



The Sizewell C Project

9.117 Sizewell C Desalination Plant Air Impact Assessment

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Forms and Procedure) Regulations 2009



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1 DESALINATION AIR IMPACT ASSESSMENT

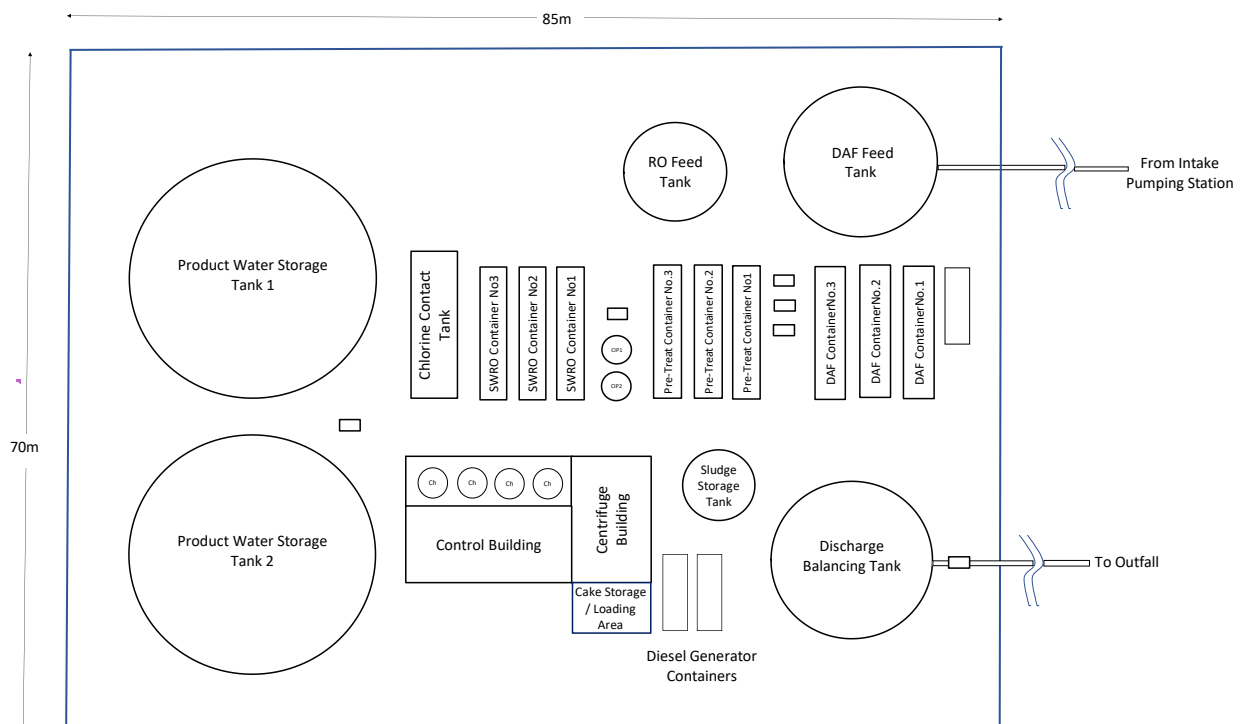
1.1 Introduction

- 1.1.1 SZC Co. has continued to engage with relevant stakeholders to help inform the final Water Supply Strategy for the Sizewell C Project ('Proposed Development'). This work and the outputs from ongoing technical studies have identified the need for further flexibility in provision of water during the construction phase of the Proposed Development.
- 1.1.2 As such, the addition of a construction-phase desalination plant has been accepted as a change to the DCO Application, which would help to provide a dependable supply of water. This would be required to support construction of the Proposed Development before the principal supply of water from Northumbrian Water Limited (NWL) comes online.
- 1.1.3 The temporary desalination plant will initially be located within the main platform of the Proposed Development. During the later stages of construction, the desalination plant will be moved to the Temporary Construction Area (TCA). This is shown in Figure 1-1 for Phase 1 and Figure 1-2 for Phase 2 (the desal plant is shown as a yellow rectangle).
- 1.1.4 For Phase 1, when the desalination plant is initially located within the main platform of the Proposed Development, the power supply will be provided by two 800kW diesel generators. However, by Phase 2 when the desalination plant would be moved to the TCA, the power supply for the desalination plant will be provided from the main development site supply following completion of a new 132/11kV Substation.
- 1.1.5 It is assumed that the required 2 x 800kW diesel generators would be operational on the main platform site for a maximum period of three years.
- 1.1.6 This report details the air impact assessment that has been carried out to confirm that the potential effects of the diesel generators on the local habitat sites are not significant, in response to the consultation response provided by Natural England to the 4th ES addendum.

2 THE DIESEL GENERATORS

2.1.1 The diesel generators are anticipated to comprise two 800kW containerised units, that will be located within the temporary desalination plant. An indicative plant layout for the desalination plant, showing the location of the diesel generators, is provided in Plate 2.1.

Plate 2.1 Indicative Desalination Plant Layout



2.1.2 Although the exact diesel generators have not been selected at this stage of the project, suitable emission parameters have been estimated for the units, based on similar sized units (where available), or scaled down from larger units, as appropriate.

2.1.3 As the aggregated thermal input of the units will be greater than 1MW but less than 50MW, it is likely that the diesel generators will fall under the requirements of the Medium Combustion Plant Directive (MCPD). An Environmental Permit to operate would be required for a 'Specified Generator' under Schedule 25B of the Environmental Permitting (England and Wales) Regulations

2016 (as amended). This means that the oxides of nitrogen (NO_x) emission from the units will need to comply with the Emission Limit Values (ELVs) for specified generator plant i.e. 190mg/Nm³ (at standard reference conditions and 15% oxygen). To achieve NO_x emissions of this order, it is possible that the diesel generators will need to be fitted with Selective Catalytic Reduction (SCR) abatement, and an additional emission of ammonia (NH₃) may therefore occur; as a worst case assumption this has been considered in this assessment.

- 2.1.4 The diesel fuel used in the generators is also likely to contain sulphur, however, as with all comparable diesel generators in use in the UK, ultra-low sulphur diesel will be used to minimise any emissions of sulphure dioxide (SO₂). However SO₂ emissions have been considered in the assessment.

2.2 Assessed Emissions

- 2.2.1 To determine the potential impacts of the diesel generators on the nearby habitat sites, dispersion modelling has been undertaken for the two desalination plant diesel generators.
- 2.2.2 Table 2-1 shows the modelled emissions from the desalination plant generators based on typical diesel generator performance, and Plate 2-2 shows the modelled location of the diesel generator stacks to be used in Phase 1. The emissions modelled are considered to be representative and conservative but the actual emissions may differ from these values slightly depending on the units installed.

Table 2-1: Desalination Plant Diesel Generators Emissions Inventory

SOURCE REF.	GRID REF (X, Y)	STACK HEIGHT (m)	STACK DIAMETER (m)	VOLUME FLOW (Nm ³ /s) ¹	ACTUAL FLOW (Am ³ /s)	EFFLUX VELOCITY (m/s)	TEMP (°C)	SUBSTANCE	RELEASE CONC (mg/Nm ³)	RELEASE RATE (g/s)
DG 1	647443, 264117							NOx	190	0.24
DG 2	647449, 264117	3	0.35	1.26	2.55	26.5	490	NH ₃	2.2 ²	0.002
								SO ₂	10 ³	0.013

¹ Normalisation based on actual flows at 12% oxygen and 8% H₂O. Normalised to standard temperature and pressure, dry gas at 15% oxygen reference conditions.

² Based on an actual emission of 5ppm, and normalised to reference conditions

³ Assumes ultra-low sulphur fuel used.

Plate 2.2 Indicative Desalination Generator Location



2.2.3 The modelling has been carried out to determine the ecological impacts at the various habitat receptors in the vicinity of the desalination plant, as described in the DCO application, Chapter 12, Appendix C Combustion Activities.

2.2.4 The impacts have been assessed against the annual and daily critical levels for NO_x, and the annual critical levels for SO₂ and NH₃. In addition, the depositional impacts of nutrient nitrogen (from NO₂ and NH₃) and acid deposition (from NO₂, NH₃ and SO₂) have also been determined.

3 RESULTS

3.1 Annual Average NO_x Impacts – Critical Levels

Desalination Plant

3.1.1 The two desalination plant generators have been modelled in isolation, and assumed to be operating continuously throughout the year. The predicted annual average ground level NO_x concentrations at the relevant habitat sites are detailed in Table 3-1.

Table 3-1: Predicted annual average PCs for NO_x from the Desalination Plant Diesel Generators

Receptors	CL (µg/m ³)	PC (µg/m ³)	PC / CL	BC (µg/m ³) ¹	PEC / CL
E1 Alde Ore	30	0.01	0.0%	7.6	25%
E2 Minsmere	30	1.05	3.5%	7.7	29%
E3 Orfordness	30	0.01	0.0%	7.2	24%
E4 Sandlings	30	0.06	0.2%	7.7	26%
E5 Sizewell Marshes	30	0.29	1.0%	7.5	26%
E6 Leiston and Aldeburgh, E8 and E9 Dower House	30	0.04	0.1%	7.5	25%
E7 Leiston Common	30	0.07	0.2%	7.8	26%
E10 Suffolk Beaches	30	0.71	2.4%	9.5	34%
E11 Reckham Pits Wood	30	0.13	0.4%	7.7	26%
E12 Sizewell Levels	30	0.85	2.8%	7.7	28%
E13 Minsmere South Levels	30	0.25	0.8%	7.7	26%

CL = Critical Level (for the Protection of Vegetation and Ecosystems), PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

3.1.2 Table 3-1 shows that the predicted concentrations from the desalination plant are insignificant (<1% of the critical level) at the majority of habitat sites. Only three sites have impacts over

1%, however in combination with the background concentration, the PECs at these sites are <70% of the critical level for annual NO_x, and therefore are very unlikely to lead to an exceedance at these sites.

3.2 Daily NO_x Impacts – Critical Levels

Desalination Plant

3.2.1 The two desalination plant generators have been modelled in isolation, and assumed to be operating continuously throughout the year. The predicted daily ground level NO_x concentrations at the relevant habitat sites are detailed in Table 3-2.

Table 3-2: Predicted daily average PCs for NO_x from the Desalination Plant Diesel Generators

Receptors	CL (µg/m ³)	PC (µg/m ³)	PC / CL	BC (µg/m ³) ¹	PEC / CL
E1 Alde Ore	75	0.2	0.2%	11.1	15%
E2 Minsmere	75	10.4	14%	11.3	29%
E3 Orfordness	75	0.1	0.2%	10.6	14%
E4 Sandlings	75	1.1	1%	11.3	17%
E5 Sizewell Marshes	75	5.7	7.6%	11.0	22%
E6 Leiston and Aldeburgh, E8 and E9 Dower House	75	0.8	1.0%	11.0	16%
E7 Leiston Common	75	1.6	2.2%	11.4	17%
E10 Suffolk Beaches	75	9.7	13%	14.0	32%
E11 Reckham Pits Wood	75	2.5	3.4%	11.3	18%
E12 Sizewell Levels	75	10.5	14%	11.3	29%
E13 Minsmere South Levels	75	3.7	5.0%	11.3	20%

CL = Critical Level (for the Protection of Vegetation and Ecosystems), PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

3.2.2 Table 3-2 shows that the majority of sites have predicted daily concentrations that are less than 10% of the daily critical level and the impacts of the desalination plant diesel generators are

considered to be insignificant. Of the remaining three sites, the PEC remains well below the daily critical level and an exceedance is considered unlikely.

3.3 Annual Average SO₂ Impacts – Critical Levels

Desalination Plant

3.3.1 The predicted annual average ground level SO₂ concentrations at the relevant habitat sites for the desalination plant diesel generators are detailed in Table 3-3.

Table 3-3: Predicted annual average PCs for SO₂ from the Desalination Plant Diesel Generators

Receptors	CL (µg/m ³)	PC (µg/m ³)	PC / CL	BC (µg/m ³) ¹	PEC / CL
E1 Alde Ore	10	0.00	0.0%	2.2	22%
E2 Minsmere	10	0.06	0.6%	4.0	40%
E3 Orfordness	10	0.00	0.0%	2.5	25%
E4 Sandlings	10	0.00	0.0%	2.7	27%
E5 Sizewell Marshes	10	0.02	0.2%	2.7	27%
E6 Leiston and Aldeburgh, E8 and E9 Dower House	10	0.00	0.0%	3.1	31%
E7 Leiston Common	10	0.00	0.0%	2.5	25%
E10 Suffolk Beaches	10	0.04	0.4%	2.4	24%
E11 Reckham Pits Wood	10	0.01	0.1%	3.0	30%
E12 Sizewell Levels	10	0.05	0.5%	4.0	40%
E13 Minsmere South Levels	10	0.01	0.1%	4.0	40%

CL = Critical Level (for the Protection of Vegetation and Ecosystems), PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

3.3.2 The predicted concentrations of SO₂ at the habitat sites are all less than 0.65% of the lower critical level for SO₂ and are considered to be insignificant.

3.4 Annual Average NH₃ Impacts – Critical Levels

3.4.1 The desalination plant generators could potentially require abatement to achieve the Specified Generator ELV for NO_x and therefore could give rise to ammonia emissions. The predicted impacts of the ammonia emissions have been compared against the relevant critical levels for the habitat sites, taken from the APIS website (www.apis.ac.uk). The results are presented in Table 3-5.

Table 3-4: Predicted annual average PCs for NH₃ from the Desalination Plant Diesel Generators

Receptors	CL (µg/m ³)	PC (µg/m ³)	PC / CL	BC (µg/m ³) ¹	PEC / CL
E1 Alde Ore	3	0.000	0.01%	1.65	55%
E2 Minsmere	1	0.013	1.3%	1.39	140%
E3 Orfordness	3	0.000	0.00%	1.85	62%
E4 Sandlings	3	0.001	0.03%	1.39	46%
E5 Sizewell Marshes	3	0.004	0.12%	1.39	47%
E6 Leiston and Aldeburgh, E8 and E9 Dower House	1	0.0005	0.05%	1.39	139%
E7 Leiston Common	3	0.001	0.03%	1.39	46%
E10 Suffolk Beaches	3	0.009	0.30%	1.39	47%
E11 Reckham Pits Wood	3	0.002	0.06%	1.39	46%
E12 Sizewell Levels	3	0.011	0.35%	1.39	47%
E13 Minsmere South Levels	3	0.003	0.10%	1.39	47%

CL = Critical Level (for the Protection of Vegetation and Ecosystems), PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

3.4.2 For all but one habitat sites the annual average impacts of ammonia can be seen to be <1% of the relevant critical levels and can be considered to be insignificant.

3.4.3 The predicted impacts at E2 Minsmere are only slightly over the 1% threshold of insignificance, however, the 2020 guidance from

the IAQM¹ clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number (paragraph 5.5.2.6). It is therefore considered that the impacts at E2 are not significant based on application of this guidance.

3.5 Additional control measures

- 3.5.1 The diesel generators supplying the desalination plant will be controlled through an environmental permit, which will specify the emission levels to be met as well as the control measures to be applied. This assessment has also been undertaken based on an initial stack height of 3m; a higher stack height could be used to reduce impacts further if required.
- 3.5.2 The generators will also only be installed and operated for up to three years before the plant is relocate and supplied from the site electrical supply, as secured through the Construction Method Statement. Therefore, any effects on the habitat sites will be temporary.

4 SUMMARY

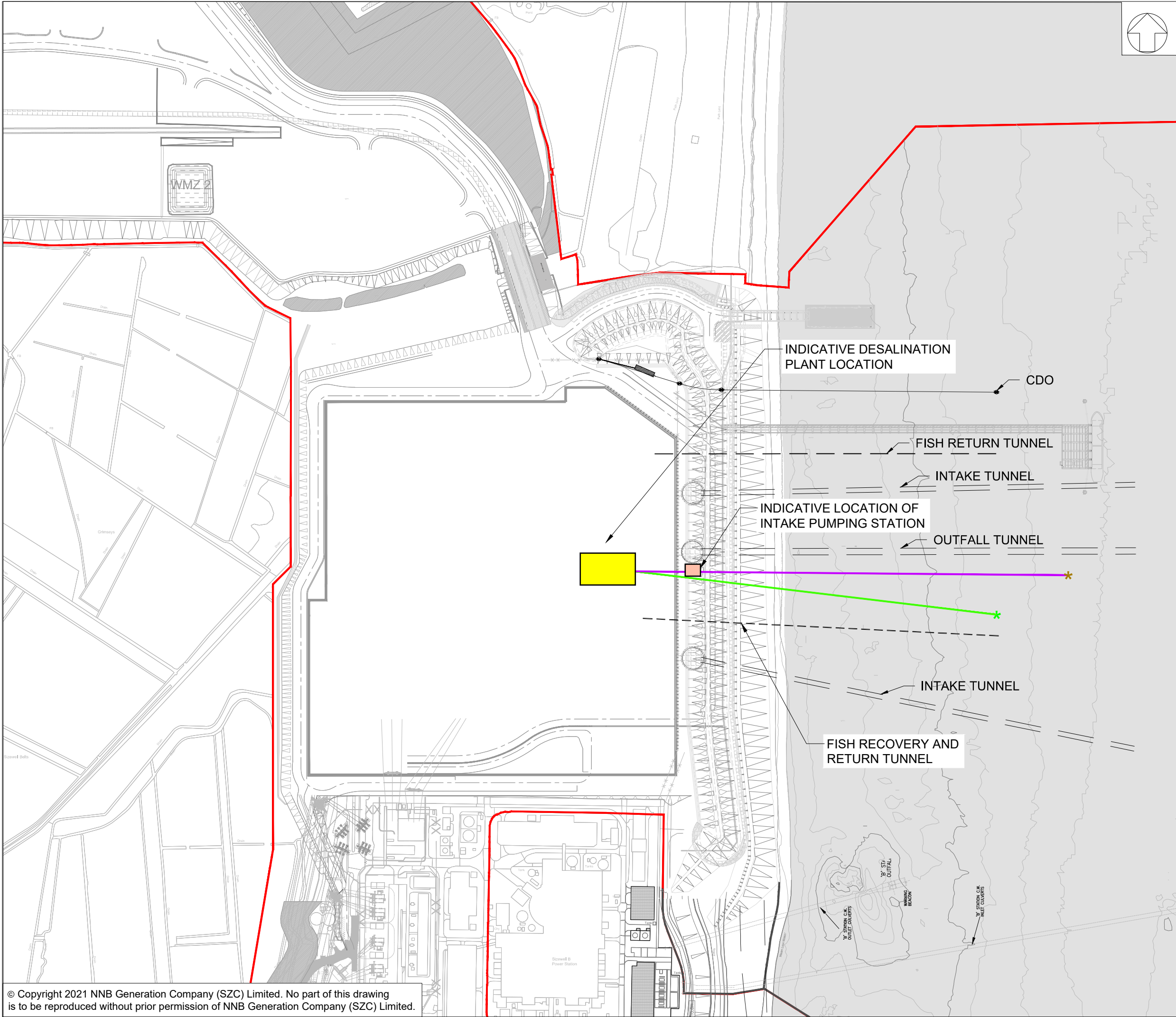
- 4.1.1 Based on the assessment undertaken, the proposed desalination diesel generators in their proposed location are not predicted to give rise to significant effects on any habitat sites, particularly when considering that they will only be installed for a maximum of three years.

¹ IAQM. (2020). A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

FIGURES

Figure 1-1 Phase 1 Indicative Location

Figure 1-2 Phase 2 Indicative Location




NOTES:



KEY:

- RED LINE BOUNDARY
- INDICATIVE INTAKE PIPE LOCATION
- INDICATIVE OUTFALL PIPE LOCATION
- FRR TUNNEL
- INDICATIVE DESALINATION PLANT LOCATION
- INDICATIVE PUMPING STATION LOCATION
- INDICATIVE OUTFALL DIFFUSER LOCATION
- INDICATIVE INTAKE SCREEN LOCATION

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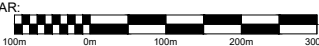
 

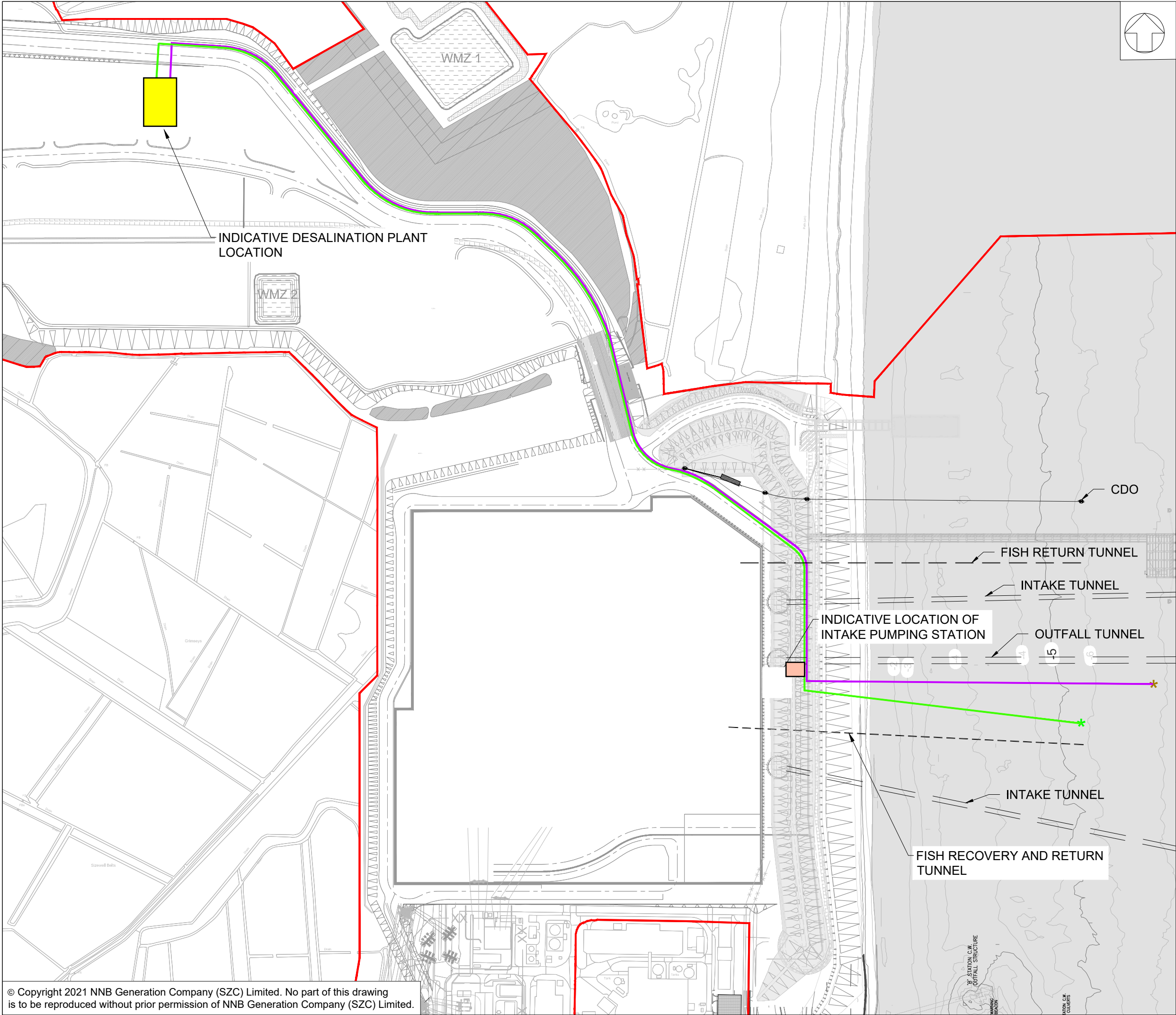
DOCUMENT:
**FIGURE 1-1 PHASE 1
INDICATIVE LOCATION**

DRAWING TITLE:
**PROPOSED TEMPORARY
DESALINATION PLANT,
INITIAL LOCATION**

DRAWING NO:

DATE: SEPTEMBER 2021 DRAWN: BK SCALE: 1:5000 @ A3 REV: 02

SCALE BAR:

Scale 1:5000



NOTES:

KEY:

- RED LINE BOUNDARY
- INDICATIVE INTAKE PIPE LOCATION
- INDICATIVE OUTFALL PIPE LOCATION
- FRR TUNNEL
- INDICATIVE DESALINATION PLANT LOCATION
- INDICATIVE PUMPING STATION LOCATION
- INDICATIVE OUTFALL DIFFUSER LOCATION
- INDICATIVE INTAKE SCREEN LOCATION

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DOCUMENT:
**FIGURE 1-2 PHASE 2
INDICATIVE LOCATION**

DRAWING TITLE:
**PROPOSED TEMPORARY
DESALINATION PLANT,
SUBSEQUENT LOCATION**

DRAWING NO:

DATE: SEPTEMBER 2021
DRAWN: BK
SCALE: 1:5000 @ A3
REV: 02

