Bridgewater Formation	Coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete.	Unnamed GIS Unit - see description	COASTAL QUATERNARY	PLEISTOCENE	Pleistocene	Pleistocene	0m
Qpr4/Qpcb/T\fe	Bridgewater Formation	Coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete.	Unnamed GIS Unit - see description	COASTAL QUATERNARY	PLEISTOCENE	Pleistocene	Pleistocene	0m
T\fe	Unnamed GIS Unit - see description	Undifferentiated Tertiary ferricrete.	Unnamed GIS Unit - see description	UNKNOWN	TERTIARY	Tertiary	Tertiary	0m
Ldc□u	Colbert Granite	Granite-gneiss, massive, foliated, medium-grained equigranular.	Donington Suite	GAWLER CRATON	PALAEOPROTEROZOIC	Palaeoproterozoic	Palaeoproterozoic	14m
Qpcb	Bridgewater Formation	Coastal barrier and shallow sub-tidal sediments: bioclastic and aeolian cross-bedded calcarenite, palaeosol horizons, often capped by calcrete.	Unnamed GIS Unit - see description	COASTAL QUATERNARY	PLEISTOCENE	Pleistocene	Pleistocene	21m
Qhck8	Unnamed GIS Unit - see description	Shelly/quartz muddy sand of intertidal flats; bare or Zostera-colonised. Veneered by cobbles and gravel in western upper Spencer Gulf.	Saint Kilda Formation	UNKNOWN	HOLOCENE	Holocene	Holocene	34m
Qpcg	Glanville Formation	Clay, mottled, shelly; calcarenite, skeletal, coquina. Geochron age 132 0006 000 years Bp on TL.	Unnamed GIS Unit - see description	COASTAL QUATERNARY	PLEISTOCENE	Pleistocene, Late	Pleistocene, Late	75m
Ql1	Unnamed GIS Unit - see description	Quaternary playa sediments.	Unnamed GIS Unit - see description	UNKNOWN	PLEISTOCENE-HOLOCENE	Quaternary	Quaternary	103m
Qhck9	Unnamed GIS Unit - see description	Organic/shelly sand/mud of mangrove woodland and samphire-algal marsh.	Saint Kilda Formation	UNKNOWN	HOLOCENE	Holocene	Holocene	456m
?Ldc	Colbert Granite	Granite-gneiss, massive, foliated, medium-grained equigranular.	Donington Suite	GAWLER CRATON	PALAEOPROTEROZOIC	Palaeoproterozoic	Palaeoproterozoic	500m

Geology Data Source: Dept of Environment, Water and Natural Resources - South Australia

Linear Structures 1:100,000

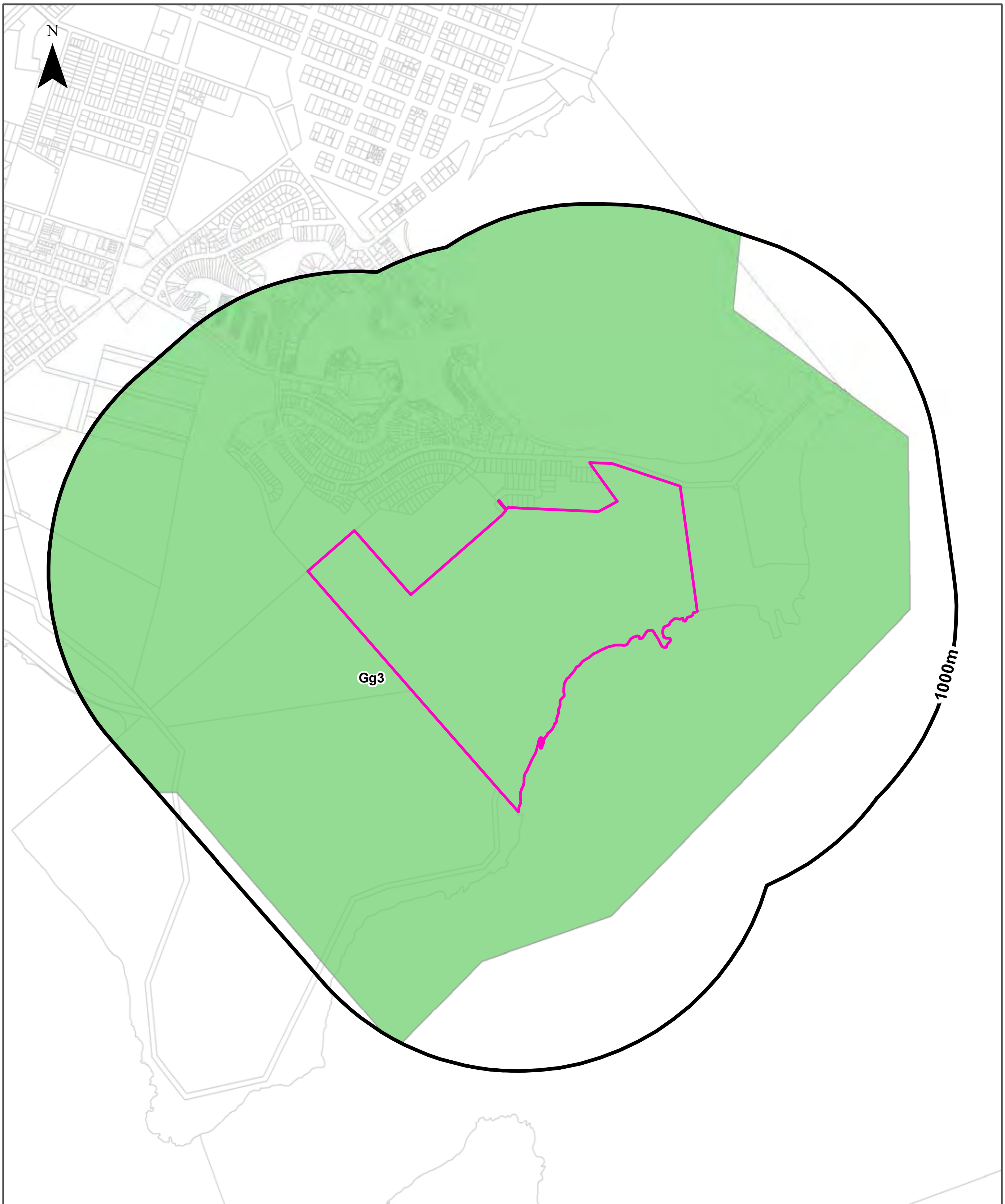
Linear geological structures within the dataset buffer:

Map Code	Description	Distance
N/A	No features in buffer	

Geology Data Source: Dept of Environment, Water and Natural Resources - South Australia

Atlas of Australian Soils

St Andrews Drive, Port Lincoln, SA 5606



Legend

Site Boundary	
Report Buffer	
Property Boundary	

Australian Soil Classification Orders

Anthroposol	Dermosol	Kandosol	Podosol	Tenosol	No Data
Calcarosol	Ferrosol	Kurosol	Rudosol	Vertosol	
Chromosol	Hydrosol	Organosol	Sodosol	Lake	

Scale: 0 100 200 400 600 800 1,000 Meters

Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Soils

St Andrews Drive, Port Lincoln, SA 5606

Atlas of Australian Soils

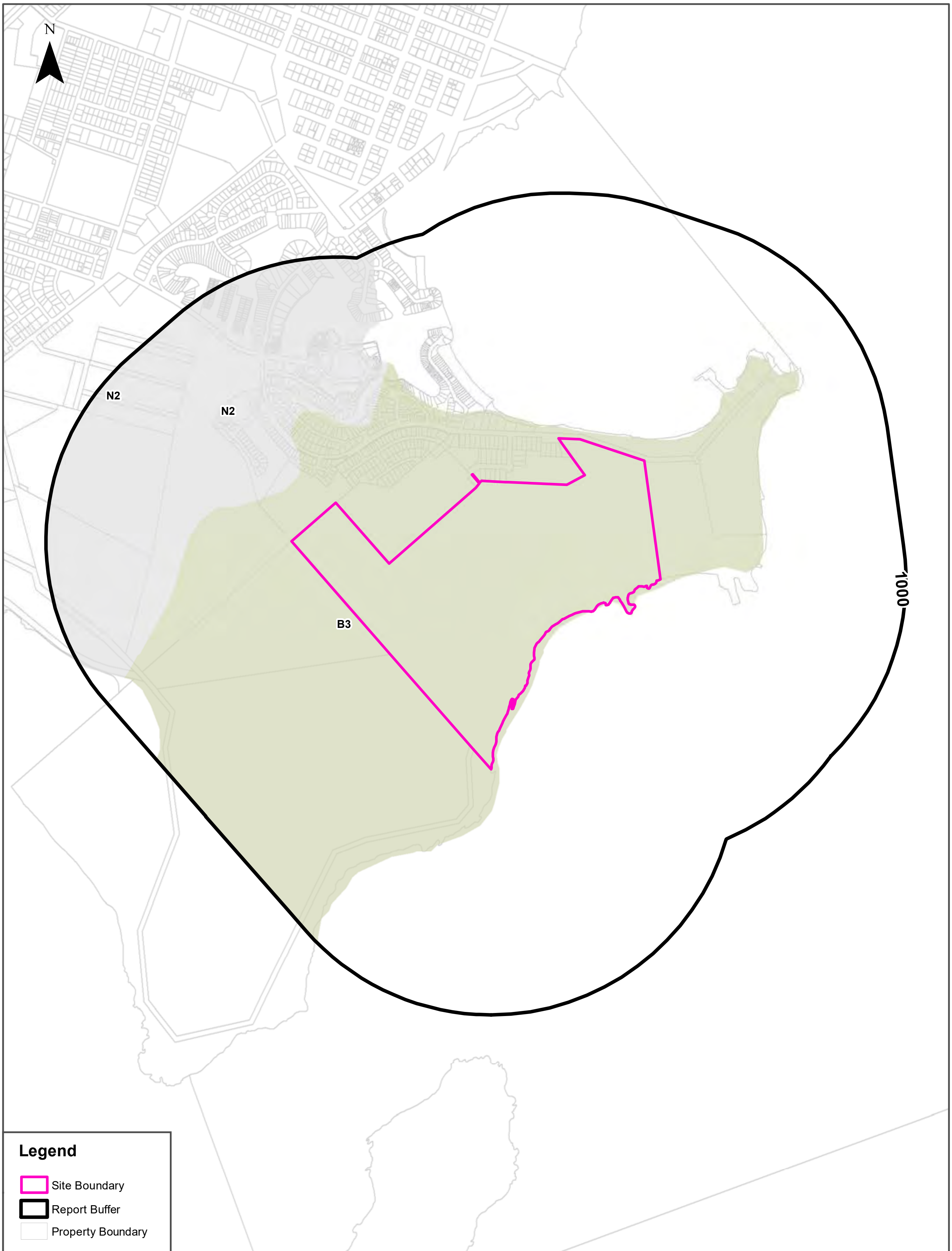
Soil mapping units and Australian Soil Classification orders within the dataset buffer:

Map Unit Code	Soil Order	Map Unit Description	Distance
Gg3	Tenosol	Undulating, broken terrain: red g porous loamy soils (Um6.24) with dark shallow porous loamy soils (Um6.21), shallow red-brown sandy soils (Uc6.13); smaller areas of sandy alkaline yellow mottled soils (Dy5.43); and calcareous sands (Uc1.11) near the coast.	0m

Atlas of Australian Soils Data Source: CSIRO

Soil Types

St Andrews Drive, Port Lincoln, SA 5606



Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Soils

St Andrews Drive, Port Lincoln, SA 5606

Soil Types

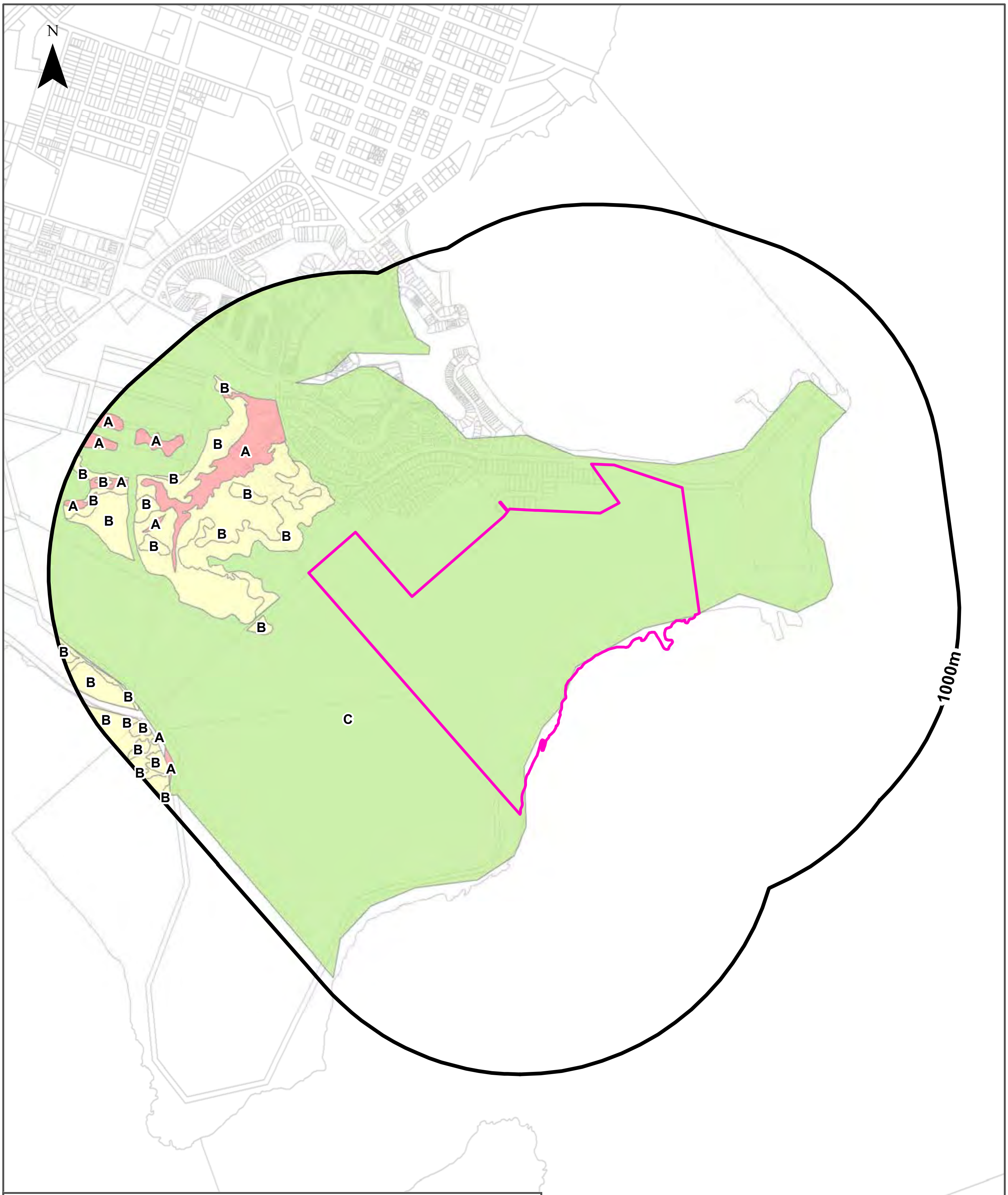
Soil types within the dataset buffer:

Map category code	Soil type description	Distance
B3	Shallow sandy loam on calcrete	0m
N2	Saline soil	176m

Soil Types Data Source: Dept of Environment, Water and Natural Resources - South Australia

Atlas of Australian Acid Sulfate Soils

St Andrews Drive, Port Lincoln, SA 5606



Legend

Site Boundary
Report Buffer
Property Boundary

Probability of occurrence of Acid Sulfate Soils

A. High (>70%)
B. Low (6-70%)
C. Extremely Low (1-5%)
D. No Chance (0%)

Scale: 0 100 200 400 600 800 1,000 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Acid Sulfate Soils

St Andrews Drive, Port Lincoln, SA 5606

Atlas of Australian Acid Sulfate Soils

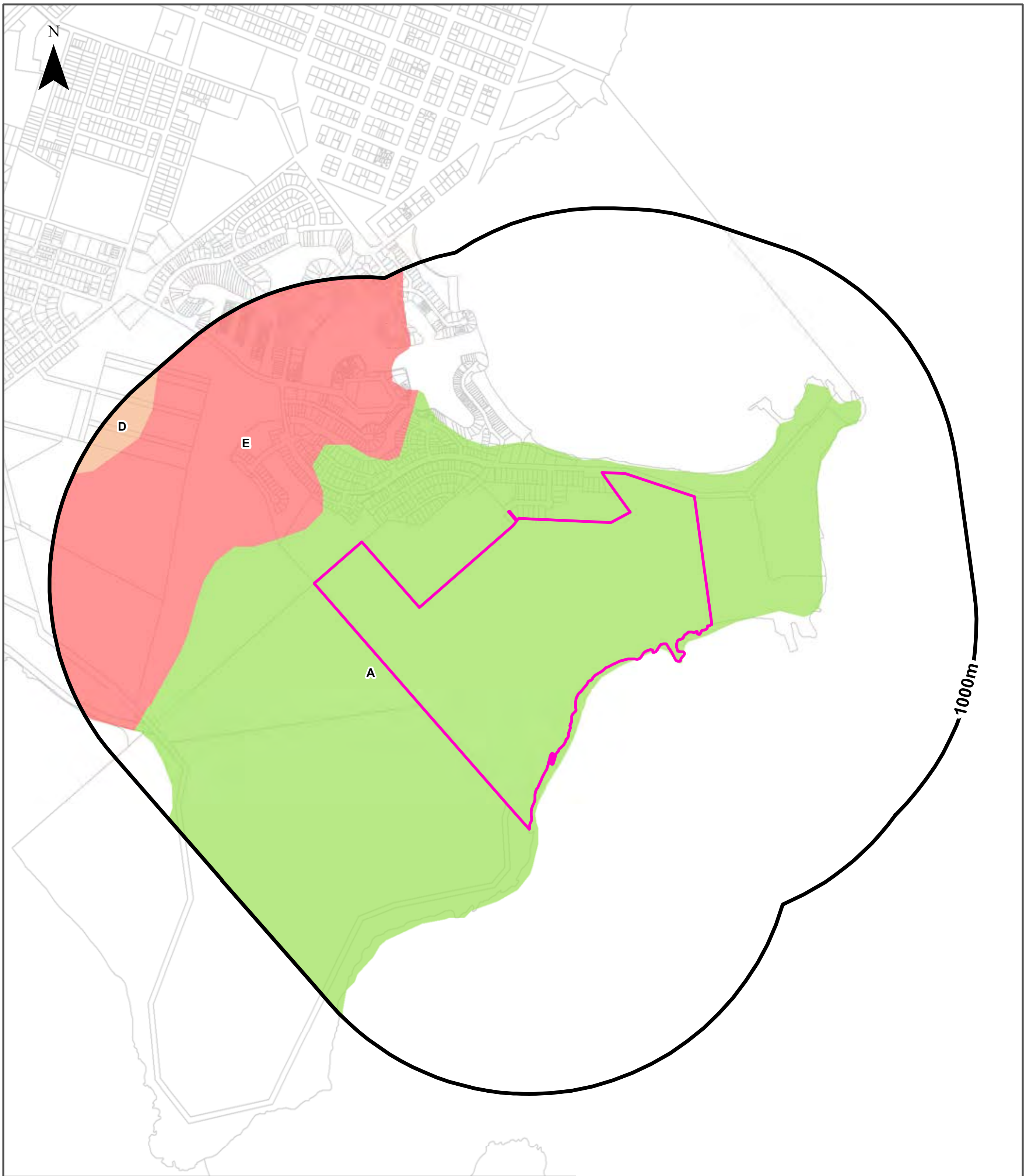
Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m
B	Low Probability of occurrence. 6-70% chance of occurrence.	96m
A	High Probability of occurrence. >70% chance of occurrence.	417m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

Acid Sulfate Soils Potential

St Andrews Drive, Port Lincoln, SA 5606



Legend

- Site Boundary
- Report Buffer
- Property Boundary

Proportion of land susceptible to the development of Acid Sulfate Soils

- Negligible
- 1-10%
- 10-30%
- 30-60%
- More than 60%
- Incomplete data (usually wet inland areas)
- Not applicable - No assessment/ analysis

Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Acid Sulfate Soils

St Andrews Drive, Port Lincoln, SA 5606

Acid Sulfate Soil Potential

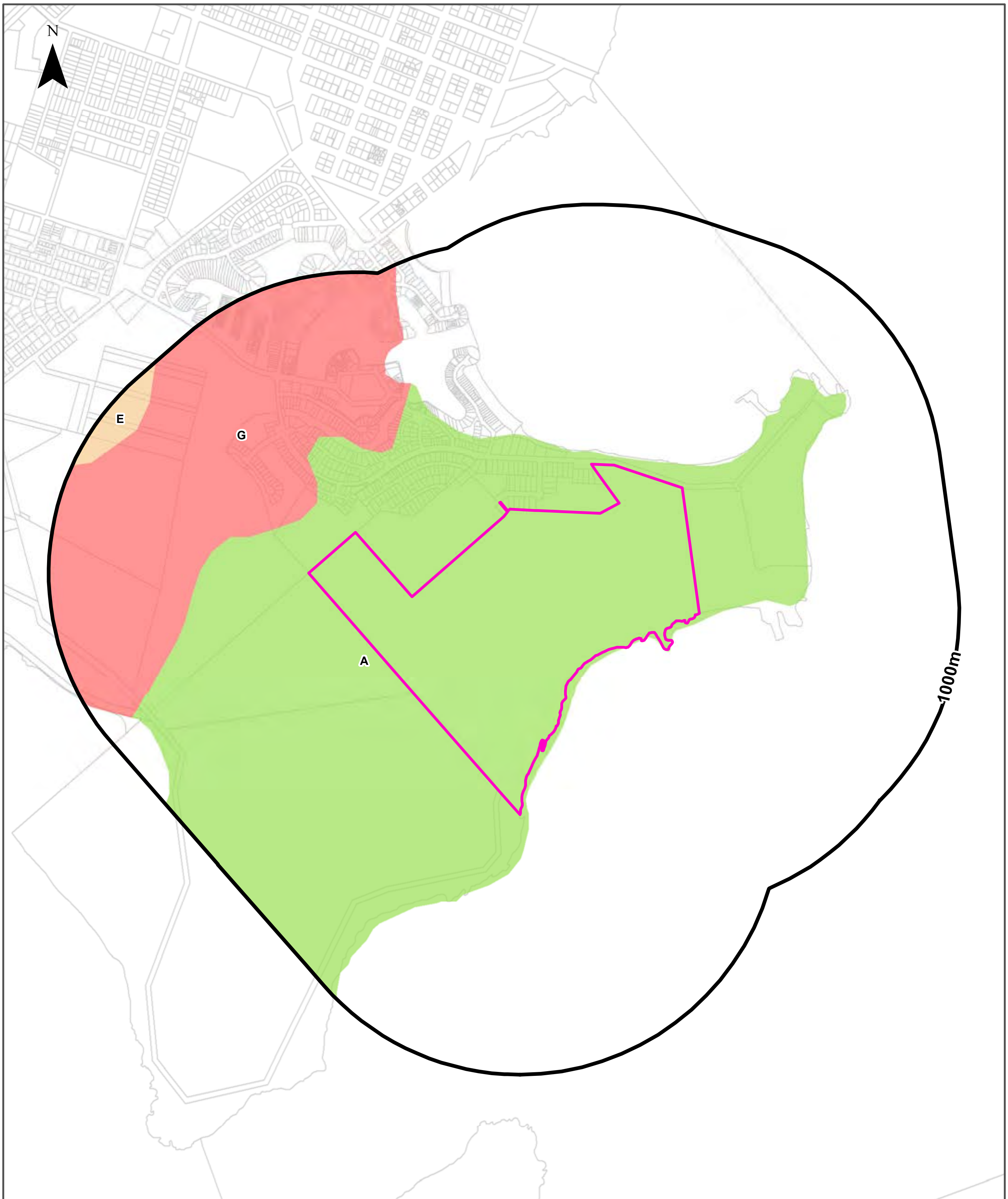
Acid sulfate soil potential within the dataset buffer:

Map category code	Proportion of land susceptible to the development of acid sulfate soils	Distance
A	Negligible	0m
E	More than 60%	176m
D	30–60%	861m

Acid Sulfate Soils Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Watertable Induced

St Andrews Drive, Port Lincoln, SA 5606



Legend

Severity of watertable induced soil salinity

Site Boundary	A. Negligible
Report Buffer	B. Moderately low
Property Boundary	C. Moderate
	D. Moderately high
	E. Moderately high to high
	F. High
	G. Very high to extreme
	X. Not applicable

Scale: 0 180 360 Meters

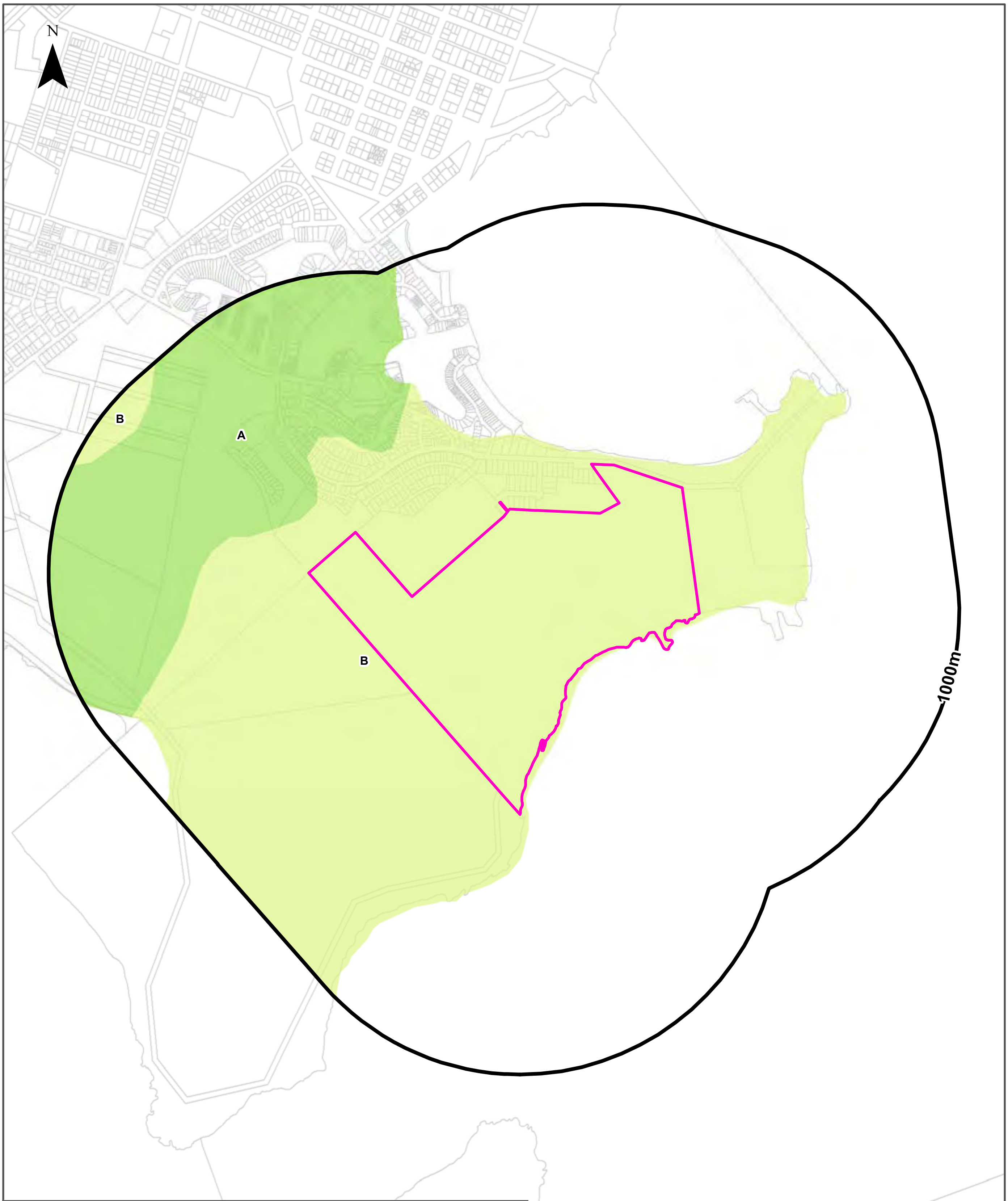
Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Soil Salinity - Non-watertable

St Andrews Drive, Port Lincoln, SA 5606



Legend

Site Boundary	
Report Buffer	
Property Boundary	

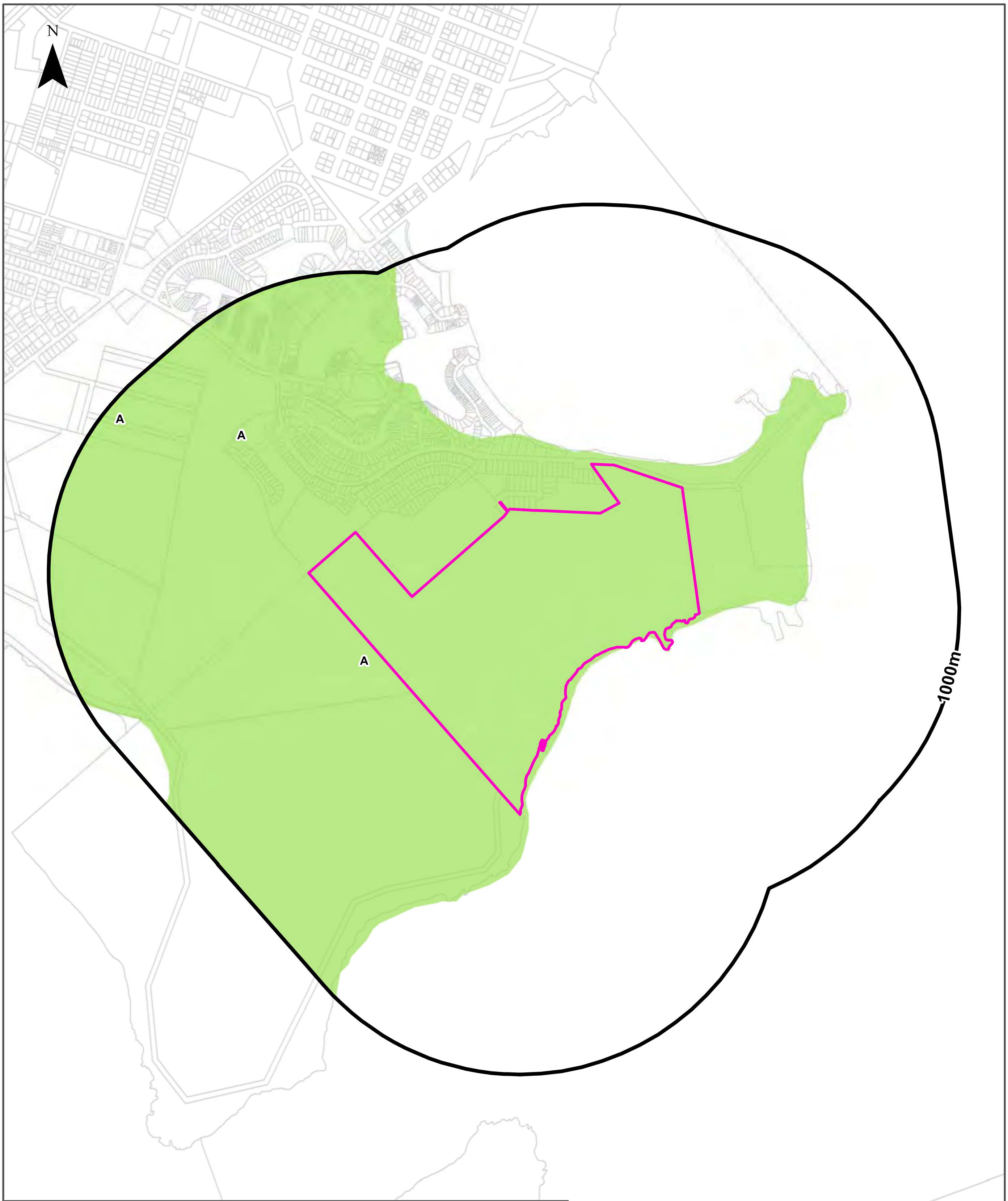
Severity of non-watertable induced soil salinity

A. Low	D. Moderately high to high
B. Moderately low	X. Not applicable
C. Moderate	

Scale: 0 180 360 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Soil Salinity - Non-watertable (Magnesia Patches)

St Andrews Drive, Port Lincoln, SA 5606



Legend

Site Boundary
Report Buffer
Property Boundary

Proportion of land affected by magnesia patches

A. Negligible
B. Up to 2%
C. 2-10%
D. 10-50%
E. More than 50%
X. Not applicable

Scale: 0 180 360 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Soil Salinity

St Andrews Drive, Port Lincoln, SA 5606

Soil Salinity - Watertable Induced

Watertable induced soil salinity within the dataset buffer:

Map category code	Severity description	Distance
A	Negligible	0m
G	Very high to extreme salinity (mainly primary)	176m
E	Moderately high to high salinity, or 30-50% of land affected by highly saline seepage	861m

Salinity Watertable Induced Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Non-Watertable

Non-watertable soil salinity within the dataset buffer:

Map category code	Severity description	Surface ECe (dS/m)	Subsoil ECe (dS/m)	Distance
B	Moderately low	2-4	4-8	0m
A	Low	<2	<4	176m

Salinity Non-Watertable Data Source: Dept of Environment, Water and Natural Resources - South Australia

Soil Salinity - Non-Watertable (Magnesia Patches)

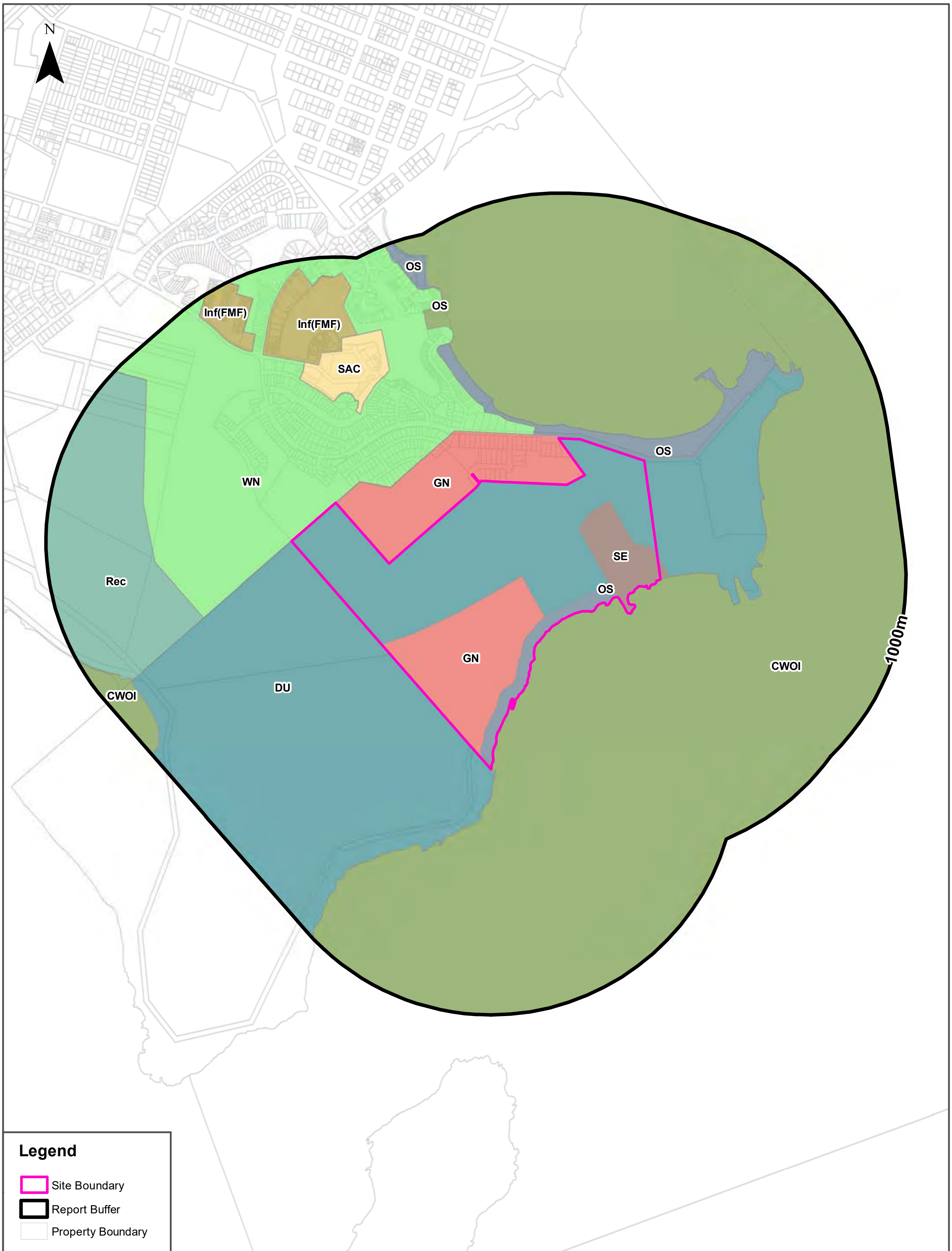
Magnesia patches within the dataset buffer:

Map category code	Proportion of land affected by magnesia patches	Distance
A	Negligible	0m

Salinity Non-Watertable (Magnesia Patches) Data Source: Dept of Environment, Water and Natural Resources - South Australia

Planning and Design Code Zones

St Andrews Drive, Port Lincoln, SA 5606



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Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Planning

St Andrews Drive, Port Lincoln, SA 5606

Planning and Design Code - Zones

Planning and Design Code zones within the dataset buffer:

Map Id	Zone Code	Zone Name	Legal Start State	Status	Distance	Direction
DU	Z1201	Deferred Urban	19/03/2021	0	0m	Onsite
GN	Z2102	General Neighbourhood	19/03/2021	0	0m	Onsite
SE	Z5720	Strategic Employment	19/03/2021	0	0m	Onsite
OS	Z4501	Open Space	19/03/2021	0	0m	Onsite
CWOI	Z0902	Coastal Waters and Offshore Islands	19/03/2021	0	0m	East
WN	Z6902	Waterfront Neighbourhood	19/03/2021	0	1m	North West
OS	Z4501	Open Space	19/03/2021	0	11m	North East
SAC	Z5705	Suburban Activity Centre	19/03/2021	0	373m	North West
Rec	Z5401	Recreation	19/03/2021	0	475m	West
Inf(FMF)	Z2705	Infrastructure (Ferry and Marina Facilities)	19/03/2021	0	564m	North West
Inf(FMF)	Z2705	Infrastructure (Ferry and Marina Facilities)	19/03/2021	0	701m	North West
OS	Z4501	Open Space	19/03/2021	0	701m	North
OS	Z4501	Open Space	19/03/2021	0	703m	North

Land Development Zones Data Source: Department of Planning, Transport and Infrastructure - South Australia

Planning and Design Code - Subzones

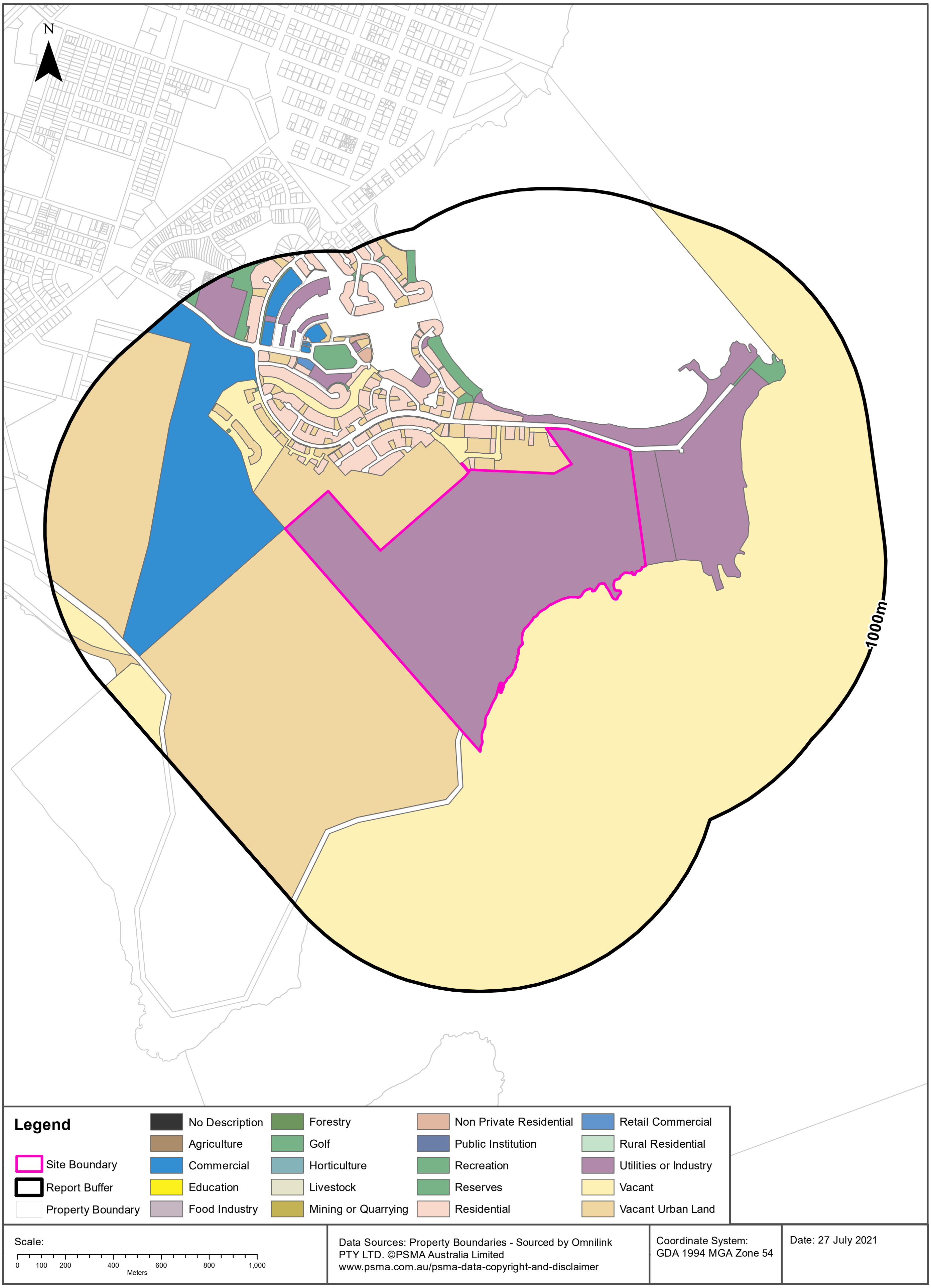
Planning and Design Code subzones within the dataset buffer:

Map Id	Subzone Code	Subzone Name	Legal Start State	Status	Distance	Direction
N/A	No records in buffer					

Land Development Zones Data Source: Department of Planning, Transport and Infrastructure - South Australia

Land Use Generalised 2019

St Andrews Drive, Port Lincoln, SA 5606



Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer

Coordinate System: GDA 1994 MGA Zone 54

Date: 27 July 2021

Planning

St Andrews Drive, Port Lincoln, SA 5606

Land Use Generalised 2019

Land use classes within the dataset buffer:

Description	Distance	Direction
Utilities or Industry	0m	Onsite
Vacant Urban Land	0m	South West
Vacant	0m	North East
Vacant Urban Land	0m	North
Vacant Urban Land	0m	North West
Vacant	0m	North
Residential	0m	North East
Commercial	1m	West
Reserves	243m	North
Recreation	261m	North
Retail Commercial	506m	North West
Non Private Residential	558m	North West

Land Use Generalised Data Source: Dept of Planning, Transport and Infrastructure - South Australia

Heritage

St Andrews Drive, Port Lincoln, SA 5606

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch

National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch

State Heritage Areas

State Heritage Areas within the dataset buffer:

Heritage Id	Name	Distance	Direction
N/A	No records in buffer		

Heritage Areas Data Source: Dept of Environment, Water and Natural Resources - South Australia

SA Heritage Places

SA Heritage Places within the dataset buffer:

Heritage No	Location	Heritage Class	Australian Class	Details	Auth Date	Distance	Direction
N/A	No records in buffer						

Heritage Places Data Source: Dept of Environment, Water and Natural Resources - South Australia

Aboriginal Land

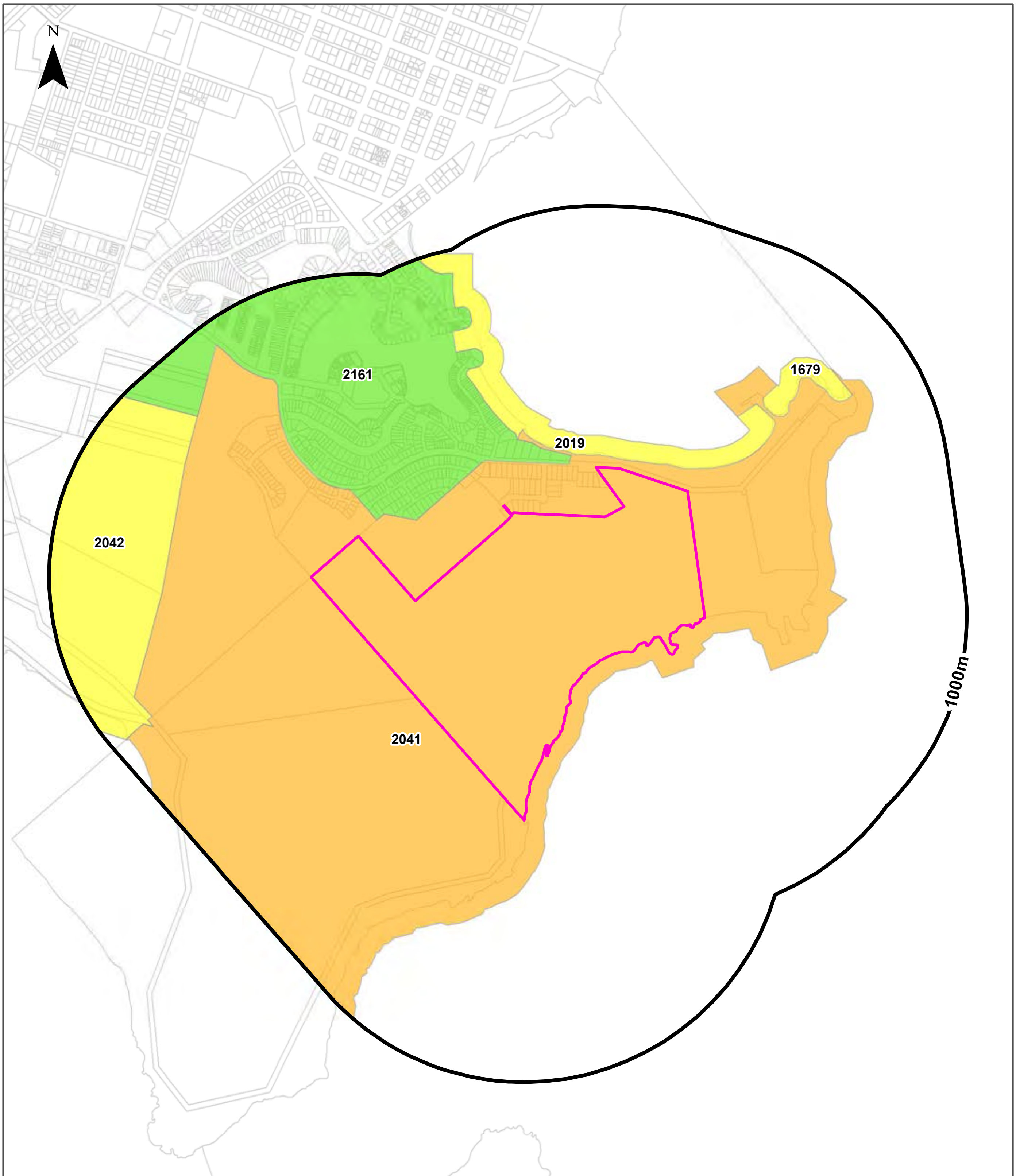
Aboriginal Land within the dataset buffer:

Map Id	Grant Date	Address	Locality	Description	Title	Distance	Direction
N/A	No records in buffer						

Aboriginal Land Data Source: Department of State Development, Resources and Energy - South Australia

Natural Hazards - Bushfire

St Andrews Drive, Port Lincoln, SA 5606



Legend

Site Boundary
Report Buffer
Property Boundary
Bushfire History

Bushfire Protection Area - Risk Level

High
Medium
General
Excluded

Scale: 0 100 200 400 600 800 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Natural Hazards

St Andrews Drive, Port Lincoln, SA 5606

Bushfire Protection Areas

Bushfire Protection Areas within the dataset buffer:

Map Id	Bushfire Risk Code	Development Plan Code	Additional Development Criteria	Distance	Direction
2041	Medium	PTL		0m	On-site
2019	General	PTL		36m	North
2161	Excluded	PTL		93m	North West
1680	General	PTL		356m	North East
1679	General	PTL		438m	North East
2042	General	PTL		549m	West

Bushfire Protection Areas Data Source: Dept of Planning, Transport and Infrastructure - South Australia

Bushfires and Prescribed Burns History

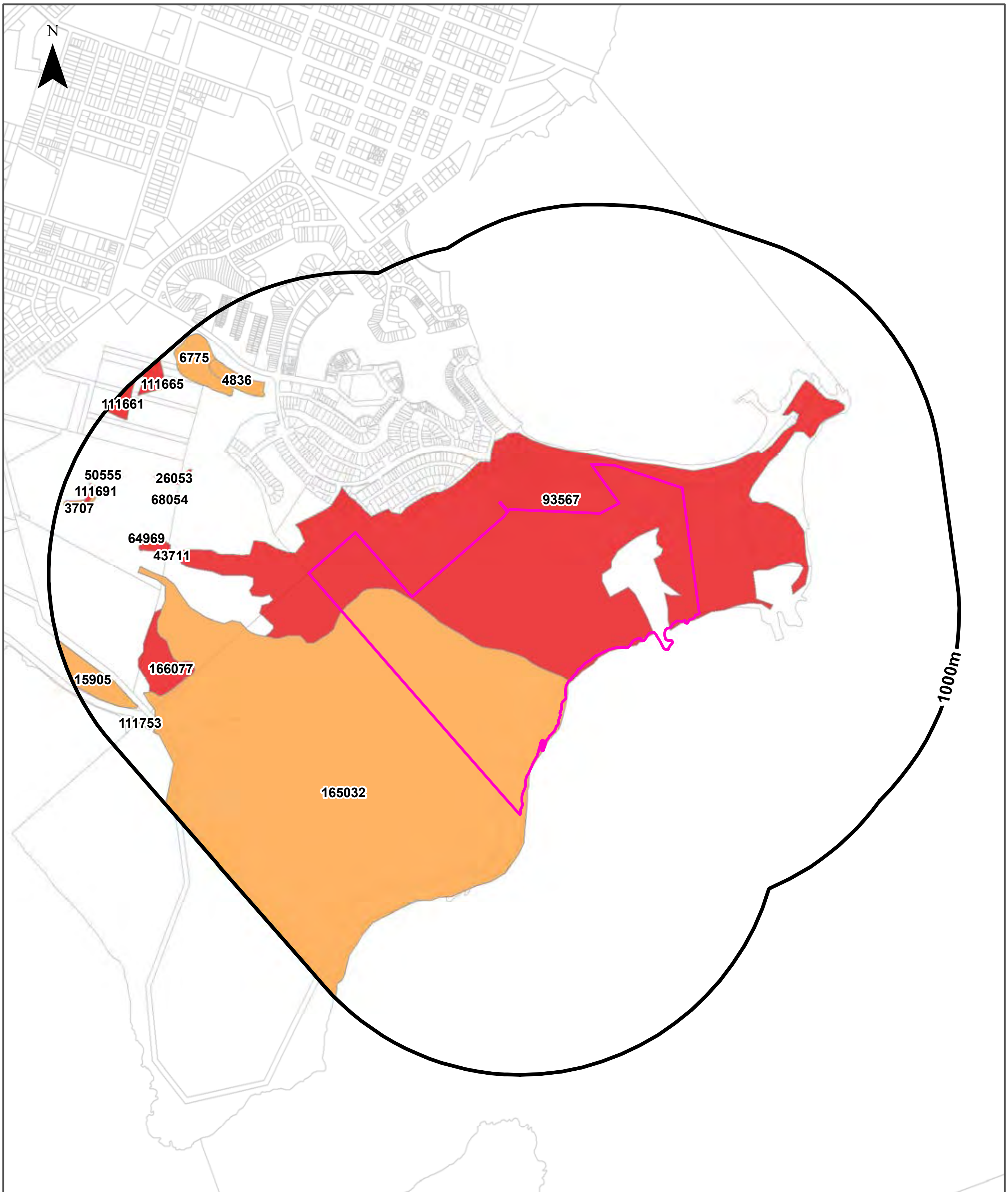
Bushfires and prescribed burns within the dataset buffer:

Map Id	Incident No.	Incident Name	Incident Type	Date of Fire	Area of Fire	Distance	Direction
N/A	No records in buffer						

Bushfires and Prescribed Burns History Data Source: Dept of Environment, Water and Natural Resources - South Australia

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

St Andrews Drive, Port Lincoln, SA 5606



Legend

- Site Boundary
- Report Buffer
- Property Boundaries
- High potential GDE - from national assessment
- High potential GDE - from regional studies
- Moderate potential GDE - from national assessment
- Moderate potential GDE - from regional studies
- Low potential GDE - from national assessment
- Low potential GDE - from regional studies
- Known GDE - from regional studies
- Unclassified potential GDE - from national assessment
- Unclassified potential GDE - from regional studies

Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries - Sourced by Omnilink PTY LTD. ©PSMA Australia Limited www.psma.com.au/psma-data-copyright-and-disclaimer	Coordinate System: GDA 1994 MGA Zone 54	Date: 27 July 2021

Ecological Constraints

St Andrews Drive, Port Lincoln, SA 5606

Groundwater Dependent Ecosystems Atlas

GDEs within the dataset buffer:

MapID	Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
93567	Terrestrial		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Vegetation		0m
165032	Terrestrial		Moderate potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Vegetation		0m
43711	Aquatic		High potential GDE - from national assessment	8	Low granite hills and plains extending as headlands and inlets.	Wetland		529m
64969	Aquatic		High potential GDE - from national assessment	8	Low granite hills and plains extending as headlands and inlets.	Wetland		533m
166077	Terrestrial		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Vegetation		562m
26053	Aquatic		High potential GDE - from national assessment	9	Low granite hills and plains extending as headlands and inlets.	Wetland		596m
5134	Aquatic		High potential GDE - from national assessment	9	Low granite hills and plains extending as headlands and inlets.	Wetland		602m
68054	Aquatic		High potential GDE - from national assessment	6	Low granite hills and plains extending as headlands and inlets.	Wetland		604m
4836	Aquatic		Moderate potential GDE - from national assessment	9	Low granite hills and plains extending as headlands and inlets.	Wetland		629m
6775	Aquatic		Moderate potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		708m
40421	Aquatic		High potential GDE - from national assessment	6	Low granite hills and plains extending as headlands and inlets.	Wetland		806m
14880	Aquatic		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		812m
15905	Aquatic		Moderate potential GDE - from national assessment	10		Wetland		831m
111753	Terrestrial		Moderate potential GDE - from national assessment	0		Vegetation		855m
50555	Aquatic		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		862m
3707	Aquatic		Moderate potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		864m
26054	Aquatic		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		867m
111691	Terrestrial		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Vegetation		869m
11737	Aquatic		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		880m
12565	Aquatic		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Wetland		882m

MapID	Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance
111665	Terrestrial		High potential GDE - from national assessment	7	Low granite hills and plains extending as headlands and inlets.	Vegetation		904m
111661	Terrestrial		High potential GDE - from national assessment	10	Low granite hills and plains extending as headlands and inlets.	Vegetation		914m

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology

Ecological Constraints

St Andrews Drive, Port Lincoln, SA 5606

Ramsar Wetlands

Ramsar Wetlands within the dataset buffer:

Wetland	Distance	Direction
No records in buffer		

Ramsar Wetlands Data Source: Dept of Environment, Water and Natural Resources - South Australia

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site
Network of features	Georeferenced to a network of features

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3. Neither Lotsearch (nor any of its officers, employees or agents) nor any of its Third Party Content Suppliers will have any liability to End User or any person to whom End User provides the Report and End User must not represent that Lotsearch or any of its Third Party Content Suppliers accepts liability to any such person or make any other representation to any such person on behalf of Lotsearch or any Third Party Content Supplier.
4. The End User hereby to the maximum extent permitted by law:
   - (a) acknowledges that the Lotsearch (nor any of its officers, employees or agents), nor any

of its Third Party Content Supplier have any liability to it under or in connection with the Report or these Terms;

(b) waives any right it may have to claim against Third Party Content Supplier in connection with the Report, or the negotiation of, entry into, performance of, or termination of these Terms; and

(c) releases each Third Party Content Supplier from any claim it may have otherwise had in connection with the Report, or the negotiation of, entry into, performance of, or termination of these Terms.

5. The End User acknowledges that any Third Party Supplier shall be entitled to plead the benefits conferred on it under clause 4, despite not being a party to these terms.
6. End User must not remove any copyright notices, trade marks, digital rights management information, other embedded information, disclaimers or limitations from the Report or authorise any person to do so.
7. End User acknowledges and agrees that Lotsearch and Third Party Content Suppliers retain ownership of all copyright, patent, design right (registered or unregistered), trade marks (registered or unregistered), database right or other data right, moral right or know how or any other intellectual property right in any Report or any other item, information or data included in or provided as part of a Report.
8. To the extent permitted by law and subject to paragraph 9, all implied terms, representations and warranties whether statutory or otherwise relating to the subject matter of these Terms other than as expressly set out in these Terms are excluded.
9. Subject to paragraph 6, Lotsearch excludes liability to End User for loss or damage of any kind, however caused, due to Lotsearch's negligence, breach of contract, breach of any law, in equity, under indemnities or otherwise, arising out of all acts, omissions and events whenever occurring.
10. Lotsearch acknowledges that if, under applicable State, Territory or Commonwealth law, End User is a consumer certain rights may be conferred on End User which cannot be excluded, restricted or modified. If so, and if that law applies to Lotsearch, then, Lotsearch's liability is limited to the greater of an amount equal to the cost of resupplying the Report and the maximum extent permitted under applicable laws.
11. Subject to paragraph 9, neither Lotsearch nor the End User is liable to the other for:

    (a) any indirect, incidental, consequential, special or exemplary damages arising out of or in relation to the Report or these Terms; or

    (b) any loss of profit, loss of revenue, loss of interest, loss of data, loss of goodwill or loss of business opportunities, business interruption arising directly or indirectly out of or in relation to the Report or these Terms,

    irrespective of how that liability arises including in contract or tort, liability under indemnity or for any other common law, equitable or statutory cause of action or otherwise.
12. These Terms are subject to New South Wales law.

Attachment C Certificate of title

Certificate of Title - Volume 6275 Folio 756

Parent Title(s)	CT 6252/672				
Creating Dealing(s)	RTC 13872880				
Title Issued	20/09/2022	**Edition**	2	**Edition Issued**	05/10/2022

Estate Type

FEE SIMPLE

Registered Proprietor

SOUTH AUSTRALIAN WATER CORPORATION
OF GPO BOX 1751 ADELAIDE SA 5001

Description of Land

ALLOTMENT 10 DEPOSITED PLAN 129500
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO RIGHT(S) OF WAY OVER THE LAND MARKED K ON D129500 (RTC 13872880)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D129500 (RTC 13492572)

Schedule of Dealings

NIL

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Certificate of Title

Title Reference:	CT 6275/756
Status:	CURRENT
Parent Title(s):	CT 6252/672
Dealing(s) Creating Title:	RTC 13872880
Title Issued:	20/09/2022
Edition:	2

Dealings

Lodgement Date	Completion Date	Dealing Number	Dealing Type	Dealing Status	Details
30/09/2022	05/10/2022	13886641	TRANSFER	REGISTERED	SOUTH AUSTRALIAN WATER CORPORATION
30/09/2022	05/10/2022	13886640	DISCHARGE OF MORTGAGE	REGISTERED	13488735
23/03/2021	26/03/2021	13488735	MORTGAGE	REGISTERED	BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6275 Folio 757

Parent Title(s) CT 6252/672

Creating Dealing(s) RTC 13872880

Title Issued 20/09/2022 **Edition** 1 **Edition Issued** 20/09/2022

Estate Type

FEE SIMPLE

Registered Proprietor

OSCAR & SIMBA PTY. LTD. (ACN: 618 130 180)
OF UNIT 2 15 MONTEREY DRIVE PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 11 DEPOSITED PLAN 129500
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED C ON D129500 TO DISTRIBUTION LESSOR CORPORATION (SUBJECT TO LEASE 8890000) (RTC 13872880)

SUBJECT TO EASEMENT(S) OVER THE LAND MARKED D ON D129500 TO SOUTH AUSTRALIAN WATER CORPORATION (RTC 13872880)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED G ON D129500 FOR SEWERAGE PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED H ON D129500 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D129500 (RTC 13492572)

TOGETHER WITH RIGHT(S) OF WAY OVER THE LAND MARKED K ON D129500 (RTC 13872880)

Schedule of Dealings

Dealing Number	Description
13488735	MORTGAGE TO BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Certificate of Title

Title Reference: CT 6275/757

Status: CURRENT

Parent Title(s): CT 6252/672

Dealing(s) Creating Title: RTC 13872880

Title Issued: 20/09/2022

Edition: 1

Dealings

Lodgement Date	Completion Date	Dealing Number	Dealing Type	Dealing Status	Details
23/03/2021	26/03/2021	13488735	MORTGAGE	REGISTERED	BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)

REAL PROPERTY ACT, 1886

South Australia

The Registrar-General certifies that this Title Register Search displays the records maintained in the Register Book and other notations at the time of searching.

REGISTRAR - GENERAL SOUTH AUSTRALIA

Certificate of Title - Volume 6252 Folio 672

Parent Title(s) CT 6213/657

Creating Dealing(s) RTC 13492572

Title Issued 06/04/2021 **Edition** 1 **Edition Issued** 06/04/2021

Estate Type

FEE SIMPLE

Registered Proprietor

OSCAR & SIMBA PTY. LTD. (ACN: 618 130 180)
OF UNIT 2 15 MONTEREY DRIVE PORT LINCOLN SA 5606

Description of Land

ALLOTMENT 600 DEPOSITED PLAN 126465
IN THE AREA NAMED PORT LINCOLN
HUNDRED OF LINCOLN

Easements

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED G ON D126465 FOR SEWERAGE PURPOSES TO SOUTH AUSTRALIAN WATER CORPORATION (223LG RPA)

SUBJECT TO SERVICE EASEMENT(S) OVER THE LAND MARKED H ON D126465 FOR DRAINAGE PURPOSES TO THE COUNCIL FOR THE AREA (223LG RPA)

TOGETHER WITH FREE AND UNRESTRICTED RIGHT(S) OF WAY OVER THE LAND MARKED B ON D126465 (RTC 13492572)

Schedule of Dealings

Dealing Number	Description
13488735	MORTGAGE TO BEECH CAPITAL PTY. LTD. (ACN: 639 057 720)

Notations

Dealings Affecting Title	NIL
Priority Notices	NIL
Notations on Plan	NIL
Registrar-General's Notes	NIL
Administrative Interests	NIL

Attachment D SA EPA Section 7

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

Receipt No :
Admin No : 110287 (66269)

WSP Australia Pty. Limited
Level 1
1 King William Street
ADELAIDE SA 5000

Contact: Section 7
Telephone: (08) 8204 2026
Email: epasection7@sa.gov.au

Contact: Public Register
Telephone: (08) 8204 9128
Email: epa.publicregister@sa.gov.au

27 July, 2021

EPA STATEMENT TO FORM 1 - CONTRACTS FOR SALE OF LAND OR BUSINESS

The EPA provides this statement to assist the vendor meet its obligations under section 7(1)(b) of the *Land and Business (Sale and Conveyancing) Act 1994*. A response to the questions prescribed in Schedule 1-Contracts for sale of land or business-forms (Divisions 1 and 2) of the *Land and Business (Sale and Conveyancing) Act 1994* is provided in relation to the land.

I refer to your enquiry concerning the parcel of land comprised in

Title Reference	CT Volume 6252 Folio 672
Address	Allotment 600 (DP 126465), St Andrews Drive, PORT LINCOLN SA 5606

Schedule – Division 1 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS OF MORTGAGES, CHARGES AND PRESCRIBED ENCUMBRANCES AFFECTING THE LAND

7. Environment Protection Act 1993

Does the EPA hold any of the following details relating to the *Environment Protection Act 1993*:

7.1	Section 59 - Environment performance agreement that is registered in relation to the land.	NO
7.2	Section 93 - Environment protection order that is registered in relation to the land.	NO
7.3	Section 93A - Environment protection order relating to cessation of activity that is registered in relation to the land.	NO
7.4	Section 99 - Clean-up order that is registered in relation to the land.	NO
7.5	Section 100 - Clean-up authorisation that is registered in relation to the land.	NO
7.6	Section 103H - Site contamination assessment order that is registered in relation to the land.	NO
7.7	Section 103J - Site remediation order that is registered in relation to the land.	NO

7.8 Section 103N - Notice of declaration of special management area in relation to the land (due to possible existence of site contamination). NO

7.9 Section 103P - Notation of site contamination audit report in relation to the land. NO

7.10 Section 103S - Notice of prohibition or restriction on taking water affected by site contamination in relation to the land. NO

Schedule – Division 2 – *Land and Business (Sale and Conveyancing) Regulations 2010*

PARTICULARS RELATING TO ENVIRONMENT PROTECTION

3-Licences and exemptions recorded by EPA in public register

Does the EPA hold any of the following details in the public register:

a) details of a current licence issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-

i) a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or[1] NO

ii) activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or[1] NO

iii) any other prescribed activity of environmental significance under Schedule 1 of that Act? NO

b) details of a licence no longer in force issued under Part 6 of the *Environment Protection Act 1993* to conduct, at the land-

i) a waste or recycling depot (as referred to in clause 3(3) of Schedule 1 Part A of that Act); or[1] NO

ii) activities producing listed wastes (as referred to in clause 3(4) of Schedule 1 Part A of that Act); or[1] NO

iii) any other prescribed activity of environmental significance under Schedule 1 of that Act? **YES**

c) details of a current exemption issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land? NO

d) details of an exemption no longer in force issued under Part 6 of the *Environment Protection Act 1993* from the application of a specified provision of that Act in relation to an activity carried on at the land? NO

e) details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to operate a waste depot at the land? NO

f) details of a licence issued under the repealed *Waste Management Act 1987* to operate a waste depot at the land? NO

[1] Note Schedule 1 Part A of the Environment Protection Act 1993 changed on 1 June 2019. Land and Business (Sale and Conveyancing) Regulations 2010 references to a 'waste or recycling depot' under 'clause 3(3)' are out of date and are to be read instead as clause 3(1), 3(2), 3(3)(a), 3(3)(b), 3(5)(b) or 3(5)(c) or a combination of them from 1 June 2019. Similarly, references to 'activities producing listed wastes' under 'clause 3(4)' are out of date and are to be read instead as clause 3(5)(a) from 1 June 2019.

g) details of a licence issued under the repealed *South Australian Waste Management Commission Act 1979* to produce waste of a prescribed kind (within the meaning of that Act) at the land? NO

h) details of a licence issued under the repealed *Waste Management Act 1987* to produce prescribed waste (within the meaning of that Act) at the land? NO

4-Pollution and site contamination on the land - details recorded by the EPA in public register

Does the EPA hold any of the following details in the public register in relation to the land or part of the land:

a) details of serious or material environmental harm caused or threatened in the course of an activity (whether or not notified under section 83 of the *Environment Protection Act 1993*)? NO

b) details of site contamination notified to the EPA under section 83A of the *Environment Protection Act 1993*? NO

c) a copy of a report of an environmental assessment (whether prepared by the EPA or some other person or body and whether or not required under legislation) that forms part of the information required to be recorded in the public register? NO

d) a copy of a site contamination audit report? NO

e) details of an agreement for the exclusion or limitation of liability for site contamination to which section 103E of the *Environment Protection Act 1993* applies? NO

f) details of an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?* NO

g) details of an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993?* NO

h) details of a notification under section 103Z(1) of the *Environment Protection Act 1993* relating to the commencement of a site contamination audit? NO

i) details of a notification under section 103Z(2) of the *Environment Protection Act 1993* relating to the termination before completion of a site contamination audit? NO

j) details of records, held by the former *South Australian Waste Management Commission* under the repealed *Waste Management Act 1987*, of waste (within the meaning of that Act) having been deposited on the land between 1 January 1983 and 30 April 1995? NO

5-Pollution and site contamination on the land - other details held by EPA

Does the EPA hold any of the following details in relation to the land or part of the land:

a) a copy of a report known as a "Health Commission Report" prepared by or on behalf of the *South Australian Health Commission* (under the repealed *South Australian Health Commission Act 1976*)? NO

b)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site contamination assessment proposal under section 103I of the *Environment Protection Act 1993?*	NO
c)	details (which may include a report of an environmental assessment) relevant to an agreement entered into with the EPA relating to an approved voluntary site remediation proposal under section 103K of the *Environment Protection Act 1993*?	NO
d)	a copy of a pre-1 July 2009 site audit report?	NO
e)	details relating to the termination before completion of a pre-1 July 2009 site audit?	NO

Details and/or copies of environmental assessments, licences,exemptions and records on the Public Register may be obtained from the Environment Protection Authority.

Prior to arranging an examination and/or copies of the required above information please telephone (08) 8204 9128 to contact the Public Register Administrator to ensure the required details are available upon arrival.

All care and diligence has been taken to access the above information from available records. Historical records provided to the EPA concerning matters arising prior to 1 May 1995 are limited and may not be accurate or complete and therefore the EPA cannot confirm the accuracy of the historical information provided.

File Reference: EPA/1370; EPA/12603

ENVIRONMENT PROTECTION AUTHORITY
South Australia

EPA Licence No : 001370
Client Co-ordinator: Peter Pfennig
Telephone : 8204 2065

Environmental Authorisation under Part 6 of the Environment Protection Act, 1993

Name: Integrated Steel Division BHP Steel
Postal Address: PO Box 21
WHYALLA 5600

is hereby issued a

Licence to undertake a prescribed activity of environmental significance under Section 36 of the Environment Protection Act, 1993.

Integrated Steel Division BHP Steel (the Licensee/s) is authorised to undertake the following activity(s) of environmental significance referred to under Schedule 1 of the Act, subject to the conditions below and the Environment Protection Act, 1993 (the Act).

7(1) Bulk Shipping Facility

carried on at

Proper Bay Shiploading Jetty PORT LINCOLN (the Premises)

This licence shall commence on 01-Dec-1997 and remain in force until 30-Nov-1999 unless sooner suspended, cancelled or surrendered. It is subject to the following conditions, which must be complied with no later than the date of commencement of this licence unless provided for on the right hand side of the condition in the column marked compliance date.

Conditions:	**Compliance Date:**
400-211 If the name and/or address of the Licensee changes, then the Licensee must inform the Environment Protection Authority within one (1) month of the change occurring.	
400-213 a. The last date for an application for renewal of this licence is 60 days before expiry.	
b. The last date for payment of the licence fee for a renewed licence period is 30 days before expiry.	
400-214 A copy of this licence is to be displayed on a notice board or other suitable place at each place named as a site on which the licensed activities are to be undertaken.	

ENVIRONMENT PROTECTION AUTHORITY
South Australia

EPA Licence No : 001370
Client Co-ordinator: Peter Pfennig
Telephone : 8204 2065

Conditions: (cont.)

400-15 The licensee shall not allow his/her discharge, emission, deposit of pollutants into coastal waters, to cause any visible debris, oil scum or other objectionable matter or odour at the discharge site.

30-1 Grit used for abrasive blasting, if unable to be collected for disposal, shall not cause environmental harm (as defined in the Environment Protection (Marine) Policy 1994).

30-2 Material being removed by abrasive blasting, if unable to be collected for disposal, shall not cause environmental harm (as defined in the Environment Protection (Marine) Policy 1994).

30-3 The Licensee shall collect all deposited material from abrasive blasting, which may cause environmental harm, for disposal to a location approved for the purpose by the Environment Protection Authority.

30-4 Where material or grit from abrasive blasting is likely to be deposited in the marine environment, it shall be analysed for leachate and assessed for its likely environmental harm and a report forwarded for approval of the operation by the Environment Protection Authority.

170-7 The Licensee shall cause any material spilt onto the wharf, dock or loading area to be removed and reused or disposed of to a site approved for the purpose by the Environment protection Authority.

400-39 The pollutant class that shall be taken into account in setting the pollutant class factor shall be particulates.

400-215 The Licensee must ensure that every employee, agent or contractor responsible for carrying out any task controlled by this licence is properly advised as to the requirements of this licence and the general environmental duty under Section 25 of the Act that relate to that person's tasks and responsibilities as employee, agent or contractor.

400-212 PROCESS CHANGE - CONSENT for CERTAIN WORKS.

1. During the term of this licence, the Licensee shall not carry out works for the construction or alteration of a building or structure or the installation or alteration of plant or equipment for use for an activity the subject of this licence where such works or alterations are likely to result in:

   - an alteration of the process by which the pollution

ENVIRONMENT PROTECTION AUTHORITY
South Australia

EPA Licence No : 001370
Client Co-ordinator: Peter Pfennig
Telephone : 8204 2065

Conditions: (cont.)

or waste arising from the activity occurs;
or
- an increased level of, or change in the nature of, the pollution or waste arising from the activity;

or
- a relocation of the point of discharge of pollution or waste at the site the subject of this licence; without application for and subsequent approval from, the Environment Protection Authority (EPA).

2. Upon application for the construction, installation or alteration of works the Licensee must provide details to the satisfaction of the EPA, to enable an appropriate assessment of the environmental impact of the proposed works to be made.

400-210 Where a Licensee (or a relevant related entity for a member of a corporate group):

1. has an annual report available to the Australian Securities Commission, shareholders or otherwise publicly available, a copy of this report is to be provided to the Environment Protection Authority within one (1) month of it becoming publicly available;

2. has an environmental policy relating to reporting of incidents, handling public complaints or requirements for environment protection practices relating to pollution and waste, a copy of this policy to be provided to the Environment Protection Authority within one (1) month of being issued a Licence unless the Authority agrees that the policy is not required to be provided.

400-201 The Environment Protection Authority may during the term of this licence impose or vary conditions :

1. in relation to testing, monitoring and reporting referred to in Section 52(1)(a) of the Act;

2. which require the Licensee, in accordance with Section 53 of the Act, to prepare a plan of action to be taken in the event of an emergency;

3. which require the Licensee to develop an Environment Improvement Programme as set out in Section 54 of the Act and to comply with the requirements of the Environment Improvement Programme;

4. in relation to any activity the conduct of which has not required a licence relating to protection of the

ENVIRONMENT PROTECTION AUTHORITY
South Australia

EPA Licence No : 001370
Client Co-ordinator: Peter Pfennig
Telephone : 8204 2065

Conditions: (cont.)
environment prior to the commencement of the Environment Protection Act;

5. which relate to provision of information relating to the Licensee or any agent or contractor operating on behalf of the Licensee;

6. which relate to provision of information relating to the activity subject to the licence including the levels of inputs and outputs and the amounts of pollutants or waste generated by the activity.

This licence is not valid unless signed below.

delegate for the
Environment Protection Authority

Date : 17.10.97

For Office use only
Date Printed:13-Oct-1997

ENVIRONMENT PROTECTION AUTHORITY
SOUTH AUSTRALIA

Environmental Authorisation under Part 6 of the Environment Protection Act 1993

LICENCE

EPA 12603

OCEANCRAFT ENTERPRISES PTY. LTD.

PO Box 496
PORT LINCOLN SA 5606

Location

Various Locations Throughout South Australia

Licensed Activities

The Licensee(s)

- OCEANCRAFT ENTERPRISES PTY. LTD.

is (are) authorised to undertake the following activities of environmental significance under Schedule 1 Part A of the Environment Protection Act 1993 (the Act), subject to the conditions of licence set out in the attached pages:

2(1) Abrasive Blasting

Term of Licence

Commence Date: 14-MAR-2013

Expiry Date: 28-FEB-2018

Delegate
Environment Protection Authority 14 March 2013

This licence is not valid unless signed Conditions of licence to follow

Definitions

"THE ACT" means the Environment Protection Act 1993.

"THE AUTHORITY" means the Environment Protection Authority established under Division 1 of Part 3 of the Act.

"AUTHORISATION FEE PAYMENT DATE" means the anniversary of the grant or renewal of this authorisation.

"ENVIRONMENTAL HARM" means the same as is defined in section 5 of the Environment Protection Act 1993.

"WATERCOURSE" is as defined in the Environment Protection (Water Quality) Policy 2003.

Acronyms

"EPA" means Environment Protection Authority.

"EIP" means Environment Improvement Programme.

Explanatory Notes

(NB. - Explanatory Notes do not constitute a part of this Authorisation)

1. This licence does not permit any activity in breach of any other approval by any other authority. For example, this licence does not permit any activity on the Premises which is not authorised under the Development Act 1993. It is the responsibility of the Licensee to ensure that any action or activity referred to in this licence is permitted by, and is carried out in compliance with, statutory requirements.

2. This licence is subject to the Act.

3. PUBLIC REGISTER INFORMATION.
The Environment Protection Authority maintains a Public Register that is available to the public.
Information maintained includes issued Environmental Authorisations (Licences, Exemptions & Works Approvals), Emergency Authorisations and various submitted Applications.
Should the conditions of an Environmental Authorisation require that the Holder submit a report or other information to the Authority, then that submitted information is made available on the Public Register subject to commercial confidentiality.
Endorsed Public Register information may be available on the EPA website.

4. Conditions of this licence can be varied by the Authority in accordance with section 45 of the Act.

5. This licence can be suspended, cancelled or surrendered during the term of the licence in accordance with sections 55 and 56 of the Act.

6. The Licensee must report to the Authority (on EPA emergency phone number 1800 100 833) all incidents causing or threatening serious or material environmental harm, upon becoming aware of the incident, in accordance with section 83 of the Act.
Note - In the event that the primary emergency phone number is out of order, phone the secondary number (08) 8204 2004.

7. The Licensee must be aware of, and comply with:
1. the requirements of the Environment Protection Policies which operate pursuant to the Act; and
2. the requirements of any National Environment Protection Measure which operates as an Environment Protection Policy under the Act.
NB: These requirements govern permissible procedures and protocols, emission or concentration levels, as well as operation and/or maintenance standards of plant and equipment.

8. The Authority undertakes to provide written advice within 14 days of receipt of all information required for assessment.

CONDITIONS OF LICENCE

The Licensee is authorised to conduct the prescribed activities as described in this licence on the Premises nominated, subject to the following conditions:

Compliance Date

Abrasive Blasting Condition(s)

1. (30-33) MOBILE ABRASIVE BLASTING, SPRAYING OF PROTECTIVE COATINGS AND BLASTING OF STRUCTURES OUTSIDE OF A BLAST CHAMBER

The Licensee must:

1. when blasting and spraying any structures or fabrications:

1.1 ensure that where practicable all non-fixed fabrications or fittings are blast or sprayed within a blasting chamber that is effective in containing all blast material;

1.2 direct all particle matter to an effective pollution control device;

2. when blasting and coating is not conducted in a blast chamber:

2.1 ensure that the object for blasting is analysed for lead paint concentrations, and if found to be in excess of Australian Standards for lead content, notify the Authority in writing at least five working days prior to the intended blasting;

2.2 where reasonable and practicable, minimise dust and paint overspray drift from the blasting and painting area using enclosure measures;

2.3 use only silica-free abrasive;

2.4 ensure that blasting operations are only carried out during favourable wind conditions to prevent any fugitive emissions arising from the blasting, creating a nuisance to any adjacent premises, or to the public;

2.5 erect signs at the entrance(s) to the site and at the blast area clearly warning of the dangers of airborne dust and paint over-spray;

2.6 take all reasonable measures to collect and remove spent abrasive and particle matter from the blast area for disposal at a site approved to receive that material by the Authority;

2.7 maintain a record of all open blasting and coating that sets out:

2.7.1 the name and address of the site at which the activity is carried out;

2.7.2 date and duration of work carried out;

2.7.3 the results of lead based paint analysis;

2.7.4 description of the structure blasted and painted; and

2.7.5 description of the enclosures used to contain dust and paint overspray and separation distance around the blasting site; and

2.8 where blasting is undertaken at a slipway, jetty or a structure over a watercourse notify the Authority in writing at least five working days prior to the intended blasting.

NOTES.

A. Where notification of open blasting is required, the notification should include the information details listed in paragraph 2.8 of this condition.

B. Further guidance on mobile blasting is provided in EPA Guideline - Abrasive Blast Cleaning, EPA, updated May 2011.

C. Management of lead paint is documented in Australian Standard AS 4361.1 - 1995.

General Administrative Condition(s)

2. (400-338) CHANGE OF LICENSEE DETAILS

If the Licensee's name or postal address (or both) changes, then the Licensee must inform the EPA within 28 days of the change occurring.

3. (400-339) DISPLAY LICENCE

The Licensee must display a copy of this licence on a notice board at the Premises.

4. (400-215) LICENCE INFORMATION TO EMPLOYEES/CONTRACTORS

The Licensee must ensure that every employee, agent or contractor responsible for carrying out any task controlled by this licence is properly advised as to the requirements of this licence and the general environmental duty under section 25 of the Act that relate to that person's tasks and responsibilities as employee, agent or contractor.

5. (400-201) IMPOSE OR VARY CONDITIONS

The EPA may during the term of this licence impose or vary conditions:

1. in relation to testing, monitoring and reporting referred to in section 52(1)(a) of the Act;

2. which require the Licensee, in accordance with section 53 of the Act, to prepare a plan of action to be taken in the event of an emergency;

3. which require the Licensee to develop an EIP as set out in section 54 of the Act and to comply with the requirements of the EIP;

4. which relate to provision of information relating to the Licensee or any agent or contractor undertaking any activity on behalf of the Licensee pursuant to this licence; and

5. which relate to provision of information relating to the activity subject to the licence including the levels of inputs and outputs and the amounts of pollutants or waste generated by the activity.

6. (400-347) CHANGE to PROCESS EMISSIONS or WASTE

The Licensee must:

1. not undertake changes to operating processes at the Premises without written approval from the EPA where such changes:

1.1 have the potential to increase the emissions, or alter the nature, of pollutants or waste currently generated by or from the licensed activity; or

1.2 have the potential to increase the risk of environmental harm; or

1.3 would relocate the point of discharge of pollution or waste at the Premises;

2. ensure that written application is submitted to the EPA on the EPA form entitled 'Application for Change to Process Emissions or Waste', that details the proposed changes; and

3. pay the prescribed application fee indicated on the Application form.

NOTES.

A. The EPA may during the term of this licence impose or vary the conditions of this authorisation upon approval of an application made in accordance with this condition.

B. The 'Application for Change to Process Emissions or Waste' form is availableon the EPA website at - http://www.epa.sa.gov.au/xstd_files/Licensing/Form/06_process_change.pdf.

7. (400-348) ALTERATIONS to PLANT and EQUIPMENT

The Licensee must:

1. not construct or alter a building or structure, or, install or alter any

plant or equipment at the Premises, without written approval from the EPA, where such changes:

1.1 have the potential to increase the emissions, or alter the nature of pollutants or waste currently generated by, or from the licensed activity, or

1.2 have the potential to increase the risk of environmental harm, or

1.3 would relocate the point of discharge of pollution or waste at the Premises;

2. ensure that written application is submitted to the EPA on the EPA form entitled 'Application for Alterations to Plant and Equipment' that details the proposed changes; and

3. pay the prescribed application fee indicated on the Application form.

NOTES.

A. The EPA may during the term of this licence impose or vary the conditions of this authorisation upon approval of an application made in accordance with this condition.

B. The 'Application for Alterations to Plant and Equipment' form is available on the EPA website at - http://www.epa.sa.gov.au/xstd_files/Licensing/Form/06_equipment_change.pdf.

C. In some circumstances installation of plant and equipment may be subject to consent under the provisions of the Development Act, which may have priority over the obligations of this condition - check with the licence coordinator for advice prior to completing the Application form.

8. (400-78) ANNUAL RETURN PROCESS

The Licensee must:

1. submit an annual return at least 90 days before the authorisation fee payment date, if this licence is for a term of two years or more; and

2. pay the annual authorisation fee by the authorisation fee payment date.

9. (400-79) LICENCE RENEWAL PROCESS

An application for renewal of this licence must be made at least 90 days before the expiry date of this licence.

Delegate

Environment Protection Authority

Date 14 - MARCH - 2013

There are 0 attachments to this Licence

Appendix H Soils, Drainage and Erosion – Impact Assessment

Design
for a better
future /

SA Water Corporation

Eyre Peninsula Desalination Plant Project

Soils, Drainage and Erosion Impact Assessment

May 2024

Question today

Imagine tomorrow

Create for the future

Eyre Peninsula Desalination Plant Project
Soils, Drainage and Erosion Impact Assessment

SA Water Corporation

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Rev	Date	Details
0	19/01/2024	Draft
A	22/05/2024	Final Draft
B	30/05/2024	Final

	Name	Date	Signature
Prepared by:	Tarsha Briese	30/05/2024	TBriese
Reviewed by:	Homer Milanes	30/05/2024	H.H. Milanes
Approved by:	Tenille Anderson	30/05/2024	T Anderson

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

Table of contents

List of figures

Abbreviations

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Annual Recurrence Interval
CEMP	Construction environmental management plans
EPA	Environmental Protection Agency
EY	Exceedances per Year
FFL	Finished Floor Level
GL	Gigalitre
HG	Overhead
km	kilometre
MHWS	Mean high water springs
Project	Eyre Peninsula Desalination Plant Project
RCBC	Reinforced Concrete Box Culvert
RCP	Reinforced Concrete Pipe
RO	Reverse osmosis
SEDMP	Soil Erosion and Drainage Management Plan
Site	The Project site
UG	Underground
WWTP	Port Lincoln Wastewater Treatment Plant

1 Introduction

1.1 Project description

SA Water has been working to ensure that the Eyre Peninsula's water supply and supporting infrastructure can meet the current and identified future demands of the local community. Approximately 75% of the Eyre Peninsula's water is sourced from the Uley South Basin, with most of the remainder coming from a pipeline from the River Murray. The health of the Uley South Basin is critical to the water security of the Eyre Peninsula as there is no alternate local drinking water supply. In recent years, the basin has been experiencing a long-term recharge decline and drawing water at current rates risks irreversible damage to the basin.

In consultation with businesses, landholders, local communities and Councils, SA Water determined that a new seawater desalination plant near the town of Port Lincoln was the preferred option to ensure a continued drinking water supply for the region. The new plant will reduce reliance on the Uley South Basin, groundwater resources and River Murray and supports both the existing and anticipated future water demand.

The Eyre Peninsula Desalination Plant Project (the Project) will involve the construction and commissioning of a new 5.3 gigalitre (GL, Stage 1, ultimate capacity 8 GL)/per year capacity seawater reverse osmosis (RO) desalination plant and marine infrastructure at Billy Lights Point in Port Lincoln, South Australia.

The Project will also include a seven (7) kilometre (km) long pipeline to transfer the treated desalination water to the existing North Side Hill tanks in Port Lincoln to supply the town.

1.2 Project area

The proposed Project site (the Site) is approximately 800 m south of the town of Port Lincoln, South Australia. The Site is located approximately 200 m west of the Port Lincoln Wastewater Treatment Plant (WWTP) and can be accessed via St Andrews Drive. Land use immediately surrounding the site is currently industrial, as the site was formerly utilised by BHP as a sand mine. The surrounding area is largely vegetated and there is a railway line that is no longer in use. See Figure 1.1 for existing site features.

Figure 1.1 Existing site features

A new access road will be constructed with an entry and exit point from St Andrews Drive.

The transfer pipeline to the North Side Hill tanks will be installed within existing road reserves along Greyhound Road, Property Bay Road and Blue Fin Road.

The closest residential properties are located within a new housing development approximately 250 m north of the proposed Site. Currently, the nearest existing dwelling to the Site is approximately 320 m away, while a number of additional dwellings in this housing development are currently under application and are proposed approximately 230 m from the Site.

1.3 Scope of report

The scope of this document is to review the impact of the RO desalination plant and propose mitigation measures in terms of flooding, erosion and drainage. In addition to this discussion, a high-level Soil Erosion Drainage Management Plan (SEDMP) has been provided. Noting, the designer and contractor are still responsible for their obligations to meet the requirement of relevant standards, policies, legislation and must ensure the design complies.

Figure 1.2 shows the current indicative location of the proposed RO desalination plant, the transfer pipeline, overhead transmission line and the seawater intake pump station. The transfer pipeline will transport desalinated water to existing water storage facilities to then be distributed using the existing water main network. The overhead transmission line will connect the RO desalination plant to the existing Port Lincoln and Port Lincoln Marina substations for power supply. The transfer pipeline is within and adjacent an existing disused railway corridor between the RO Desalination plant and Greyhound Road, depending on requirements.

Eyre Peninsula Desalination Plant Project

Figure 1.2
Project Location

Legend

- Substation
- Local Government Area
- Desalination Plant Site Boundary
- Easement
- New Site Access
- SAPN Transmission Line
- Overhead Transmission Line
- Outgoing Treated Water Transfer Pipeline
- Seawater Transfer Pipeline
- Sewer Rising Main
- Saline Waste Transfer Pipeline

Marine Infrastructure

- Marine Outfall
- Raw Seawater Intake
- Marine Tunnel Portion

0 500 1,000
Metres

Coordinate system: GDA2020 MGA Zone 53

Scale ratio correct when printed at A3

1:24,000

Date: 21/05/2024

Data sources: WSP, DataSA, MetroMap WMS Services:

1.4 Legislative and policy requirements

The following legislative and policy requirements were referenced when developing this document and will need to be referenced when completing the detailed design.

1. *Environment Protection Act 1993.*
2. The Environment Protection (Water Quality) Policy 2015 (under the *Environment Protection Act 1993*).
3. Environmental Protection Agency Government of South Australia (EPA) 1999, Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry 1999.
4. Environmental Protection Authority Government of South Australia 2021, EPA Water Quality: Environmental management of dewatering during construction activities.
5. Environmental Protection Authority Government of South Australia 2021, EPA Industry: Construction environmental management plans (CEMP).
6. DPTI Protecting Waterways Manual July 2016.
7. Environmental Protection Agency's Handbook for Pollution Avoidance on Commercial and Residential Building Sites 2004.
8. Landscape South Australia Eyre Peninsula 2023, Water Affecting Activity Control Policy.
9. *Landscape South Australia Act 2019.*
10. Port Lincoln Stormwater Management Plan 2014.
11. Port Lincoln Council Development Plan 2018.
12. Coastal Protection Board Policy 2022.

The design of access tracks and other engineering works are to be in accordance with the relevant Australian Standards, Austroads Guide to Road Design, and Port Lincoln Council development requirements.

1.5 Assessment methodology

1.5.1 *Overview of methodology*

The main objectives of this report are to assess the existing topography and stormwater drainage characteristics of the Site, and to identify any flooding and drainage issues which may impact the development, along with the surrounds.

The assessment comprised of the following activities:

- review of GIS mapping of the site
- review of desalination project components and access roads against the site topography
- identification of any road drainage crossings and propose likely crossing types (floodway, culvert/pipe crossing, etc)
- propose typical stormwater requirement details, if required
- identification of likely surface flow conveyance, treatment, and detention options
- identification of potential civil risk and mitigation measures
- understanding of potential construction impacts
- recommend high-level SEDMP requirements.

1.5.2 Reference materials

The assessment of the existing conditions was undertaken on available data sources/websites listed below:

- Location SA Map Viewer Tool
- Google Earth and Google Maps
- WaterConnect
- Data.SA
- Principal supplied information: survey dwg file '94111-1-1-SV-TO1-r0', existing contours as shown in concept drawings
- Soils, Drainage and Erosion Technical Memo A0012-0025-GEN-MEM-0006_0.1 (Rev 1 2023). Referenced loosely as design has developed since receiving the file.
- Under revision set of concept design drawings by SA Water dated 12.04.2024.

1.5.3 Assumptions

Pavement requirements, design vehicle and traffic loading will be confirmed during future design development phase and outlined in the Design Basis Report.

1.5.4 Constraints

The assessment was undertaken with the following constraints:

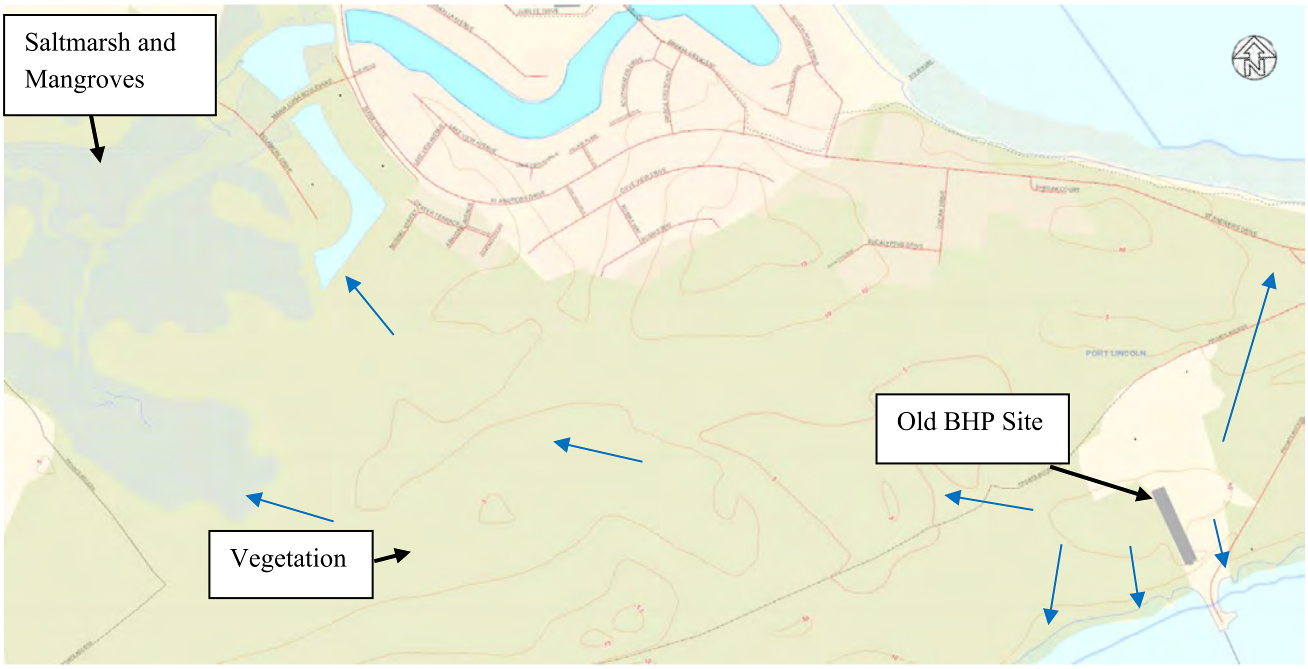
- Survey data of the Site was limited to the available information listed in Section 1.5.2.
- The finished floor levels shall accommodate anticipated changes in sea level due to natural subsidence and probable climate change during the first 100 years of the development. The designer is to ensure the Finished Floor Levels (FFL) are selected based on the requirements of the Coast Protection Board Policy Document 2022 along with storm surge, high tide, climate change seal level rise and land subsidence. The finished floor level of buildings should be designed to ensure 1% Annual Exceedance Probability (AEP) overland flow does not inundate buildings and provides freeboard with the relevant standards.
- Mean high water springs (MHWS) was adopted from the Port Lincoln Flood Mapping Study, Hydrology and Hydraulic Modelling Report (Tonkin, 2017) as 0.79 m Australian Height Datum (AHD). Any stormwater outlets should be located above this height, while also considering climate change sea level rise, if discharge conditions are to be free to atmosphere and free of tidal influence.
- Sea level values taken from BOM monthly sea levels records (accessed January 2024). The highest recorded tide was 1.87 mAHD on 25/05/1994.

2 Existing conditions

2.1 Topography and site drainage

2.1.1 Desalination plant

The RO desalination plant site is located on the east of existing infrastructure of an old BHP sand mine site, 650 m South of St Andrews Drive at the end of an existing private access sealed track. The old BHP sand mine site is located on a high point approximately of 10 m AHD and is surrounded by pervious vegetated area. Currently the existing surface where the RO desalination plant site is proposed drains away in all directions from the existing disused sand storage shed and eventually drains back into the ocean using the natural topography of the area as shown by the contours in Figure 2.1. Overland flow will predominantly travel north-east with no drainage infrastructure or directly make its way back to the ocean shore to the south. For larger storm events it is possible flow will travel northwest via low lying regions that may eventually enter the saltmarsh and mangrove area, ultimately ending up in the marina and out into the ocean.



Source: LocationSA Map Viewer Tool

Figure 2.1 Contour data of site and surrounding area 2 m intervals (flow arrows in blue)

Tail water effects of tide and sea level rise due to climate change will need to be reviewed during the design phase. However, this is considered a low risk item as the Site is currently designed between 4-10m above the coast, as identified by the existing survey information shown in Figure 2.2.

The Coast Protection Board Policy Document recommends site levels 0.3 m minimum above standard sea-flood risk level and building floor levels a minimum of 0.55 m. As the site is 4-10 m AHD, it is anticipated that there should be low risk of inundation due to sea level rise. However, the designer should confirm standard sea flood risk level during the detailed design process and compare against the site design levels.

As the Site is located at a high point, it is anticipated that the contributing catchment to the Site will be limited to the Site itself and potentially a small portion of the old BHP site shown in Figure 2.2. The proposed site layout will result in stormwater runoff travelling northeast towards the ocean.

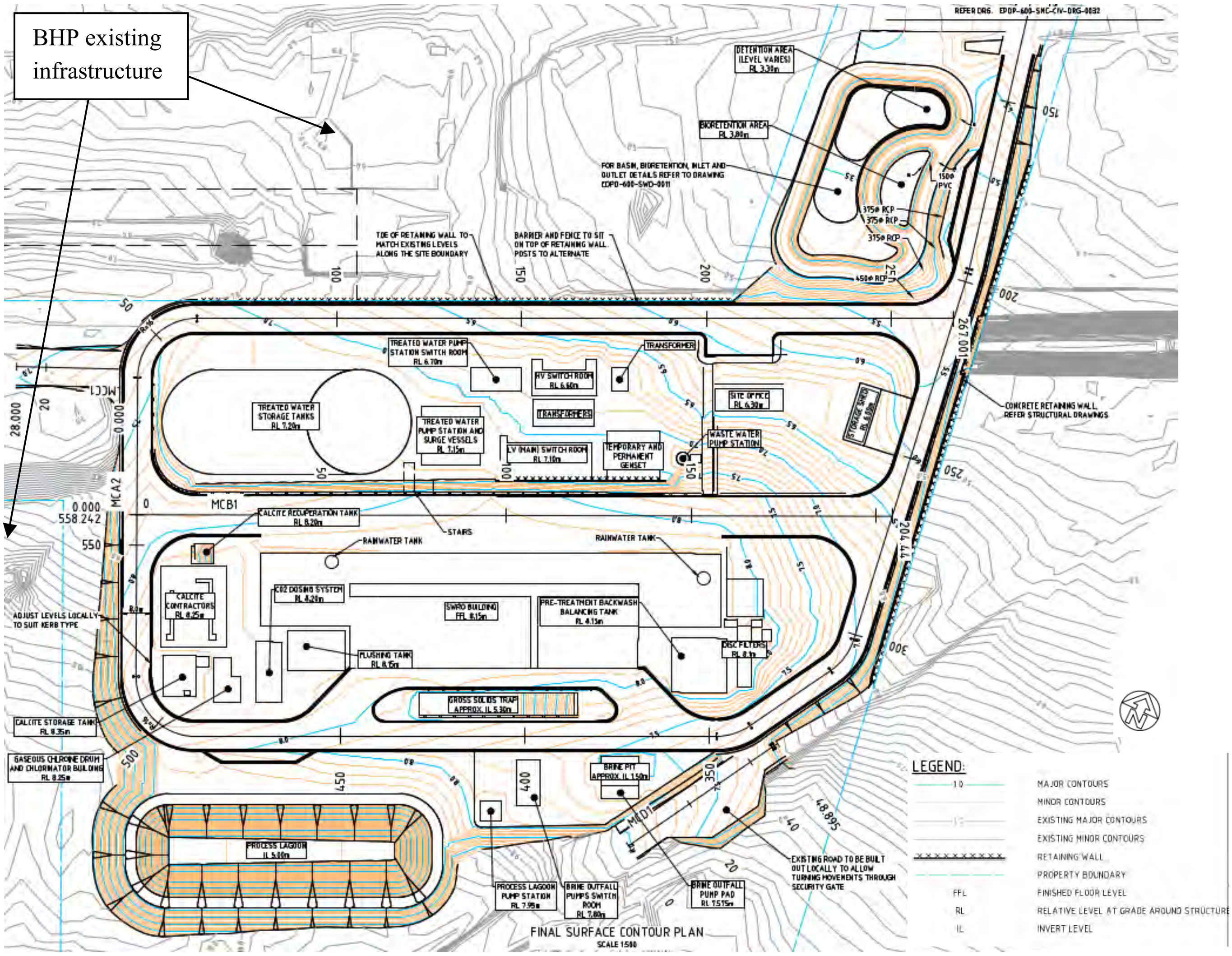


Figure 2.2 Indicative Civil Earthworks Contour Plan showing existing and proposed site contours (EPDP-600-SMC-CIV-DRG-0031)

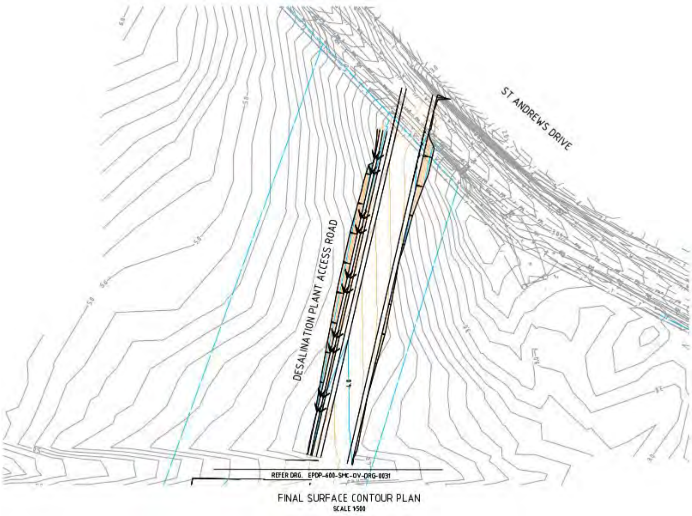


Figure 2.3 Indicative Civil Earthworks Contour Plan showing existing and proposed site contours (EPDP-600-SMC-CIV-DRG-0032)

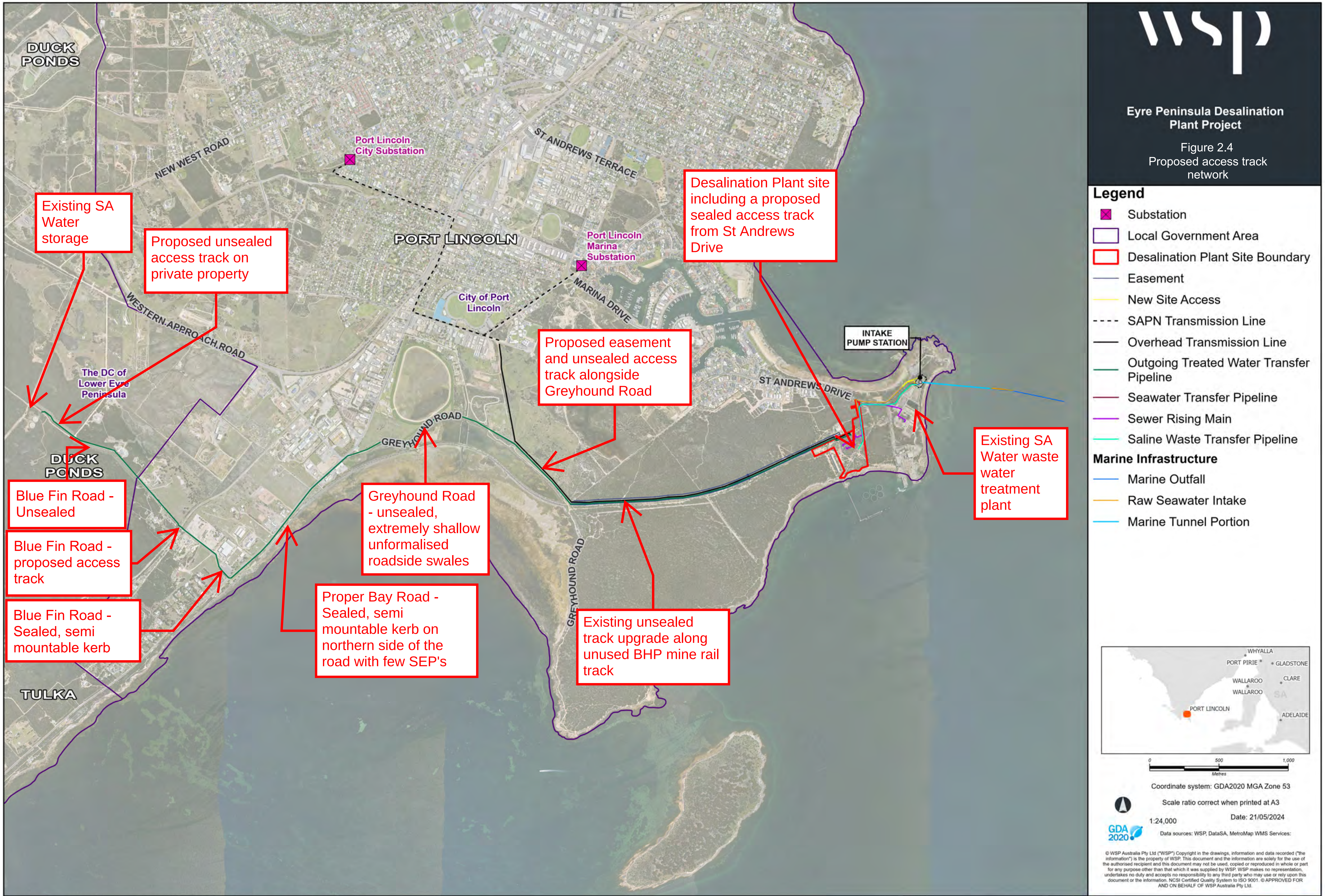
2.1.2 Transfer pipeline

For the purposes of this assessment, the proposed buried pipes including the transfer pipeline and overhead (HG) electrical infrastructure has been assumed to have no material effect on the flooding, erosion and stormwater drainage of the Site. This is on the basis that the trenches will be reinstated to existing ground levels so as not to impede any overland flows. Flooding, erosion and drainage impacts related to construction of these infrastructures shall be managed through the Contractor's CEMP, please refer to Section 3.1 for more details.

Along the extent of the transfer pipeline, a combination of existing sealed and unsealed roads/tracks will be used to access and maintain the pipeline. Where an existing sealed or unsealed track or road is not available, one shall be proposed in the design.

The existing sealed and unsealed access tracks and roads appear to have adequate crossfall conditions such that water does not pool on the road/track based on LocationSA contour data and Google Maps. Blue Fin Road (south of the rail corridor) is sealed with semi mountable kerbs draining stormwater towards Proper Bay Road. Proper Bay Road is sealed with semi mountable kerbs on the northwestern side of the road with a number of side entry pits provided to drain any ponding/captured stormwater.

The remaining unsealed roads and access tracks are well built up with minimal ponding of water in the verge and do not appear to have formalised swales either side of the road. The existing drainage infrastructure for these roads will need to be investigated in the design phase upon receipt of the full site survey to accurately determine the pre-development conditions for the length of the transfer pipeline to identify if any upgrades are required. For a summary of the existing and proposed road and easement network, refer to Figure 2.4 below.



Eyre Peninsula Desalination Plant Project
Figure 2.4
Proposed access track network
Legend
Substation
Local Government Area
Desalination Plant Site Boundary
Easement
New Site Access
SAPN Transmission Line
Overhead Transmission Line
Outgoing Treated Water Transfer Pipeline
Seawater Transfer Pipeline
Sewer Rising Main
Saline Waste Transfer Pipeline
Marine Infrastructure
Marine Outfall
Raw Seawater Intake
Marine Tunnel Portion
DUCK PONDS
PORT LINCOLN
TULKA
NEW WEST ROAD
ST ANDREWS TERRACE
WESTERN APPROACH ROAD
MARINA DRIVE
ST ANDREWS DRIVE
GREYHOUND ROAD
Port Lincoln City Substation
Port Lincoln Marina Substation
City of Port Lincoln
The DC of Lower Eyre Peninsula
INTAKE PUMP STATION
Existing SA Water storage
Proposed unsealed access track on private property
Desalination Plant site including a proposed sealed access track from St Andrews Drive
Proposed easement and unsealed access track alongside Greyhound Road
Existing SA Water waste water treatment plant
Blue Fin Road - Unsealed
Blue Fin Road - proposed access track
Blue Fin Road - Sealed, semi mountable kerb
Greyhound Road - unsealed, extremely shallow unformalised roadside swales
Proper Bay Road - Sealed, semi mountable kerb on northern side of the road with few SEP's
Existing unsealed track upgrade along unused BHP mine rail track
WHYALLA
PORT PIRIE
GLADSTONE
WALLAROO
CLARE
WALLAROO
SA
PORT LINCOLN
ADELAIDE
0
500
1,000
Metres
Coordinate system: GDA2020 MGA Zone 53
Scale ratio correct when printed at A3
1:24,000
Date: 21/05/2024
GDA 2020
Data sources: WSP, DataSA, MetroMap WMS Services:

2.1.3 Intake pump station

The marine infrastructure is proposed to be located in the most northern decommissioned lagoon at the Port Lincoln WWTP. The existing lagoon will be filled with approved engineered fill to the top of bank level so it is flush with the surrounding access road. The concept design by SA Water shows the proposed finished ground level as 3.4m AHD. The intake pump station will be over an open wet well with a mesh screening at ground level. Stormwater from the intake pump station is assumed to pass through the mesh screening and be processed alongside the standing water in the wet well.

A temporary construction access road will be built for construction works on the intake pump station. Use of the road will be discontinued once the RO desalination plant is operational and existing roads will then be used for future access.

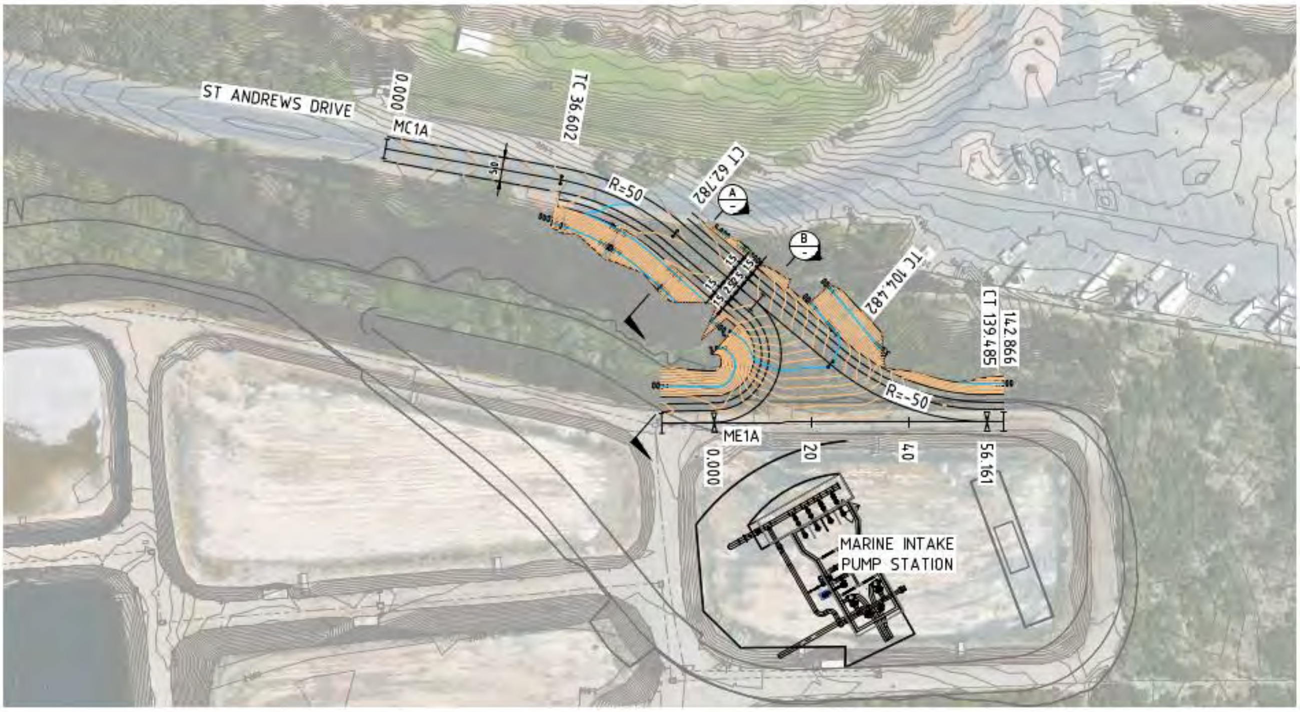


Figure 2.5 Proposed temporary access track to marine intake pump station (Concept drawing EPDP-300-SMC-TFM-SKT-0011)

The Coast Protection Board Policy Document recommends site levels 0.3 m minimum above standard sea-flood risk level and building floor levels a minimum of 0.55 m which should be located above the existing topographical level of the site. The design team is to confirm the standard sea flood risk level during the detailed design process and compare against the site design levels. Tail water effects of tide and sea level rise due to climate change will also need to be reviewed by the designer. Consultation with council and other relevant stakeholders/authorities to be undertaken if required.

2.2 Geotechnical review

The WaterConnect website was utilised to locate existing borehole logs and groundwater information in the area. There are a series of borehole logs completed within 1km of the site with ID's 6028-2775 to 6028-2783 displaying a standing water level of 2-2.8 m (below the surface level). Therefore, groundwater may pose an issue to the development of this site in relation to the surface civil works, such as service utility trenching, drainage mains, or site pavement. In addition, any design works for detention basins, tailings areas, lagoons, swales or deep excavation may be impacted by the groundwater. The designer is to use the site geotechnical findings of the groundwater levels to inform the design i.e. consider use of impermeable lining for basins/opens water storage if required, set a maximum depth of excavation and basin inverts, etc.

Please refer to Existing Conditions section of the Development Application Report for the Project for further information on subsurface materials, groundwater levels, likelihood of acid sulphate soils, earthquake site classification and other geotechnical data.

A detailed geotechnical site investigation will be required in the next phase of design to confirm geotechnical characteristics of the Site, identify geotechnical risks, and to aid in the design of the facility.

3 Potential impacts

The following section outlines the potential impacts of the project scope on the existing site, at different project stages. Section 4 then details potential mitigation measures to manage these impacts and risks.

3.1 Construction

Construction of the RO desalination plant will involve earthmoving activities to form the access tracks and hardstands for the RO desalination plant. This may include benching or shoring depending on the depth of excavation.

Civil works will include the stripping of topsoil and localised regrading to ensure the access road is trafficable and drains stormwater away from the access track and the site. Any localised regrading across the site will need to be considered in terms of potential impacts to existing watercourses and catchments.

Trenching (to link power, communications, water mains) will include the stripping of topsoil, excavation, backfill and replacing of topsoil. Excess excavated material shall be utilised in fill zones elsewhere on the site where possible.

There is a potential for encountering groundwater during excavation for the trenching of services and the deep excavations required at the intake pump station site. Dewatering activities shall be undertaken in accordance with the EPA Guidelines, including but not limited to:

- Water Quality: Environmental management of dewatering during construction activities.
- Industry: Construction environmental management plans (CEMP).

Storm events during construction may result in sediment damaging downstream watercourses. Class 1 or 2 pollutants present during construction have the potential to enter waterways downstream, and seriously damage the wider stormwater network and the environment. Pollutants are listed under the *Environment Protection (Water Quality) Policy 2015,* which explicitly states that a person must not discharge these pollutants into waterways or onto land from which it is likely they will enter a waterway. This is classed as a Category B offence and significant financial penalties apply where the policy is not abided by.

As the Site was previously a BHP sand mine with rail infrastructure, this may have resulted in potential contamination of soil or groundwater at the Site. Refer to PS137455-ADL-CLM-PSI-MEM-001 for the site contamination preliminary site investigation.

The rail corridor is no longer in use and should not pose as safety risk during construction for workers.

Spills and leaks from construction vehicles may cause site contamination and enter waterways. Standard operating procedures should be followed on site to ensure machinery is well maintained and do not enter the site with any leaks present. A spills management plan should be included in the CEMP in the event of a spill occurring on Site.

3.2 Design/operation

The RO desalination plant will increase the quantity of impervious surfaces across the Site, due to the construction of hardstand zones, buildings, access tracks and removal of vegetation; and in turn will increase runoff and risk of erosion and pollutant contribution downstream and into the ocean.

Small external surface flows will pass over the site and if not captured or diverted, increase the risk of erosion and pollutant contribution downstream and into the ocean.

An increase in traffic in the area may increase the vehicle related impacts such as spills, collisions, dust and an increase in pollutant loading.

The Site will introduce additional access roads and connections to the sealed access road currently located between St Andrews Drive and the existing BHP site. An access track is also proposed to follow the entire transfer pipeline length by a combination of existing roads or proposed sealed and unsealed tracks. These access/site roads will likely be built in fill and will impact the existing flow regime of surface runoff in the area.

Sea level rise and climate change factors may increase the risk of the site flooding in the future, in particular the intake pump station.

Any stormwater outlets should be located above the Mean high water springs (MHWS), while also considering climate change sea level rise, if discharge conditions are to be free to atmosphere and free of tidal influence.

The Site will introduce potential new contaminants as part of the desalination processes. Pollutants from the site operation cannot enter into surface flows and the stormwater network. Class 1 or class 2 pollutants must not enter the stormwater system as this will then classify the stormwater as contaminated stormwater. If the contaminated stormwater is discharged into any waters or onto land in a place from which it is reasonably likely to enter any waters (including by processes such as seepage or infiltration or carriage by wind, rain, sea spray or stormwater or by the rising of the water table) it is deemed a Category B offence and significant financial penalties will apply if the *Environment Protection (Water Quality) Policy 2015* is abided by.

Seasonal, tidal, and climate change fluctuations of ground water level may result in a high water table infiltrate into the basin making a portion of its operational capacity redundant if not accounted for.

4 Management and mitigation measures

4.1 Design

4.1.1 Approvals

The proposed development is subject to a number of assessments. Please refer to the Section 131 Development Application Report for Eyre Peninsula's new reverse osmosis seawater desalination plant for further information.

4.1.2 Drainage

The following steps are be completed during the design phase to manage and mitigate impacts during the operation phase:

- Any stormwater runoff from the Site is to meet Australian Runoff Quality Guidelines. This includes treatment of pollutants such as Total Nitrogen, Total Phosphorus, Total Suspended Solids, Gross Pollutants, and oils.
- All drainage of road works and the project sites are to be designed for a Minor storm. The minor storm is to be a minor storm of 0.2EY (5-year ARI event), as documented in the Port Lincoln Stormwater Management Plan 2014 by Tonkin. The minor design event requirements are to be confirmed with the Client during the design period and recorded in the Design Basis Report.
- The effect of Major storm events of 1% AEP (100-year ARI event) are to be reviewed against the proposed development to ensure the proposed infrastructure will have adequate protection from flooding. External flow paths and catchments are to be considered where applicable. Earthwork bunds and cut off swales may be specified to mitigate these risks.
- The development is not to adversely impact the pre-development flows of the existing site in both a minor and major design event.
- The Site shall limit runoff from the site to predevelopment levels, by providing an appropriately designed detention basin or equivalent.
- The final design of the Project will not result in any of the following items:
  - impede the flow of overland flow through the land or other surrounding land
  - increase the potential hazard risk to public safety of persons during a flood event
  - aggravate the potential for erosion or siltation or lead to the destruction of vegetation during a flood
  - increase the risk of flooding of other land
  - obstruct a watercourse.
- Hydraulic modelling to be completed to ensure drainage components are sized adequately for minor and major storm events.
- Surface drainage within the RO desalination plant site is subject to the refinement of the site layout, however it is recommended that the layout of the Site and the drainage of structures and hardstand pavements continue to follow the existing topography wherever possible.

- Council requirements regarding site development shall accommodate anticipated changes in sea level due to natural subsidence and probable climate change during the first 100 years of the development. As such, site levels are to be to be 0.3 m minimum above standard sea-flood risk level and building floor levels are to be 0.55 m minimum above standard sea-flood risk level as per the Coast Board Protection Policy Document 2016. The contractor is to confirm selection of the FFL with all relevant stakeholders.
- Safety in Design shall be incorporated across the design development process.
- The designer is to use the site geotechnical findings of the groundwater levels to inform the design i.e. consider use of impermeable lining for basins/opens water storage if required, set a maximum depth of excavation and basin inverts, etc.
- New earth batters (in cut or fill) should be reseeded with native grasses following construction works. Exposed rock batters do not require revegetation works.
- The location, design and operation of the facilities should be completed such that the 'adverse impacts to the natural environment and other land uses' are minimised.

4.1.2.1 Proposed Design

Concept design drawings have been prepared by SA Water for the RO desalination plant site along with a previous issue of the technical memo A0012-0025-GEN-MEM-0006_0.1. The design drawings and technical memo includes the marine infrastructure and the horizontal and vertical geometry of the transfer pipeline. The concept design also includes typical construction corridor details but there are no specific designs completed for the proposed access tracks for the transfer pipeline at the time of writing this development application. The following sections outline the proposed concept design stormwater solutions for the RO desalination plant and recommendations of steps to be completed during the detailed design phase to manage and mitigate impacts during the operation phase.

It should be noted that the concept design is provided as an example of what can be implemented on Site and does not have to be followed precisely. The designer is required to thoroughly review the design requirements, standards and guidelines to ensure the design is appropriate for the Project throughout the design stages.

Figure 4.1, Figure 4.2 and Figure 4.3 displays the concept design stormwater management plan for the RO desalination plant. The current site layout includes:

- Rainwater tanks for collecting rainwater from the RO building roof, and pump to reuse systems potentially to toilet flushing, area washdown, local irrigation.
- Underground drainage system to manage flows resulting from the design minor storm event (5% AEP) and connection to the stormwater system.
- A rock lined diversion swale is proposed along the western extent of the site to protect the site from upstream overland stormwater flows during designated storm events, such as from the scrubland and existing infrastructure to the West of the site. An earth lined cut off swale is proposed along the southern edge of the process lagoon to divert external catchments around the site. The swales will also assist in reducing the pollutant loading. Swales are to be designed to Austroads Guide to Road Design. Trapezoidal swales are recommended to minimise scouring issues adjacent to the road, additional capacity and maintenance purposes. A 1 in 4 fore slope and 1 in 6 back slope are recommended for ease of maintenance and recoverability for errant vehicles.
- A network of double side entry pits and reinforced concrete pipes is proposed to capture stormwater runoff from the impervious site surfaces including concrete slabs, concrete pavement, asphalt pavement and hardstands.
- Stormwater quality improvement devices such as a gross pollutant trap, combined sediment and oil interceptor device are proposed to improve stormwater quality prior to discharging into a stormwater basin.
  - Consultation with the water quality treatment device manufacturer is required to adequately size and confirm the appropriate devices.

— A detention basin is proposed to detain flows to pre-development conditions with the following features;

  — Proposed at the lowest point of the site (north eastern corner) to utilise gravity to drain the underground drainage system and SEP and RCP network.

  — A standard RCP pipe with orifice plate has been nominated as the main outlet with an overflow weir to ensure a safe flow path away from the site in the event of blockages are larger events than the major design storm event.

  — Biofiltration separated from the detention zone for up to 0.2EY events. This will provide improved water quality benefits, and more readily achieve the Environment Protection (Water Quality) Policy trigger levels for TSS, TP and TN.

  — A low flow discharge direct to downstream pit has been provided to bypass the detention basin.

  — A low-level outlet from the basin restricting flow to predevelopment levels has been provided and an appropriately sized spillway should be provided within the basin design. The outlet will discharge flows via a headwall with scour protection out to the ocean, north of the Site.

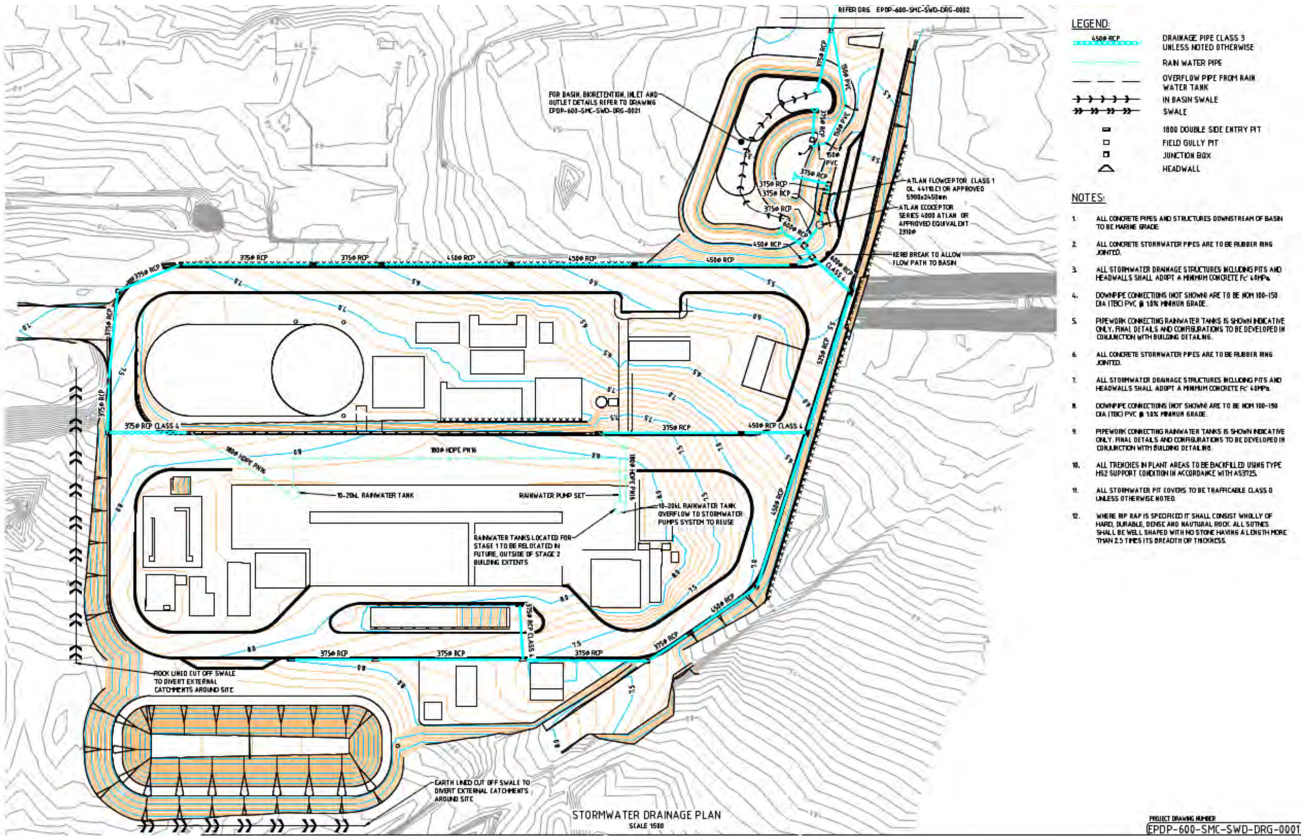


Figure 4.1 Stormwater management plan sheet 1 Concept design (EDPD-600-SMC-SWD-DRG-0001)

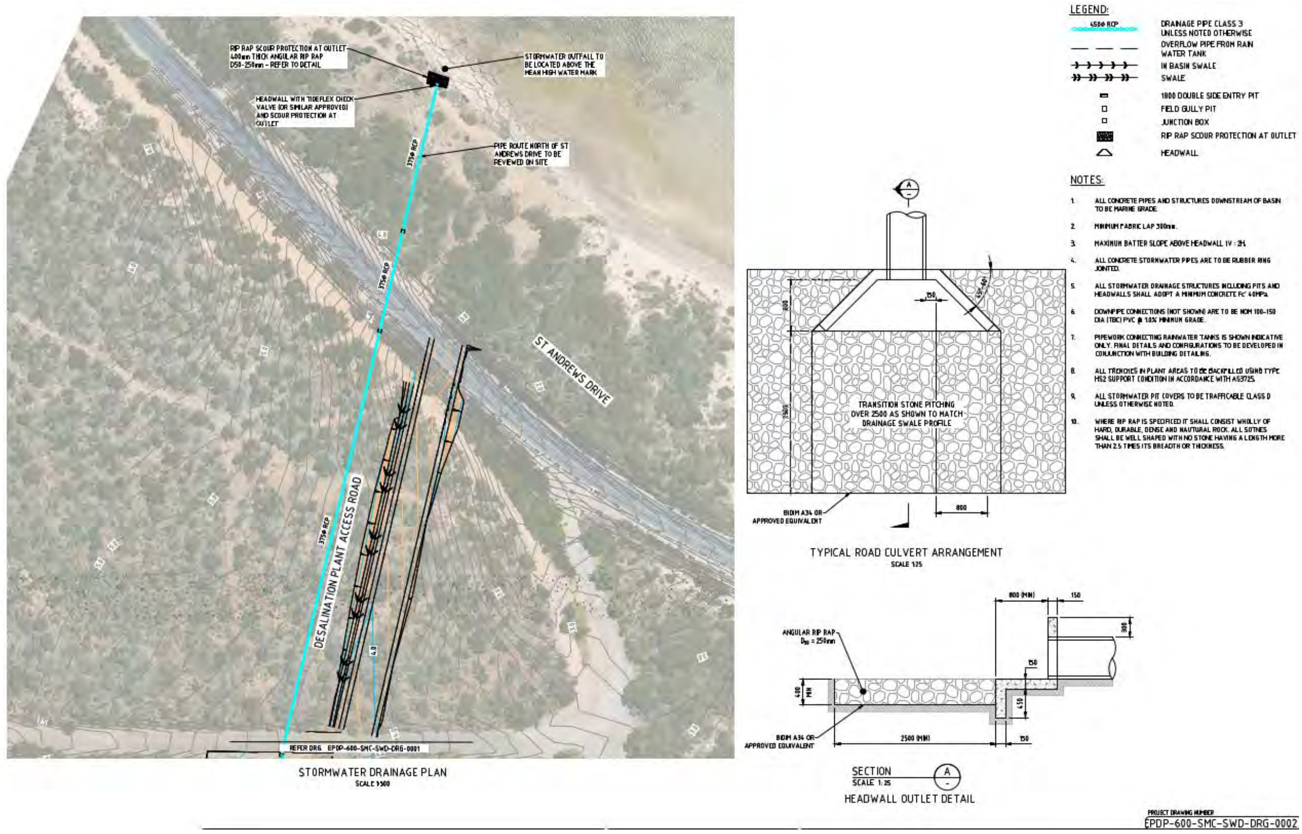


Figure 4.2 Stormwater management plan sheet 2 Concept design (EDPD-600-SMC-SWD-DRG-0002)

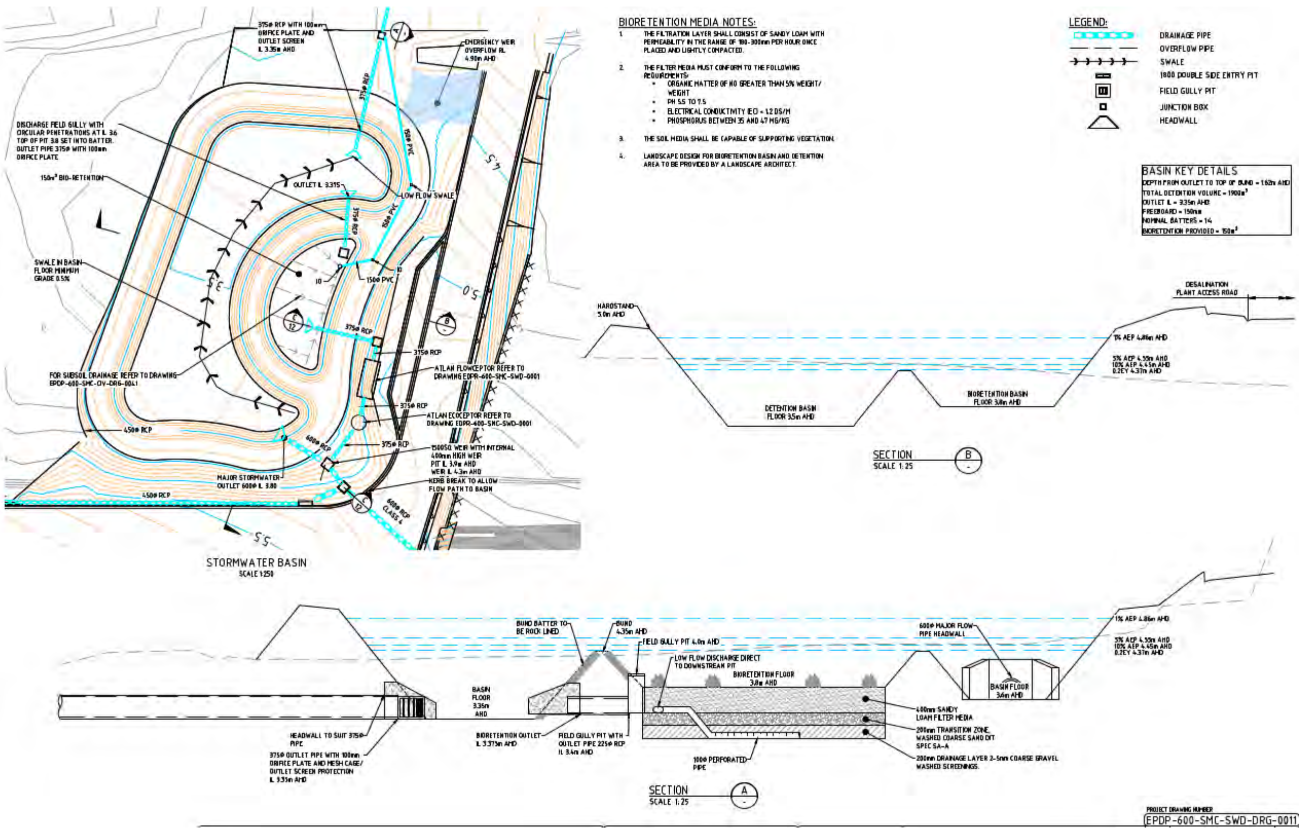


Figure 4.3 Stormwater basin Concept design (EDPD-600-SMC-SWD-DRG-0011)

Access roads

Several access roads are proposed or nominated along the transfer pipeline outlined in Figure 2.4.

- Where the transfer pipeline is to follow along existing sealed roads, no civil works are required only trenching for the transfer pipeline.
- Where the transfer pipeline is to follow along existing unsealed roads, civil works may be required to ensure there are adequate roadside swales and culvert crossings if existing conditions are poor along with trenching for the transfer pipeline.
- Where the transfer pipeline is to run parallel to a proposed access road, sealed or unsealed, culverts and roadside swales may be required to eliminate risks of pooling and damage to the new access road. The impervious catchment percentage increase is considered negligible when compared to the existing catchment impervious to pervious ratio.
- Where road works are to be completed, existing flow regimes are to maintained via culverts, overflow sections and crossfall.
- Noting the remote nature of the Site and presumed low speed limit, aquaplaning is likely low risk but should be reviewed upon the adoption of a speed limit.

Culvert Crossings

Road drainage crossings may be required under potential new access tracks. If required, a reinforced concrete pipe (RCP) or reinforced concrete box culvert (RCBC) may be used at such locations with a headwall at each end. Blocking factors for pipes, culverts and pits should also be identified and applied throughout the design process to ensure they have sufficient capacity in the minor and major design events.

Figure 4.4 below outlines a typical road crossing culvert treatment. Stormwater culvert sizing shall be developed during the next design phase.

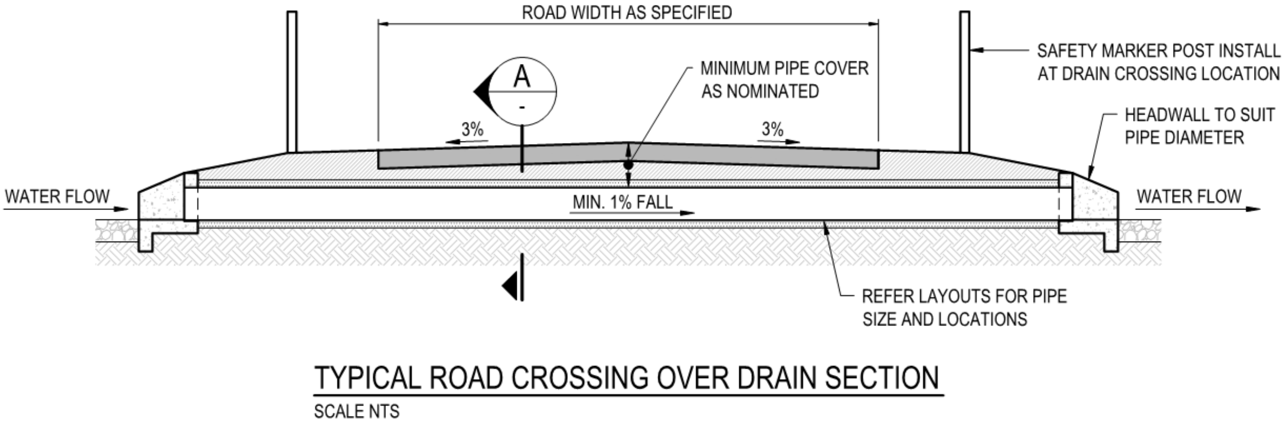


Figure 4.4 Typical culvert crossing detail

Transfer pipeline and UG/OH Transmission line

For the purposes of this assessment the proposed buried pipes and OH/UG electrical infrastructure has been assumed to have no material impact on the flooding, erosion and stormwater drainage of the Site. Design of pits need to consider potential for water ingress, including in services pits. Construction management and mitigation measures have been discussed in Section 4.2.

Intake pump station

The marine infrastructure includes a raw seawater intake pump station and a brine outfall sump and the following design and details were included in the Concept design by SA Water. 2 OD900 intake pipelines and a OD900 brine outfall pipeline will run east out of the intake pump station and brine outfall sump out into the ocean. The intake pipelines will be located in a tunnel below the bathymetry for 500 m. At Ch500 an area of the bathymetry will be excavated to allow the brine outfall pipeline to continue for another 490 m above the bathymetry. The marine infrastructure is proposed to be located in northern lagoon in the SA Water WWTP (Figure 4.5). The existing lagoon will be filled with approved engineered fill to the top of bank level so it is flush with the surrounding access road. The existing surface level in the lagoon at the proposed location is approximately 2 mAHD, with the proposed finished ground level as 3.4 m AHD. The intake pump station will be over an open wet well with a mesh screening at ground level. Rainfall on the intake pump station is assumed to pass through the mesh screening and be processed alongside the standing water in the wet well. External stormwater runoff should not be captured within the wet well and should be diverted around and into the WWTP existing stormwater network.

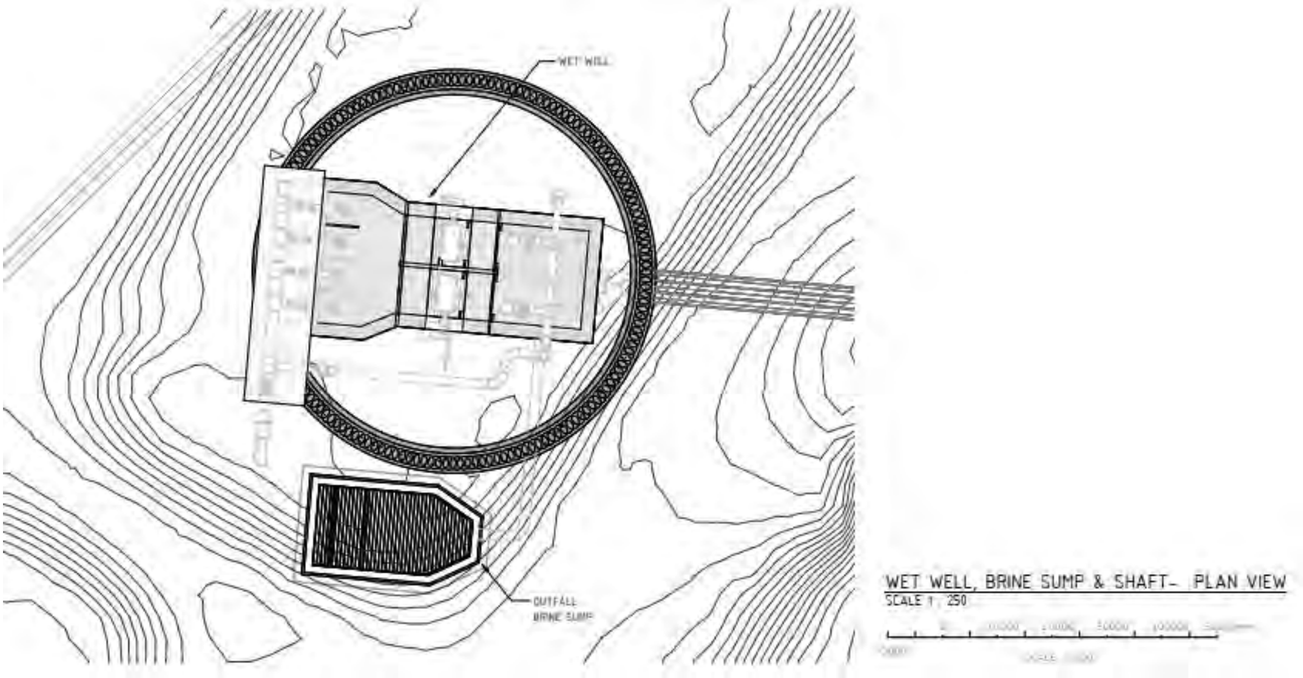


Figure 4.5 Indicative intake pump station arrangement (EPDP-300-AED-CIV-DRG-1001)

4.2 Construction

4.2.1 *General*

The following measures should be put in place to manage and mitigate impacts during the construction phase:

- Sediment and erosion controls should be implemented. These may include:
  - preserving existing vegetation where feasible/possible
  - construction vehicles should enter and leave the site by a construction access driveway to limit the tracking of mud and/or soil onto roads
  - large gravel or aggregate should be used to establish the entry/exit point, and should only require periodic maintenance by topping up the rock when required
  - a guide to the design and operation of a wash area should be outlined in the construction environmental management plan documents
  - a guide to waste management should be outlined in the documents

- where practical, upstream catchments should be diverted around the site onto stable areas and should not be diverted into neighbouring properties unless written permission is obtained from the landowner(s)
- all areas disturbed by construction should be promptly stabilised—for example, re-vegetated—so they can no longer act as a sediment source
- all construction vehicles on-site are to be fitted with a suitable oil/fuel spill kit.

— If a significant rainfall event has been forecasted, all work may need to be temporarily halted until the storm has passed. It is also advisable to secure loose materials including construction waste and equipment, or to alternatively remove them from the Site. Any washing of site vehicles and equipment should also be prohibited on-site to prevent stormwater contamination unless an appropriate facility is provided.

— The Environment Protection (Water Quality) Policy 2015 must be complied with, in protecting waters and land from listed pollutants.

— If there is a risk that contaminants have entered the sea/waterways, it is recommended that water quality tests be undertaken immediately. If there is any trace of contamination, works will be suspended until an appropriate treatment is implemented.

— All exposed soil batters should be top dressed with topsoil and re-seeded with native grasses following completion of construction works, providing benefits to stormwater runoff quality. In locations of rock, no further surface works are required.

— Development boundaries within the tidal zones are unlikely to require protection from tidal flow and wave actions due to the height difference between the Site and pipeline and sea level.

— Construction activities shall consider existing services along the route where most heavy equipment will travel to ensure that construction activity impact to existing services are safely managed.

— Construction site shall be kept secured at all times by providing temporary fencing during construction to prevent unauthorised access.

— If site contamination is identified during construction, site contamination will be included in the CEMP and outline all management, mitigation and treatment measures required for the site contamination found in line with the guidelines in the EPA Industry Guideline: Construction environmental management plans (CEMP). Any site contamination issues should be addressed by a suitably qualified and experienced site contamination consultant.

— Spills and leaks from construction vehicles may cause site contamination and enter waterways. Standard operating procedures will be followed on site to ensure machinery is well maintained and do not enter the site with any leaks present. A spills management plan should be included in the CEMP in the event of a spill occurring on site.

4.2.2 Reuse of site materials

Reuse of site materials should be considered as part of the design and set out in a technical specification.

The reuse of materials onsite should be investigated as to reduce the ecological footprint of the works, reusing excavated materials won onsite for pavements and access tracks reduces demand for importing material.

4.2.3 Disposal of excavation material

In the event material is to be removed from the site or re-used, appropriate laboratory testing should be undertaken to characterise the material to ensure a suitability for re-use or for selection of a suitable disposal facility.

Any excess water used in construction cannot be disposed directly to Council drains or the sea, without appropriate approvals in place.

4.2.4 Construction phase inspections

Local site topography and other conditions may vary slightly from high level survey data. Access track alignments may be adjusted slightly onsite to suit local factors with the designer's approval. The effects on drainage will need to be reviewed and regular inspection by the civil design engineer is recommended during civil works across the site.

4.2.5 High level soil erosion and drainage management plan (SEDMP)

The construction activity as a result of the proposed RO desalination plant may result in stormwater pollution and impact nearby receiving ocean if appropriate mitigations are not implemented. A SEDMP is recommended to be prepared prior to construction to adhere to the requirements set out under the guidelines given in the Code of Practice for the Building and Construction Industry by the South Australian Environmental Protection Authority (EPA). This requirement is linked to the Environment Protection (Water Quality) Policy 2015 and the *Environment Protection Act 1993*.

The following high-level strategies may be implemented to address soil erosion and drainage management during construction:

- minimising the land area to be disturbed during construction
- earth moving activities should be timed and staged to minimise the time and extent where soil is exposed to water and wind
- establish a single entry/exit point to the site area and stabilize pavement entry/exit point by using gravel or aggregate
- diversion of stormwater around site by installing bunding and/or swale drains
- stabilized exposed earth batters using vegetation or erosion control mats or similar
- capture runoff from site and treating prior to discharge
- revegetate the site as soon as possible
- dust control during excavations – such as use of a water cart.

It is recommended that a detailed SEDMP be developed before construction starts. Often SEDMP's are submitted to the relevant council/regulator along with the engineering plans for building consent and/or a condition of Development Approval.

4.3 Operation

4.3.1 General civil

The following general civil mitigation measures are recommended to support the operation phase:

- Maintenance and inspection activities shall be undertaken in accordance with the site maintenance specification guidelines for the site. Vehicles used onsite shall be appropriately maintained, with access tracks to be designed in accordance with principles stipulated within accepted guidelines. Appropriate spill kits for vehicles will be required.

4.3.2 Drainage

The following measures should be put in place to manage and mitigate impacts during the operation phase:

- Any stormwater drainage/diversion measures taken at the intake pump station site and desalination plant site shall require monitoring and maintenance to ensure the site is protected from overland stormwater flows.
- Any proposed and existing culverts pipes and pits shall be monitored for blockages and maintenance completed if blockage is more than designed for.
- Any stormwater detention and sediment control measures implemented shall require monitoring and maintenance to ensure the Environment Protection (Water Quality) Policy 2015 and EPA guidelines are met.

4.3.2.1 Water quality

The Environment Protection (Water Quality) Policy 2015 outlines that a person must not discharge pollutants into any water or land which is likely to enter any waters. Pollutants can include wash down from cleaning vehicles, green waste, soil, clay, gravel, sand or wastewater from operations or construction i.e.. cutting bricks.

The impact of the desalination plant on downstream water quality cannot be determined without a full understanding of catchment area properties (impervious, pervious, building locations, bunded areas, hazardous areas etc). Assessment of these factors will typically occur during detailed design. As such, for the comments on additional requirements for water quality treatment infrastructure in this report are considered preliminary.

The primary risks associated with water quality have been identified as:

— Contaminated spills from the RO desalination plant site; risk is low as areas with hazardous material will be self-contained. Hazardous materials produced/used on Site should be referenced in the CEMP.

— Increased pollutant load runoff from RO desalination plant due to an increase of impervious area; runoff from the proposed site would likely enter a swale or detention basin where they will be treated prior to discharge.

— Excavation and works completed during construction – to be addressed in the SEDMP.

The use of swales on the site will assist in reducing the pollutant loading to a level equivalent to status quo. A bio-retention basin may be considered to reduce and treat levels of pollutant loadings produced from the development site such as phosphorus and nitrogen. Further understanding of the site layout and water quality modelling is required to specify preferred options. It is expected that further detailed assessments will occur during detailed design.

5 Summary and recommendations

The assessment suggests that the existing site will be impacted by the proposed development. Impacts will likely be the result of the construction of access roads, hardstand zones and buildings which will involve earth-moving activities. The following key recommendations are provided:

- SA Water and Council must review and approve a CEMP and SEDMP prior to the commencement of any construction, i.e. erosion and sediment controls should be implemented.
- Stormwater detention and water quality treatment requirements are to be investigated during concept design phase and will likely be required to reduce the risk of scouring and pollutant loading downstream. Consideration of the water table and tidal impacts are to be accounted for.
- Anecdotal or recorded evidence of flooding in the RO desalination plant area was not found. It is recommended that the designer consult with council to identify any anecdotal evidence of flooding.
- Council requirements regarding site development shall accommodate anticipated changes in sea level due to natural subsidence and probable climate change during the first 100 years of the development. As such, it is recommended that site levels are to be to be 0.3 m minimum above standard sea-flood risk level and building floor levels are to be 0.55 m minimum above standard sea-flood risk level as per the Coast Board Protection Policy Document 2016. The designer is to ensure the FFLs are selected based on the requirements of the Coast Board Protection Policy with consideration to storm surge, high tide, climate change seal level rise and land subsidence.
- The finished floor level of buildings should be designed to ensure 1% AEP overland flow does not inundate buildings.
- Work should be temporarily halted if a significant storm is forecasted; making sure to secure any loose materials, including construction waste and equipment, or alternatively removing them from the Site.
- The Site should make use of existing sealed property access to minimise the increase of impermeable surface.
- Physically locating existing drainage infrastructure prior to any construction activity shall be undertaken to mitigate the risk of any clash and/or damage to existing drainage infrastructure.

6 Limitations

This Report is provided by WSP Australia Pty Limited (*WSP*) for South Australian Water Corporation (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 9 March 2023 and agreement with the Client dated 29 March 2023 (*Agreement*).

6.1 Permitted purpose

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

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Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information)*, those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

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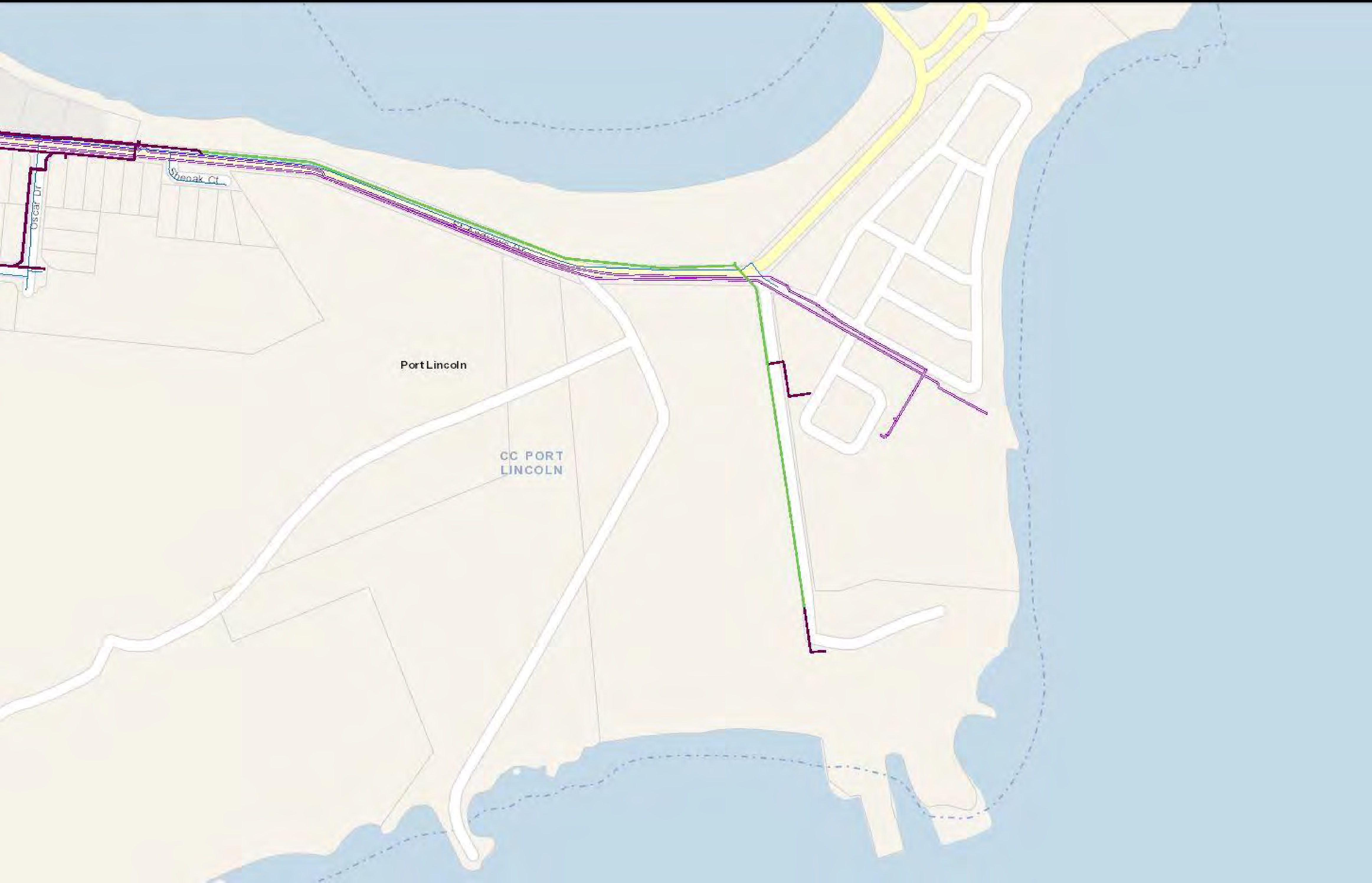
Appendix I SA Viewer and BYDA Search Results

LocationSA MapViewer

Search for an address or location



14.85.1.5 – Ref No. I2311472

Date: 10/08/2023

To: WSP

Attention: Kingsley Wong

According to our records your enquiry with the following details **does not impact** our infrastructure. Please review other documents included with this response for additional details:

Sequence No:	**228039748**
Job No:	**34781494**
Location:	**Lot 900 St Andrews Drive, Port Lincoln**

If you require further information, please contact the City of Port Lincoln on 08 8621 2300 or plcc@plcc.sa.gov.au

<u>This enquiry is valid for 30 days from the enquiry date.</u>

Important Notice: This enquiry response, including any associated documentation, has been assessed and compiled from the information detailed within the DBYD enquiry outlined above**. Please ensure that the DBYD enquiry details and this response accurately reflect your proposed works.**

Please note:
When working in the vicinity of the City of Port Lincoln's assets you have a legal 'Duty of Care' that must be observed.

Please ensure that you read the 'Duty of Care' document (attached) - it contains important information including essential steps that must be undertaken prior to commencing construction activities.

We recommend that you engage the services of a **<u>DBYD Certified Locator</u>** otherwise you may be liable for damage costs if no location is undertaken or uncertified locators are used. (Mandatory requirements for DBYD Certified Locators include having appropriate training, equipment and having current insurance).

Important Information

In particular The City of Port Lincoln **wishes to advise –**

- The actual location of any City of Port Lincoln assets may differ significantly from the position shown on the attached plans. *(refer to the attached Duty of Care for further information on the accuracy of supplied information)*
- All City of Port Lincoln assets, including underground network, must be validated (physically sighted and identified), prior to commencing any excavation. *(refer to the attached Duty of Care for further information)*
- All City of Port Lincoln assets once validated must be protected from damage. *(refer to the attached Duty of Care for further information)*
- If your project is dependent on the position of the City of Port Lincoln assets, then it is recommended that you validate the position of the network prior to finalising your design. *(refer to the attached Duty of Care for further information)*
- Plans are valid for 30 days after issue and must be replaced if required after the 30 days
- Asset correction (incorrect plans) – Please advise if there are any errors or incorrect locations shown on the plans by contacting 08 8621 2300 or irene.hird@plcc.sa.gov.au or use the DBYD web link at Asset Location Feedback SA/NT
- **Any damage to City of Port Lincoln owned infrastructure or property must be reported immediately to 08 8621 2300**
- An engineering permit is required if you want to do things like: -
    - Install, widen or repair driveway crossover
    - Install or repair existing stormwater outlet
    - Lay underground services

Further Information

- Be aware that works on City of Port Lincoln assets require a Section 221 Permit available on request.
- http://www.dbydlocator.com/certified-locators/
- https://www.1100.com.au/sa-nt/asset-location-feedback-sant/
- Dial Before You Dig Best Practices
- PDF Map Files - free viewing software is available from the internet e.g.
  Adobe Acrobat Reader (http://get.adobe.com/reader/), or
  Foxit Reader (http://www.foxitsoftware.com/downloads/)

If you require further information, please contact the City of Port Lincoln on 08 8621 2300 or plcc@plcc.sa.gov.au

General Responsibilities and Duty of Care

Duty of Care

• This enquiry is valid for 30 days from the enquiry date
• Asset location plans are intended to be indicative only, completeness and accuracy of the information provided cannot be guaranteed
• Council infrastructure is not to be altered by any third party without prior approval. Council reserves the right to recover compensation for loss or damage to infrastructure or any property
• Location of underground assets must be confirmed by field investigation. It is recommended an DBYD Certified service locator be engaged for the locating of assets

City of Port Lincoln endorses the 5Ps of Safe Excavation to prevent damage

Plan > Prepare > Pothole > Protect > Proceed

1 PLAN:

You must have current plans and information via the DBYD process. The City of Port Lincoln advises that the accuracy of the information provided conforms to Quality Level D as defined in AS5488-2013. This means the information is indicative only, not a precise location.

2 PREPARE:

Prepare for your works by reviewing the plans and information and contacting The City of Port Lincoln if you need assistance. Look for on-site asset and infrastructure clues such as pit lids, marker posts and meters. These on-site clues will assist you to identify the potential location of assets on site from the plans and also identify any other assets and infrastructure that may not be marked on the plans

It is then recommended to engage a DBYD Certified Locator.

http://www.dbydlocator.com/certified-locators/

3 POTHOLE:

- When assets are in the vicinity of the excavation site then potholing (I.e.: careful hand digging or hydro vacuum excavation) must be carried out prior to excavation to validate the position of existing services
- The use of a DBYD Certified Locator when potholing will minimise the amount of exploratory potholing and save costs and assist in validating the correct asset when exposed
- When potholing only utilises non-destructive methods. Methods can include careful hand digging and hydro vacuum excavation
- On completion of potholing the reinstatement and restoration must meet the requirements of The City of Port Lincoln .The site must be left in a condition such that no safety hazards associated with the locating work activities remain
- Please ensure that the reinstatement standards applicable to the service type (i.e. Gas, Water, Telecommunications etc) are adhered to and using like for like material (e.g. asphalt, concrete, crushed rock etc).

4 PROTECT:

- Located asset information should be communicated to all on site, the assets must be clearly marked or flagged and if necessary, have protective barriers, supports erected or other methods in accordance with the City of Port Lincoln requirements
- Any Asset Owner Member or industry regulated No Go Zones or Exclusion Zones must be adhered to and enforced on site
- Utilise SWMS (Safe Work Method Statements) and /or JSA (Job Safety Analysis)
- All recorded information/measurements of any subsurface utilities (from locating, potholing etc.) should be recorded in accordance with AS5488 - 2013 and have the correct Quality Levels specified i.e. A, B, C or D to prevent future damage
- Isolate the work near underground assets from the public at all times
- **You must maintain the following minimum clearance distances between construction activity and the validated position of Councils assets.**

  (Please note that this is an example only as copied from the Telstra Duty of Care statement. Note that councils may consider including Tree protection Zones)

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual validated location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of **actual validated location** of conduits.* *300mm compact clearance cover before compactor can be used across conduits.*
Boring Equipment **(in-line, horizontal and vertical)**	*Not within 2.0m of **actual validated location**.* *Constructor to hand dig or use non-destructive water jet method (pothole) and expose plant.*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Conduits (or plant) with less than 600mm cover.* *Constructor to check actual depth via hand digging.*
Mechanical Excavators, Farm ploughing and Tree Removal	*Not within 1.0m of **actual validated location.*** *Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.*

5 PROCEED:

You should only proceed with your excavation work after:

- The first four steps above have been completed
- You have verified that all the information in the preceding steps is still current. If the use by date of the plans have expired, you will need to obtain current plans and if necessary, re-validate any changes that may have occurred
- If requested advise other DBYD members when works are to be undertaken near their asset or area of interest
- You have met all the requirements of the SafeWork SA Code of Practice and Regulations

Dial Before You Dig (DBYD)

Location Information

To:
WSP - Kingsley Wong
Level 15, 28 Freshwater Place
Southbank VIC 3006

Enquiry Details	
Utility ID	50800
Sequence Number	228970350
Enquiry Date	29/08/2023 13:45
Response	**AFFECTED**
Address	Lot 601 St Andrews Drive Port Lincoln
Location in Road	Road,Nature Strip,Footpath
Activity	Planning and Design

Enquirer Details	
Customer ID	3180352
Contact	Kingsley Wong
Company	WSP
Email	kingsley.wong@wsp.com
Phone	+61398612380

Underground cable locations
ASSETS FOUND

The process:

1. You made an enquiry with Dial Before You Dig (1100).
2. Dial Before You Dig referred your enquiry to SA Power Networks (South Australia's Distribution Network).
3. SA Power Networks has checked their records and have found underground assets in your request area.
4. Please review the attached Asset Map(s) in regard to your excavation, as there may be some restrictions that apply if your excavation is greater than 300mm below ground level and less than 3.0m from an SA Power Networks Asset. Further explanation of restricted and exclusion zones can be found at *http://www.sapowernetworks.com.au/public/download.jsp?id=1775* OR search sapowernetworks.com.au for NICC 404 and by referring to the figure on page 10, 11 or 12.
5. An on-site assessment and/or technical drawings may also be necessary to ascertain the exact cable/asset location. This service can be provided by SA Power Networks and may incur a cost.
6. Please contact your local SA Power Networks Location Officer to schedule work or make further enquiries regarding this request either by return email or the contact number supplied. Other general enquiries can be made on (08) 8292 0218.
7. If you have damaged SA Power Networks Assets immediately notify Faults & Emergencies on (08) 8404 4496.

Please note: Underground services in the vicinity of any proposed earthworks must be located by hand digging (pot-holing) prior to the commencement of works. Persons conducting works will be held responsible for any resulting loss or damage to the services associated with infrastructure

Important information and conditions of use for users of underground services information supplied by SA Power Networks

Indicative information only

The accompanying information is intended only to indicate the presence of SA Power Networks' underground services and/or to convey general indicative information in respect of the location marked on the plans. **The information does not necessarily provide current, comprehensive or accurate description or location of the underground services or associated infrastructure.**

The information may also describe or indicate the presence of underground services or infrastructure not owned by SA Power Networks, for example, electrical services connected to an SA Power Networks' service point. SA Power Networks takes no responsibility for services or infrastructure that is not owned or operated by SA Power Networks or the accuracy or completeness of their description or location in the accompanying information.

Additional technical information may be requested from SA Power Networks for planning or engineering design (non-digging) purposes. Such requests are to be directed to SA Power Networks Builders and Contractors Electrical Service Line (1300 650 014).

Identifying the location of underground services

Working near or around live electrical cables can be hazardous. **An on-site assessment is strongly recommended prior to undertaking ANY works and is necessary to determine the location of the underground services.** This can be undertaken by SA Power Networks or an alternative professional locating service provider. Enquiries can be made about SA Power Networks' cable location service by telephoning (08) 8292 0218.

Restrictions may apply in regard to your excavation particularly if your excavation is greater than 300mm below ground level and less than 3.0m from an SA Power Networks asset. Further explanation regarding restricted exclusion zones can be found at *http://www.sapowernetworks.com.au/public/download.jsp?id=1775* OR search sapowernetworks.com.au for NICC 404 and by referring to the figures on pages 10, 11 or 12.

Underground services in the vicinity of any proposed earthworks must be located by hand digging (pot-holing) prior to the commencement of the works. Persons conducting works will be held responsible for any resulting loss or damage to the services or associated infrastructure.

Working near high voltage 66kV underground cables

Persons intending to conduct earthworks in the vicinity of an SA Power Networks high voltage 66kV underground cable MUST first obtain a site-specific clearance by contacting the SA Power Networks Cable Management Technical Officer on 0403 582 174.

Basis of information supply

The accompanying information is supplied at the request of, and is only provided for use by, the requestor. The information is valid for 30 days from the date of issue.

SA Power Networks, its employees, agents and contractors shall accept no responsibility for any inaccuracy or incompleteness in the information provided or liability in respect of any personal injury, death, loss or damage to any real or personal property or otherwise that arises out of or in connection with, directly or indirectly, the provision of or reliance upon the information.

It is the requestor's responsibility to ensure that the information provided accords with the area depicted on the requestor's Dial Before You Dig request. The information provided should not be used in respect of any area outside of the area depicted on the Dial Before You Dig request. SA Power Networks does not warrant that the information is suitable for the requestor's intended purposes.

Any use of the accompanying information is subject to the requestor's agreement to the conditions contained in this document. Upon acceptance of these conditions, SA Power Networks grants the requestor permission to use the information. The information must be returned to SA Power Networks if the conditions are not accepted.

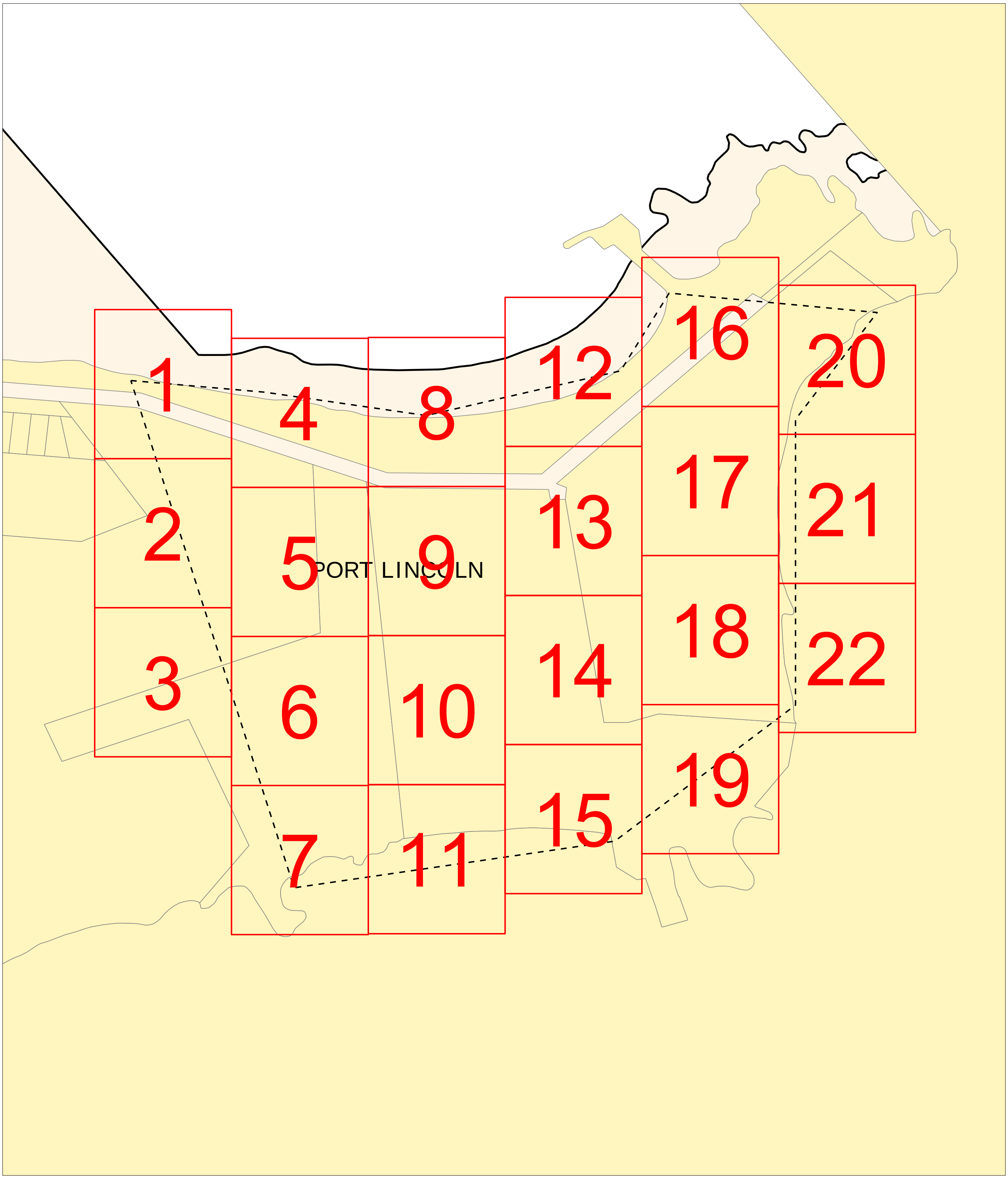
Important note: It is an offence under the Electricity Act 1996 (SA) to cause damage to or interfere with electrical infrastructure

Date: 29/08/2023

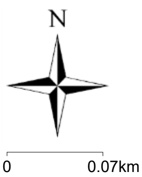
Overview Map

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Disclaimer: The Plan/Sketch is supplied at your request and is subject to your agreement that SA Power Networks shall not be liable or responsible for the correctness or otherwise of any such information supplied pursuant to this request. Upon acceptance of this condition SA Power Networks grants you permission to use the Plan/Sketch as a guide to the location of SA Power Networks assets. The Plan/Sketch must be returned to SA Power Networks if you fail to accept the conditions of use.



LEGEND:

1 Detail Map

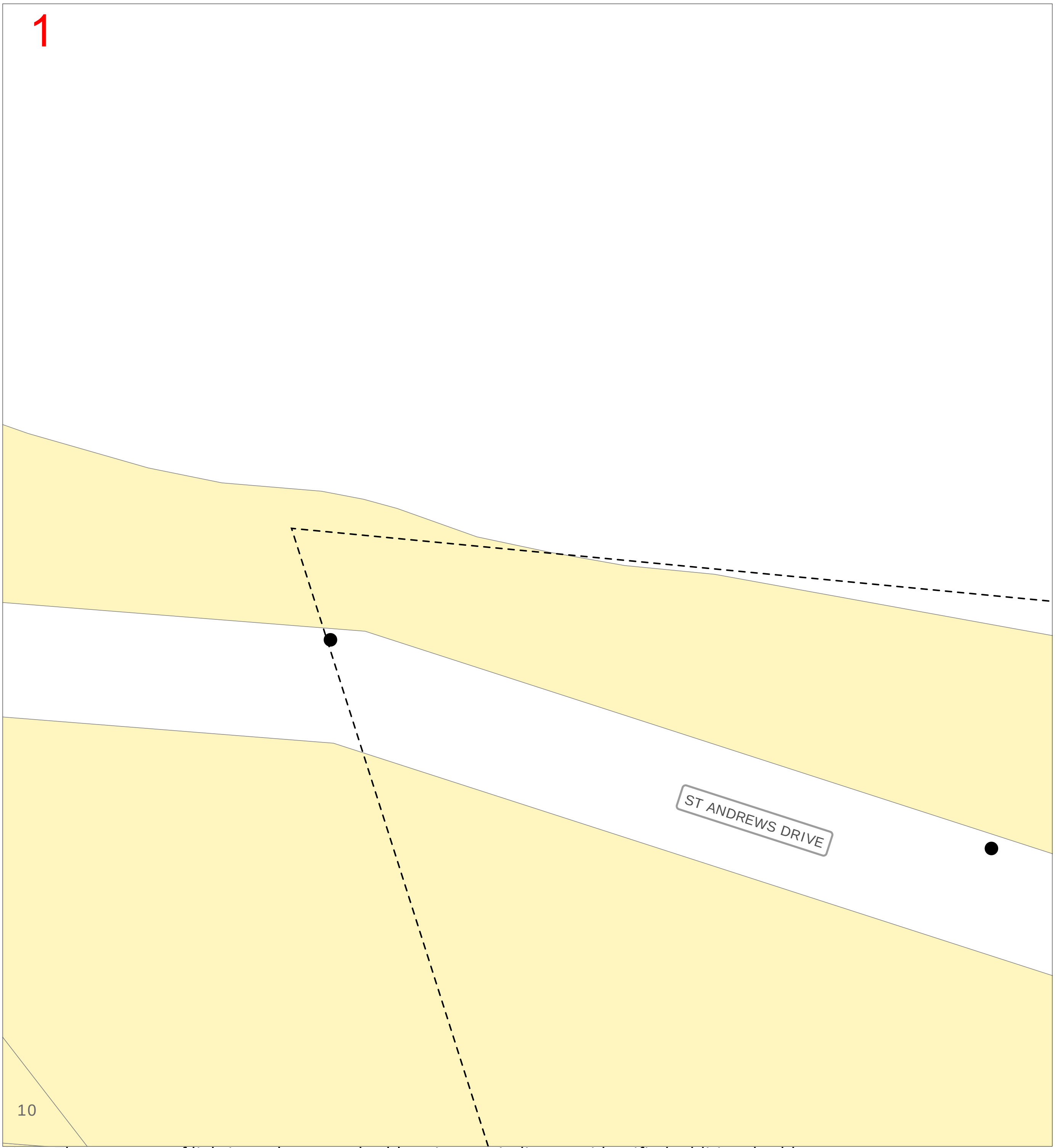
DBYD Requested Area

Date: 29/08/2023

Map 1

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

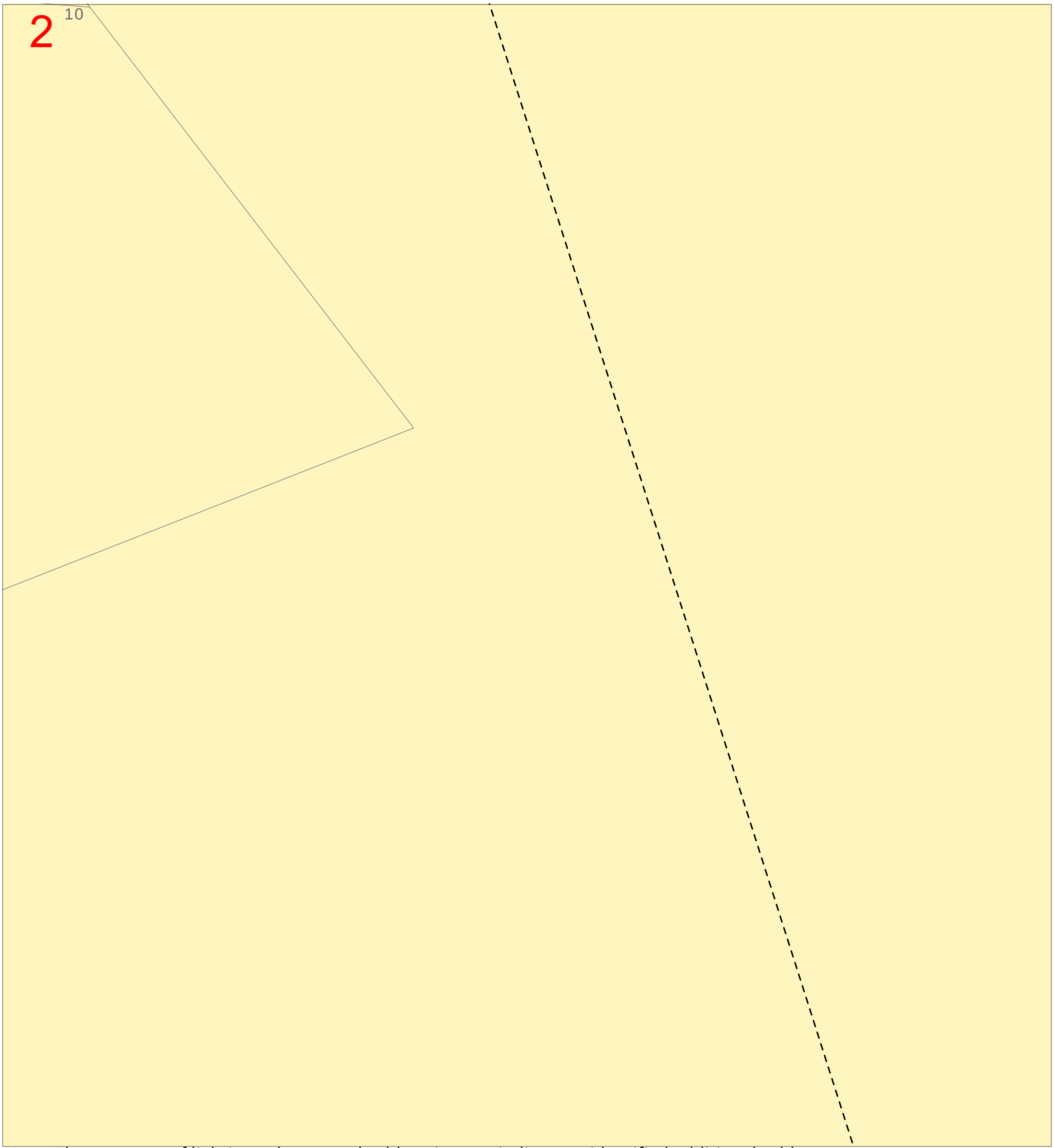
Date: 29/08/2023

SA Power Networks

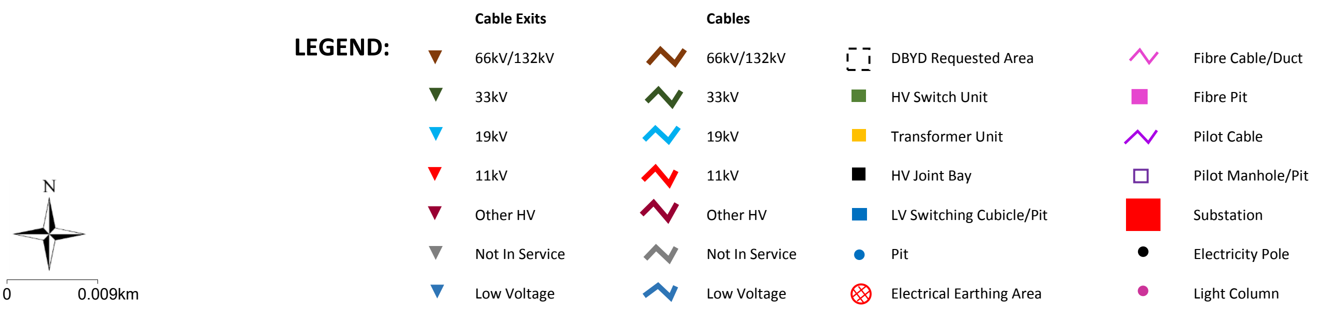
Map 2

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.



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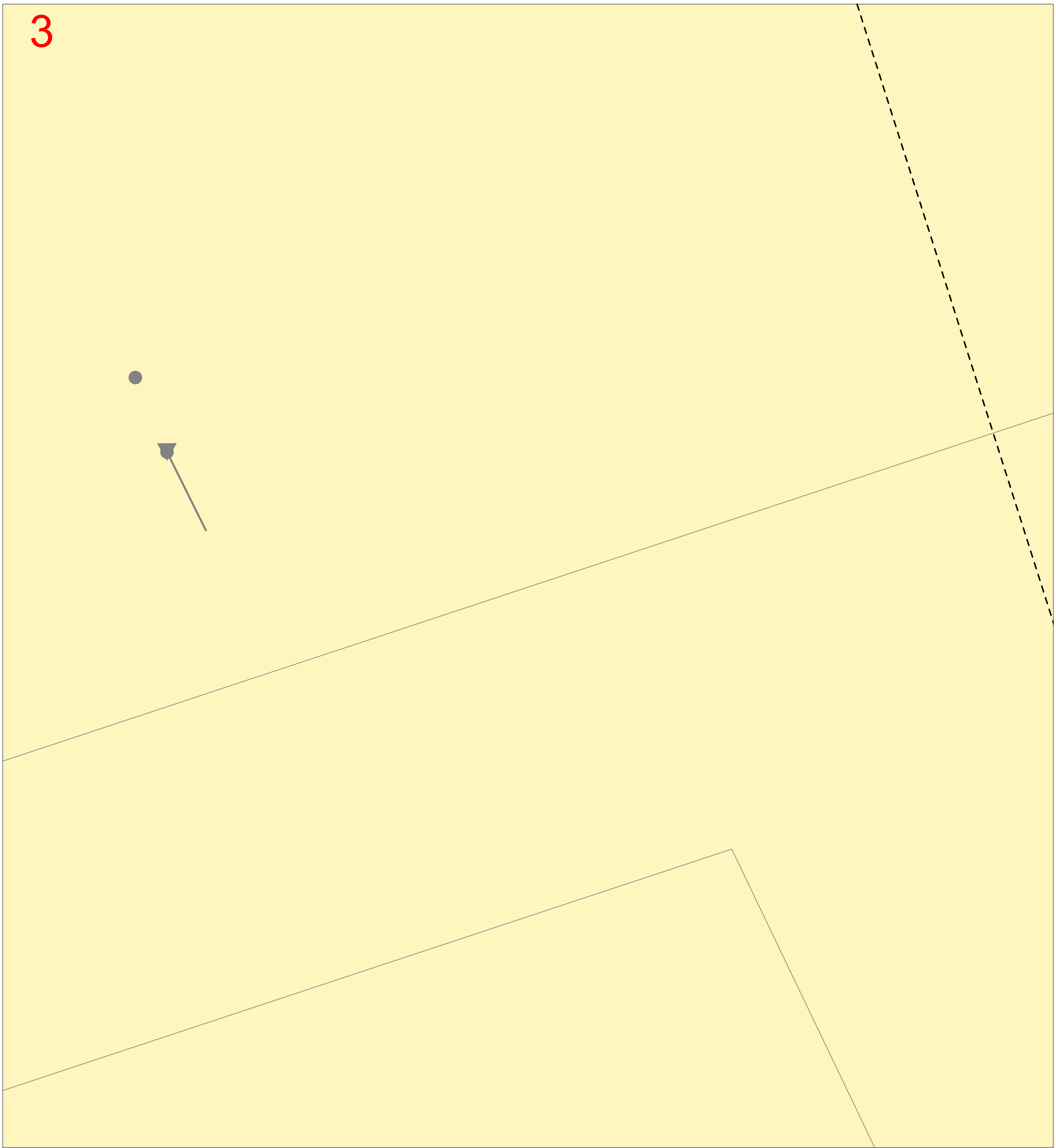
Date: 29/08/2023

SA Power Networks

Map 3

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables				
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

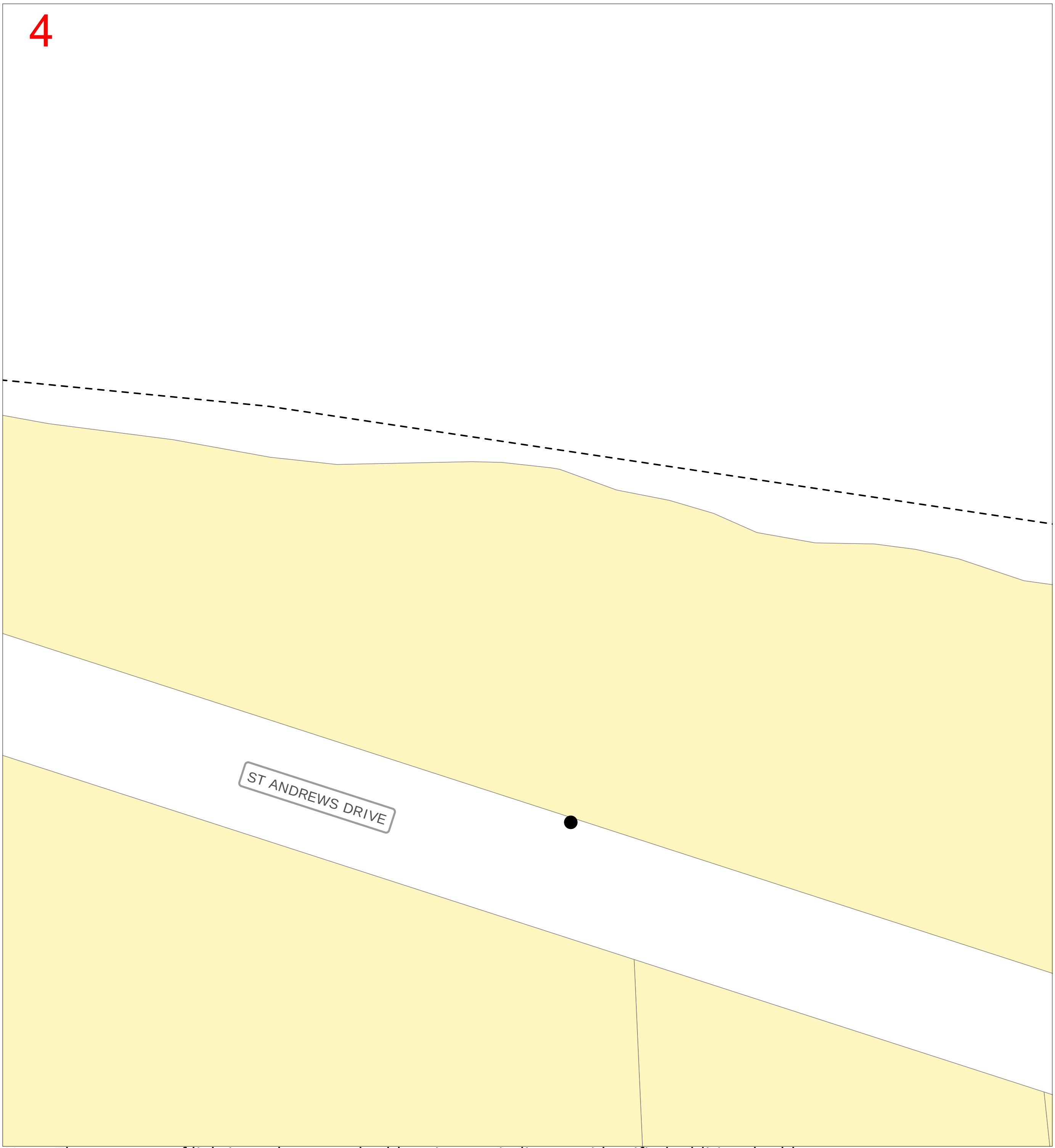
Powered by dbyd x-info

SA Power Networks

Map 4

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

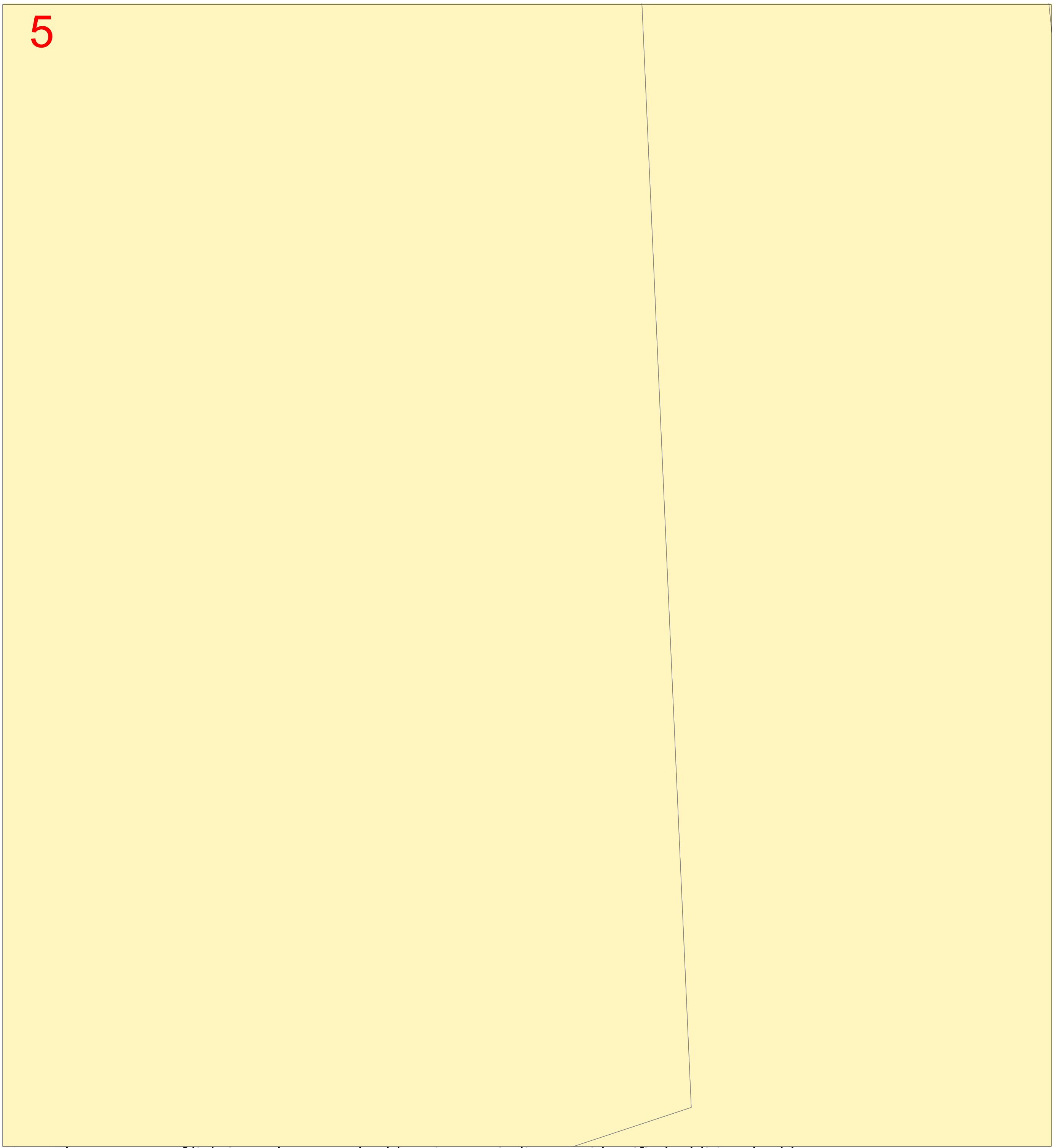
0 0.009km

Date: 29/08/2023

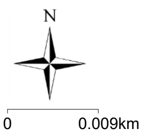
Map 5

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.



LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

Powered by dbyd

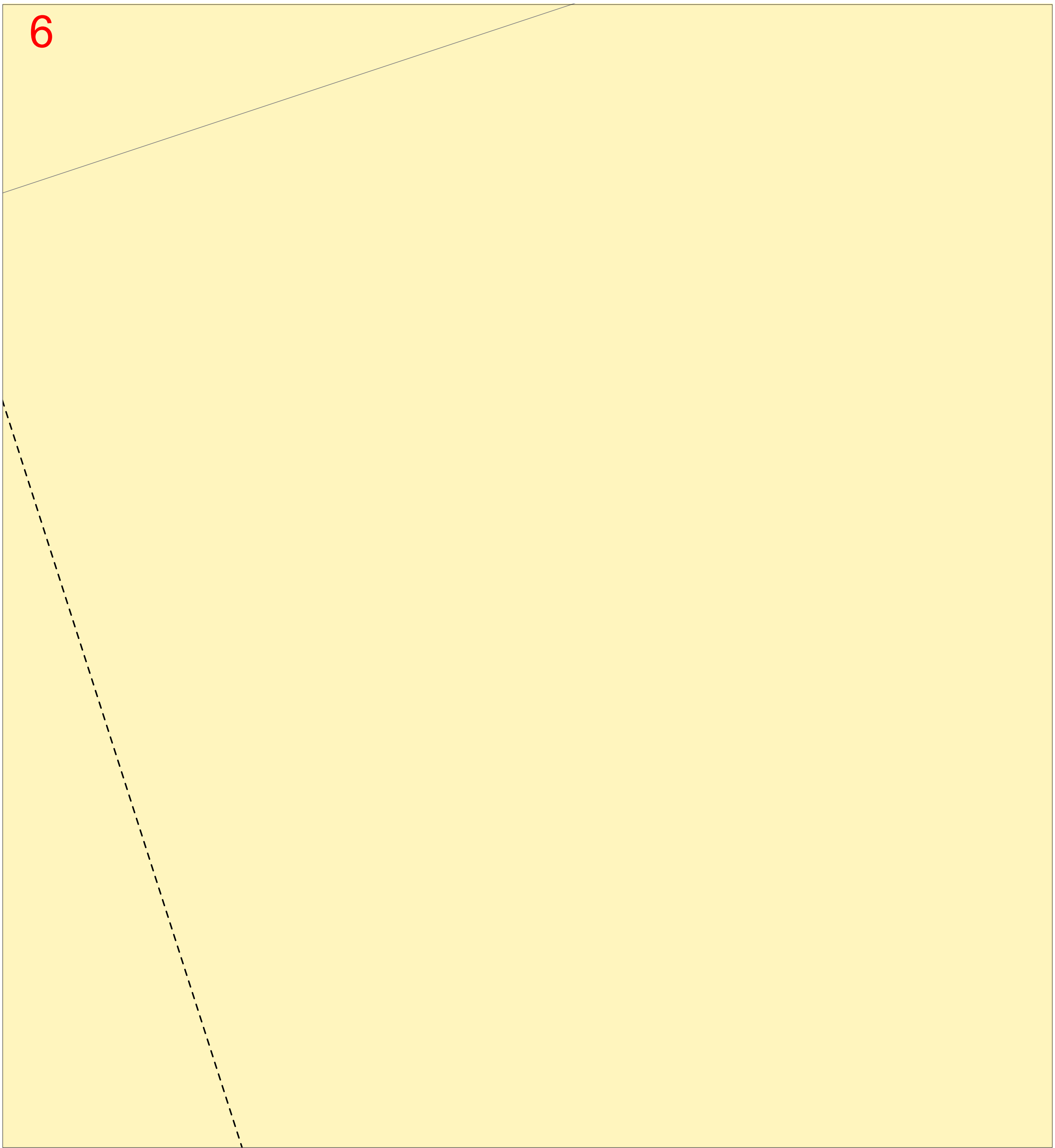
Date: 29/08/2023

SA Power Networks

Map 6

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

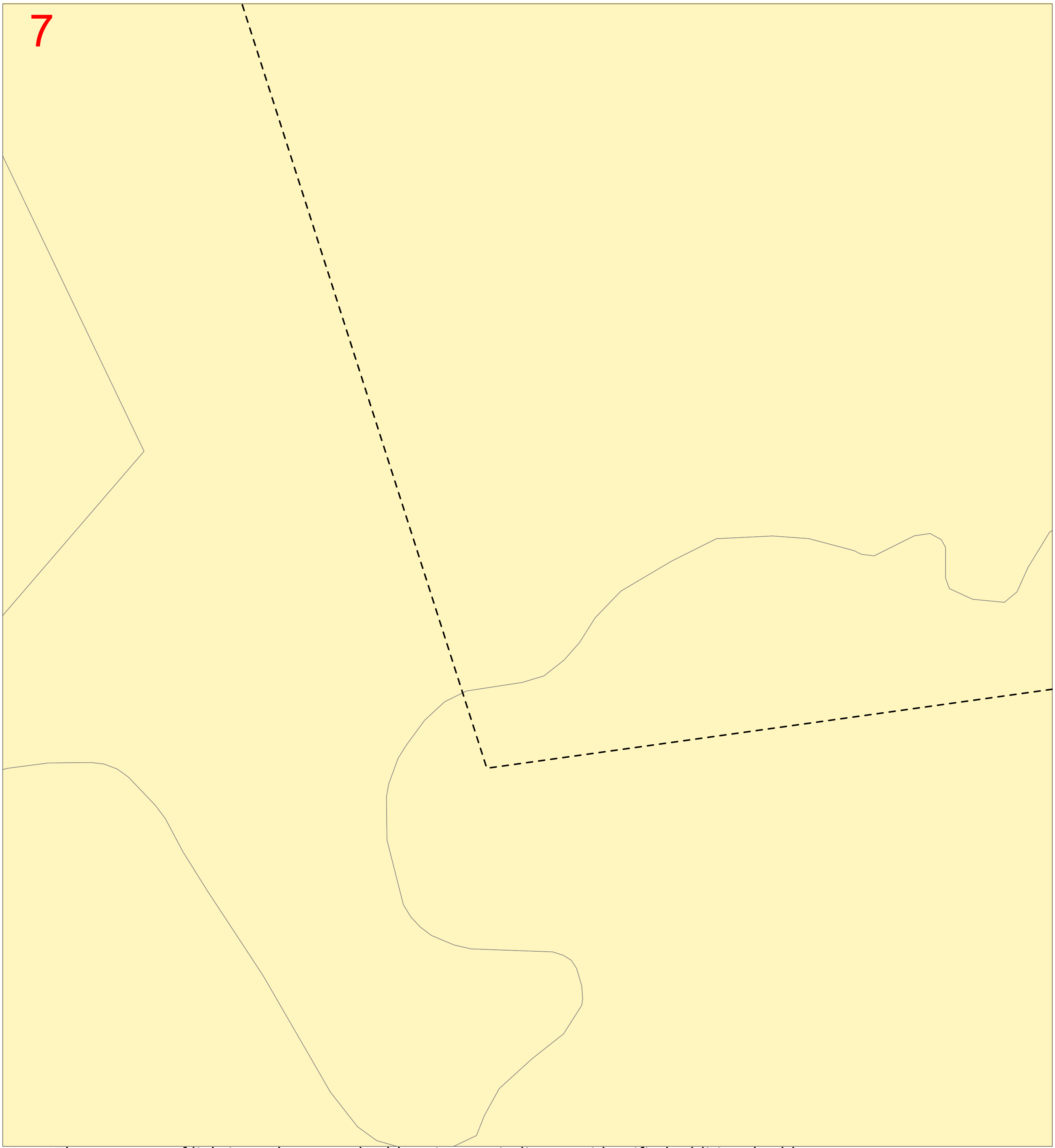
0 0.009km

SA Power Networks

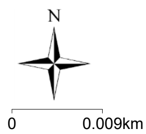
Map 7

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.



LEGEND:

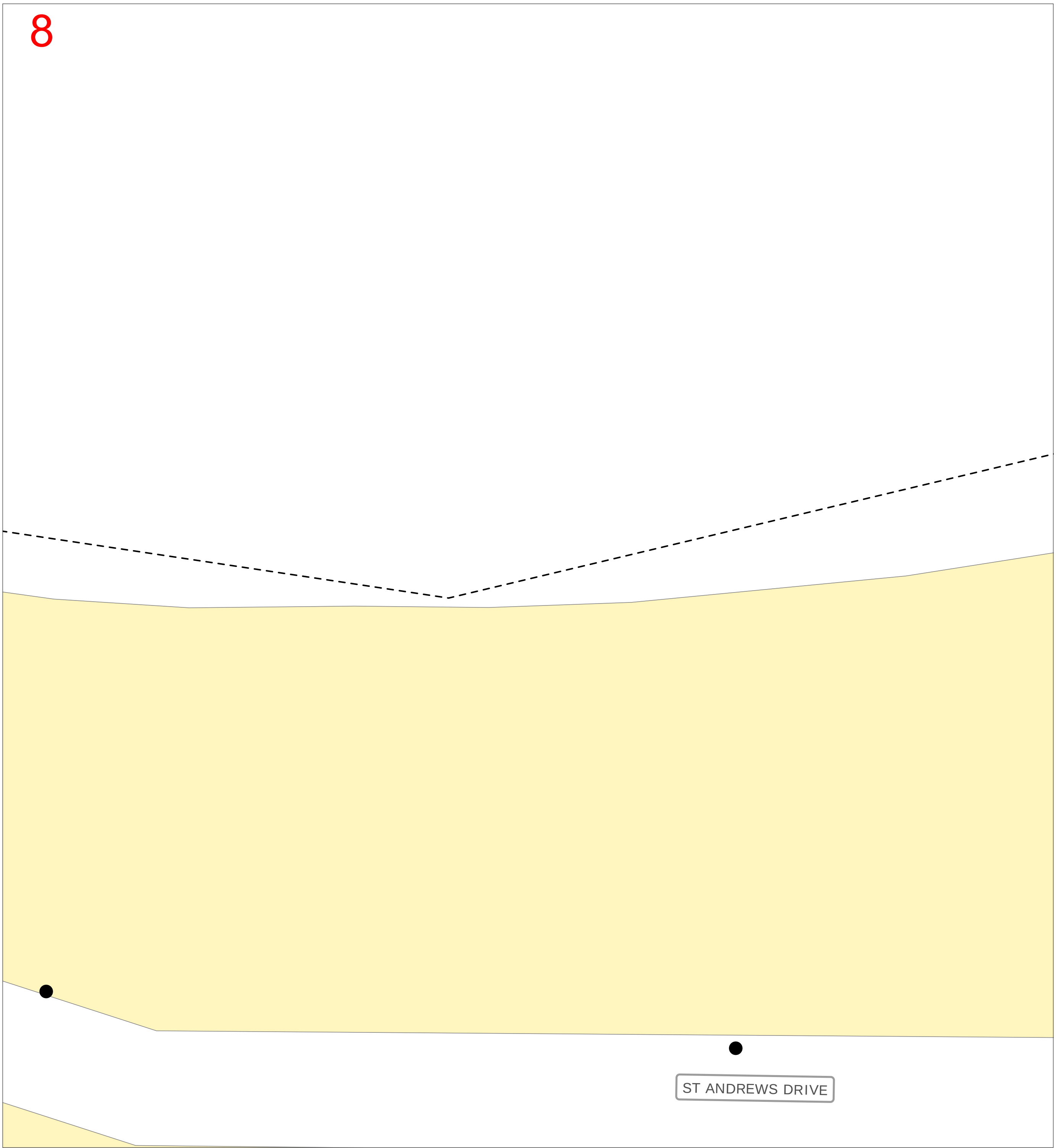
Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

SA Power Networks

Map 8

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

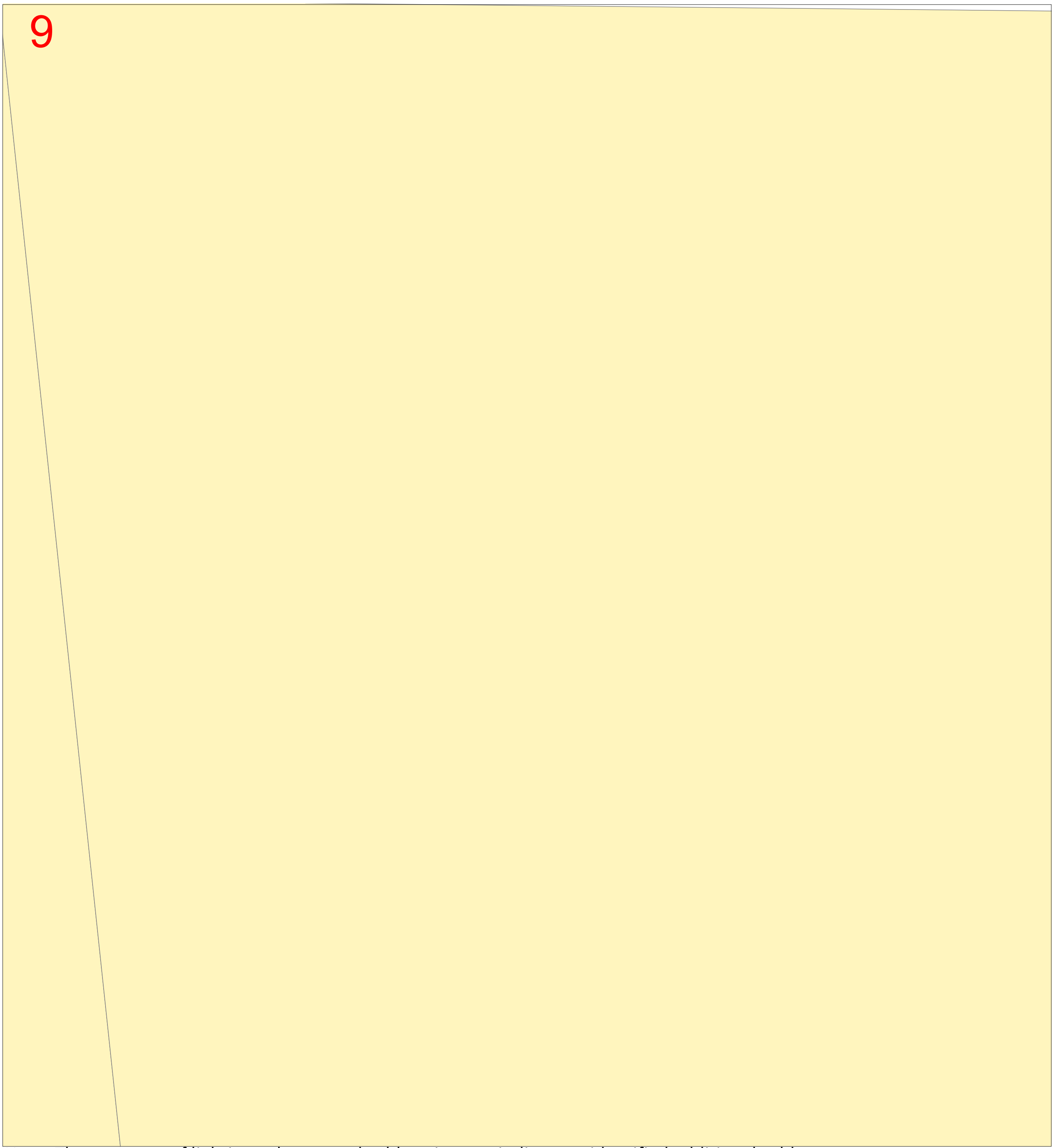
Date: 29/08/2023

SA Power Networks

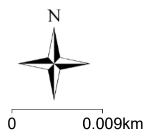
Map 9

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.



LEGEND:

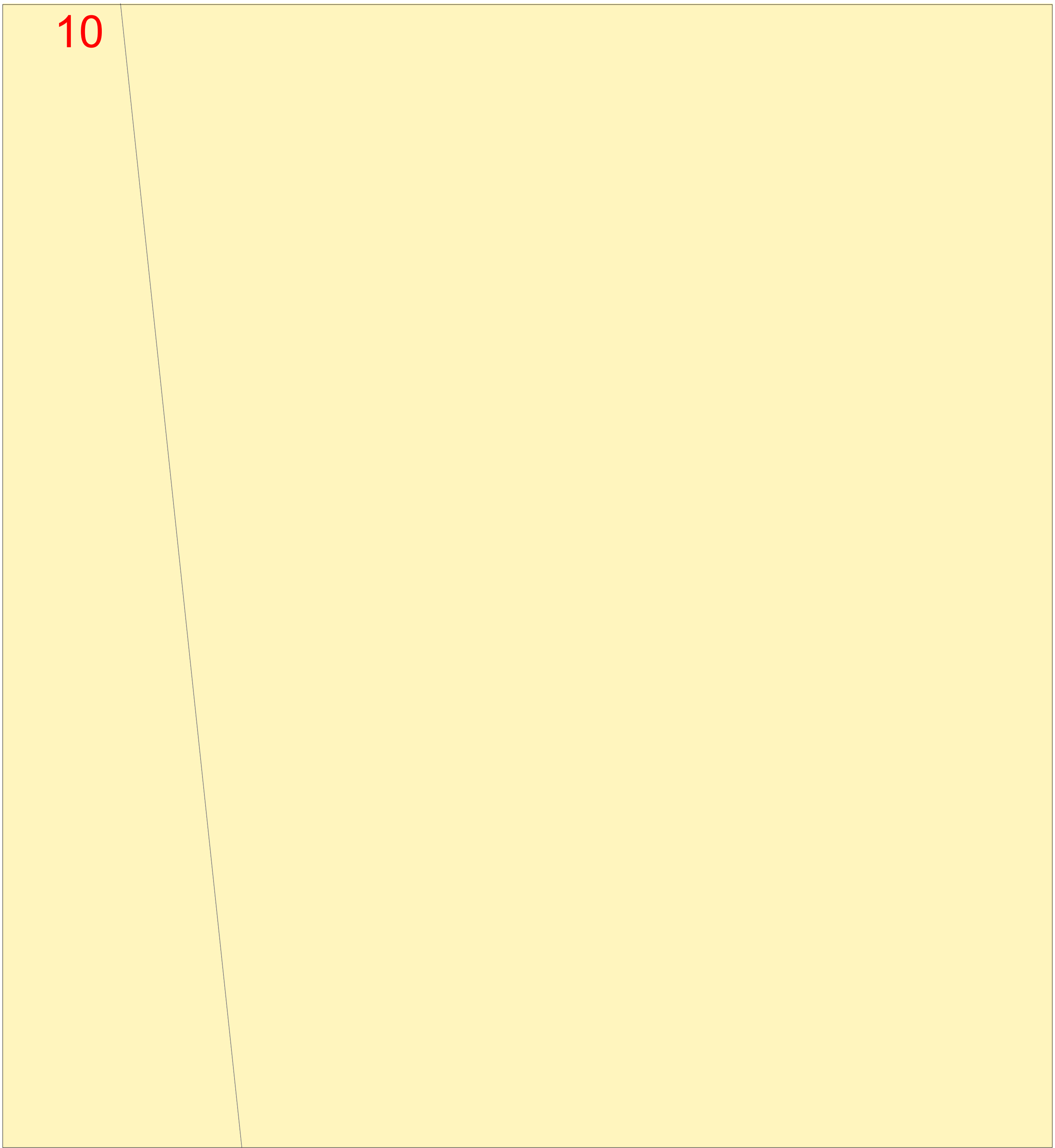
Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

SA Power Networks

Map 10

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

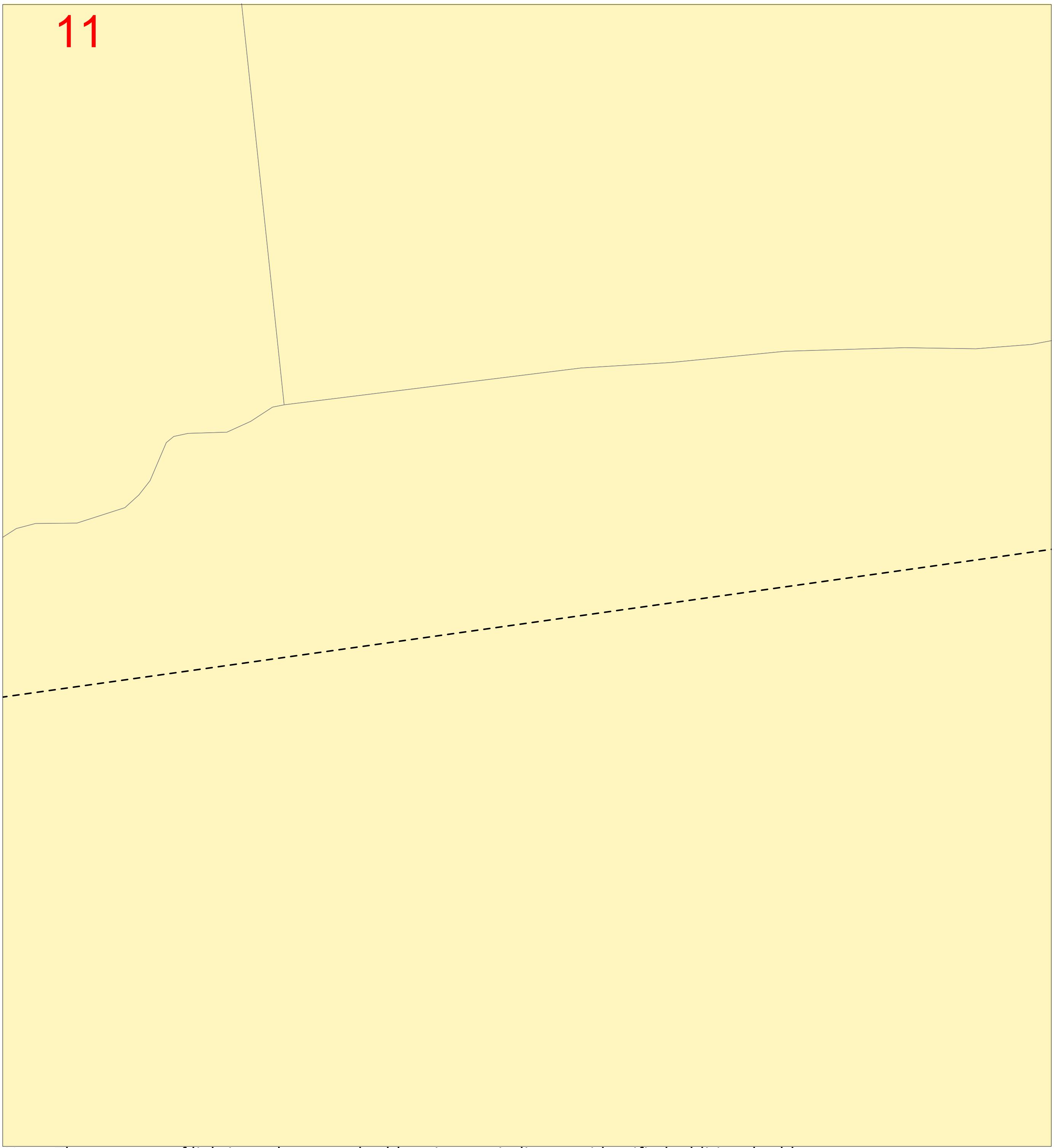
0 0.009km

Date: 29/08/2023

Map 11

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

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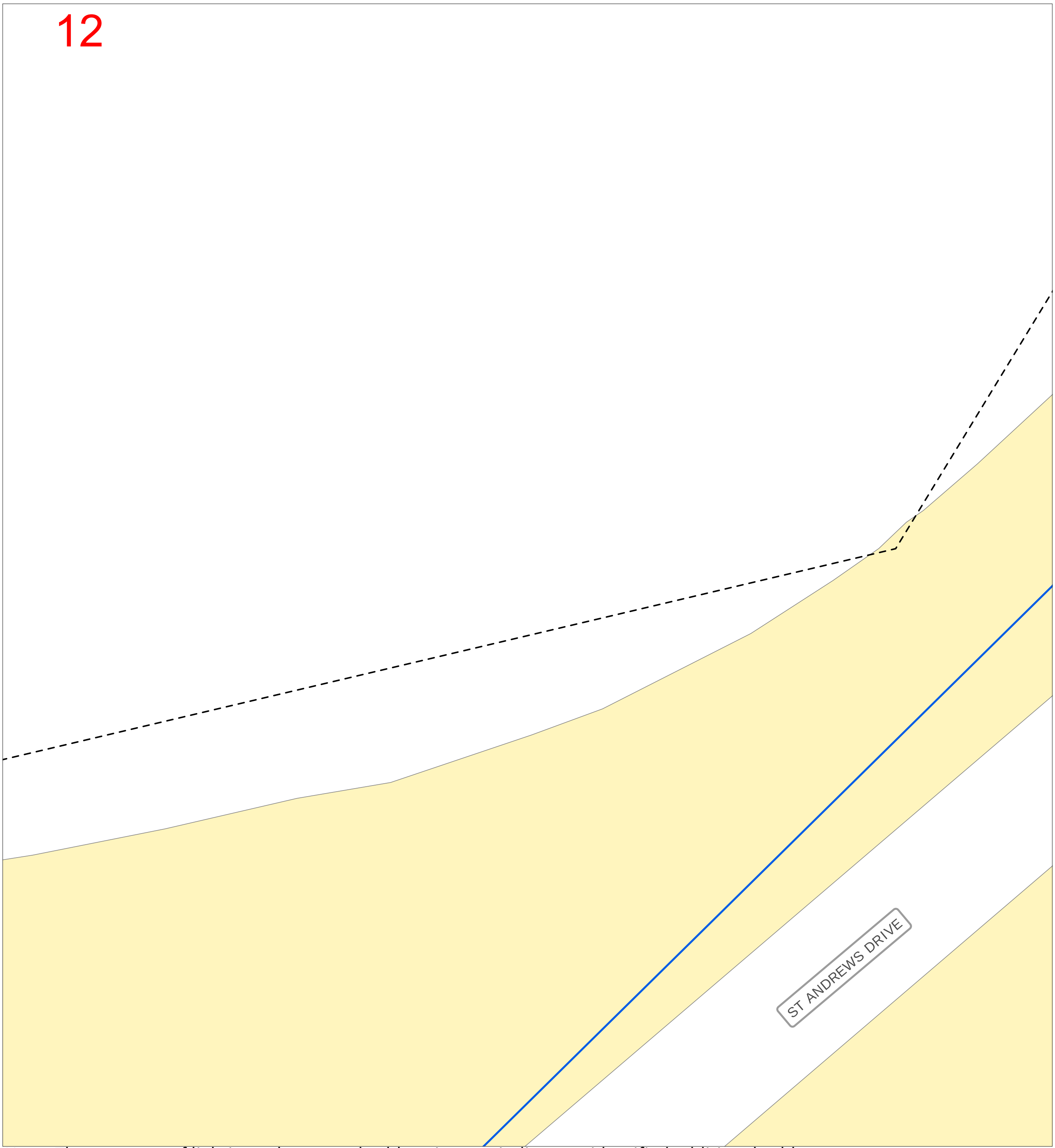
SA Power Networks

Map 12

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

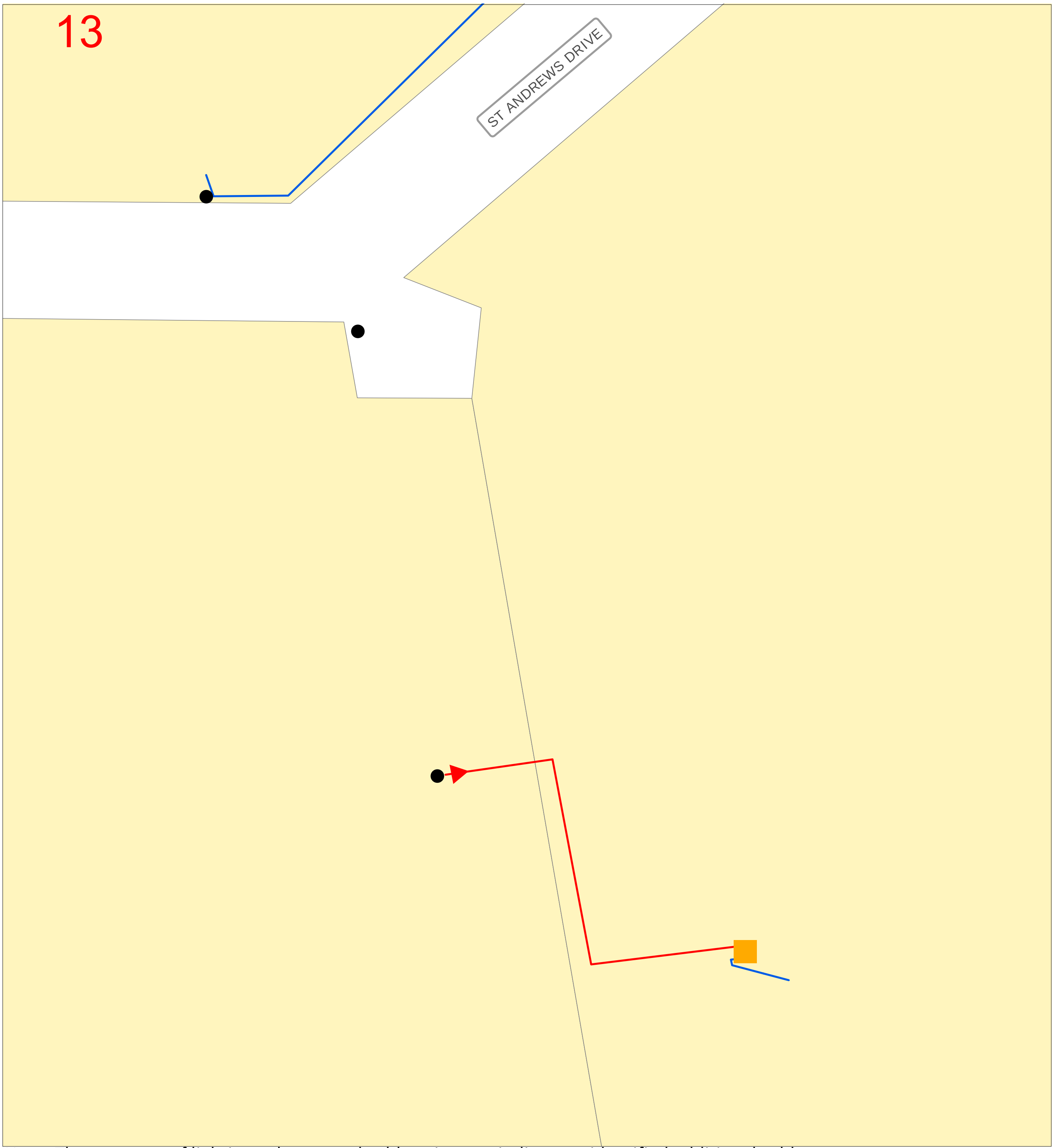
0 0.009km

Date: 29/08/2023

Map 13

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

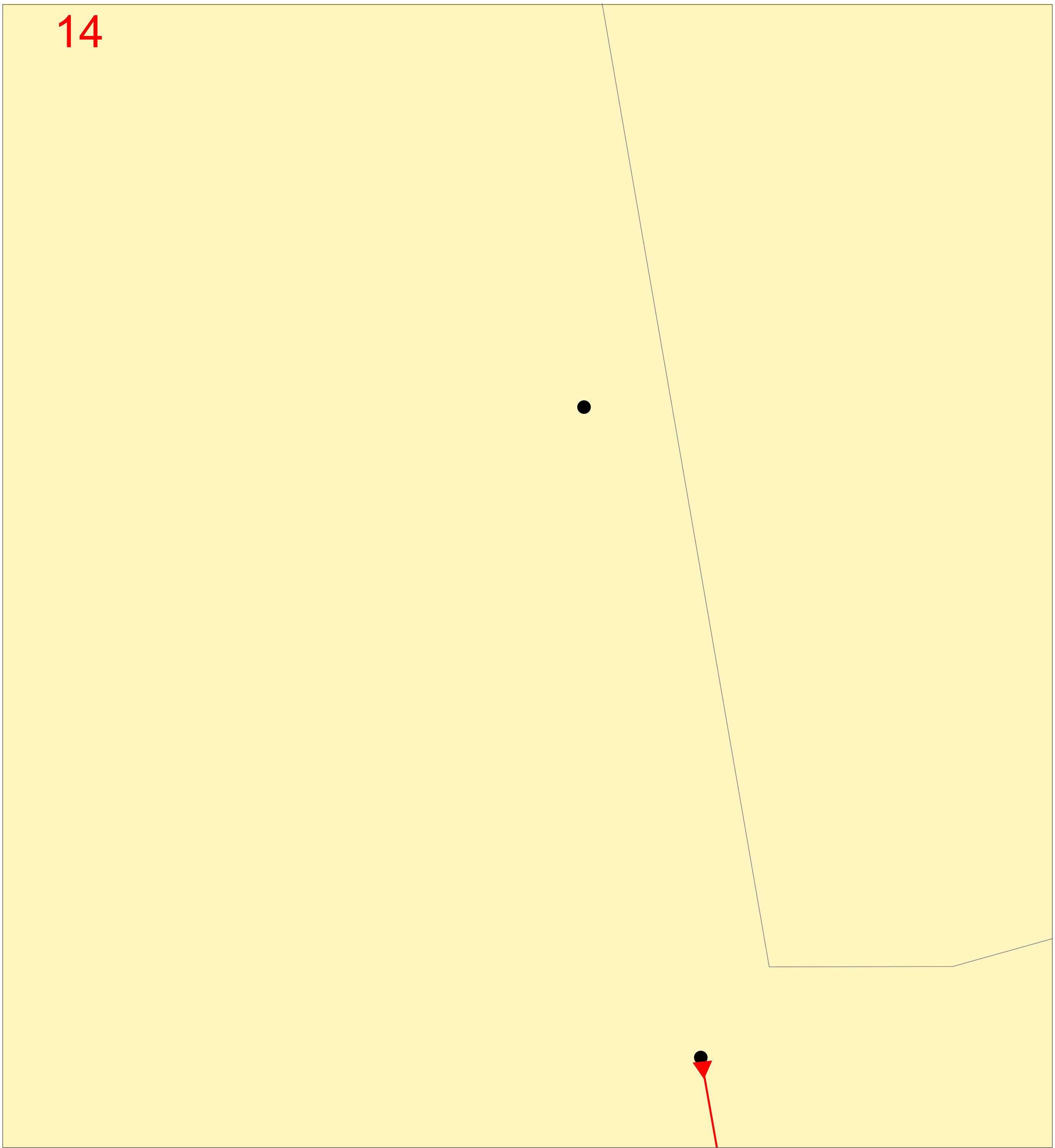
Date: 29/08/2023

SA Power Networks

Map 14

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

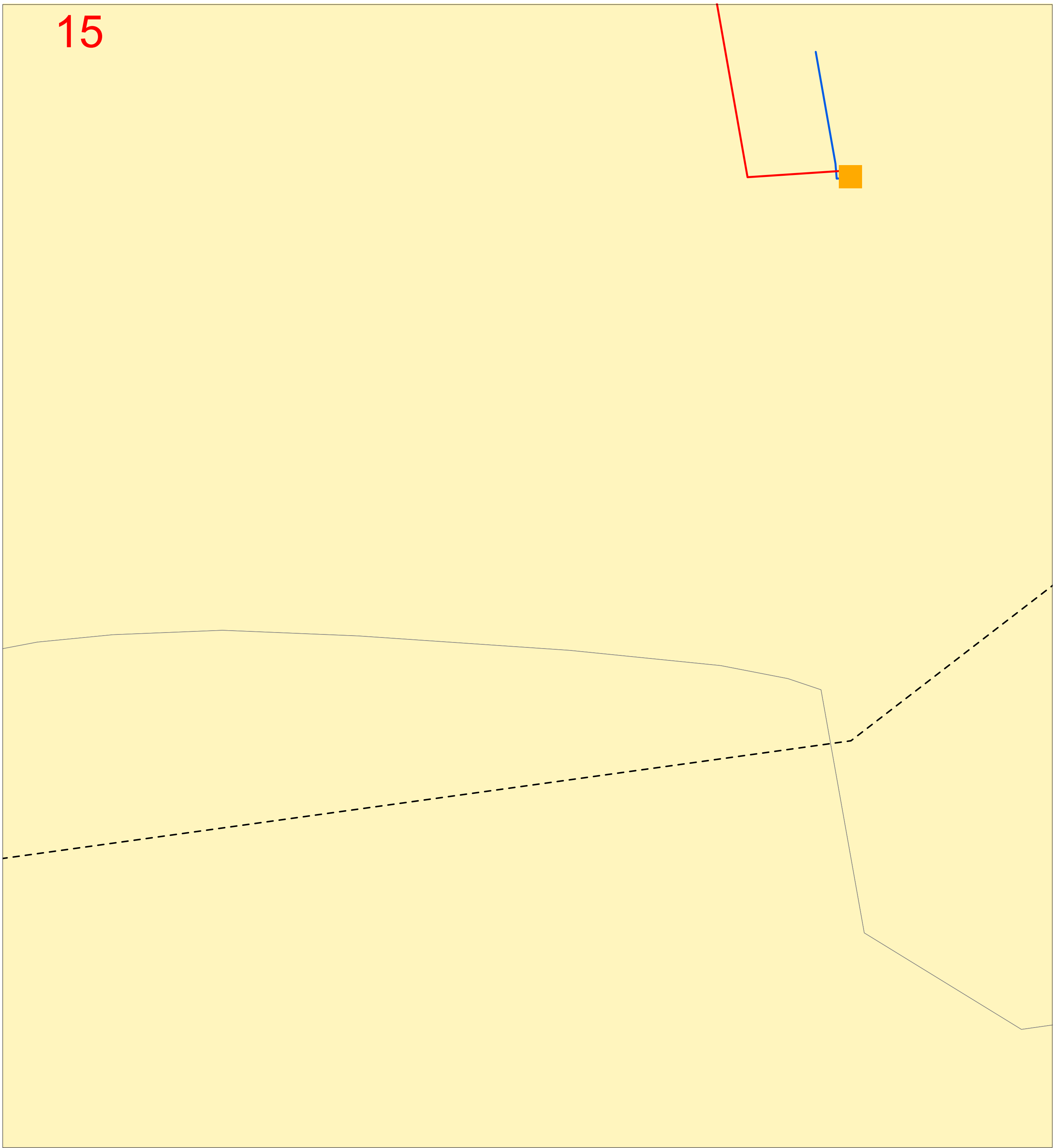
Date: 29/08/2023

SA Power Networks

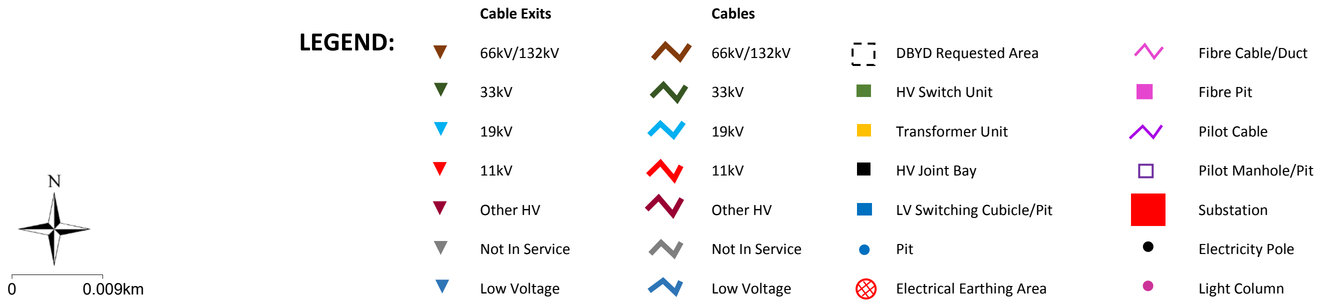
Map 15

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

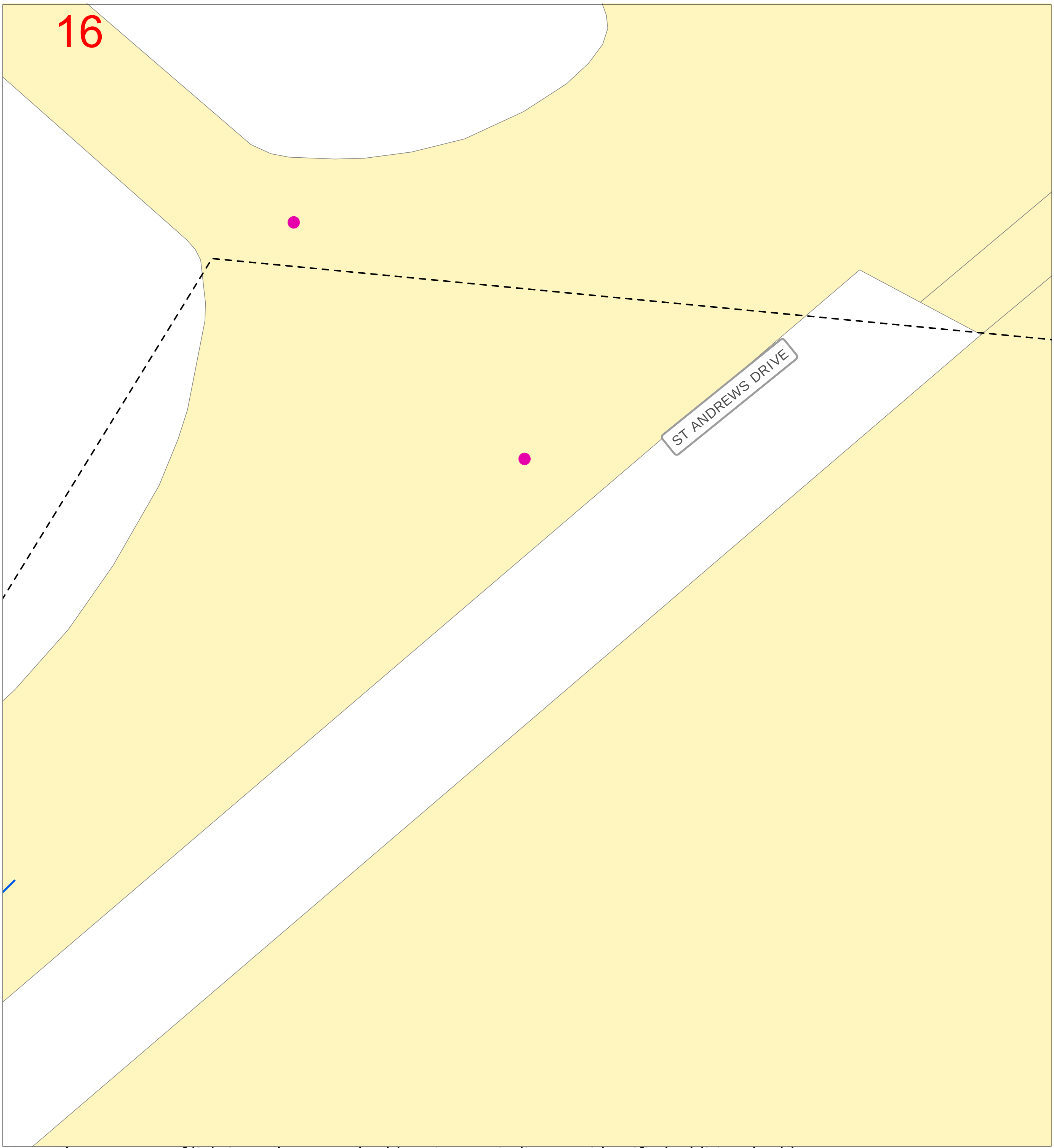


SA Power Networks

Map 16

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

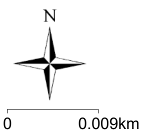
0 0.009km

Map 17

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln

Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.



LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

SA Power Networks

Map 18

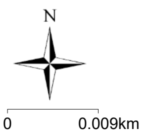
Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln

Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

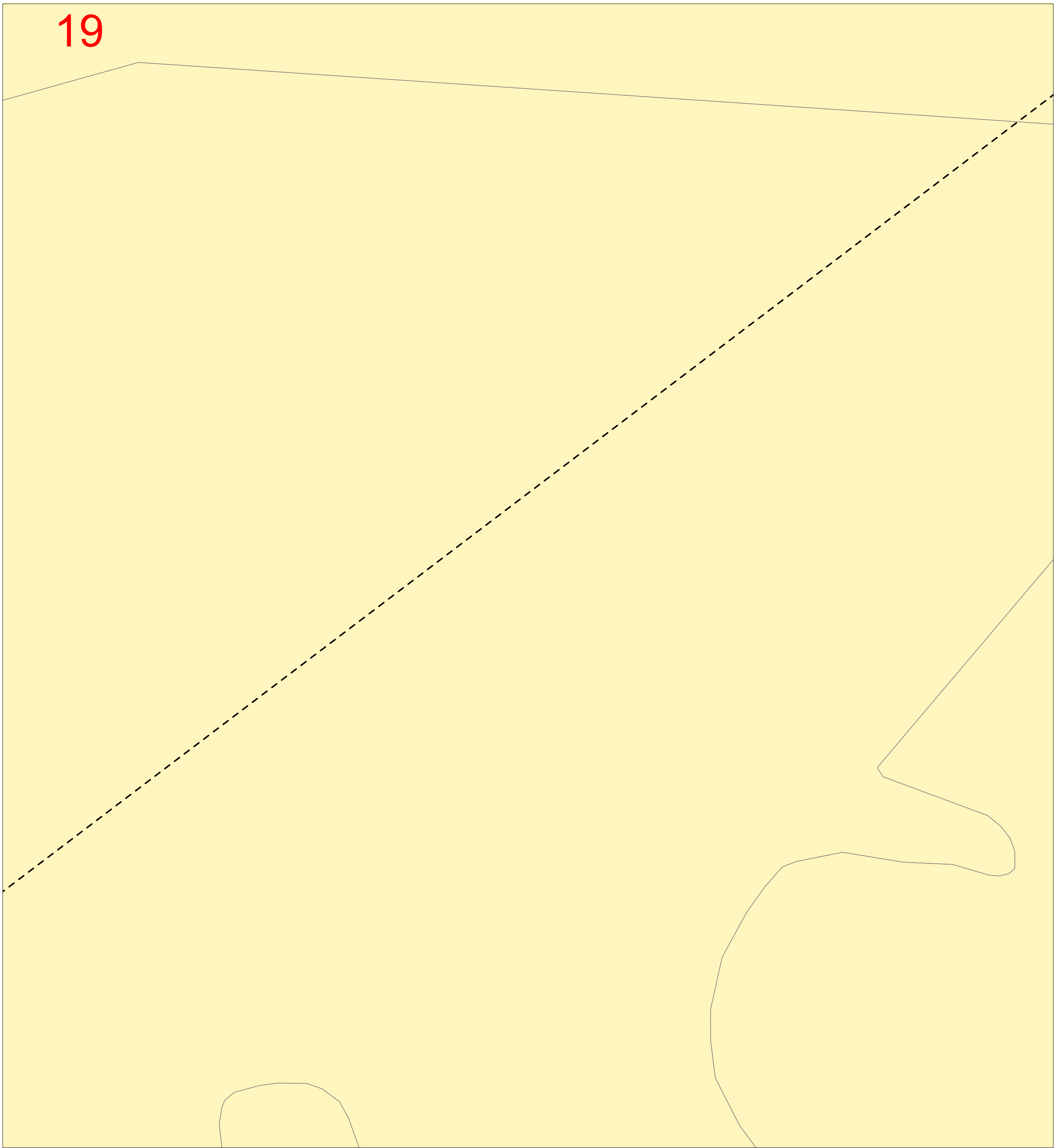


SA Power Networks

Map 19

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

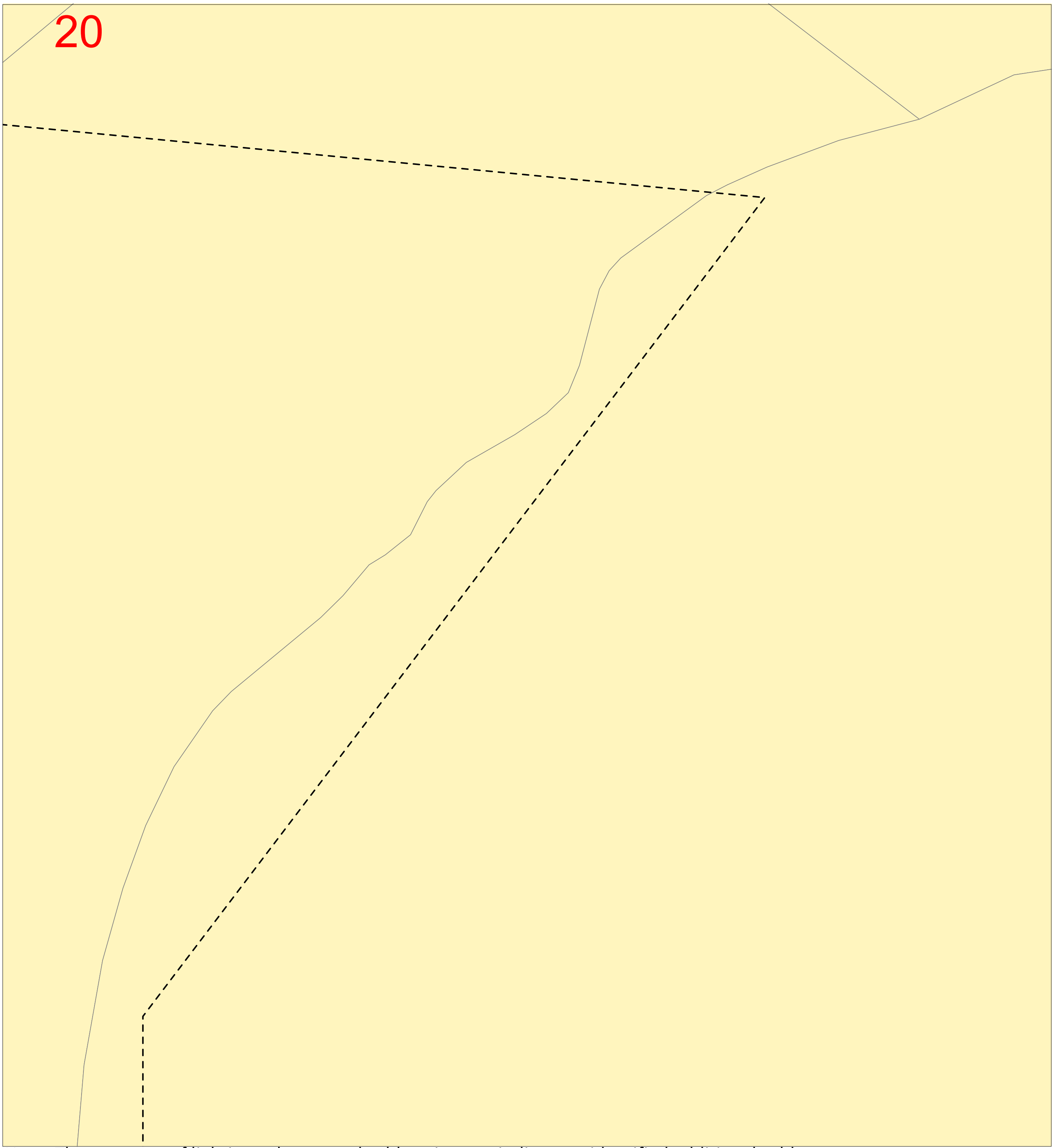
Date: 29/08/2023

SA Power Networks

Map 20

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

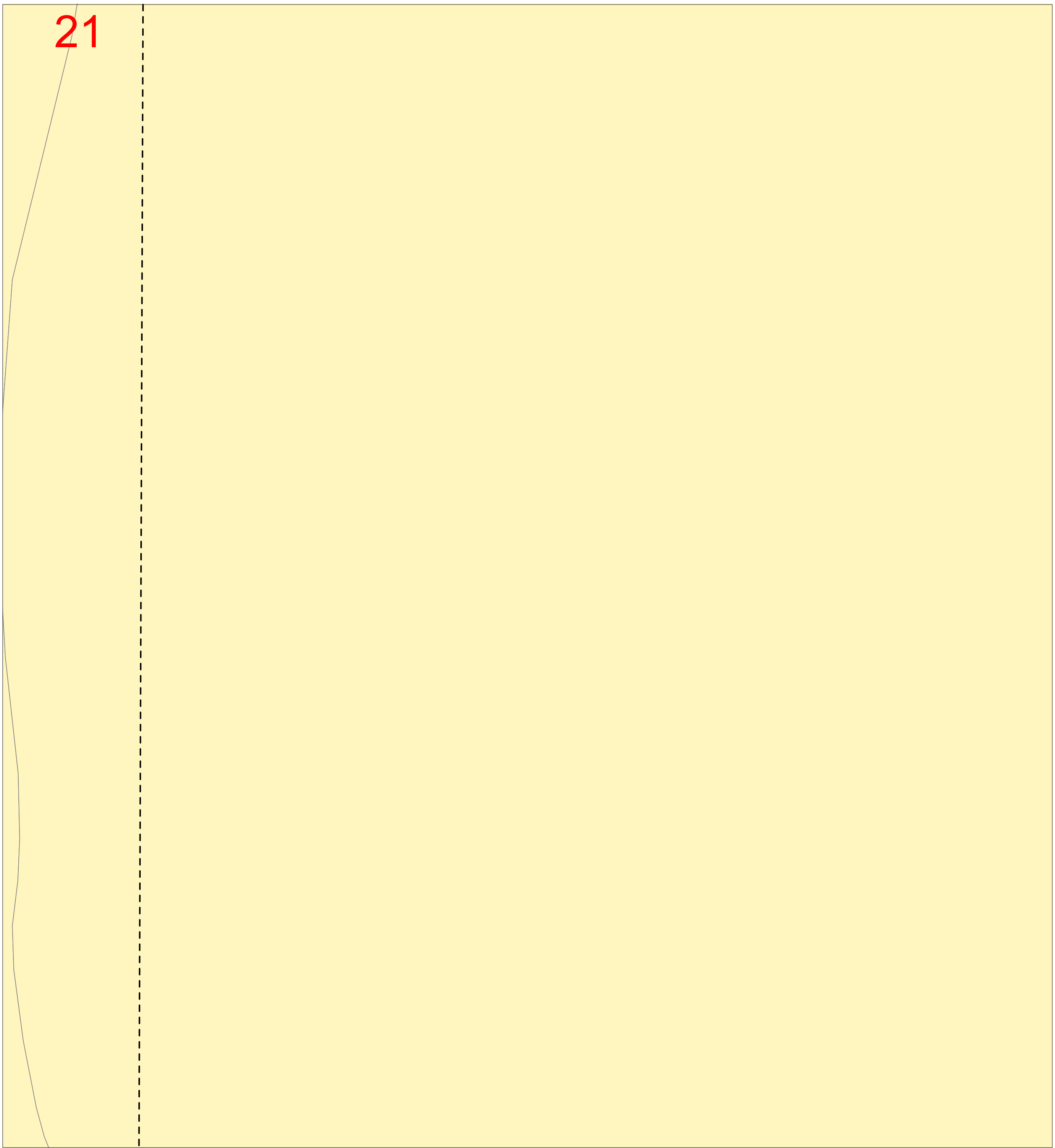
Powered by dbyd x-info

Date: 29/08/2023

Map 21

Sequence No: 228970350

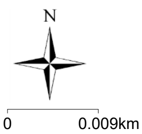
Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

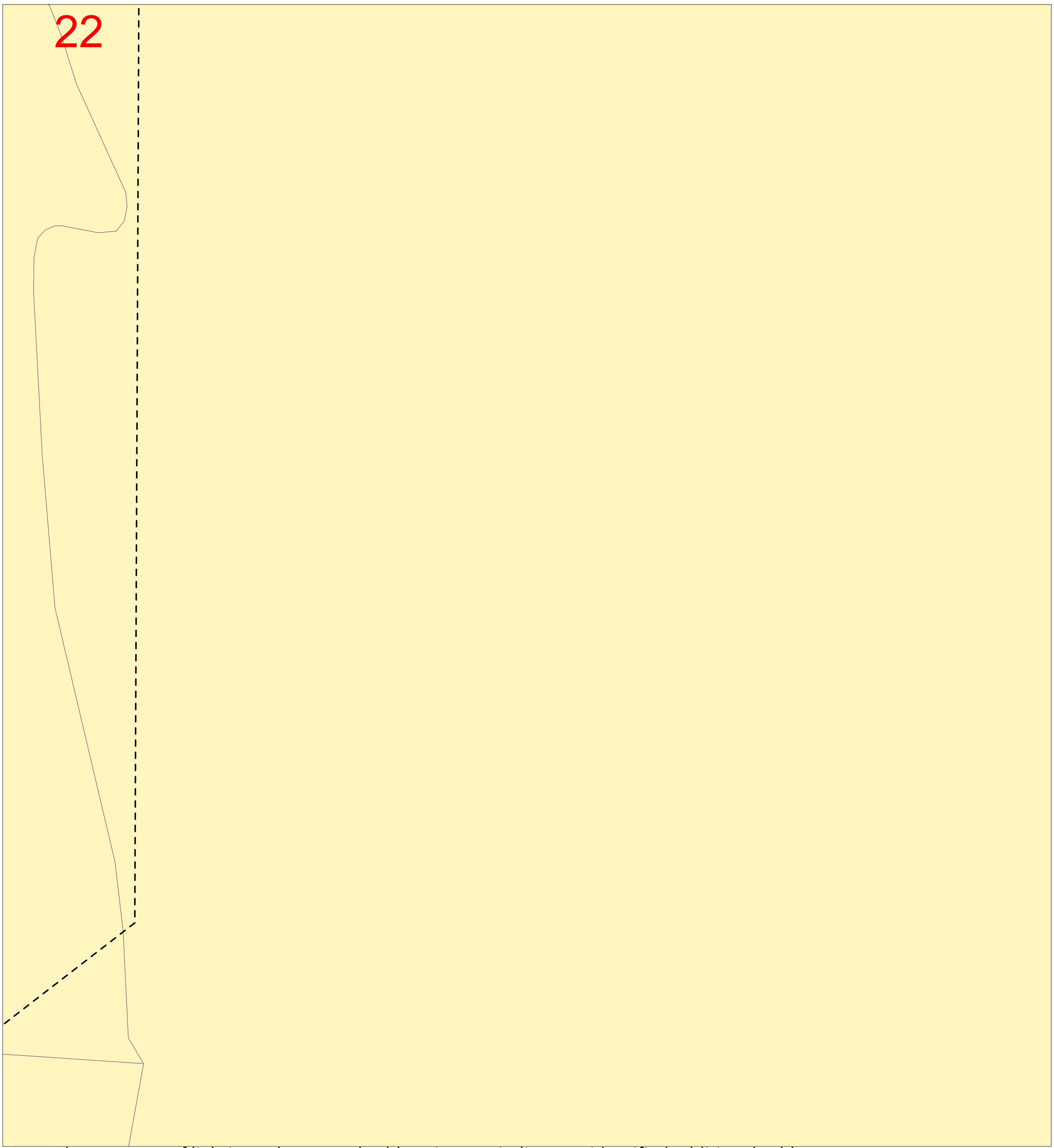


SA Power Networks

Map 22

Sequence No: 228970350

Lot 601 St Andrews Drive Port Lincoln



Note: The presence of lighting columns and cable exits may indicate unidentified additional cables.

LEGEND:

Cable Exits	Cables		
66kV/132kV	66kV/132kV	DBYD Requested Area	Fibre Cable/Duct
33kV	33kV	HV Switch Unit	Fibre Pit
19kV	19kV	Transformer Unit	Pilot Cable
11kV	11kV	HV Joint Bay	Pilot Manhole/Pit
Other HV	Other HV	LV Switching Cubicle/Pit	Substation
Not In Service	Not In Service	Pit	Electricity Pole
Low Voltage	Low Voltage	Electrical Earthing Area	Light Column

N

0 0.009km

SA Water

Notification number:	34937764
Sequence number:	228970351
Enquiry date:	29 August 2023
Enquiry location:	Lot 601 St Andrews Drive Port Lincoln SA 5606

Dear Kingsley Wong

Thank you for contacting Before You Dig **(BYDA)** before starting any work or activities which may affect the water and sewerage infrastructure of SA Water.

Our records indicate there has been SA Water infrastructure identified within your nominated search area and has been shown on the attached plan.

The requirements concerning works undertaken near SA Water infrastructure are contained in SA Water Technical Standard TS0136 (Third Party Works Near SA Water Pipework), which is available on the SA Water website.

Disclaimer

The information has been generated by an automated system based on the area highlighted. It is your responsibility to ensure that the dig site is properly defined when submitting your Before You Dig enquiry. If the information does not match the dig site or you have received this message in error, please resubmit your enquiry.

This advice and/or information is given for your private use only. The accuracy of the advice and information is not guaranteed, and no responsibility is accepted by the crown, the South Australian Water Corporation or their officers, agents or servants for any loss or damage caused by reliance upon this advice and/or information, as a result of any error, omission, incorrect description or statement therein whether caused by negligence or otherwise.

The information contained in this message may be confidential and may also be subject of legal, professional or public interest immunity. If you are not the intended recipient any use, disclosure or copying of this document is unauthorised. If you have received this message in error, please contact Dial Before You Dig.

For further enquiries or assistance with interpretation of plans and search content, or to report any obvious errors with the data provided, please contact our BYDA support team via email dialbefore.youdig@sawater.com.au

Thank you for contacting SA Water's BYDA section.

Kind regards,

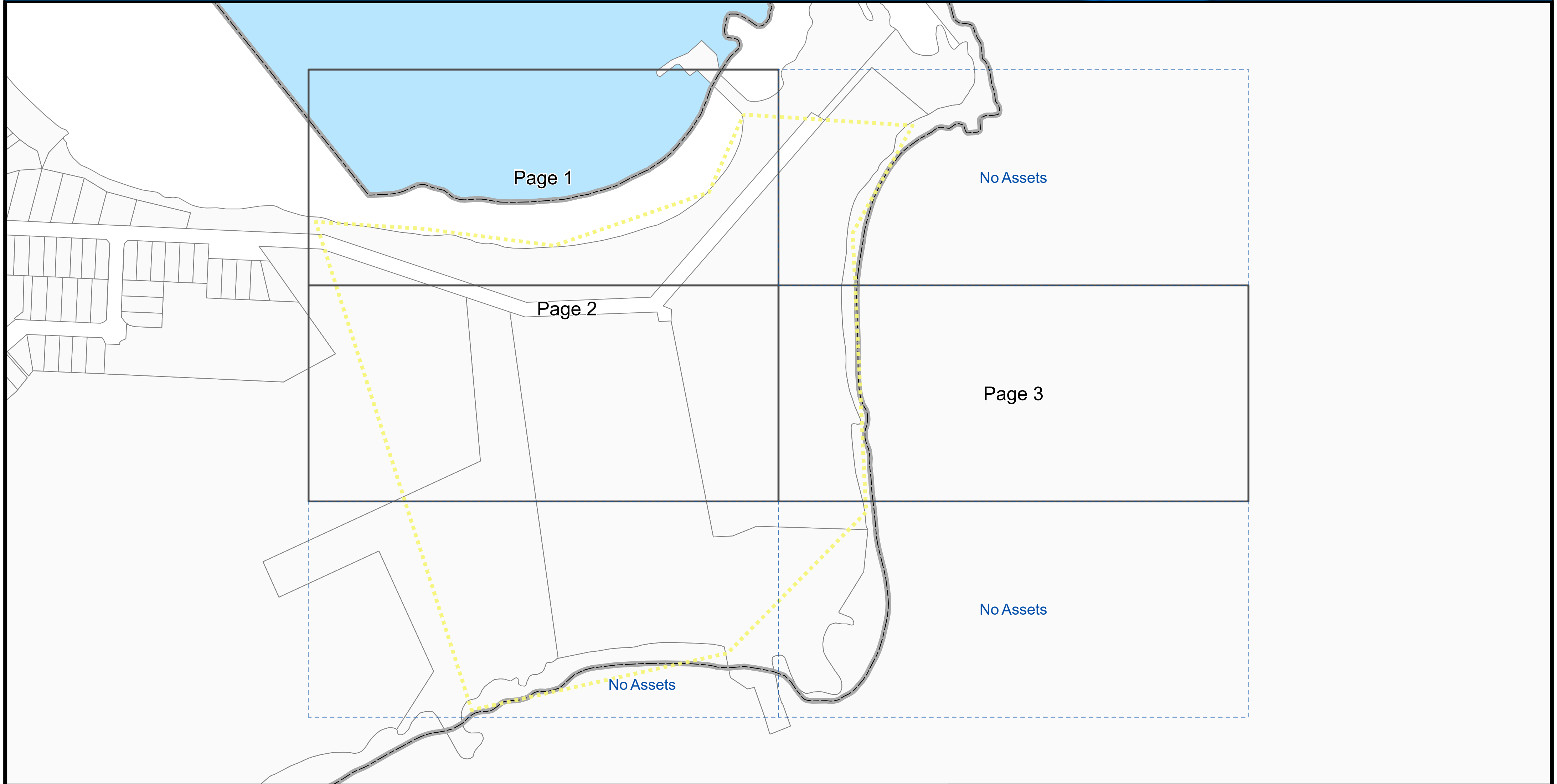
Before You Dig Support Team
SA Water BYDA

Please note: Any damage to SA Water infrastructure must be reported immediately to our Faults Team (24 hours, 7 days) on 1300 SA WATER (1300 729 283)

WASTEWATER RETICULATION

Seq # 228970351
Job # 34937764

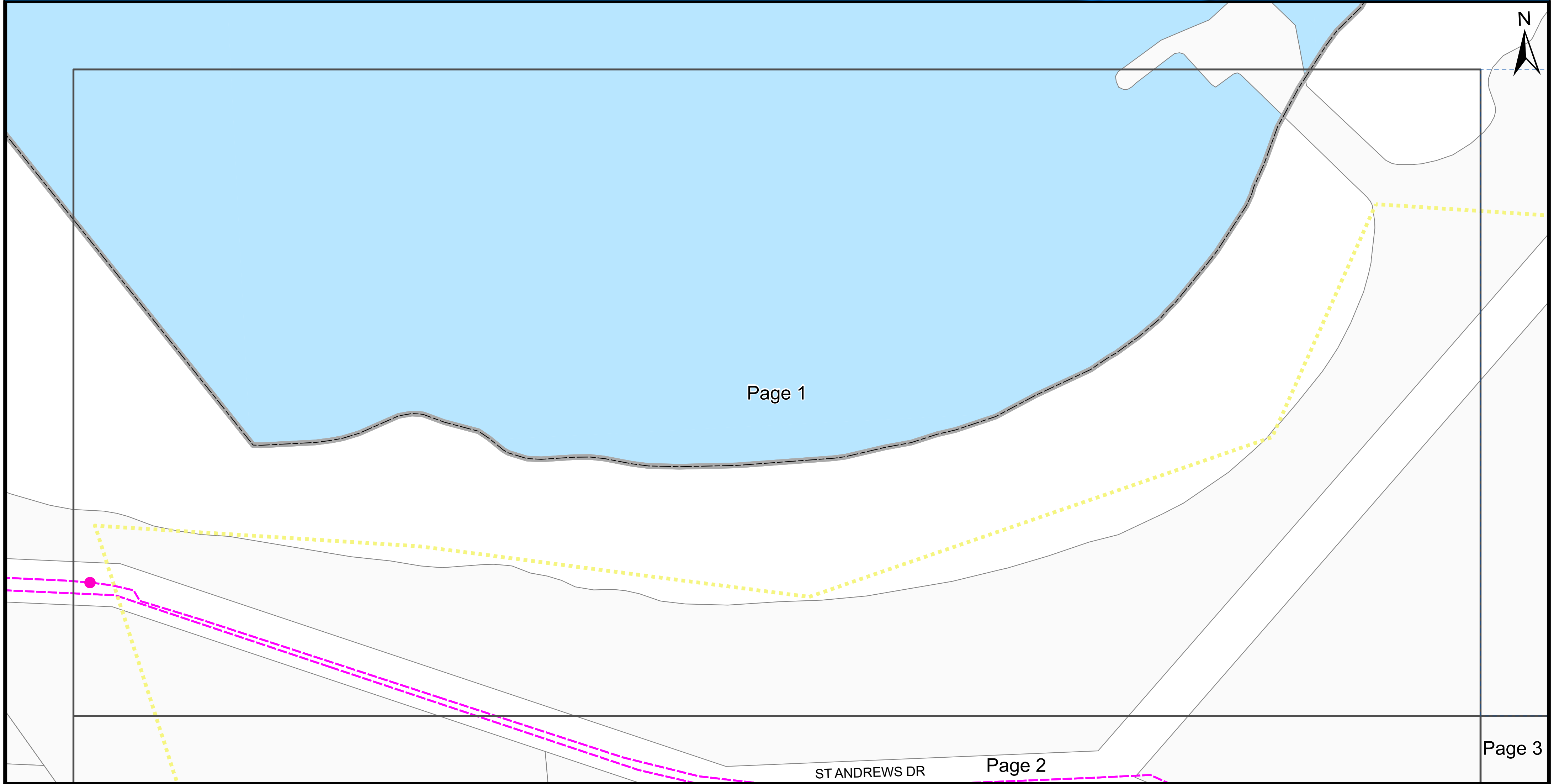
SA Water



BYDA Enquiry
Detailed map page
No dig site assets

WASTEWATER RETICULATION

Seq # 228970351
Job # 34937764



BYDA Enquiry
GIP
Valve
Inspection Opening
Maintenance Hole
Maintenance Shaft
Connections
Gravity Mains
Low Pressure
Pumping Mains
Vacuum
CP Anode Bed Outlines
CP Anode Cathode Cables
CP Facility
CP Electricity Supply Cables
TelemetryCables
Land Parcels
Suburbs and Towns

Scale @ A4: 1:2,500

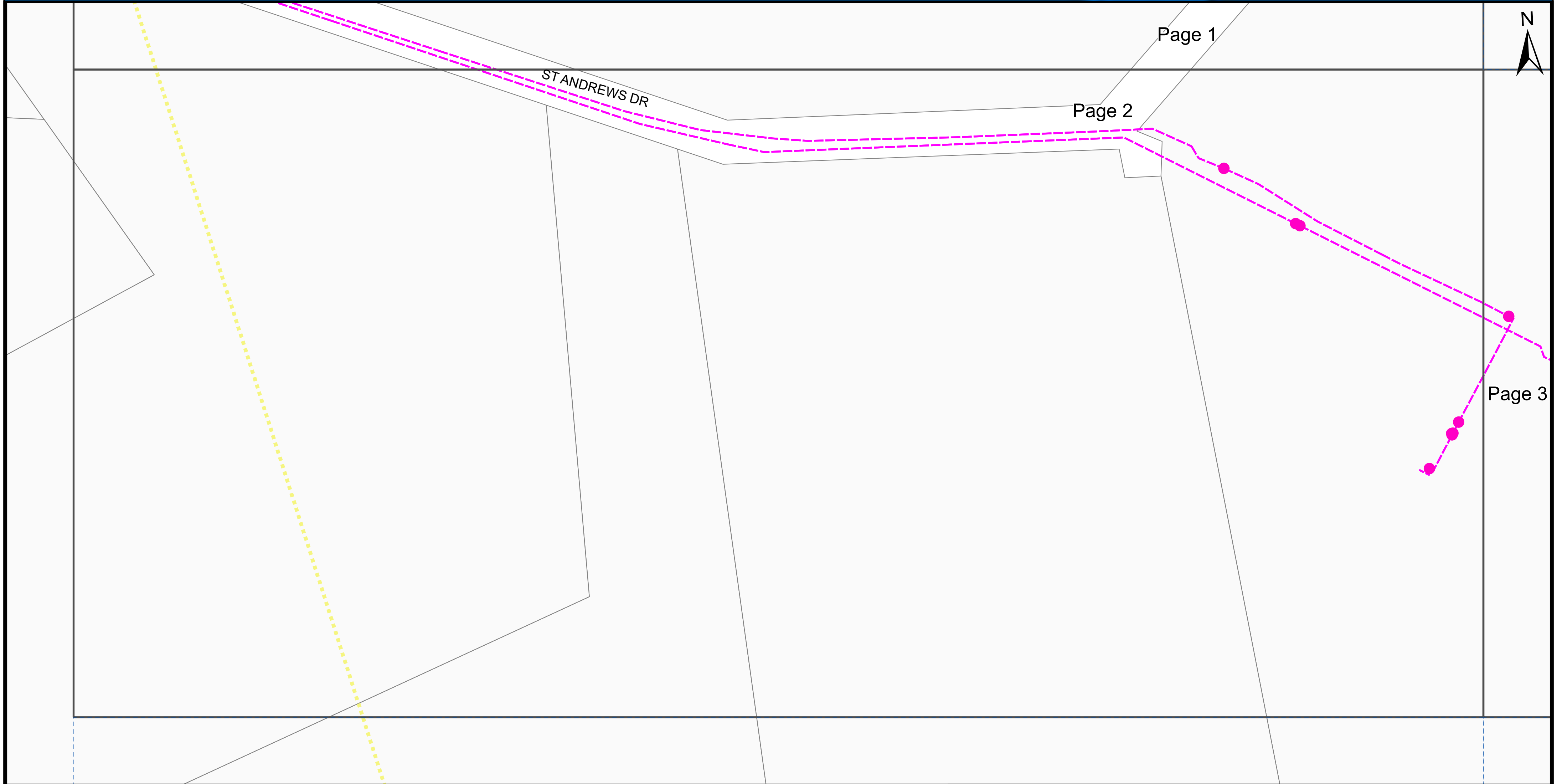
WASTEWATER RETICULATION

Seq # 228970351

Job # 34937764

BEFORE YOU DIG www.byda.com.au

SA Water



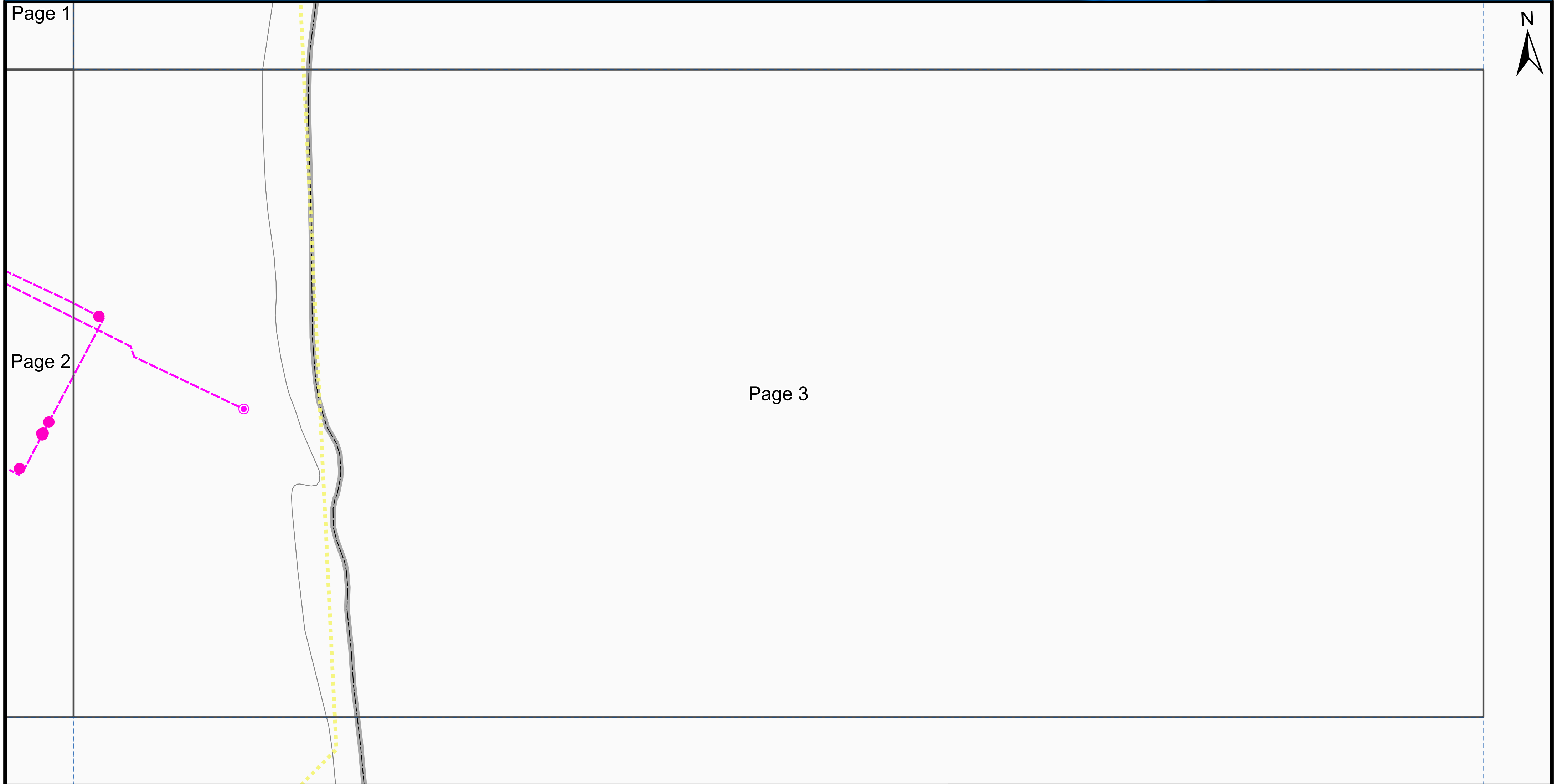
- BYDA Enquiry
- GIP
- Valve
- Inspection Opening
- Maintenance Hole
- Maintenance Shaft
- Connections
- Gravity Mains
- Low Pressure
- Pumping Mains
- Vacuum
- CP Anode Bed Outlines
- CP Anode Cathode Cables
- CP Facility
- CP Electricity Supply Cables
- TelemetryCables
- Land Parcels
- Suburbs and Towns

Scale @ A4: 1:2,500

WASTEWATER RETICULATION

Seq # 228970351

Job # 34937764



BYDA Enquiry
GIP
Valve
Inspection Opening
Maintenance Hole
Maintenance Shaft
Connections
Gravity Mains
Low Pressure
Pumping Mains
Vacuum
CP Anode Bed Outlines
CP Anode Cathode Cables
CP Facility
CP Electricity Supply Cables
TelemetryCables
Land Parcels
Suburbs and Towns

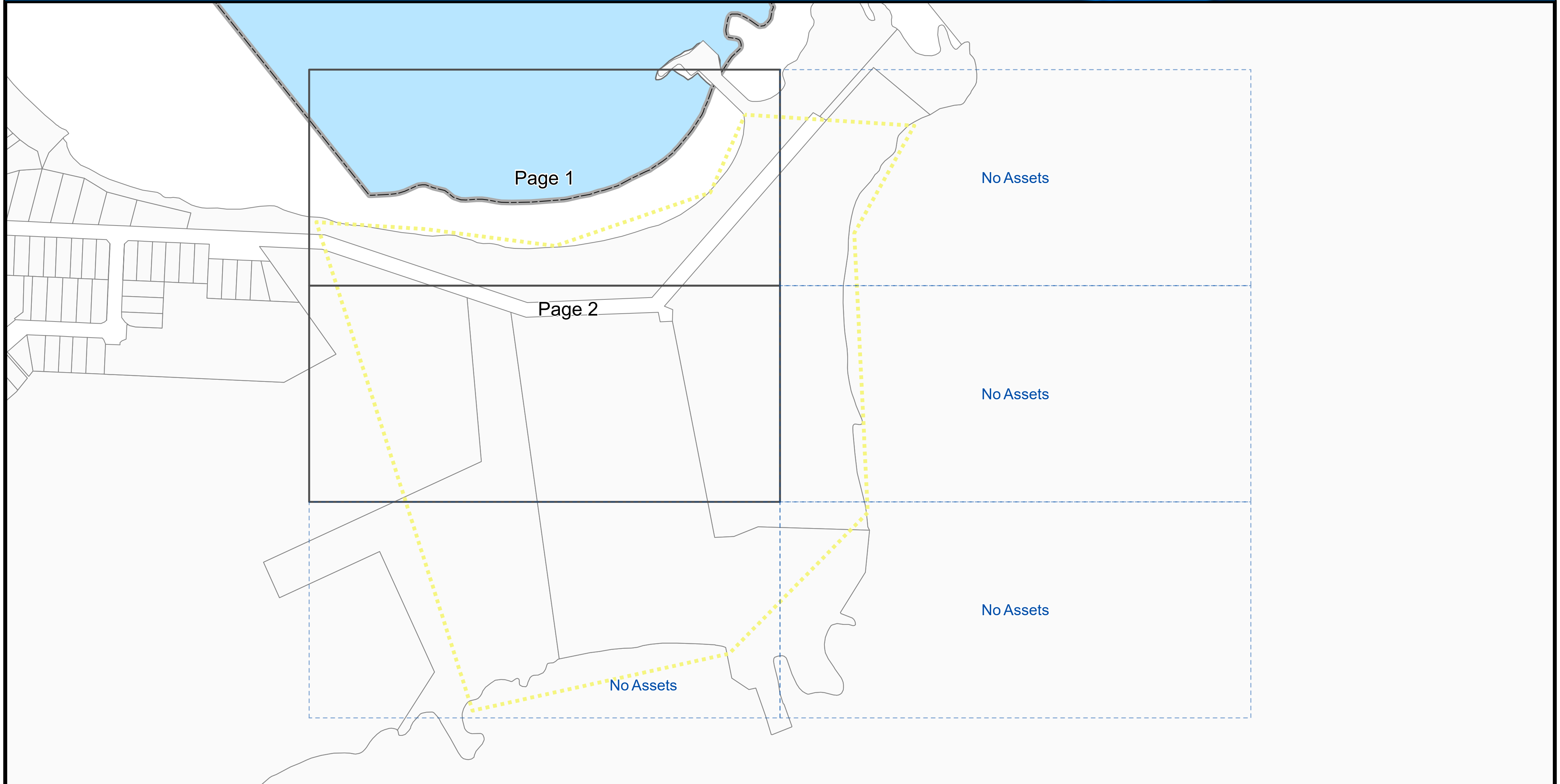
Scale @ A4: 1:2,500

WATER RETICULATION

Seq # 228970351
Job # 34937764

BEFORE YOU DIG www.byda.com.au

SA Water

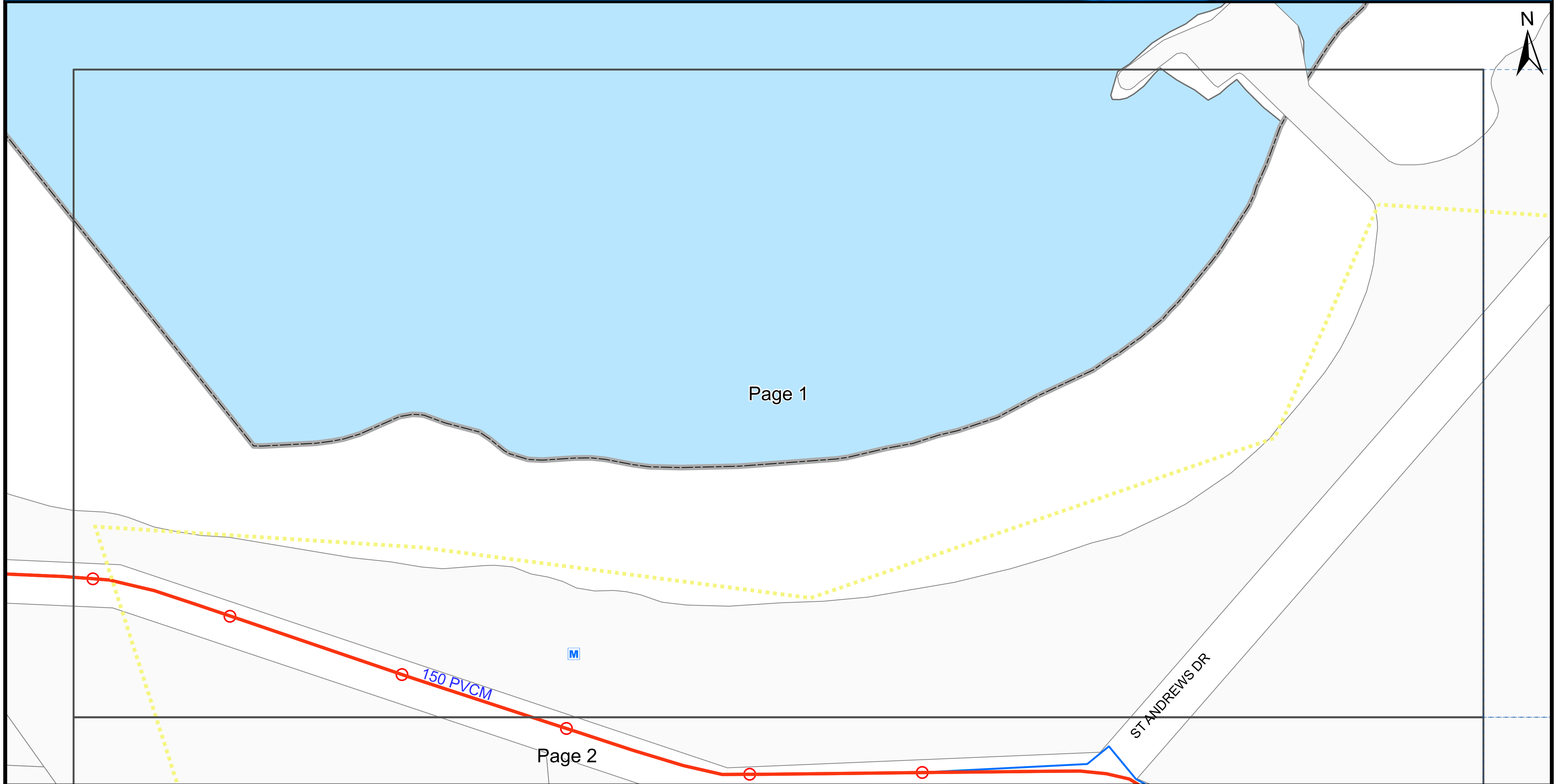


BYDA Enquiry
Detailed map page
No dig site assets

WATER RETICULATION

Seq # 228970351
Job # 34937764

SA Water



BYDA Enquiry	Water Main (Decommissioned)	Water Hydrant	CP Anode Cathode Cables	Shifted Water Meter*
Water Valves	Decommissioned Asbestos Mains	CP Facility	CP Anode Bed Outlines	Water Meter
Water Main	Water Pillar Hydrant	CP Electricity Supply Cables	Land Parcels	Suburbs and Towns

Scale @ A4: 1:2,500

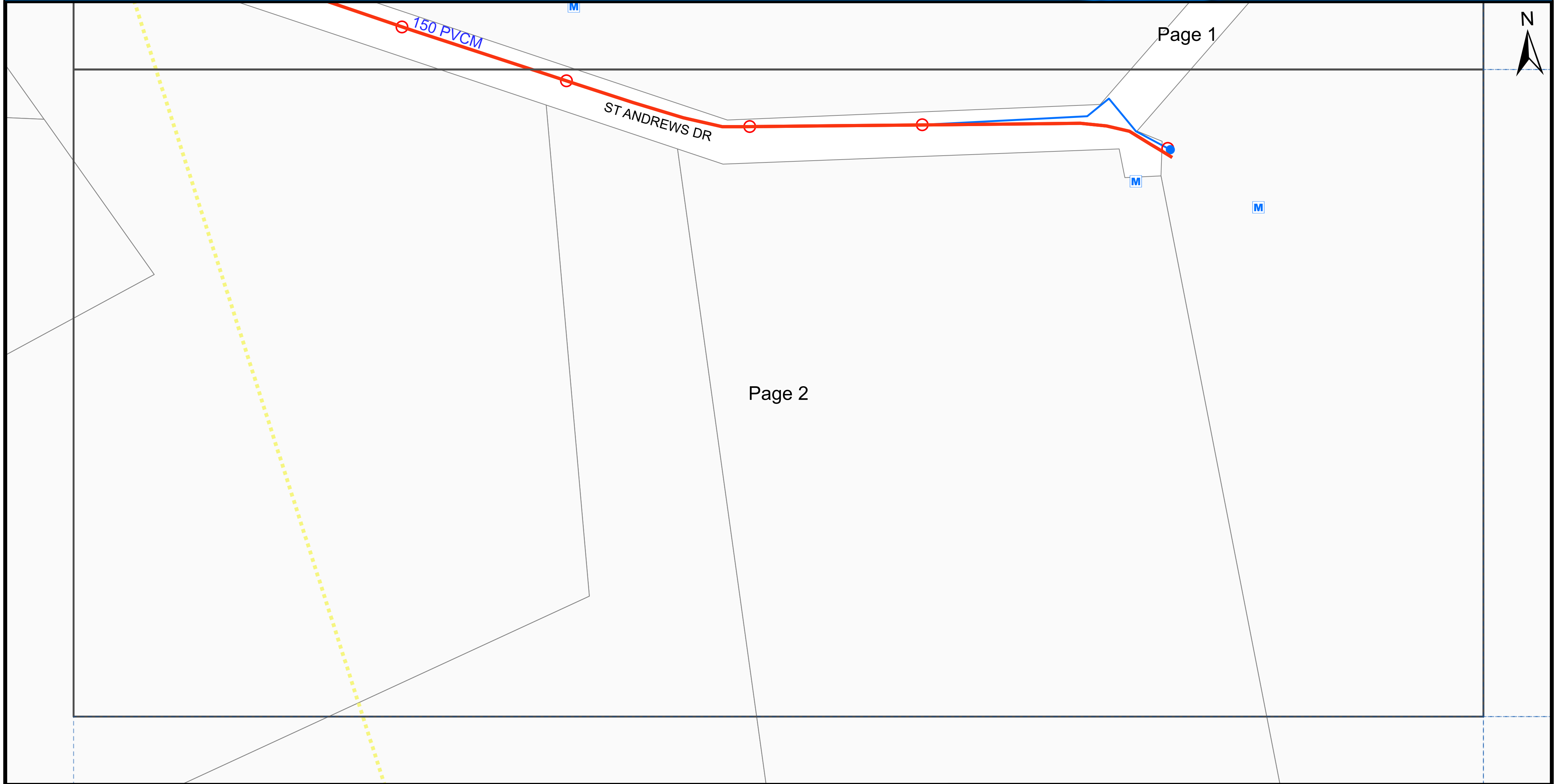
Connection between water meter and pipe not shown

WATER RETICULATION

Seq # 228970351

Job # 34937764

SA Water



BYDA Enquiry
Water Valves
Water Main
Water Main (Decommissioned)
Decommissioned Asbestos Mains
Water Pillar Hydrant
Water Hydrant
CP Facility
CP Electricity Supply Cables
CP Anode Cathode Cables
CP Anode Bed Outlines
Land Parcels
Shifted Water Meter*
Water Meter
Suburbs and Towns

Scale @ A4: 1:2,500

Connection between water meter and pipe not shown

Plans Generated [8/29/2023 2:18 PM] by SmarterWX™ Automate (valid for 30 days)

To:	Kingsley Wong
Phone:	Not Supplied
Fax:	Not Supplied
Email:	kingsley.wong@wsp.com

Dial before you dig Job #:	34781494	DIAL BEFORE YOU DIG www.1100.com.au
Sequence #	228039750	
Issue Date:	07/08/2023	
Location:	Lot 900 St Andrews Drive , Port Lincoln , SA , 5606	

Information

The area of interest requested by you contains one or more assets.

nbn™ Assets	Search Results
Communications	Asset identified
Electricity	No assets

In this notice **nbn™ Facilities** means *underground fibre optic, telecommunications and/or power facilities, including but not limited to cables, owned and controlled by **nbn™***

Location of **nbn™** Underground Assets

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn's** records indicate that there **ARE** **nbn™** Facilities in the vicinity of the location identified above ("Location").
- **nbn** indicative plan/s are attached with this notice ("Indicative Plans").
- The Indicative Plan/s show general depth and alignment information only and are not an exact, scale or accurate depiction of the location, depth and alignment of **nbn™** Facilities shown on the Plan/s.
- In particular, the fact that the Indicative Plans show that a facility is installed in a straight line, or at uniform depth along its length cannot be relied upon as evidence that the facility is, in fact, installed in a straight line or at uniform depth.
- You should read the Indicative Plans in conjunction with this notice and in particular, the notes below.
- You should note that, at the present time, the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables. As such, consistent with the notes below, particular care must be taken by you to make your own enquiries and investigations to precisely locate any power cables and manage the risk arising from such cables accordingly.
- The information contained in the Indicative Plan/s is valid for 28 days from the date of issue set out above.You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators, e.g DBYD Certified Locators, at your cost to locate **nbn™**

Facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Dial Before You Dig Service. For any enquiries related to moving assets or Planning and Design activities, please visit the **nbn** Commercial Works website to complete the online application form. If you are planning to excavate and require further information, please email dbyd@nbnco.com.au or call 1800 626 329.

Notes:

1. You are now aware that there are **nbn™** Facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (CoA) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
3. Any information provided is valid only for **28 days** from the date of issue set out above.

Referral Conditions

The following are conditions on which **nbn** provides you with the Indicative Plans. By accepting the plans,you are agreeing to these conditions. These conditions are in addition, and not in replacement of, any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators, e.g DBYD Certified Locators, at your cost to locate **nbn™** Facilities during any activities you carry out on site).
2. You acknowledge that **nbn** has specifically notified you above that the Indicative Plans are likely to be more accurate in showing location of fibre optics and telecommunications cables than power cables. There may be a variation between the line depicted on the Indicative Plans and the location of any power cables.
3. You should not assume that **nbn™** Facilities follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
4. In carrying out any works in the vicinity of **nbn™** Facilities, you must maintain the following minimum clearances:
   - 300mm when laying assets inline, horizontally or vertically.
   - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates.
   - 1000mm when operating mechanical excavators.
   - Adherence to clearances as directed by other asset owner's instructions and take into account any uncertainty for power cables.
5. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn™** fibre optic,copper and coaxial cables,and power cable feed to **nbn™** assets).Damage to underground electric cables may result in:
   - Injury from electric shock or severe burns, with the possibility of death.
   - Interruption of the electricity supply to wide areas of the city.
   - Damage to your excavating plant.
   - Responsibility for the cost of repairs.
6. You must take all reasonable precautions to avoid damaging **nbn™** Facilities. These precautions may include but not limited to the following:
   - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likelihood of damage to the cable, for example: the blades of hand equipment should be aligned parallel to the line of the cable rather than digging across the cable.
   - If any undisclosed underground cables are located, notify **nbn** immediately.

- All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
- The safety of the public and other workers must be ensured.
- All excavations must be undertaken in accordance with all relevant legislation and regulations.

7. You will be responsible for all damage to **nbn™** Facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include, without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
8. You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.
9. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any plans(including Indicative Plans) attached hereto. Except as expressly provided to the contrary in this information sheet or the attached plans(including Indicative Plans), all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

State/Territory	Documents
National	Work Health and Safety Act 2011
	Work Health and Safety Regulations 2011
	Safe Work Australia - Working in the Vicinity of Overhead and Underground Electric Lines (Draft)
	Occupational Health and Safety Act 1991
NSW	Electricity Supply Act 1995
	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
VIC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
QLD	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
SA	Electricity Act 1996
TAS	Tasmanian Electricity Supply Industry Act 1995
WA	Electricity Act 1945
	Electricity Regulations 1947
NT	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
ACT	Electricity Act 1971

Thank You,

nbn DBYD

Date: 07/08/2023

To: Kingsley Wong
Phone: Not Supplied
Fax: Not Supplied
Email: kingsley.wong@wsp.com

Dial before you dig Job #:	34781494
Sequence #	228039750
Issue Date:	07/08/2023
Location:	Lot 900 St Andrews Drive , Port Lincoln , SA , 5606

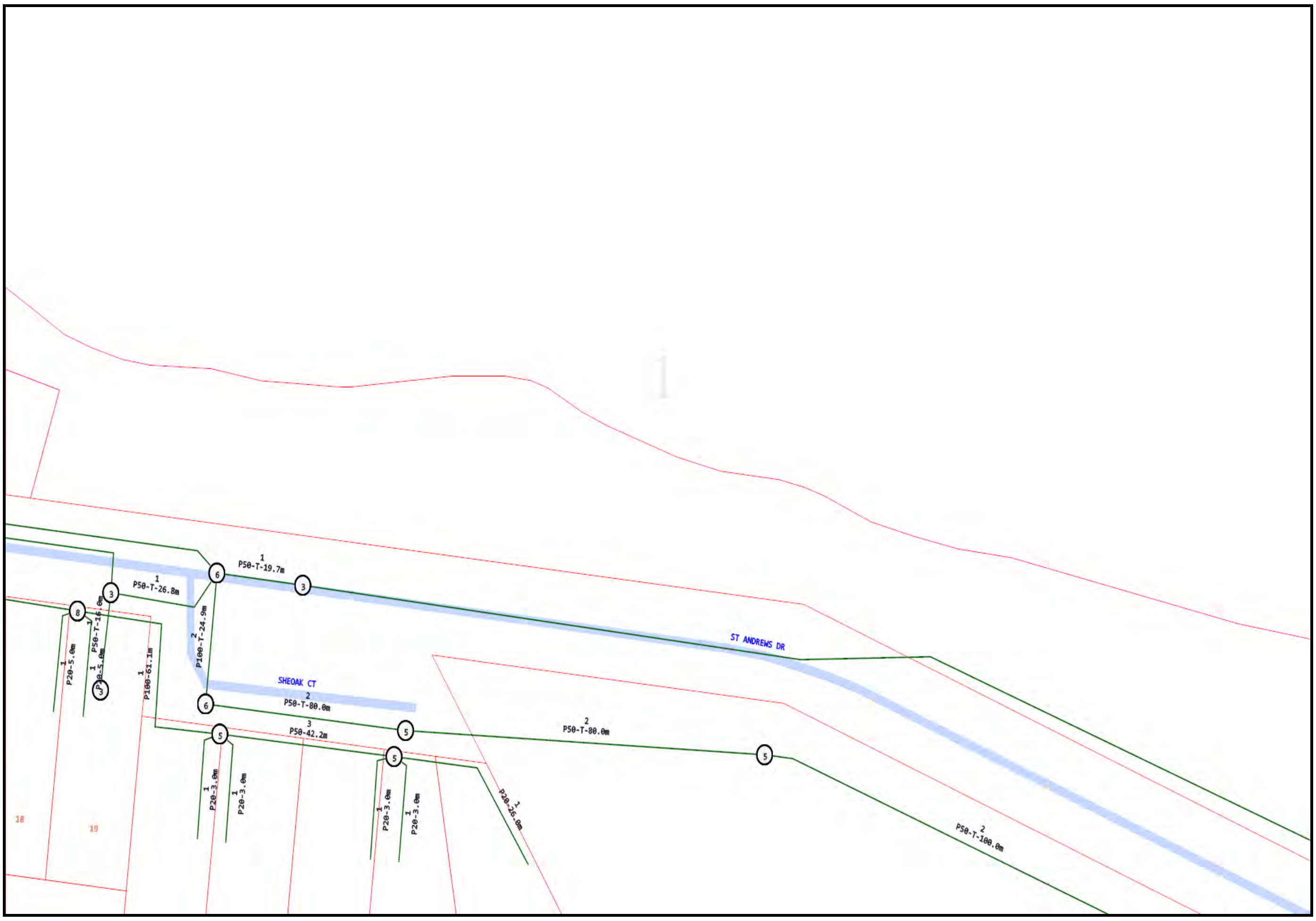
Indicative Plans

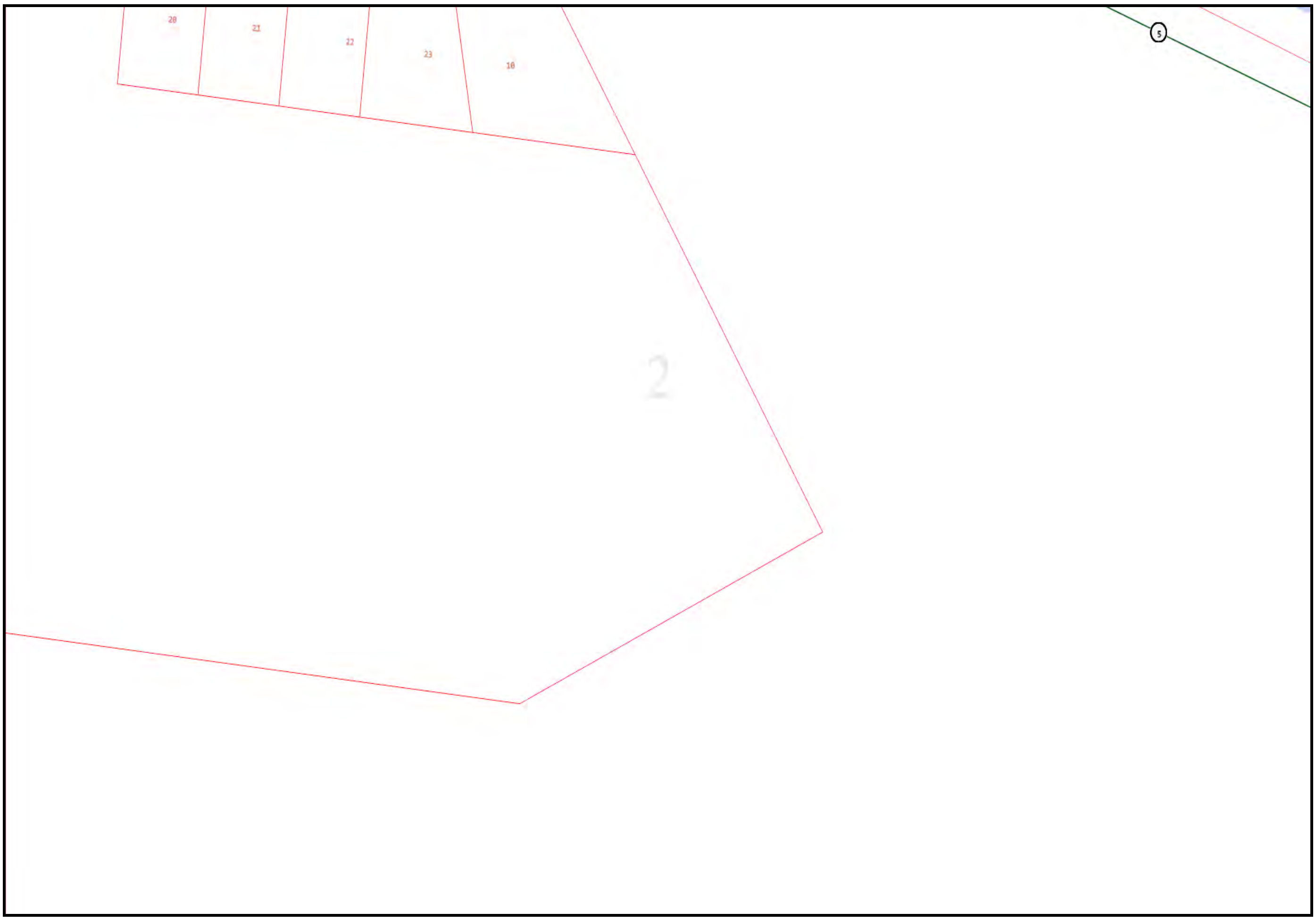
1	4
2	5
3	6

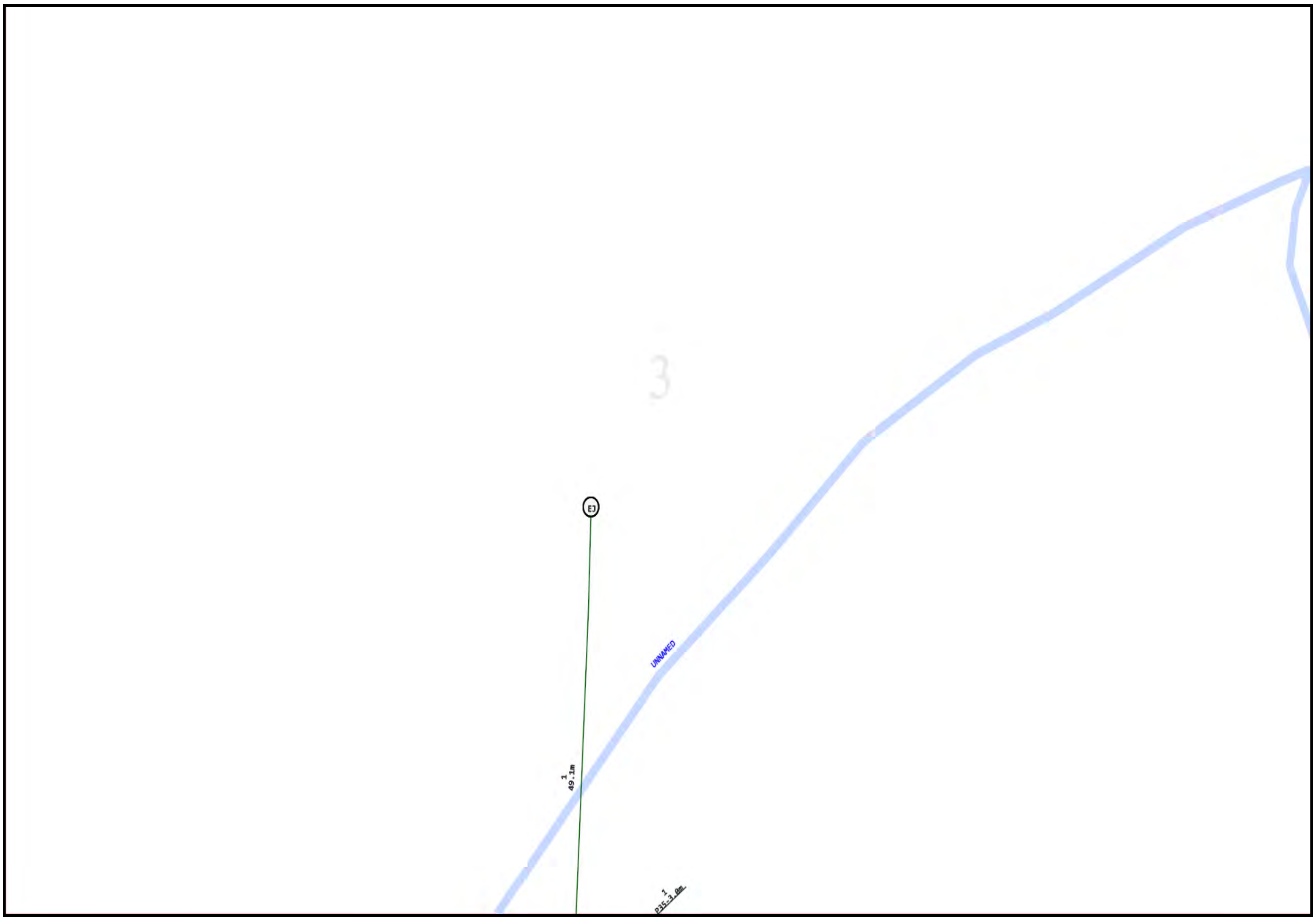
nbn™

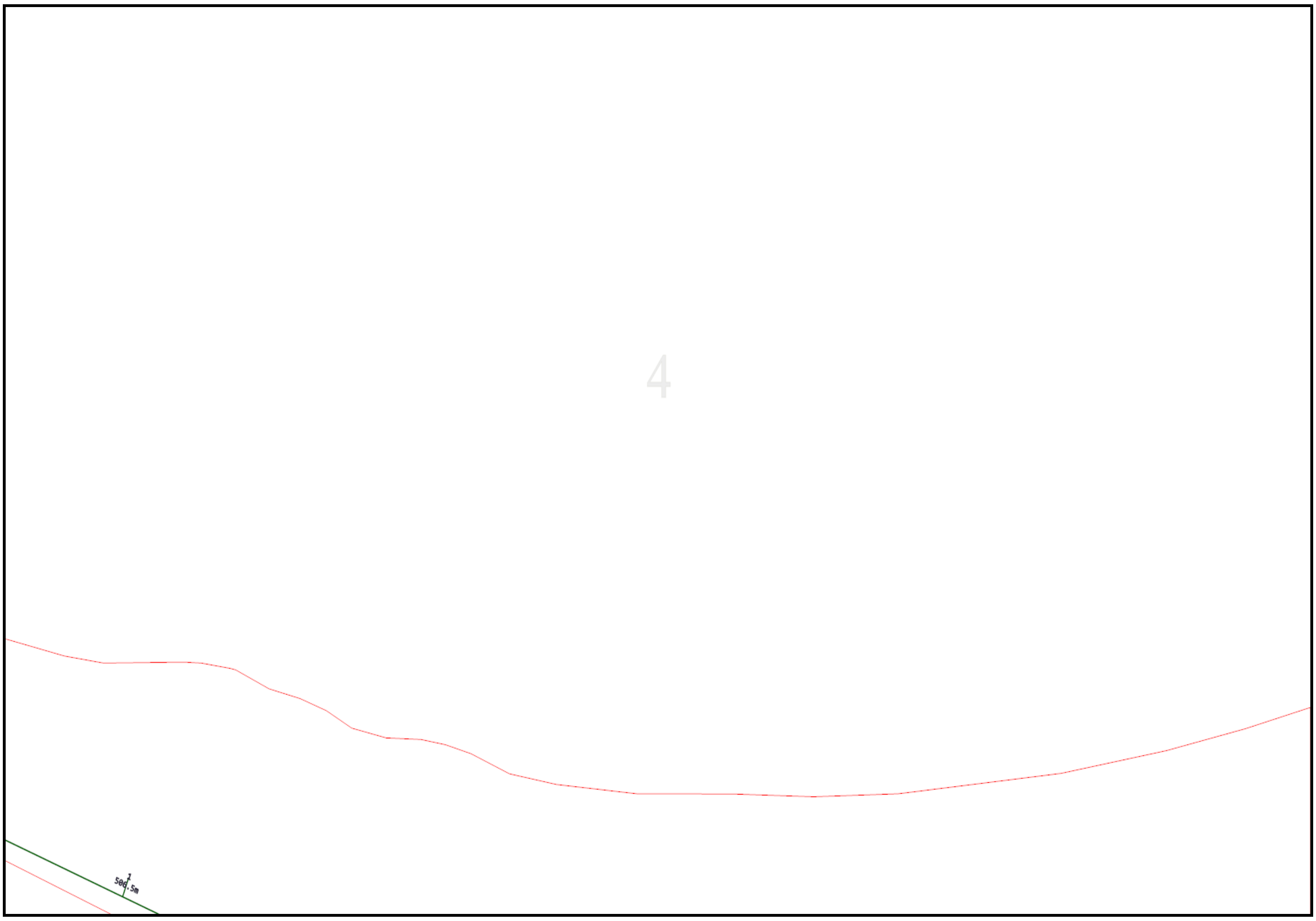
LEGEND

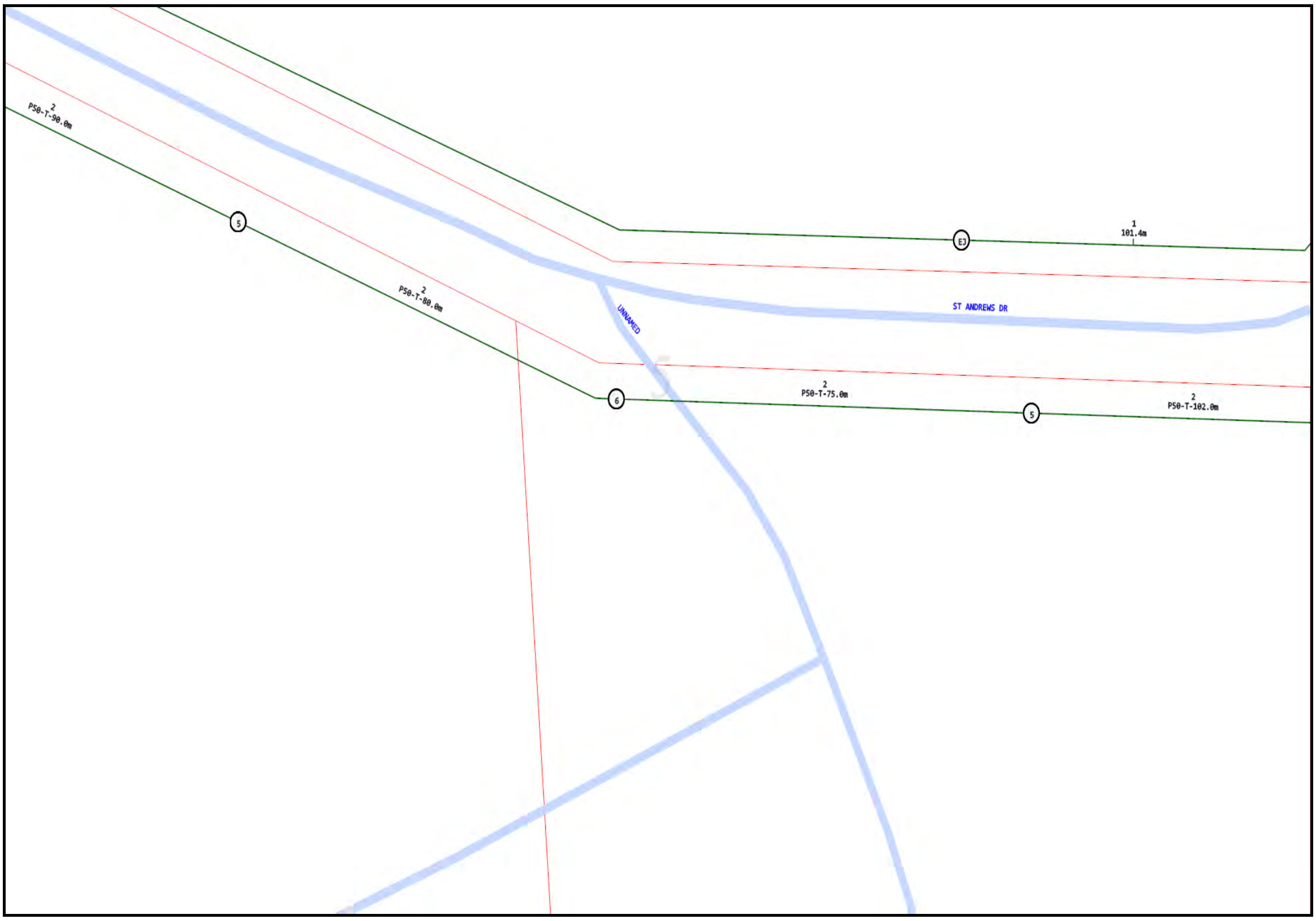
	Parcel and the location
5	Pit with size "5"
2E	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m 5 — 9	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m 5 — 9	2 Direct buried cables between pits of sizes ,"5" and "9" are 10.0m apart.
5 — 9	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
5 — 9	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
5 — 9	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
BROADWAY ST	Road and the street name "Broadway ST"
Scale	0 20 40 60 Meters 1:2000 1 cm equals 20 m


ST ANDREWS DR
SHEOAK CT
1 P50-T-19.7m
1 P50-T-26.8m
1 P50-T-16.0m
2 P100-T-24.9m
1 P20-5.0m
1 P100-61.1m
2 P50-T-80.0m
3 P50-42.2m
2 P50-T-80.0m
2 P50-T-100.0m
1 P20-3.0m
1 P20-3.0m
1 P20-3.0m
1 P20-3.0m
1 P20-26.0m
18
19

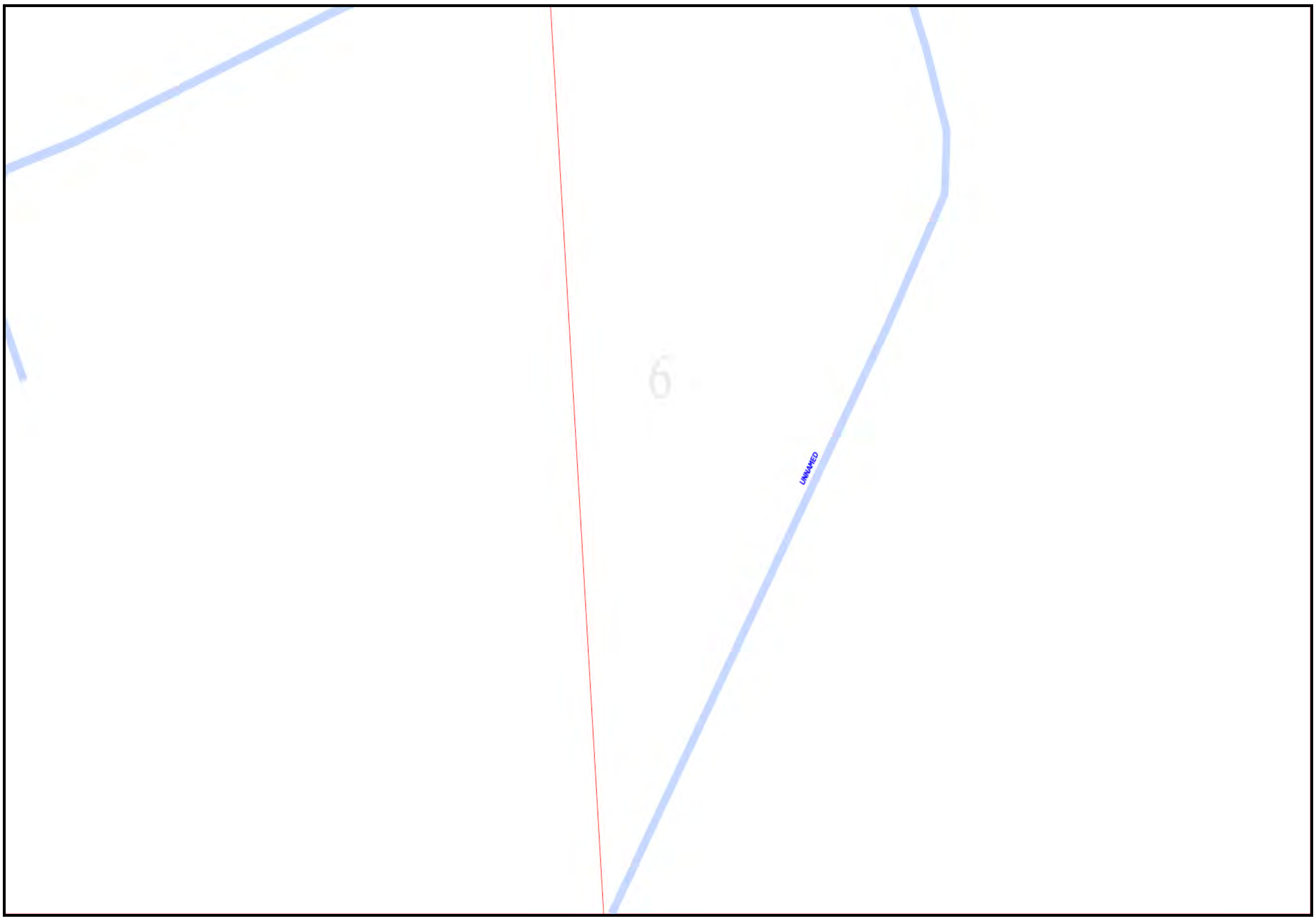

20
21
22
23
16
2
5


3
E3
UNNAMED
1
49.1m
1
P35-3.0m


4
1
500.5m



2
P50-T-90.0m
5
2
P50-T-80.0m
1
101.4m
EJ
UNNAMED
ST ANDREWS DR
6
2
P50-T-75.0m
5
2
P50-T-102.0m



Emergency Contacts

You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

To:	Kingsley Wong
Phone:	Not Supplied
Fax:	Not Supplied
Email:	kingsley.wong@wsp.com

Dial before you dig Job #:	34787552	DIAL BEFORE YOU DIG www.1100.com.au
Sequence #	228076192	
Issue Date:	08/08/2023	
Location:	Lot 3 St Andrews Drive , Port Lincoln , SA , 5606	

Information

The area of interest requested by you contains one or more assets.

nbn™ Assets	Search Results
Communications	Asset identified
Electricity	No assets

In this notice **nbn™ Facilities** means *underground fibre optic, telecommunications and/or power facilities, including but not limited to cables, owned and controlled by **nbn™***

Location of **nbn™** Underground Assets

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn's** records indicate that there **ARE** **nbn™** Facilities in the vicinity of the location identified above ("Location").
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Facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Dial Before You Dig Service. For any enquiries related to moving assets or Planning and Design activities, please visit the **nbn** Commercial Works website to complete the online application form. If you are planning to excavate and require further information, please email dbyd@nbnco.com.au or call 1800 626 329.

Notes:

1. You are now aware that there are **nbn™** Facilities in the vicinity of the above property that could be damaged as a result activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (CoA) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn's** network facilities.
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4. In carrying out any works in the vicinity of **nbn™** Facilities, you must maintain the following minimum clearances:
   - 300mm when laying assets inline, horizontally or vertically.
   - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates.
   - 1000mm when operating mechanical excavators.
   - Adherence to clearances as directed by other asset owner's instructions and take into account any uncertainty for power cables.
5. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn™** fibre optic,copper and coaxial cables,and power cable feed to **nbn™** assets).Damage to underground electric cables may result in:
   - Injury from electric shock or severe burns, with the possibility of death.
   - Interruption of the electricity supply to wide areas of the city.
   - Damage to your excavating plant.
   - Responsibility for the cost of repairs.
6. You must take all reasonable precautions to avoid damaging **nbn™** Facilities. These precautions may include but not limited to the following:
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   - If any undisclosed underground cables are located, notify **nbn** immediately.

- All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
- The safety of the public and other workers must be ensured.
- All excavations must be undertaken in accordance with all relevant legislation and regulations.

7. You will be responsible for all damage to **nbn™** Facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include, without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
8. You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.
9. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any plans(including Indicative Plans) attached hereto. Except as expressly provided to the contrary in this information sheet or the attached plans(including Indicative Plans), all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

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	Work Health and Safety Regulations 2011
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	Occupational Health and Safety Act 1991
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	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
VIC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
QLD	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
SA	Electricity Act 1996
TAS	Tasmanian Electricity Supply Industry Act 1995
WA	Electricity Act 1945
	Electricity Regulations 1947
NT	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
ACT	Electricity Act 1971

Thank You,

nbn DBYD

Date: 08/08/2023

To: Kingsley Wong
Phone: Not Supplied
Fax: Not Supplied
Email: kingsley.wong@wsp.com

Dial before you dig Job #:	34787552
Sequence #	228076192
Issue Date:	08/08/2023
Location:	Lot 3 St Andrews Drive , Port Lincoln , SA , 5606

Indicative Plans

1	4
2	5
3	6

LEGEND

	Parcel and the location
5	Pit with size "5"
2E	Power Pit with size "2E". Valid PIT Size: e.g. 2E, 5E, 6E, 8E, 9E, E, null.
	Manhole
	Pillar
2 PO – T- 25.0m P40 – 20.0m 5 9	Cable count of trench is 2. One "Other size" PVC conduit (PO) owned by Telstra (-T-), between pits of sizes, "5" and "9" are 25.0m apart. One 40mm PVC conduit (P40) owned by NBN, between pits of sizes, "5" and "9" are 20.0m apart.
2 10.0m 5 9	2 Direct buried cables between pits of sizes ,"5" and "9" are 10.0m apart.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Copper/RF/Fibre) cables.
5 9	Trench containing only DESIGNED/PLANNED (Copper/RF/Fibre/Power) cables.
5 9	Trench containing any INSERVICE/CONSTRUCTED (Power) cables.
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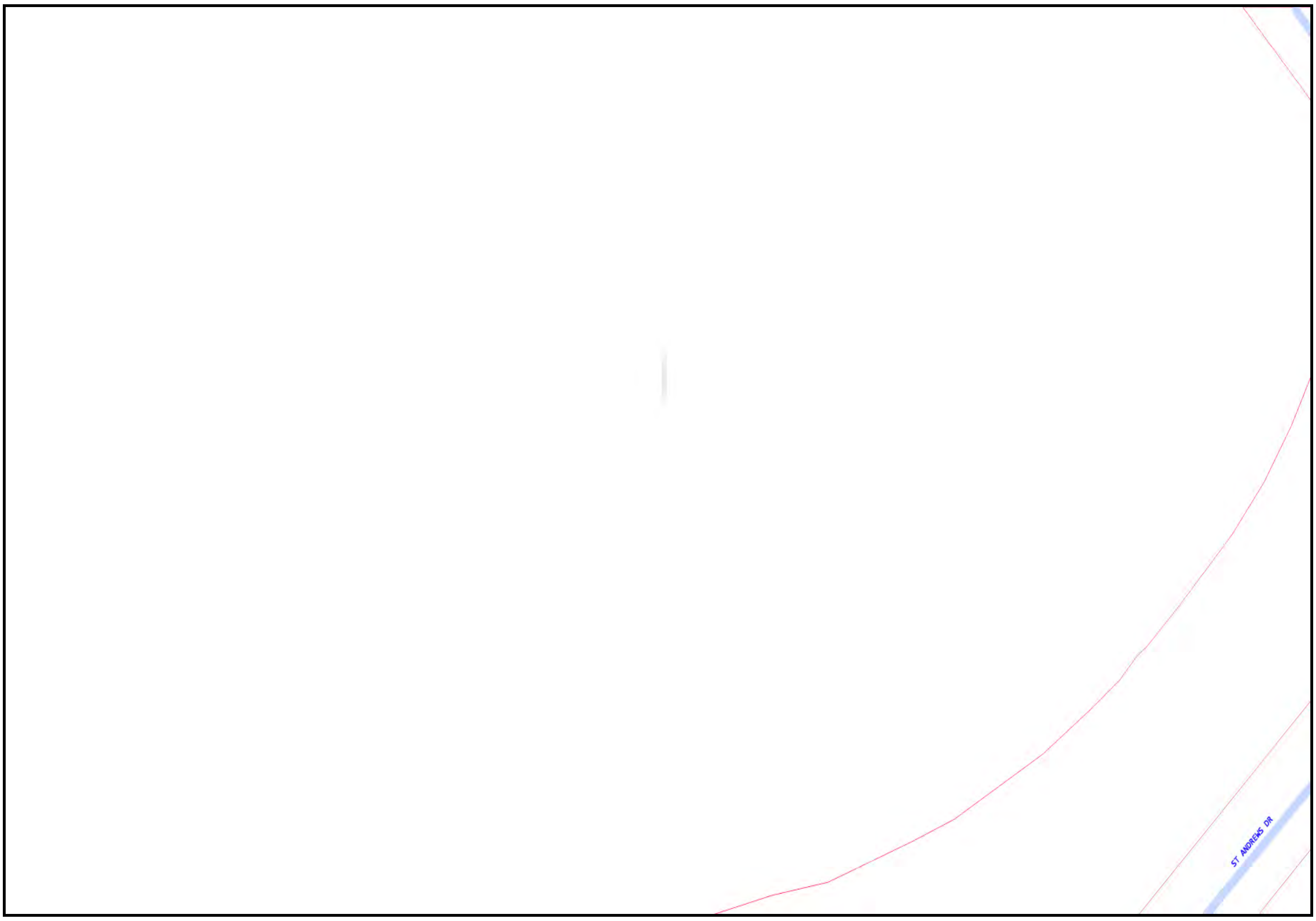
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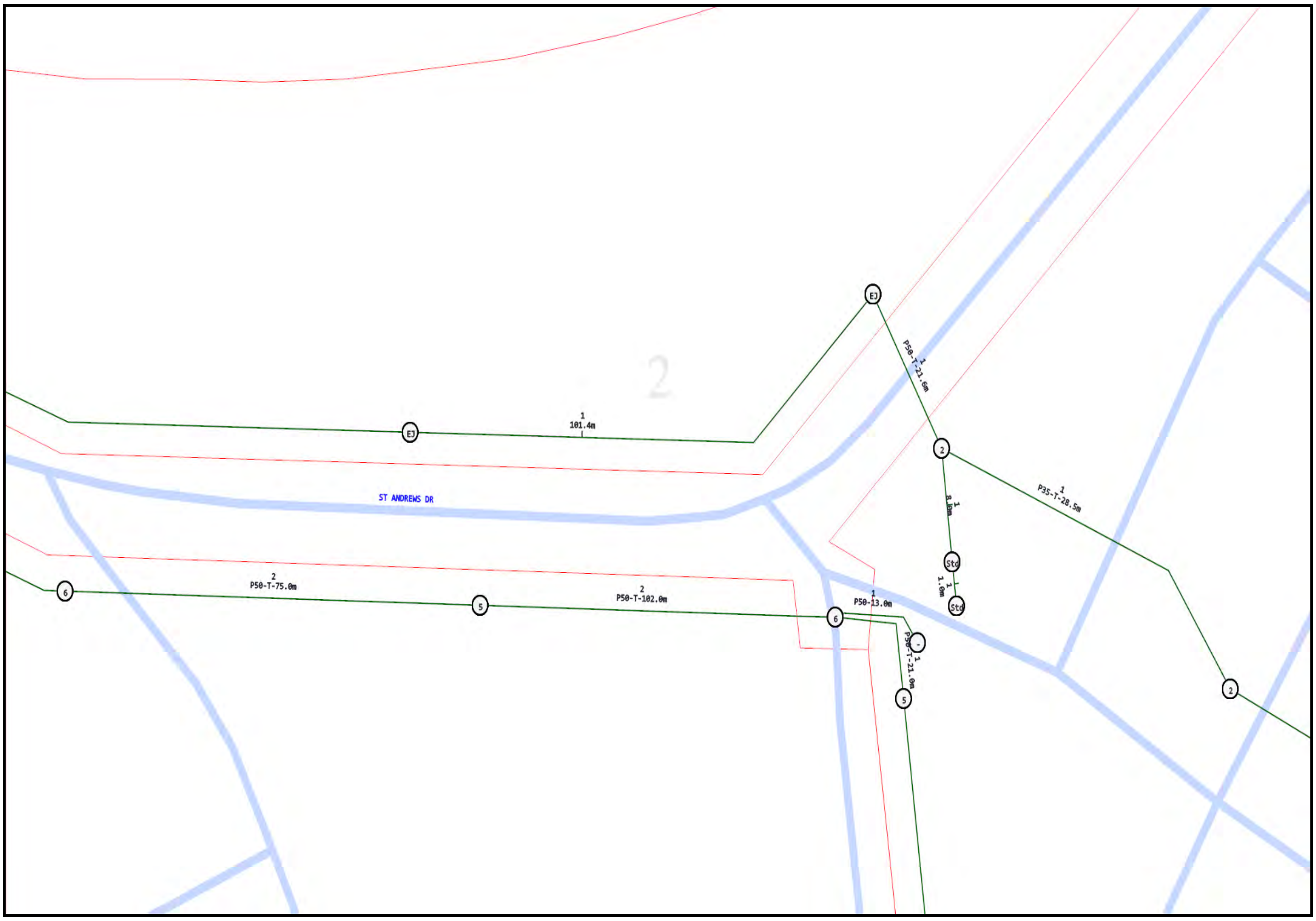

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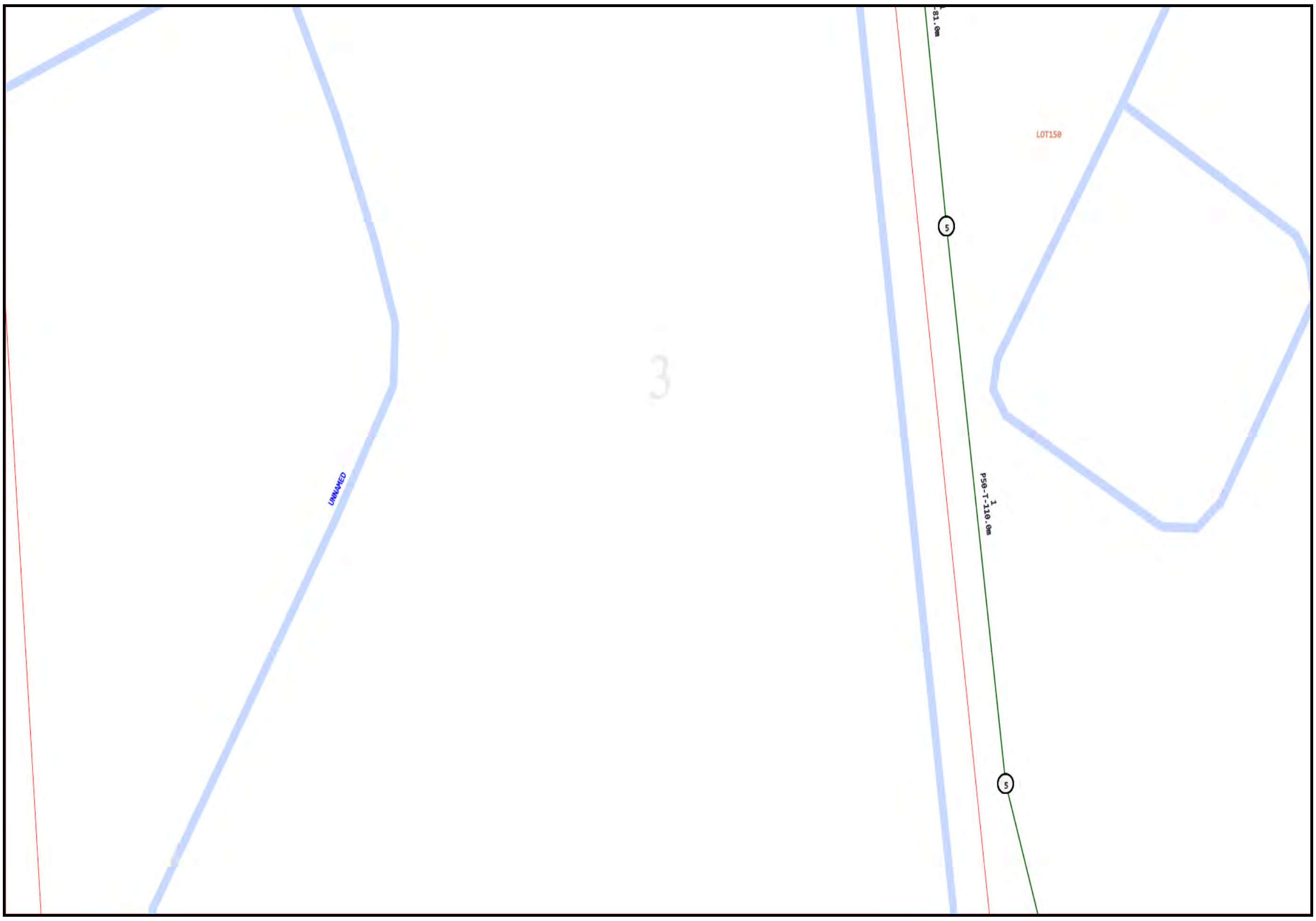
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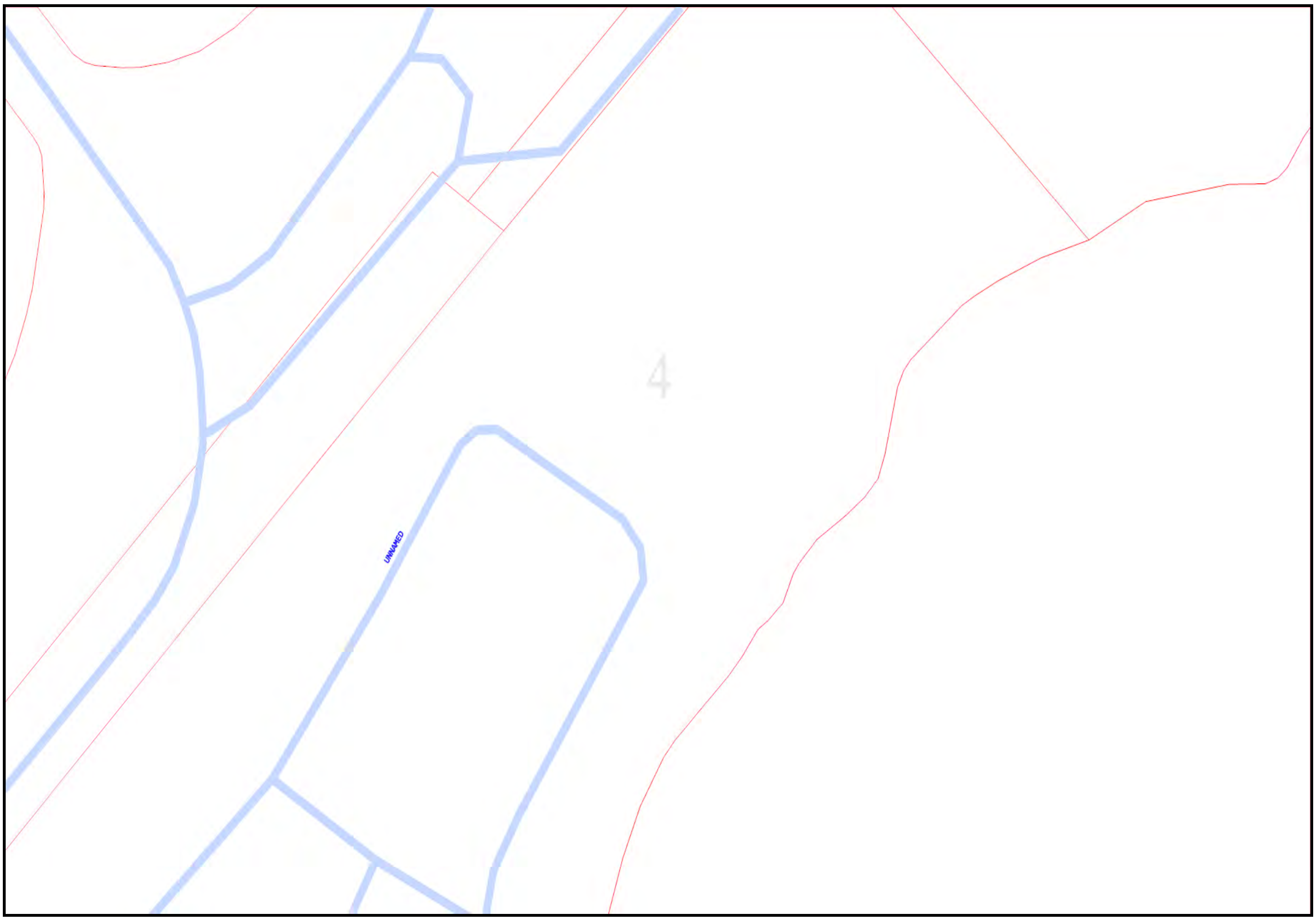
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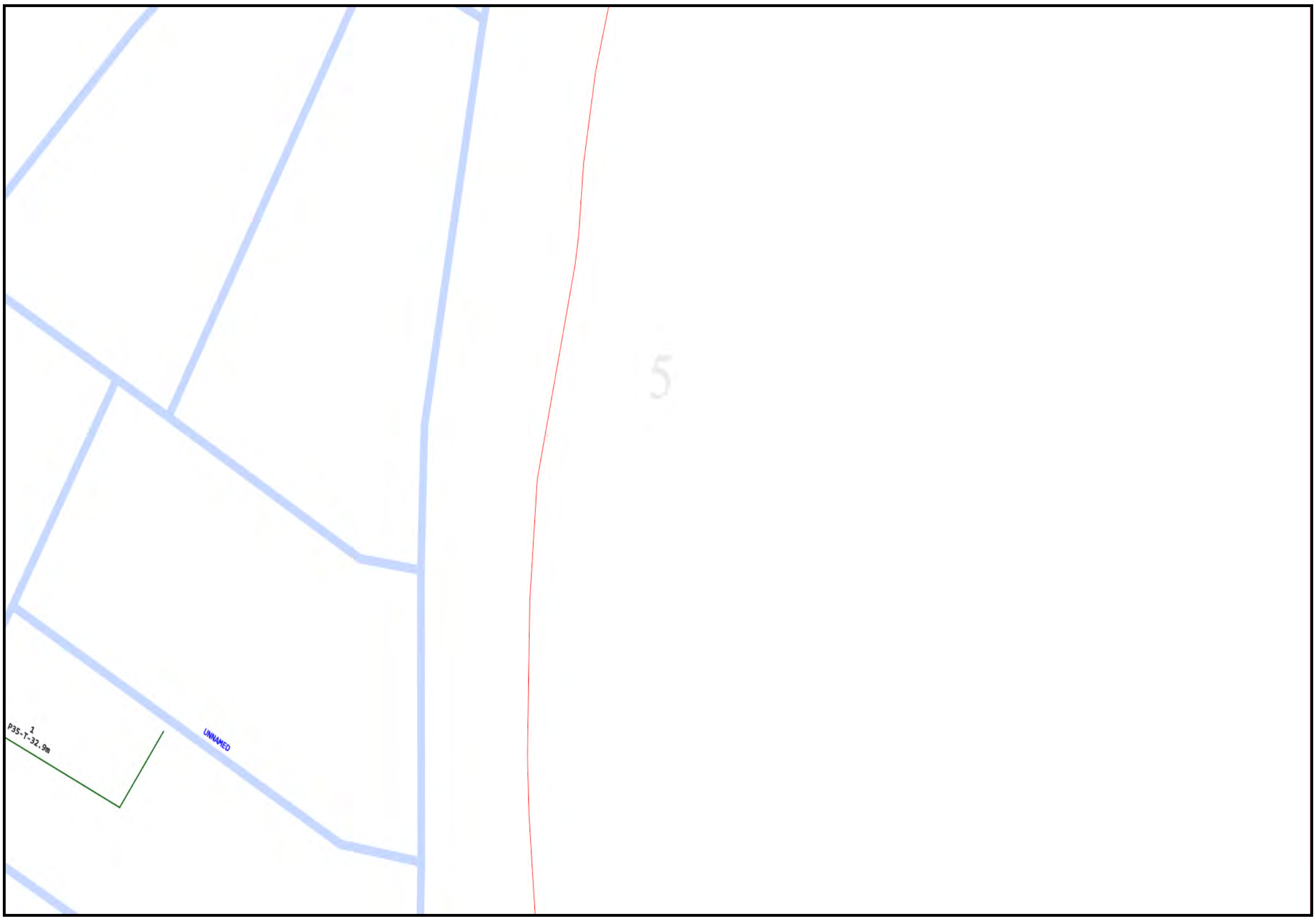
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Emergency Contacts

You must immediately report any damage to the **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

Appendix J SARDI Far-field Modelling Report

Marine Ecosystems

Oceanographic monitoring and far-field modelling to inform desalination in Boston Bay

M. Doubell & C. James

SARDI Publication No. F2022/000347-1
SARDI Research Report Series No. 1165

SARDI Aquatics Sciences
PO Box 120 Henley Beach SA 5022

February 2023

Report to SA Water

SA Water

Government of South Australia
Department of Primary Industries and Regions

SARDI
South Australian Research and Development Institute

Oceanographic monitoring and far-field modelling to inform desalination in Boston Bay

Report to SA Water

M. Doubell and C. James

SARDI Publication No. F2022/000347-1
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February 2023

The South Australian Research and Development Institute respects Aboriginal people as the state's first people and nations. We recognise Aboriginal people as traditional owners and occupants of South Australian land and waters. We pay our respects to Aboriginal cultures and to Elders past, present and emerging.

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Signed:	
Date:	09 February 2023
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

This work was funded by SA Water. We are grateful to Dr Hazel Vandeleur and Dr Tim Kildea for their assistance and support. Thank you to SARDI staff (Dr Hugo Bastos de Oliveira, Paul Malthouse, Ian Moody) and SA Water technical staff for their professionalism and dedication in implementing the field sampling program and associated data processing.

Valuable comments which improved the quality of this report were made by Associate Professor Marty Deveney and Dr Roger Kirkwood. The report was approved by Professor Simon Goldsworthy (SARDI Marine Ecosystems Science Leader) and cleared for release by Dr Mike Steer, Research Director SARDI Aquatic & Livestock Sciences.

Data was sourced from Australia's Integrated Marine Observing System (IMOS) – IMOS is enabled by the National Collaborative Research Infrastructure Strategy (NCRIS). It is operated by a consortium of institutions as an unincorporated joint venture, with the University of Tasmania as Lead Agent.

EXECUTIVE SUMMARY

SA Water are proposing to build a small desalination plant (4-5.3GL per year) with the potential for expansion to 8 GL per year to supplement the existing water supply. Several plant intake and outfall sites in and around Boston Bay (Port Lincoln) are being considered. Given the reduced flushing of the regions surrounding embayment's, the importance of co-located aquaculture industries, and the need to protect receiving ecosystems, there is a need to examine the potential impacts and capacity for the area to host a desalination plant.

In this study, a high-resolution three-dimensional hydrodynamic model for the Port Lincoln region is developed to examine the effect of hydrodynamics on the far-field dispersal of brine discharges for five outfall locations, including inshore outfalls proposed near Billy Lights Point and Point Boston. Hydrodynamic model predictions are additionally used to drive a particle tracking model to understand the far-field connectivity of planktonic larvae, such as the commercially important blue mussel (*Mytilus galloprovincialis*), with proposed intake locations. Comparison of the hydrodynamic model with moored field measurements made over a one-year period showed the model was able to reproduce tidal and lower-frequency (weather-band and seasonal variations) in currents, sea level, temperature, and salinity. The model therefore demonstrated predictive capability for assessing the transport, dispersal and fate of brine discharges and planktonic larvae associated with the operation of the proposed desalination plant.

Using a 5-year model hindcast, far-field predictions of the salinity differences (i.e., anomalies) between a 12 GL per year desalination plant operating at full capacity and a model simulation with no desalination, showed a maximum seasonally-averaged salinity anomaly of 0.44 PSU within 250 to 500m of outfalls. This anomaly is equivalent to a 1.2 % change in the ambient salinity. Maximum seasonally-averaged anomalies were reduced to <0.1 PSU (<0.3% change in the ambient salinity) at distances >1 km from outfalls. At hourly timescales, predicted far-field increases in salinity at distances of ~300 m from outfalls were always <0.9 PSU (<2.5 % change in the ambient salinity) and decreased to <0.4 PSU (<1.1 % change in the ambient salinity) at distances >1 km from outfalls. The predicted changes in salinity due to desalination discharges are within the natural salinity variability of the region determined from the measured data. Salinity observations showed an annual range of 1.46 PSU equivalent to a 4% change in ambient salinity, and variations of ~0.1 and ~0.5 PSU across timescales of several hours to a week, respectively.

Comparison of the brine dispersal patterns from the different outfall locations demonstrated that the spatial extent and magnitude of long-term salinity increases were reduced when outfalls were in offshore waters east of Boston Island. For all outfall locations, salinity increases predicted at distances greater than 250 m from outfalls associated with the 12 GL per year plant modelled in this study were below the less than 5% change in ambient salinity (~1.8 PSU) recommended by the Australian and New Zealand Guidelines for Fresh and Marine Waters and the 1 PSU environmental and ecological tolerance limits for flora and fauna reported in the desalination literature. This suggests, given the small size of the proposed plant (8 GL per year maximum), there are unlikely to be any substantial environmental impacts from brine discharges in the far-field. To adequately minimise salinity increases, however, it will be important that sufficient dilution is achieved by appropriate diffuser designs in the near field.

Biophysical modelling results for planktonic larvae, based on a limited understanding of the spawning characteristics of blue mussels, showed the far-field spatial connectivity of simulated passive larvae with intakes was strongly influenced by tides and the regional circulation patterns. This identified that mussels sourced from Proper Bay and the Boston Bay area inshore from Boston Island had increased connectivity with intakes located near Billy Lights Point and reduced connectivity with the intake located near Point Boston. Similarly, mussels sourced from Louth and Peake Bays had increased connectivity with the intake located near Point Boston and reduced connectivity with intakes located near Billy Lights Point. For all intake locations, the far-field connectivity modelling indicated that less than 0.1% of the particles released over the course of the mussel spawning season may be at risk of coming within a 25 m radius of intakes. Future validation and development of the biophysical model, including *in situ* sampling to understand larval source regions and concentrations and the vertical distribution of mussel larvae, is needed to improve the far-field connectivity modelling to better inform the number of larvae possibly removed by desalination intakes.

The modelling results presented in this study on the potential far-field increases in salinity due to desalination brine outfalls and larval entrainment by intakes should be considered in the context of current and future cumulative environmental impacts in the Port Lincoln region, which is home to South Australia's most valuable and productive aquaculture zone. For example, these impacts include the combined effects resulting from other anthropogenic emissions (e.g., nutrients from tuna and finfish aquaculture, wastewater treatment plants and other sources) and climate change (e.g., marine heatwaves) on the regions ecosystems which remain areas of active research. In

this context, the hydrodynamic model developed in this study for the Port Lincoln region provides an improved tool that can be used to guide, assess, and minimise the potential impacts of desalination (and other anthropogenic point sources) to ensure the health, productivity, and sustainability of the region.

Keywords: hydrodynamic model, larval transport, desalination, brine discharges, dispersal, dilution

1. INTRODUCTION

1.1. Background

Security of water supply is a key priority for SA Water. Existing supplies for regional communities on South Australia's Eyre Peninsula need to be supplemented to ensure future proofing. To achieve this, SA Water plans to build a reverse osmosis desalination plant to initially supply 4-5.3 GL of freshwater per year, with potential for expansion to 8 GL per year. In 2021 a plant planned for construction at Sleaford Bay encountered substantial engineering issues due to geological conditions. Alternative sites in and around Boston Bay (Port Lincoln) are subsequently being considered (Figure 1).

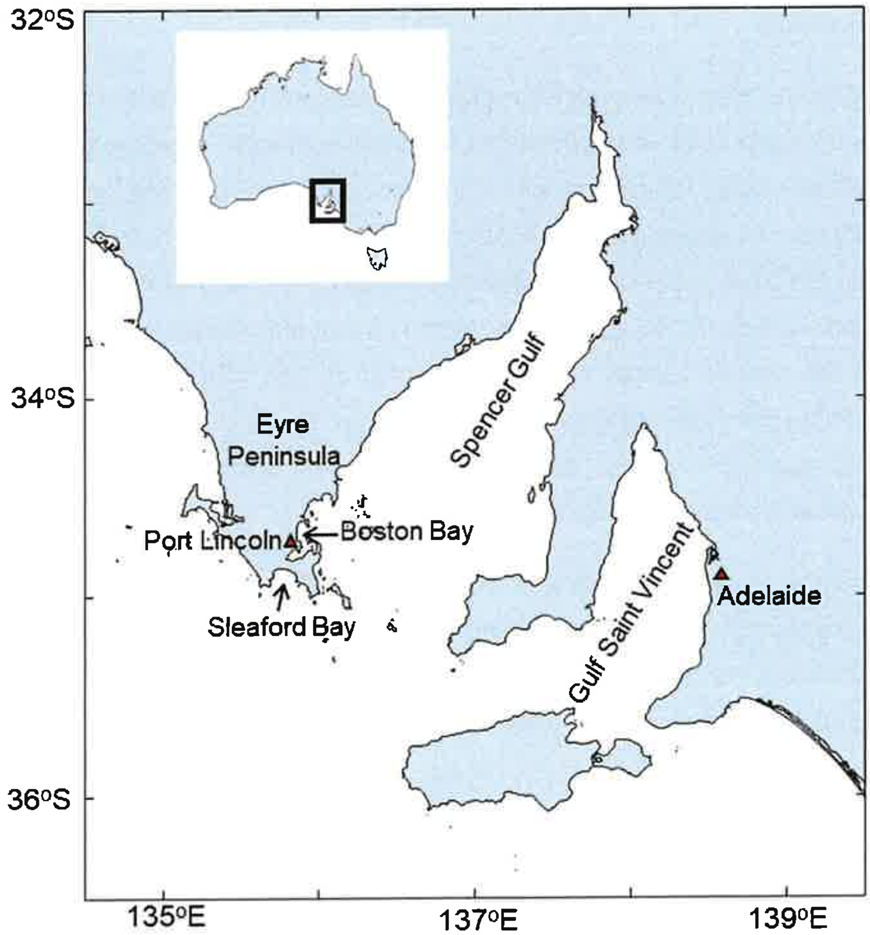

Figure 1. Map showing the location of the Eyre Peninsula region, South Australia.

Boston Bay and its adjoining waters are home to South Australia's most valuable and productive aquaculture zone (The Lower Eyre Peninsula Aquaculture Zone) and contain mussel, oyster, abalone, southern bluefin tuna, and other finfish aquaculture. In 2019/20 it was estimated approximately 13,150 tonnes of seafood valued at $180M per annum was produced from this zone (BDO EconSearch, 2020). Oceanographic research has demonstrated that the inshore waters of Boston Bay and adjacent embayments experience reduced flushing both at the site (Middleton et al., 2013, 2014) and bay scale (Herzfeld et al., 2008) relative to adjacent offshore waters. In addition, water quality (Tanner at al. 2020) and seagrass monitoring (Tanner at al. 2019) programs have raised concerns that dissolved nutrient emissions from co-located tuna and other finfish aquaculture, and wastewater treatment plants, are inter-connected and may be having cumulative impacts on the health and ecology of the regions surrounding planktonic and seagrass ecosystems.

Construction and operation of a desalination plant can have environmental and ecological impacts (Lattemann and Höpner 2008; Panagopoulos and Haralambous 2020; Tanner and Drabsch 2021; Omerspahic et al., 2022). In recognition of the reduced flushing of inshore waters and the adjoining co-location of valuable aquaculture industries, there is concern about whether the Port Lincoln region can absorb the outputs of a desalination plant without environmental impacts. Specific concerns raised by the aquaculture industry about the operation of a desalination plant are the potential impacts related to (i) the disposal of high salinity desalination brine and associated harmful chemical contaminants (Mavukkandy et al., 2019) on the receiving marine ecosystem and aquaculture sector, and (ii) the entrainment of the eggs and larvae of marine organisms, such as blue mussels, by the desalination intake.

This study aimed to develop and apply a high-resolution (300m grid resolution) hydrodynamic model for the Port Lincoln region to predict the far-field dispersal of brine outfalls and the far-field transport and connectivity of planktonic larvae. Model results were analysed for several proposed intake and outfall locations to support selection of a site where environmental impacts would be acceptable. Additional outfalls located in offshore waters outside of the embayments were also investigated for comparison with outfalls located closer to the shore. Near-field studies examining the design and application of diffuser systems, that are required to achieve rapid mixing and a 40:1 dilution of brine at the seabed under all conditions over spatial scales of metres to several hundred meters are not resolved by the models applied in this study and are being undertaken separately as part of the engineering design.

1.2. Objectives

The project objectives were to:

1. Use ocean moorings to collect baseline field observations of oceanographic parameters over 12 months.
2. Use the field observations of temperature, salinity, and currents to develop and validate a high-resolution hydrodynamic model for the Boston Bay region (HRBBM).
3. Use the HRBBM to produce a 5-year hindcast simulation and model the far-field dispersion of brine for several proposed desalination plant intake/outfall locations.
4. Use ocean current predictions from the HRBBM to undertake particle tracking studies to better understand the far-field transport and connectivity of planktonic larvae (i.e., blue mussel) with proposed desalination plant intake locations.

2. METHODS

2.1. Field measurements: ocean moorings

Between 19-July 2021 and 18-August 2022, three oceanographic moorings (SAW1, SAW2, and SAW3) were placed in and around Boston Bay (Figure 2, Table 1). The moorings collected data essential for understanding baseline environmental variability and supporting hydrodynamic model development and validation. Mooring frames (Figure 3) were deployed on the seafloor and, at two locations (SAW1 and SAW2), were equipped with Nortek Acoustic Doppler Current Profilers (ADCP) to measure current speed and direction throughout the water column. At all three locations, conductivity, temperature, and depth (CTD) as well as water quality measures including dissolved oxygen, chlorophyll and turbidity, were measured. All parameters were sampled at sub-hourly intervals (15-30 minutes depending on the sensor). Moorings were serviced at approximately 2-monthly intervals, when data were downloaded, moorings cleaned and sensors either redeployed or exchanged.

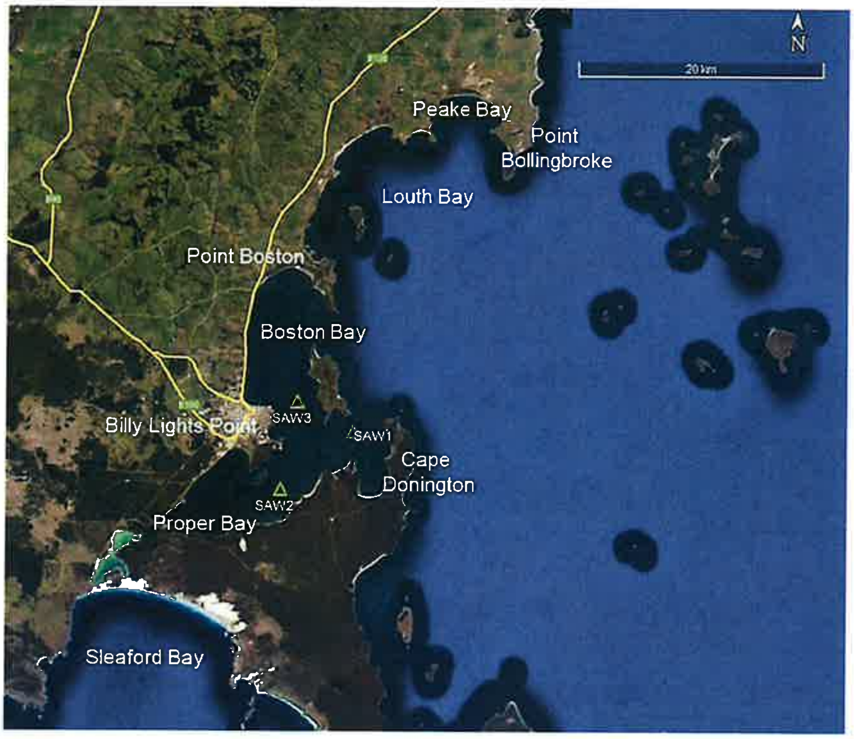

Figure 2. Google Earth image showing Port Lincoln and the surrounding bays. The location of the oceanographic moorings SAW1, SAW2 and SAW3 are indicated by the green triangle markers.

Table 1. Description of the mooring locations and ocean sensors used at each mooring.

Mooring Name	Equipment Provider	Sensors	Latitude (°S)	Longitude (° E)	Depth (m)
SAW1	SARDI	- Nortek Signature 500 or 1000 ADCP - Seabird SBE16plus CTD with water quality sensors	34.7381	135.9557	17
SAW2	SA Water	- Nortek Signature 1000 ADCP - YSI EXO2 CTD Sonde with water quality sensors and/or RBR Duo TS loggers	34.7818	135.8917	11
SAW3	SA Water	-YSI EXO2 CTD Sonde with water quality sensors and/or RBR Duo TS loggers	34.7167	135.9042	17

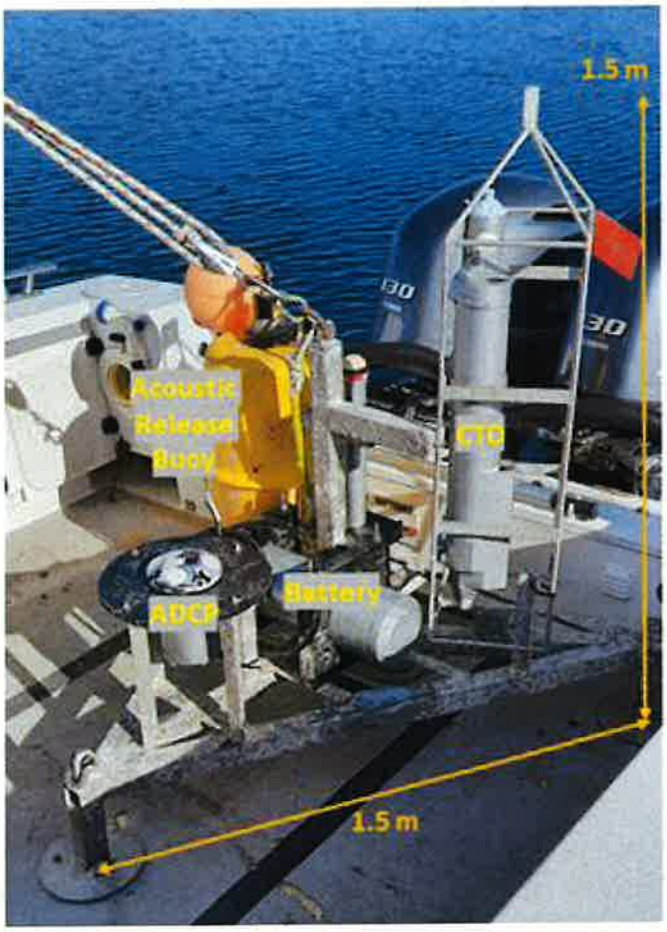

Figure 3. Picture of the coastal ocean mooring deployed at SAW1.

Fouling and sensor calibration issues compromised data quality on occasions, particularly for salinity measurements. For example, Figure 4 shows an example of the step change in salinity of ~1 PSU following a change of sensor at the SAW2 mooring during servicing in September 2021.

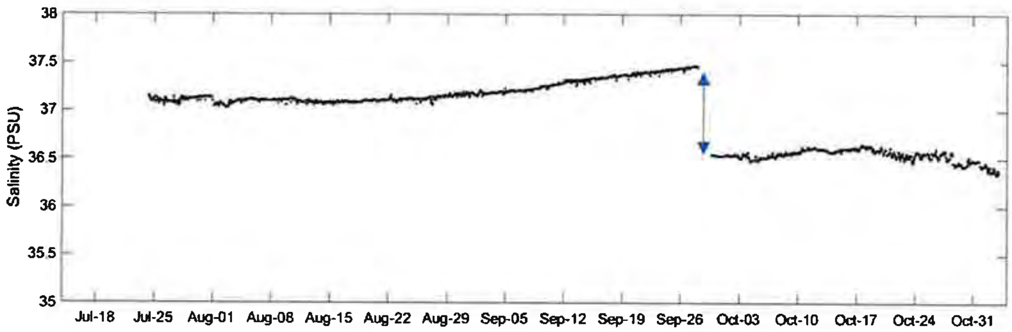

Figure 4. Example of sensor calibration issues which complicate the model validation process. Observed salinities at the SAW2 mooring site showed a distinct step change (indicated by the blue arrow) when sensors were changed during servicing on the on the 28th and 29th of September 2021.

For model validation purposes, calibration errors for each moored temperature and salinity sensor were identified by undertaking tank comparison tests at SARDI using seawater from Gulf Saint Vincent (Table 2). Mean temperature and salinity signals for each moored sensor were averaged over 30-minutes and compared to the SARDI Seabird 19plus profiling CTD which was used as a reference. This CTD is calibrated annually at the CSIRO Oceanographic Calibration Facility and showed strong agreement with *in-situ* bottle samples (Figure 5) taken at the Integrated Marine Observing System (IMOS) Kangaroo Island National Reference Station (r^2 = 0.99, root-mean-square (RMS) error = 0.11 PSU, bias = 0.0003 PSU). Calibration corrections for subsequent deployments were applied using profiles taken with the reference CTD at the start and end of each deployment.

Table 2. Calibration offsets for temperature (°C) and salinity (PSU) for moored instruments.

Sensor	Serial No.	Test date	Salinity Offset	Temperature Offset
SBE16+	50291	15/07/2022	0.004	0.001
SBE16+	50292	18/01/2022	0.004	0.002
EXO2	102998	18/01/2022	0.272	0.038
EXO2	104518	18/01/2022	0.749	-0.008
EXO2	101382	18/01/2022	1.183	0.320
EXO2	103326	18/01/2022	0.989	0.062
RBR Duo	61653	28/04/2022	-0.062	0.013

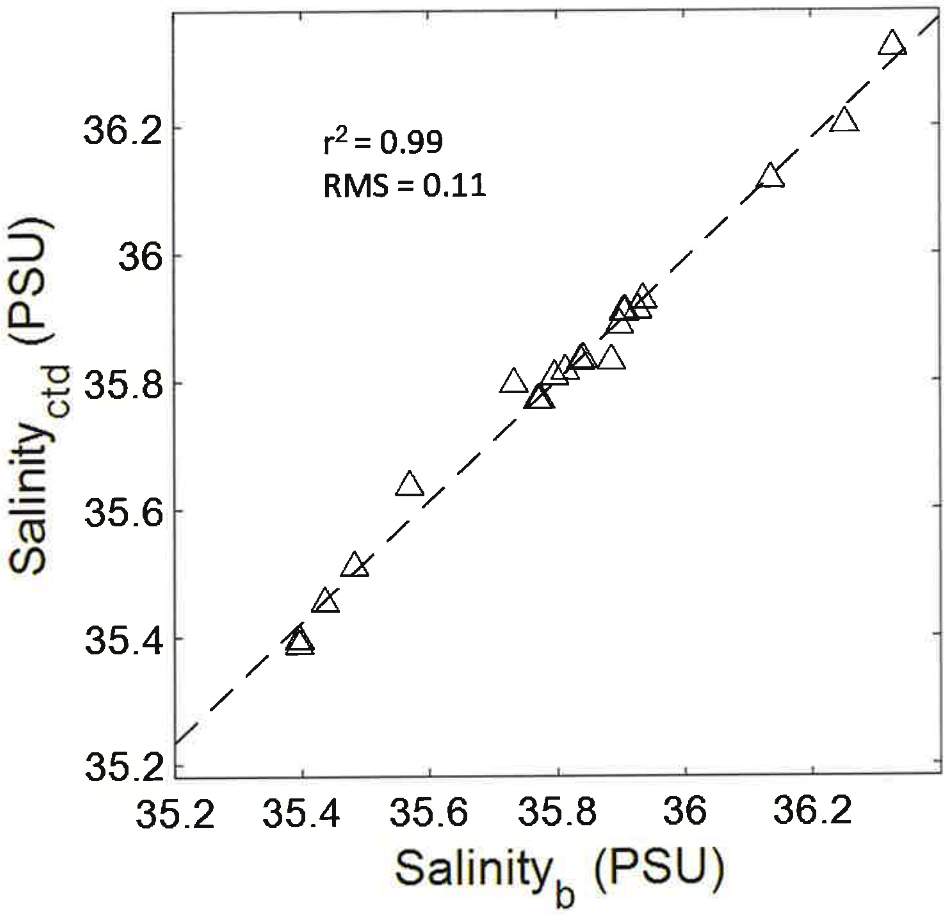

Figure 5. Comparison of salinity measures (PSU) using the SARDI/IMOS Seabird 19plus CTD (SN 6658) with bottle samples ($Salinity_b$) taken between 0 and 100m depth at the IMOS Kangaroo Island National Reference Station across three sampling events (February, May, and August) in 2021. Dashed lines show linear regression. RMS is the root-mean-square error.

2.2. Ocean modelling system

The open-source Regional Ocean Modelling System (ROMS, https://www.myroms.org/) was used to simulate circulation and mixing in Spencer Gulf. ROMS is a high resolution, three-dimensional, free-surface oceanic model that uses topography-following coordinates in the vertical direction, and orthogonal curvilinear coordinates in the horizontal direction (Shchepetkin & McWilliams 2005; Song & Haidvogel 1994). A nested model approach was applied to increase boundary condition resolution from near-global (non-Arctic) ocean models (10 km grid) to the gulf scale using the 1.5 km resolution version of the Two Gulfs Model (TGM). The bathymetry for the

TGM grid was based on the 0.0025° resolution, Geoscience Australia (GSA), bathymetric grid for Australia Bathymetry (Whiteway 2009). Validation of the TGM has included comparisons against field observations collected by IMOS and other datasets for sea level height, currents, shear, temperature, and salinity. These comparisons have been presented across several peer-reviewed publications (Middleton et al. 2014, McLeay et al. 2016, Rogers et al. 2021) and technical reports (Middleton et al. 2013, 2017; Tanner et al. 2020).

To achieve the finer spatial resolution required to model the potential impact of desalination in Boston Bay, a 2-way nested high-resolution model for Boston Bay (HRBBM) was embedded within the TGM. The HRBBM has a horizontal spatial resolution of 300m and 15 sigma levels in the vertical. Lateral boundary conditions and interior solutions for the HRBBM are exchanged with the TGM and the model is run with a time-step of 40 s. The HRBBM grid allows for wetting and drying (Warner et al. 2013) to improve the simulation of physical processes in the shallow water bays located within the model domain. Improvements to the model's bathymetry was achieved using bathymetric data obtained from the Australian Hydrographic Office (AHO). The AHO bathymetry was adjusted to mean sea level and merged with the GSA bathymetry in the TGM to provide consistency within both models (Figure 6).

Both the TGM and HRBBM were forced with pressure, wind, humidity, heat-fluxes, and precipitation from global atmospheric models provided by the NCEP Climate Forecast System Reanalysis v.2 (Saha et al. 2014). Tidal forcing was provided by the global TPXO9 model (Erofeeva & Egbert 2014). Lateral oceanic boundary conditions and initial fields for TGM (i.e., temperature, salinity, currents, and sea level) were provided by the 10 km resolution Ocean Forecast Australia Model (OFAM). Due to product availability, CSIRO's Blue Link Reanalysis 2020 (BRAN2020; Oke et al., 2013) was used for modelling the years from July 2015 to June 2022 and the CSIRO/Bureau of Meteorology's OceanMAPS v3.4 analysis from July 2022 onwards. Improvement to the model sea surface temperature (SST) was achieved by adjusting the heat-fluxes using remote sensed SST provided by the Level 4 Multi-scale Ultra-high Resolution (MUR) SST Analyses (Chin et al. 2017). The entire desalination hindcast simulation period extended from 1-January 2016 to 1-January 2021. A six-month model spin-up was run, using BRAN-derived initial conditions, from 1-July 2015 to 1-January 2016 to provide artefact free initial conditions for the hindcast simulations. The final hindcast model configuration was determined using the results of a model validation run from 1-January 2021 to 20-August 2022, for comparison with measurements obtained from the moorings.

For all hindcast configurations model outputs were saved in the following formats to support further analysis. In summary, daily snapshots taken at 00:00 UTC of all model fields across the entire model domain are heavily aliased by the daily tides and were used for producing the 5-year hindcast animations of bottom salinity for each outfall (see Animation 1, Appendix 3). In section 4, three-day averages of all fields across the entire model domain were used to calculate long-term (i.e., seasonal) increases in salinity and to understand the influence of tides on the horizontal dispersal of brine discharges in the vicinity of outfalls. Three-day averages filter out transient features associated with daily tides while preserving the influence of the fortnightly tides including "dodge-tides". Hourly outputs of all fields at specific sites (see Figure 7) were used to perform model validations against measured mooring data (see section 3) and to produce tide resolving salinity-anomaly plots. Hourly velocity fields over 5 months (May-September) for three consecutive years (2016-2018) were used for the particle tracking studies shown in section 5. Hourly outputs of all model fields across the entire model domain for a 3-month period (January-April 2016) were used to understand the sensitivity of far-field salinity increases to brine releases spread over increasing model layers (i.e., depths) in the vertical (see Appendix 2).

For model validation the predictive skill and performance of the HRBBM was assessed using three metrics – the bias, root-mean-square error (RMS) and the coefficient of determination (r^2). Bias is the difference between the mean value predicted by the model and the measured mean, RMS error is the root-mean-square of differences between the model and the measurement, and r^2 is a measure of the fraction of variability (i.e., variance) explained by the model.

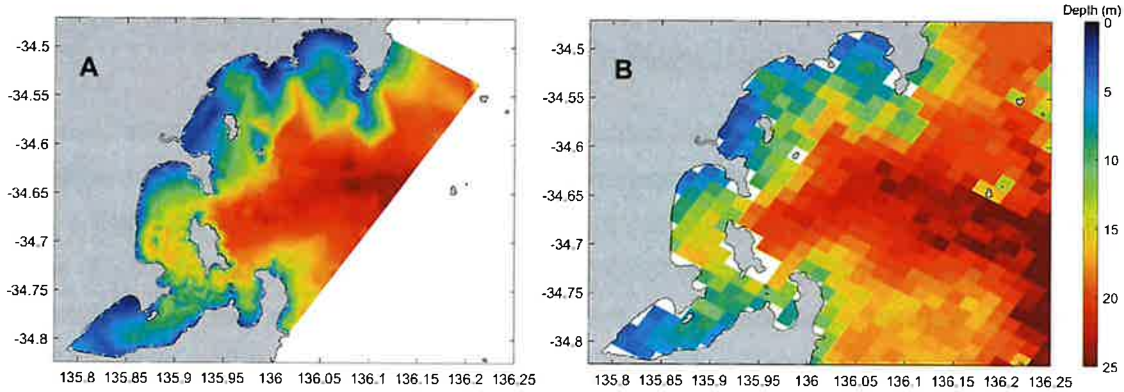

Figure 6. Hydrodynamic model grids developed using the AHO bathymetric datasets for (A) the HRBBM with a horizontal spatial resolution of 300 m and (B) merged with the GSA bathymetry within the corresponding subsection of the TGM with a horizontal spatial resolution of 1500 m.

2.3. Far-field modelling of desalination discharges

Far-field hydrodynamic modelling to understand the fate and transport of brine discharges was undertaken for three intake and five outfall locations within the greater Port Lincoln region (Figure 7). Brine discharges from the desalination plant were implemented as a point source flux and neglected the impact of density changes on the salt flux (Kämpf et al. 2009) such that:

$$\Delta S = \frac{(Sb - S)q_b}{V}\Delta t \quad (1)$$

where ΔS is the salinity increment for each time step (Δt) within the model, S is the salinity concentration (PSU) in the bottom model grid cell corresponding to the outfall location, Sb is the salinity of the brine discharge, q_b is the brine discharge rate, and V is the volume of the bottom model grid cell. The brine discharge rate was set to the peak outflow for the proposed desalination plant of q_b = 2800 m^3/hr.

A conservative approach was taken by discharging brine into the bottom sigma layer at each outfall location; this maximises the bottom anomaly. Due to the use of a terrain following sigma-coordinate model, the thickness of this bottom layer in the model ranged between 0.4 and 1.6 m across the five outfall sites. Model sensitivity studies to understand the far-field salinity increases associated with brine releases spread vertically over two and three model grid layers from the bottom are shown in Appendix 2. Sb was calculated as a function of the salinity at the intake and temperature was set to the background water temperature at the outfall. The specified peak plant intake rate of 4191 m^3/hr and discharge rate of 2800 m^3/hr implies the collection of 1391 m^3/hr of freshwater, equivalent to a ~12 GL per year plant operating at an efficiency (E) of 33%. The resultant salinity of discharged brine (Sb) was approximately $(1-E)^{-1}$=1.50 times the intake value.

Table 3. Location of desalination plant intakes and outfalls investigated in this study.

Site Name	Intake		Outfall	
	Longitude (°E)	Latitude (°S)	Longitude (°E)	Latitude (°S)
Billy Lights Point – inshore	135.8855	34.7558	135.8968	34.7484
Billy Lights Point – extension	135.8968	34.7484	135.9202	34.7454
Cape Donington	135.8855	34.7558	136.0102	34.7239
Point Boston – inshore	135.9460	34.6158	135.9466	34.6273
Point Boston – extension	135.9460	34.6158	136.0719	34.6384

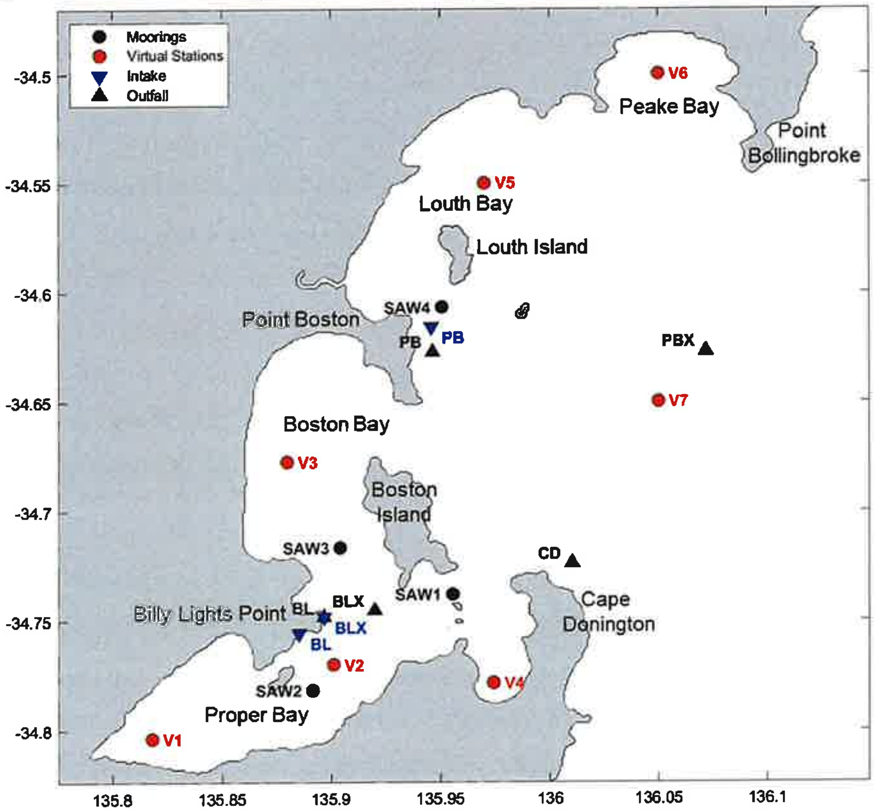

Figure 7. Map of the bays in the Port Lincoln region showing the location of: i) mooring sites (SAW1-4, black circle markers), ii) 'virtual' monitoring sites (V 1-7, red circle markers), iii) potential desalination plant intake (blue triangle markers) and iv) outfall sites (black triangle markers). BL = Billy Lights Point inshore, BLX = Billy Lights Point extension, PB = Point Boston inshore, PBX = Point Boston extension, CD = Cape Donington. No moorings were deployed at a proposed SAW4 site during this study.

2.4. Particle tracking modelling

Dispersal of marine species with a pelagic larval duration is influenced by bio-physical interactions between ocean currents and characteristics of larval behaviour and development (Robins et al., 2013). With an understanding of these characteristics, bio-physical modelling, using outputs from regional hydrodynamic models, have been applied to understand the connectivity and recruitment in South Australia's gulfs of several important commercial species, including Western King prawns (McLeay et al. 2016) and King George Whiting (Rogers et al. 2021).

Spat of free-living blue mussels (*Mytilus galloprovincialis*) are caught and grown-out in aquaculture leases around Boston Bay. Unfortunately, little is known about the pelagic larval duration and development characteristics of the local blue mussel. The biological model for blue mussels used in this study was therefore developed based on discussions with local mussel farmers and the scientific literature for other *Mytilus species*. In summary, blue mussels are expected to be distributed across the intertidal zone of rocky coastlines (Svane 2011). The species uses a broadcast spawning strategy which involves several synchronised mass spawning events to maximise their reproductive success (De Vooys 1999). After spawning, mussel larvae are expected to remain in the water column for 2 to 4 weeks but can take up to 10 weeks to reach final settlement (Seed 1969; Demmer et al. 2022). Although there is limited evidence that planktonic blue mussel larvae can exert some control over their position in the water column (Dobretsov and Miron 2001), mussel larvae are assumed to be passive (i.e., with no active vertical migration behaviour). This is consistent with the approach used in recent particle tracking studies for blue mussels (Coolen et al. 2020; Demmer et al. 2022) and allows generalisation of the results to other species.

Based on this understanding, particle tracking was undertaken to assess the far-field connectivity of the local blue mussel with proposed desalination intake locations. Larval transport was simulated using the larval transport particle tracking model (LTRANS; North et al. 2006; 2008). LTRANS uses ocean current predictions from the HRBBM hydrodynamic model to track the trajectories of particles in three-dimensions and accounts for particle advection and diffusion due to turbulence. Hourly HRBBM outputs were used to run LTRANS which had an internal time step of 120 seconds. LTRANS uses reflective coastal boundary conditions to keep particle trajectories within bounds. As described by North et al. (2008), particles that intersected a coastal boundary were reflected at an angle equal to the angle of approach and at a distance equal to the distance that the particle had passed the boundary. Particles that passed through vertical boundaries were returned to the water column just above or below the bottom and surface boundary, respectively. Particles that crossed open ocean boundaries were removed from further tracking.

To account for potential interannual differences in the regional circulation on mussel transport, spawning seasons were simulated for three consecutive years (2016, 2017, 2018). Each season included five monthly spawning events, which spanned the period May to September. Monthly spawning events lasted 5-days and involved the daily release of particles. Since blue mussels are expected to be found in the coastal intertidal zone, 10 particles were released each day from HRBBM grid cells within 1 km of the coast. In total 88,350 particles were released during each monthly spawning event. Particle numbers released at each grid point are not representative of actual mussel spat concentrations which are unknown but are expected to be much larger.

Particles were tracked until they exited the model domain. Any particles passing within a radius of 300 m of the proposed desalination intake were counted and removed from further tracking. Finally, to estimate the percentage of particles with connectivity to an intake pipe with a potential entrainment radius of 25 m, the proportion of particles released during each monthly spawning event with connectivity to within 300 m of the intake was downscaled by adjusting for the reduced cross-sectional area of the entrainment zone (i.e., $\pi 25^2/\pi 300^2$).

3. RESULTS: MODEL VALIDATION

This section provides a comparison of measured and modelled parameters.

3.1. Sea surface height

Sea level variations at the mooring sites were dominated by the tides with amplitudes up to 1.5 m (Figure 8 and Figure 9). The model performed well and reproduced both the phase and amplitude of the tidal variations with a bias of < 0.01 cm, RMS < 8 cm and $r^2 \geq 0.96$.

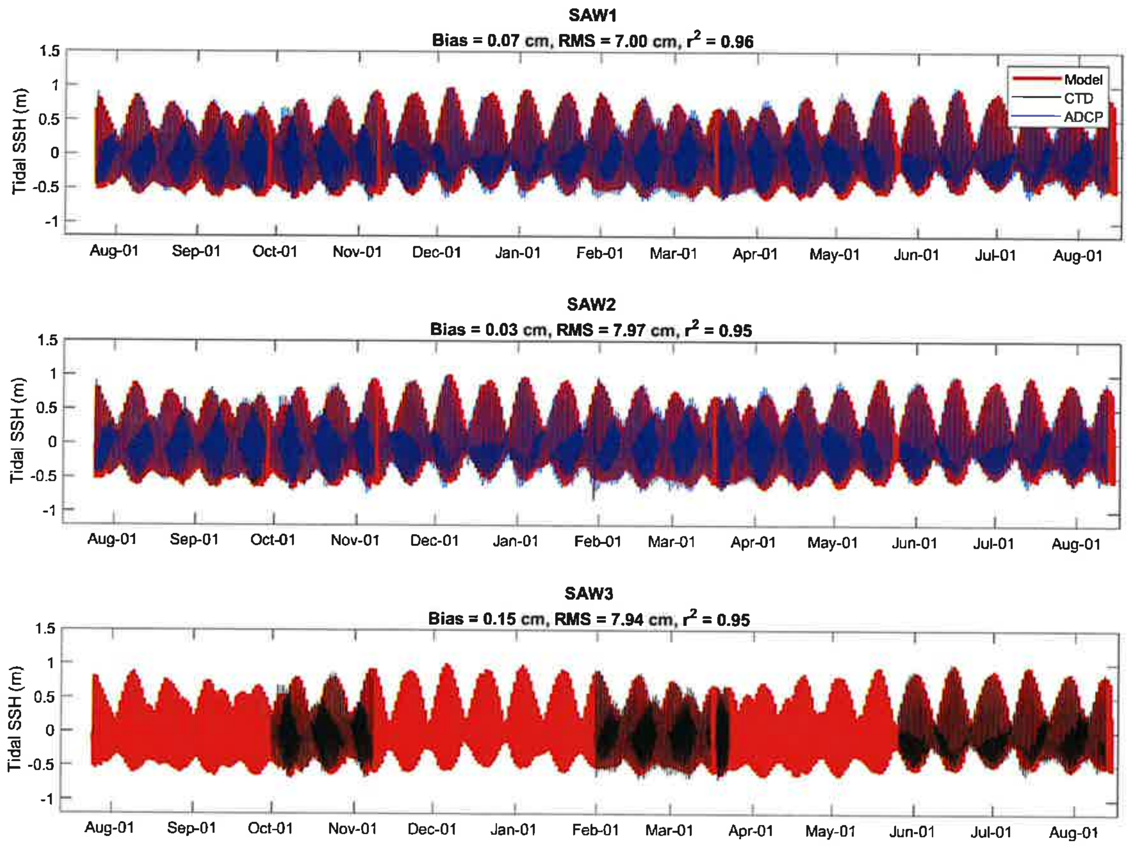

Figure 8. Comparison of measured and modelled Sea Surface Height (SSH, m) at the SAW1, SAW2 and SAW3 moorings.

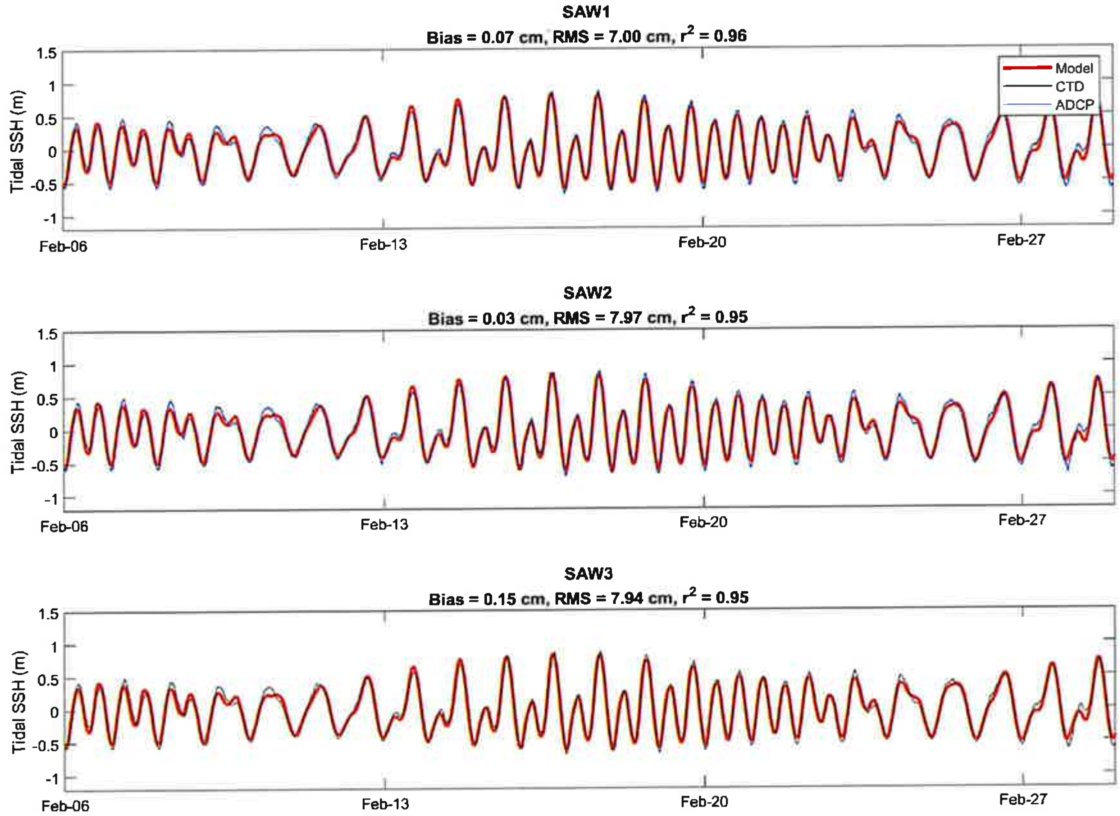

Figure 9. A closer comparison of the measured and modelled Sea Surface Height (SSH, m) at the SAW1, SAW2 and SAW3 moorings (shown in Figure 8) demonstrating the spring-neap tide cycle for the period 6 to 27 February 2022.

Removal of the tidal signal using the Thompson (1983) low-pass filter revealed the low-frequency variability in sea surface height (Figure 10). Unlike tidal fluctuations, which are generally predictable, lower frequency variations in sea surface height are driven by a complex combination of local and remote wind forcing associated with passing atmospheric high- and low-pressure systems referred to as the 'weather-band'. Sea level variations with amplitudes of up to 50 cm measured over periods of 3-20 days were reproduced well by the model, with a bias of ≤ 0.15 cm, RMS < 8 cm and $r^2 \geq 0.94$. This result indicated that the model had a strong capability for simulating the dynamics that influenced sea surface height.

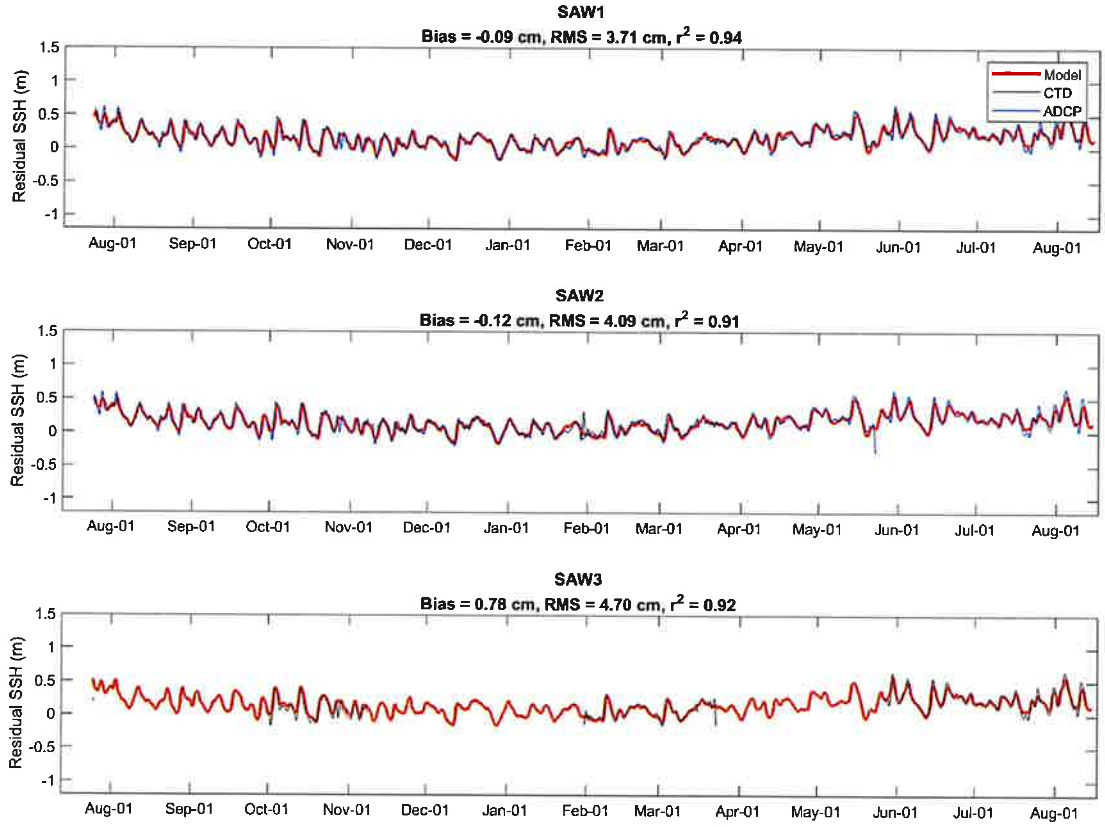

Figure 10. Comparison of measured and modelled low-pass-filtered Sea Surface Height (SSH) (m) at the SAW1, SAW2 and SAW3 moorings.

3.2. Currents

A comparison of the measured and modelled, depth-averaged tidal currents resolved along the principal axis of observation (i.e., major current direction) are shown in Figure 11 and Figure 12. Tidal currents with amplitudes up to approximately 0.3 m/s and 0.2 m/s were measured at the SAW1 and SAW2 moorings, respectively. The principal axis was aligned to the east/west (with positive values to the east) at the SAW1 mooring and the northeast/southwest (with positive vales to the northeast) at the SAW2 mooring. Model agreement was very good for tidal currents at the SAW2 mooring, with an RMS error = 0.039 m/s (approximately 1/10 of the tidal signal) and r^2 =0.70. Model agreement was slightly less at the SAW1 mooring with an RMS error = 0.075 m/s and r^2 =0.56. Histograms show the model to be in good agreement with the observed current speeds at both mooring locations (Figure 13), particularly during periods of lower current speeds. The model slightly over-predicted maximum current speeds at SAW1 by up to 0.1 m/s, particularly during spring tides when currents were directed to the west (Figure 12). At both mooring locations the tidal signals fell to close to zero velocity every 14 days during the 'dodge' tide (a neap tide with minimal rise and fall over the course of ~2-3 days) as expected for a tidal signal that is dominated by M2 and S2 semi-diurnal components (Figure 12).

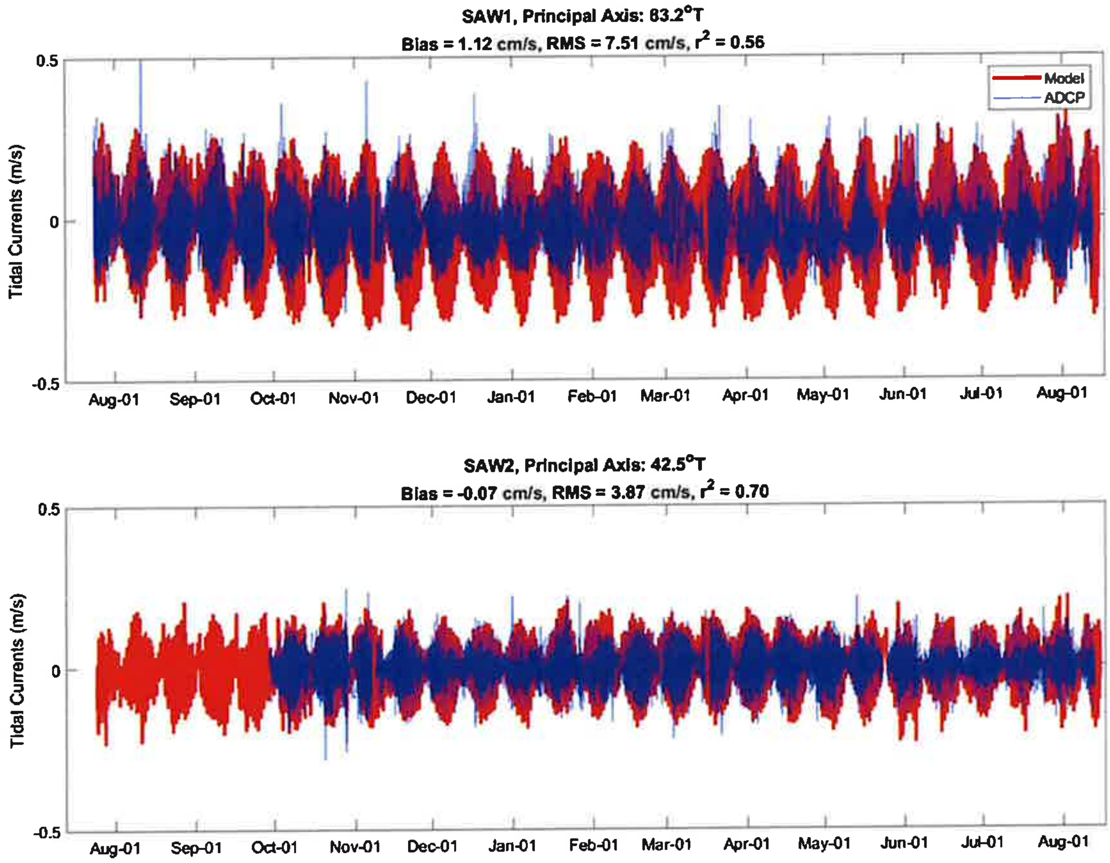

Figure 11. Comparison of the measured and modelled depth-averaged velocity (m/s) resolved along the principal axis at the SAW1and SAW2 moorings. Positive values are to the east at SAW1 and northeast at SAW2.

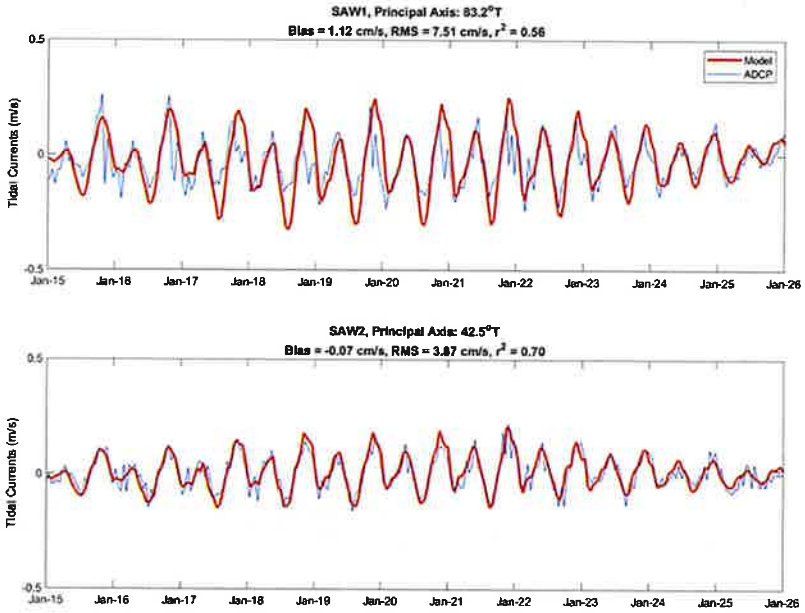

Figure 12. Closer comparison of the measured and modelled depth-averaged velocity (m/s) resolved along the principal axis at the SAW1, SAW2 and SAW3 moorings.

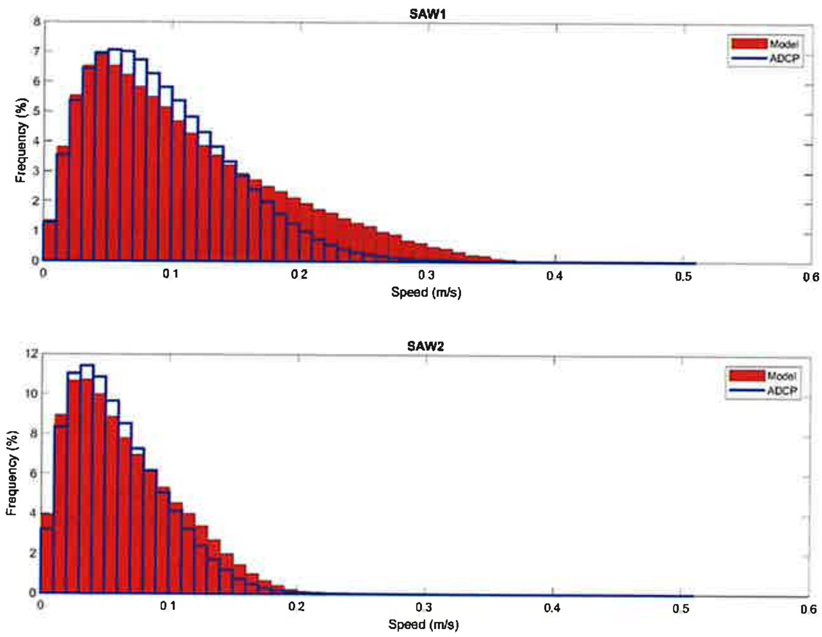

Figure 13. Histogram of current speeds comparing observed values (blue bins) with model (red bins) predictions at the (top panel) SAW1 and bottom panel (SAW2) mooring sites.

Currents driven by weather-band events were weaker than those generated by tides and showed variability over periods of 3-10 days with speeds up to 0.05 m/s measured at the SAW1 mooring and <0.05 m/s at the SAW2 mooring (Figure 14). The model qualitatively reproduced the measured signals but not always the timing. During cooler months the amplitude of the weather band currents were often overpredicted, particularly at the shallower SAW2 mooring. Compared to tidal currents, model agreement for weather-band currents was reduced, as indicated by the RMS errors ≤ 0.03 m/s (approximately 1/2 of the signal) and $r^2 \leq 0.25$. The ADCP measurements were noticeably noisier than the model predictions, which may reflect sub grid-scale processes that the model is not able to reproduce.

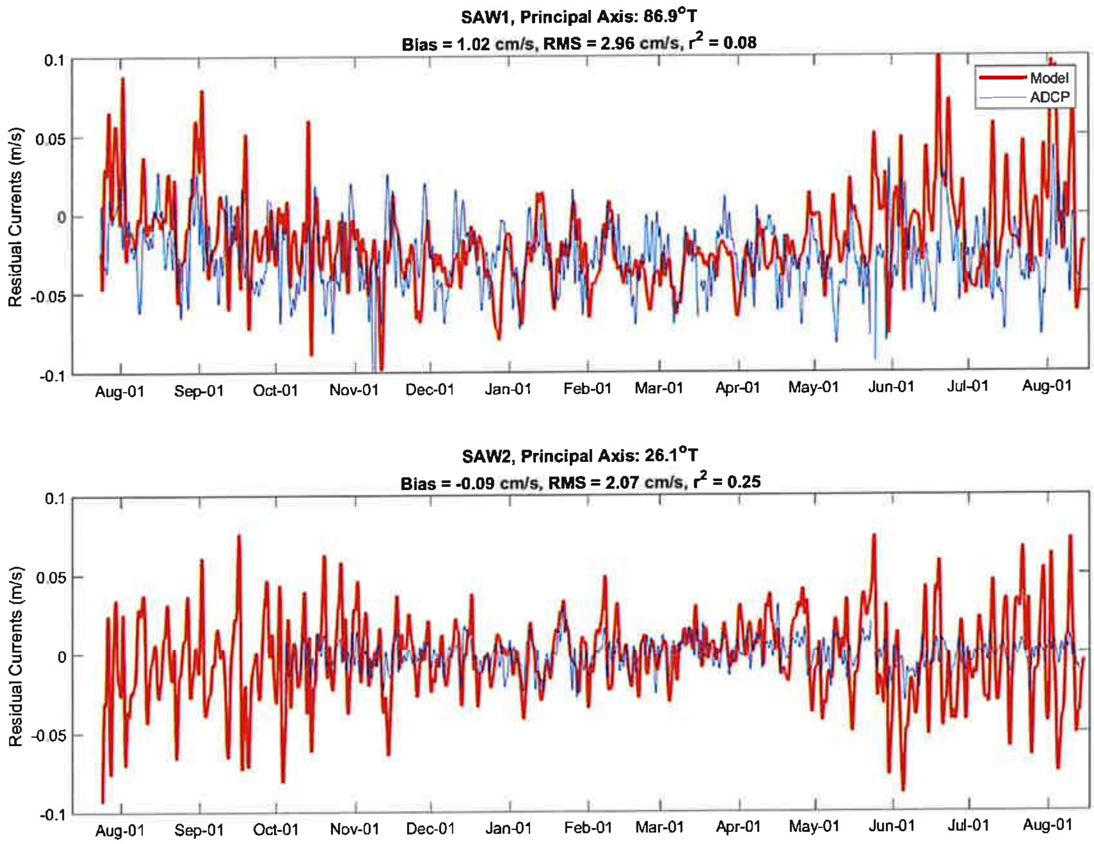

Figure 14. Comparison measured and modelled low-pass-filtered and depth-averaged velocity (m/s) resolved along the principal axis at the SAW1 and SAW2 moorings.

3.3. Temperature

Accurate prediction of temperature and salinity by the hydrodynamic model is important for modelling the density driven circulation. Measured and modelled temperatures ranged from 12 °C in August to 24 °C in February (Figure 15) and were in excellent agreement, as indicated by the small biases ≤ 0.52 °C and RMS errors ≤0.69 °C, and high r^2 values ≥ 0.98.

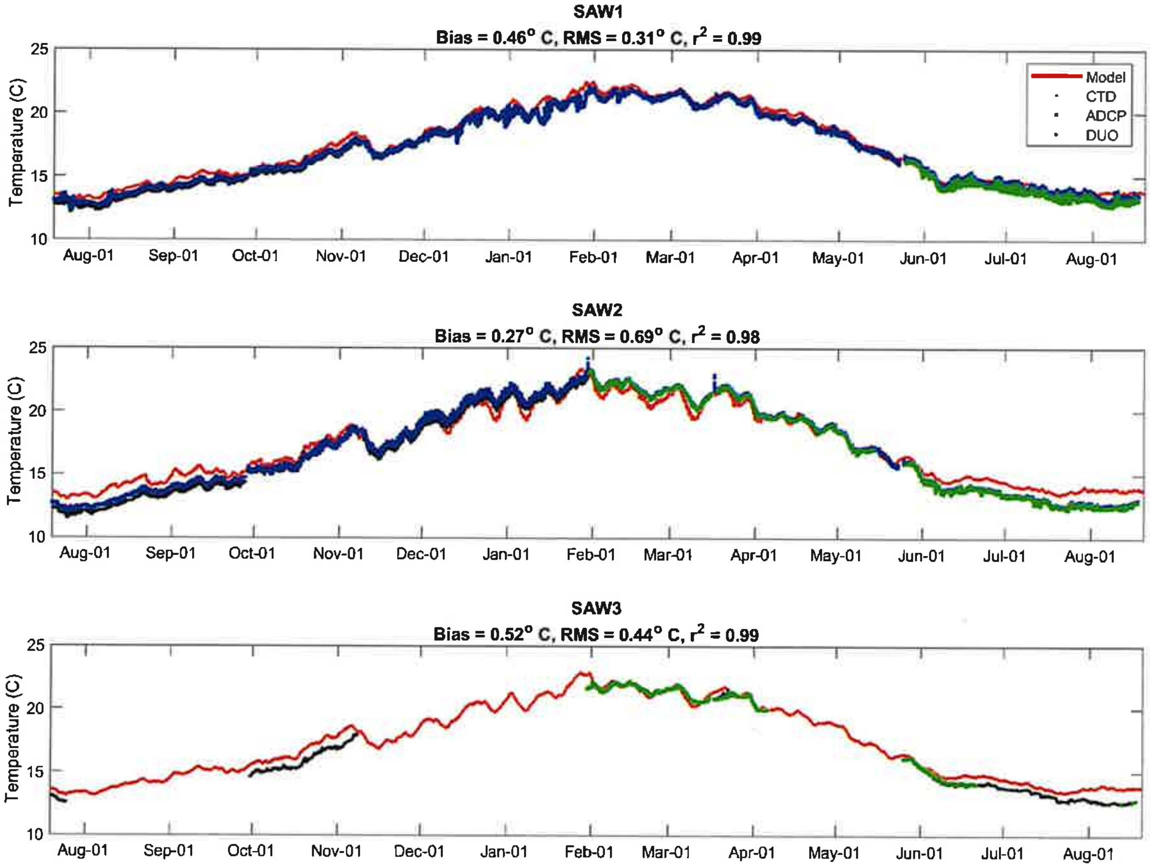

Figure 15. Comparison of the measured and modelled temperature (°C) at the SAW1, SAW2 and SAW3 moorings.

3.4. Salinity

Measured and modelled salinities at each mooring site are shown in Figure 16. The quality of measured data suffered from calibration and fouling issues, particularly at the SAW3 mooring site. The errors in salinity were in part managed by applying calibration corrections (Table 2) and adjusting for salinity drifts. Following adjustments and the removal of erroneous measurements, the model showed reasonable agreement with the model at the SAW1 and SAW2 moorings, as indicated by biases = 0.06 PSU, RMS errors <0.4 PSU and $r^2 \geq 0.56$. The comparison was less favourable at the SAW3 mooring where the quality of measurements returned was questionable.

Measured salinities at the SAW1 ranged between a minimum (Smin) of 35.82 PSU and maximum (Smax) of 37.28 PSU with an average value (Savg) of 36.23 PSU. The observed annual range was 1.46 PSU and the ambient salinity varied by 4% ([Smax-Smin]/Savg) between the maximum and minimum values. During warmer months, salinity variations of between approximately 0.1 and 0.5 PSU were observed across shorter timescales of hours to weeks, respectively (Figure 17). Both the annual range and observed salinities during warmer months were underpredicted by the model following an intense rain event which occurred in the region on 22-February 2022.

In a comparison with the Port Lincoln automated weather station (PL-AWS), the NCEP Climate Forecast System Reanalysis v.2 (CFSRv2) freshwater flux for this event over-estimated the local rainfall by more than 100% (Figure 18). While most events are well represented by the CFSRv2 grid resolution (~20km), intense precipitation events can be much patchier and can be overestimated by atmospheric models (Davis et al., 2006). In this case, the over-estimate of freshwater flux by CFSRv2 extended over much of Spencer Gulf and probably contributed to the underestimation of salinity for a considerable period. Adjustments for one-off events are not systematic and cannot be applied to the 5-year hindcasts. Because of this, and due to the lack of precipitation measurements over most of the TGM parent grid, the freshwater flux cannot be adjusted to accommodate unpredicted variations in rainfall.

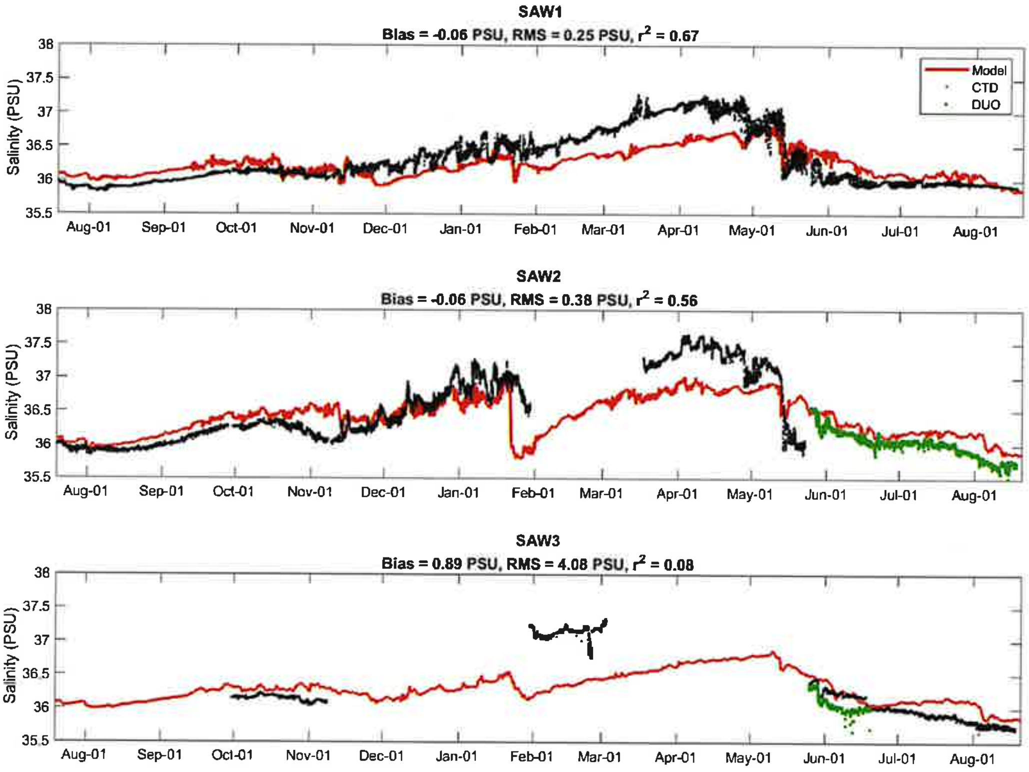

Figure 16. Comparison of the measured and modelled salinity (PSU) at the SAW1, SAW2 and SAW3 moorings.

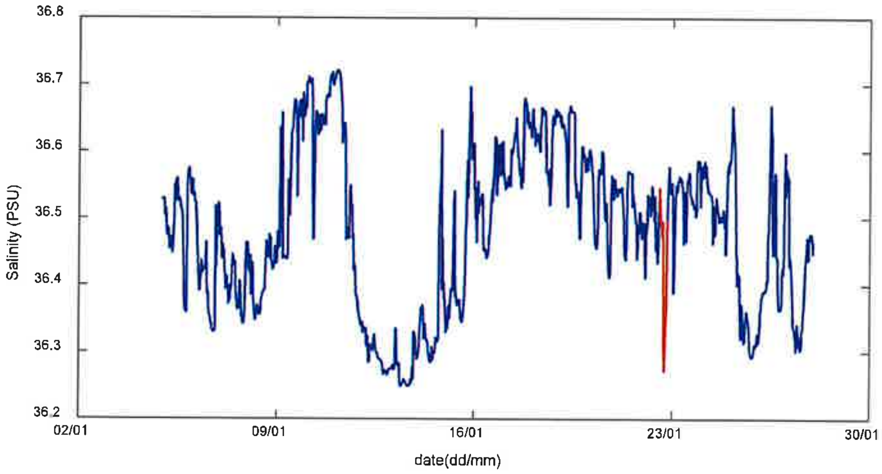

Figure 17. Bottom measurements of salinity (PSU) taken at SAW1 in January 2022. Measurements were made at 30-minute intervals. The salinity decrease on 22-January (red highlight) corresponds with a strong localised precipitation event.

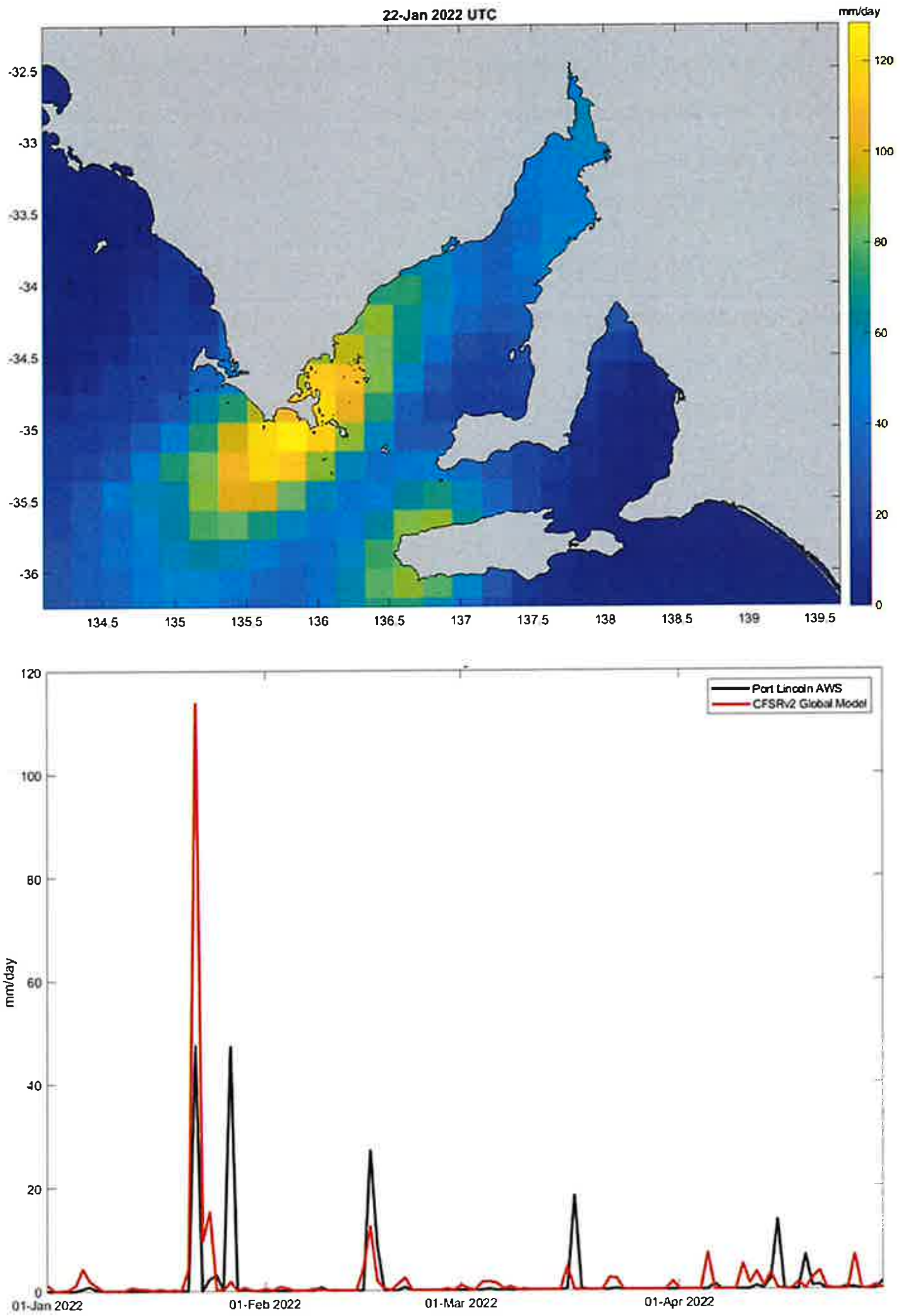

Figure 18. Measured and modelled freshwater fluxes. (Top) Distribution of precipitation (mm/day) in atmospheric model used to force the hydrodynamic models on 22-January 2022. (Bottom) Comparison of the precipitation (mm/day) measured at the Port Lincoln automated weather station (AWS) between 1-January and 1-April 2002 with the atmospheric model.

4. RESULTS: BRINE OUTFALL SCENARIOS

Figure 19 shows the seasonal circulation patterns averaged over the five-year model simulation without desalination. The observed patterns provide a climatological picture of the region's long-term net flow and are expected to be important to the flushing and transport of passive tracers and, potentially, brine discharges and planktonic larvae.

Seawater circulation is characterised by flows which enter from the offshore region into the centre of the embayments and leave against both the north and south coasts. The penetration of these flows into embayments surrounding Port Lincoln is typically weak but increases in winter (when it is directed towards Louth Bay) relative to other seasons. In the embayments there are two main flow regimes. The first involves flows in and around Boston and Proper Bay. Flows generally enter Boston Bay from the north of Boston Island, setting up a clockwise circulation in northern Boston Bay, with waters exiting beside Point Boston, and an anti-clockwise circulation in southern Boston Bay, with outflow south of Boston Island. This changes in summer, when inflow from south of Boston Island results in a clockwise circulation throughout Boston Bay. Water enters centrally into shallow Proper Bay and exits along either the north coast, past Billy Lights Point, or the south coast, toward Cape Donington. Within Proper Bay, circulation is variable being dependant on wind direction, strength and channelling. A weak persistent anticyclonic gyre is centred a few kilometres offshore to the northeast of Cape Donington. The second main flow regime describes the circulation in Louth Bay. Water predominantly flows into Louth Bay past Point Boston, south of Louth Island, and moves northwards along the coast, into and past Peake Bay, before exiting past Point Bollingbroke. In winter, though, water enters north of Louth Island and flows south along the coast to exit past Point Boston. A small, clockwise, cyclonic gyre persists year-round to the north of Louth Island. Other permanent circulation features predicted by the model included stronger year-round flows directed northwards of Point Bollingbroke and eastwards near Cape Donington.

To examine and compare the effect of hydrodynamics on the far-field dispersal of desalination brine discharges from different outfall locations, 5-year hydrodynamic model hindcast simulations with and without desalination outfalls were undertaken. Figure 20 shows a snapshot of the modelled bottom salinity predicted on March 17, 2017, showing discharges from each outfall site relative to the model run without desalination. A full animation of the 5-year hindcast is provided in Appendix 3. Comparison of model predictions with and without desalination were used to estimate the far-field increases in salinity (i.e., anomalies) across a range of temporal and spatial scales and are presented for each outfall location as follows.

Maps of the seasonally-averaged maximum salinity anomalies are shown in Figure 21, Figure 24, Figure 27, Figure 30 and Figure 33. Using the three-day averaged results over the 5-year hindcast, seasonal-average maps were calculated by averaging the maximum anomaly predicted at each model grid point over the calendar months corresponding with the Australian seasons: Summer (December, January and February), Autumn (March, April and May), Winter (June, July and August) and Spring (September, October and November). Maximum anomalies provide a 'worst case' estimate of the predicted salinity increase across the water-column. Seasonal-averaging filters out positive and negative anomalies associated with dynamically driven changes in the circulation resulting from the injection of brine into the model, while preserving the positive anomalies associated with the brine discharge itself. The maps provide a conservative estimate of the spatial distribution (i.e., footprint) of long-term salinity increases associated with outfalls and the seasonal circulation patterns shown in Figure 19.

The use of three-day averaged hindcasts filters out daily tides and transient anomalies (those lasting less than three days). An indication of the variability and magnitude of salinity anomalies at hourly timescales at the virtual monitoring stations and mooring sites (see locations in Figure 7) is provided by the 5-year hourly time-series of the water column mean and maximum salinity anomalies shown in Figure 22, Figure 25, Figure 28, Figure 31 and Figure 34. For stations and sites located within the footprint of the salinity anomalies shown in the seasonally-averaged maps, positive anomalies provide an estimate of the maximum salinity increases expected in the far-field at hourly timescales. At distances beyond the footprint of the positive salinity anomalies, the predicted positive and negative hourly anomalies are due to dynamic differences in the model circulation between simulations with and without desalination inputs.

To understand the influence of tides on the vertical and horizontal dispersal of brine discharges in the vicinity of the outfalls, lateral transects and vertical profiles of the salinity anomaly modelled during dodge and spring tide conditions are shown in Figure 23, Figure 26, Figure 29, Figure 32 and Figure 35.

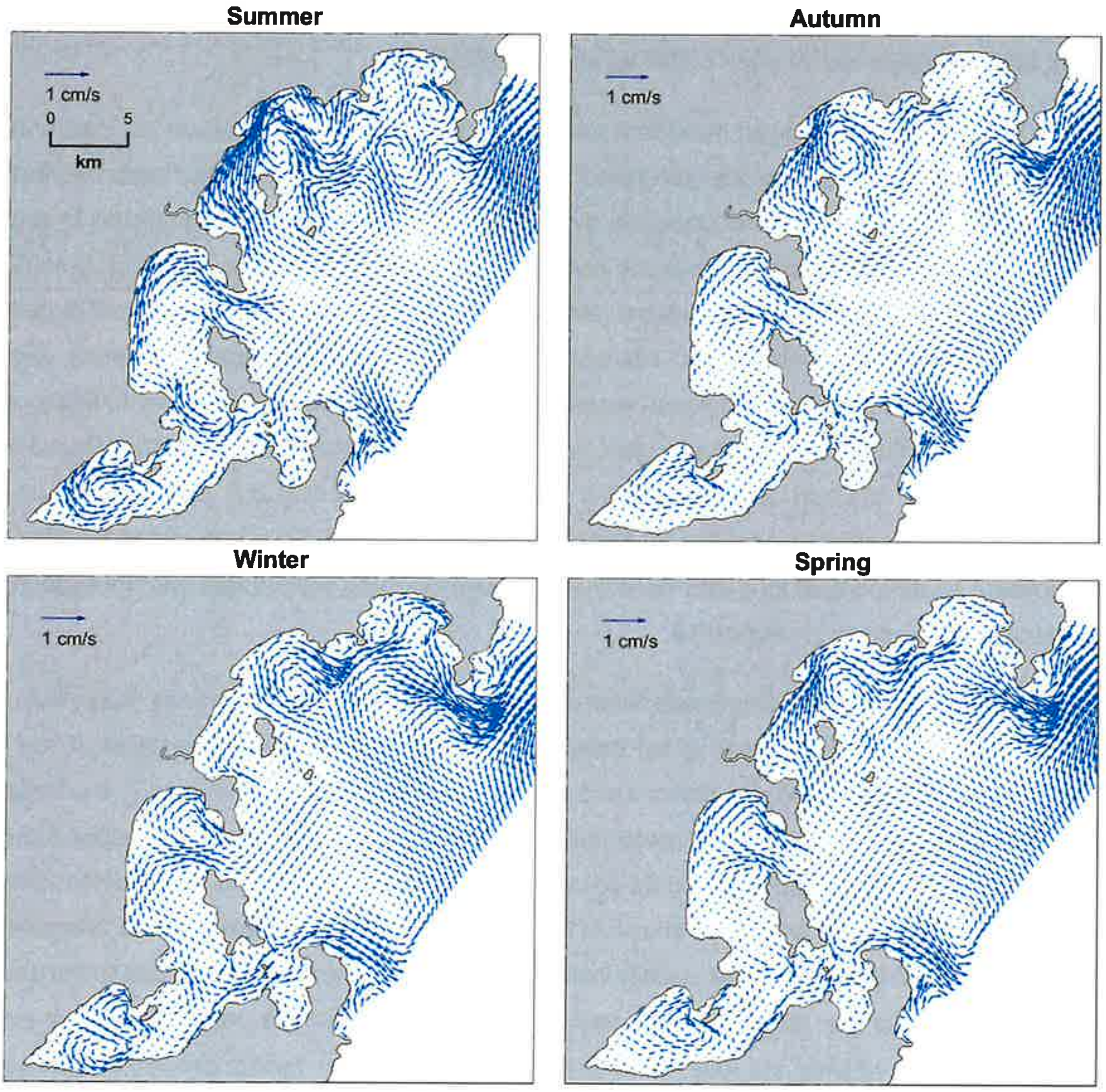

Figure 19. Time and depth averaged seasonal circulation patterns averaged over 5-years.

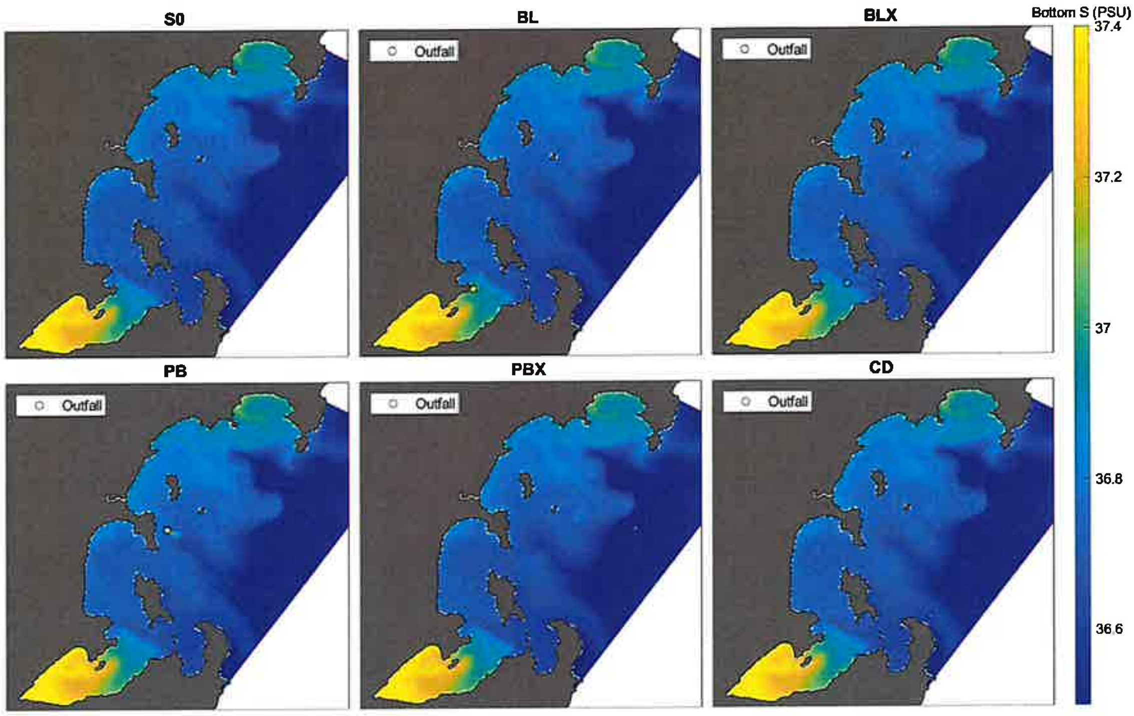

Figure 20. Snapshot of the bottom salinity on March 17, 2017, showing discharges from each outfall site relative to the default model run without desalination. SO = simulation without desalination, BL = Billy Lights Point, BLX = Billy Lights Point-extension, PB = Point Boston, PBX = Point Boston-extension, CD = Cape Donington.

4.1. Billy Lights Point - inshore

The spatial distribution of seasonally averaged maximum salinity anomalies calculated from 5-years of model predictions for the Billy Lights Point inshore outfall are shown in Figure 21. Seasonally-averaged maximum salinity anomalies decreased from 0.76 PSU in the bottom layer of the model grid cell corresponding with the outfall location to 0.26 PSU and 0.07 PSU (Figure 21,Table 4) at distances of 0.5 and 1 km from the outfall. Assuming an average, ambient salinity of 36.2 PSU these increases correspond to salinity changes of ≤2%, ≤0.7% and ≤0.3% in the ambient salinity, respectively. The dispersion of salinity was influenced by the long-term net flow (Figure 19). For example, in winter, salinity increases were largely restricted to Proper Bay and Billy Lights Point. In summer, flows directed north along the shore of Boston Bay were predicted to disperse brine throughout Boston Bay and offshore past Point Boston and Boston Island. Smaller anomalies of

≤0.05 (<0.15% of the ambient salinity) were predicted up to 5 km from the outfall and encroached on the intake year-round.

Figure 22 shows the far-field increases in salinity predicted at hourly intervals at the virtual monitoring stations and mooring sites (shown in Figure 7). Hourly anomaly values never exceeded 0.4 PSU and were typically <0.2 PSU (<0.6% the ambient salinity). During cooler months anomalies were effectively zero. Consistent with the seasonally averaged maps shown in Figure 21, the largest anomalies were consistently predicted to occur at locations within 5 km of the outfall (e.g., V2, SAW1, SAW3). At greater distances (e.g., virtual monitoring station V7), anomalies of up to ~0.2 PSU occurred at various depths across the water column due to dynamical changes resulting from the injection of brine into the model rather than from direct connectivity with the brine discharge. Mean hourly anomalies averaged across the 5-year hindcast (highlighted to the right of each timeseries in Figure 22) ranged from <0.01 to 0.035 PSU (i.e., always <0.1% of the ambient salinity), and were relatively steady on annual timescales.

At a distance of approximately 300 m from the outfall (a map showing the location of the measurement point relative to the outfalls is provided in Appendix 1, Figure 42), maximum salinity anomalies of 0.55 PSU (1.5% of the ambient salinity) were predicted to occur intermittently on the seafloor (Figure 23) and were modulated by the tides. In the vertical plane, anomalies were mixed towards the surface during spring tides but were largely restricted to the bottom 2 m during dodge tides. Lateral transects (see Appendix 1 for the transect locations) of the salinity anomaly averaged over 3-days indicated increased bottom salinities of >0.1 PSU extended approximately 600 m downslope from the outfall, consistent with increased density of the brine discharge. Slightly increased salinity anomalies were predicted on the seafloor during the dodge tide relative to the spring tide.

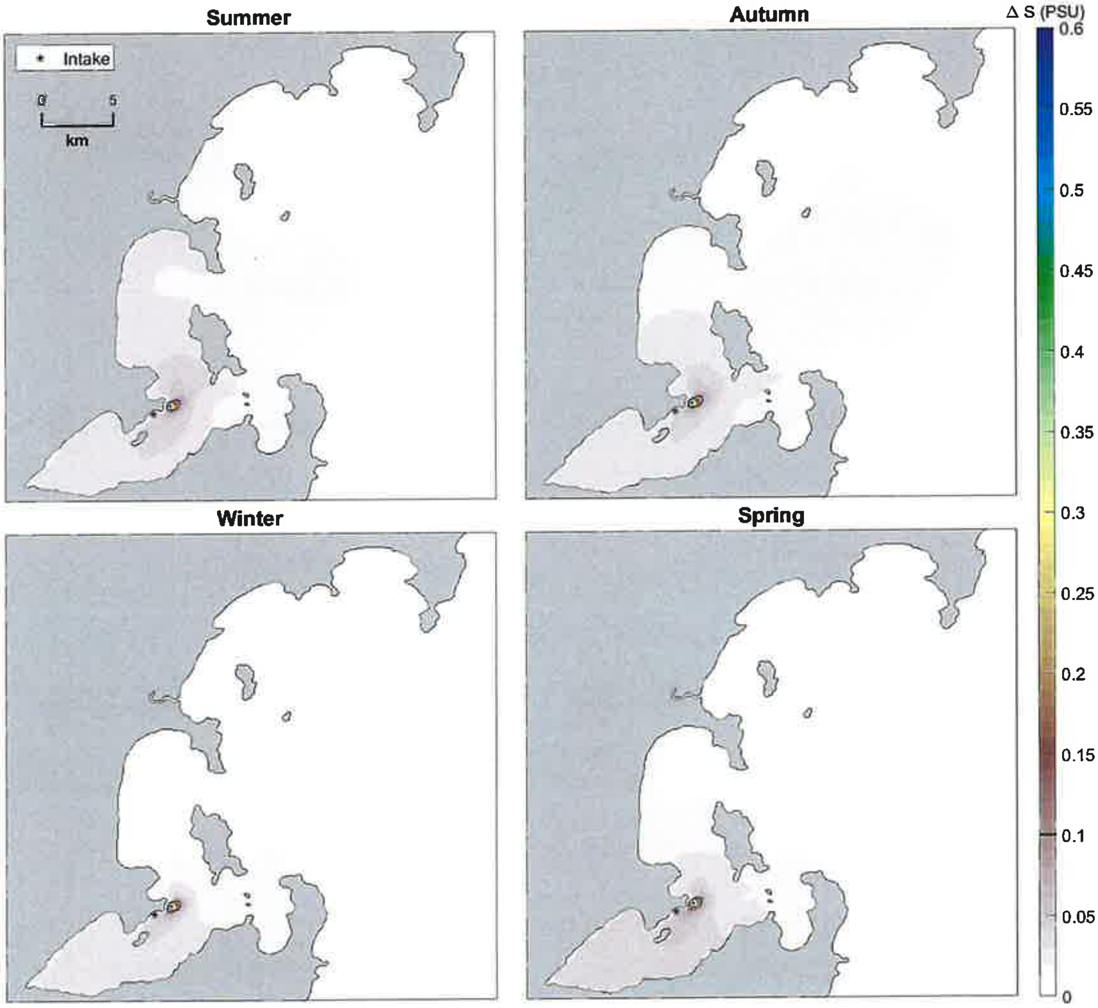

Figure 21. Maps of the seasonally-averaged maximum salinity anomaly for the Billy Lights Point inshore outfall. The map limits are set to 0.6 PSU for visualisation purposes and actual anomalies may exceed 0.6 PSU at the grid cell corresponding with the outfall site.

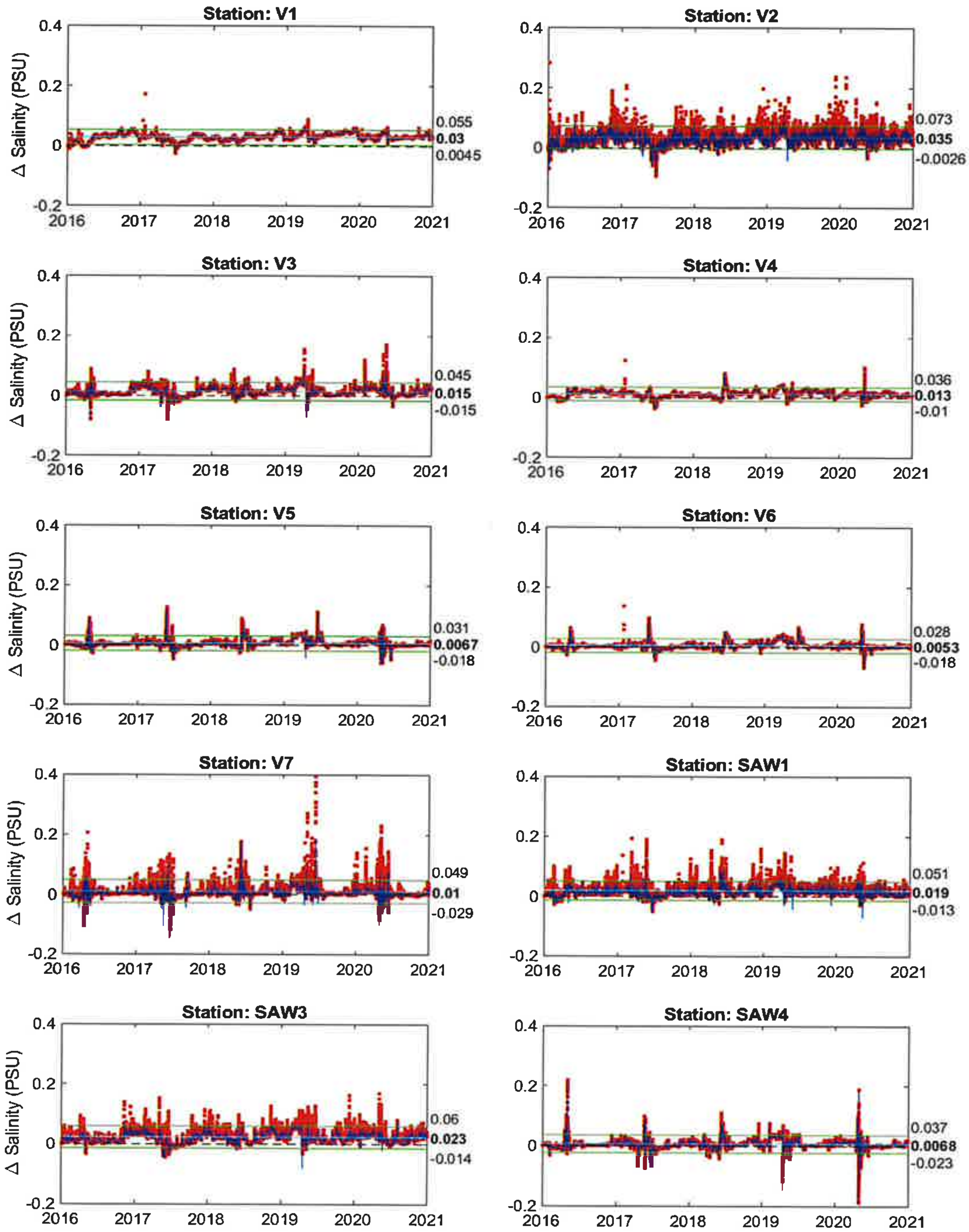

Figure 22. Far-field salinity anomalies predicted every hour over the 5-years hindcast at multiple locations for the Billy Lights Point inshore outfall. Blue line is the depth averaged anomaly. Red marker the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Figure 7 provides a map showing the corresponding locations.

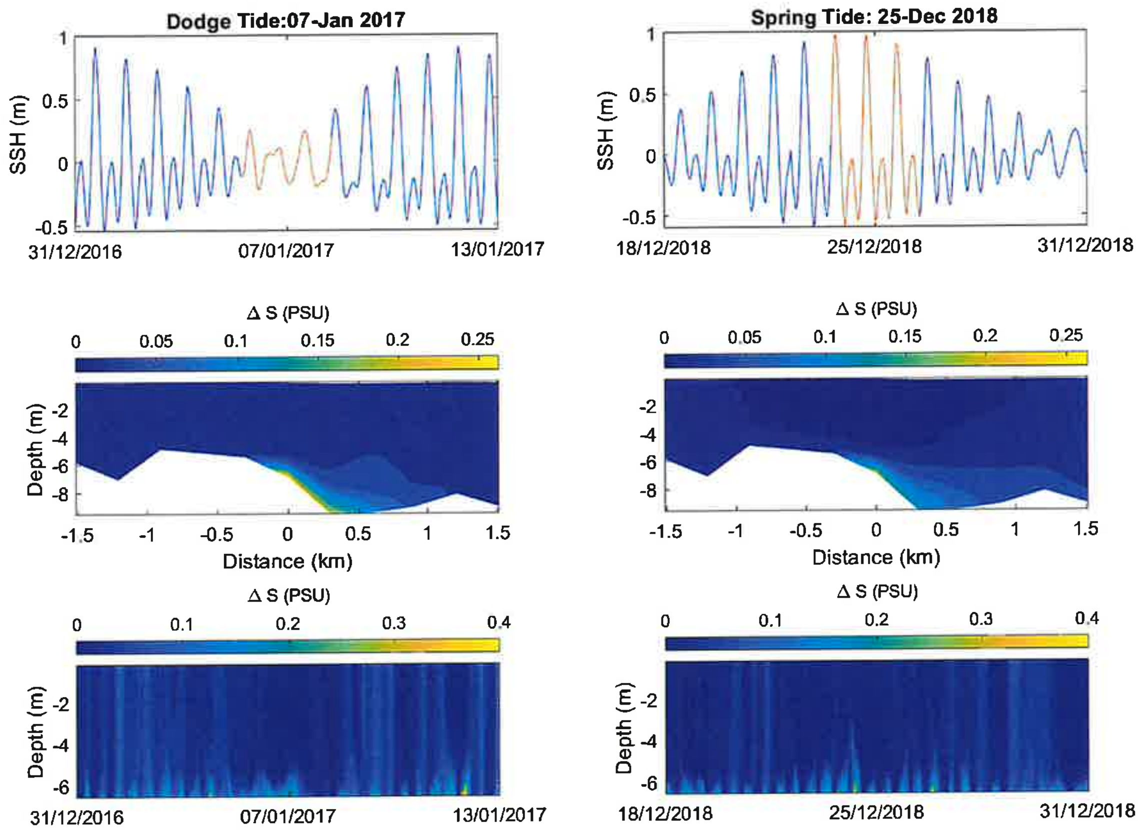

Figure 23. Snapshots of the salinity anomalies predicted in the vicinity of the Billy Lights Point inshore outfall during a (left panels) dodge and (right panels) spring tide. Top panels – 14-day timeseries of sea surface height (SSH, m) 300 m from the outfall. Middle panels – lateral transect of the 3-day average salinity anomaly (PSU) centred 300m from the outfall and corresponding with the SSH highlighted in red. Bottom panels – hourly changes in the salinity anomaly throughout the water column 300 m from the outfall. Figure 42 in the Appendix provides a map showing the locations corresponding with the plotted transect and timeseries. The map limits are set for visualisation purposes and actual anomalies may exceed these limits.

4.2. Billy Lights Point - extension

The spatial distribution of seasonally averaged maximum salinity anomalies calculated from 5-years of model predictions for the Billy Lights Point extension outfall are shown in Figure 24. Salinity anomalies decreased from 0.43 PSU in the bottom layer of the model grid cell corresponding with the outfall location to 0.17 PSU and 0.06 PSU (Figure 24,Table 4) at distances of 0.5 and 1 km from the outfall. These increases correspond to salinity changes of ≤1.2%, ≤0.5% and ≤0.2% in the ambient salinity, respectively. Smaller anomalies of ≤0.5 PSU were predicted up to 20 km from the outfall and, except for winter, showed connectivity with the intake and Proper Bay. The observed distribution of salinity anomalies can again be explained by seasonal circulation patterns (Figure 19). In winter, salinity increases were dispersed offshore with the offshore outflow of water on the southern side of Boston Island. In summer, coastal flows were predicted to disperse brine into Proper Bay and northward along the coast of Boston Bay.

Figure 25 shows the far-field increases in salinity predicted at hourly intervals at the virtual monitoring stations and mooring sites (shown in Figure 7). Maximum anomalies were predicted to be greater during warmer months and rarely exceeded 0.2 PSU at stations within 5 km of the outfall (e.g., V2, SAW1, SAW2). During cooler months, anomalies typically reduced to zero. Mean anomalies averaged across the 5-year hindcast ranged from <0.01 to 0.02 PSU (<0.1% of the ambient salinity) and were relatively steady on annual timescales.

The maximum salinity anomaly within 300m of the outfall was predicted to reach up to 0.37 PSU at times on the bottom (Figure 26) and was modulated by the tide. In the vertical plane, bottom anomalies associated with the discharge were predicted to be mixed towards the surface and diluted by the tides. Lateral transects of the salinity anomaly averaged over 3 days corresponding to dodge and spring tides showed anomalies between 0.1 and 0.37 PSU during dodge tides and spring tides, respectively. Anomalies ≥0.1 PSU extended out to approximately 0.6 km from the outfall.

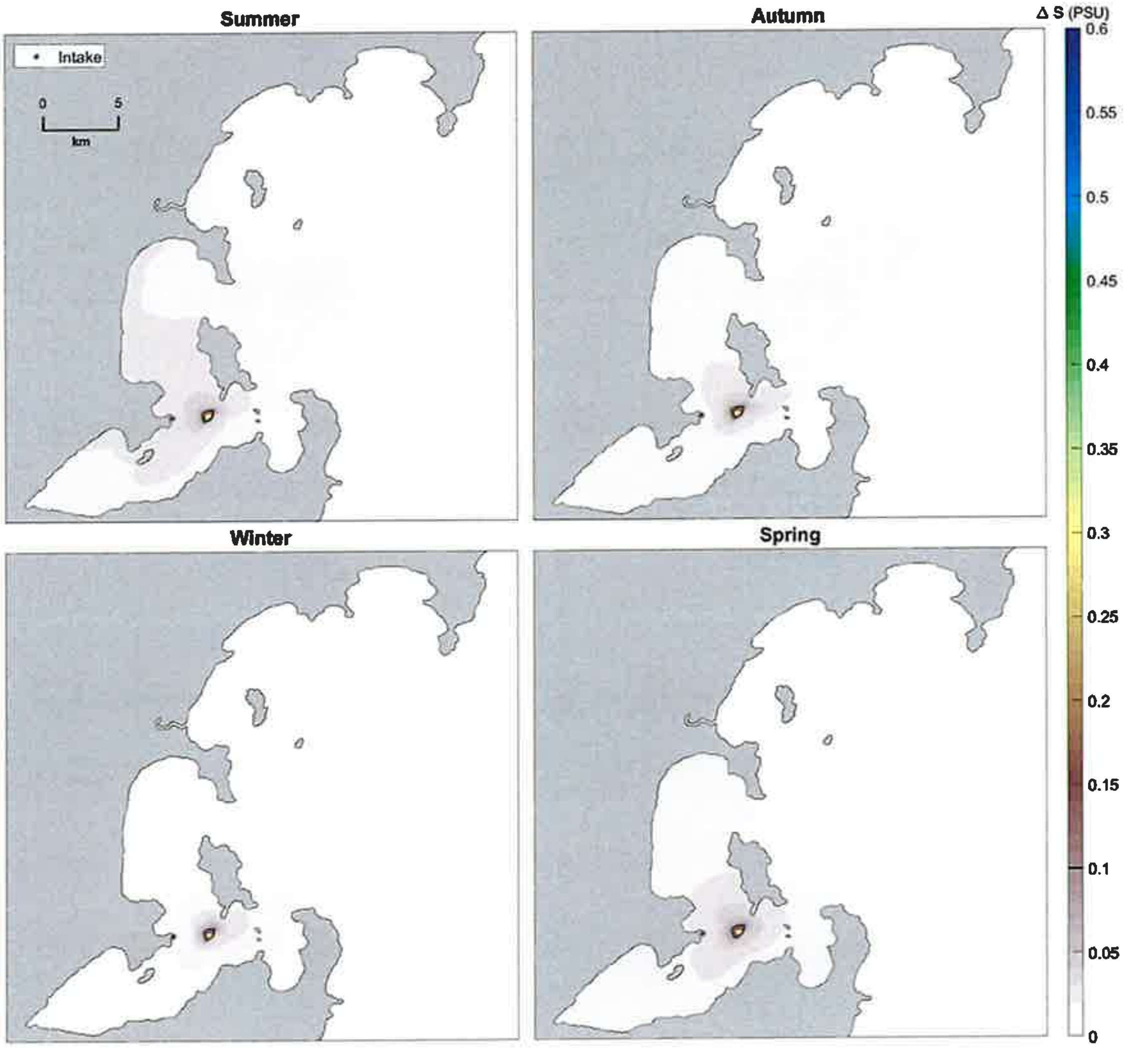

Figure 24. Maps of the seasonally-averaged maximum salinity anomaly for the Billy Lights Point extension outfall. The map limits are set to 0.6 PSU for visualisation purposes and actual anomalies may exceed 0.6 PSU at the grid cell corresponding with the outfall site.

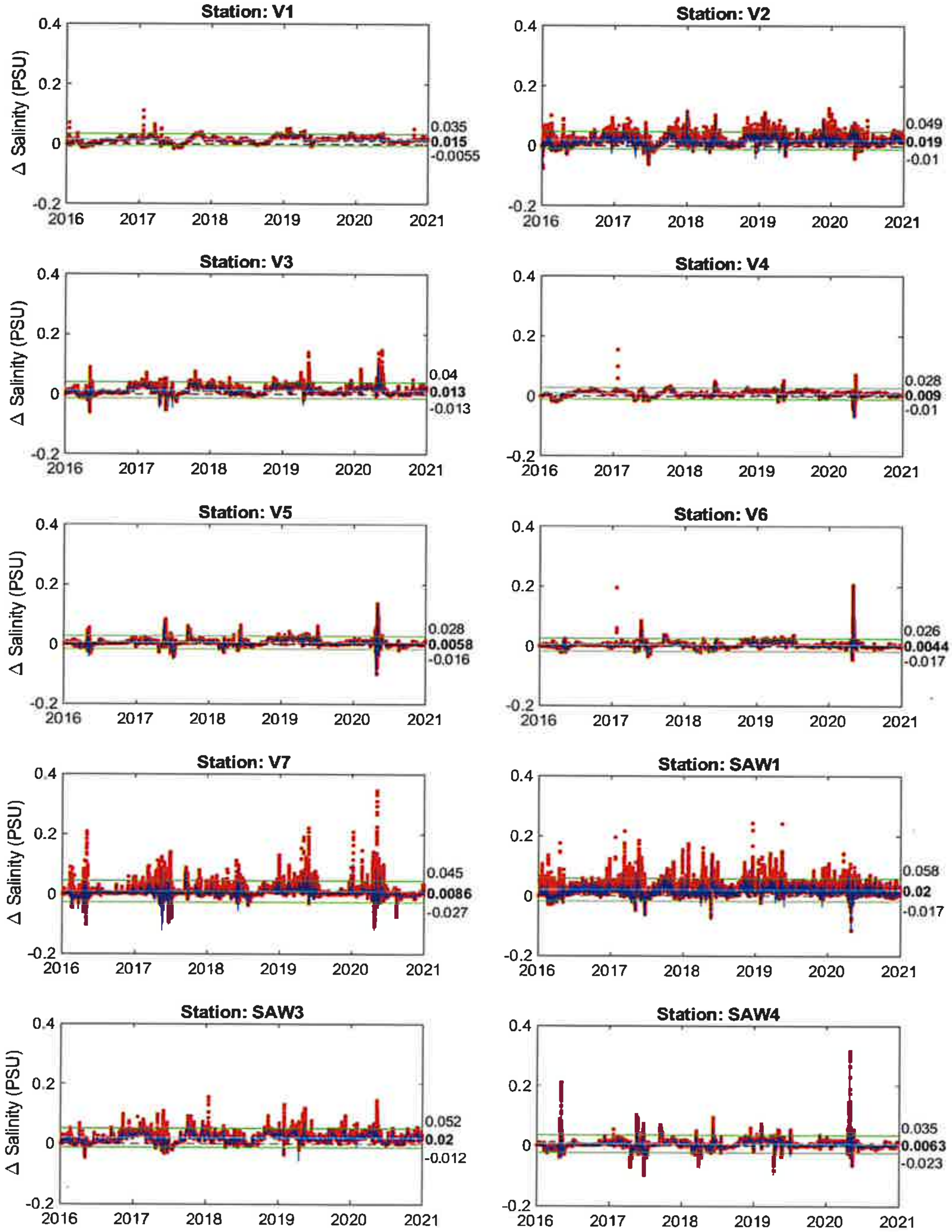

Figure 25. Far-field salinity anomalies predicted every hour over the 5-years hindcast at multiple locations for the Billy Lights Point offshore outfall. Blue line is the depth averaged anomaly. Red marker the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Figure 7 provides a map showing the corresponding locations.

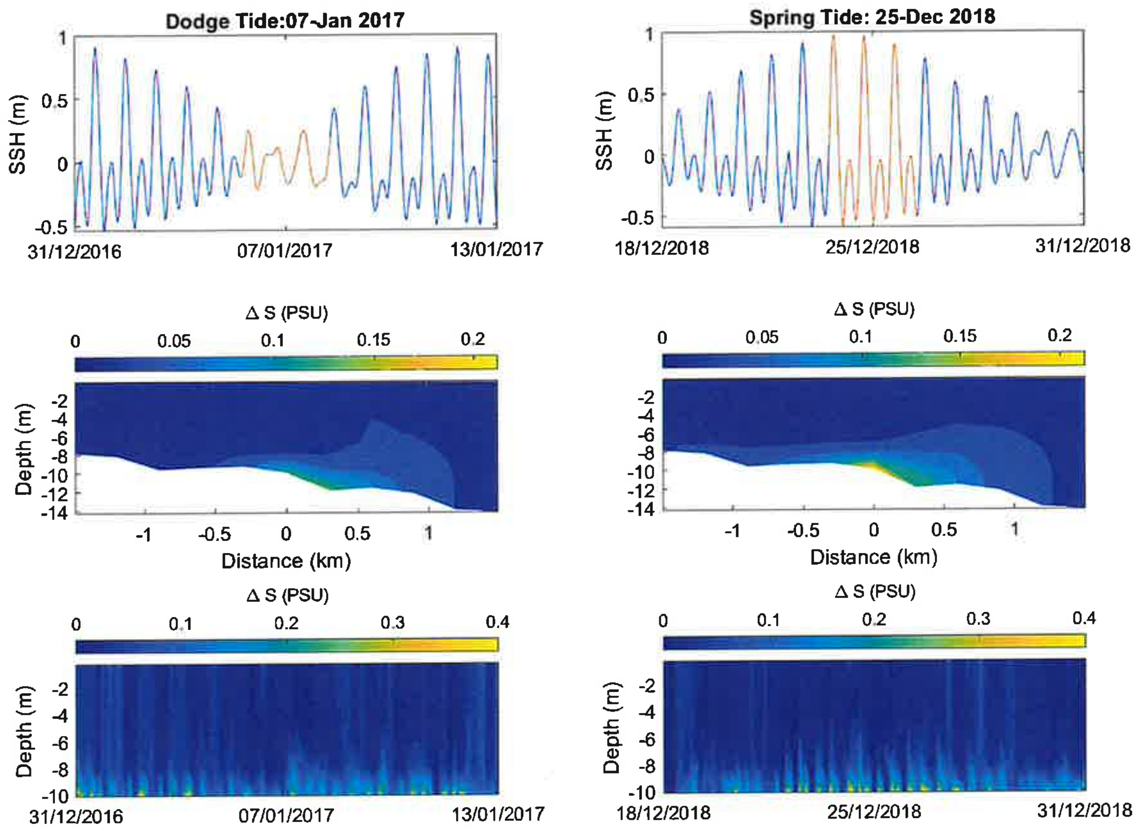

Figure 26. Snapshots of the salinity anomalies predicted in the vicinity of the Billy Lights Point extension outfall during a (left panels) dodge and (right panels) spring tide. Top panels – 14-day timeseries of sea surface height (SSH, m) 300 m from the outfall. Middle panels – lateral transect of the 3-day average salinity anomaly (PSU) centred 300m from the outfall and corresponding with the SSH highlighted in red. Bottom panels – hourly changes in the salinity anomaly throughout the water column 300 m from the outfall. Figure 42 in the Appendix provides a map showing the locations corresponding with the plotted transect and timeseries. The map limits are set for visualisation purposes and actual anomalies may exceed these limits.

4.3. Point Boston - inshore

The spatial distribution of seasonally-averaged maximum salinity anomalies calculated from 5-years of model predictions for the Point Boston inshore outfall are shown in Figure 27. Salinity anomalies decreased from 0.97 PSU in the bottom layer of the model corresponding with the outfall location to 0.44 PSU and 0.1 PSU (Figure 27,Table 4) at distances of 0.5 and 1 km from the outfall. These increases correspond to salinity changes of ≤2.7%, ≤1.2% and ≤0.3% in the ambient salinity.

Smaller anomalies ≤0.05 PSU were predicted to be dispersed northwards along the coast into Louth Bay and Peake Bay in Autumn, consistent with the long-term net flow (Figure 19).

Figure 28 shows the far-field increases in salinity predicted at hourly intervals at the virtual monitoring stations and mooring sites (shown in Figure 7). Maximum anomalies rarely exceeded 0.1 PSU at stations within 5 km of the outfall (e.g., SAW4). At the V7 site located about 10 km offshore from the outfall, anomaly spikes >0.1 PSU predicted each autumn were associated with dynamical changes resulting from the injection of brine into the model and the greater dispersal of the brine plume in autumn (Figure 27) due to changes in the regions seasonal circulation patterns (Figure 19). Mean anomalies averaged across the 5-year hindcast were very small, <0.02 PSU, and anomalies at all sites were steady on annual timescales.

The salinity anomaly within 300m of the outfall reached 0.87 PSU on the bottom during both the dodge and spring tides (Figure 29). In the vertical plane, anomalies >0.4 PSU were largely restricted to the bottom 2 m and were mixed towards the surface on the spring tide. Lateral transects of the salinity anomaly averaged over 3 days showed negligible differences between dodge and spring tides with maximum anomalies ≥0.1 PSU extending out to approximately 0.75 km from the outfall.

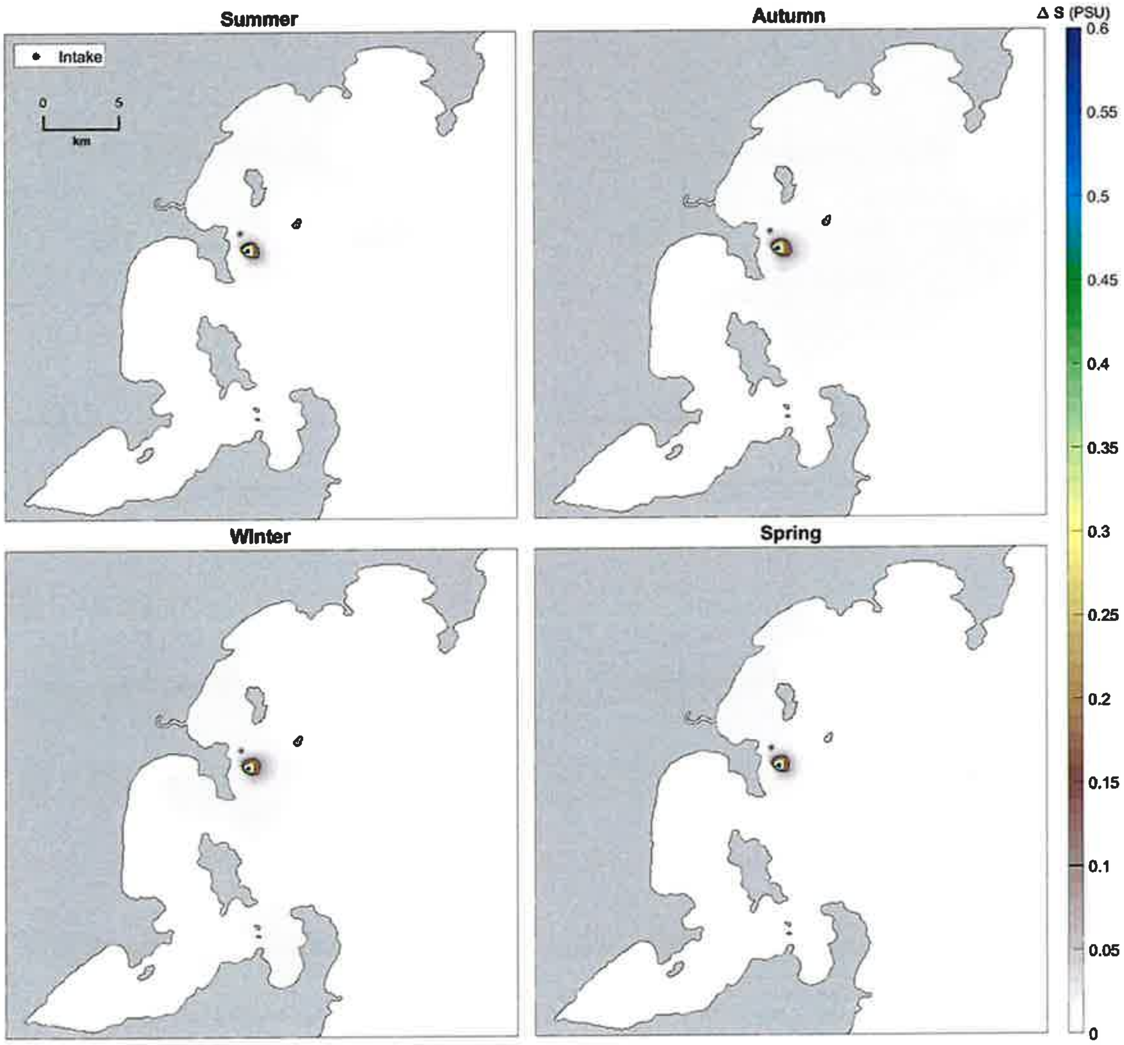

Figure 27. Maps of the seasonally-averaged maximum salinity anomaly for the Point Boston inshore outfall. The map limits are set to 0.6 PSU for visualisation purposes and actual anomalies may exceed 0.6 PSU at the grid cell corresponding with the outfall site.

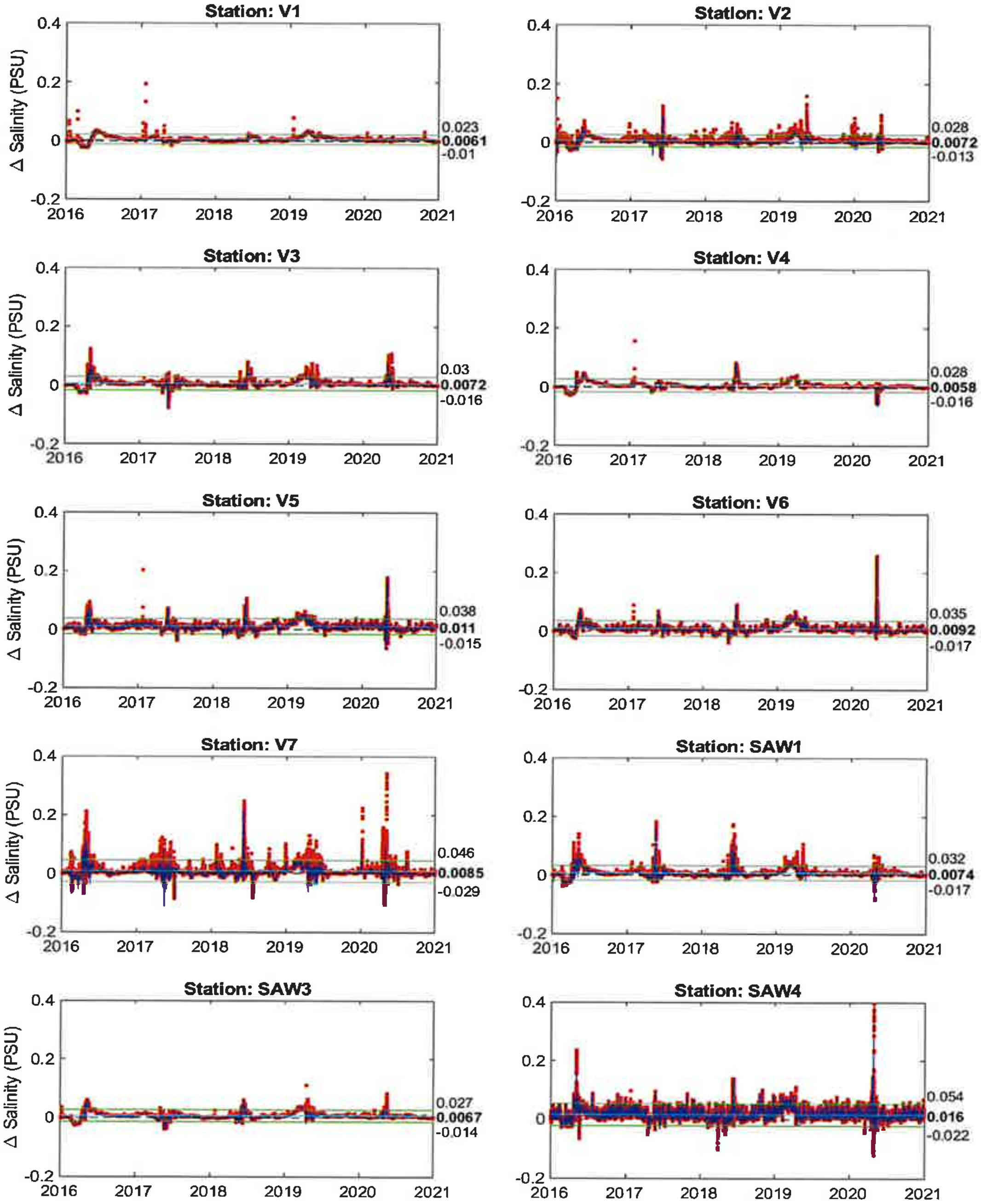

Figure 28. Far-field salinity anomalies predicted every hour over the 5-years hindcast at multiple locations for the Point Boston inshore outfall. Blue line is the depth averaged anomaly. Red marker the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Figure 7 provides a map showing the corresponding locations.

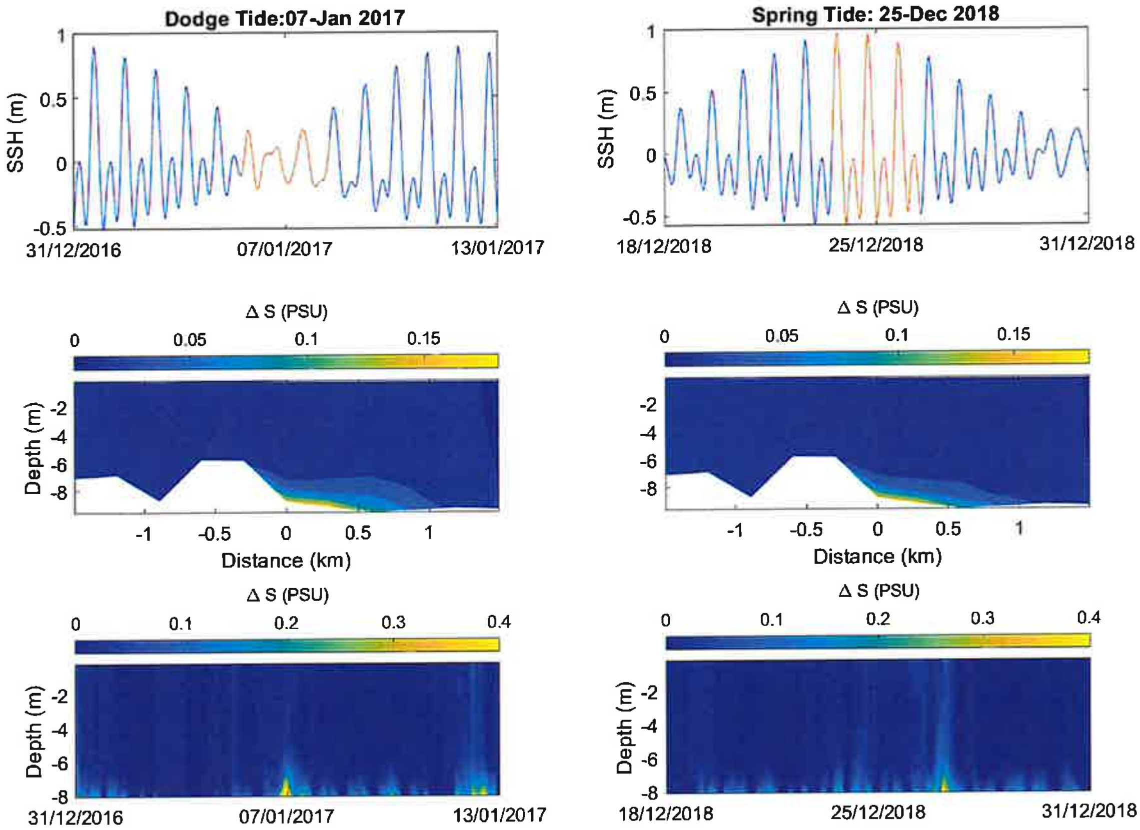

Figure 29. Snapshots of the salinity anomalies predicted in the vicinity of the Point Boston inshore outfall during a (left panels) dodge and (right panels) spring tide. Top panels – 14-day timeseries of sea surface height (SSH, m) 300 m from the outfall. Middle panels – lateral transect of the 3-day average salinity anomaly (PSU) centred 300m from the outfall and corresponding with the SSH highlighted in red. Bottom panels – hourly changes in the salinity anomaly throughout the water column 300 m from the outfall. Figure 42 in the Appendix provides a map showing the locations corresponding with the plotted transect and timeseries. The map limits are set for visualisation purposes and actual anomalies may exceed these limits.

4.4. Point Boston - extension

The spatial distribution of seasonally-averaged maximum salinity anomalies calculated from 5-years of model predictions for the Point Boston extension outfall are shown in Figure 30. Salinity anomalies decreased from 0.36 PSU in the bottom layer of the model grid cell corresponding with the outfall location to 0.16 PSU and 0.08 PSU (Figure 30, Table 4) at distances of 0.5 and 1 km from the outfall. These increases correspond to salinity changes of ≤1%, ≤0.4% and ≤0.2% in the ambient salinity, respectively. Smaller anomalies of ≤0.5 PSU were predicted up to 1.5 km from the outfall.

Figure 31 shows the far-field increases in salinity predicted at hourly intervals at the virtual monitoring stations and mooring sites (shown in Figure 7). Maximum anomalies predicted at any site rarely exceeded 0.1 PSU and mean anomalies across the 5-year hindcast were negligible and less than <0.001 PSU.

The maximum salinity anomaly within ~300m of the outfall on the bottom reached 0.44 PSU during the dodge tide and was reduced to a ≤0.2 PSU during the spring tide (Figure 32). In the vertical plane, anomalies were predicted to be restricted to the bottom 2 m during dodge and spring tides and quickly mixed to ambient levels. Lateral transects of the salinity anomaly averaged over 3 days showed salinity anomalies ≥0.1 PSU during dodge tides extending out to ~1 km of the outfall. Salinity anomalies were reduced to <0.05 PSU within 1 km of the outfall during spring tides.

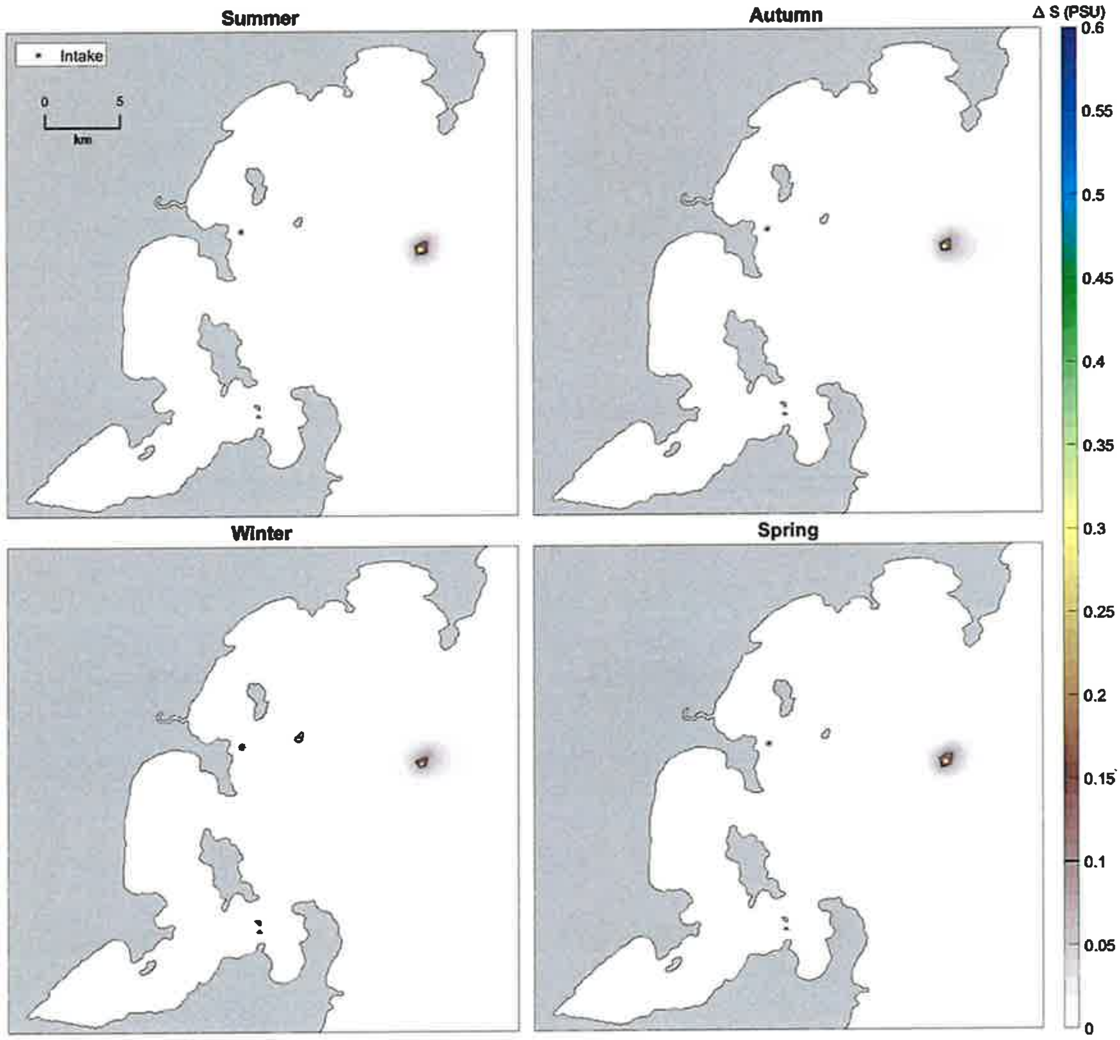

Figure 30. Maps of the seasonally-averaged maximum salinity anomaly for the Point Boston extension outfall. The map limits are set to 0.6 PSU for visualisation purposes and actual anomalies may exceed 0.6 PSU at the grid cell corresponding with the outfall site.

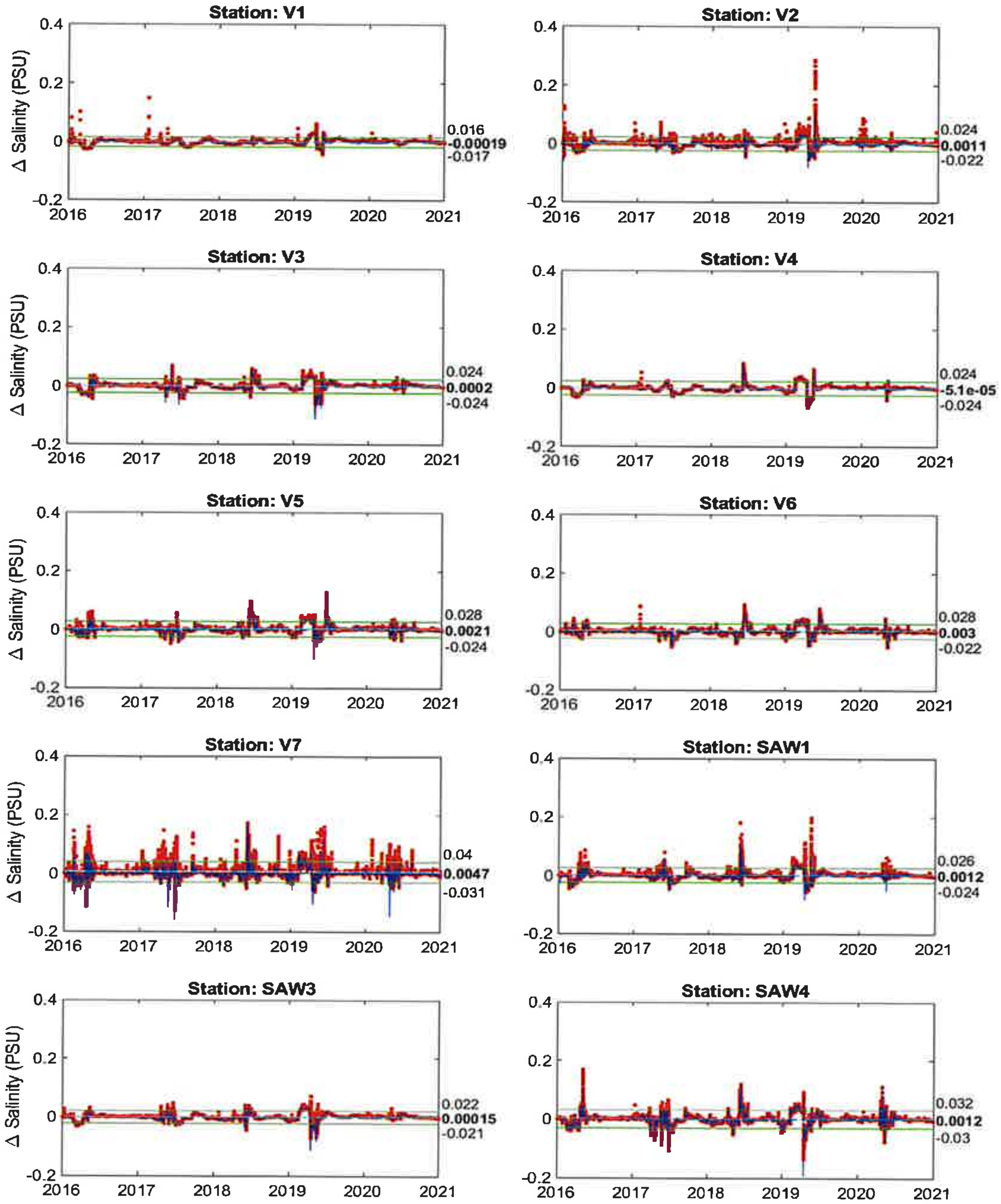

Figure 31. Far-field salinity anomalies predicted every hour over the 5-years hindcast at multiple locations for the Point Boston offshore outfall. Blue line is the depth averaged anomaly. Red marker the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Figure 7 provides a map showing the corresponding locations.

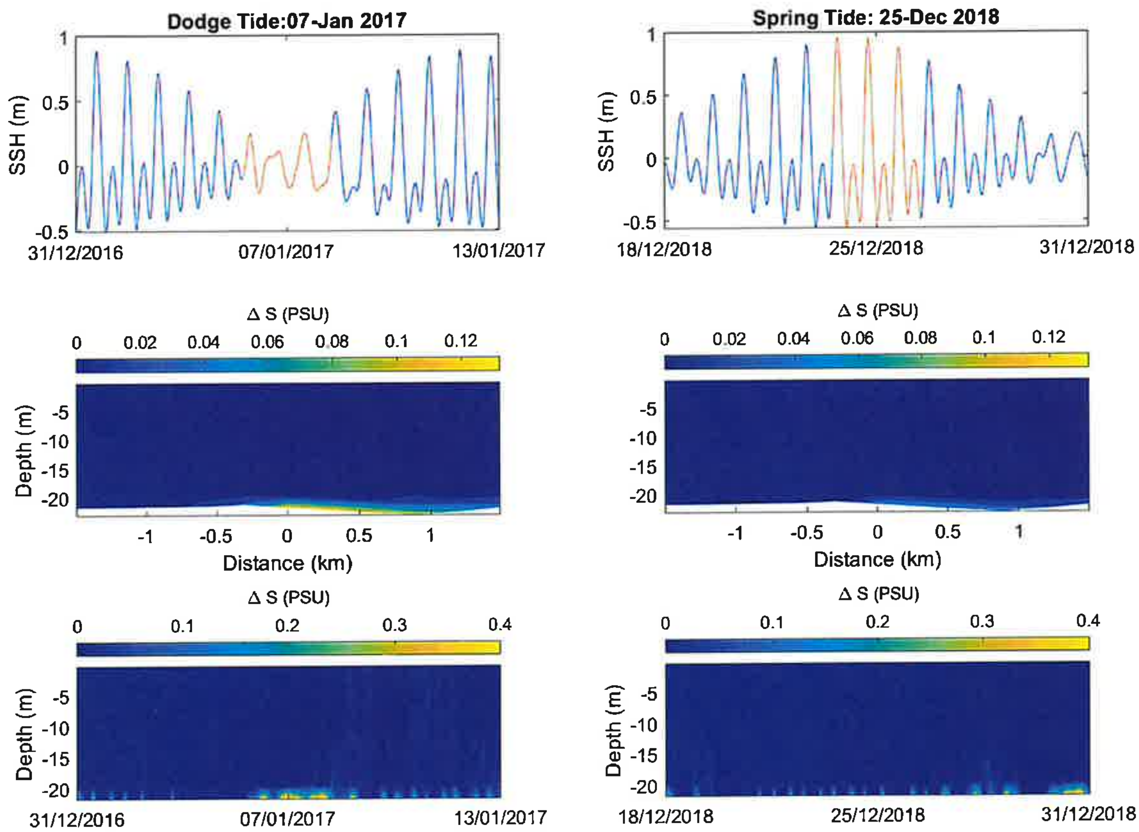

Figure 32. Snapshots of the salinity anomalies predicted in the vicinity of the Point Boston extension outfall during a (left panels) dodge and (right panels) spring tide. Top panels – 14-day timeseries of sea surface height (SSH, m) 300 m from the outfall. Middle panels – lateral transect of the 3-day average salinity anomaly (PSU) centred 300m from the outfall and corresponding with the SSH highlighted in red. Bottom panels – hourly changes in the salinity anomaly throughout the water column 300 m from the outfall. Figure 42 in the Appendix provides a map showing the locations corresponding with the plotted transect and timeseries. The map limits are set for visualisation purposes and actual anomalies may exceed these limits.

4.5. Cape Donington

The spatial distribution of seasonally-averaged maximum salinity anomalies calculated from 5-years of model predictions for the Cape Donington outfall are shown in Figure 33. Salinity anomalies decreased from 0.36 PSU in the bottom layer of the model grid cell corresponding with the outfall location to 0.11 PSU and 0.03 PSU (Figure 33, Table 4) at distances of 0.5 and 1 km from the outfall. These increases correspond to salinity changes of ≤1%, ≤0.3% and ≤0.1% in the ambient salinity, respectively.

Figure 34 shows the far-field increases in salinity predicted at hourly intervals at the virtual monitoring stations and mooring sites (shown in Figure 7). Maximum anomalies predicted at any site rarely exceeded 0.1 PSU and mean anomalies across the 5-year hindcast were negligible and less than <0.001 PSU.

The maximum salinity anomaly within ~300m of the outfall on the bottom reached 0.3 PSU during the dodge tide and was reduced to a maximum of <0.15 PSU during the spring tide (Figure 35). During both tidal phases brine discharges were quickly mixed to ambient levels in the vertical. Lateral transects of the salinity anomaly averaged over 3 days show anomalies of ~0.05 to 0.1 PSU extending out to ~1 km from the outfall during the dodge tide. Salinity anomalies were reduced during spring tides to <0.05 PSU within 0.5 km of the outfall.

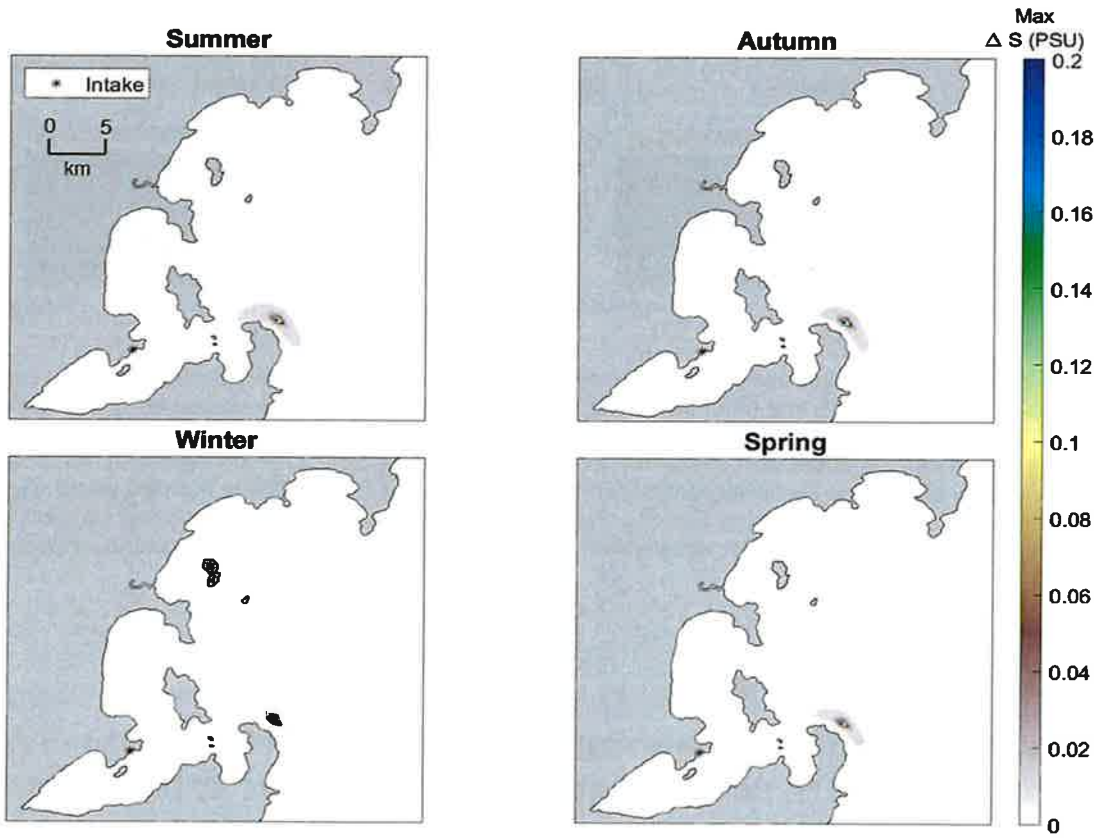

Figure 33. Maps of the seasonally-averaged maximum salinity anomaly for the Cape Donington outfall. The map limits are set to 0.6 PSU for visualisation purposes and actual anomalies may exceed 0.6 PSU at the grid cell corresponding with the outfall site.

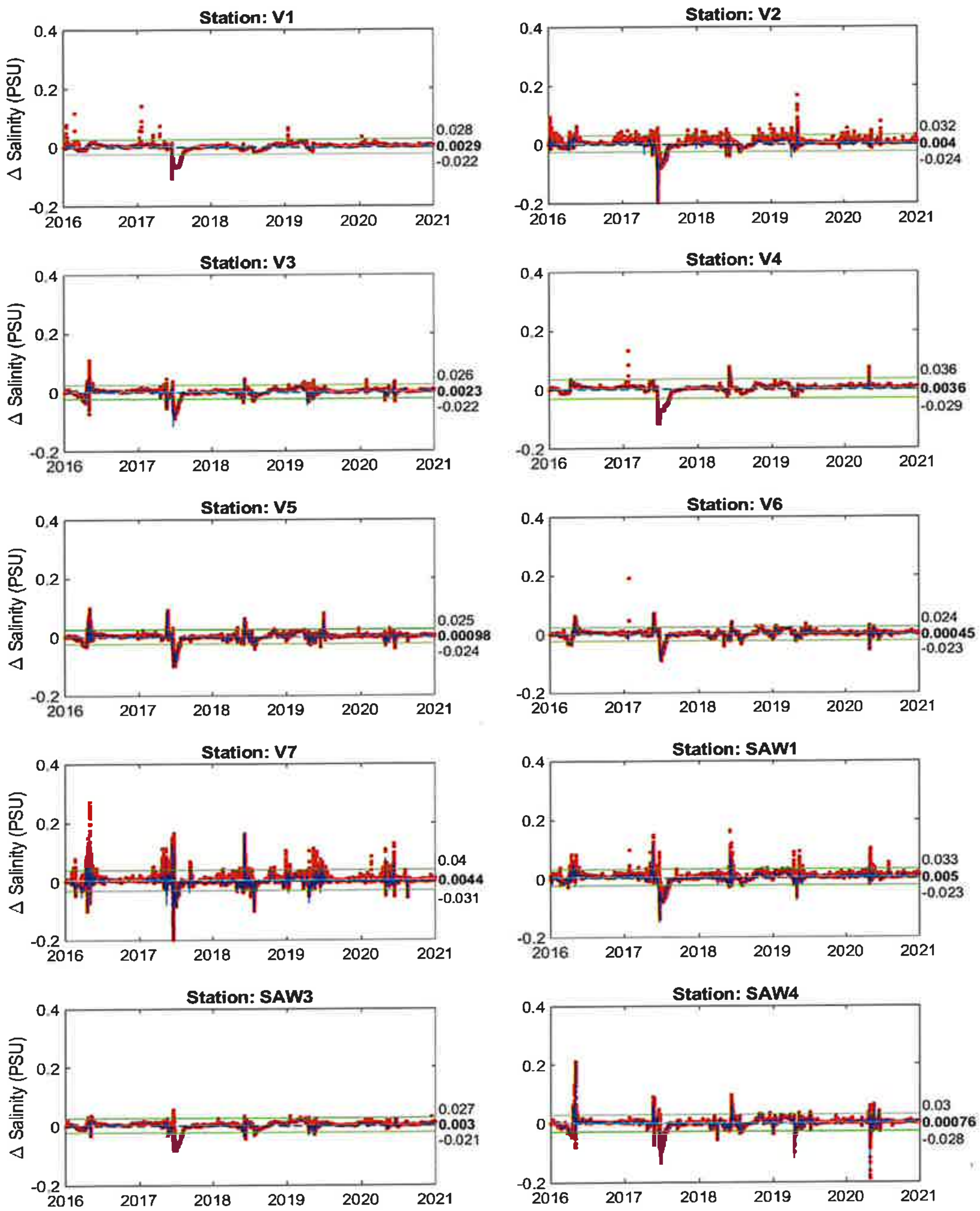

Figure 34. Far-field salinity anomalies predicted every hour over the 5-years hindcast at multiple locations for the Cape Donington outfall. Blue line is the depth averaged anomaly. Red marker the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Figure 7 provides a map showing the corresponding locations.

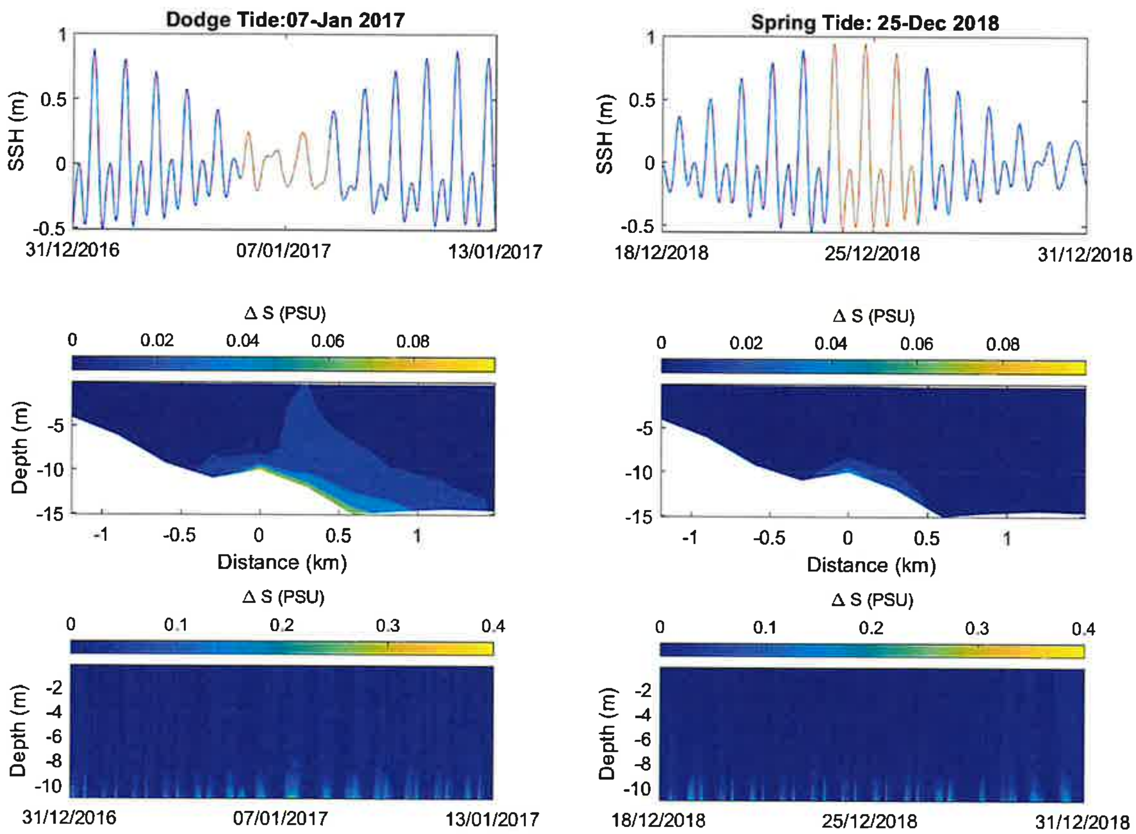

Figure 35. Snapshots of the salinity anomalies predicted in the vicinity of the Cape Donington outfall during a (left panels) dodge and (right panels) spring tide. Top panels – 14-day timeseries of sea surface height (SSH, m) 300 m from the outfall. Middle panels – lateral transect of the 3-day average salinity anomaly (PSU) centred 300m from the outfall and corresponding with the SSH highlighted in red. Bottom panels – hourly changes in the salinity anomaly throughout the water column 300 m from the outfall. Figure 42 in the Appendix provides a map showing the locations corresponding with the plotted transect and timeseries. The map limits are set for visualisation purposes and actual anomalies may exceed these limits.

4.6. Site comparison summary

Figure 36 summarizes the decrease in maximum seasonally-averaged salinity anomalies with distance from each outfall. For each outfall, the maximum anomaly from each of seasonal maps (shown in Figure 21, Figure 24,Figure 27, Figure 30 and Figure 33) were determined at different distances from the outfall using a bin width of 250 m. Corresponding values are shown in Table 4. Except for the Billy Lights Point and Point Boston inshore outfalls, maximum long-term salinity increases below 0.2 PSU were predicted within 0.25 - 0.5 km of outfalls. For all outfalls, long-term salinity increases ≤0.1 PSU were predicted within 0.75-1 km of outfalls.

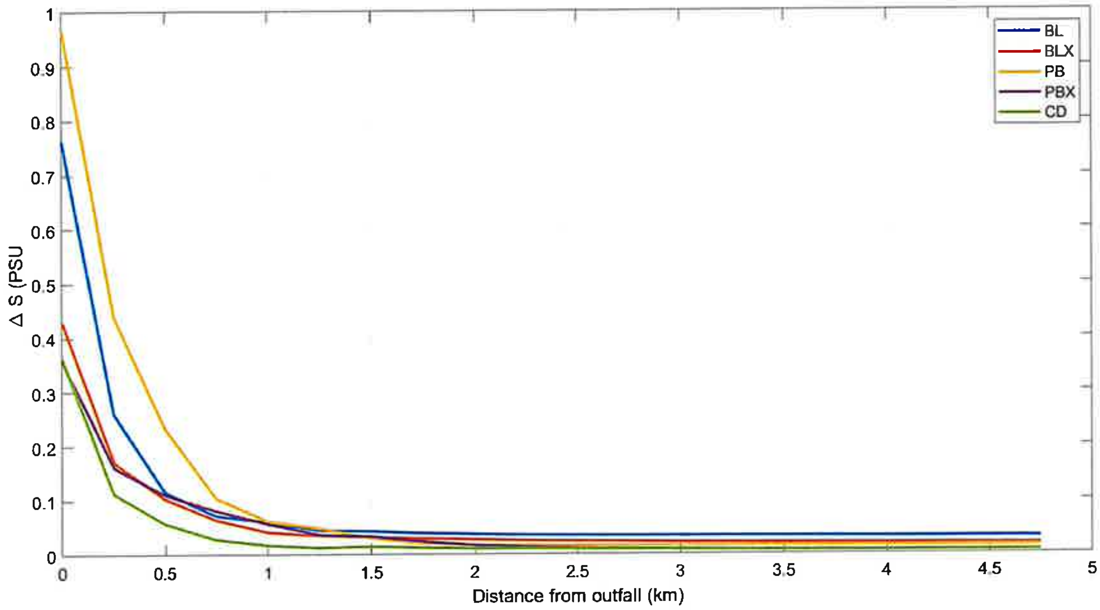

Figure 36. The maximum seasonally-averaged salinity anomaly (PSU) predicted at different distances from each outfall site. BL = Billy Lights Point inshore, BLX = Billy Lights Point extension, PB = Point Boston inshore, PBX = Point Boston extension, CD = Cape Donington. Salinity anomaly values on the x-axis corresponded with the minimum value of the bin shown inTable 4.

Table 4. Maximum seasonally-averaged salinity anomaly values predicted over the 5-year hindcast at different distances from each outfall site.

Site	0 - 0.25 km	0.25 - 0.5 km	0.75 - 1 km	1.25 - 1.5 km	1.75 - 2 km	2.75 - 3 km	4.75 - 5 km
Billy Lights Point inshore	0.76	0.26	0.07	0.05	0.04	0.03	0.03
Billy Lights Point extension	0.43	0.17	0.06	0.04	0.03	0.02	0.02
Point Boston inshore	0.97	0.44	0.10	0.05	0.02	0.02	0.02
Point Boston extension	0.36	0.16	0.08	0.04	0.02	0.01	0.01
Cape Donington	0.36	0.11	0.03	0.01	0.01	0.01	0.01

5. RESULTS: PARTICLE TRACKING MODELLING

Larval dispersal patterns simulated by the biophysical model predicted larvae will be largely transported along the coastal boundaries and away from the coast into offshore waters by the tidal and wind driven circulation (Figure 37). Maps showing the percentage of particles from each source location arriving within 25 m radius of the different intakes are shown in Figure 38, Figure 39, and Figure 40. The predicted spatial patterns were averaged over the three annual spawning events and demonstrate increased connectivity of larvae (≥0.3%) within 2 km of the intakes. This is consistent with tidal displacement distances of ~2 km estimated over 3 hours for a current speed of 0.2 m/s.

For the Billy Lights Point inshore and Cape Donington intake, connectivity was predicted to be dominated by larvae from Proper Bay, with slightly greater levels of connectivity early in the spawning season (May and June) relative to the later months (July-September) (Figure 38). Despite being located less than 2 km away, connectivity with the Billy Lights Point extension intake were distinct from those predicted from the inshore intake. Connectivity with the extension intake was characterised by increased connectivity with Boston Bay and Boston Island across the spawning season. There was a slight increase in connectivity with Proper Bay later in the spawning season (July-September) relative to the inshore intake (Figure 39). For the Point Boston intake, connectivity was dominated by larvae sourced from Louth Bay, Louth Island, the northern coastline of Boston Island and Boston Bay, across the spawning season. Connectivity with Peake Bay was predicted to be strongest in May (Figure 40).

The mean percentage of total particles (i.e., larvae) released each month estimated to come within 25 m of the intakes is shown in Figure 41. Less than 0.04% percent of each monthly spawning event was estimated to be at risk of entrainment by the Billy Lights Point inshore and extension intakes. For these intakes monthly connectivity was predicted to be slightly higher in May and June. Connectivity was greatest with the Point Boston intake, with up to 0.06% of the total particles released each month estimated to be at risk of entrainment. As for the previous intake sites, connectivity was predicted to be slightly higher early in the spawning season (May and June) compared to the later months.

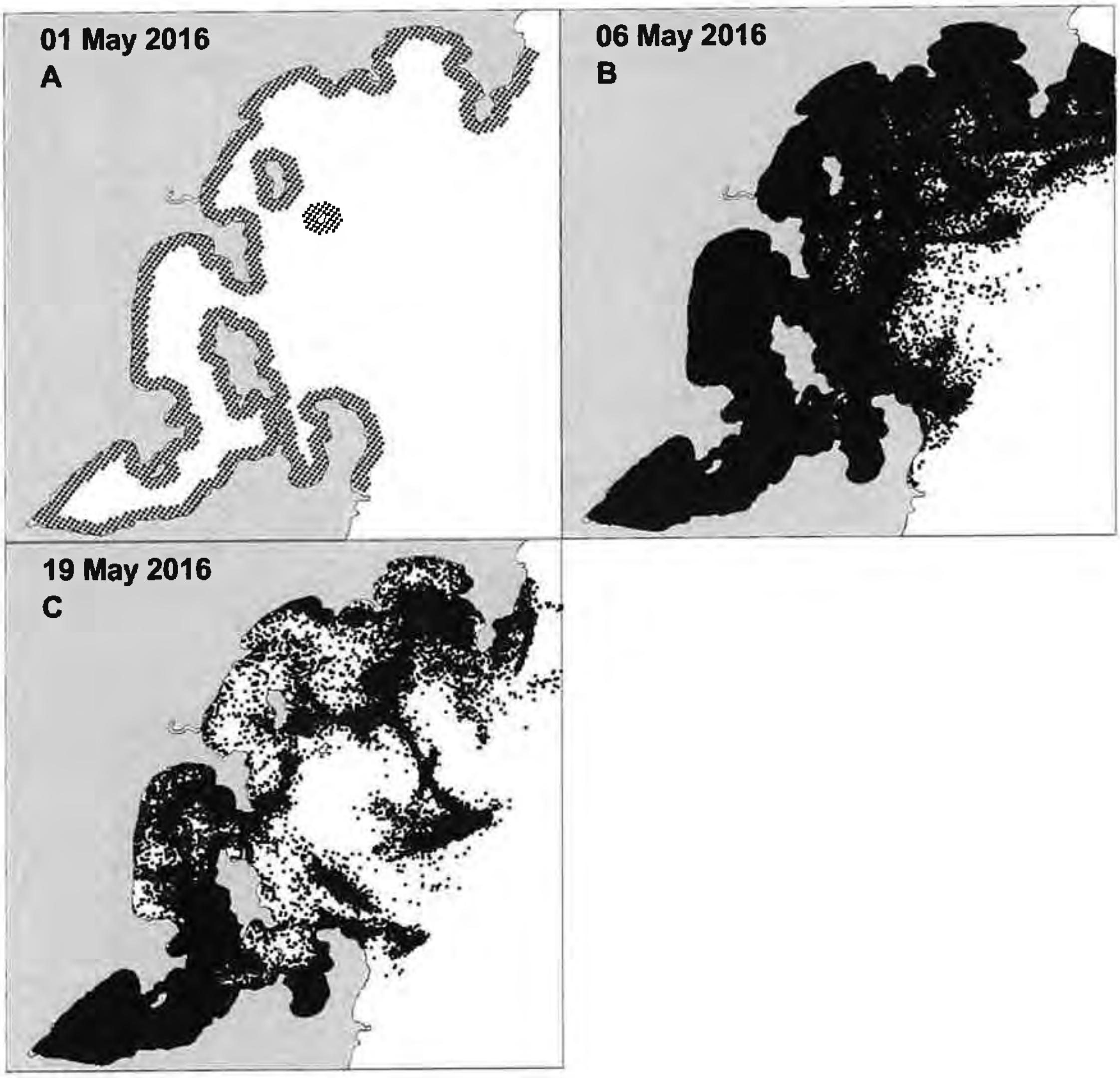

Figure 37. Snapshots of larvae distribution simulated during the May 2016 spawning event. (A) Initial distributions corresponding to model grid cell within 1 km of the coast 1, (B) distributions on day 6 following the release of all larvae and (C) distributions on day 20.

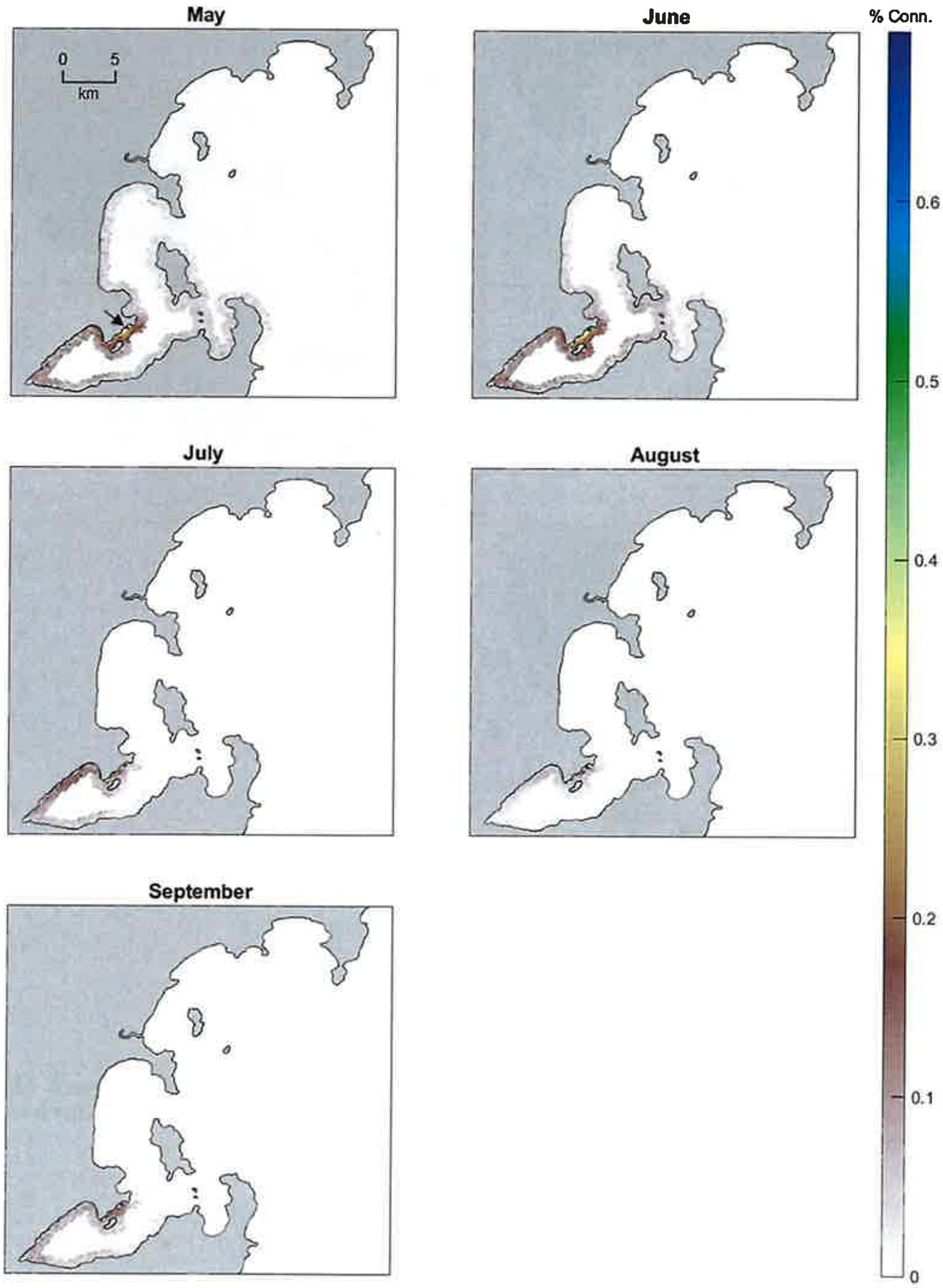

Figure 38. Modelled connectivity of larvae with Billy Lights Point inshore and Cape Donington intake showing the percentage of larvae from each release point which came within a 25m radius of the intake. Results are the monthly averaged distributions for each monthly spawning events averaged over three years (2016-2019). Black arrow in the top left plot indicates the intake location.

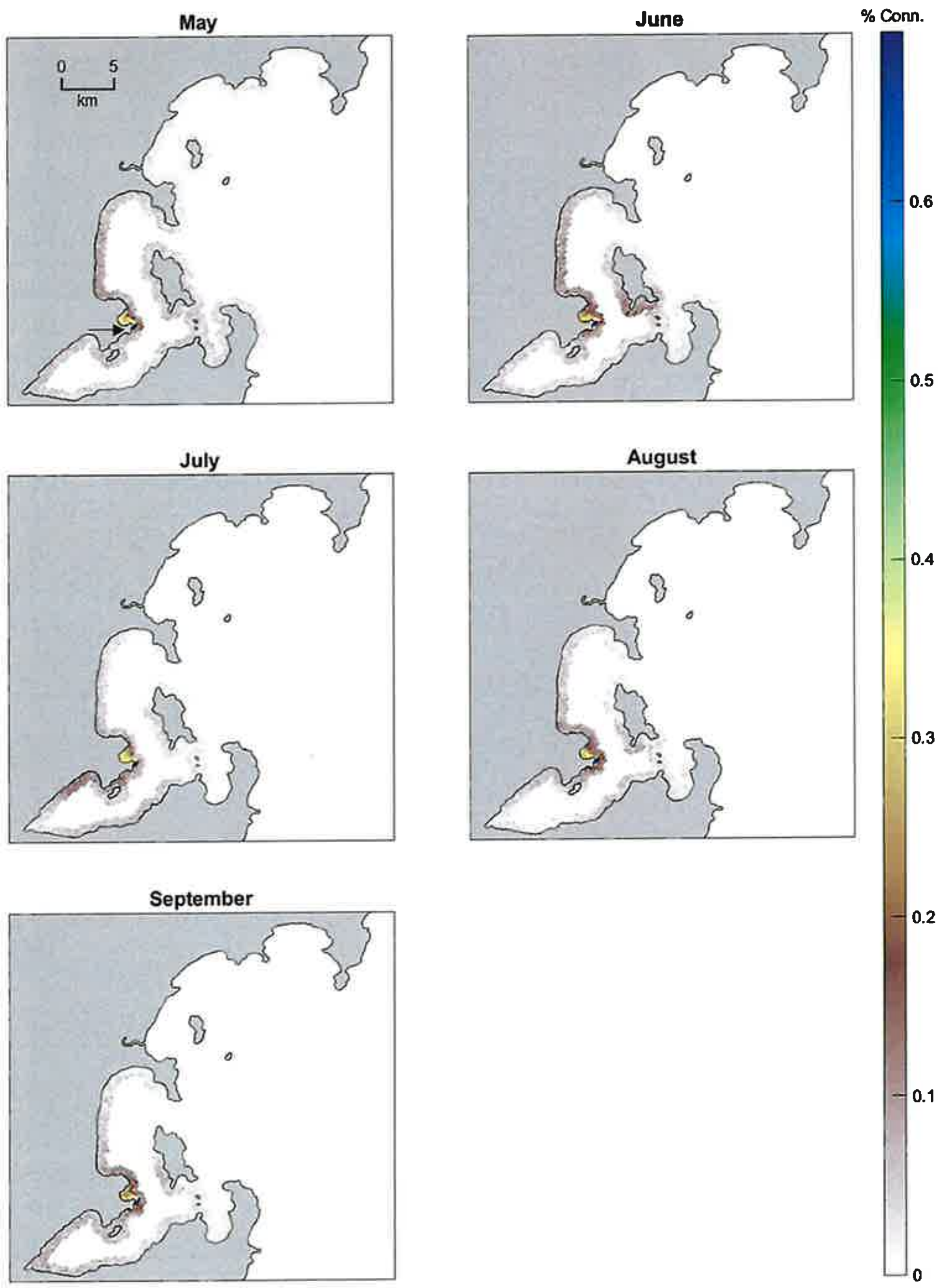

Figure 39. Modelled connectivity of particles (representative of larvae) with Billy Lights Point extension intake showing the percentage of larvae from each release point which came within a 25m radius of the intake. Results are the monthly averaged distributions for each monthly spawning events averaged over three years (2016-2019). Black arrow in the top left plot indicates the intake location.

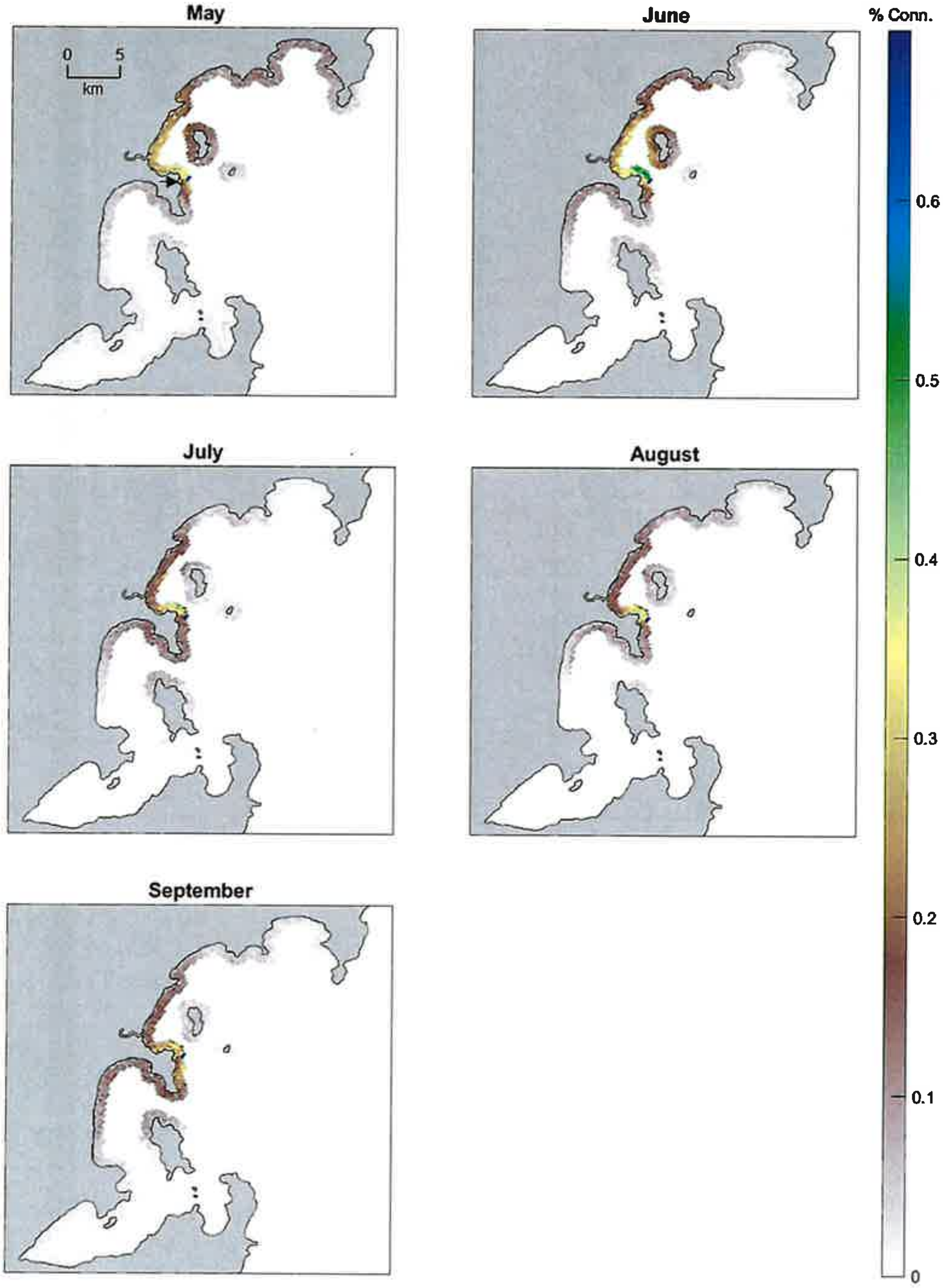

Figure 40. Modelled spatial connectivity of particles (representative of larvae) with the Point Boston inshore and Point Boston extension intake showing the percentage of larvae from each release point which came within a 25m radius of the intake. Results are the monthly averaged distributions for each monthly spawning events averaged over three years (2016-2019). Black arrow in the top left plot indicates the intake location.

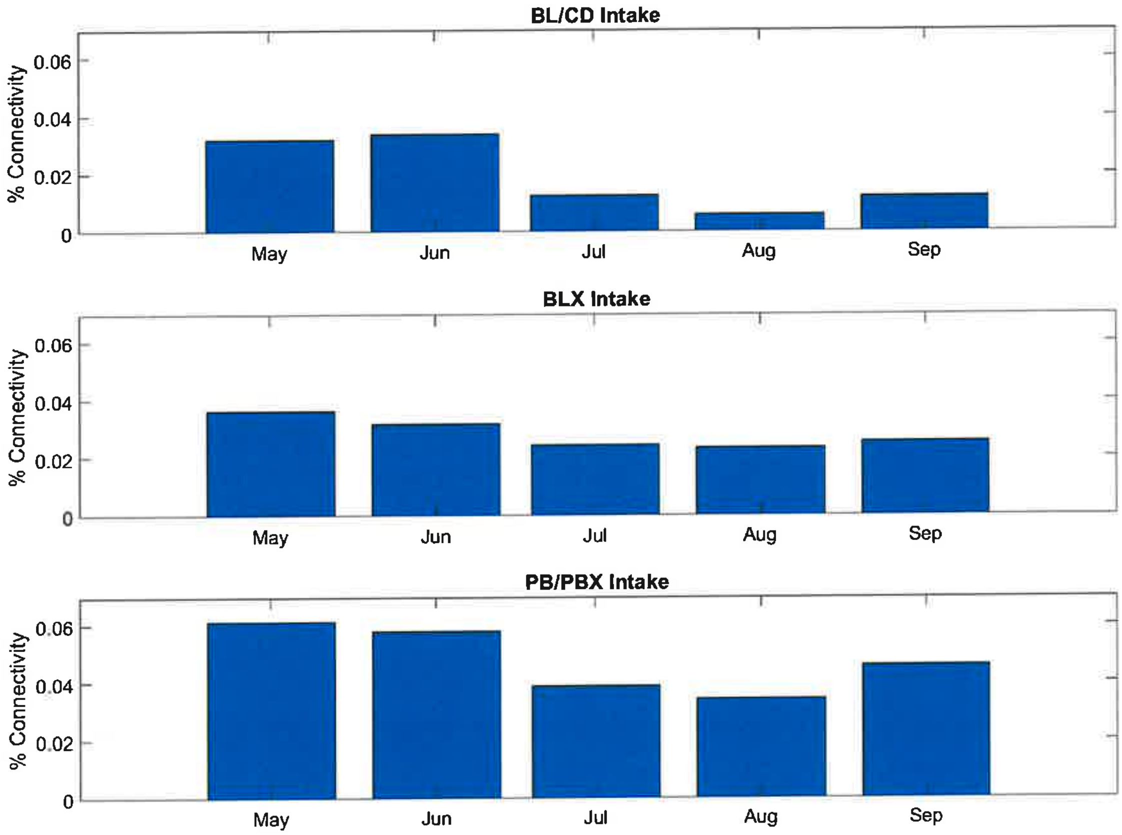

Figure 41. Modelled temporal connectivity showing the estimated percentage of particles (representative of larvae) released in each monthly spawning event which came within 25m radius of the (Top) Billy Lights Point inshore/Cape Donington (BLP / CD), (Middle) Billy Lights Point extension (BLX) and (Bottom) Point Boston (PB) intakes. Results are the average for the three annual spawning events (2016-2019).

6. CONCLUSIONS

A high-resolution 3D hydrodynamic model was developed for the Boston Bay region to examine the effect of hydrodynamics on the dispersal of brine outfall and connectivity of planktonic larvae (i.e., blue mussel) with intakes for several possible desalination plant outfall/intake locations.

Comparison with field measurements showed that the model was able to reproduce tidal and lower-frequency (i.e., weather-band and seasonal) variations in currents, sea level (including dodge and spring tides), temperature and salinity. The model predictions were consistent with, and improve on, existing oceanographic modelling for this region (Herzfeld et al. 2009; Middleton et al. 2013, Middleton and Doubell 2014; Middleton et al. 2014) that have been used to aid developing management for local aquaculture industry and fisheries sectors. The measurements and model results showed strong tidal currents (~0.2 m/s) and weaker (<0.05 m/s) weather-band currents. The model therefore had predictive capability for determining the mixing, diffusion, long-term transport and flushing of brine outfalls and planktonic larvae (Herzfeld et al. 2009; Middleton et al. 2014).

Using a 5-year model hindcast, far-field predictions of the salinity increases (anomalies) for a 12 GL per year desalination plant indicated maximum seasonally-averaged anomalies within 250-500m of the outfalls ranged between 0.11 and 0.44 PSU (≤1.2% change in the ambient salinity) depending on the outfall location. For all locations, maximum seasonally-averaged anomalies decreased to ≤0.1 PSU (≤0.3 % change in the ambient salinity) within 1km from the outfalls and were steady on annual timescales. The predicted changes are within the range of natural salinity variability determined from the measured data which showed an annual range of 1.46 PSU, equivalent to a 4% annual change in ambient salinity concentrations, and variations of 0.1 and 0.5 PSU observed over periods of several hours to weekly, respectively.

Although the predicted increases from the modelled outfall sites were low and within natural salinity variability, increases in salinity and the potential for long-term accumulation were smaller when outfalls were sited in better flushed locations. Consistent with previous estimates of flushing at the site (Middleton et al. 2014) scale and the scale of the bays within the Port Lincoln region (Herzfeld et al. 2009), the reduced flushing and the far-field transport brine from outfalls located inshore at Billy Lights Point was predicted to result in long-term mean increases of <0.05 PSU across Boston and Proper Bay. The spatial extent of this impact, and the potential for long-term accumulation in Proper Bay and Boston Bay, was lower when the outfall was located at the Billy

Lights extension outfall or Point Boston inshore outfall. Predicted salinity increases in the embayments were lowest when outfalls were in well flushed offshore waters east of Boston Island (i.e., Point Boston extension or Cape Donington).

At shorter timescales, hourly predictions of the far-field increase in salinity at distances >250m from the outfalls investigated in this study were always <0.9 PSU and remained below the 5% change in ambient salinity (~1.8 PSU) recommended by the Australian and New Zealand Guidelines for Fresh and Marine Waters. More recent studies on the impacts of desalination recommend environmental or ecological tolerance limits of 1 PSU for flora and fauna (Lattemann and Höpner 2008; Panagopoulos and Haralambous 2020; Omerspahic et al., 2022) including local aquaculture species (Tanner and Drabsch 2021). Given that the proposed plant is small (8 GL per year maximum), the modelling results from this study predicted for a 12 GL per year plant operating at full capacity suggest there is unlikely to be any substantial environmental impacts from brine discharges on salinity increases in the far-field. To further minimise environmental impacts, it is important sufficient mixing and dilution is achieved by optimising the design and application of diffuser systems in the near-field.

Biophysical modelling of planktonic larvae, based on the spawning characteristics of blue mussel larvae, indicated that less than 0.1% of the particles released (i.e., spawned biomass) are likely to be at risk of entrainment by the proposed desalination plant's intakes. Assuming larvae are passive and are sourced uniformly from the coastline of the surrounding embayments, spatial connectivity with proposed intakes was demonstrated to be strongly influenced by tides and the long-term mean circulation patterns. Connectivity patterns identified that mussels sourced from Proper Bay and the Boston Bay area inshore from Boston Island had increased connectivity with intakes located near Billy Lights Point and reduced connectivity with the intake located near Point Boston. Similarly, mussels sourced from Louth and Peake Bays had increased connectivity with the intake located near Point Boston and reduced connectivity with intakes located near Billy Lights Point. These results are based on a very limited understanding of the pelagic larval duration, development characteristics and source areas of the local blue mussel. Improved estimates of the total amount of larvae possibly removed by entrainment requires larval sampling to better understand source regions and concentrations. Additional model improvements could also be achieved with a better understanding of the pelagic larval duration and development characteristics (e.g., extent of vertical migration (McLeay et al. 2016)) for local blue mussels and other commercially important species.

This study suggests that the impact of salinity increases resulting from brine discharges associated with a 12 GL per annum plant on the receiving marine ecosystems and co-located aquaculture is likely to be small and within the regions natural variability. In part, this would be due to the small scale of the proposed plant. Initially, this is planned to be 4-5.3 per year, but up to a maximum of 8 GL per year, which compares, for example, with the 100 GL annual capacity desalination plant in Adelaide. A caveat for this conclusion is that slight increases in salinity could add an additional cumulative stress to some species that may be already stressed. For example, there are currently existing concerns that the cumulative effects of dissolved nutrient emissions from tuna and finfish aquaculture, wastewater treatment plants, and other sources may be potentially impacting the regions planktonic (Tanner at al. 2020) and seagrass (Tanner at al. 2019) ecosystems. These could potentially be compounded by stresses caused by climate induced changes in sea temperature, salinity, and water quality (Harley et al. 2006; Roberts et al. 2019; Chenoweth et al. 2022).

The hydrodynamic model developed here provides an improved tool that can be used to optimise desalination plant intake and outfall location determinations (and other anthropogenic point sources) to minimise potential and asses potential impacts from multiple sources to ensure the health and sustainability of the Port Lincoln region.

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7. APPENDIX

7.1. Appendix 1: Station transects

Figure 42 shows the locations of model stations and the transects from which model results were used to investigate the salinity increases in the vicinity of outfalls presented in Figure 23, Figure 26, Figure 29, Figure 32 and Figure 35.

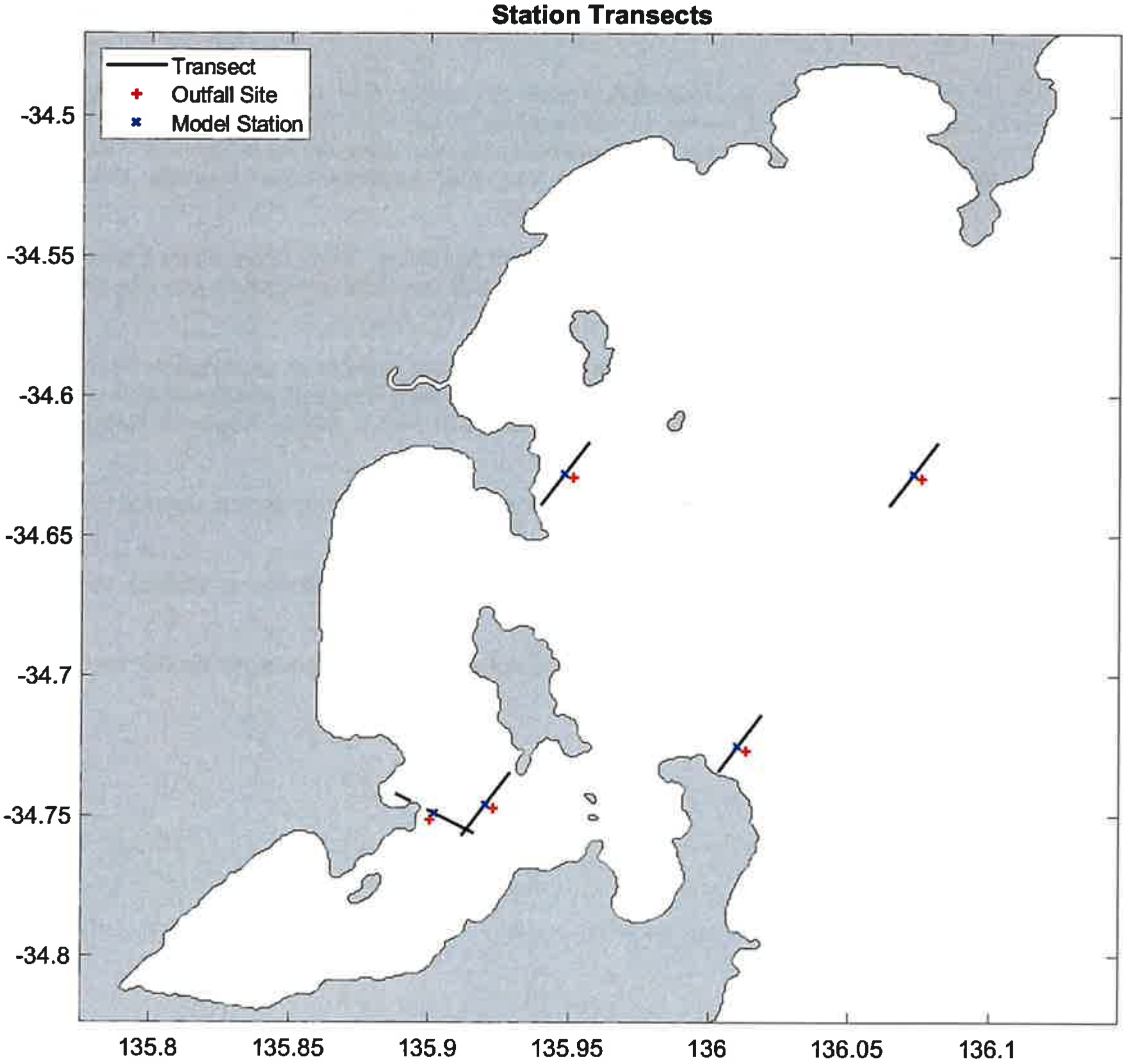

Figure 42. Location of transects (black lines) and model stations (blue markers) relative to potential outfall sites (red markers).

7.2. Appendix 2: Model sensitivity to the vertical distribution of brine discharges

As detailed in the methods (see section 2.3) desalination brine was discharged into the bottom (sigma) layer of the model at each outfall location. This provided a conservative approach to understand the potential 'worst case' increases in salinity. In reality, brine discharged through diffusers, which are designed to achieve a 40:1 dilution at the seabed under all conditions, are expected to achieve rapid mixing and dispersal of discharges over spatial scales of metres to several hundred meters.

To better understand the sensitivity of far-field salinity increases associated with a more realistic brine releases in the vertical, model simulations for the Billy Lights Point and Point Boston inshore outfalls were run for a period of 3 months from 1-January to 1-May 2016 with brine discharges spread across the bottom 1, 2 and 3 layers of the model, respectively. Figure 43 shows example time-series of the vertical salinity distribution at the Point Boston inshore outfall location corresponding with discharges spread over increasing distances in the vertical. Not surprisingly, dilution of the outfall was achieved by discharging brine into larger volumes. Maximum salinity anomalies averaged across the 3-month simulation at the Billy Lights inshore outfall reduced from 0.7±0.4 PSU (± 2 standard deviations of the mean) for discharges into the single bottom layer of the model to 0.39±0.25 PSU for discharges spread across the bottom three layers of the model (Figure 45). Similarly, for the Point Boston outfall, maximum salinity anomalies decreased from 0.98±0.5 PSU (± 2 standard deviations of the mean) for discharges into the single bottom layer of the model to 0.44±0.27 PSU for discharges spread across the bottom three layers of the model.

Figure 46 and Figure 47 show map views of the hourly-averaged bottom salinity distribution predicted for the different vertical discharge scenarios from the Billy Lights Point and Point Boston outfalls, respectively. A full animation of the 3-month period is provided in Appendix 3. The dilution of brine achieved by discharging across increasing distances in the vertical was predicted to have a small, localised impact on the far-field dispersion of salinity. This was evidenced by a ~50 % reduction in the size of the spatial footprint indicated by the 0.2 PSU anomaly contour, which decreased from a diameter of ~1-2 km for outfalls discharged into the bottom layer of the model to ≤1 km for discharges spread across the bottom three layers of the model.

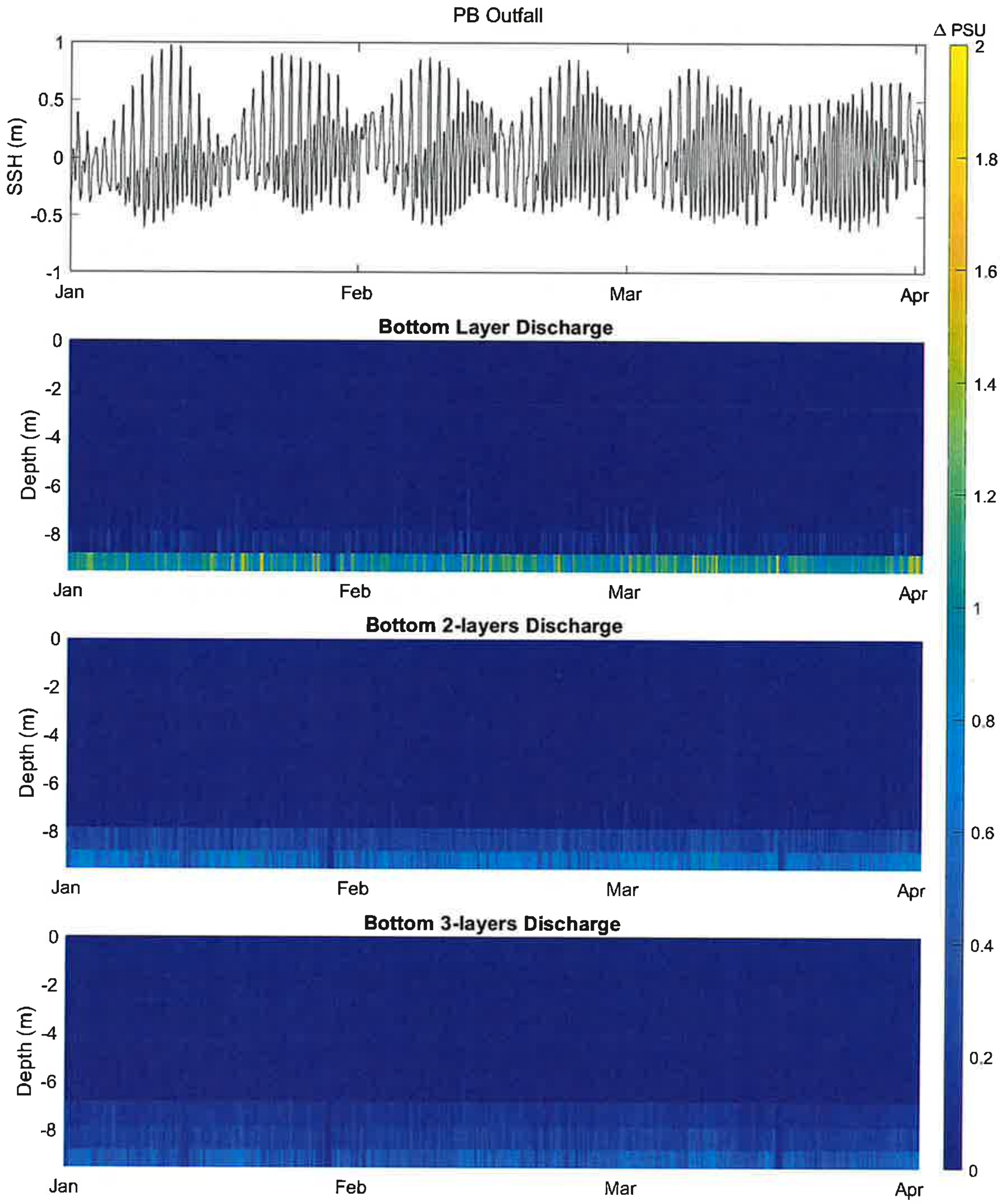

Figure 43. Hourly time-series of salinity (PSU) throughout the water column at the Point Boston inshore outfall associated with brine discharged into the bottom 1, 2 and 3 layers of the model, respectively.

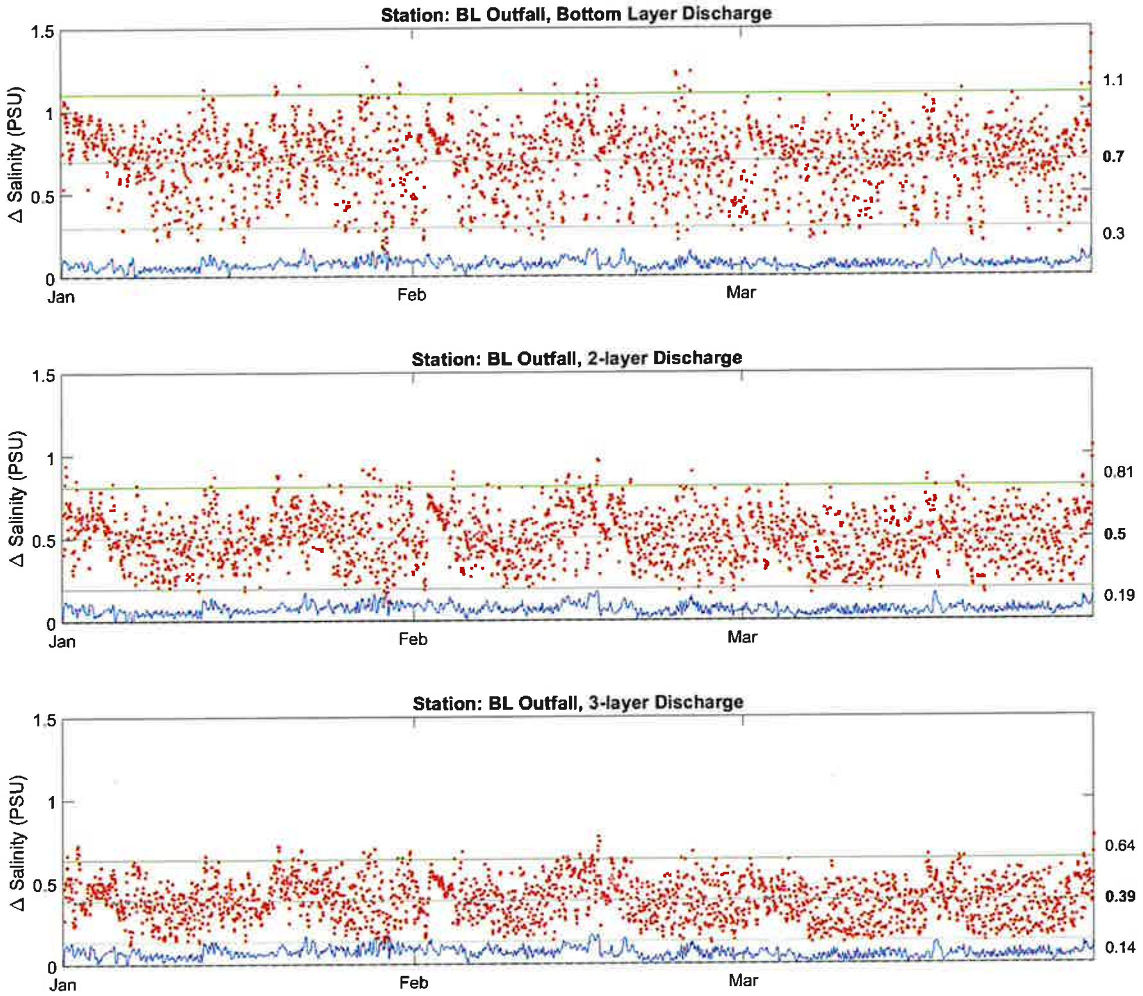

Figure 44. Hourly salinity anomalies (PSU) at the Billy Lights Point outfall associated with discharges spread across the bottom 1, 2 and 3 layers of the model. Red markers show the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Dark blue line shown the vertically averaged salinity anomaly.

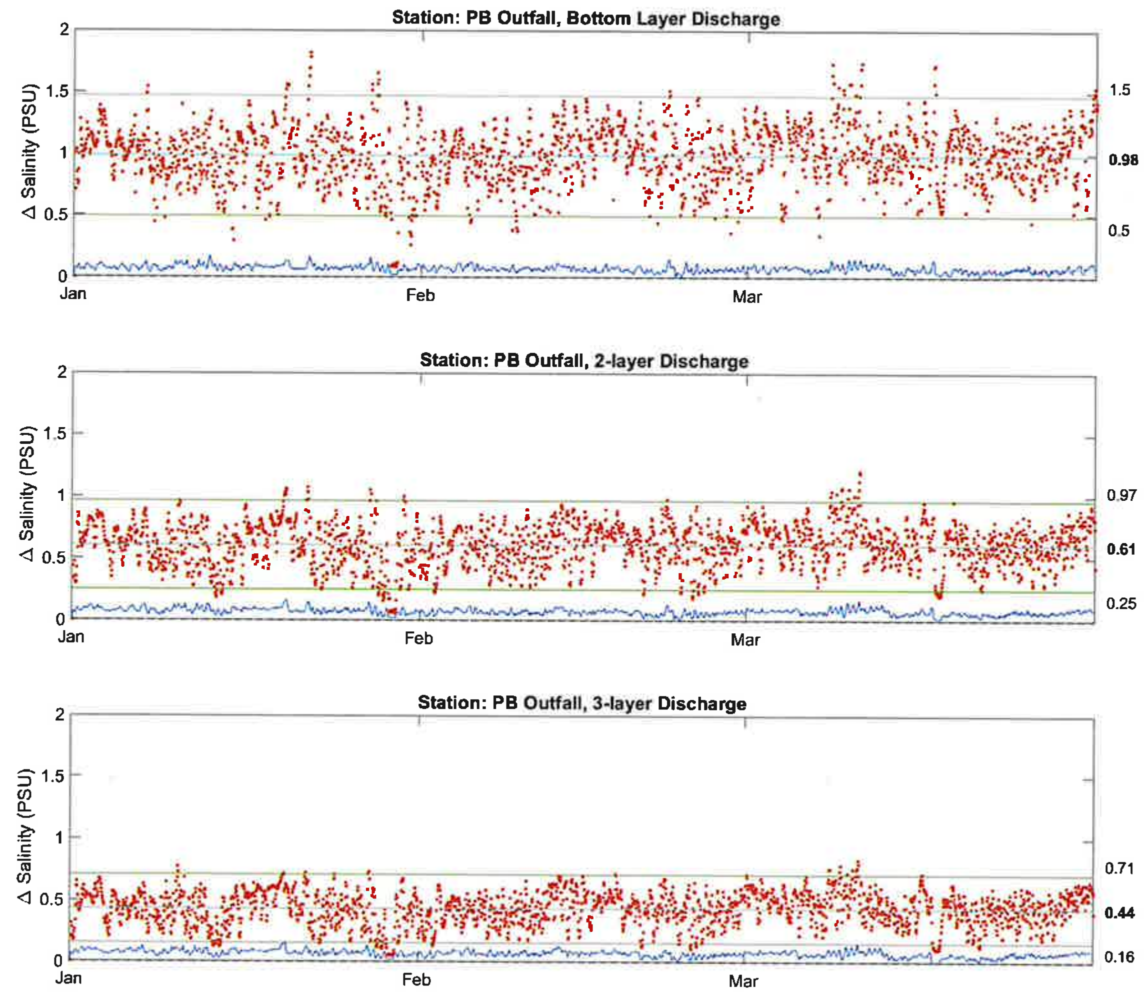

Figure 45. Hourly salinity anomalies (PSU) at the Point Boston outfall associated with discharges spread across the bottom 1, 2 and 3 layers of the model. Red markers show the maximum anomaly. Light blue and green lines show the timeseries mean ± 2 standard deviations, respectively. Dark blue line shown the vertically averaged salinity anomaly.

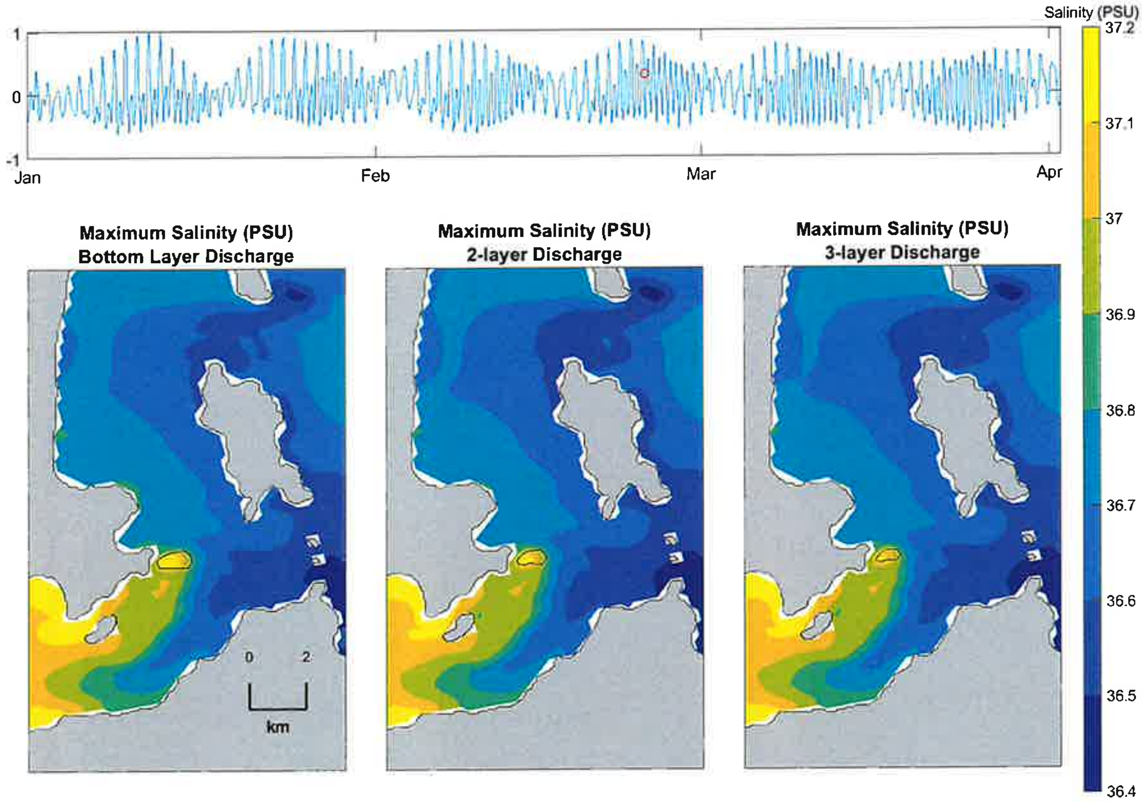

Figure 46. Snapshot of the bottom salinity in the vicinity of the Billy Lights Point outfall for discharges spread across the bottom 1, 2 and 3 layers of the model. Top panel - shows the sea level height (m). Red marker shows the point in time corresponding to the salinity maps shown in the bottom panels. Black line shows the 0.2 PSU salinity anomaly contour.

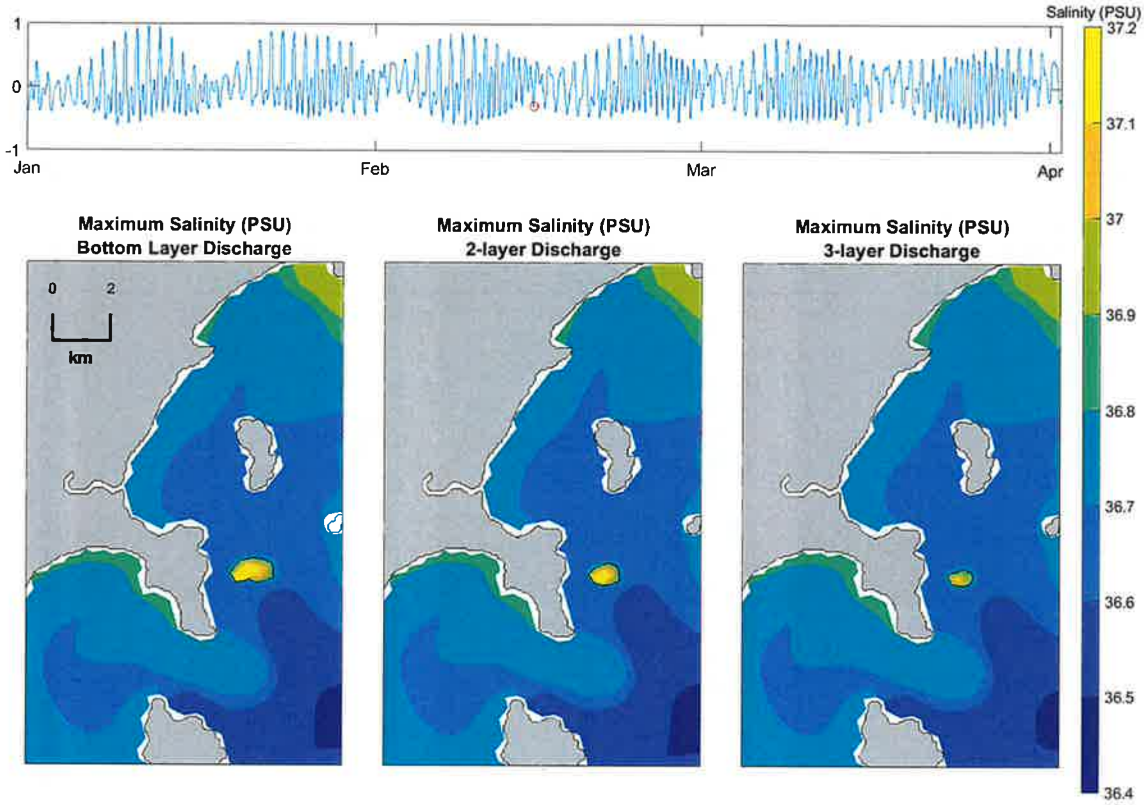

Figure 47. Snapshot of the bottom salinity in the vicinity of the Point Boston outfall for discharges spread across the 1, 2 and 3 bottom layers of the model. Top panel - shows the sea level height (m). Red marker shows the point in time corresponding to the salinity maps shown in the bottom panels. Black line shows the 0.2 PSU salinity anomaly contour.

7.3. Appendix 3: List of supplementary model animations

Animation1. 5-year hindcast showing daily bottom salinity distributions for model scenarios with and without desalination and at each outfall location. S0 = default model run without desalination. BL = Billy Lights Point, BLX = Billy Lights Point-extension, PB = Point Boston, PBX = Point Boston-extension, CD = Cape Donington.

Animation 2a. 3-month hindcast of hourly-averaged bottom salinity in the vicinity of the Billy Lights Point outfall for discharges spread across the bottom 1, 2 and 3 layers of the model. Top panel - shows the sea level height (m). Red marker shows the point in time corresponding to the salinity maps shown in the bottom panels. Black line shows the 0.2 PSU salinity anomaly contour.

Animations 2b. 3-month hindcast of hourly-averaged bottom salinity in the vicinity of the Point Boston outfall and for discharges spread across the bottom 1, 2 and 3 layers of the model. Top panel - shows the sea level height (m). Red marker shows the point in time corresponding to the salinity maps shown in the bottom panels. Black line shows the 0.2 PSU salinity anomaly contour.