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SERIES L: CONSTRUCTION, INSTALLATION AND
PROTECTION OF CABLES AND OTHER ELEMENTS OF
OUTSIDE PLANT

Digital database for marine cables and pipelines

ITU-T Recommendation L.55

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Digital database for marine cables and pipelines

Summary

This Recommendation describes the nature of the information regarding marine cables and pipelines that should be maintained by National or Regional government agencies which are responsible for marine shorelines, and the cable or pipeline installations that may either be present or added.

Information about marine cable and pipeline installations can affect the cost of future installations or maintenance, including their environmental impact. At present, there is no global authority to maintain such information and the responsibility rests with individual countries. Given that information from multiple shoreline databases is necessary in designing new cable links, a standardization of the information that should be maintained will assist all participating parties. Such information is also useful in managing shoreline infrastructure when cables and pipelines are decommissioned, thereby allowing the possibility of reusing the space.

Source

ITU-T Recommendation L.55 was approved on 28 November 2003 by ITU-T Study Group 6 (2001-2004) under the WTSA Resolution 1.

Keywords

Database, maritized terrestrial cable, submarine cable, survey.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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ITU-T Recommendation L.55

Digital database for marine cables and pipelines

1 Scope

This Recommendation covers the reasons for maintaining a digital database for marine cables and pipelines. It outlines the minimum contents of such a database and recommends procedures by which such databases can be initiated, maintained, and used.

This Recommendation assumes that the creation and maintenance of these digital databases are under the responsibility of National or Regional government agencies that are responsible for the shorelines where marine cables or pipelines are terminated. This Recommendation does not mandate National or Regional regulations on data collection and dissemination, but does offer the possibility of determining a minimum set of data needed.

This Recommendation is applicable for the creation of digital databases to be implemented after it enters into force.

This Recommendation is originated and maintained by ITU-T Study Group 6, "Outside plant", which normally has within its scope construction, installation, and maintenance of marinized terrestrial communication cables. The recommended database applies, however to the following, which are normally not in the scope of SG 6:

- Submarine telecommunication cables (ITU-T Rec. G.972);
- Submarine electrical power cables;
- Submarine pipelines.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- ITU-T Recommendation L.28 (2002), *External additional protection for marinized terrestrial cables*.
- ITU-T Recommendation L.29 (2002), *As-laid report and maintenance/repair log for marinized terrestrial cable installation*.

3 Terms and Definitions

This Recommendation defines the following terms:

3.1 regulating body (RB): The National or Regional government agency that is responsible for maintaining records of a given portion of shoreline and the associated waters.

3.2 shoreline region: The shores and associated waters under the authority of a given regulating body.

3.3 cable awareness charts (CAC): Detailed maps of the shorelines including the waters in the vicinity. These maps may or may not be digital, but should be numbered in a manner consistent with accessing them, based on a pointer.

3.4 transport infrastructure: The cable or pipeline that is deployed undersea with a shore termination.

3.5 terminating infrastructure: Buildings and protections at the interface of land and sea that are not part of the transport infrastructure, but which are part of the overall installation.

3.6 owner/operator: The entity that holds the legal ownership of the transport and terminating infrastructure and the associated rights of way or real property.

3.7 installer: The entity that completes the actual installation.

3.8 local termination: The point within the shoreline region where a transport infrastructure terminates.

3.9 distant termination: The point outside the shoreline region where the transport infrastructure terminates.

NOTE – When a given transport infrastructure is terminated at both ends in the same shoreline region, there should appear two records in the database of the RB, one for each. For each, the distant termination will be a reference to the other end.

4 Abbreviations

This Recommendation uses the following abbreviations:

CAC Cable Awareness Chart

ITU International Telecommunication Union

RB Regulating Body

5 Overview

Information on the benefits of maintaining databases is given in Appendix I. It is assumed that one database is maintained by the RB of a given shoreline region. In many cases, the databases of multiple RBs may need to be researched before a complete new link design can be completed. While the position and condition of transport infrastructure that passes under the open sea may be available, this information is included only as an optional map pointer.

The database for a given shoreline region can only be initiated and maintained with the cooperation of several parties, each with different responsibilities. The following outlines the roles of these parties:

NOTE – This Recommendation is applicable for the creation of digital databases to be implemented after it enters into force.

5.1 Regulating body

- Initiate the database (see clause 7).
- Communicate the requirements to owner/operators and installers.
- Maintain the CACs.
- Add new data to the database.
- Establish database security policies and access requirements.
- Publish guidelines on sea surface transportation (shipping, etc.) and water use (fisheries) to prevent damage to transport infrastructure.

5.2 Owner/Operators

- Review the database before planning a new installation to avoid damaging existing infrastructure.

- Include the requirements of the RB in contracts with the installers.
- Require installers to conform to the requirements of ITU-T Rec. L.29.
- Conform to the requirements of ITU-T Rec. L.29 for maintenance.
- Inform the RB when the transport infrastructure is no longer in use.

5.3 Installers

- Check the database before proceeding with new installations.
- Conform to the requirements of the RB and ITU-T Rec. L.29.

5.4 Other commercial entities

These include:

- Fishing authorities;
- Vessel owners and captains;
- Military authorities;
- Offshore oil operators;
- Port authorities;
- Hydrographic offices.

All these entities are responsible for reviewing and publicly following available guidelines from the RB. Those entities that may have database access are responsible for reviewing the database before engaging in any new programs that may cause infrastructure damage, or before changing existing infrastructure.

6 Database contents

The overall database consists of four primary elements, the first two of which can be digital. The others, which may exist only in paper copy, should be organised with identification numbers which can be referenced. These are:

- Primary records;
- Activity records;
- Cable awareness charts;
- Installation and maintenance logs and reports.

The primary records are for the retention of information that does not change much with time. They include a primary ID defined with the longitude and latitude of the termination point, along with a serial number for possible multiple items at a given location. They also contain information on the owner, installer, distant termination, charts, and other descriptors. They also contain pointers to the first and last activity records, which form a linked list.

Every activity, including that of primary record initiation is reflected by an activity record. These records indicate time dependent material such as record initiation, and pointers to various reports that may occur during installation, maintenance or decommissioning. The dates and identification of the person authorizing the data entry are among the items included in these records.

NOTE – This Recommendation is applicable for the creation of digital databases to be implemented after it enters into force.

6.1 Primary record

Table 1 contains the recommended fields for the primary records.

Table 1/L.55 – Primary record fields

Description	Field	Data type	Notes
Primary ID	Longitude	number	This is the unique identification for each item of infrastructure
	Latitude	number	It is positional to allow the addition of future installations between current ones
	Serial	number	The serial number is used to distinguish between items that are so close (they have the same location)
Cable type	Primary	code	0 power line, 1 oil pipe, 2 gas pipe, 3 electrical telecom, 4 optical telecom with electricity, 5 all optical telecom
	Secondary	code	This secondary code is for local use to further differentiate types of infrastructure
Permits	Right of Way	text	These fields are provided to allow a pointer to local legal permits
	Property ID		
	Construction	text	
Owner	Name	text	If the owner is not known, enter Unknown
	Address	text	
	Telephone	number	
	Fax	number	
	email	text	
Status	InUse	binary	This is to record whether the infrastructure is out of use
	Replaced	binary	This is to record whether the infrastructure has been replaced with new
Replacement ID	longitude	number	This is a pointer to the replacement infrastructure
	latitude	number	
	Serial	number	
Installer	Name	text	If the installer is not know, enter Unknown
	Address	text	
	Telephone	number	
	Fax	number	
	email	text	

Table 1/L.55 – Primary record fields

Description	Field	Data type	Notes
Termination description	Legal address	text	Used to find the termination from the terrestrial side
	Description of the shoreline	text	
	Building present	binary	
	Description of additional protections (see ITU-T Rec. L.28)	text	
	Other	text	This can be used to document items such as close presence of other infrastructures
Cable Awareness Charts	Number referenced	number	More than one chart might be referenced
	Chart1	text	
	Chart2	text	
	Chart3	text	
	Chart4	text	
	Chart5	text	
	Chart6	text	
	Chart7	text	
Distant Termination	Distant RB name	text	If the distant RB is not known, enter Unknown
	Name	text	
	Address	text	
	Telephone	number	
	Fax	number	
	email	text	
Distant RB primary ID	Longitude	number	These can be used to identify the details associated with the distant termination point
	Latitude	number	
	Serial	number	
Activity Record	First record ID	number	This points to the first activity record
	Last record ID	number	This points to the last activity record

6.2 Activity record

Table 2 contains the recommended fields for the activity records.

Table 2/L.55 – Activity record fields

Description	Field	Data type	Notes
Source primary ID	longitude	number	All activity records need pointer to "owner"
	latitude	number	
	serial	number	
Activity pointers	Prior	number	Negative if first
	Next	number	Negative if last
Data entry data	Date	date	
	Employee	text	This could be a number for some RBs
Activity data	date	date	
	Source organization	code	0 RB, 1 owner, 2 installer
	Activity type	code	0 initiation, 1 correction/update, 2 maintenance, 3 out of use, 4 replacement/removal
	Activity summary	text	This should be a brief description
	Document ID		This should point to a complete document as the As-laid log or a survey report

7 Database initiation

Define and document the shores and waters covered by the database. Inform any related government agencies of the intent to create the database and request their assistance in enforcing reporting requirements.

7.1 Charts

Define and document the means by which the charts are organized and labelled. Gather the existing charts into this organization.

7.2 Reports and logs

Define and document the means by which the reports and logs are organized and labelled. Gather the existing reports into this organization.

7.3 Software

Create or obtain software that is suitable for efficient data-entry and extraction and that is compatible with the record field structure and the means of identifying charts and reports.

7.4 Security

Define and document the database security policy and data access requirements.

7.5 Infrastructure owners

Prepare a list of known infrastructure owners and, if possible, sublists of the individual infrastructures owned by each. Prepare a survey form that contains fields appropriate for the owners to enter the data needed for the records. Gather any existing data and pre-fill out the surveys to the best level.

Prepare a notification of the intent to create a database, along with reference to any laws of authorization and send it, along with the survey, to the known owners. Include in the notification the security policies.

7.6 Initial data

Update the database with initial data and the survey results. In many cases, the data may be incomplete. Empty fields or some missing value code can be used to note this. The decision to follow-up on missing data is for the RB.

7.7 Field survey

Field surveys, taking one sub-shore region at a time, are also a recommended means of gathering initial data. Using satellite location devices can greatly facilitate obtaining the position of observed infrastructure termination. The survey team should also be trained in the use of ITU-T Recs L.28 and L.29, as well as this Recommendation, to facilitate their work.

8 Maintenance

The proper initialization of the database should greatly facilitate its maintenance.

8.1 Charts and reports

Prepare to add or modify charts and reports. The revision of charts, in particular, should be done with care. Often, rather than modifying an existing chart, a new chart identification number should be created. The prior chart should also be marked with a "forward pointer" to the chart that replaces it and the revised chart should be marked with a "backward pointer" to the chart it replaces. This will reduce the need to update the database.

In general, reports should not be modified. Provision exists with the activity records to add new reports. At some point it may be desirable to microfilm or electronically store the reports. The design of the organization of the reports should take this into account.

8.2 Contact point

A single department should be identified as the "Owner" of the database. This department should control all new entries and serve as the principle contact. The internal procedures of this department should be documented.

Appendix I

More information and justification on the need for marine infrastructure digital databases

In the last decade, a huge number of new underwater cables have been laid all over the world which have caused, in many cases, an overcrowding of many shore approach areas.

The liberalization of markets in general (telecom, energy, gas pipeline, oil pipeline, etc.) has caused, in the above-mentioned shore areas, an increased presence of underwater cables and other services from different companies.

It is necessary to take into consideration the time and the cost associated with the necessary detailed route survey that each telecommunication and other companies have generally to perform when new cable has to be laid in shallow water areas, or when a maintenance activity has to be carried out on existing plants in the same areas.

The application of this Recommendation should consider the importance, in terms of total transmission capacity, of the new underwater cables and the necessity to reduce the time it takes to obtain permission from local authorities and to carry out the route survey, both for laying new cables and for repairs.

The existence of many old plants (i.e. decommissioned plants) whose position is not well defined suggests the necessity of carrying out a survey and mapping these areas with greater accuracy by using new survey technologies, such as Differential GPS (Global Positioning System) for positioning "cable trackers" and "pipe trackers" for submarine services detection. Certain equipment can be installed on a Remotely Operated Vehicle (R.O.V.) system, where water depth, conditions and extent of the area involved allows it.

Such a survey would allow us to know which submerged services exist, as well as being a tool to avoid overlaying and plant damages during cable burial or maintenance activities.

In order to simplify the operation related to the installation of new infrastructures (cables, gas pipeline, oil pipeline, etc.) as well as to minimize the environmental impact, it is advisable to recover cables out of service, obsolete or dismissed.

In such cases, the owners of new cable(s), in agreement with the owners of the dismissed cable(s), shall arrange for the recovery of as many such cables as possible in order to minimize future interference with other users.

Even though there are some national authorities (i.e. the most important Hydrographic Institutes) which have created a kind of cable database (at least to update the nautical charts of the country concerned), the information available often does not reflect the real situation.

Moreover, there are several countries which have no record offices and, in any case, references, sources and geodesy of the data, when available, often differ from one country to another.

Recent experiences of cable owners and installers confirm the above statements, i.e. they have found that it is impossible to get reliable information in areas of high concentration of plants originating from different countries and from several unknown owners (e.g. recently, in the Gibraltar Strait it was ascertained that neither the local nor Governmental authority, nor the Hydrographic Institutes of Spain and Morocco, nor the British Admiralty nor telecom/power companies were capable of providing the installer company with suitable and useful data (see the maps attached to Appendix I showing the problem of existing cables crossing the strait).

Therefore, in order to assist cable owners whose planned systems will cross or closely approach existing in-service cables, and owners of existing systems which may be crossed by a planned

system, it is advisable that a "Digital Database" containing updated, reliable and, whenever possible, uniform information be created for future reference.

Moreover, the availability of such a database, concerned with the sensitive issue of underwater installations, would greatly facilitate the work of the interested parties, such as cable owners, installer companies, any plant maintenance authority, etc., involved in laying/maintenance/recovering of underwater cables or other underwater plant installations. The creation of a digital database could be particularly useful for those areas in which a lot of cables or services already exist (i.e. overcrowded shore approach areas).

Besides, the availability of an updated digital database on the above matter could have a double effect:

- a) to avoid or to minimize any possible damage to existing services that could occur during laying and burial operations;
- b) to save time and money each time interventions have to be made for repairs/recovering or for surveying.

Below is a list of possible involved entities and/or recommended actions, information, and documentation that could be useful to the different organizations involved:

a) Information for the fishing authorities and for owners/captains:

Updated copies of cable warning charts, which show very clearly the position of underwater cables and the boundaries of cable protection areas, as well as information on how to contact the cable maintenance authorities for any clarification or additional information.

Such documentation can be provided by the local Hydrographic or Oceanographic Institutes or by commercial organizations. It may also be useful to provide such authorities with video material, showing the seabed and highlighting the most important problems which occurred during the laying/recovering, etc.

b) Information to other marine authorities such as:

Military authorities in order to:

- ensure that their vessels do not damage cables when anchoring;
- ensure that potentially dangerous submarine activities, such as submarine explosions/firing, etc. are avoided in submarine cable areas;
- ensure that new telecommunication cable systems, maintenance or recovery operations carried out on the existing ones, do not impact on existing military facilities or ongoing military activities.

Commercial entities, such as:

- Offshore operators;
- Oil companies, etc.

Port authorities

- which are responsible for maritime traffic corridors and ship mooring or waiting areas.

Cable maintenance authorities in order to:

- ensure regular exchange of information among cable maintenance authorities within each area.

Hydrographic offices in order to:

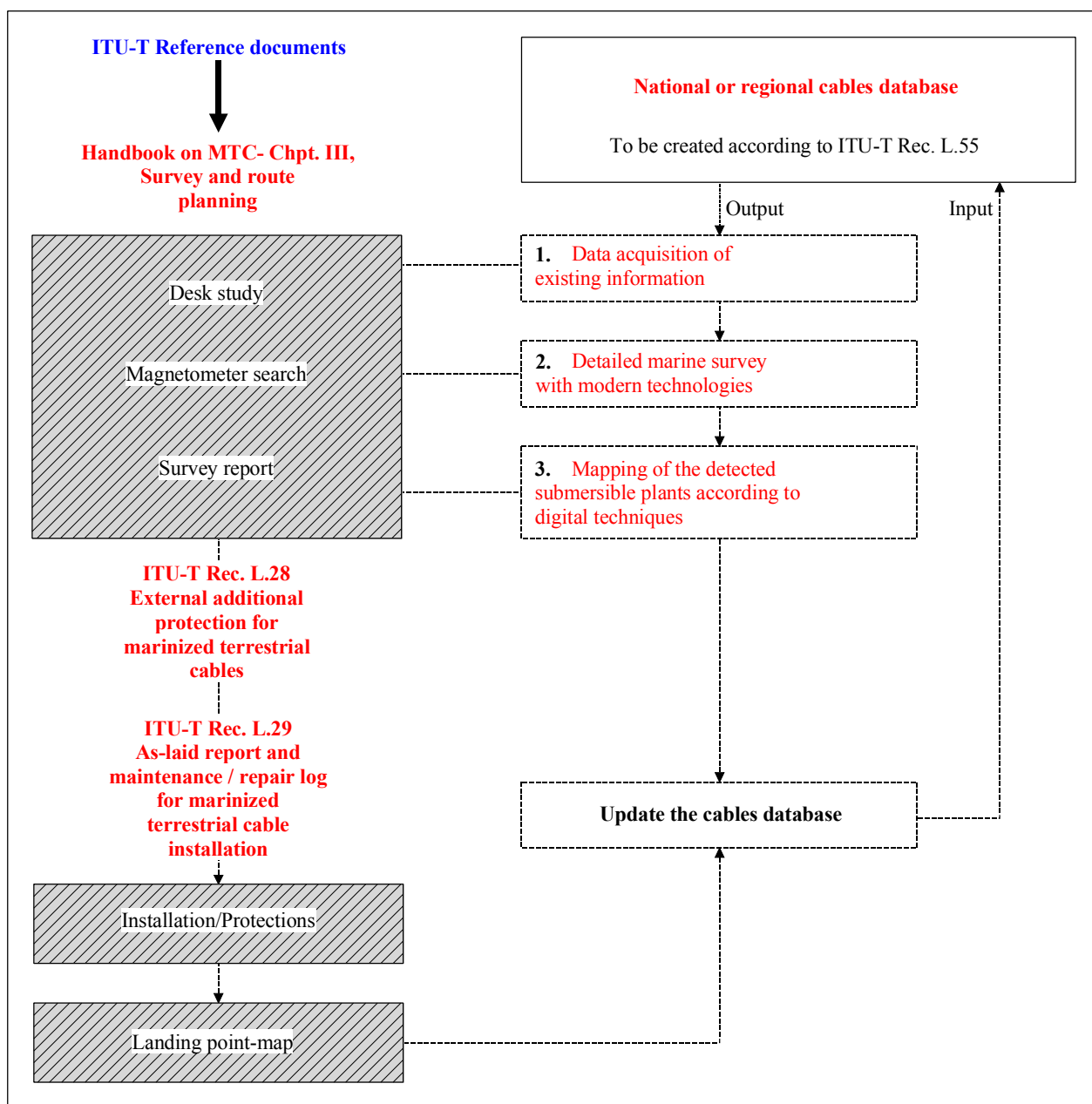
- be informed of a new cable installation and the status of existing cables for updating nautical charts.

c) **Information to terrestrial authorities, such as:**

Local authorities and environmental authorities in order to:

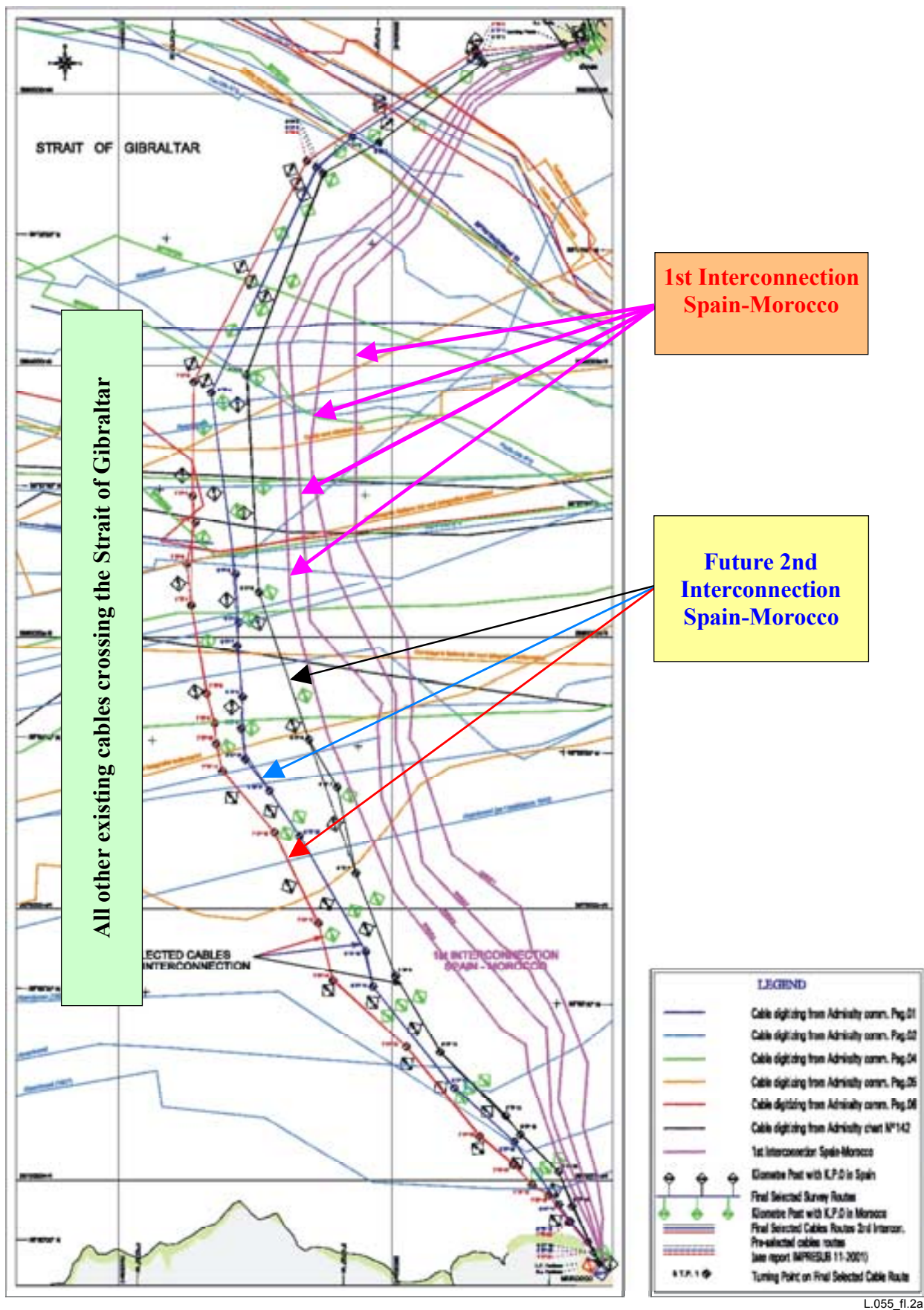
- be informed on the routes of land cables and on the location of beach joint facilities to protect cables and infrastructure from potential damage caused by future works.

In order to illustrate the information procedure and the content of such a digital database, in relationship with existing ITU-T reference documents, refer to Figure I.1.



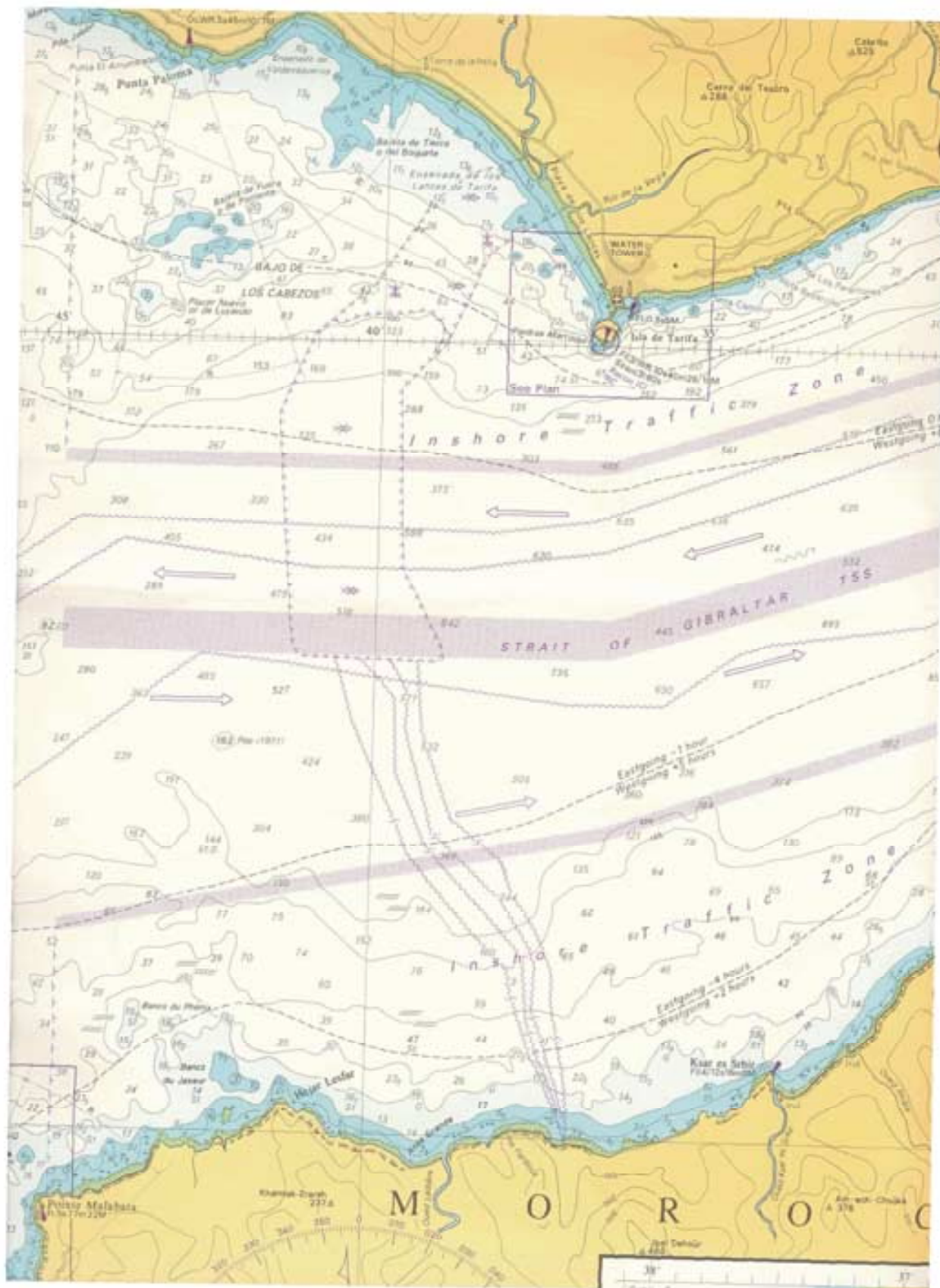
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Figure I.1/L.55 – Marine infrastructure Proposal database



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GIBRALTAR STRAIT – OLD SITUATION (Map 4)

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