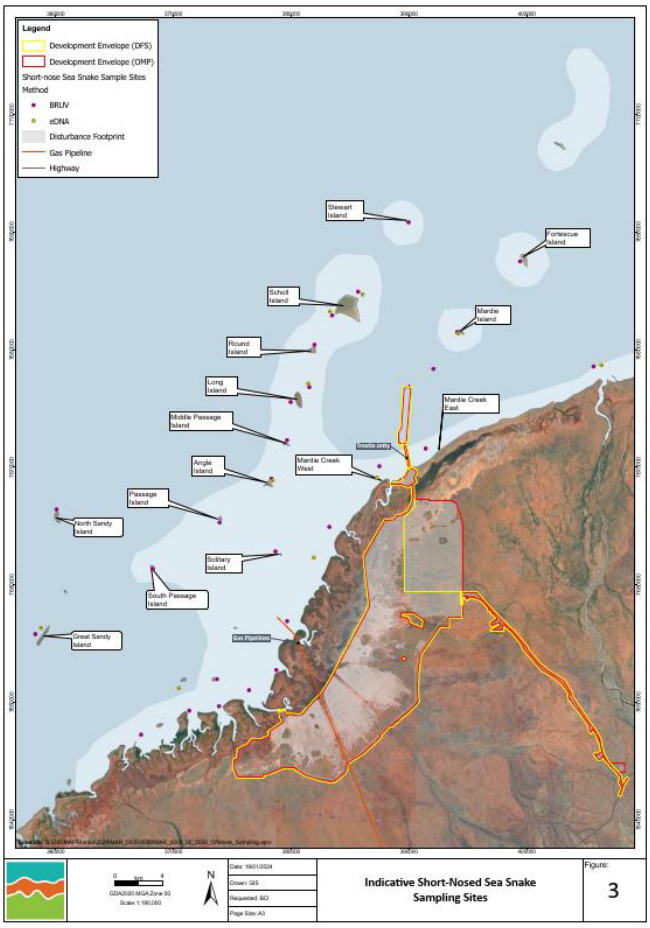
Generating a sampling design across the Mardie region

****** Note: The sampling design below shows an indicative approach and is therefore NOT final.***

We will generate a spatially balanced sampling design across the Mardie region while taking into account indicative Short-nosed sea snake sampling sites as presented in the image below. That is, our design will prioritise these identified sites when generating our design.



(Source: Daniella Hanf, O2 Marine)

Here, "spatially balanced" means that the sites we will place within the survey boundary (approximated from the map above)will yield adequate, representative data of the sea snakes that occur in the area including the Short-nosed sea snake (*Aipyusurus apraefrontalis*). We created a custom function (`sbs_mardie`) that will automate the entire process (see function script here). The function and required arguments are shown below:

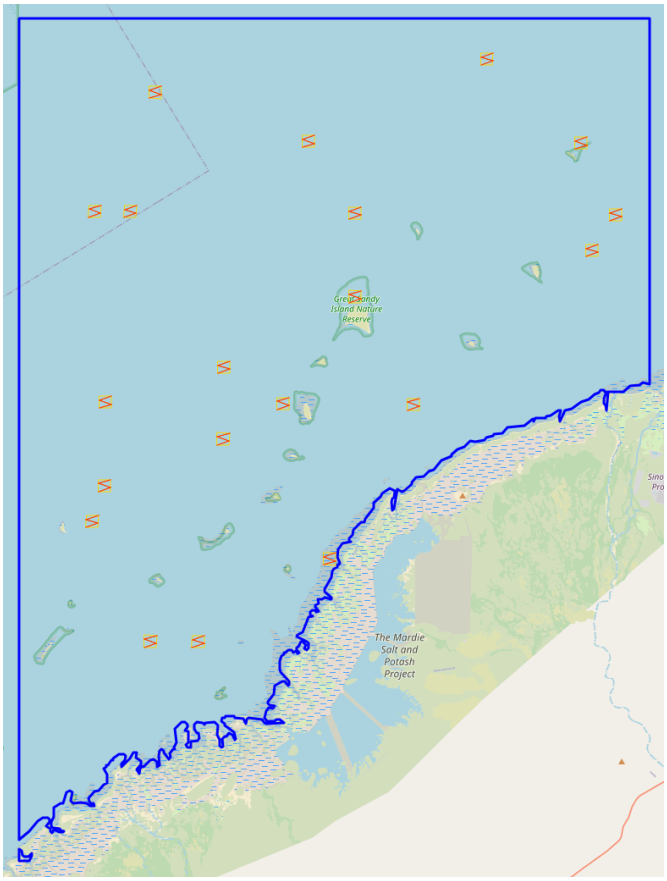
```
sbs_mardie(seed = 777,          # iteration ID
           n_block = 20,        # total number of blocks (squares) that will have transect lines
           block_size = 1000,   # length of each side of the square (in metres)
           n_trns = 60,         # total number of transects across total number of blocks
                                # (here, 60 transects across 20 blocks = 3 transects/block)

           # Approximate extent from provided map
           xmin = 115.61768,
           xmax = 116.12871,
           ymin = -21.35492,
           ymax = -20.71698)
```

This function produces the following output:

1. shapefiles (`.shp`) of the blocks and of the transects
2. a `.csv` file containing start and end coordinates of the transects
3. a `.gpx` version of the `.csv` file which may be useful for boat interfaces
4. an interactive map (`.html`); and
5. a record of the arguments used for the unique iteration (`.txt`)

Below is a preview of the output:

```
Arguments used:
    seed = 23, n_block = 20, block_size = 1000, n_trns = 60,
    xmin = 115.61768, xmax = 116.12871,
    ymin = -21.35492, ymax = -20.71698
```



Spatially balanced sampling design of 20 total blocks and 60 total transect lines (ID: 23).