

Legend

- Site Boundary
- Crookhaven River Catchment
- 2 m Contours



0 700 1400 2100 2800 3500 m
 1:60000 @ A3

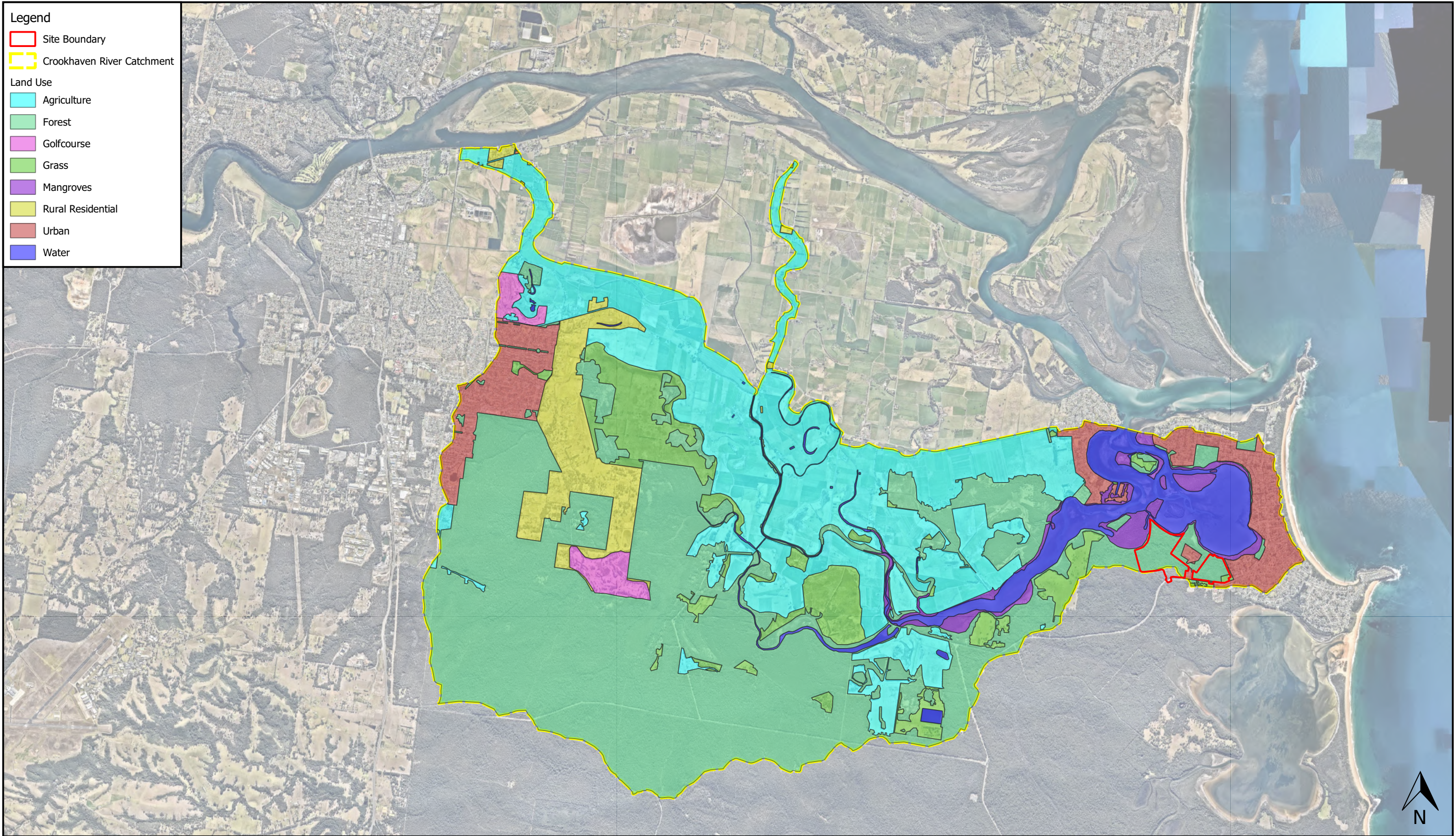
Notes:
 - Aerial image from Nearmap (2019).
 - Topography from NSW LPI 10 m LiDAR and NSW DFSI 1 m DEM over site.
 - Bathymetry from NSW OEH (2012).

Crookhaven River Catchment Topography

Map Title / Figure:

Legend

- Site Boundary
- Crookhaven River Catchment
- Land Use**
- Agriculture
- Forest
- Golfcourse
- Grass
- Mangroves
- Rural Residential
- Urban
- Water

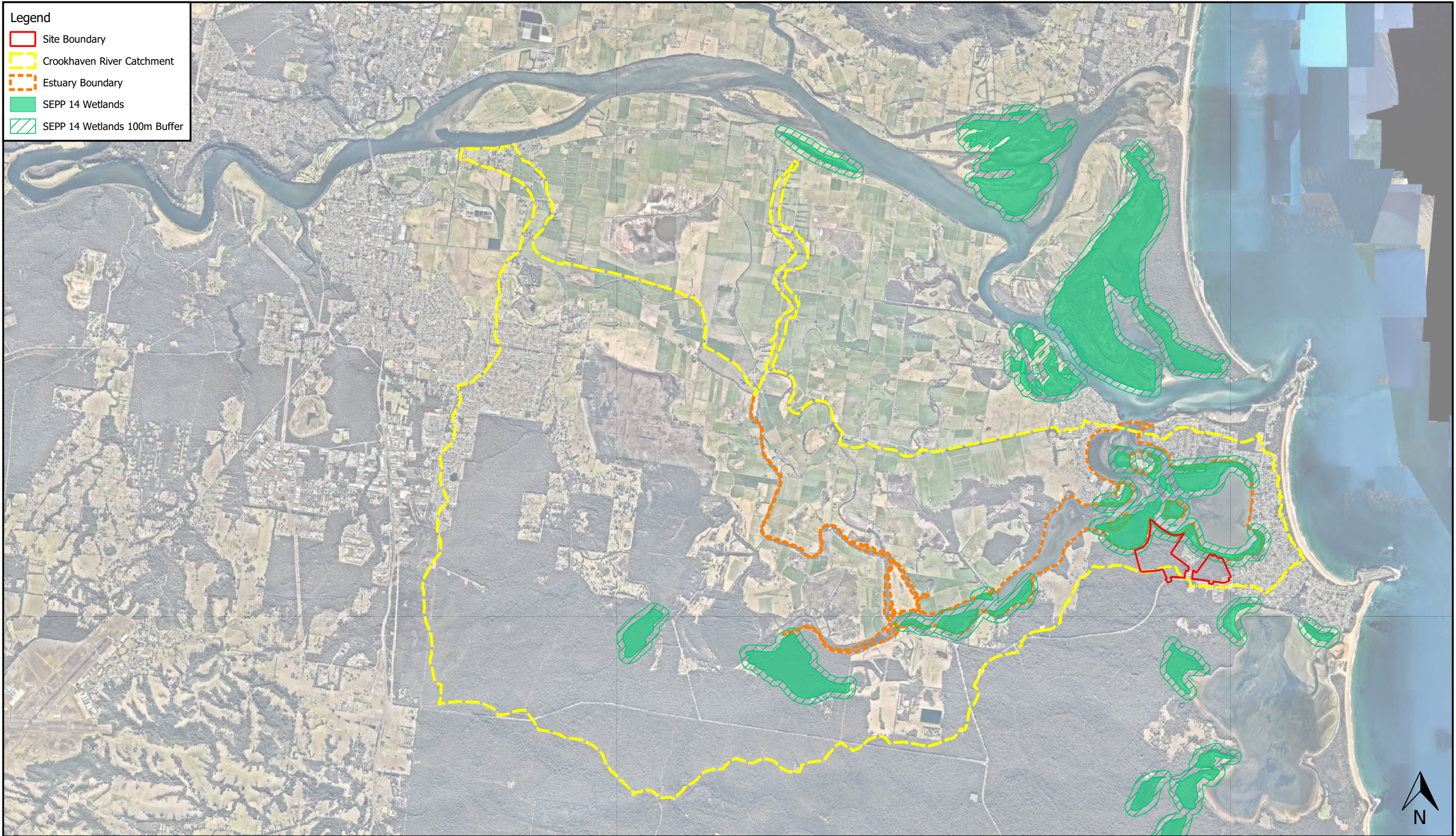


0 700 1400 2100 2800 3500 m Notes:
 - Aerial image from Nearmap (2019).

1:60000 @ A3

Map Title / Figure:
Crookhaven River Catchment Land-use

- Legend**
- Site Boundary
 - Crookhaven River Catchment
 - Estuary Boundary
 - SEPP 14 Wetlands
 - SEPP 14 Wetlands 100m Buffer



0 700 1400 2100 2800 3500 m

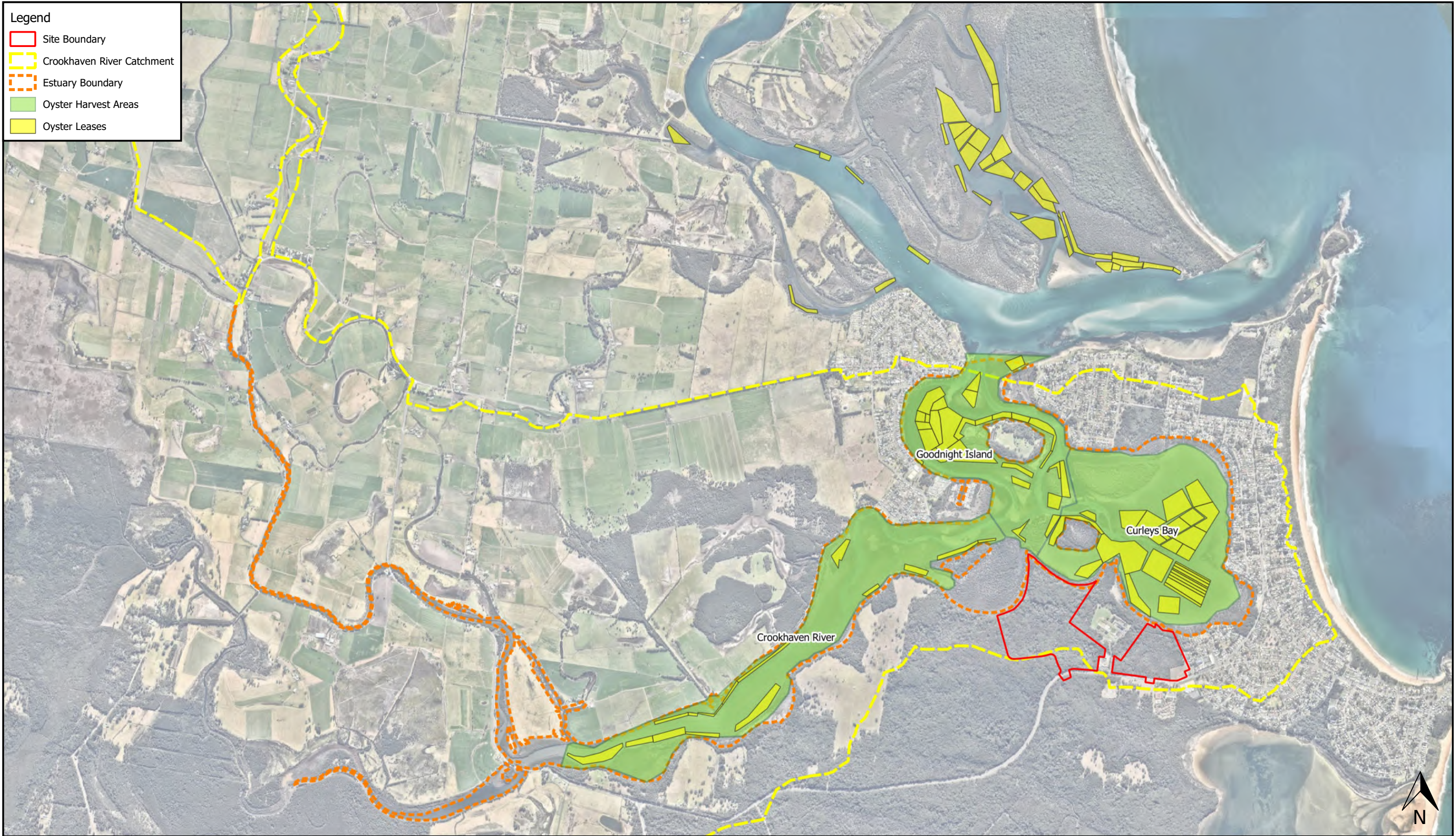
Notes:
 - Aerial image from Nearmap (2019).
 - SEPP 14 Wetlands from NSW OEH.

1:60000 @ A3

Map Title / Figure:
SEPP 14 Wetlands

Legend

- Site Boundary
- Crookhaven River Catchment
- Estuary Boundary
- Oyster Harvest Areas
- Oyster Leases



0 300 600 900 1200 1500 m

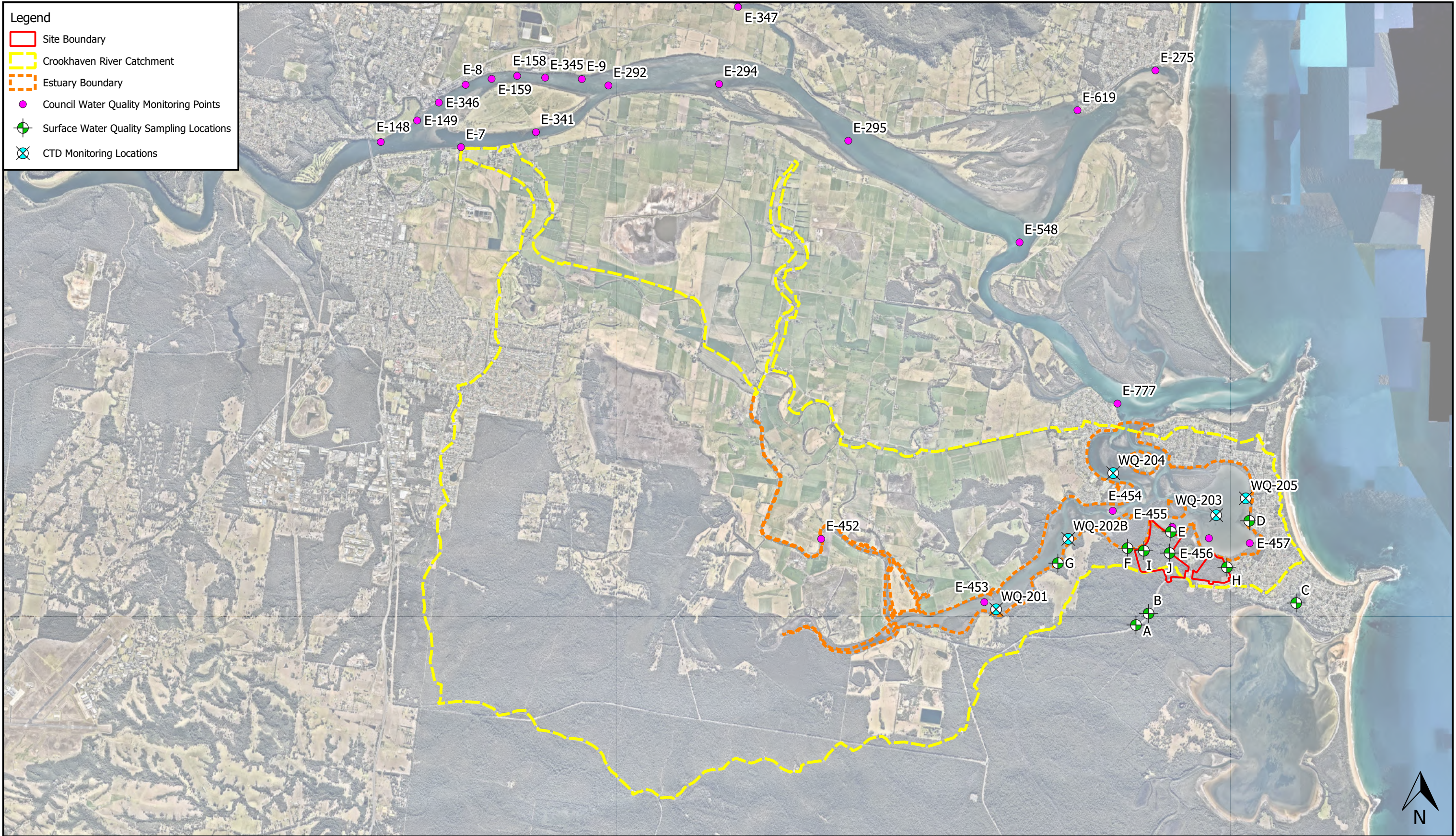
Notes:
 - Aerial image from Nearmap (2019).
 - Oyster lease locations from NSW DPI Fisheries Spatial Data Portal.

1:30000 @ A3
 Viewport A

Map Title / Figure:
Oyster Leases

Legend

- Site Boundary
- Crookhaven River Catchment
- Estuary Boundary
- Council Water Quality Monitoring Points
- ⊕ Surface Water Quality Sampling Locations
- ⊗ CTD Monitoring Locations



0 700 1400 2100 2800 3500 m
 1:60000 @ A3

Notes:
 - Aerial image from Nearmap (2019).
 - Council water quality monitoring locations from Shoalhaven City Council Aquadata Portal.

Map Title / Figure:
Water Quality Monitoring Locations



Legend

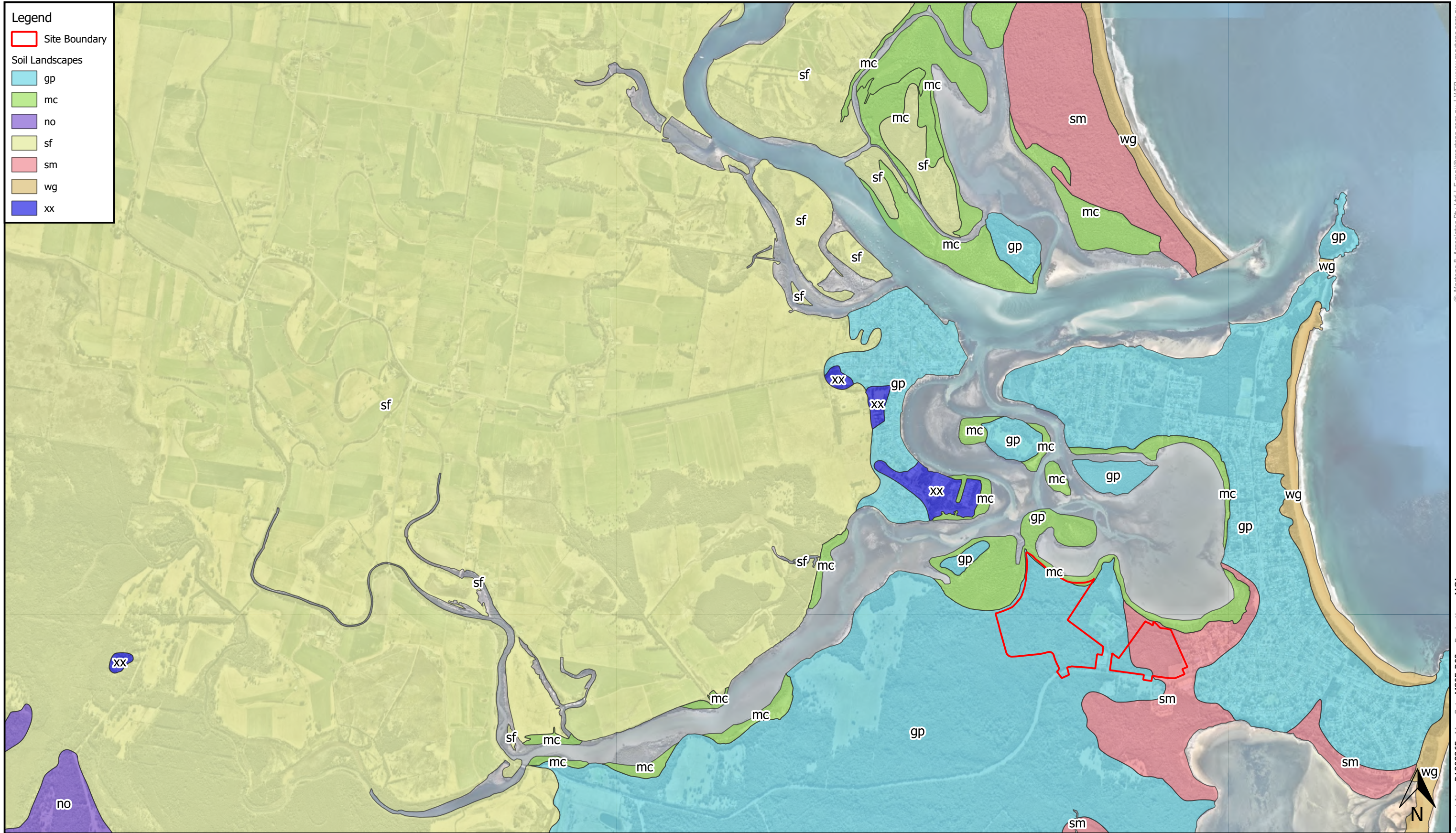
- Site Boundary
- Geology**
- Psn
- Psw
- Qal

0 300 600 900 1200 1500 m

Notes:
 - Aerial image from Nearmap (2019).
 - Geological map from NSW Resources & Geoscience Wollongong 1:250,000 Geological Map.

1:30000 @ A3
 Viewport A

Map Title / Figure:
Geology



0 300 600 900 1200 1500 m

Notes:
 - Aerial image from Nearmap (2019).
 - Soil map from NSW Department of Planning, Industry & Environment Kiama 1:100,000 Soil Landscape Map.

1:30000 @ A3
 Viewport A

Map Title / Figure:
Soil Landscapes



Legend

- Site Boundary
- High-Priority GDEs

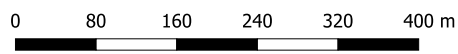
0 200 400 600 800 1000 m

Notes:
 - Aerial image from Nearmap (2019).
 - High Priority GDEs from Bureau of Meteorology (Australian Government) GDE Atlas.

1:25000 @ A3
 Viewport B



Map Title / Figure:
High-Priority Groundwater Dependent Ecosystems



Notes:
- Aerial image from Nearmap (2019).

1:7500 @ A3
Viewport D

Map Title / Figure:

Soil Borehole / Test Pit Locations

Legend

- Cadastre
- Site Boundary
- + Permeability Tests (30/01/20)



0 80 160 240 320 400 m

Notes:
- Aerial image from Nearmap (2019).

1:7500 @ A3
Viewport D

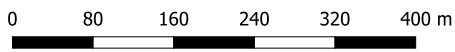
Map Title / Figure:
Soil Ksat Test Locations (permeameter)

Legend

- Cadastral
- Site Boundary



KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %
CROOKHAVEN ESTUARY CATCHMENT				
[Yellow Hatch]	BUSINESS (B2)	1E01	11.134	0
[Red Hatch]	GENERAL INDUSTRIAL (IN1)	1E02	7.820	0
[Green Hatch]	RESIDENTIAL ZONE (2(c))	1E03	24.330	0
[Blue Hatch]	INFRASTRUCTURE (SP2)	1E04	2.331	5
[Light Blue Hatch]	ENVIRONMENTAL PROTECTION (E2)	1E05	0.191	0
LAKE WOLLUMBOOLA CATCHMENT				
[Pink Hatch]	GENERAL INDUSTRIAL (IN1)	1F01	2.956	0
[Light Green Hatch]	RESIDENTIAL ZONE (2(c))	1F02	2.656	0
[Green Hatch]	INFRASTRUCTURE (SP2)	1F03	1.864	24
TOTAL SITE				
TOTAL - OVERALL			53.279	= 100 % OF OVERALL AREA
TOTAL - IMPERVIOUS			0.570	= 1 % OF OVERALL AREA
TOTAL - PERVIOUS			52.709	= 99 % OF OVERALL AREA



Notes:
- Aerial image from Nearmap (2019).

Pre-Development MUSIC Model (PD-LU) Catchments (Land Use Zoning)

1:7500 @ A3
Viewport D



KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %
CROOKHAVEN ESTUARY CATCHMENT				
	AGRICULTURAL	1A01	1.710	0
	FOREST	1A02	39.721	0
	ROAD	1A03	0.242	50
	UNSEALED ROAD	1A04	1.198	0
	REVEGETATING LAND	1A05	2.933	0
LAKE WOLLUMBOOLA CATCHMENT				
	FOREST	1B01	6.397	0
	ROAD	1B02	0.900	50
	UNSEALED ROAD	1B03	0.095	0
	REVEGETATING LAND	1B04	0.083	0
	TOTAL SITE			
	TOTAL - OVERALL		53.280	= 100 % OF OVERALL AREA
	TOTAL - IMPERVIOUS		0.571	= 1 % OF OVERALL AREA
	TOTAL - PERVIOUS		52.709	= 99 % OF OVERALL AREA

Notes:
- Aerial image from Nearmap (2019).



KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %
CROOKHAVEN ESTUARY CATCHMENT				
	AGRICULTURAL	1A01	1.582	0
	FOREST	1A02	43.982	0
	ROAD	1A03	0.242	50
LAKE WOLLUMBOOLA CATCHMENT				
	FOREST	1B01	6.575	0
	ROAD	1B02	0.900	50
	TOTAL SITE			
	TOTAL - OVERALL		53.281	= 100 % OF OVERALL AREA
	TOTAL - IMPERVIOUS		0.571	= 1 % OF OVERALL AREA
	TOTAL - PERVIOUS		52.710	= 99 % OF OVERALL AREA

Pre-Development MUSIC Models PD-LC1 (current land cover, left) and PD-LC2 (forest land cover, right) Catchments

Map Title / Figure:

Legend

Cadastre
 Water Treatment Areas

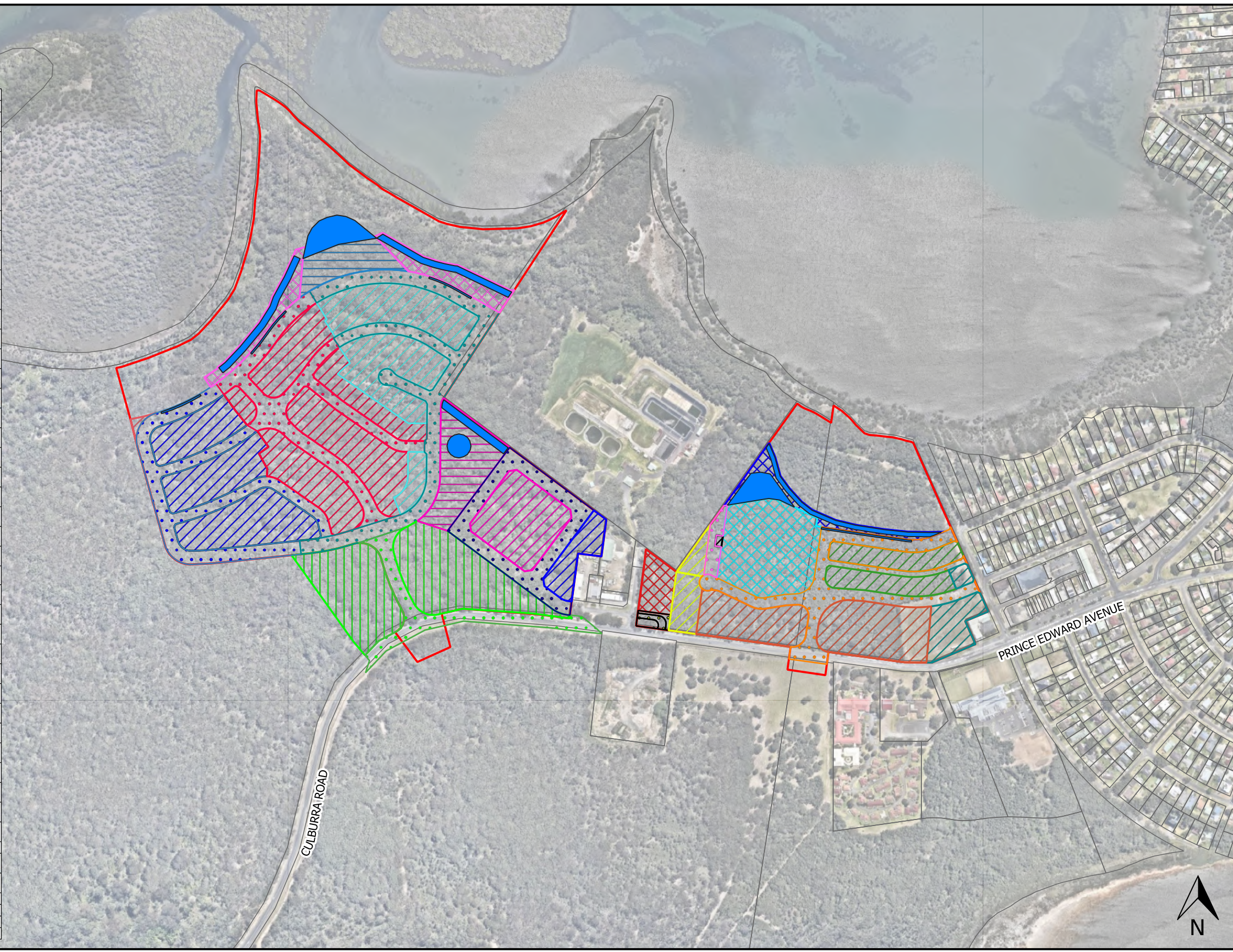
Site Boundary

KEY	DESCRIPTION	MUSIC NODE ID	AREA (ha)	IMPERVIOUS %
CROOKHAVEN ESTUARY CATCHMENT				
	C1 ROOF TO B1	1C01	2.004	100
	C1 ROAD TO B1	1C02	2.596	35
	C1 REMAINING TO B1	1C03	2.449	5
	C1 PARK TO B1	1C10	0.053	0
	C2 ROOF TO B2	2C01	2.675	100
	C2 ROAD TO B2	2C02	2.483	40
	C2 REMAINING TO B2	2C03	3.269	5
	C3 ROOF TO B3	3C01	1.944	100
	C3 ROAD TO B3	3C02	3.097	36
	C3 REMAINING TO B3	3C03	2.376	5
	C4 ROOF TO POND 3	4C01	0.360	100
	C4 REMAINING TO BIO D	4C02	0.360	44
	C4 ROOF TO POND 3	4C03	0.984	100
	C4 ROAD TO POND 3	4C04	1.873	33
	C4 REMAINING TO POND 3	4C05	0.984	44
	C4 PARK	4C06	1.485	0
	C5 ROOF TO POND 2	5C01	0.288	100
	C5 ROAD TO POND 2	5C02	0.170	39
	C5 REMAINING TO POND 2	5C03	0.288	44
	C5 PARK UPPER	5C04	0.530	0
	C5 PARK MIDDLE	5C05	0.240	0
	C5 CARPARK	5C06	0.267	100
	C5 SPORT CLUB	5C07	0.024	100
	C5 PARK LOWER	5C08	2.771	0
	C6 ROOF (MEDIUM DENSITY) TO B6	6C01	1.933	100
	C6 REMAINING (MEDIUM DENSITY) TO B6	6C02	1.459	16
	C6 ROOF (MIXED USE COMMERCIAL) TO B6	6C03	0.584	100
	C6 REMAINING (MIXED USE COMMERCIAL) TO B6	6C04	0.389	16
	C6 ROOF (INTEGRATED) TO B6	6C05	0.967	100
	C6 ROAD TO B6	6C06	2.483	39
	C6 REMAINING (INTEGRATED) TO B6	6C07	0.730	20
	C8 PARK	8C01	0.131	0
	C8 SPS	8C02	0.060	0
	C8 PARK	8C03	1.004	0
	C8 REVEGETATED	8C05	0.919	0
	C8 REVEGETATED	8C06	0.497	0
	WQ TREATMENT		1.957	
LAKE WOLLUMBOOLA CATCHMENT				
	C7 ROAD	1D01	1.532	44
	C7 FOREST	1D02	5.063	0
	TOTAL SITE			
	TOTAL - OVERALL		53.277	= 100 % OF OVERALL AREA
	TOTAL - IMPERVIOUS		18.965	= 36 % OF OVERALL AREA
	TOTAL - PERVIOUS		34.313	= 64 % OF OVERALL AREA

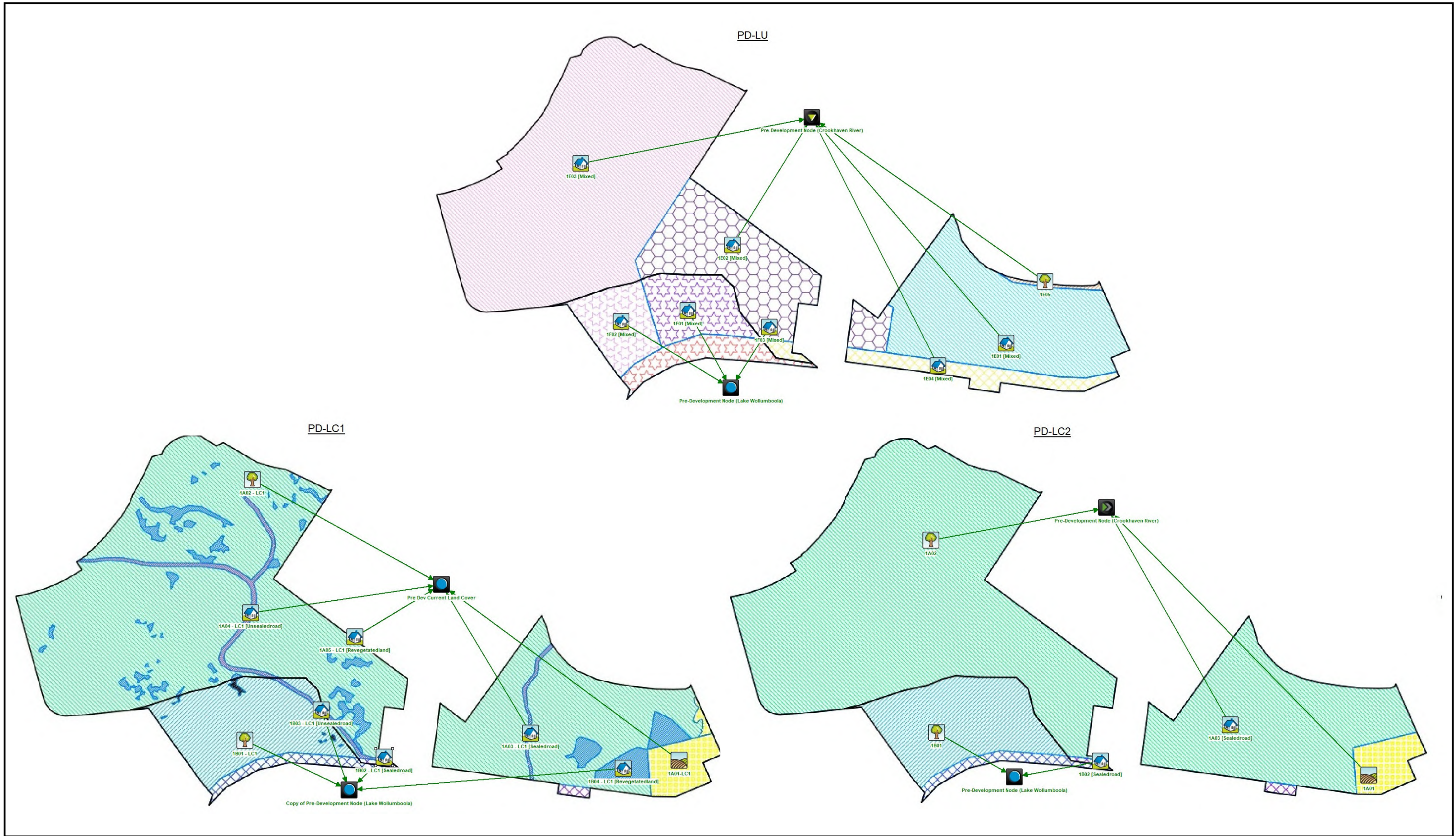


- Notes:
- Aerial image from Nearmap (2019).
 - 1. All lots have been split into 'roof', 'road' and 'remaining'.
 - 2. Assumed roof area for residential lots = 45% of the lot area.
 - 3. Assumed roof area for medium density lot/ integrated housing lot = 57% of the lot area.
 - 4. Assumed roof area for mixed use residential/commercial lot = 60% of the lot area.
 - 5. Assumed roof area for industrial lot = 50% of the lot area.
 - 6. Assumed each lot has a driveway of 3 x 6 = 18 m².

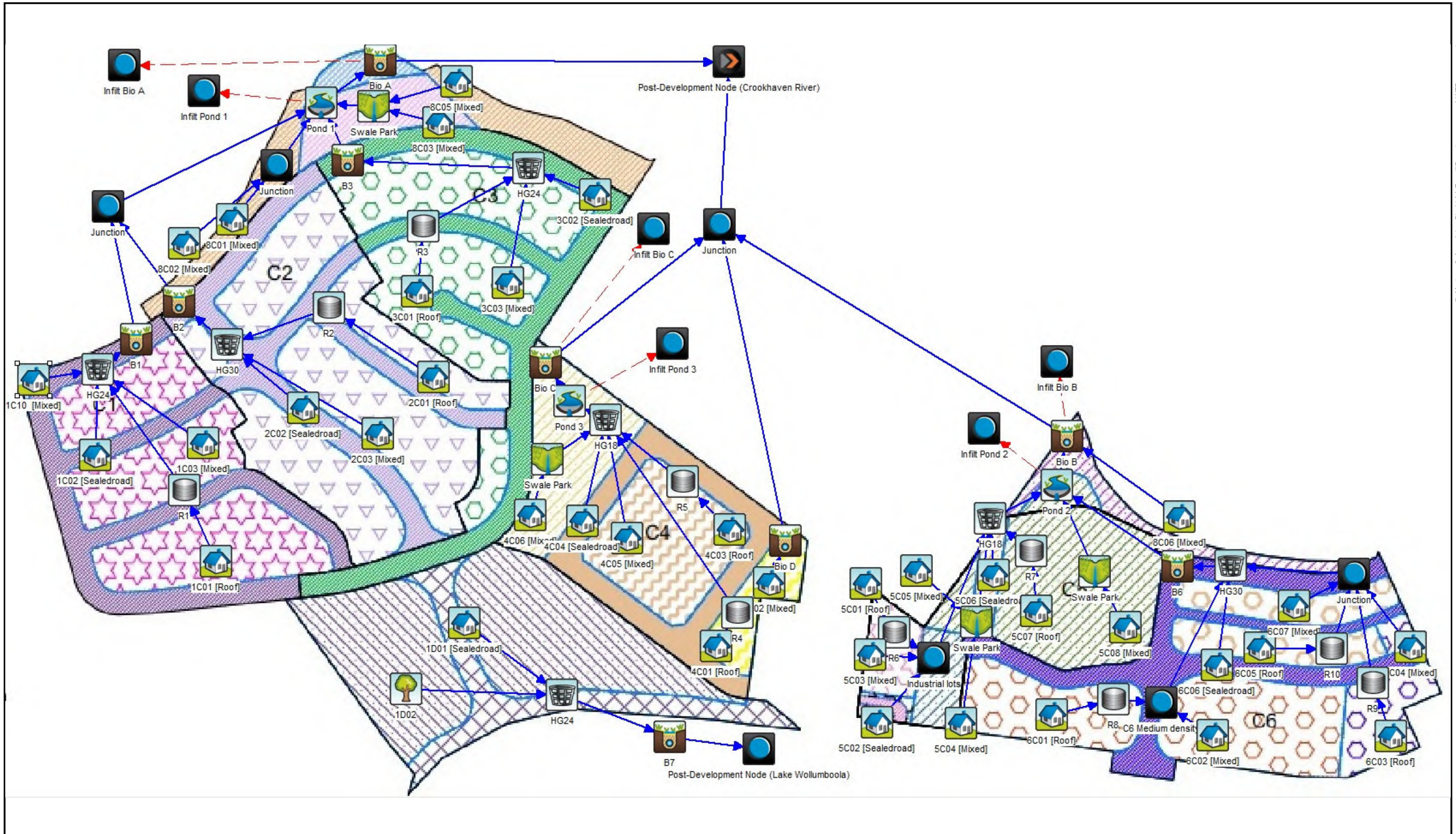
1:7500 @ A3
Viewport D



Map Title / Figure:
Post-Development MUSIC Model (D-T) Catchments








Map Title / Figure:
Pre-Development MUSIC Model Layout



Project No: P1203365 Map Set: MS05-R02 Projection: MGA © Martens & Associates Pty Ltd | E mail@martens.com.au | WEB www.martens.com.au

Map Title / Figure:
Post-Development MUSIC Model Layout

Legend

-  Cadastre
-  Site Boundary
- Current GW Monitoring Bores**
-  MA Boreholes
-  HGeo Boreholes
-  MA Water Quality Testing



0 200 400 600 800 1000 m

Notes:
- Aerial image from Nearmap (2019).

1:20000 @ A3
Viewport C

Map Title / Figure:
Hydrogeological Testing Plan