4.0 Definition of Study Area

This section describes the study area under which the proposed five hundred (500) room Hotel Project Development at Kilgwyn Bay, Environmental Impact Assessment (EIA) will operate.

The definition of the study area draws on several primary and secondary data sources which present an overview of the surrounding area in which the project will take place.

The study area for this (EIA) considered both near field and far field impacts on the receiving environment (Silva, Santos, and Correia 2011). Activities during all project phases; pre-construction, during and post construction operations may create localized effects on air, noise, water and sediment quality, and nearshore marine environment. Therefore, immediate or near field impacts are expected to be confined to areas immediately surrounding the proposed hotel infrastructure (Friendship-Tyson Hall communities) including the back of the house support facilities. **Figure 18 - 4.3** illustrates the extent of the immediate or near field study area based on a 2 km zone around the proposed hotel development. All direct impacts from planned hotel project activities are expected to be captured within this zone.

To a lesser extent far field impacts (based on a 5 km zone around the proposed hotel development - **Figure 19 - 4.4**) may extend to the northern hamlets and villages within the Bon Accord and Canaan area and southern coastline (Cove and Crown Point) mainly during the construction and operational phases. Therefore, various communities and terrestrial and nearshore marine environments present along the west coast were included as part of this EIA's far field study area. All study areas are discussed in this section and are accompanied by relevant spatial maps and diagrams.

4.1 Proposed Hotel Site Location

The Project site is located on the south-western side of the island of Tobago, within 1 kilometer of the Sir A.N.R. Robinson International Airport landing strip (**Figures 16 - 4.1** and **17 - 4.2**). The area is characterized as nearshore environment linked to an

active marine transition zone and encompasses 47 acres of terrestrial mangrove wetlands/onshore land space (**Figure 17 - 4.2**)

The site is bounded to the west by the Sir A.N.R. Robinson International Airport and east by the hamlet of Friendship. Towards the north by commercial businesses, abandoned warehouse buildings and aggregate stockpile yard operations and to the south by the Atlantic Ocean.

The project site has a polygonal shape with a perimeter and area of approximately 18.7258 hectares or 46.27 acres. The site is relatively terraced on the northern fringes which then moderately slopes to the mid-section before flattening towards the south coastal regions and then gradually slopes to the coastline.

Drainage is generally lacking on the site and surface run off is predominantly towards the south east towards a relic sluice canal, along roadways and the sloped terrain, where it either enters the ponded area within the mangrove, percolates into the earthen ground or enter shallow earthen drains and finally emptying into the Atlantic Ocean (**Figure 16 - 4.1**).

Vegetation within the site at time of field works were moderate to heavily dense with tall grasses, mangroves and secondary forest. A few mature trees are sparsely and randomly located along the north-east, south east and western fringes of the site.

The site is primarily used for agriculture, recreational crab hunting and a beach along the nearshore environment. There is also evidence of stranded boats outside the south eastern border of the property of interest, indicating that the area is also used as a transitional fishing hub and landing stage for recreation fisherfolk.

There is very low-density housing or commerce settlements within a 1km radius from the hotel development site with only access to the Kilgwyn Bay being the local Kilgwyn Bay Beach road with no lighting and very poor drainage supporting infrastructure (**Figure 16 - 4.1**)

Figure 16 - 4.1: The 500 Room Dreams and Secrets Hotel Project Area, Situated at Kilgwyn Estate, Tobago. Property Cadastral within to provide proximity context with landscape.
Source: OptimalGESL, 2022.

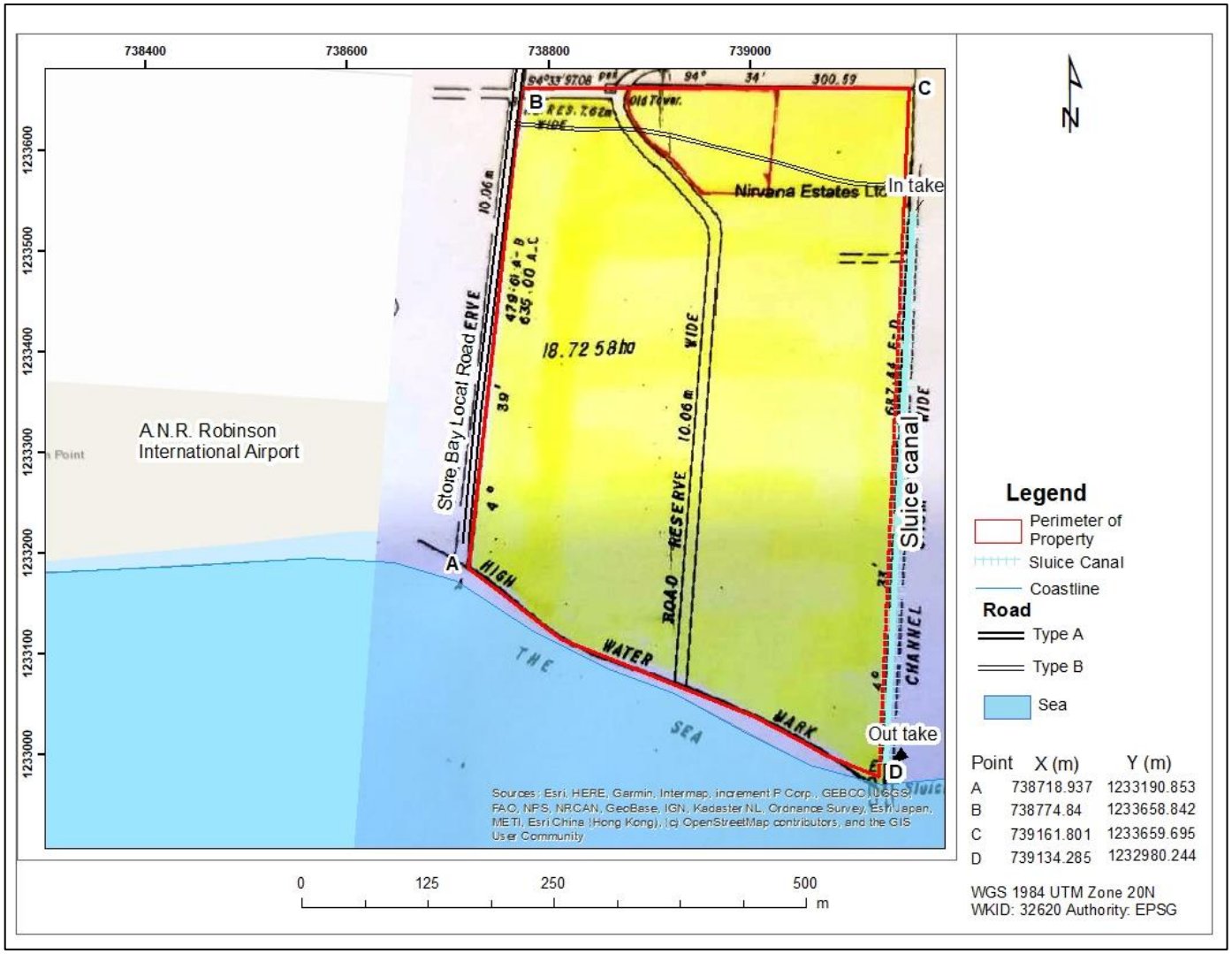

Figure 17 - 4.2: Property Cadastral Relative to Coastline and Anthropogenic Land Use/Infrastructure.
Source: OptimalGESL, 2022.

4.2 Proximity Analysis

4.2.1 Immediate or Near Field Impacts Areas

These areas are defined as the within a 2km sphere of influence from the immediate hotel development and encompasses most of the environmentally sensitive areas; mangroves, terrestrial water courses, dry forest areas, Kilgwyn Bay beach and nearshore marine environment. Socioeconomic impacts areas within this zonation; Friendship, Kilgwyn Bay and Tyson Hall. **Figure 18 - 4.3** illustrates the near field impact zonation considered in the EIA.

4.2.2 Longer Term Far Field Impacts Areas

Far field impacts are defined as those areas that will be less impacted by the hotel project based on a 5 km zone around the proposed hotel development and include environmentally sensitive areas; Cove, Canoe Bay and Crown Point coastline. In term of socioeconomic impacts this zonation may extend to the northern communities of Bon Accord and Canaan. **Figure 19 - 4.4** illustrates the far field impact zonation considered in the EIA.

4.2.3 Other Far Field Impact Considerations

During the Pre-Construction, Construction and Operational phases of the hotel development there will be increased volume of traffic from the Scarborough Port of entry to the Kilgwyn Bay hotel development site; via Claude Noel Highway to Milford Road then to Store Bay Local Road route. Traffic density will increase during the daytime (6am to 6pm) and reduced during the night (6pm to 6am). Similarly, there would be increased traffic volume from Crown Point International Airport, via the Store Bay Local and Milford roads heading east towards Kilgwyn Bay.

The classification of vehicular traffic will also see changes to more Heavy-T Class, Trailers, Trucks and heavy machinery equipment on tow. The impacts of these traffic changes to the environment are further discussed in **Section 8.0 – Analysis of Environmental and Climate Change Impacts**.

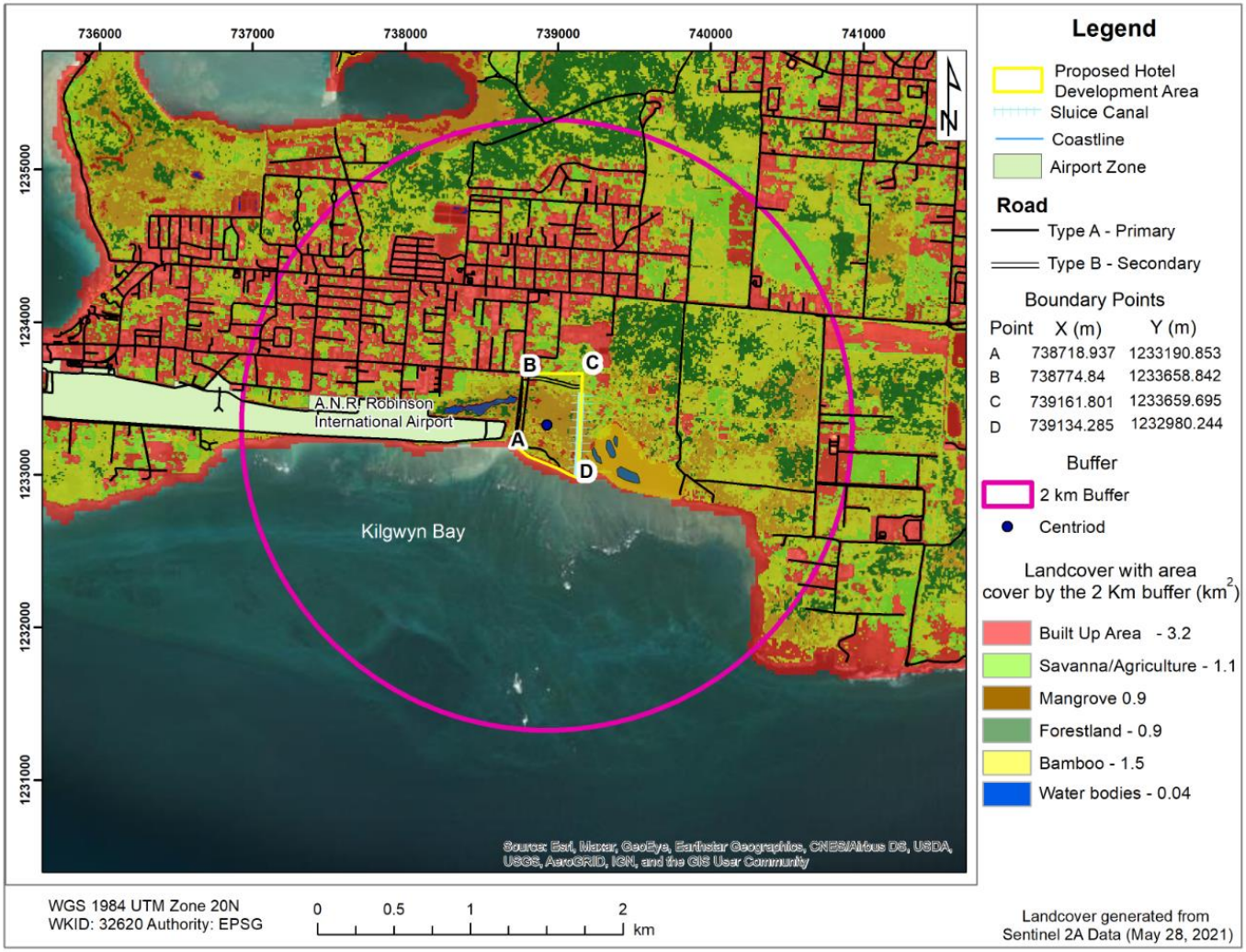

Figure 18 - 4.3: Near Field (2km) Impact Zonation Considered in the EIA - Kilgwyn Bay, South-West, Tobago.
Source: OptimalGESL, 2022.

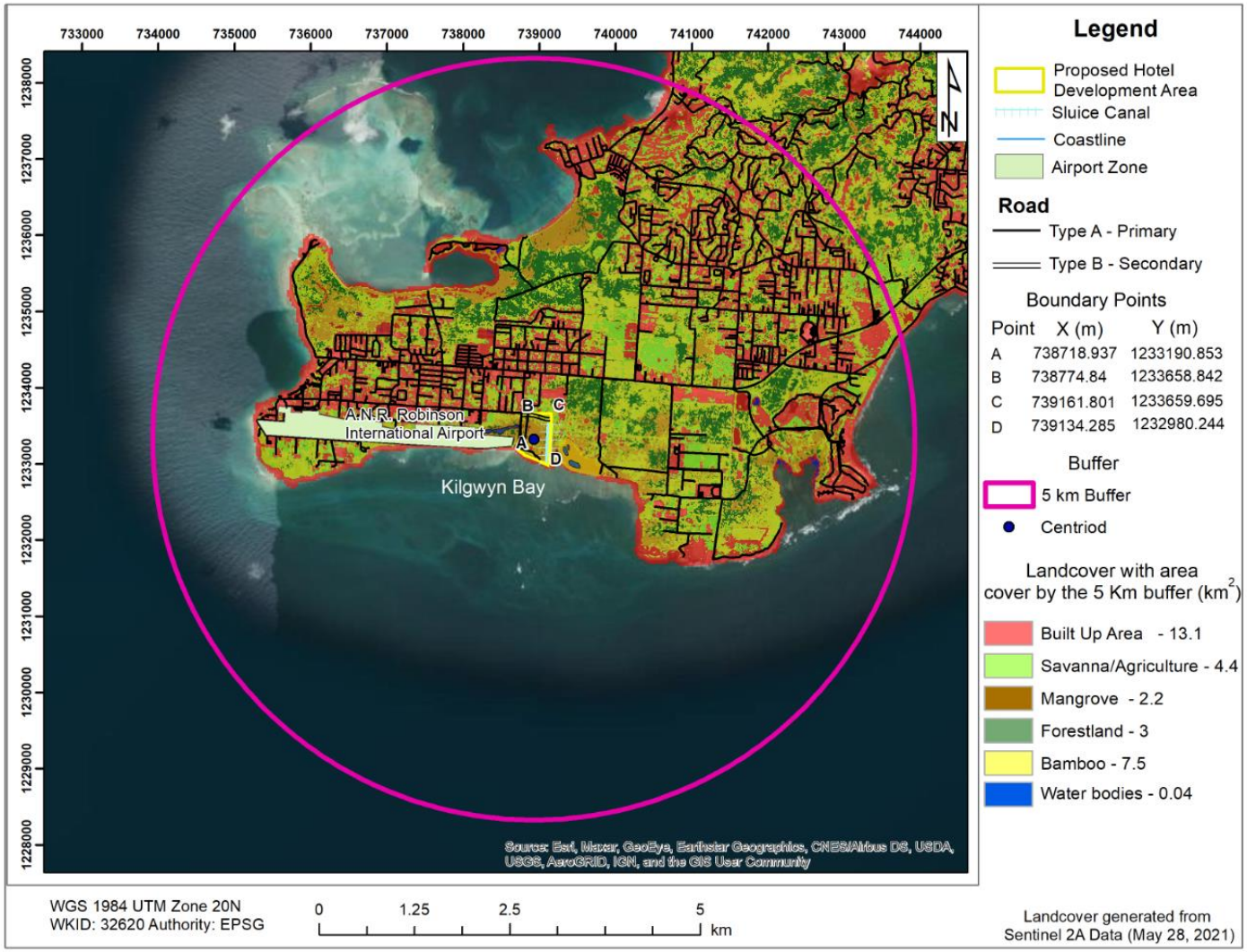

Figure 19 - 4.4: Far field (5km) Impact Zonation Considered in the EIA. Kilgwyn Bay, South-West, Tobago. Source: OptimalGESL, 2022.

4.3 GPS Line Transects Mapping, GIS Mapping and Land Use

4.3.1 GPS Line Transects Mapping

High density GPS line transect mapping was undertaken within all terrestrial and nearshore sensitive areas to substitute for the unavailability of Drone/UAV mapping due to the close proximity (circa 100m) of the property to the no-fly zone of the ANR Robinson International Airport. This also involved the collection of high-resolution ground photos, videos of land use, geomorphology, anthropogenic activity and vegetation cover. Over 600 GPS transect points were collected with horizontal accuracy of 2m and elevation accuracy of 1m; these were calibrated against mean sea level (MSL-0m elevation) to offset against any elevation anomalies (Figure **20 - 4.5**).

This data was then integrated and processed using ArcGIS and Surfer software to generate the following:

- Generation of high-resolution geotagged photomontages of landscape
- Generation of Spatial and Digital Terrain Models (DTM) and Digital Surface Models for the property
- Land use perspective of rivers, vegetation, coastlines, and buildings.
- Conversion of output maps to KML (Google Earth), ASCII, TXT and other formats for import into other GIS programs

Figure 20 - 4.5: GPS Transect Line Mapping with Over 600 GPS Points over the Kilgwyn Bay Property, South-West Tobago.

4.3.2 Integrated GIS Mapping- Topography, DEM and Slope Analysis

Integrated GIS mapping was carried out across the area of study with 100m overlaps beyond the cadastral limits of the Kilgwyn Bay property. This involved the collection of high-resolution photos, topographic surveys and GPS line transect mapping.
This data was then integrated and processed using ArcGIS, Agisoft Photoscan, and Surfer software to generate the following:

- Digital Terrain Models (DTM) and Digital Surface Models for areas of interest (**Figures 23 - 4.8** to **25 - 4.10**).
- Generation of high resolution Spatial, Geostatistical, Hydrological, Digital Elevation Model (DEM), Spatial Analysis maps
- 3D perspective of rivers, vegetation, coastlines, and buildings.
- Conversion of output maps to KML (Google Earth), ASCII, TXT and other formats for import into other GIS programs

  Methodology employed:
- The cadastral of the property was geo-referenced using ESRI ArcMap.
- Projection – 1984 UTM zone 20 (EPSG: 32620)

- ESRI ArcMap was used to vectorized the property boundary from the geo-referenced cadastral.
  - Contours were generated for the project area using GPS data collected by OptimalGESL team using Golden Software Surfer and applying the Kriging Method
  - The generated contours were imported in to ESRI ArcMap and used to generate the Hill-shade model and slope model for the project area.
  - Used field data collected OptimalGESL team as well as secondary data to generate a landuse/landcover classification of the project area.
  - Several maps were generated of the project area using ESRI ArcMap, Google Earth and Surfer Software.

4.3.3 Integrated GIS Mapping- Land use

Integrated GIS mapping was carried out across the property with 100m overlaps beyond the cadastral limits using ArcGIS and Surfer software to generate a landuse map of current surface conditions. Spatial analysis of and classification of each land use type was undertaken.

4.3.4 Near field /Immediate Environmentally Sensitive Areas

Mangrove Swamps and ponded areas

Approximately 55% of the property (**Figure 18 - 4.3**) is covered with mangrove vegetation; *Rhizophora mangle*, a mangrove tree 5-10 m tall. It is a native species in coastal areas of Tobago in with many environmental benefits, protecting coasts against storm and tidal damage and providing habitats needed for numerous marine and estuarine species. It has colonized areas rapidly and form dense, naturally monospecific stands that outcompete other species.

Another species of mangrove, *Avicennia nitida*, known as black mangrove, siriuba or canoé mangrove, accounts for a further 15% of vegetative cover. The mangrove species is tree or shrub-sized with smooth trunk bark that when scraped, presents a yellowish color. Within the southern reaches of the property this mangrove species reaches an average height of 10 m with an average trunk diameter of 20 cm, and a sub-aerial root system with pneumatophore.

The ponded areas mapped can be classified an unnatural/manmade, a result of unregulated beach sand mining. These ponds do no exceed a depth of 2m and outer banks invaded with black mangrove. These ponds are act as a habitat to many species of flora and fauna.

Figure 21 - 4.6: Avicennia Nitida, Known as Black Mangrove (Left Image) and Rhizophora Mangle, Red Mangrove (Right Image).

Dry Evergreen Vegetation and dry sandy soils

Coccoloba uvifera is a species of flowering plant in the buckwheat family, Polygonaceae, and is native to coastal beaches throughout Tobago and the Caribbean. Common names include seagrape and baygrape. This accounts for 15% of the vegetative cover, but restricted to the berm and nearshore environment towards the south (**Figure 22 - 4.7**).

Figure 22 - 4.7: Coccoloba Uvifera, Sea Grape (Left Image) and Manchineel Tree (Right Image).

Old Secondary Forest with minimal undergrowth

The remainder of vegetative cover comprises a mix of coconut trees (Cocos nucifera) and the native manchineel tree. The latter provides excellent natural windbreaks and its roots stabilize the sand, thus reducing beach erosion; these trees are restricted to the berm and nearshore environment towards the south and northern terrace/upper watershed (**Figures 24 - 4.9** to **26 - 4.11**)

Nearshore Marine Environment

The beach is a dynamic environment, very fine sediment can only accumulate under fairly calm hydrodynamic conditions, building fairly mild (1:1000 – 1:1500) and wide slopes with its deposits. Because of these mild and wide slopes, the tidal motion is largely perpendicular to the coastline and tidal velocities are low. Wind waves and swell are damped over the soft muddy bed, and refract towards the coastline. Coastal waters become fresher during the wet season from run-off and from the tributaries around Kilgwyn Bay. Thus, a cross-shore salinity gradient is induced. These gradient drives a cross-shore gravitational circulation with an undertow towards the coast bringing sediments onshore together with the tidal motion. As a result, wave-induced long-shore sediment transport occurs, though generally low still allows the development of a distinctive 1m berm parallel to shoreline.

Future anthropogenic disturbances, such as over-harvesting mangroves during excavation, the establishment of hard infrastructure/construction and groundwater extraction will induce large-scale erosion and subsidence of the nearshore environment/coastline.

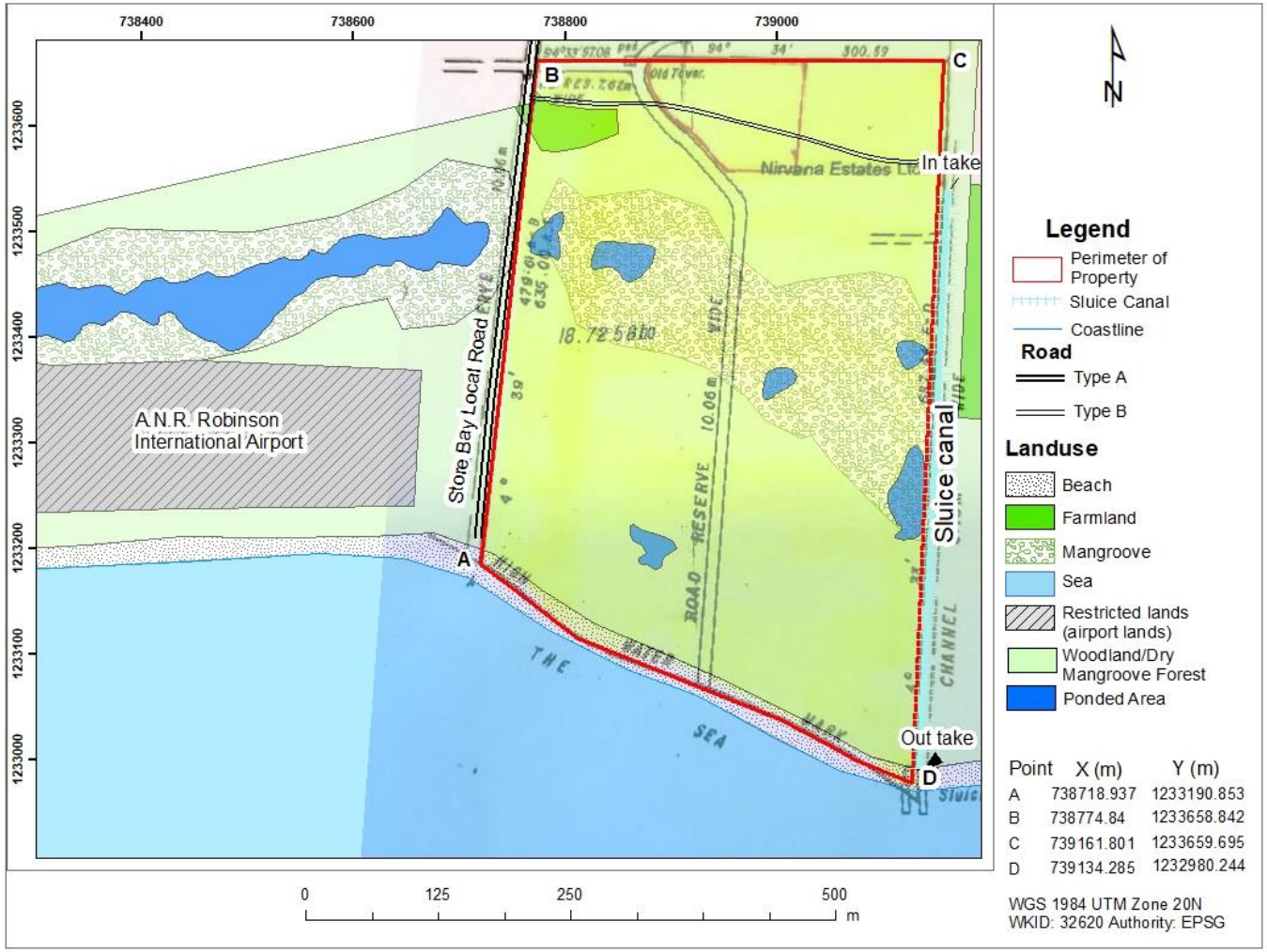

Figure 23 - 4.8: Land Use Spatial Analysis Across the Property and Surrounding Areas, Kilgwyn Bay, Tobago.

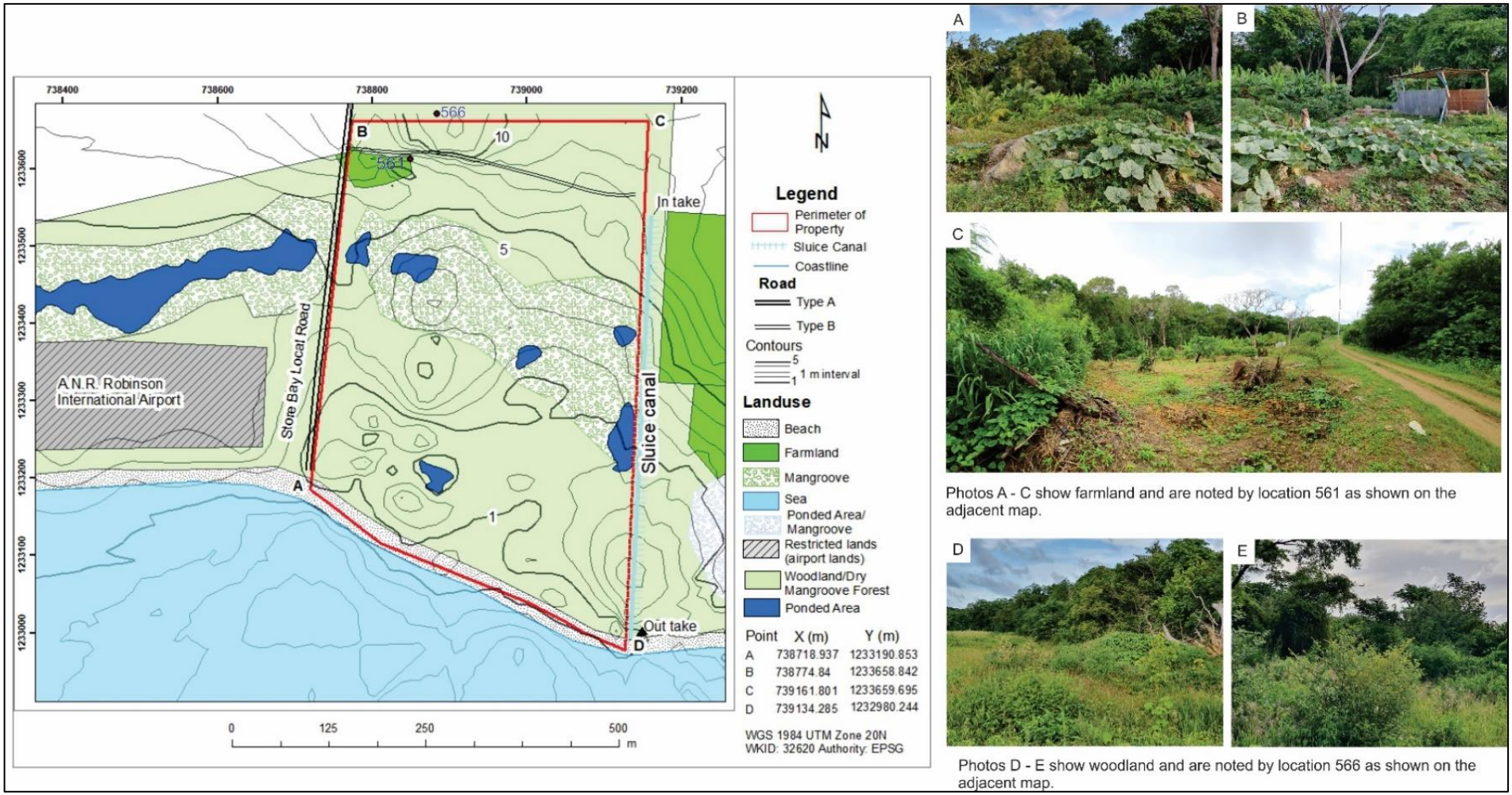

Figure 24 - 4.9: Integrated Land Use Montage 1: Nearfield Proximity Analysis, Topography and Property Perimeter.

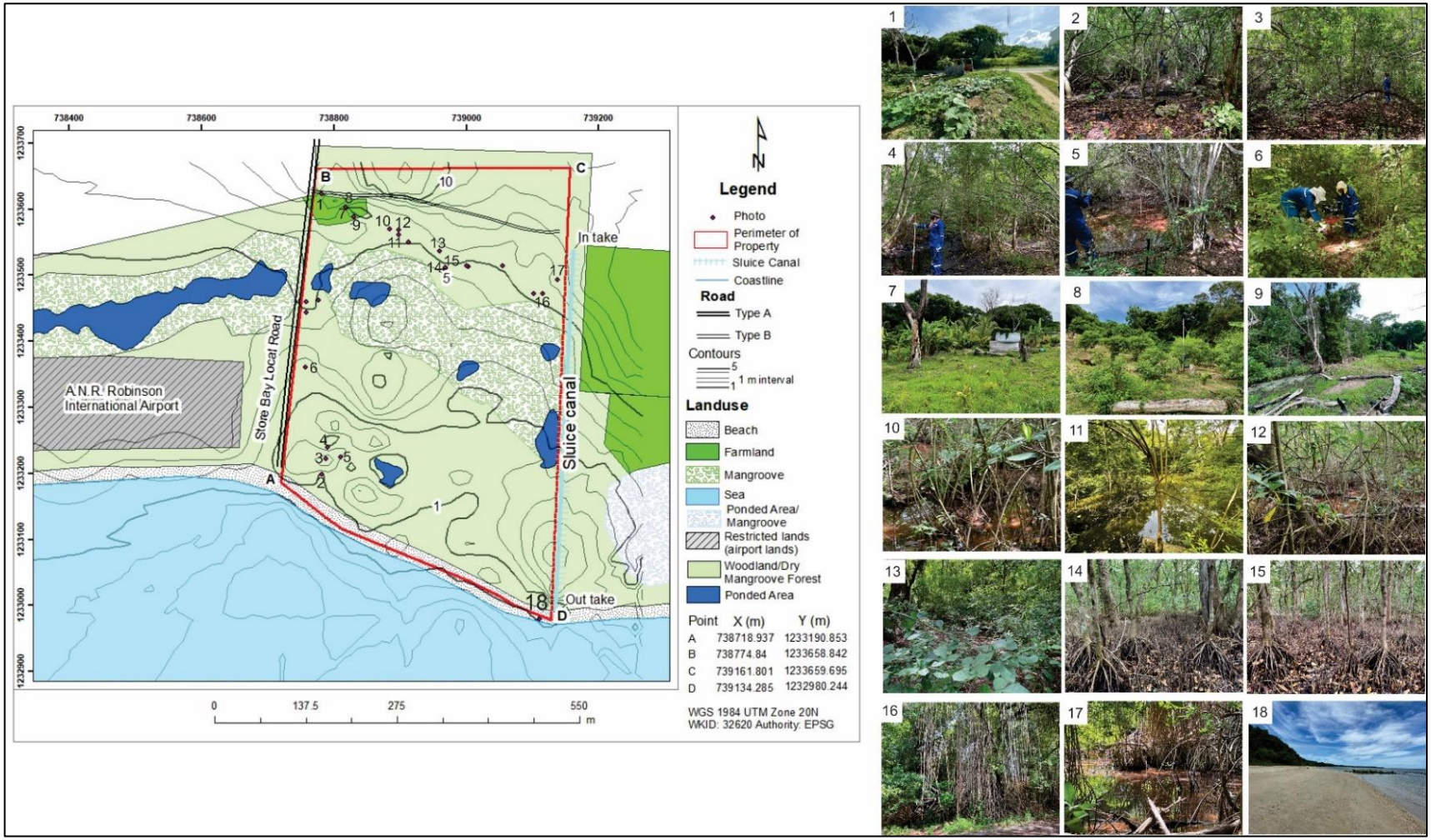

Figure 25 - 4.10: Integrated Land Use Montage 2: Near Field Proximity Analysis, Topography and Property Perimeter.

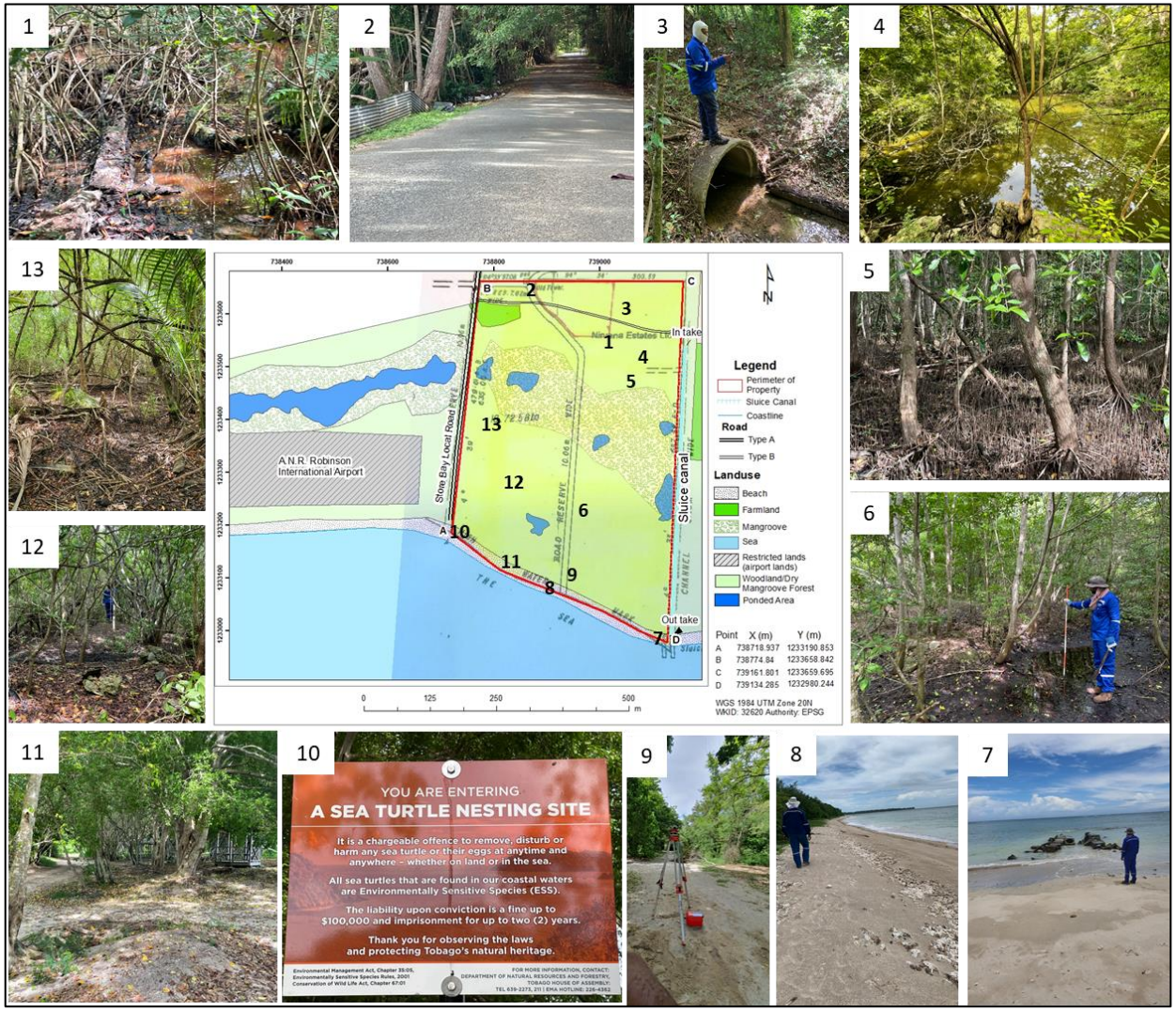

Figure 26 - 4.11: Integrated Land Use Montage 3: Proximity Analysis, Topography and Property Perimeter.