

Marine Traffic Information

Assessed Vessel Type	Yacht
Location	Gold Coast Marina
Total Length of Berth (m)	2,195
Monthly Vessel Count in Decemeber 2019 of the entire Gold Coast Marina ^[1]	155
Travelling Speed (knots) ^[2]	3

Notes:

[1] Monthly Vessel Count is based on the AIS and Radar data in 2019 from Marine Department. Due to the pandemic situation, data of Year 2019 is considered the most appropriate. Since it is expected that the capacity of Gold Coast will remain unchanged, the vessel count in 2019 is assumed the same and adopted for future years.

[2] Average speed of 3 knot is based on the AIS and Radar data in 2019 from Marine Department.



Marine Traffic Information by Routes

Sailing Route	Length of Berth (m) within Assessment Area	Monthly Vessel Count in Dec ^[1]	Travelling Speed (knots) ^[2]	Length of Sailing Route (m) within Assessment Area ^[3]
1	217	15	3	435
2	290	20	3	206
3	185	13	3	42
4	0	0	3	0
5	0	0	3	0

Notes:

[1] No information on the vessel count breakdown at different berth and routes. Hence monthly vessel count by routes is estimated by pro-rata to the length of the approached berth. Only marine vessel approaching the berth within 500m assessment area is assessed. The monthly marine vessel count in Dec within the assessment area (e.g. for Sailing route 1, it is 15) is estimated by the marine vessel count of the entire Gold Coast Marina (i.e. 155) * length of berth within assessment area in each sailing route (e.g. 217m in Sailing Route 1) / Total Length of Berth (2195m).

[2] Average speed of 3 knot is based on the AIS and Radar data in 2019 from Marine Department.

[3] Possible maximum length of sailing route is estimated for conservative assessment.

Marine Emission Inventory

Total Emission Rate

Sailing Route	Emission Rate per Trip (g/s) ^{[1][2]}		
	NOx	RSP	FSP
1	1.60E-02	2.97E-04	2.97E-04
2	1.73E-02	3.20E-04	3.20E-04
3	4.18E-03	7.75E-05	7.75E-05

Notes:

[1] On-shore power is provided at Gold Coast Marina and hence assumed engine is turned off during berth. Only emission during maneuvering is considered.

[2] The emission rate per trip is calculated based on the following equation. Breakdown is provided and documented in "Technical Notes on Marine Emission for So Kwun Wat and Tsing Lung Tau Areas" submitted to EPD and emission rates are evenly apportioned into point sources in the model as shown in subsequent pages of this Appendix.

Engine Emission Rate per Trip = (i)Time-in-mode x (ii)Engine Load Factors x (iii) Engine Power x (iv) Emission Factor, where

(i) Time-in-mode is calculated from the average speed and possible maximum length of sailing route within assessment area provided by Marine Traffic Consultant.

(ii) Engine Load Factors are made reference to Table 3-56 of USEPA (2008) – “Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder”.

(iii) The average engine powers are based on desktop review.

(iv) The engine emission factors are made reference to Table 3-58 of USEPA (2008) – “Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder”. Tier 2 emission factors are adopted, which assumed the age of vessels is >40 years old in Year 2048 for conservative assessment. Emission factors of FSP is assumed to be the same as those of RSP.

Modelling Parameters

Sailing Route	Source ID	Type ^[1]	X	Y	Base Elevation	Release Height ^[1]	Exit Temperature ^[1]	Exit velocity ^[1]	Internal diameter ^[1]	Emission Rate per Trip		
										NOx	RSP	FSP
			(m)	(m)	(mpd)	(m)	(K)	(m/s)	(m)	(g/s)	(g/s)	(g/s)
1	GC_R1_001	POINTHOR	817299.9	825727.2	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_002	POINTHOR	817271.1	825771.3	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_003	POINTHOR	817242.4	825815.4	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_004	POINTHOR	817209.3	825839.7	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_005	POINTHOR	817165.4	825814	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_006	POINTHOR	817121.4	825788.2	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_007	POINTHOR	817077.4	825762.5	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_008	POINTHOR	817033.4	825736.7	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
1	GC_R1_009	POINTHOR	817009.4	825704.4	0	0.5	673	8	0.3	1.78E-03	3.30E-05	3.30E-05
2	GC_R2_001	POINTHOR	817240.8	825789.5	0	0.5	673	8	0.3	3.45E-03	6.40E-05	6.40E-05
2	GC_R2_002	POINTHOR	817197.1	825763.2	0	0.5	673	8	0.3	3.45E-03	6.40E-05	6.40E-05
2	GC_R2_003	POINTHOR	817153.4	825736.9	0	0.5	673	8	0.3	3.45E-03	6.40E-05	6.40E-05
2	GC_R2_004	POINTHOR	817109.7	825710.7	0	0.5	673	8	0.3	3.45E-03	6.40E-05	6.40E-05
2	GC_R2_005	POINTHOR	817066.8	825684.9	0	0.5	673	8	0.3	3.45E-03	6.40E-05	6.40E-05
3	GC_R3_001	POINTHOR	817279.7	825732.9	0	0.5	673	8	0.3	4.18E-03	7.75E-05	7.75E-05

Notes:

[1] The modelling parameters including release height, exit velocity, internal diameter and release direction are made reference to the approved EIA of Tuen Mun South Extension (AERIAR-236/2022) and the exit temperature refers to the Examination Guidebook on Pleasure Vessel Operator Grade 2 Certificate of Competency.

Modelled Hourly Emission Multiplier of Yachts in Gold Coast Marina**Distribution of Vessel Count in Different Routes derived from Berth Length**

Sailing Route	Length of Berth (m)	Percentage of Berth Length within Assessment Area ^[1]	Monthly Vessel Count in Dec ^[2]
1	217	10%	15
2	290	13%	20
3	185	8%	13

Notes:

[1] The percentage of berth length is used for estimating the number of vessels entering into each route and berthing within the Assessment Area (i.e. 500m). The number of vessels entering each route within the Assessment Area is estimated by the percentage of berth length (i.e. length of the berth within the Assessment Area divided by total length of the berth within the marina).

[2] Vessel Count by routes is estimated according to the percentage of berth length. Please see "Marine Traffic Information" for more details.

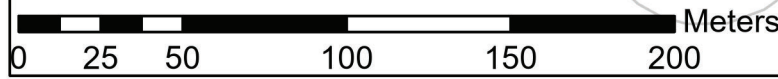
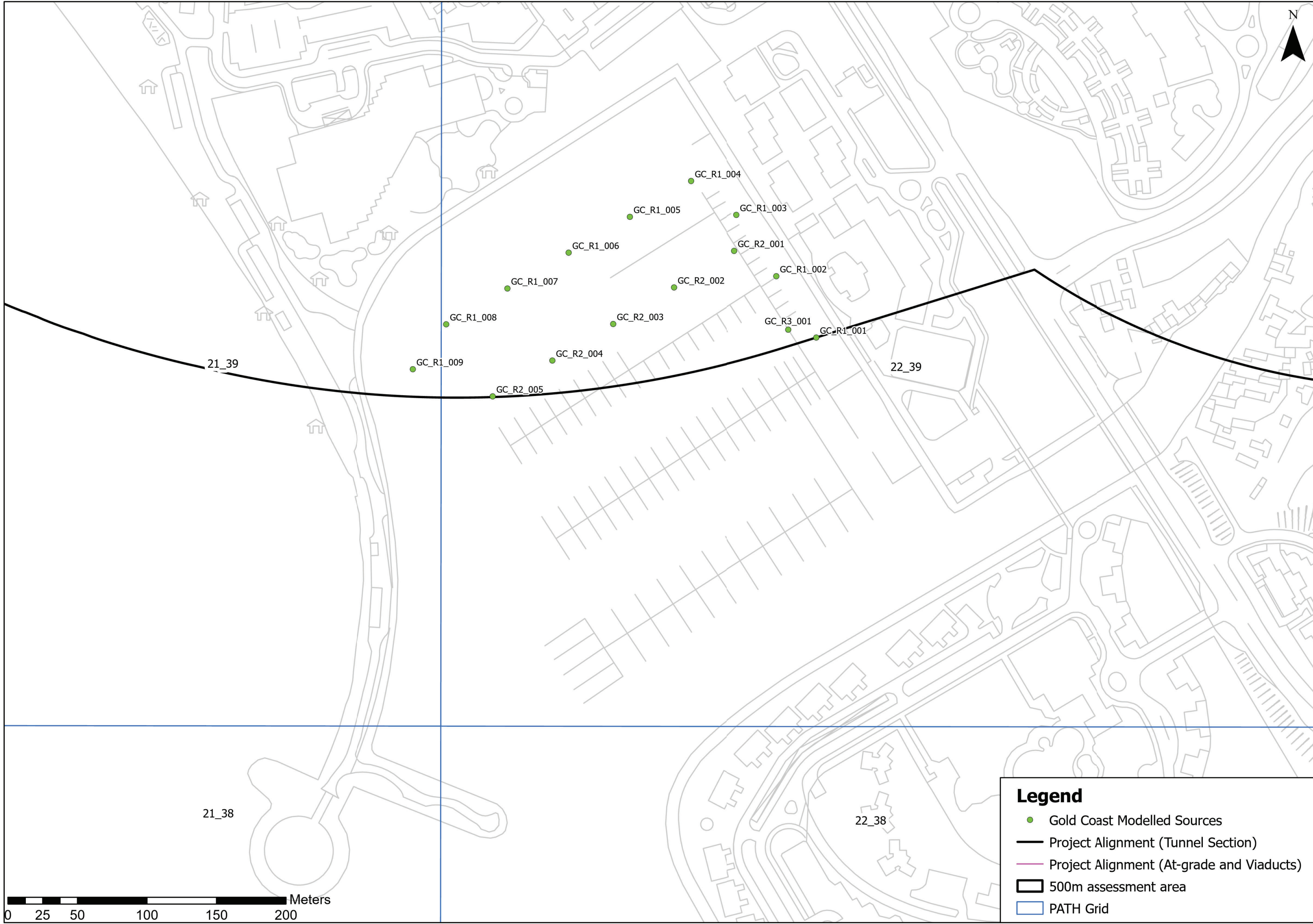
Total Marine Vessels Count in December 2019 by hour

Hour	Start	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Monday		1	6	3	0	1	1	0	3	1	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0
Tuesday		1	2	1	2	0	1	2	1	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Wednesday		5	3	3	2	1	1	2	2	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0
Thursday		1	7	4	1	0	1	4	4	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Friday		0	5	2	2	1	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Saturday		2	2	1	3	3	1	2	3	2	2	0	0	2	0	0	1	0	1	0	0	0	0	2	2
Sunday		2	2	6	1	1	0	0	1	4	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1

Notes:

[1] The number of hourly marine vessels for Dec 2019 is provided based on the AIS and Radar data in 2019 from Marine Department. Due to the pandemic situation, data of Year 2019 is considered the most appropriate and therefore adopted and assumed the same for future years. It contains the total number of marine vessels for the 31 days in December in Year 2019 for each hour. For example, from Hour 0 to Hour 1 (i.e. first hour of 1 Dec + first hour of 2 Dec, 1st hour of 31 Dec), there are total 1 marine vessels during the whole December. Due to the fixed capacity of Gold Coast Marina, no growth is assumed.

Location of Modelled Point Sources

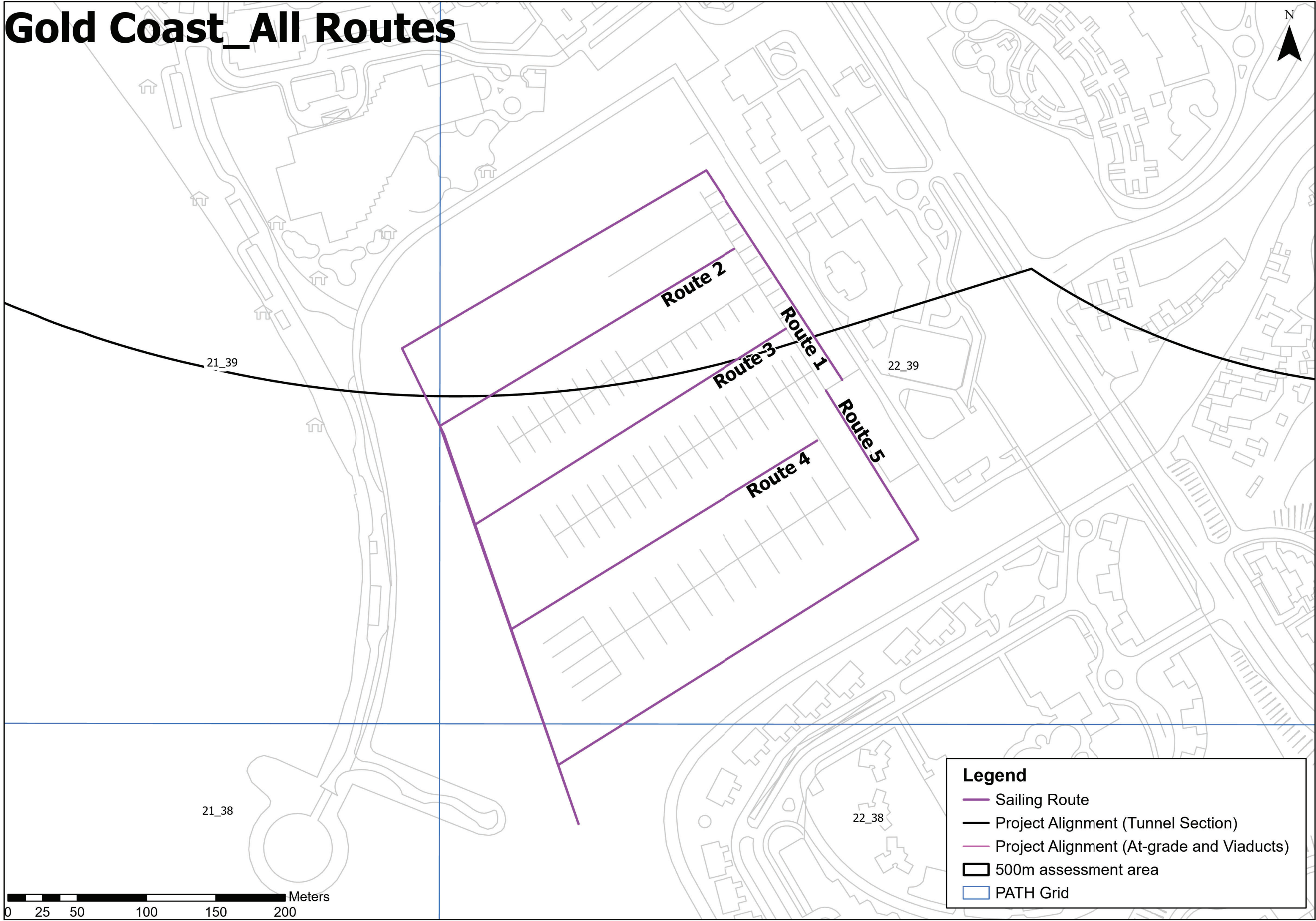


Legend

- Gold Coast Modelled Sources
- Project Alignment (Tunnel Section)
- Project Alignment (At-grade and Viaducts)
- ▭ 500m assessment area
- ▭ PATH Grid

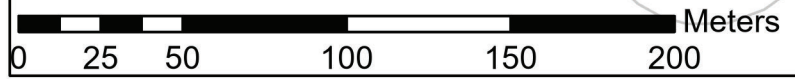
Sailing Route and Berth Length

Gold Coast_All Routes

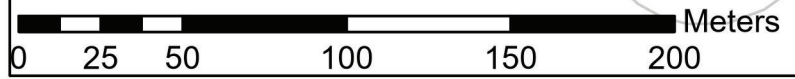
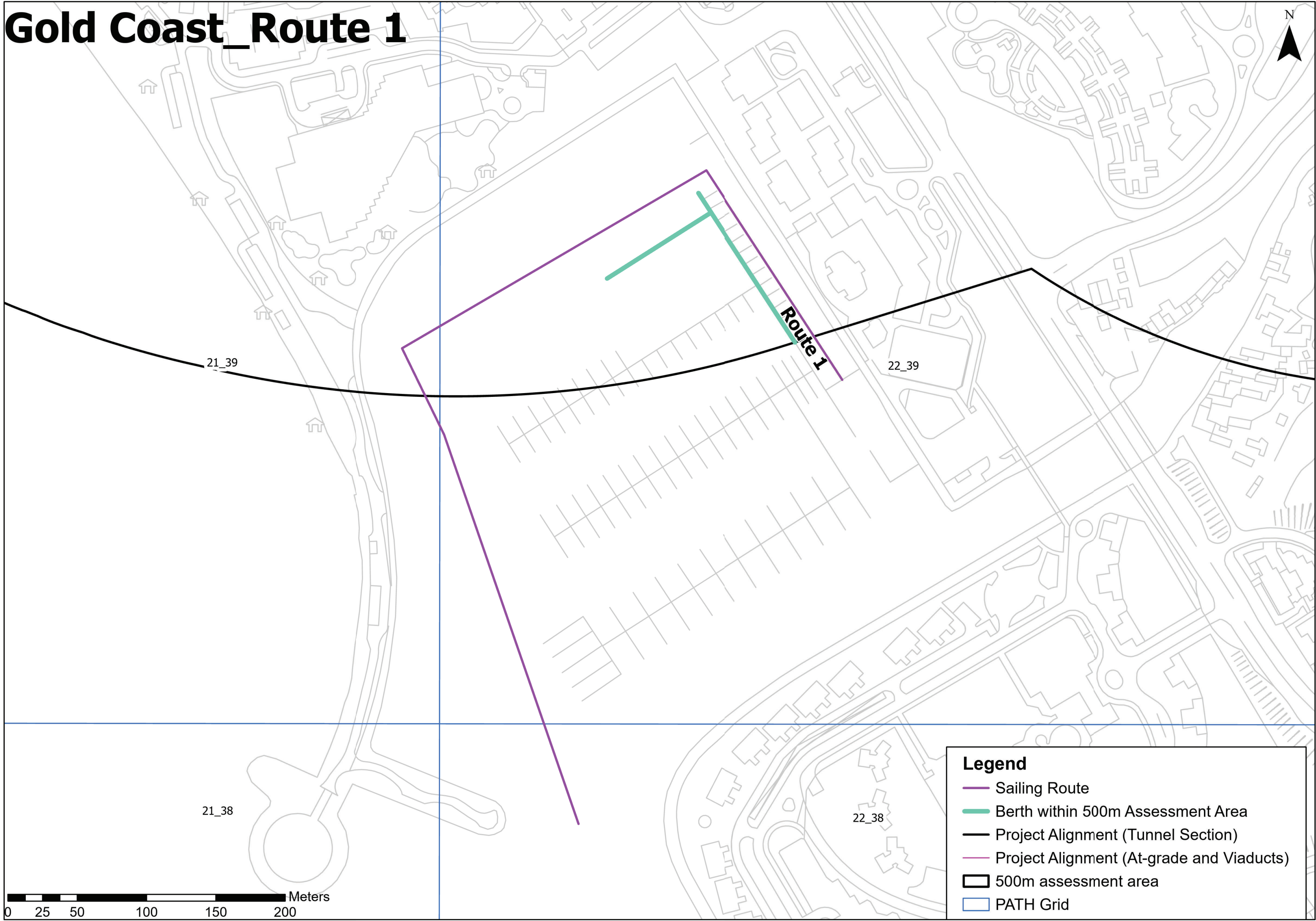


Legend

- Sailing Route
- Project Alignment (Tunnel Section)
- Project Alignment (At-grade and Viaducts)
- 500m assessment area
- PATH Grid



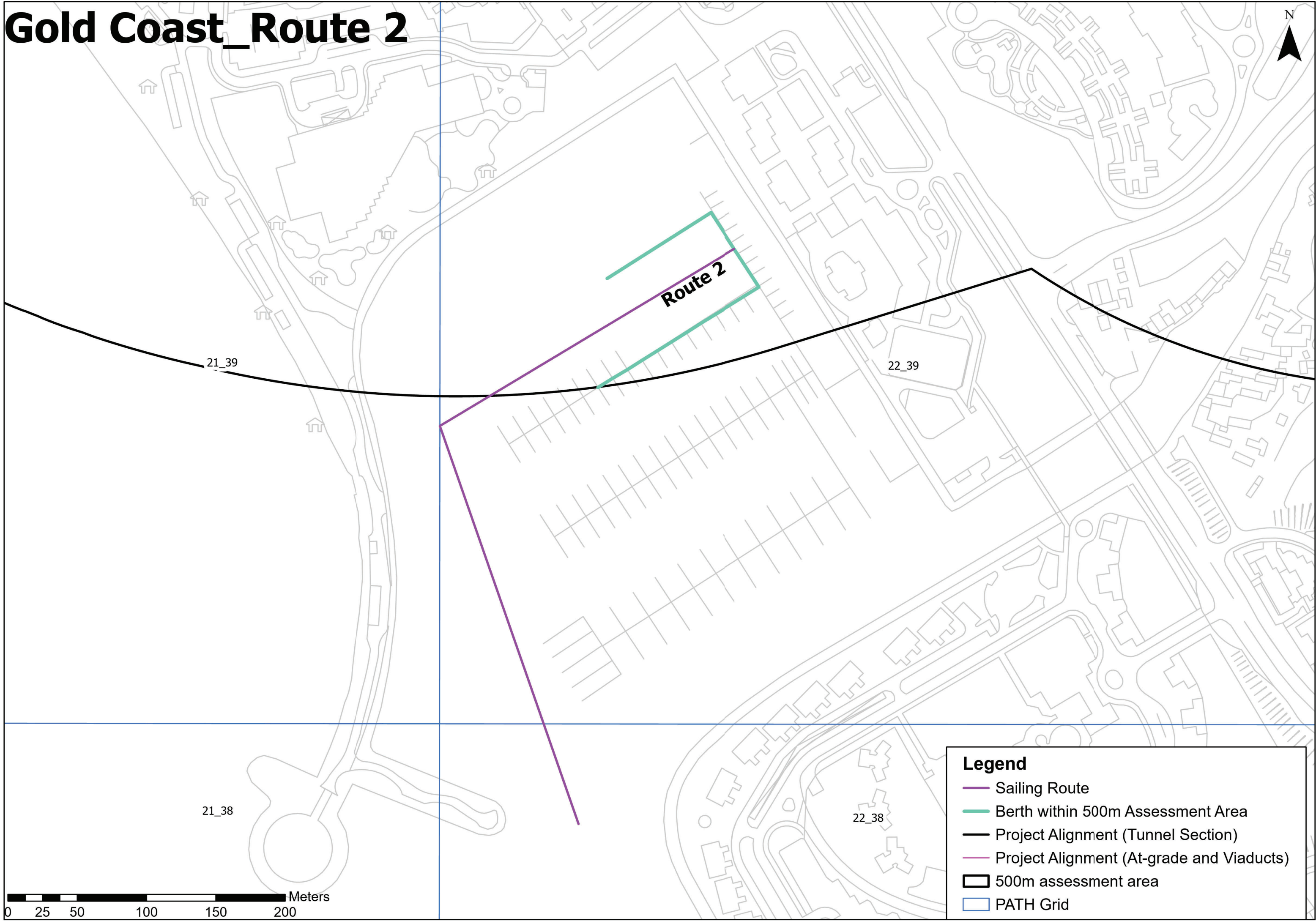
Gold Coast_Route 1



Legend

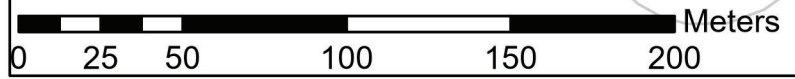
- Sailing Route
- Berth within 500m Assessment Area
- Project Alignment (Tunnel Section)
- Project Alignment (At-grade and Viaducts)
- 500m assessment area
- PATH Grid

Gold Coast_Route 2

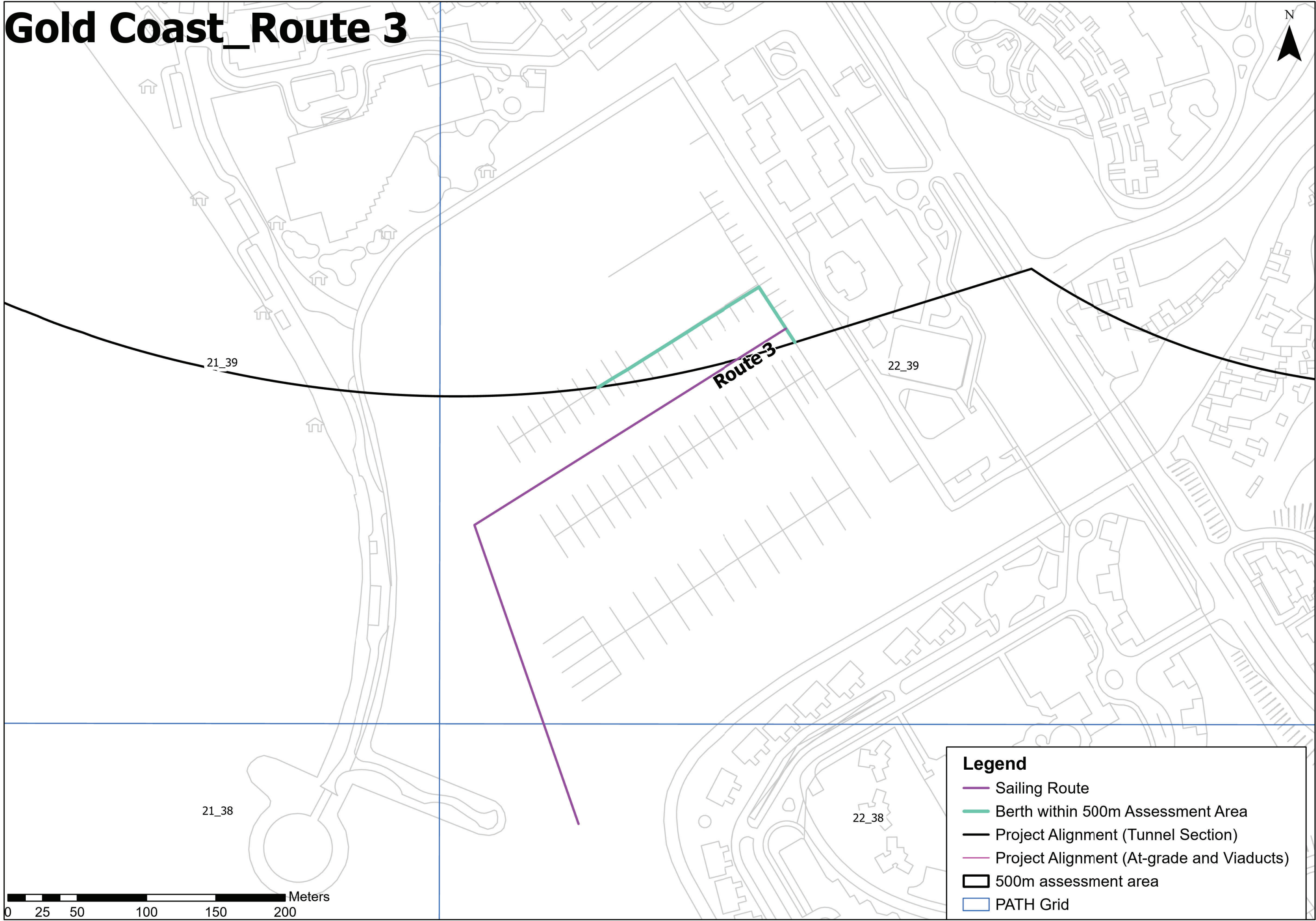


Legend

- Sailing Route
- Berth within 500m Assessment Area
- Project Alignment (Tunnel Section)
- Project Alignment (At-grade and Viaducts)
- 500m assessment area
- PATH Grid



Gold Coast_Route 3



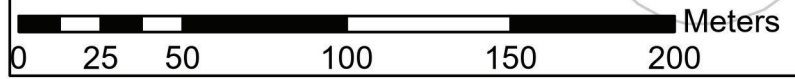
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Route 3



Legend

- Sailing Route
- Berth within 500m Assessment Area
- Project Alignment (Tunnel Section)
- Project Alignment (At-grade and Viaducts)
- 500m assessment area
- PATH Grid