SOUTH THOMSON BARGE LANDING DEVELOPMENT

Benthic habitat assessment: Plume Extension Survey Area

The Plume Extension Survey Area (PESA) represents the 2.54 hectare (ha) area southeast of the Thomson Bay Field Survey Area (FSA) and within the eastern extent of the dredge plume modelling Zone of Influence (maximum predicted extent of visible plumes; ZoI) (Figure 1, Figure 2). A benthic habitat map of the PESA was developed for assessing the estimated impacts of planned dredging activities in the development area of the FSA.

Methods

Habitat mapping was undertaken using methods described in the South Thomson Barge Landing Development: Marine Fauna and Benthic Habitat Assessment (RPS, 2024). Esri's ArcGIS Pro was used to create a digitised image in vector shapefile format, using select Landgate Web Map Service aerial photographs. The February 2023 image (summer; Figure 3) was used as the base-map to maintain consistency with the habitat map developed for the FSA. The August 2023 image (winter; Figure 4) was used as the reference image, which provided a clear comparison against the base-map for identifying areas of wrack that are not present year-round (i.e., areas of dark seabed not shared between the two images), so that these could be removed from the habitat map. Note that isolated areas of habitat less than a few metres in diameter were generally too small for effective digitisation and mapping; however, this is not expected to have a meaningful effect on the results.

The RIA visually surveyed the benthic habitat at six sites within the 2.54 ha PESA on 22 March 2024 (Figure 1, Figure 2). Five sites were assessed over the darker areas of habitat observed in the aerial images, and one site over the lighter area of habitat. For the purposes of developing the habitat map, benthic habitat data obtained from the RIA survey are assumed to be commensurate with the species identifications and dominance-based method used by RPS in the FSA (RPS, 2024).

Benthic habitat was then classified into categories based on the dominant habitat type observed in the aerial images and confirmed via ground truth survey data (Table 1). Habitat classifications may be limited by aerial image clarity and habitat complexity (e.g., mixing of wrack with living seagrass). Darker areas of habitat shared between the aerial images that have confirmed seagrass dominated habitat at RIA survey sites are classified as "mixed seagrass". Based on similar habitat in the FSA, habitats in this category are likely comprised of *Posidonia*, *Amphibolis*, and *Halophila* seagrass species, but may also include macroalgae and sand. As such, the area of seagrass may be overestimated. This classification of the non-sand habitat as "mixed seagrass" provides a conservative estimate of the dredge plume impact on seagrass habitat in the PESA.

Table 1: Classification scheme used in the analysis of benthic habitat in the PESA

Benthic habitat class	Description
Sand / Sand with wrack[1]	Sand dominated (majority bare sand) and/or wrack
Mixed seagrass[1]	Seagrass dominated (majority seagrass species)
Limestone reef / pavement[2]	Limestone reef or platform with minor attached seagrass/macroalgae

[1]Identified by aerial image classification and RIA ground-truth data

[2]Identified by aerial image classification only

Results

Six sites were surveyed by the RIA on 22 March 2024 for the development of the benthic habitat map. Five sites were identified as *Posidonia sinuosa* dominated, and one site as sand (Figure 1, Figure 2).

"Sand/Sand with wrack" dominated 50 % of the PESA (1.27 ha), while "mixed seagrass" and "limestone reef/pavement" covered 36.22 % (0.92 ha) and 13.78 % (0.35 ha) of the PESA, respectively (Table 2, Figure 1, Figure 2). Mixed seagrass dominated the central area of the PESA,

surrounded by sand and wrack. RIA survey data confirmed the presence of living seagrass at sites along the edge of the mixed seagrass habitat. A significant amount of wrack was present to the east of the mixed seagrass, as shown by the markedly different shaded areas between the February and August aerial images (Figure 3, Figure 4). Closer to the FSA, limestone reef/pavement habitat extended from the shoreline to the north of the PESA. Patches of mixed seagrass covered the southern and eastern edges of the limestone reef/pavement habitat, with sand and wrack between the reef/pavement and the FSA.

Table 2: Area of benthic habitats within the PESA

Benthic habitat class	Area (hectares)	Percentage of PESA (%)
Sand / Sand with wrack[1]	1.27	50
Mixed seagrass[1]	0.92	36.22
Limestone reef / pavement[2]	0.35	13.78
Sum	**2.54**	**100**

[1]Identified by aerial image classification and RIA ground-truth data

[2]Identified by aerial image classification only

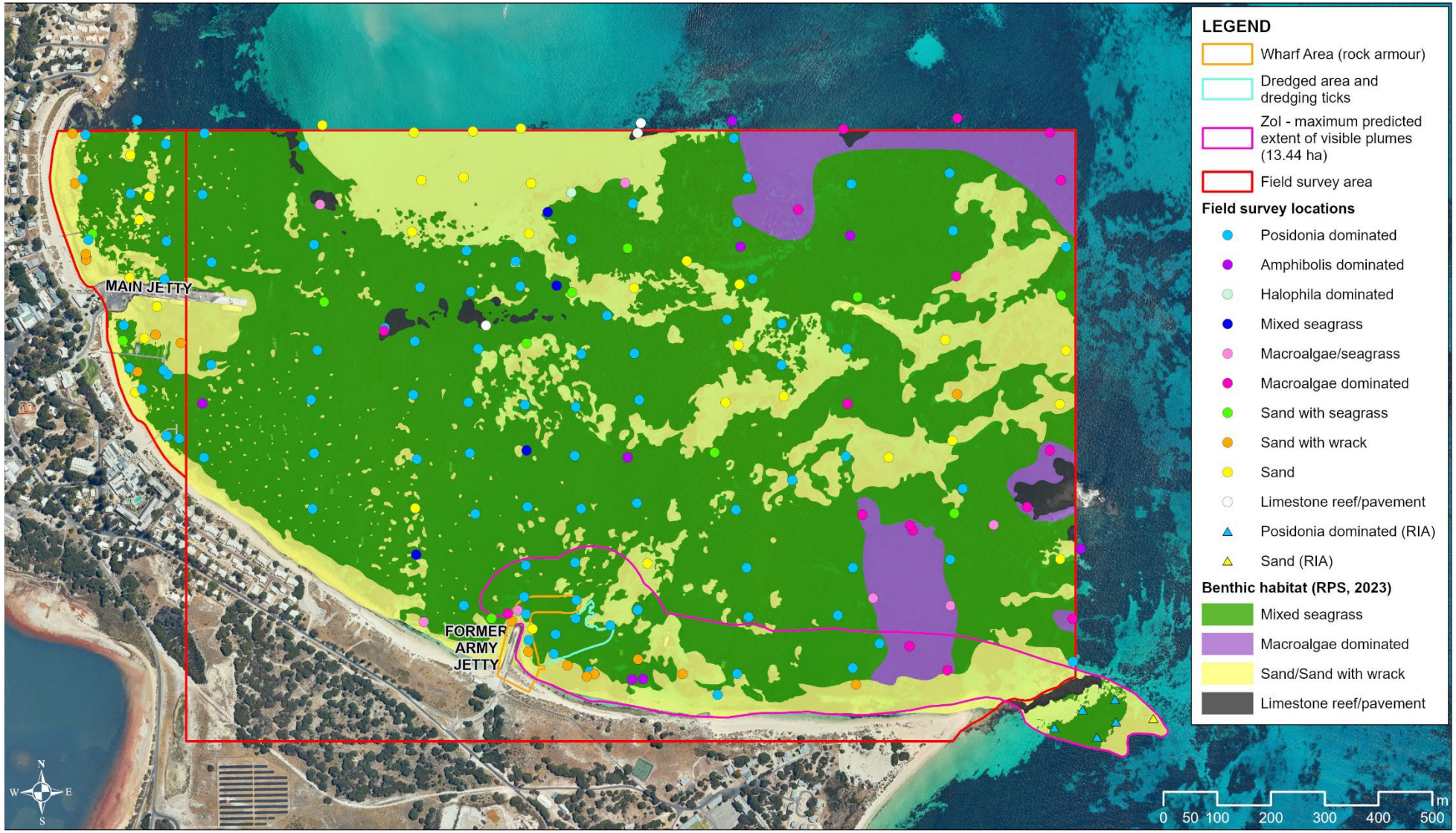

Figure 1: Benthic habitat map of the Field Survey Area, Main Jetty Survey Area, and Plume Extension Survey Area at Thomson Bay, Rottnest Island

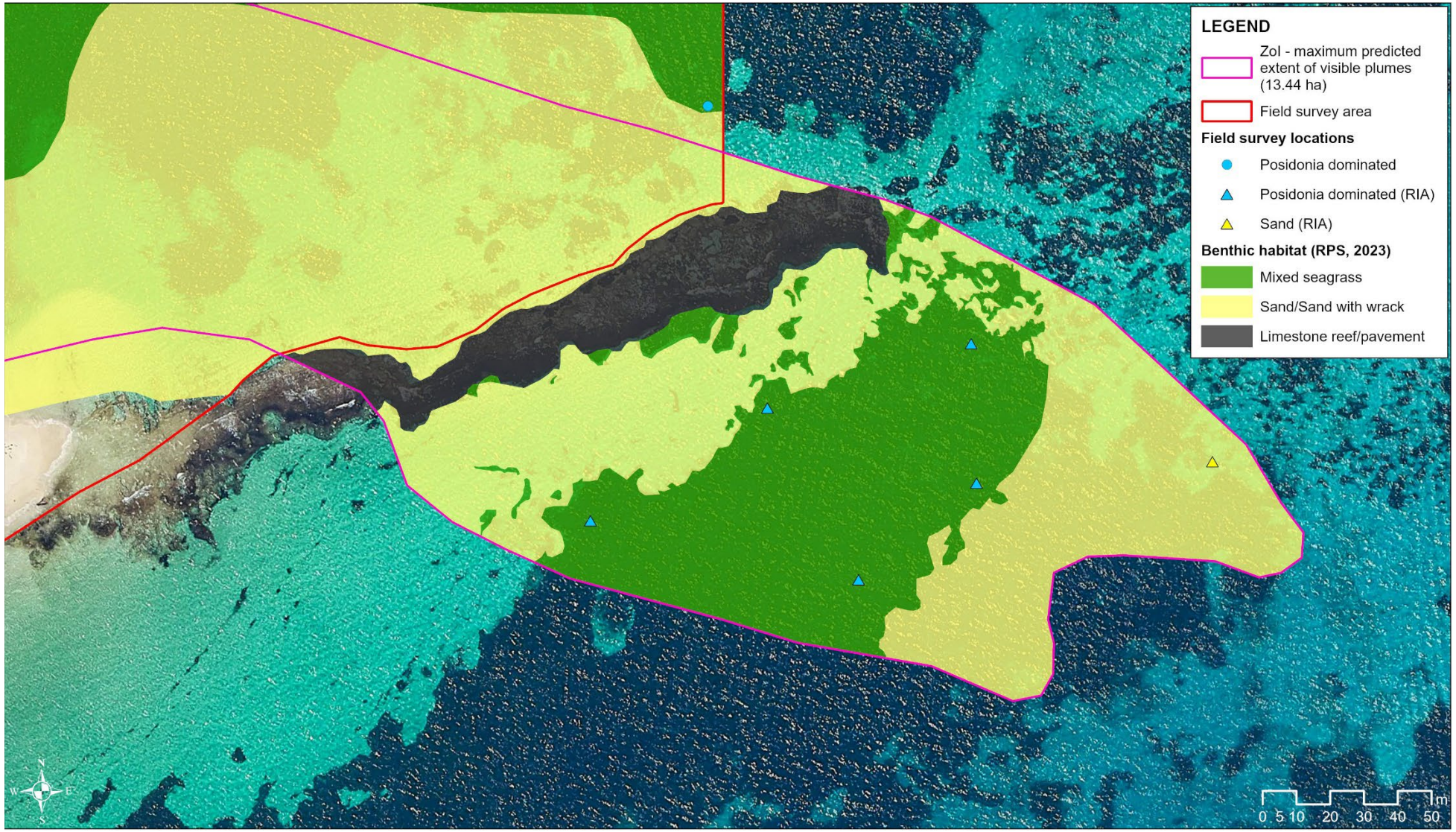

Figure 2: Benthic habitat map of the Plume Extension Survey Area at Thomson Bay, Rottnest Island

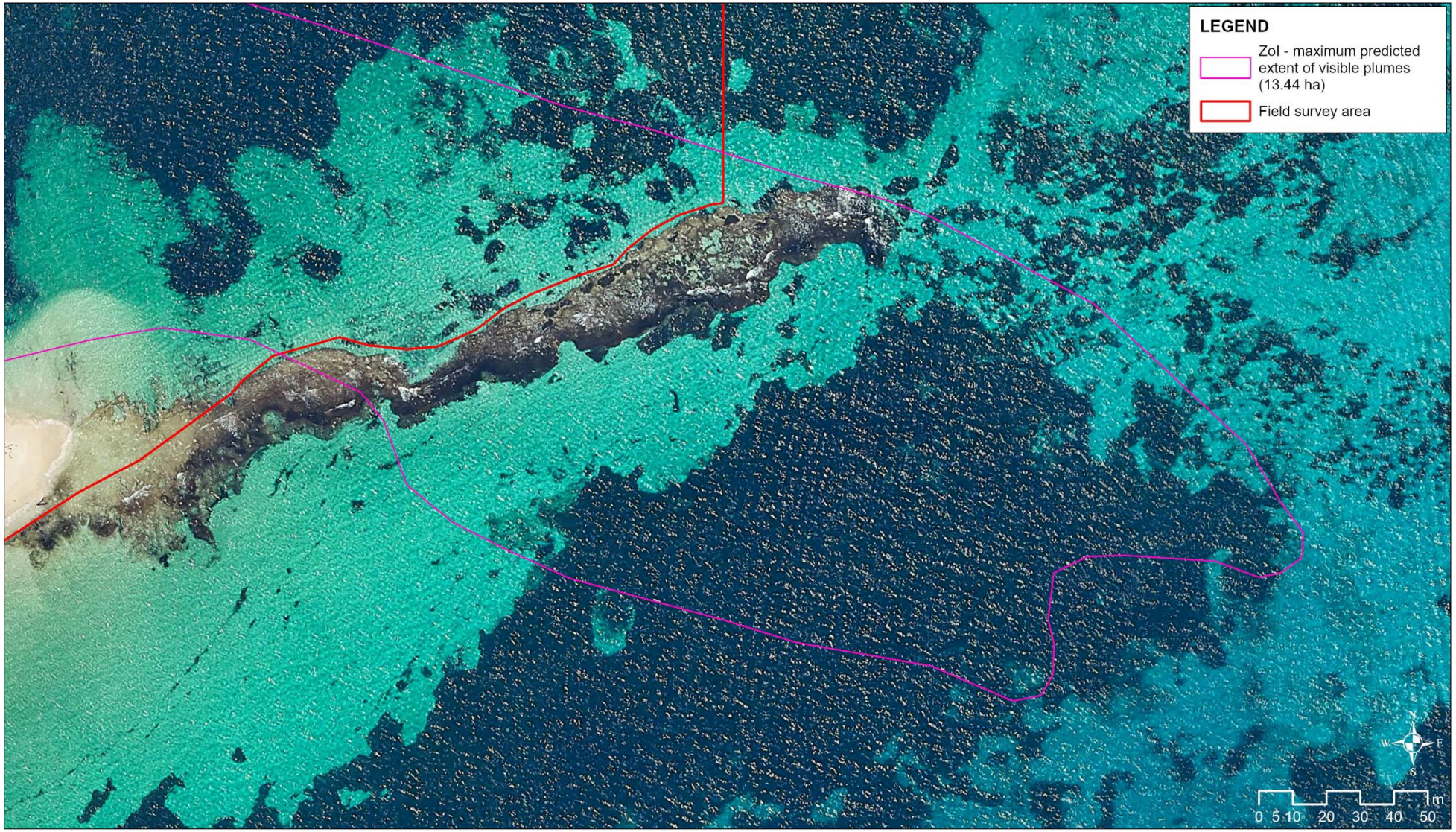

Figure 3: Aerial image of the Plume Extension Survey Area, Thomson Bay, February 2023 (source: Landgate)

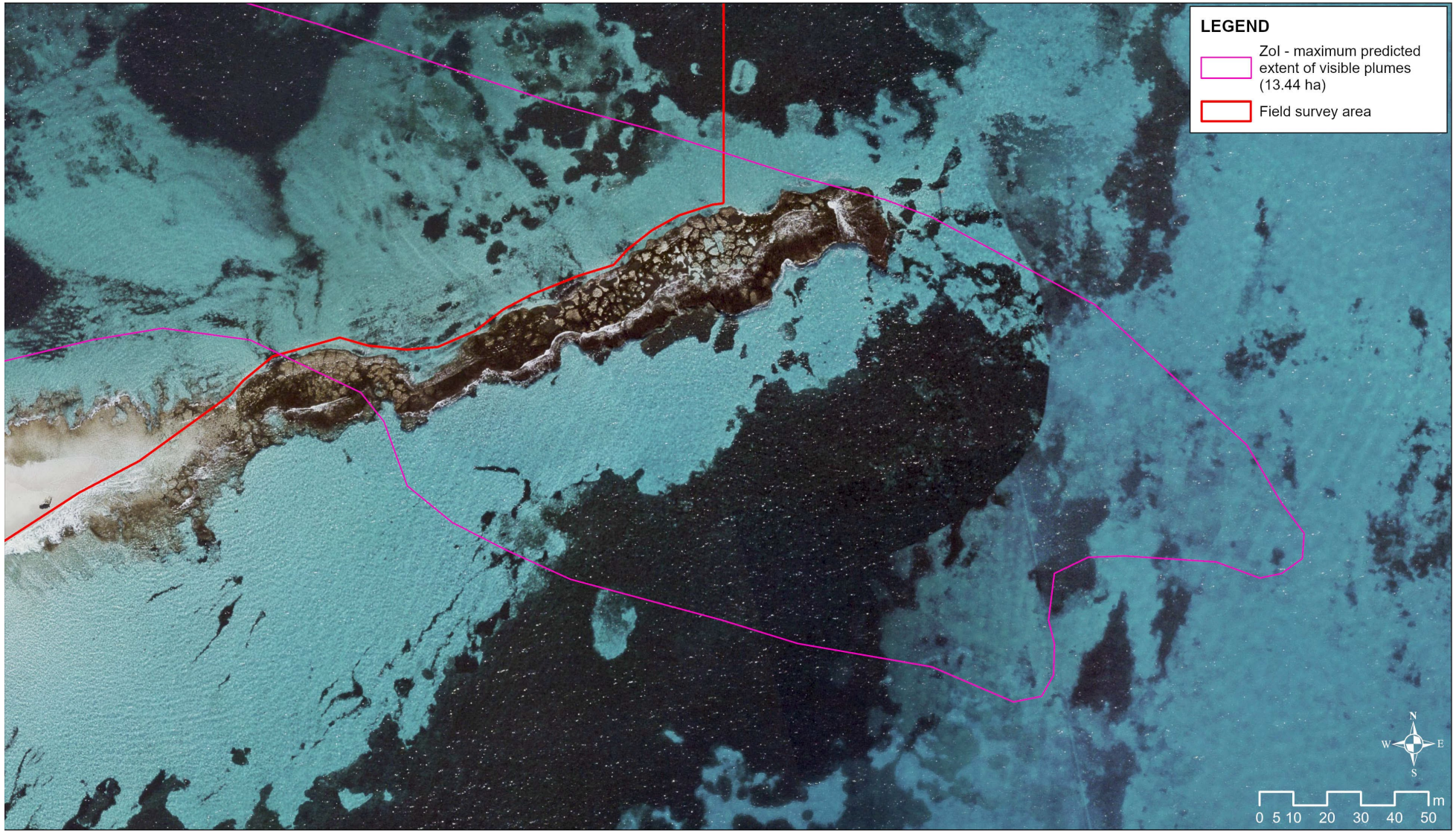

Figure 4: Aerial image of the Plume Extension Survey Area, Thomson Bay, August 2023 (source: Landgate)

References

RPS, 2024. South Thomson Barge Landing Development: Marine Fauna and Benthic Habitat Assessment. RPS AAP Consulting Pty Ltd.