ICPC Recommendation

Recommendation No. 9

Minimum Technical Requirements for a Desktop Study (also known as Cable Route Study)

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1. INTRODUCTION

A Desktop Study (DTS) is an essential prerequisite to a detailed submarine cable route survey. Properly performed, the DTS and the Marine Route Survey will identify the safest and most technically viable route for use in the engineering, construction, installation and subsequent maintenance a submarine cable system.

This ICPC Recommendation sets out the minimum technical requirements of a Desktop Study in order to ensure the above requirements are satisfactorily met.

[Note: A Desktop Study is also known as a Cable Route Study]

2. DESKTOP STUDY – MINIMUM REQUIREMENTS

2.1 Overview

The Desktop Study is the first major step in the overall route design process (a Route Feasibility Study may have previously been undertaken to study the route concept). It is the foundation on which the subsequent marine survey is built and adequate time must be allowed for the DTS to be properly conducted if an optimum route for the proposed submarine cable system is to be identified.

Failure to complete a thorough DTS will inevitably result in increased survey and marine installation costs and impact on the scheduled Ready for Service (RFS) date of the system. A deficient DTS may result in installation delays, route diversions, changes in landing site or, in the worse case, poor system reliability.

Identification of the requirements for permits to conduct both the surveys and also the actual cable installation is a critical component of the DTS. Failure to obtain all the correct permits for a survey can result in extensive delays with expensive resources being placed on standby until the permit issues are resolved.

Depending on local permitting requirements there may be a need for jurisdictional specific versions of the DTS.

2.2 Routing Selection and Landing

One intention of a DTS is to validate the proposed route between the chosen landing points of the new submarine cable system, particularly the inshore sections. Whilst the DTS may highlight the need to make relatively minor changes to the location of the landing points, the landing points are usually constrained by the location of existing land based telecommunications infrastructure, other interconnecting cable systems, the existence of cable corridors, international boundaries and/or disputed territorial claims and other geopolitical issues, and the general coastal bathymetry.

In more recent times, the ability to obtain the required landing permits in the required timeframe has often had a critical role to play in landing point selection. As such, the DTS should examine the permit process for previous cable systems, where possible, in order to ascertain likely permitting problems. Permit conditions applicable to other recently installed sea structures, such as pipelines, should also be examined.

The importance of thoroughly investigating permitting requirements as early as possible in the DTS cannot be overstated.

Prior to commencing the DTS, it is essential that the fundamental owner requirements are fully understood and any constraints noted. Failure to do so will most likely result in rework being required at a later date with attendant delays in overall project timing.

However, it must also be remembered that the overall purpose of the DTS is for specialists to design a route, initially using the fundamental owner requirements, which represents the most appropriate technical and environmental solution.

2.3 Site Visits

As part of the DTS, site visits should be made to the primary Landing Points as well as, where possible/practical, alternate Landing Points. The site visit(s) shall examine;

(a) the existing infrastructure for landing and terminating a submarine cable,

(b) suitable locations to land the submarine cable and construct new suitable landing facilities (for example beach manholes, system earthing facilities and ducts), if no existing infrastructure exists (include lat/long positions and photographs of the area in the DTS report),

(c) existing utilities that may conflict with proposed routeing,

(d) the geology to provide a geotechnical analysis of the landing sites which will aid in the design, construction or improvement of any proposed landing facilities,

(e) shore end protection measures required (i.e. articulated pipe, directional drilling etc),

(f) marine and terrestrial constraints, that may determine whether the cable landing is to be direct from the main lay cable ship or a separate shore end installation,

(g) security issues that may constrain operations at the proposed landing,

(h) the climate and weather and its potential impact on the construction, durability and landing of the cable into any proposed landing facilities,

(i) all environmental aspects, both natural and man-made, which will impact on or be impacted by the implementation of any proposed landing facilities and the subsequent installation of the cable system,

(j) all local organisations and authorities, including local fishing organisations, that will need to be liaised with during the planning, construction and operation of any proposed landing facilities and the installation, operation and maintenance of the cable system on both the land and marine routes within the Territorial Waters and possibly Exclusive Economic Zone (EEZ) or Continental Shelf of each landing site,

(k) conditions applicable to permits for previous cable systems installed at each Landing Point and assess their relevance to the proposed cable system,

(l) information on other seabed users and interested parties who could potentially oppose a permit application at a specific Landing Point and the stance that such groups could be expected to take.

The Site Visit Report should also include a Shore End Landing Site Inspection report that should, as a minimum, include such data as:

(m) Area, site and beach descriptions (of all alternate landings investigated)

(n) Site accessibility (roadway width, surface, etc.)

(o) Working space assessments

(p) Tides, weather, sea, swell information

(q) Potential for beach erosion during severe storms

(r) Marine traffic and fishing activity

(s) Beach utilisation by public (and implications of applying access restrictions during laying operations)

(t) Communications (radio permits, cell phone/mobile signal strengths)

(u) Local facilities (civil contractor availability, shore end support, divers, hotels, etc.)

(v) General facilities (airport, taxis, local ports, truck hire, etc.)

(w) Initial assessment on availability of locally chartered survey vessels and diving contractors

(x) Identification of potential local shipping agents

It is recommended the DTS Contractor, the Supplier and the Purchaser's Representative should all be present during site visits where practicable.

2.4 DTS Contents

The DTS should include, but not be limited to, the following subject matter and shall examine their impact on the planning (including the route surveys), installation (including the land and marine based facilities) and the operation of the cable system.

2.1.1 Executive Summary

(a) Introduction

(b) Cable Engineering overview

(c) Tabulated Risk Analysis/Summary, which identifies mitigation recommendations, where necessary)

(d) Outstanding Issues

2.1.2 Site Visit data summary

Providing information for the selected BMH locations

2.1.3 Route Description

Including crossing tables for cables, pipelines, maritime boundaries and restricted areas

2.1.4 Geology

The DTS should include research on regional level information to provide a broad perspective of the geological risks to the cable. This should include, but not be limited to, examination of:

(a) the tectonic setting

(b) seafloor morphology and lithology,

(c) volcanic activity, including sub-sea volcanoes and hydrothermal venting, with location and dates of eruption

(d) Seismicity (including locations, dates and magnitude of earthquakes),

(e) Tsunamis

(f) surface faulting,

(g) turbidity currents,

(h) sediment transport,

(i) sand waves,

(j) beach and near shore seabed stability: this includes determining the nature and composition of beach and nearshore soils as well as examining indicators of shoreline instability such as the presence of offshore bars, washouts, beach erosion and slumping,

(k) Offshore geology and burial assessment: this includes sections along the proposed routing where soils are likely to prove good/difficult for cable burial. To this end, where feasible, details of likely soil shear strength, the presence of steep slopes, rock outcrops, ridges, ravines, side slopes and sea mounts along the shallow water sections of the route should be obtained in order to assess whether the chosen route is suitable for burial, and

(l) other geohazards, not covered in above sections.

2.1.5 Climatology

In order to assist in scheduling route survey and installation activities, the DTS should include, but not be limited to, research on:

(a) seasonal variations in climate and weather on a regional basis for the area adjacent to and along the proposed cable route.

(b) examination of the major climatological controls, such as monsoons, convergence zones and the like, temperatures, rainfall, winds and the seasonality and frequency of gales, storms, hurricanes and the like

(c) proximity to flood prone areas.

Due consideration should be given to any recorded changes in climate or weather patterns in recent years.

2.1.6 Oceanography

The DTS should include, but not be limited to, an examination of all existing data to identify.

(a) typical sea states experienced in the region of interest

(b) surface, midwater and bottom currents including tidal streams and currents (in order to determine the optimum direction of installation)

(c) bottom water temperatures

(d) wind and wave data (including wave height and dominant wind directions)

(e) other environmental anomalies that may affect survey and installation (eg sea fog and sea ice if applicable)

(f) Tidal levels and variations at the landings and at pertinent areas along the planned route

(g) Local and seasonal variations should be investigated for the above parameters

2.1.7 Commercial Operations, Hazards and Restricted Areas

The DTS should examine all existing information pertaining to existing or planned commercial operations, restricted areas and obstructions in the vicinity of the proposed cable route and landings. The factors to be addressed should include, but not be limited to:

(a) Shipping

i. Shipping patterns

ii. Designated shipping channels

iii. Anchorages

iv. Informal anchoring practices (based on analysis of AIS data)

v. cable protection zones and other no-anchoring areas

(b) Restricted areas (full-time or part-time) such as;

i. mined areas (*),

ii. military exercise areas (*),

iii. dumping grounds (chemical/industrial wastes, explosives (*), radioactive materials) either in use, abandoned or planned,

iv. culturally significant sites

v. tourist attractions.

(*) Should previously mined areas or other areas with a potential for Unexploded Ordnance (UXO) unavoidably overlap areas where burial is considered essential, a UXO specific DTS and survey should be commissioned. Note however that no UXO survey can guarantee the absence of a hazard along the installation route; the installer will need to assess the risk to the cable and burial equipment and determine whether burial is practical for each specific instance.

(c) Commercial and Research activities such as;

i. artisanal and commercial fishing activities (current and future), including information on fish aggregation devices,

ii. offshore petroleum leases (current and future) that may require the construction of in-field or platform to shore transmission pipelines or umbilicals,

iii. offshore renewable energy installations (current and future)

iv. pipelines (current and future),

v. other submarine cables (out-of-service and in-service, both current and planned in the vicinity of the proposed route) and their fault history, with tabulated information on the crossed systems name, cable type, position, water depth and angle at the crossing point and, where possible, distance to the crossed systems underwater plant, (i.e. repeaters and equalisers),

vi. plans to remove existing out-of-service submarine cables,

vii. oceanographic and weather buoys,

viii. dredging activities,

ix. submarine resource development (including deep sea mining) and offshore renewable energy developments,

x. coastal construction projects such as new port facilities, outfalls and intake structures

(d) Other obstructions such as shipwrecks, artificial reefs etc,

(e) Known security threats and piracy, or political groups that may pose security risks (including 'non friendly' countries or unstable governments).

It is important that the DTS database/basemap and subsequent survey database/basemap should be updated to cover these areas in an appropriate GIS format with clear reference to source and date. This is to ensure that if the DTS Author and Survey Contractor obtain different information the survey contractor can easily check sources from the DTS against existing knowledge and ensure there is no missing, out of date or conflicting data.

2.1.8 Biological Factors

It is imperative that landing area seasonal constraints due to nesting birds and animals, migrating whales and dolphins, schooling fish, etc. are thoroughly investigated. The DTS should examine all information pertaining to biological factors that could have an impact on the proposed cable project. These factors include, but are not limited to:

(a) Marine Protected Areas (MPAs) or similar marine conservation zones for example coral reefs (including cold water corals*), marine sanctuaries and national parks

(b) Flora and fauna (particularly endangered and protected species) located at the proposed landings

(c) Seabed communities including shellfish, crustaceans and coral

(d) Fish and crustacean spawning grounds and nursery areas

(e) Local and migratory bird populations

(f) Marine mammals

* Note: UNEP (United Nations Environment Program) have advised the ICPC that cold-water corals thrive in water temperatures between 4°C and 13°C. The ICPC have agreed with UNEP that it would be very useful if submarine cables could be included as one of the layers in UNEP-WCMC IMAPS (Interactive Map Services). This would help to identify those areas where submarine cables and coral reefs are in close proximity. IMAPS is an openly accessible resource that can be found at: http://www.unep-wcmc.org/imaps/imaps_index.htm

2.1.9 Permitting

In more recent times, the ability to obtain the required landing permits in the required timeframe has often had a critical role to play in landing point selection. As such, the DTS should examine the permit process for previous cable systems, where possible, in order to ascertain likely permitting problems. Permit conditions applicable to other recently installed sea structures, such as pipelines, should also be examined.

The importance of thoroughly investigating permitting requirements as early as possible in the DTS cannot be overstated.

The DTS should carefully examine and provide information about the laws and regulations of the region such as:

(a) Limits of national/territorial waters (TW), Contiguous Zone (CZ) and Exclusive Economic Zone (EEZ), as applicable, and details of disputed waters and maritime boundaries, and marine sanctuaries, where relevant,

(b) Statutory requirements for both marine and land based activities such as environmental studies and reports, permits (installation and operating), notice to mariners, fishery seasonal restrictions, visas, equipment importation etc, which should be both described and summarised in a permit matrix or table for ease of reference.

2.1.10 Cable Engineering

(a) Route Recommendations (RPLs and SLDs etc)

(b) Changes made to the Pre-DTS route

(c) Burial Assessment and Estimated External Aggression Risk

(d) Burial or other cable protection mechanism recommendations

(e) Cable recommendations

(f) Slack recommendations

2.1.11 Survey Recommendations

(a) Proposed Co-ordinate system

(b) Basic survey requirements

(c) Project specific recommendations

2.1.12 Contacts and Bibliography

(a) List of all persons and organisations (plus contact details) consulted during the DTS

(b) Bibliography of all research material and advice.

2.5 Route Recommendation

Based on the information acquired from the site visits and desktop investigative work the DTS shall recommend at least one appropriate cable route which, to the extent feasible, avoids any hazards and meets the cable burial requirements.

The recommended route should ensure that crossings of existing pipelines and cables follow applicable ICPC Recommendations as well as consider the future maintenance of the planned cable as well as existing or planned infrastructure.

The DTS should also provide a proposed route position list (RPL) and, where possible, a Straight Line Diagram (SLD).

The route recommendations shall include, but not be limited to the following details.

(a) Route position shown in latitude and longitude based on WGS84.

(b) Type of landing, such as, beach excavation or directional drilled conduits,

(c) Seabed depths,

(d) Initial cable engineering recommendations such as cable types and quantities, slack and definition of areas where cable should be buried for protection and the depth of burial,

(e) Route Engineering recommendations resulting from, for example, slope angles, seabed feature avoidance, burialability, existing regional fault history and alter course angles (which should ideally not exceed 25 degrees)

2.6 Survey Recommendation

The DTS shall provide recommendations for suitable terrestrial and marine surveys to accurately define the proposed route and for determining the precise route length, appropriate types and quantities of cable and installation and burial requirements.

The DTS shall provide, where possible, geodetic parameters, methodology and example computations of all transformations required to transform the proposed route WGS84, or other local reference system, geographical co-ordinates into National Mapping Parameters for all landing sites and/or other appropriate areas as required by National Mapping Agencies/Government Organisations.

The recommendation should include, but not be limited to, the equipment and techniques required for the collection and collation of the following types of data.

(a) Bathymetry,

(b) Seabed and Sub-seabed Features,

(c) Seabed Temperatures,

(d) Ocean Currents,

(e) Cable Burial Assessment (DTS to specify recommended equipment & techniques to be used. These should comprise a combination of geotechnical and geophysical equipment and techniques.)

(f) Topographic and Geotechnical data for each landing,

(g) Survey swathe widths

(h) Areas on the route where further route development may be necessary during the survey

2.7 Reporting and Documentation

The DTS shall provide for the following reports.

2.1.13 Regular Status Reports

Regular Status Reports (timing to be agreed between contractor and client) should be provided to the client from the date of execution of the Contract up until the completion of the DTS. It is recommended that the Regular Status Reports should include, but not be limited to;

(a) Current Plan of Work,

(b) Update on the progress of significant events such as site visits and the Desktop Study Report and,

(c) Advice on the key issues noted during site visits or desktop research, which may impact on the choice of landings or routing of the proposed cable and,

(d) Progress against the baseline plan of work, critical path items and any items that may impact the finishing the DTS on schedule.

2.1.14 Preliminary Site Visit Reports

Preliminary Site Visit Reports, if required by the client, should be provided to the client within the duration agreed between the contractor and client. (Note that it may be decided that the contents of such a Report be included within the DTS as per Section 2.3.)

If required, the Preliminary Site Visit Report shall include, but not be limited to;

(a) Summary of observations with regard to the requirements listed above [including photographs, geo-referenced beach sketches and GPS measurements of proposed BMH position and other salient features],

(b) List of people and authorities, particularly local fishing organisations, visited and nature of discussions with or advice from these parties,

(c) List of follow-on actions to be taken by as part of the desktop research and,

(d) List of recommended actions such as initiating environmental approvals with relevant local authorities.

2.1.15 Desktop Study Report

The Desktop Study Report shall provide detailed information on all the issues specified above and shall be structured along the lines set out in Section 2.4 above. Emphasis should be given to the provision of relevant maps, diagrams, charts, figures, tables and photographs in order to add clarity to the report.

The report contents should include:

- All the information gathered during the desk study
- The provisional cable route in the form of both a physical description and route position list that has been developed during the initial conceptual system design and desk study phases of system planning. The provisional route would also be plotted on the system planning charts showing all route alter course points.
- Definition of provisional cable quantities and cable engineering including provisional cable armouring schemes.
- Full detailed description of the cable landing sites (including photographs and diagrams).
- Full details of route permitting issues and procedures including the status of routing negotiations (including contact details for the relevant entities). Estimated times to obtain the various permits should be indicated wherever feasible.
- Definition of detailed route survey procedures and scope of work, which should be based on the most appropriate technical approach that addresses the prevailing physical conditions of the route and the cable protection and installation strategies, recommended in the report.

2.1.16 DTS Report database and basemap

All database information should be collated into the DTS basemap in an appropriate GIS format with clear reference to source and date. This should then be passed on to the Survey Contractor in a timely manner to allow the cross checking of sources from the DTS against existing knowledge and ensure there is no missing, out of date or conflicting data.

2.1.17 Digital Format of DTS Report

The Desktop Study Report shall be provided in a digital version, including all text, tables, photographs and diagrams. Consideration should be given to producing digital copies, including photographs, drawings, etc. in a machine independent universal platform such as Adobe's Acrobat™ software.

The ideal platform for displaying and manipulating diverse datasets simultaneously (as well as being a data management system) is a Geographical Information System that does not rely on data transfer to software specific formats. The digital copies

should be provided electronically either on digital media or made available on a FTP or similar site.

2.1.18 DTS Report Quantities

It is recommended that consideration be given to the requirements of the cable system supplier when determining the required number of copies of each DTS report.

2.8 Charting Requirements

2.1.19 Description

The DTS shall include a series of north up, adjoining, overlapping charts which should include data presentations showing the proposed cable route, bathymetry contours, existing cables and other pertinent features. Any features identified on the charts shall be annotated in terms of scale, composition and with an appropriate interpretation. The charts should exhibit the following features:

(a) All charts should show latitude and longitude, graduated in degrees, minutes and decimal minutes. It is recommended that Mercator Projection charts are used for overview and long line segments whilst Universal Transversal Mercator and Lambert Conformal Conic Projections are used for detail and short leg charts. Note that in some areas, such as Landings, the charts of the cable route may also be required in the National Mapping Projections and Spheroids required for the particular location. Wherever possible, however, one projection should ideally be used throughout the DTS to avoid complications and confusion arising from datum transformations.

(b) Each chart shall have appropriate title boxes on each of its co-registered parts. Each title box shall include at least:

- ✓ Title (including cable system name and landing points)
- ✓ Projection
- ✓ Central meridian specific to that chart
- ✓ Datum
- ✓ Scale presented as both a representative fraction and as a linear scale in kilometres (km)
- ✓ Chart production date
- ✓ Project identification
- ✓ Chart key including a suitably scaled overview of the geographic region and the locations of bordering charts. The chart key shall also show the geographic limits of the specific chart
- ✓ Chart notes
- ✓ Chart legend
- ✓ Names of Purchasers
- ✓ Contractor's name and contact details
- ✓ A separate chart(s) of the landing that shall identify navigational and other information pertinent to the anchoring/cable landing operations

shall be provided. These charts shall extend to at least the 20m water depth and include nearby terrestrial landmarks that may be of assistance in positioning the ship while the cable "shore-end" is landed.

2.1.20 Chart Scales

Recommended chart scales required for various regions along the route are summarised in the table below. Scales should be appropriate for presentation of the most detailed available bathymetry. Specific requirements should be agreed between the DTS contractor and client prior to contract signing.

	Zone	**Chart Scale**
(a)	Overview chart for the whole route	Best Fit
(b)	A series of charts for the whole route	1:100,000 to 1:1,000,000 depending on available bathymetry scales
(c)	Terminal site to 20 metres water depth	1:20,000 to 1:50,000 depending on available bathymetry scales
(d)	Landfall	1:5,000 to 1:20,000 (including landfall sketch map, at any scale, where necessary for clarity, or as required for permitting requirements)

The scales here are a recommendation only. In areas where more detail is available scales should be adjusted to maximise the data presented.

3. REFERENCES

Document Number	Title
ICPC Recommendation No 2	Recommended Routing & Reporting Criteria For Cables in Proximity to Others

4. DEFINITIONS

The following words, acronyms and abbreviations are referred to in this document.

Term	Definition
BMH	Beach Manhole
DTS	Desktop Study (also known as a Cable Route Study)
EEZ	Exclusive Economic Zone
FTP	File Transfer Protocol
GIS	Geographic Information System
RFS	Ready for Service date
RPL	Route Position List
SLD	Straight Line Diagram

5. ATTACHMENTS

Document Number	Title
Nil	