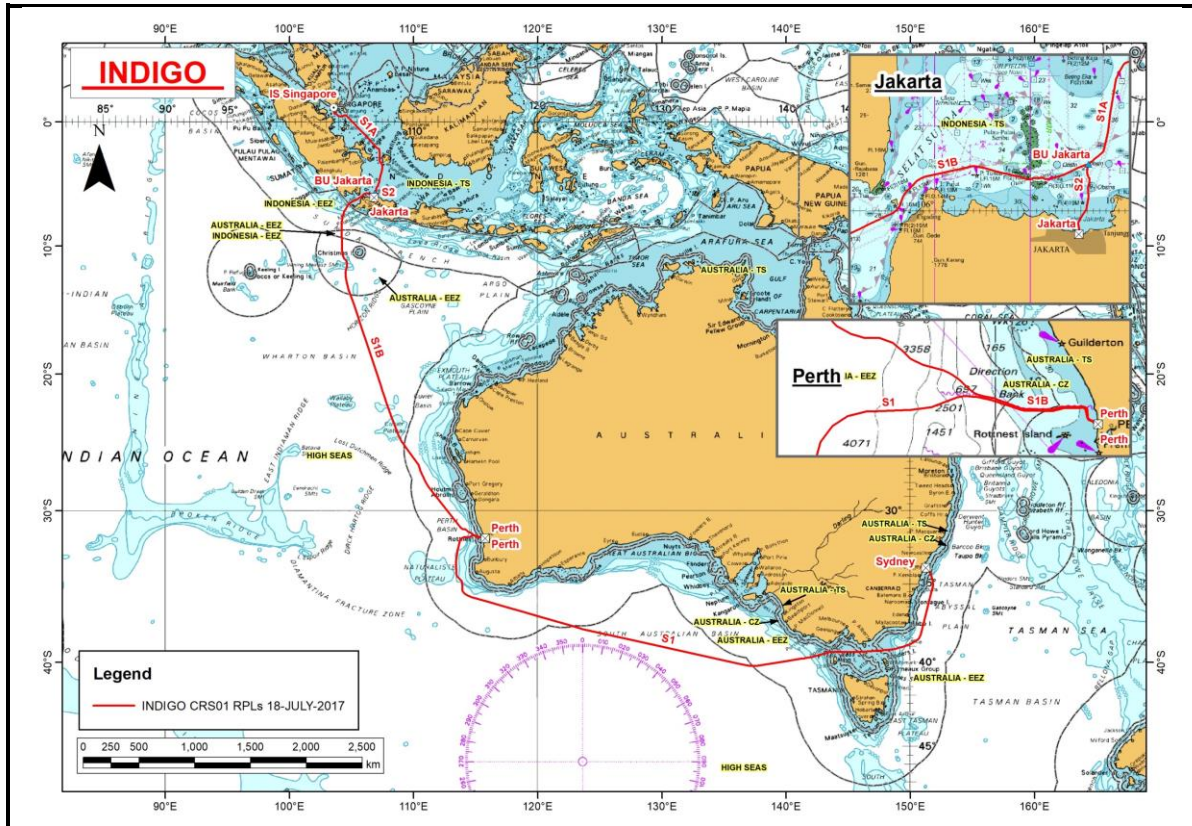


INDIGO SUBMARINE CABLE SYSTEM MARINE ROUTE SURVEY FOR CABLE ROUTE DESIGN AND ENGINEERING



PROJECT BRIEF

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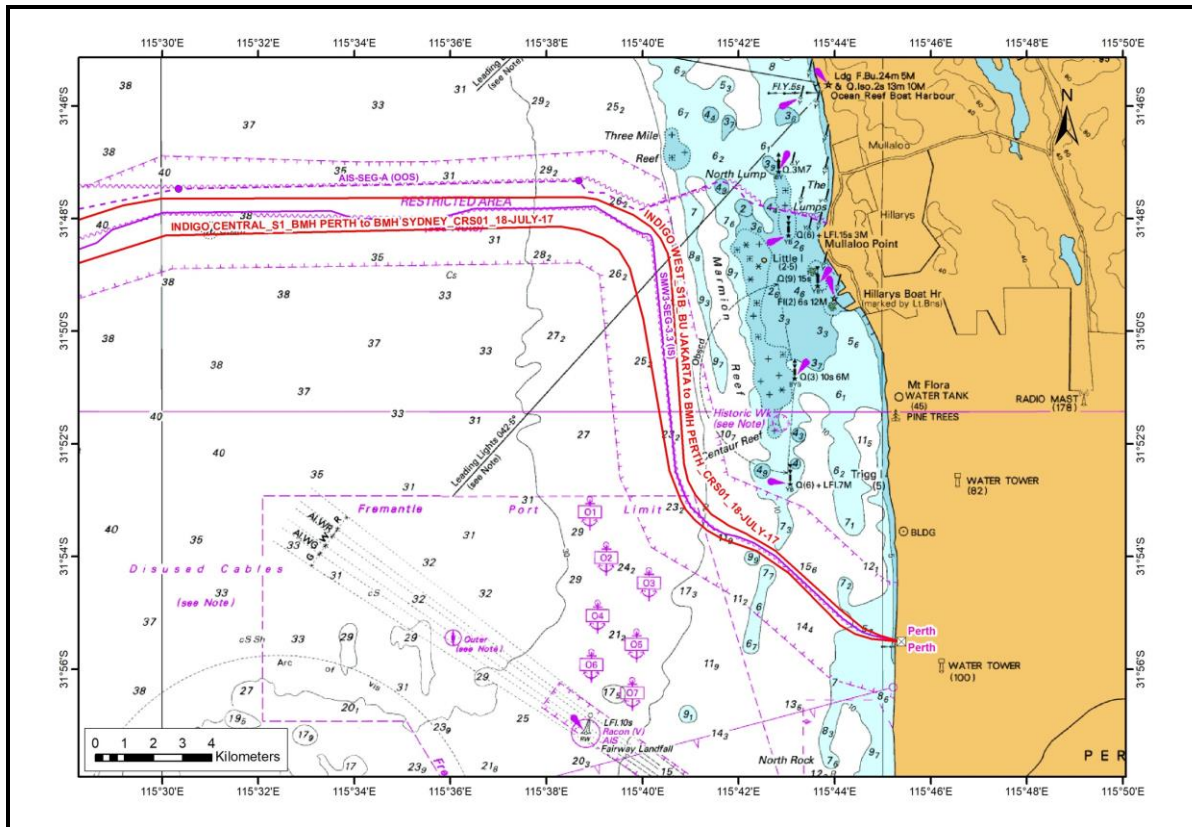
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ATTACHMENTS

Project RPL
Vessel Specifications
Overview Chart



The offshore INDIGO cable route will be entirely surveyed within Australia waters by the same vessel and using the same survey equipment. The equipment and the use there of will be operated to conform to the requirements set out in Australia referrals and guidelines for the reduction or elimination of disturbance to marine mammals.

This technical project brief is intended to:

- i) provide all necessary information to third party organizations that have an interest in the survey or the activities of the vessel which will be utilized for the survey; as well as;
- ii) provide all necessary information to facilitate the granting of the survey permits and security clearance to allow for the marine hydrographic survey to be performed within Territorial Seas (TS) and Exclusive Economic Zone (EEZ).

Note that the submarine cable route is indicative only at this time; the route will be finalized after the survey is completed. The survey route coordinates and overview of the proposed route are appended to this document.

1.2 THE CONTRACTUAL PARTIES

1.2.1 INDIGO Submarine Cable Owners (Australia)

The contact details and the person in charge are as follows:

Person in Charge: Perth Roger Schwarz - Telstra Corporation Ltd, 363 Oxford Street, Paddington, NSW 2021
Tel: Desk: +61 (0)2 8289 0174 Mobile: +61 407 949 679
Email: Roger.J.Schwarz@team.telstra.com

Person in Charge: Sydney Lee Harper – SubPartners Pty Ltd, 333 Anne Street, Brisbane, Queensland, 4000
Tel: Desk: +61 730 885 922 Mobile: +61 439 606 006
Email: lee.harper@subpartners.net

1.2.2 System Supplier

The Marine Survey is being conducted directly for the Owners of the system who have in turn appointed Alcatel Submarine Networks as Cable Supplier.

Person in Charge: Chris Fenn and Jean Aude (Project Managers Marine)
Telephone: +44 (0)208 465 1500
Email: chris.fenn@asn.com / jean.aude@asn.com

1.2.3 Survey Contractors

EGS (Asia) Ltd, whose Group Head Office located in Hong Kong is the Survey Contractor and is responsible for the route survey of the INDIGO Submarine Cable System. Their contact details and the persons in charge are:

Project Manager Captain Richard Poole (Sr. Project Manager)
Telephone: +852 2911 9306
Mobile: +852 9024 2794
Email: rpoole@egssurvey.com

Project Manager Dr. Elias Tahchi (Project Manager, Sr. Geoscientist)
Telephone: +852 2911 9309
Mobile: +852 6690 1441
Email: etahchi@egssurvey.com

EGS has appointed the Project Manager, Richard (Rick) Poole who will assume day-to-day responsibility for the management of the project and co-ordination of the participating survey organizations. The Project Manager will be the principle interface between EGS and all other parties. Furthermore EGS propose to provide an interdisciplinary project team with clearly defined roles and responsibilities lead by Dr. Elias Tahchi. The responsibility for overall project management for the survey will be vested with the Project Management Centre based in Hong Kong.

Operations, permitting and nearshore surveys in Australia will be conducted by EGS Survey Pty Ltd. Their contact details and the persons in charge are:

Project Manager Anthony Pyne (General Manager)
Telephone: Front Desk: +61 2 9290 8591 Direct: +61 2 9994 8036
Mobile: +61 (0) 410 837 360 Skype: ant.pyne
Email: apyne@egssurvey.com.au

1.3 PROGRAM

It is intended that the offshore survey work of the *RV Geo Resolution* will be carried out within the months of August 2017 to December 2017. The Sydney and Perth inshore surveys will be conducted by local participants in Australia as required within this time frame.

The exact dates depend on various external factors, such as the overall survey plan, the weather conditions, and the logistics of vessel and equipment transportation and mobilization.

2. REVIEW OF SCOPE OF WORK

The scope of work within the TS and EEZ of Australia comprises a full electronic and geophysical hydrographic survey along the chosen route in water depths assigned for burial (down to 1500m water depths off Sydney, and 1000m water depths along the Bass Strait and off Perth) with swath bathymetry, side scan sonar, sub-bottom profiling, Cone Penetration Tests in addition to ground truthing. The nominal corridor to be surveyed in these “shallow water” areas is 500m wide to allow adjustment of the cable location if unfavourable seabed terrain conditions are encountered. For all “deep water” survey operations (greater than 1500m water depth off Sydney and 1000m water depth off Bass Strait and Perth) only swath bathymetry will be carried out to a corridor width of 3 x water depth or 10km, whichever is greater. The final installed cable will be designed to lie within the surveyed corridor.

The coordinates of the centreline of the corridor to be surveyed are provided in the Route Position Lists (RPLs) for INDIGO Submarine Cable System, attached.

2.1 PURPOSE AND OBJECTIVE

The INDIGO Submarine Cable System cable route survey is required to provide information for use in the engineering, construction and subsequent maintenance of the submarine cable system. The primary objective of the survey is to ascertain a suitable route to determine exact cable length, cable design, deployment and survivability of the cable network with respect to the marine environment. In addition, the survey will serve as a subsequent database for maintenance and repair of the cable.

2.2 FIELDWORK PROCEDURE

2.2.1 Survey Equipment

2.2.1.1 Inshore (Beach to 15m water depth)

The inshore surveys in Australia will utilize the following equipment or similar:

- VERIPOS or C Nav GcGPS / GNSS
- QINSY navigation system
- Kongsberg 2040 or R2SONIC 2024 Multi Beam Echo Sounder System
- VALEPORT MIDAS CTD and Mini SVS probe
- KONGSBERG EA400 Single Beam System with 33/200kHz Combi-transducer
- Low Voltage Boomer
- C-VIEW Acquisition system
- EDGETECH 4200 or BENTHOS 1624 Dual Frequency Sidescan Sonar
- MARINE MAGNETICS 1000m SeaSPY System
- Van-Veen Grab sampler
- 3m Probing (Beach)
- RADIODETECTION RD8100 / NILSSON 715 Cable Locator

2.2.1.2 Offshore (>15m water depth)

The offshore survey will utilize the following equipment or similar on *RV Geo Resolution*:

- C-NAV 2000 DGPS System
- VERIPOS GNSS
- RAYTHEONS Standard 22 Gyro Compass
- QINSY navigation system
- RESON Seabat 7150 Multi Beam Echo Sounder System
- CODA OCTOPUS F185 + Motion Sensor
- TELEDYNE TSS Orion Marine Motion Sensor
- VALEPORT MIDAS CTD and Mini SVS probe
- SIPPICAN MK21 expendable bathythermograph
- KONGSBERG EA400 Single Beam System with 38/200kHz Combi-transducer
- C-VIEW Acquisition system
- A Benthos SIS-1625 Dual frequency Chirp/Side Scan Sonar Combined System (or equivalent)
- A hull mounted GeoAcoustics 4x4 Pinger sub-bottom profiling system
- A Seaspay Overhauser effect magnetometer or equivalent technology
- A Datem MCPT 3000 will be used to acquire geotechnical data
- A gravity corer and a Shipek type grab sampler will be used for obtaining surface samples

2.2.2 Survey Design

The table set out below summarizes the proposed equipment and survey pattern to be used for the various water depths that EGS propose to survey within TW, all remaining Shallow Water areas and Deep water:

Depth Range	Survey Corridor	Survey Line Spacing	No of Survey Lines	Side Scan Sonar Range	Equipment
250m behind Manhole to 0m	500m	50m	5	N/A	Total Station, GcGPS
0 to $\pm$ 3m	500m	50m	5	N/A	Total Station, Diving Equipment (on centreline only), GcGPS
$\pm$ 3m to 15m	500m	50m	21-11	75m	Multi beam echo sounder, sub-bottom profiler, side-scan sonar, magnetometer, Grab @ 500m, GcGPS
15m to 30m	500m	75m	9-5	100m	Multi beam echo sounder, Single beam echo sounder, sub-bottom profiler, side-scan sonar, magnetometer, Corer @ 10km, CPT @ 4km interval, DGPS
30m to 40m	500m	100m	5-3	125m	Multi beam echo sounder, Single beam echo sounder, sub-bottom profiler, side-scan sonar, magnetometer, Corer @ 10km, CPT @ 4km interval, DGPS
40m to 500m	500m	125m	3	150m	Multi beam echo sounder, Single beam echo sounder, sub-bottom profiler, side-scan sonar, magnetometer, Corer @ 10km, CPT @ 4km interval, DGPS
500m to 1,000m	500m	125m	3	150m	Multi beam echo sounder, Single beam

Depth Range	Survey Corridor	Survey Line Spacing	No of Survey Lines	Side Scan Sonar Range	Equipment
					echo sounder, sub-bottom profiler, side-scan sonar, magnetometer, Corer @ 10km, CPT @ 4km interval, DGPS
>1500m off Sydney >1,000m off Perth & Bass Strait	10km or 3x WD	NA	1	N/A	Multi beam echo, Single beam echo sounder, DGPS

Table 2.1: Summary of survey parameters

The provisional pre-survey RPL is presented with this document.

Offshore operations will be carried out on a 24-hour day basis. Inshore operations will be carried out in daylight only.

2.2.3 Landing Site Survey

Conventional surveying techniques and Global Positioning System (GcGPS) surveying practices will be utilized for the establishment of a survey baseline at each of the landing sites and for positioning the BMH and landing point of the cable.

A diver swim team using dive depth gauge, video camera and probe will be used to swim along the planned survey lines between the Landing Point and inshore limit of inshore survey vessel or 3m water depth (whichever is deeper), in order to characterise the seabed soil conditions and confirm that the route is free from obstruction.

2.2.4 Inshore Survey

It is intended that either a locally chartered vessel or the *MV Ming Jai*, an annex motorboat available on board the mother boat *RV Geo Resolution*, will be used to perform the inshore surveys from the coastline out to approximately 15m water. The survey parameters are as described in the table above. Grab samples would be taken at 500m intervals. Coral, sea grass and environmentally sensitive areas will not be subject to sampling.

2.2.5 Offshore Survey

The *RV Geo Resolution* will be used to perform the offshore survey in all waters deeper than 15m. This will involve a full geophysical survey out to end of burial water depth and beyond that a single line Multi-Beam Echo Sounder in all water depths in excess of the burial water depth.

2.2.6 Seabed Sampling

Only a conventional Van-Veen grab sampler will be employed for seabed sampling equipment in water depths of less than 15m during the inshore survey. The grab sampler is lowered to the seabed where a small scoop of sediment is recovered from the surface soils. Sample locations will be selected by the on board geoscientist utilizing a nominal sample interval of 500m. It should be noted that sample locations are selected in areas where sediment is present i.e. reef habitats and areas of biological significance are avoided. For the shallow water survey being conducted by the *RV Geo Resolution* seabed sampling using a 3m gravity corer and a Shipek grab sampler will be conducted out to the end of burial water depth. A nominal sampling interval of 10km will

be used to determine sample locations, although this interval may be increased or decreased depending on the interpreted seabed conditions from geophysical data.

2.2.7 Seabed Penetrometer Testing

EGS propose to use a Datan Neptune 3000 MCPT for the geotechnical survey along the survey route in water depths between 15m and the end of burial water depth. Geotechnical testing using MCPT will be carried out at a nominal 4km interval along the route. Location of CPT testing will be chosen by the onboard senior geophysicist in conjunction with the Owner's representative.

Near real time data processing and interpretation will be carried out to allow the early identification of problematic burial areas.

2.3 SURVEY VESSELS

The primary survey vessel will be the *RV Geo Resolution*. For the inshore survey work locally chartered survey vessels will be employed (still to be identified), or the *MV Ming Jai* motorboat launch from onboard the R.V. Geo Resolution.

NAME	R.V. <i>Geo Resolution</i>	NAME	Republic of Marshall Islands
TYPE	Research Vessel	TYPE	5923
CLASSIFICATION	Lloyd's Register	CLASSIFICATION	V7IE2
YEAR BUILT	1989	IMO No.	8835243
Length Overall	68.3 m	Length Overall	4.4 m
Beam	13.1 m	Gross Tonnage	1,913

Table 2.2: RV Geo Resolution Specifications

NAME	MV Ming Jai	TYPE	Survey Launch
YEAR BUILT	1993 / converted 2015	MOTHER VESSEL	R.V. Geo Resolution
Length Overall	7.5 m	Length Overall	1.4 m
Beam	2.9 m	Gross Tonnage	3.5

Table 2.3: MV Ming Jai Specifications

Please also find an annex providing further details of the RV Geo Resolution and MV Ming Jai and example locally chartered survey vessels.

2.4 SURVEY PERSONNEL

The offshore survey team will comprise:

- 1 x Offshore Project Manager/Party Chief
- 2 x side scan/ sub-bottom engineers
- 1 x MCPT engineer
- 2 x multibeam operators
- 2 x data processors/CAD
- 2 x geophysicists
- 1 x senior geophysicist/reporting manager
- 2 x navigators
- 1 x multibeam processor

The inshore survey team will comprise:

1 x Party Chief
1 x Navigator/Surveyors
1 x On-line Geophysicists
1 x Systems/Electronics Engineer

2.5 COMMUNICATION

The offshore survey vessel is equipped with communication devices such as the Inmarsat phone to allow communication between shore and the vessel, by voice, VHF, fax and email. Details will be provided near the time of commencement of operations.

2.6 DAILY REPORT

The preparation and issue of a Daily Report will be required which will include vessel position, activities in the previous 24 hours and the planned activities in the following 24 hours. This Daily Report will be distributed to all parties concerned and to relevant authorities that may wish to receive a copy.